NATIONAL HIGHWAYS INFRA TRUST

(Registered in the Republic of India as an irrevocable trust set up under the Indian Trusts Act, 1882, on October 19, 2020, and registered as an infrastructure investment trust under the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014, as amended, on October 28, 2020, having registration number IN/InvIT/20-21/0014. The Units of the Trust were listed on the Stock Exchanges on November 10, 2021.)

Principal Place of Business: G - 5 & 6, Sector 10, Dwarka, New Delhi – 110 075
Tel: 011 49253927 **Compliance Officer**: Smt. Gunjan Singh
E-mail: nhit@nhit.co.in; **Website**: www.nhit.co.in

SPONSOR	INVESTMENT MANAGER	TRUSTEE
NATIONAL HIGHWAYS AUTHORITY OF INDIA	NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED	IDBI TRUSTEESHIP SERVICES LIMITED

ISSUE OF [●]^ (THE "UNITS") BY WAY OF AN INSTITUTIONAL PLACEMENT TO ELIGIBLE INVESTORS, REPRESENTING AN UNDIVIDED BENEFICIAL INTEREST IN THE NATIONAL HIGHWAYS INFRA TRUST (THE "TRUST") AT A PRICE OF ₹ [●] PER UNIT ("ISSUE PRICE"), AGGREGATING TO [●] MILLION BY THE TRUST (THE "ISSUE"). THE FLOOR PRICE IS ₹ 133 PER UNIT*. EACH BIDDER MUST MAKE A BID AT OR ABOVE THE FLOOR PRICE. BIDS BELOW THE SPECIFIED FLOOR PRICE, ARE LIABLE TO BE REJECTED.

^ THE IM BOARD BY WAY OF ITS RESOLUTION DATED FEBRUARY 5, 2025 AND THE UNITHOLDERS OF THE TRUST BY WAY OF THEIR RESOLUTION DATED MARCH 10, 2025 HAVE APPROVED THE ISSUE AT OR ABOVE THE BASE PRICE OF ₹ 131.94 PER UNIT.

****AS APPROVED BY THE IM BOARD BY WAY OF ITS RESOLUTION DATED MARCH 17, 2025.***

THE ISSUE, AND THE DISTRIBUTION OF THIS PRELIMINARY PLACEMENT DOCUMENT AND THE PLACEMENT DOCUMENT, WILL BE MADE ONLY TO ELIGIBLE INVESTORS IN RELIANCE UPON CHAPTER 7 ON '*GUIDELINES FOR PREFERENTIAL ISSUE AND INSTITUTIONAL PLACEMENT OF UNITS BY LISTED INVITS*' OF SEBI MASTER CIRCULAR NO. SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 DATED MAY 15, 2024, AS AMENDED FROM TIME TO TIME ("SEBI INSTITUTIONAL PLACEMENT GUIDELINES") AND THE SECURITIES AND EXCHANGE BOARD OF INDIA (INFRASTRUCTURE INVESTMENT TRUSTS) REGULATIONS, 2014, AS AMENDED FROM TIME TO TIME ("INVIT REGULATIONS"). NO OFFER IS BEING MADE TO THE PUBLIC OR ANY OTHER CLASS OF INVESTORS.

The Units of the Trust are proposed to be listed on National Stock Exchange of India Limited ("**NSE**") and BSE Limited ("**BSE**" and together with NSE, the "**Stock Exchanges**"). The Trust has received in-principle approval from NSE and BSE for listing of the Units pursuant to letters, each dated March 17, 2025. Applications shall be made to the Stock Exchanges for obtaining the final listing and trading approvals for the Units to be Allotted pursuant to the Issue. The Stock Exchanges assume no responsibility for the correctness of any statements made, opinions expressed or reports contained herein. Admission of the Units to be Allotted pursuant to the Issue for trading on the Stock Exchanges should not be taken as an indication of the merits of the Trust or of the Units. A copy of this Preliminary Placement Document has been, and a copy of the Placement Document will be delivered to NSE and BSE.

The Issue Price, should not be taken to be indicative of the market price of the Units after the Units are listed. No assurance can be given regarding an active or sustained market for trading in the Units or regarding the price at which the Units will be traded after listing. This Preliminary Placement Document has not been, and will not be, registered as a prospectus, will not be circulated or distributed to the public at large in India or any other jurisdiction, and will not constitute a public offer in India or any other jurisdiction.

The Units have not been and will not be registered under the United States Securities Act of 1933, as amended ("**Securities Act**") and may not be offered or sold within the United States except pursuant to an exemption from, or in a transaction not subject to, the registration requirements of the Securities Act and applicable U.S. state securities laws. Accordingly, the Units are only being offered and sold outside the United States in "offshore transactions" as defined in, and in reliance on, Regulation S under the Securities Act ("**Regulation S**") and the applicable law of the jurisdictions where such offers and sales occur. The Units are transferable only in accordance with the restrictions described under the section entitled *"Selling and Transfer Restrictions"* on page 430 of this Preliminary Placement Document.

THIS PRELIMINARY PLACEMENT DOCUMENT WILL BE PERSONAL TO EACH ELIGIBLE INVESTOR. THIS PRELIMINARY PLACEMENT DOCUMENT HAS BEEN PREPARED BY THE TRUST SOLELY FOR PROVIDING INFORMATION IN CONNECTION WITH THE ISSUE. YOU MAY NOT, AND ARE NOT AUTHORIZED TO, (1) DELIVER THIS PRELIMINARY PLACEMENT DOCUMENT TO ANY OTHER PERSON; OR (2) REPRODUCE THIS PRELIMINARY PLACEMENT DOCUMENT IN ANY MANNER WHATSOEVER. ANY DISTRIBUTION OR REPRODUCTION OF THIS PRELIMINARY PLACEMENT DOCUMENT, IN WHOLE OR IN PART, IS UNAUTHORIZED. FAILURE TO COMPLY WITH THIS INSTRUCTION MAY RESULT IN A VIOLATION OF THE SECURITIES AND EXCHANGE BOARD OF INDIA (INFRASTRUCTURE INVESTMENT TRUSTS) REGULATIONS, 2014, AS AMENDED OR OTHER APPLICABLE LAWS OF INDIA AND OF OTHER JURISDICTIONS.

INVESTMENTS IN UNITS INVOLVE RISKS AND INVESTORS SHOULD NOT INVEST ANY FUNDS IN THE ISSUE UNLESS THEY CAN AFFORD TO TAKE THE RISK OF LOSING THEIR ENTIRE INVESTMENT. IN MAKING AN INVESTMENT DECISION, INVESTORS MUST RELY ON THEIR OWN EXAMINATION OF THE TRUST, THE UNITS, THE ISSUE, AND THE PLACEMENT DOCUMENT, INCLUDING THE RISKS INVOLVED. INVESTORS ARE ADVISED TO CAREFULLY READ THIS PRELIMINARY PLACEMENT DOCUMENT, INCLUDING THE SECTION ENTITLED "*RISK FACTORS*" ON PAGE 43 BEFORE MAKING AN INVESTMENT DECISION. EACH ELIGIBLE INVESTOR IS ADVISED TO CONSULT ITS OWN ADVISORS, ABOUT THE CONSEQUENCES OF AN INVESTMENT IN THE UNITS BEING ISSUED PURSUANT TO THIS PRELIMINARY PLACEMENT DOCUMENT AND THE PLACEMENT DOCUMENT.

Unless a serially numbered Preliminary Placement Document along with an Application Form is addressed to a particular Eligible Investor, no invitation to offer shall be deemed to have been made to such Eligible Investor to make an offer to subscribe to Units pursuant to the Issue. For further details, please see the section entitled "*Issue Procedure*" on page 441. The distribution of this Preliminary Placement Document or the Placement Document or the disclosure of its contents without the Trustee's or Investment Manager's prior consent, to any person, is unauthorized and prohibited.

Each addressee, by accepting delivery of this Preliminary Placement Document, agrees to observe the foregoing restrictions and shall make no copies of this Preliminary Placement Document or any documents referred to in this Preliminary Placement Document.

LEAD MANAGERS				REGISTRAR AND UNIT TRANSFER AGENT
SBI CAPITAL MARKETS LIMITED 1501, 15th Floor, A & B Wing Parinee Crescenzo Building, G Block Bandra Kurla Complex, Bandra (East) Mumbai 400 051 **Tel:** +91 22 4196 8300 **E-mail:** project.ascent@sbicaps.com **Investor Grievance E-mail:** investor.relations@sbicaps.com **Contact Person:** Mandeep Singh **Website:** www.sbicaps.com **SEBI Registration Number:** INM000003531	**AXIS CAPITAL LIMITED** 1st Floor, Axis House Pandurang Budhkar Marg, Worli Mumbai 400 025 Maharashtra, India **Tel**: +91 22 4325 2183 **E-mail**: nhaiinvit@axiscap.in **Investor Grievance E-mail**: compliants@axiscap.com **Contact Person**: Harish Patel **Website**: www.axiscapital.co.in **SEBI Registration Number**: INM000012029	**HDFC BANK LIMITED** **Address:** Investment Banking Group, Unit no. 701, 702 and 702-A, 7th floor, Tower 2 and 3, One International Centre, Senapati Bapat Marg, Prabhadevi, Mumbai – 400013 **Tel:** +91 22 3395 8233 **E-mail:** nhitinvit@hdfcbank.com **Investor Grievance E-mail:** Investor.redressal@hdfcbank.com **Contact Person:** Bharti Ranga/ Souradeep Ghosh **Website:** www.hdfcbank.com **SEBI Registration Number:** INM000011252	**ICICI SECURITIES LIMITED** ICICI Venture House, Appasaheb Marathe Marg, Prabhadevi, Mumbai 400 025, Maharashtra, India **Tel**: +91 22 6807 7100 **E-mail**: nhitinvit@icicisecurities.com **Investor Grievance E-mail**: customercare@icicisecurities.com **Contact Person**: Aboli Pitre/ Sumit Singh **Website**: www.icicisecurities.com **SEBI Registration Number**: INM000011179	**KFIN TECHNOLOGIES LIMITED** Selenium, Tower B Plot No- 31 and 32, Financial District Nanakramguda, Serilingampally Hyderabad, Rangareddy 500 032 Telangana, India **Tel.**: +91 18003094001/ +91 406716 2222 **E-mail**: nhit.invit @kfintech.com **Investor Grievance E-mail**: einward.ris@kfintech.com **Website**: www.kfintech.com **Contact Person**: M. Murali Krishna **SEBI Registration No.**: INR000000221

This Preliminary Placement Document is dated March 17, 2025.

The information in this Preliminary Placement Document is not complete and may be changed. The Issue is meant only for Eligible Investors on an institutional placement basis and is not an offer to the public or to any other class of investors to purchase the Units. This Preliminary Placement Document is not an offer to sell any Units and is not soliciting an offer to subscribe for or buy the Units in any jurisdiction where such offer or sale is not permitted. It is being issued for the sole purpose of information or discussion relating to the Units that may be Allotted through the Placement Document .

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NOTICE TO INVESTORS

The statements contained in this Preliminary Placement Document relating to the Trust and the Units are, in all material respects, true and accurate and not misleading, and the opinions and intentions expressed in this Preliminary Placement Document with regard to the Trust and the Units are honestly held, have been reached after considering all relevant circumstances and are based on reasonable assumptions and information presently available to the Investment Manager. There are no material facts in relation to the Trust and the Units, the omission of which would, in the context of the Issue, make any statement in this Preliminary Placement Document misleading in any material respect. Further, the Investment Manager has made all reasonable enquiries to ascertain such facts and to verify the accuracy of all such information and statements.

Each Bidder must rely on his/her own examination of the Trust and the merits and risks involved in investing in the Units. Bidders should not construe the contents of this Preliminary Placement Document as legal, business, tax, accounting or investment advice.

No person is authorized to give any information or to make any representation not contained in this Preliminary Placement Document and any information or representation not so contained must not be relied upon as having been authorized by or on behalf of the Trust or by or on behalf of the Lead Managers. The delivery of this Preliminary Placement Document, at any time, does not imply that the information contained in it is correct as of any time subsequent to its date.

Certain U.S. Matters

The Units to be issued pursuant to the Issue have not been approved, disapproved or recommended by any regulatory authority in any jurisdiction, including the United States Securities and Exchange Commission ("**SEC**"), any other federal or state authorities in the United States, the securities authorities of any non-United States jurisdiction or any other United States or non-United States regulatory authority. No authority has passed on or endorsed the merits of the Issue or the accuracy or adequacy of this Preliminary Placement Document. Any representation to the contrary is a criminal offence in the United States and may be a criminal offence in other jurisdictions.

The Units have not been and will not be registered under the Securities Act and may not be offered or sold within the United States except pursuant to an exemption from, or in a transaction not subject to, the registration requirements of the Securities Act and applicable state securities laws. Accordingly, the Units are only being offered and sold outside the United States in "offshore transactions" as defined in, and in reliance on, Regulation S and the applicable laws of the jurisdictions where those offer and sales occur. The Units are transferable only in accordance with the restrictions described under the section "*Selling and Transfer Restrictions*" on page 430 of this Preliminary Placement Document.

Each purchaser of the Units offered by the Placement Document will be deemed to have made the representations, agreements and acknowledgments as described in this section titled "*Notice to Investors – Representations by Eligible Investors*" on page 1 and in the section entitled "*Selling and Transfer Restrictions*" on page 430.

Notice to Investors in certain other jurisdictions

The distribution of this Preliminary Placement Document and the issue of the Units in certain jurisdictions may be restricted by law. As such, this Preliminary Placement Document does not constitute, and may not be used for, or in connection with, an offer or solicitation by anyone in any jurisdiction in which such offer or solicitation is not authorized or to any person to whom it is unlawful to make such offer or solicitation. In particular, no action has been taken by the Sponsor Group, Investment Manager or the Lead Managers which would permit an Issue of the Units or distribution of this Preliminary Placement Document in any jurisdiction, other than India. Accordingly, the Units may not be offered or sold, directly or indirectly, and neither this Preliminary Placement Document nor any Issue materials in connection with the Units be distributed or published in or from any country or jurisdiction that would require registration of the Units in such country or jurisdiction. For details, please see the section entitled "*Selling and Transfer Restrictions*" on page 430 .

Representations by Eligible Investors

References herein to "you" or "your" is to each Eligible Investor in the Issue.

By purchasing, or subscribing to, Units pursuant to the Issue, you are deemed to have represented to the Trustee, the Investment Manager and the Lead Managers, and acknowledge and agree as follows:

(1) You are entitled to acquire the Units under the laws of all relevant jurisdictions and that you have all necessary capacity and have obtained all necessary consents, governmental or otherwise and authorisations to enable you to commit to this participation in the Issue and to perform your obligations in relation thereto (including, without limitation, in the case of any person on whose behalf you are acting, all necessary consents and authorisations to agree to the terms set out or referred to in this Preliminary Placement Document) and will honour such obligations;

(2) You undertake to (i) hold, manage or dispose of any Units that are Allotted to you in accordance with the InvIT Regulations and all other applicable laws; and (ii) to comply with all requirements under applicable law in relation to reporting obligations, if any, in this relation;

(3) You will make all necessary filings, in relation to the Issue and your investment in Units, with appropriate governmental, statutory or regulatory authorities, including the RBI, as may be required, in accordance with applicable law, including in your respective jurisdiction;

(4) You agree to provide on request in a timely manner, and consent to the use and disclosure (including to any taxation or other regulatory authorities) of, any information or documentation in relation to yourself and, if and to the extent required, the direct or indirect beneficial ownership of your Units (if any), as may be necessary for the Trust (or the Trustee and its agents) and the Investment Manager to comply with any regulatory obligations and/or prevent the withholding of tax or other penalties under FATCA, the CRS or other similar exchange of tax information regimes. You acknowledge and agree that you shall have no claim against the Trust (or the Trustee and its agents) and the Investment Manager for any losses suffered by you (including in relation to the direct or indirect beneficial ownership of your Units (if any)) as a result of such use or disclosure of such information or documentation to, any relevant regulatory, governmental or statutory authority;

(5) You are aware that the Units have not been, and will not be, registered through a prospectus under the InvIT Regulations, or under any other law in force in India. This Preliminary Placement Document and the Placement Document will be submitted to the Stock Exchanges;

(6) You confirm that, either: (i) you have not participated in or attended any investor meetings or presentations by the Trust, or its agents ("**Presentations**") with regard to the Trust, the Units or the Issue; or (ii) if you have participated in or attended any Presentations, you understand and acknowledge that the Lead Managers or the Trustee may not have knowledge of the statements that the Trust, or its agents may have made at such Presentations and are therefore unable to determine whether the information provided to you at such Presentations may have included any material misstatements or omissions, and, accordingly you acknowledge that the Lead Managers, the Trustee (or its agents) or the Investment Manager have advised you not to rely in any way on any information that was provided to you at such Presentations;

(7) None of the Investment Manager, the Trustee or any of the Lead Managers or any of their respective shareholders, members, directors, officers, employees, counsel, representatives, agents or affiliates is making any recommendations to you or advising you regarding the suitability of any transactions it may enter into in connection with the Issue and that participation in the Issue is on the basis that you are not and will not, up to the Allotment, be a client of the Lead Managers;. None of the Investment Manager or any of their respective shareholders, members, employees, counsel, officers, directors, representatives, agents or affiliates have any duties or responsibilities to you for providing the protection afforded to their clients, or for providing advice in relation to the Issue and are in no way acting in a fiduciary capacity towards you;

(8) All statements, other than statements of historical fact included in this Preliminary Placement Document, including, without limitation, those regarding the Trust's financial position, business strategy, plans and objectives for future operations, the Investment Objectives, are forward-looking statements. Such forward-looking statements involve known and unknown risks, uncertainties and other important factors that could cause actual results to be materially different from future results, performance or achievements expressed or implied by such forward-looking statements. Such forward-looking statements are based on numerous assumptions regarding the Trust's present and future business strategies and the environment in which the Trust will operate in the future. You should not place undue reliance on forward-looking statements, which speak only as of the date of this Preliminary Placement Document. The Trust the Investment Manager or any of their respective shareholders, members, directors, officers, employees, counsel, representatives, agents, associates or affiliates assume no responsibility to update any of the forward-looking statements contained in this Preliminary Placement Document;

(9) You have been provided a serially numbered copy of the Preliminary Placement Document and will be deemed to have read the Preliminary Placement Document in its entirety, including, in particular, the section entitled "*Risk Factors*" on page 43 ;

(10) You are aware and understand that the Units are being issued only to Eligible Investors and are not being offered to the general public and the Allotment shall be on a discretionary basis;

(11) You have made, or are deemed to have made, as applicable, the representations provided in the section entitled "*Selling and Transfer Restrictions*" on page 430 ;

(12) You (i) are not acquiring or subscribing for the Units as a result of any "directed selling efforts" (as defined in Regulation S) and (ii) are acquiring or subscribing for the Units in an "offshore transaction" as defined in, and in reliance on, Regulation S, and are not an affiliate of the Trust or the Lead Managers or a person acting on behalf of such an affiliate;

(13) You understand and agree that the Units are transferable only in accordance with the restrictions described in the section entitled "*Selling and Transfer Restrictions*" on page 430, and you warrant that you will comply with such restrictions;

(14) In making your investment decision, you have (i) relied on your own examination of the Trust, the Units and the terms of the Issue, including the merits and risks involved, (ii) made and will continue to make your own assessment of the Trust, the Units and the terms of the Issue based solely on the information contained in the Placement Document, (iii) consulted your own independent advisors or otherwise have satisfied yourself concerning, without limitation, the effects of local laws, (iv) relied solely on the information contained in the Placement Document and no other disclosure or representation by the Investment Manager or the Lead Managers or any other party; (v) received all information in the Placement Document that you believe is necessary or appropriate in order to make an investment decision in respect of the Trust and the Units, and (vi) relied upon your own investigation in deciding to invest in the Issue;

(15) You have such knowledge and experience in financial, business and investment matters as to be capable of evaluating the merits and risks of an investment in the Units. You and any accounts for which you are subscribing to the Units, (i) are each able to bear the economic risk of the investment in the Units; (ii) will not, subject to the terms of the Placement Document, look to any of the Investment Manager, the Trustee, or the Lead Managers or any of their respective shareholders, members, employees, counsel, officers, directors, representatives, agents or affiliates for all, or part, of any such loss or losses that may be suffered due to your investment in the Units; (iii) are able to sustain a complete loss on the investment in the Units; (iv) have no need for immediate liquidity with respect to the investment in the Units, and (v) have no reason to anticipate any change in your or their circumstances, financial or otherwise, which may cause or require any sale or distribution by you or them of all or any part of the Units. You acknowledge that an investment in the Units involves a high degree of risk and that the Units are, therefore, a speculative investment. You are seeking to subscribe to the Units in the Issue for your own investment and not with a view to resell or distribute in any manner that could characterise you as an underwriter or similar party in any jurisdiction;

(16) The Trustee, the Investment Manager, the Lead Managers or any of their respective shareholders, members, directors, officers, employees, counsel, representatives, agents or affiliates have not provided you with any legal, financial or tax advice or otherwise made any representations regarding the tax consequences of the Units (including but not limited to, the Issue and the use of the proceeds of the Issue). You will obtain your own independent legal, financial or tax advice and will not rely on the Investment Manager, the Trustee, the Lead Managers or any of their respective shareholders, members, employees, counsel, officers, directors, representatives, agents or affiliates or the Investment Manager when evaluating the tax consequences in relation to the Units (including but not limited to the Issue and the use of the proceeds of the Issue). You waive and agree not to assert any claim against the Lead Managers, the Trustee or the Investment Manager with respect to the tax aspects of the Units or the Issue or as a result of any tax audits by tax authorities, in relation to the Units and the Issue, wherever situated;

(17) You are not the Trustee, or the Valuer or an employee of the Valuer involved in the valuation of the Project SPVs;

(18) You are aware that (i) we have received the in-principle approval from NSE dated March 17, 2025, and the in-principle approval from BSE dated March 17, 2025, respectively, and (ii) the application for the final listing and trading approvals will be made only after Allotment. There can be no assurance that the final approvals for listing and trading of the Units will be obtained in a timely manner, or at all. The Trust, the Trustee and the Investment Manager shall not be responsible for any delay or non-receipt of such final approvals (except to the extent prescribed under the InvIT Regulations) or any loss arising from such delay or non-receipt;

(19) You shall not undertake any trade in the Units credited to your demat account until such time that the final listing and trading approvals for the Units have been issued by the Stock Exchanges, subject to compliance with applicable law;

(20) The only information you are entitled to rely on, and on which you have relied, in committing yourself to acquire the Units, shall be contained in this Preliminary Placement Document and the Placement Document, such information being all that you deem necessary to make an investment decision in respect of the Units and that you have neither received nor relied on any other information given or representations, warranties or statements made by the Investment Manager, and neither the Investment Manager will be liable for your decision to accept an invitation to participate in the Issue based on any other information, representation, warranty or statement that you have obtained or received;

(21) You understand that the Units to be Allotted in this Issue will, when issued, be credited as fully paid and will rank *pari passu* in all respects with all other Units, including in respect of the right to receive all distributions declared, made or paid in respect of the Units after the Allotment. For details, please see the section entitled "*Distribution*" on page 393;

(22) You are eligible to Bid for, and hold, Units, so Allotted. Your unitholding after the Allotment of the Units shall not exceed the investment level permissible as per any applicable law and regulation;

(23) You agree to indemnify and hold the Trustee, Investment Manager, and the Lead Managers harmless from any and all costs, claims, liabilities and expenses (including legal fees and expenses) arising out of or in connection with any breach of the representations and warranties in this section;

(24) The Trustee, the Investment Manager, the Lead Managers, their respective shareholders, members, employees, counsel, offices, directors, representatives, agents or affiliates, will rely on the truth and accuracy of the foregoing representations, warranties, acknowledgements and undertakings which are given to the Lead Managers on their own behalf and on behalf of the Trust, the Investment Manager, the Trustee, and the same are irrevocable;

(25) You are eligible to invest in India and in the Units under applicable law, including the FEMA Rules, and have not been prohibited by SEBI or any other statutory, regulatory or judicial authority from buying, selling or dealing in securities;

(26) You understand that, subject to the terms of this Preliminary Placement Document and the Placement Document, neither the Lead Managers, the Investment Manager nor the Trustee has any obligation to purchase or subscribe to all, or any part, of the Units purchased by you in the Issue, or to support any losses directly or indirectly sustained or incurred by you for any reason whatsoever in connection with the Issue;

(27) Any dispute arising in connection with the Issue will be governed by, and construed in accordance with, the laws of the Republic of India and the courts at New Delhi shall have exclusive jurisdiction to settle any disputes which may arise out of or in connection with this Preliminary Placement Document or the Placement Document; and

(28) You have made, or are deemed to have made, as applicable, the representations provided in this section and each of the representations, warranties, acknowledgements and agreements set out above shall continue to be true and accurate at all times, up to, and including, the Allotment, listing and trading of the Units in the Issue.

Available Information

The Investment Manager agrees to comply with any undertakings given by it from time to time in connection with the Units to the Stock Exchanges and, without prejudice to the generality of foregoing, shall furnish to the Stock Exchanges all such information as the rules of the Stock Exchanges may require in connection with the listing of the Units on such Stock Exchanges.

IMPORTANT NOTICE

THE VALUE OF UNITS AND THE INCOME DERIVED FROM THEM MAY FALL AS WELL AS RISE. UNITS ARE NOT OBLIGATIONS OF, DEPOSITS IN, OR GUARANTEED BY, THE TRUST, THE TRUSTEE, THE INVESTMENT MANAGER, THE LEAD MANAGERS OR ANY OF THEIR RESPECTIVE SHAREHOLDERS, MEMBERS, EMPLOYEES, COUNSEL, OFFICERS, DIRECTORS, MEMBERS, REPRESENTATIVES, AGENTS, ASSOCIATES OR AFFILIATES. AN INVESTMENT IN UNITS IS SUBJECT TO INVESTMENT RISKS, INCLUDING THE POSSIBLE LOSS OF THE PRINCIPAL AMOUNT INVESTED. FURTHER, LISTING OF THE UNITS ON THE STOCK EXCHANGES DOES NOT GUARANTEE A LIQUID MARKET FOR THE UNITS. INVESTORS HAVE NO RIGHT TO REQUEST THE TRUST, THE TRUSTEE, THE SPONSOR OR THE INVESTMENT MANAGER OR ANY OF ITS SHAREHOLDERS, MEMBERS, EMPLOYEES, COUNSEL, OFFICERS, DIRECTORS, MEMBERS, REPRESENTATIVES, AGENTS, ASSOCIATES OR AFFILIATES TO REDEEM THEIR UNITS WHILE THE UNITS ARE LISTED, UNLESS OTHERWISE PERMITTED BY APPLICABLE LAW. THE PERFORMANCE OF ANY OF THE LISTED UNITS OF THE TRUST IS NOT NECESSARILY INDICATIVE OF THE FUTURE PERFORMANCE OF UNITS OF THE TRUST.

DEFINITIONS AND ABBREVIATIONS

This Preliminary Placement Document uses the definitions and abbreviations set forth below which you should consider when reading the information contained herein.

References to any legislation, act, regulations, rules, guidelines, circulars, notifications, clarifications or policies shall be to such legislation, act, regulations, rules, guidelines, circulars, notifications, clarifications or policies as amended, supplemented, or re-enacted from time to time and any reference to a statutory provision shall include any subordinate legislation made under that provision.

The words and expressions used in this Preliminary Placement Document, but not defined herein shall have the meaning ascribed to such terms under the InvIT Regulations, SEBI Institutional Placement Guidelines, the SEBI Act, the Depositories Act, and the rules and regulations made thereunder.

Notwithstanding the foregoing, the terms not defined but used in the Annexure A entitled "Audited Financial Information", and the section entitled "Taxation" and "Legal and other Information" on pages 451 and 408, respectively, shall have the meanings ascribed to such terms in those respective sections.

In this Preliminary Placement Document, unless the context otherwise requires, a reference to "we", "us" and "our" refers to the Trust and the Project SPVs on a consolidated basis.

Trust Related Terms

Term	Description
A&F Policy	The Asset acquisition and unit funding policy adopted by the Investment Manager pursuant to the resolution of the IM Board dated September 30, 2021.
Abu Road - Swaroopganj Project	The Abu Road – Swaroopganj section of NH 27 with a total length of 31.00 kms, in the state of Rajasthan
Additional Concession Agreements	The R4 Concession Agreements
Agra Bypass Project	Agra Bypass section with a total length of 32.80 kms, connecting NH19 (old NH2) to NH44 (old NH7) in Uttar Pradesh
Amended and Restated Project Implementation and Management Agreement	Amended and Restated Project Implementation and Management agreement dated March 7, 2024, entered into amongst the Trustee (on behalf of the Trust), the Project Manager, the Investment Manager and NWPPL read with the Deed of Adherence as executed from time to time.
Anandapuram – Pendurthi – Anakapalle Project	Anandapuram-Pendurthi-Anakapalle section of NH-16 with a total length of 48.605 kms in the state of Andhra Pradesh.
Appointed Date	In relation to (i) the R1 Toll Roads is the date on which all conditions precedent (as specified in the relevant concession agreement) have been satisfied, being, December 16, 2021; (ii) the R2 Toll Roads is the date on which all conditions precedent (as specified in the relevant concession agreement) have been satisfied, being, October 29, 2022; (iii) the R3 Toll Roads shall be the date on which all conditions precedent (as specified in the relevant concession agreement) have been satisfied being April 1, 2024; and (iv) the Target Toll Roads shall be the date on which all conditions precedent (as specified in the relevant concession agreement) will be satisfied.
Asset Revenue Information	Revenue data of the InvIT Assets as has been historically collected through toll collection and maintenance contracts and based on actual toll collections, for the financial years ended March 31, 2024, March 31, 2023, and March 31, 2022, and for the period from April 1, 2024 to February 28, 2025.
Associate	Associate shall have the meaning set forth in Regulation 2(1)(b) of the InvIT Regulations. Since (i) the Sponsor is a body corporate whose capital is funded by the Central Government and members are appointed and executive decisions taken by the President of India (acting through the Department of Personnel and Training and MoRTH), and (ii) the President of India is the Promoter of the Investment Manager, persons or entities that may be classified as "associates" of the Sponsor and Investment Manager in terms of Regulation 2(1)(b)(ii) and Regulation 2(1)(b)(iii) of the InvIT Regulations, have not been identified as 'associates' of the Sponsor and the Investment Manager. Further, since the Project Manager is a wholly-owned subsidiary of the Sponsor, it has not been identified as 'associates' of the Sponsor and the Investment Manager.
Audit Committee	The audit committee of the Investment Manager constituted in accordance with the InvIT Regulations
Audited Financial Information	Audited consolidated financial statements of the Trust as of and for the year ended March 31, 2022, March 31, 2023, March 31, 2024 and the six months period ended September 30, 2024 and notes and other explanatory statements provided thereto, prepared in accordance with Ind AS.
Auditors	The statutory auditors of the Trust, i.e., A.R. & Co., Chartered Accountants
Bareilly – Sitapur Project	Bareilly - Sitapur Section of NH-30 (Old NH-24) with a total length of 157.590 Km in the State of Uttar Pradesh.

Term	Description
Base Concession Fee	Base Concession Fee is the aggregate of concession fees payable to NHAI in terms of the Additional Concession Agreements
Borkhedi - Kelapur Project	Borkhedi-Kelapur-Maharashtra/Telangana border stretch of NH44 (old NH7) with a total length of 138.15 kms, in the state of Maharashtra
Borrowing Policy	The borrowing policy of the Trust adopted by the Investment Manager pursuant to a resolution of the IM Board dated February 3, 2021, as amended pursuant to the resolution of the IM Board dated September 27, 2021, and as amended from time to time.
Chichra – Kharagpur Project	Chichra – Kharagpur Road stretch on NH-49 with a total length of 56.12 kms, in the state of West Bengal.
Chitradurga Bypass - Hubli Project/ Karnataka Project	Chitradurga Bypass - Chitradurga - Davanagere - Haveri – Hubli road stretch on NH- 48 with a total length of 214.47 kms, in the state of Karnataka
Chittoor to Mallavaram Project	Chittoor to Mallavaram section of NH-140 with a total length of 61.128 kms in the state of Andhra Pradesh;
Chittorgarh – Kota and Chittorgarh Bypass Project	Chittorgarh – Kota section of NH 27 with a total length of 160.50 kms, in the state of Rajasthan
Compliance Officer	The compliance officer of the Trust namely Gunjan Singh. For further details, please see the section titled "*General Information – Compliance Officer of the Trust*" on page 70.
Concession Agreements	Collectively, the R1 Concession Agreements, R2 Concession Agreements, R3 Concession Agreements and the R4 Concession Agreements
Concessionaires	The Project SPVs
Distribution Policy	The distribution policy adopted by the Investment Manager pursuant to a resolution of its board of directors dated March 4, 2024, as amended from time to time.
Existing Toll Roads	Collectively, the R1 Toll Roads, R2 Toll Roads and R3 Toll Roads
Gandhidham (Kandla) to Mundra Port Project	Gandhidham (Kandla) to Mundra Port section of NH-41 with a total length of 71.400 kms in the State of Gujarat
Gundugolanu-Devarapalli-Kovvuru Project	Gundugolanu-Devarapalli-Kovvuru section of NH-16 with a total length of 69.884 kms in the state of Andhra Pradesh.
IM Board	The board of directors of the Investment Manager
Initial Concession Agreements	Collectively, the R1 Concession Agreements, R2 Concession Agreements and R3 Concession Agreements
Investment Management Agreement	Investment management agreement dated October 21, 2020, entered into between the Trustee (on behalf of the Trust) and the Investment Manager, as amended on December 22, 2023 and February 2, 2024 and from time to time.
Investment Manager or NHIIMPL	National Highways Infra Investment Managers Private Limited
Investment Objectives	The investment objectives of the Trust, as provided under the section entitled "*Overview of the Trust*" on page 28
InvIT Assets	InvIT assets as defined in Regulation 2(1) (zb) of the InvIT Regulations, in this case being the concessions granted under the Concession Agreements, in respect of the R1 Toll Roads, R2 Toll Roads, R3 Toll Roads and the Target Toll Roads
InvIT Documents	Collectively, (i) The Trust Deed; (ii) the Investment Management Agreement; (iii) the Amended and Restated Project Implementation and Management Agreement; and (iv) such other policies, documents, agreements and letters executed in connection with the Trust, as originally executed and amended, modified, supplemented or restated from time to time, together with the respective annexures, schedules and exhibits, if any, as amended from time to time.
Kachugaon - Kaljhar Project	Kachugaon - Rakhaldubi Bus Junction - Kaljhar section of NH 27 with a total length of 114.17 kms, in the state of Assam
Kaljhar - Patacharkuchi Project	Kaljhar - Patacharkuchi section of NH 27 with a total length of 27.30 kms, in the state of Assam
Kothakota Bypass – Kurnool Project	The Kothakota bypass – Kurnool section of NH 44 with a total length of 74.6 kms, connecting the states of Telangana to Andhra Pradesh.
Lakhnadon – Mahagaon (Mohgaon) – Khawasa Project	Lakhnadon – Mahagaon (Mohgaon) – Khawasa section of NH 44 with a total length of 107.35 kms, in the state of Madhya Pradesh
Maharashtra/Karnataka Border (Kagal) – Belgaum Project	The Belgaum – Kagal section of NH 48 with a total length of 77.7 kms, connecting the states of Karnataka and Maharashtra
Muzaffarnagar – Haridwar Project	Muzaffarnagar to Haridwar section of Old NH 58 (New NH-334) with a total length of 78.56 kms in the State of Uttar Pradesh & Uttarakhand.
Narasannapeta to Ranasthalam	Narasannapeta to Ranasthalam section of NH-16 with a total length of 53.799 kms in the state of Andhra Pradesh

Term	Description
NEPPL	NHIT Eastern Projects Private Limited
NEPPL Concession Agreements	The R3 Concession Agreements
NEPPL Facility Agreements	The facility agreement dated March 12, 2024 entered into between the Trust (acting through the Trustee), the Trustee, the Investment Manager and NEPPL.
NHAI	National Highways Authority of India
NSPPL	NHIT Southern Projects Private Limited
NSPPL Concession Agreements	The R4 Concession Agreements
NSPPL Facility Agreements	The facility agreement to be entered into between the Trust (acting through the Trustee), the Trustee, the Investment Manager and NSPPL.
NWPPL	NHIT Western Projects Private Limited (formerly known as National Highways Infra Projects Private Limited)
NWPPL Concession Agreements	Collectively, the R1 Concession Agreements and the R2 Concession Agreements
NWPPL Facility Agreement	Each of the facility agreements dated September 30, 2021, and October 10, 2022, entered into between the Trust (acting through the Trustee), the Trustee, the Investment Manager and NWPPL
Orai – Barah Project	The Orai Barah Road stretch on NH- 27 with a total length of 62.90 kms in the state of Uttar Pradesh.
Palanpur/Khemana Abu Road Project	The Palanpur/Khemana – Abu Road section of NH 27 with a total length of 45.00 kms, connecting the states of Gujarat and Rajasthan
Parties to the Trust	The Sponsor, the Sponsor Group, the Trustee, the Investment Manager and the Project Manager
Project Manager or NHIPMPL	National Highways InvIT Project Managers Private Limited
Project SPV Facilities Agreements	Collectively, NWPPL Facility Agreement, NEPPL Facility Agreement and NSPPL Facility Agreement
Project SPV(s)	Collectively, NWPPL, NEPPL and NSPPL.
R1 Concession Agreements	Collectively, the concession agreements entered between NHAI and NWPPL on March 30, 2021, being, (i) Concession Agreement for the tolling, operation, maintenance transfer of Maharashtra/Karnataka border (Kagal) (from km 515+000 to km 592+705) of NH-48 in the State of Maharashtra/Karnataka; (ii) Concession Agreement for the tolling, operation, maintenance transfer of Chittorgarh Bypass to Kota Section (from km 891+929 to km 1052+429) of NH-27 in the State of Rajasthan; (iii) Concession Agreement for the tolling, operation, maintenance transfer of Kothakota Bypass – Kurnool Section (from km 135+469 to km 211+000) of NH-44 in the State of Telangana; (iv) Concession Agreement for the tolling, operation, maintenance transfer of Abu Road to Swaroopganj Section (from km 646+000 to km 677+000) of NH-27 in the State of Rajasthan; and (v) Concession Agreement for the tolling, operation, maintenance transfer of Palanpur/ Khemana to Abu-Road Section (from km 601+000 to km 646+000) of NH-27 in the State of Gujarat, Rajasthan.
R1 Toll Roads	Collectively, (i) Abu Road - Swaroopganj Project; (ii) Chittorgarh – Kota and Chittorgarh Bypass Project; (iii) Kothakota Bypass – Kurnool Project; (iv) Maharashtra/Karnataka Border (Kagal) – Belgaum Project; and (v) Palanpur/Khemana Abu Road Project
R2 Concession Agreements	Collectively, (a) the concession agreements entered between NHAI and NWPPL on September 26, 2022, being, (i) Concession Agreement for the tolling, operation, maintenance transfer of Agra bypass Section (from km 0.000 to km 32.800) of NH-19 in the state of Uttar Pradesh; (ii) Concession Agreement for the tolling, operation, maintenance transfer of Borkhedi-Wadner-Deodhari-Kelapur Section (from km 36.600 to km 175.000) of NH-44 in the state of Maharashtra; and (iii) Concession Agreement for the tolling, operation, maintenance transfer of Shivpuri – Jhansi Section (from km 1305.087 to km 1380.387) of NH-27 in the states of Madhya Pradesh and Uttar Pradesh; and (b) the supplementary agreements entered between NHAI and NWPPL on November 2, 2022, being, (i) Supplementary Concession Agreement for the tolling, operation, maintenance transfer of Agra bypass Section (from km 0.000 to km 32.800) of NH-19 in the state of Uttar Pradesh; (ii) Supplementary Concession Agreement for the tolling, operation, maintenance transfer of Borkhedi-Wadner-Deodhari-Kelapur Section (from km 36.600 to km 175.000) of NH-44 in the state of Maharashtra; and (iii) Supplementary Concession Agreement for the tolling, operation, maintenance transfer of Shivpuri – Jhansi Section (from km 1305.087 to km 1380.387) of NH-27 in the states of Madhya Pradesh and Uttar Pradesh.
R2 Placement Document	The placement document dated October 11, 2022, issued in relation to the institutional placement of 111,602,600 units by in accordance with the InvIT Regulations and SEBI Institutional Placement Guidelines available at https://www.bseindia.com/downloads1/NHIT_PD.pdf
R2 Toll Roads	Collectively, (i) Agra Bypass Project; (ii) Borkhedi - Kelapur Project; and (iii) Shivpuri - Jhansi Project
R3 Concession Agreements	Collectively, the concession agreements entered between NHAI and NEPPL on March 7, 2024 being, (i) Concession Agreement for the tolling, operation, maintenance transfer of Kaljhar to Patacharkuchi Section from Km 1013+000 to Km 1040+000 of NH 27 in the State of Assam; (ii) Concession Agreement for the tolling, operation, maintenance transfer of (a) Chitradurga Bypass from Km 0+000 to Km 20+700, (b) Chitradurga to Davanagere from Km 208+000 to Km 260+000

Term	Description
	(c) Davanagere to Haveri from Km 260+000 to 338+923, and (d) Haveri to Hubli from Km 340+000 to Km 403+000 of NH 48 in the State of Karnataka; (iii) Concession Agreement for the tolling, operation, maintenance transfer of Lakhnadon – Mahagaon (Mohgaon) to Khawasa Section from Km 546+420 to Km 653+770 of NH 44 in the State of Madhya Pradesh; (iv) Concession Agreement for the tolling, operation, maintenance transfer of Four lane Chichra to Kharagpur (existing Km 185+150 (Design Km 16+130) to Km 129+000 (Design Km 72+250) of National Highway – 49 (Old NH -06) in the state of West Bengal; (v) Concession Agreement for the tolling, operation, maintenance transfer of Four Lane with paved shoulder of NH-27(old NH-31C) from Kachugaon to Rakhaldubi Bus junction (existing Km. 30+000 to Km 92+671) & NH-27(old NH-31) from Rakhaldubi Bus Junction to Kaljhar (Km 961+500 to Km 1013+000) in the State of Assam; (vi) Concession Agreement for the tolling, operation, maintenance transfer of Orai to Barah Section (From km 1515+713 To km 1578+872 on LHS & From km.1578+360 to km. 1515+713 on RHS) of NH25 (New NH – 27) in the State of Uttar Pradesh; and (vii) Concession Agreement for the tolling, operation, maintenance transfer of of Rewa-Katni-Jabalpur-Lakhnadon Section from Km 656+000 to Km 891+780 of NH 30 & Km 1358+000 to Km 1428+557 of NH-34 in the State of Madhya Pradesh (MP).
R3 Placement Document	The placement document dated March 15, 2024, issued in relation to the institutional placement of 497,926,000 units by in accordance with the InvIT Regulations and SEBI Institutional Placement Guidelines available at https://nhit.co.in/pdf/communication-to-stock-exchange/NCDs/Project-Leap-Placement-Document_15.03.2024.pdf
R3 Toll Roads	Collectively, (i) Chichra – Kharagpur Project; (ii) Orai Barah Project; (iii) Rewa – Lakhnadon Project; (iv) Kachugaon - Kaljhar Project; (v) Kaljhar - Patacharkuchi Project; (vi) Lakhnadon – Mahagaon (Mohgaon) – Khawasa Project; and (vii) Chitradurga Bypass - Hubli Project/ Karnataka Project
R4 Concession Agreements	Collectively, (i) concession agreement for tolling, operation, maintenance & transfer of Narasannapeta to Ranasthalam (from 580+671 634+470 of NH 16)) in state of Andhra Pradesh; (ii) Concession agreement for tolling, operation, maintenance & transfer of Visakhapatnam Section (from 634+000 700+544 of NH16) in state of Andhra Pradesh; (iii) Concession agreement for tolling, operation, maintenance & transfer of Anandapuram-Pendurthi-Anakapalle (from 682+980 to731+585 of NH-16) in the state of Andhra Pradesh (iv) Concession agreement for tolling, operation, maintenance & transfer of Gundugolanu-Devarapalli-Kovvuru section (from 15+320 to 85+204 of NH-16) in the state of Andhra Pradesh; (v) Concession agreement for tolling, operation, maintenance & transfer of Chittoor – Mallavaram Section (from Km 0.000 to Km 61.128 of NH 140) in state of Andhra Pradesh; (vi) Concession agreement for tolling, operation, maintenance & transfer of TN/AP – Border to Nalagampalli to AP/Karnataka Border Section (from Km 134+890 to Km 219+687) of NH 4 in the State of Andhra Pradesh; (vii) Concession agreement for tolling, operation, maintenance & transfer of Bareilly-Sitapur Section ((From Km 262.000 to Km 419.590 of NH-24) of NH-30 (Old NH-24) in the State of Uttar Pradesh; (viii) Concession agreement for tolling, operation, maintenance & transfer of Muzaffarnagar to Haridwar from Km 130+560 to Km 209+120 of Old NH 58 (New NH-334) in the State of Uttar Pradesh & Uttarakhand; (ix) Concession agreement for tolling, operation, maintenance & transfer of Tolling, Operation, Maintenance & Transfer of Raipur to Simga Section (from Km 0 + 000 to Km 48 + 580 of NH-30 (Old NH200)) in the State of Chhattisgarh; (x) Concession agreement for tolling, operation, maintenance & transfer of Simga to Bilaspur Section (from Km 48+580 to Km126+525 of NH-30 (Old NH-200) & NH-49) in the State of Chhattisgarh; and (xi) Concession agreement for tolling, operation, maintenance & transfer of Gandhidham (Kandla) to Mundra Port section of NH-41 (from Existing Km 0+000 to Existing Km 71+400) in the State of Gujarat.
Raipur to Simga Project	Raipur to Simga Section of NH-30 (Old NH 200) with a total length of 48.580 kms in the State of in the State of Chhattisgarh;
Ranasthalam to Hanumanthavaka Project	Ranasthalam to Anandapuram section of NH 16 and from Anandapuram to Hanumanthavaka (Visakhapatnam) Section of NH 16 with a total length of 66.544 kms in the State of Andhra Pradesh
Related Parties	Related parties, as defined under Regulation 2(1)(zv) of the InvIT Regulations
Rewa – Lakhnadon Project	Rewa – Katni – Jabalpur – Lakhnadon section of NH 30 and NH 34 with a total length of 306.340 kms, in the state of Madhya Pradesh
SEBI Exemption	Letter received from SEBI bearing reference no. SEBI/HO/DDHS-RAC-1/P/OW/2025/7590/1 dated March 7, 2025, read with the e-mail dated March 12, 2025 in relation to the exemptions in relation to proposed institutional placement of units of the Trust. For further details, see "*Management's Discussion and Analysis Of Factors By The Directors Of The Investment Manager Affecting The Financial Condition, Results Of Operations And Cash Flows*" on page 380.
Shivpuri - Jhansi Project	Jhansi-Shivpuri section of NH 27 with a total length of 75.30 kms, connecting the districts of Jhansi in the state of Uttar Pradesh and Shivpuri in the state of Madhya Pradesh
Simga to Bilaspur Project	Simga to Bilaspur Section of NH-130 (Old NH-200) & NH-49 with a total length of 77.945 kms in the State of Chhattisgarh.
Sponsor	National Highways Authority of India
Sponsor Director	A director nominated on the IM Board by the Sponsor

Term	Description
Sponsor Group	NHAI Since the Sponsor is a body corporate whose capital is funded by the Central Government and whose members are appointed, and executive decisions taken by the President of India (acting through the Department of Personnel and Training and MoRTH), certain persons or entities that may be classified as "sponsor group" in terms of Regulation 2(1)(zxc) and Regulation 4(2)(d)(i) of the InvIT Regulations, have not been identified as the 'sponsor group'.
SPV(s)	Special purpose vehicles, as defined in Regulation 2(1)(zy) of the InvIT Regulations
Target Toll Roads	Collectively(i) Narasannapeta to Ranasthalam Project (ii)Ranasthalam to Hanumanthavaka (iii) Anandapuram-Pendurthi-Anakapalle (iv) Gundugolanu-Devarapalli-Kovvuru (v) Chittoor – Mallavaram (vi) TN/AP Border to Nalagampalli to AP/Karnataka (vii) Bareilly-Sitapur (viii) Muzaffarnagar to Haridwar (ix) Raipur to Simga (x)Simga to Bilaspur (xi) Gandhidham (Kandla) to Mundra Port
Technical Consultants	Samarth Infraengg Technocrats Private Limited, Ramboll India Private Limited and Egis India Consulting Engineers Private Limited
Technical Reports	The technical reports prepared by each of the Technical Consultants in respect of the Target Toll Roads, which form part of this Preliminary Placement Document, as set out in **Annexure D.**
TN/AP – Border to Nalagampalli to AP/Karnataka Border	TN/AP Border to Nalagampalli to AP/Karnataka Border Section of NH 4 with a total length of 84.797 kms in the State of Andhra Pradesh
Toll Roads	Collectively, the R1 Toll Roads, R2 Toll Roads, R3 Toll Roads and Target Toll Roads
Traffic Consultant(s)	IBI Group India Private Limited, Ramboll India Pvt Ltd, and CRISIL India
Traffic Reports	The traffic reports prepared by each of the Traffic Consultants in respect of the Target Toll Roads, which forms part of this Preliminary Placement Document, as set out in **Annexure C**.
Trademark Agreement	The trademark agreement dated March 12, 2025 entered into amongst IDBI Trusteeship Services Limited and National Highways Infra Trust in relation to use trademark, logo and trade name of National Highways Authority of India.
Transitional Support Agreement	The transitional support agreement dated March 13, 2025 entered into amongst the Sponsor, Project Manager and NSPPL in relation to Target Toll Roads. For further details, please see the section entitled "*Related Party Transactions – Transitional Support Agreement*" on page 396.
Trust	National Highways Infra Trust
Trust Deed	Trust deed dated October 19, 2020, entered into between the Sponsor and the Trustee, as amended on March 7, 2024 and from time to time.
Trustee	IDBI Trusteeship Services Limited
Unexpired Cash Flow	The amount calculated by multiplying the concession fee with the percentages provided in the relevant Concession Agreements
Unit	An undivided beneficial interest in the Trust, and such Units together represent the entire beneficial interest in the Trust
Unitholder(s)	Any Person who holds Units (as hereinafter defined) upon making a defined contribution as determined by the Trustee
UPSI Policy	The unpublished price sensitive information policy adopted by the Investment Manager pursuant to a resolution of its board of directors dated February 3, 2021, as amended pursuant to the resolution of the IM Board dated September 27, 2021, March 30, 2022, January 4, 2023 and October 24, 2024.
Valuation Reports	The valuation report dated February 28, 2025, issued by the Valuer in relation to Target Toll Roads, which sets out their opinion as to the fair enterprise value of the Target Toll Roads as on December 31, 2024, which is set out in **Annexure B** to this Preliminary Placement Document
Valuer	Ernst & Young Merchant Banking Service LLP

Issue Related Terms

Term	Description
Allocated/ Allocation	The allocation of Units, to successful Bidders on the basis of the Application Form submitted by them, by the Investment Manager, in consultation with the Lead Managers
Allot/ Allotment/ Allotted	Unless the context otherwise requires, the issue and allotment of Units to successful Bidders, pursuant to the Issue
Allottees	Bidders to whom Units are issued and Allotted pursuant to the Issue
Application Form	The serially numbered form pursuant to which Eligible Investors shall submit a Bid for the Units in the Issue
Bid(s)	Indication of interest of an Eligible Investor, as provided in the Application Form, to subscribe for the Units at a price being at or above the floor price specified in the Placement Document, in terms of the Placement Document and the Application Form

Term	Description
Bid Amount	The Bid Price multiplied by the total number of Units Bid for by a Bidder as indicated in the Application Form
Bid/ Issue Closing Date	March 19, 2025
Bid/ Issue Opening Date	March 18, 2025
Bid/ Issue Period	Period between the Bid/ Issue Opening Date and the Bid/ Issue Closing Date, inclusive of both days, during which Eligible Investors submitted their Bids
Bid Lot/ Minimum Bid Size	A minimum of 19,00,000 units and in multiples of 10 units thereafter
Bid Price	An amount per Unit, at or above the Floor Price as indicated by a Bidder in the Application Form
Bidder	Any Eligible Investor, who made a Bid pursuant to the terms of the Placement Document and the Application Form
Business Day	Any day from Monday to Friday, excluding any public holiday
Cash Escrow Account	'No-lien' and 'non-interest bearing' account opened with the Escrow Bank and in whose favour Bidders transferred money through direct credit/NEFT/NECS/RTGS in respect of the Bid Amount when submitting a Bid
Cash Escrow Agreement	The cash escrow agreement dated March 17, 2025, entered into amongst the Trust (acting through the Trustee), the Investment Manager, the Lead Managers, the Trustee and the Escrow Bank for, among others, collection of the Bid Amounts and for remitting refunds, if any, of the amounts collected, to the Bidders
Client ID	Client identification number maintained with one of the Depositories in relation to a demat account
Closing Date	The date on which Allotment of Units pursuant to the Issue shall be made, i.e. on or about March 24, 2025
Demographic Details	Details of the Bidders, including the Bidder's address, name of the Bidder's father/husband, investor status, occupation and bank account details, PAN, DP ID and Client ID
Designated Date	The date of credit of Units to the Eligible Investors' demat accounts
Eligible Investors	Institutional Investors
EPFO	Employees' Provident Fund Organisation
Escrow Bank	Axis Bank Limited
Floor Price	The price of ₹ 133 per unit at or above which the Issue Price will be finalised and below which no Bids will be accepted
Issue	Issue of [●] Units by way of a fresh issue, through an institutional placement to Eligible Investors aggregating up to ₹ [●] million by the Trust
Institutional Investors	Institutional investors as defined in Regulation 2(1)(ya) of the InvIT Regulations
Listing Agreements	The listing agreements entered into with the Stock Exchanges by the Trust, in line with the format as specified under the Securities and Exchange Board of India circular number CIR/CFD/CMD/6/2015 dated October 13, 2015, on "Format of uniform Listing Agreement"
Listing Date	The date on which the Units offered pursuant to the Issue will be listed on the Stock Exchanges
Lead Managers	Collectively, the SBI Capital Markets Limited, Axis Capital Limited, HDFC Bank Limited and ICICI Securities Limited
Mutual Funds	Mutual funds registered with SEBI under the Securities and Exchange Board of India (Mutual Funds) Regulations, 1996
Net Proceeds	Proceeds of the Issue that will be available to the Trust, i.e., Issue Proceeds, less Issue Expenses apportioned to the Trust
Issue Expenses	Expenses in relation to the Issue
Issue Price	₹ [●] per Unit
Issue Proceeds	The proceeds of the Issue that are available to the Trust. For further details about the use of the Issue Proceeds, please see the section entitled "*Use of Proceeds*" on page 354
Issue Size	The Issue of [●] Units aggregating to ₹ [●] million
Placement Agreement	The placement agreement dated March 17, 2025 entered into among the Trust (acting through its Trustee), the Investment Manager, the Trustee and the Lead Managers
Placement Document	The placement document to be issued in relation to this Issue in accordance with the SEBI Institutional Placement Guidelines, the InvIT Regulations and circulars issued therein
Preliminary Placement Document	This preliminary placement document dated March 17, 2025 issued in accordance with the SEBI Institutional Placement Guidelines, the InvIT Regulations and the circulars issued therein.
Registrar and Unit Transfer Agent or Registrar	KFin Technologies Limited
Working Day	Working Day, with reference to (a) Bid/ Issue Period, shall mean all days, excluding Saturdays, Sundays and public holidays, on which commercial banks in Mumbai are open for business; and (b)

Term	Description
	the time period between the Bid/ Issue Closing Date and the listing of the Units on the Stock Exchanges, shall mean all trading days of Stock Exchanges, excluding Sundays and bank holidays

Technical and Industry Related Terms

Term	Description
%	Percentage
2A	2 axle truck
3A	3 axle truck
AB	Agra Bypass Project
AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
AP	Palanpur/Khemana - Abu Road Project
AR	Alternate Route
APA	Anandapuram-Pendurthi-Anakapalle
AS	Abu Road – Swaroopganj Project
BIA	Broad Influence Area
BOT	Build Operate Transfer
BRO	Border Roads Organisation
BK	Belgaum - Kagal
BWK	Borkhedi – Kelapur Project
BS	Bareilly-Sitapur
CAGR	Compounded Annual Growth Rate
CDHH	Chitradurga - Davanagere - Haveri – Hubli
CJV	Cars / Jeeps / Vans
CM	Chittoor – Mallavaram
CK	Chittorgarh – Kota & Chittorgarh Bypass Project
CKP	Chichra Kharagpur Project
COD	Commercial Operations Date
CRISIL Report	Report entitled "*Roads and Highways"* by CRISIL India
DBFOT	Design, Build, Finance, Operate and Transfer
DEA	Department of Economic Affairs
DME	Delhi Mumbai Expressway
DPR	Detailed Project Report
ETC	Electronic Toll Collection
FY	Financial Year
GDP	Gross Domestic Product
GM	Gandhidham (Kandla) to Mundra Port
GDK	Gundugolanu-Devarapalli-Kovvuru
GSDP	Gross State Domestic Product
HAM	Hybrid Annuity Model
HCV	Heavy Commercial Vehicles
HME	Heavy Machinery and Equipment
IDC	Interest during construction
IHMCL	Indian Highways Management Company Limited
IIA	Immediate Influence Area
IRC	Indian Road Congress
InvIT	Infrastructure Investment Trust
Km	Kilometre
KGK	Kachugaon - Kaljhar
KP	Kaljhar – Patacharkuchi

Term	Description
JEPL	Jadcherla Expressways Private Limited
KK	Kothakota Bypass – Kurnool Highway Project
LCV	Light Commercial Vehicle
LMMK	Lakhnadon – Mahagaon (Mohgaon) – Khawasa
M Bus	Minibus
MAV	Multi Axle Vehicle
MLCV	Mini LCV
NCT	National Capital Territory
MH	Muzaffarnagar to Haridwar
NH	National Highway
NHAI	National Highways Authority of India
NHDP	National Highways Development Program
NHIIMPL	National Highways Infra Investment Managers Private Limited
NHTIS	National Highway Toll Information System
NIP	National Infrastructure Pipeline
NPV	Net Present Value
NRRDA	National Rural Road Department Agency
NR	Narasannapeta to Ranasthalam
NSDP	National State Domestic Production
OB	Orai Barah Project
O&M	Operation and Maintenance
OD	Origin Destination
ODS	Origin-Destination survey
OECD	Organisation for Economic Cooperation and Development
PCU	Passenger Car Unit
PIA	Project Influence Area
PR	Project Road
PWD	Public Works Departments
RL	Rewa - Lakhnadon Project
RH	Ranasthalam to Hanumanthavaka
RS	Raipur to Simga Section
RNP	Registered Number Plate
RUCS	Road User Cost Study
SCF	Seasonality Correction Factors
SCOD	Scheduled commercial operations date
SEZ	Special Economic Zone
SH	State Highway
SJ	Shivpuri – Jhansi Project
SPV	Special Purpose Vehicle
SB	Simga to Bilaspur
T&R	Traffic and Revenue
TMS	Traffic Management System
TOT	Toll-Operate-Transfer
TN/AP	TN/AP – Border to Nalagampalli to AP/Karnataka Border
TP	Toll Plaza
TVC	Traffic Volume Count
VOC	Vehicle Operating Cost
VOT	Value of Time
WPI	Wholesale Price Index
YOY	Year on Year

Term	Description
YTD	Year to Date

Abbreviations

Term	Description
AIF	Alternative Investment Fund as defined in and registered with SEBI under the SEBI AIF Regulations
BSE	BSE Limited
CCEA	Cabinet Committee on Economic Affairs
CCI	Competition Commission of India
CDSL	Central Depository Services (India) Limited
CIN	Corporate Identity Number
Companies Act	Companies Act, 1956 and/or the Companies Act, 2013, as applicable
Companies Act, 1956	Erstwhile, Companies Act, 1956
Companies Act, 2013	Companies Act, 2013, read with the rules and regulations, thereunder
Competition Act	Competition Act, 2002
Depository	A depository registered with SEBI under the Securities and Exchange Board of India (Depositories and Participants) Regulations, 2018
Depositories Act	Depositories Act, 1996
DIN	Director Identification Number
FEMA	Foreign Exchange Management Act, 1999, read with rules and regulations thereunder
FEMA Rules	Foreign Exchange Management (Non-debt Instruments) Rules, 2019
Financial Year or Fiscal Year or Fiscal	Period of 12 months ended March 31 of that particular year, unless otherwise stated
FPI	Foreign portfolio investors
FVCI	Foreign venture capital investors, as defined under the SEBI FVCI Regulations
GAAR	General Anti-Avoidance Rules
GoI or Government	Government of India
GST	Goods and Services Tax
ICAI	Institute of Chartered Accountants of India
Income Tax Act or IT Act	The Income-tax Act, 1961
Ind AS	Companies (Indian Accounting Standards) Rules, 2015, notified on February 19, 2015 by the MCA, including any amendments or modifications thereto
Indian GAAP	Generally Accepted Accounting Principles in India
Indian GAAS	Generally Accepted Auditing Standards in India
InvIT	Infrastructure investment trust
InvIT Regulations	Securities and Exchange Board of India (Infrastructure Investment Trust) Regulations, 2014, including any circulars, modifications, guidelines, clarifications and amendments thereto
IRDAI	Insurance Regulatory and Development Authority of India
MCA	Ministry of Corporate Affairs, Government of India
MoEF	Ministry of Environment, Forest and Climate Change
MoRTH	Ministry of Road Transport and Highways
NACH	National Automated Clearing House
NEFT	National Electronic Funds Transfer
NHAI	National Highways Authority of India
NHAI Act	National Highways Authority of India Act, 1988, as amended
NSDL	National Securities Depository Limited
NSE	The National Stock Exchange of India Limited
PAN	Permanent account number
RBI	Reserve Bank of India
Regulation S	Regulation S under the Securities Act
RoC	Registrar of Companies, Delhi and Haryana at New Delhi
Rs./Rupees/INR/₹	Indian Rupees

Term	Description
RTGS	Real Time Gross Settlement
SCRA	Securities Contracts (Regulation) Act, 1956
SCRR	Securities Contracts (Regulation) Rules, 1957
SEBI	Securities and Exchange Board of India constituted under the SEBI Act
SEBI Act	The Securities and Exchange Board of India Act, 1992
SEBI AIF Regulations	Securities and Exchange Board of India (Alternative Investments Funds) Regulations, 2012
SEBI Debenture Trustees Regulations	Securities and Exchange Board of India (Debenture Trustees) Regulations, 1993
SEBI FPI Regulations	Securities and Exchange Board of India (Foreign Portfolio Investors) Regulations, 2019
SEBI FVCI Regulations	Securities and Exchange Board of India (Foreign Venture Capital Investors) Regulations, 2000
SEBI Institutional Placement Guidelines	Chapter 7 read with Annexure 7 on of SEBI Master Circular
SEBI Master Circular	SEBI Master Circular bearing reference number SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024 and as updated on November 13, 2024 and as amended from time to time
Securities Act	U.S. Securities Act of 1933
Stock Exchanges	BSE Limited and the National Stock Exchange of India Limited
U.S./U.S.A./United States	United States of America
USD/US$	United States Dollars

PRESENTATION OF FINANCIAL DATA AND OTHER INFORMATION

Certain Conventions

All references in this Preliminary Placement Document to "India" are to the Republic of India.

Unless stated otherwise, all references to page numbers in this Preliminary Placement Document are to the page numbers of this Preliminary Placement Document.

Financial Data

The Trust was settled on October 19, 2020, and has acquired ownership of NWPPL on November 3, 2021. Further, NEPPL was incorporated on April 19, 2023, at New Delhi, under the Companies Act, 2013, having obtained a certificate of incorporation, from the Registrar of Companies, Delhi and Haryana. Further, NSPPL was incorporated on March 8, 2025, at New Delhi, under the Companies Act, 2013, having obtained a certificate of incorporation, from the Registrar of Companies, Delhi and Haryana. The Trust (jointly with its nominee) holds 100% of the issued, subscribed and paid-up share capital of the Project SPVs as on the date of this Preliminary Placement Document.

The Audited Financial Information of the Trust as of and for the year ended March 31, 2022, March 31, 2023, March 31, 2024 and the six months period ended September 30, 2024, prepared in accordance with Ind AS, is included in this Preliminary Placement Document.

Further, the limited review consolidated financial information of the trust for the nine month period ended December 31, 2024, prepared in accordance with Ind AS, is included in this Preliminary Placement Document.

In relation to the Toll Roads, the asset revenue information that was provided by the Sponsor by way of its letters dated August 24, 2021, September 21, 2022, March 7, 2024 and March 12, 2025 has been disclosed in the section entitled "*Asset Revenue Information*" on page 469. Further, no separate financial information, including audited financial information for the previous three financial years is available for the Target Toll Roads, are currently available, which could be used to clearly ascertain financial information including revenue and expenses in respect of each of the Target Toll Roads. Accordingly, in terms of the SEBI Exemption, the revenue data for the Target Toll Roads that NHAI has historically been collecting through toll collection and maintenance contracts, as communicated *vide* letter dated March 12, 2025, has been included in the section entitled "*Asset Revenue Information*" on page 469 . The said amounts being collected are at times intermittent on account of gaps in tolling contract periods and would not be a true reflection of the revenue that these Target Toll Roads are actually generating. Please refer to "*Risk Factors - We have no operating history or financial information for the Target Toll Roads. Accordingly, the information disclosed in this Preliminary Placement Document in relation to the Target Toll Roads is limited*" on page 43 in this regard.

Further, this Preliminary Placement Document includes summary audited financial information of the Sponsor, as of and for the financial years ended March 31, 2023, March 31, 2022, and March 31, 2021 and unaudited financial results of the Sponsor for the financial year ended March 31, 2024 and for each of the period ended June 30, 2024 and September 30, 2024. For further details, please see the sections entitled "*Summary Financial Information of the Sponsor*" on page 33.

The summary audited financial information of the Investment Manager for Fiscals 2022, 2023 and 2024 has been included in this Preliminary Placement Document in the section entitled "*Summary Financial Information of the Investment Manager" on* page 34.

The degree to which the financial information included in this Preliminary Placement Document will provide meaningful information is entirely dependent on the reader's level of familiarity with Indian accounting policies and practices, the Companies Act, Ind AS, Indian GAAP and the InvIT Regulations. Any reliance by persons not familiar with Indian accounting policies and practices on the financial disclosures presented in this Preliminary Placement Document should accordingly be limited.

The financial year for the Trust and Parties to the Trust commences on April 1 and ends on March 31 of the next year; accordingly, all references to a particular financial year, unless stated otherwise, are to the 12-month period ended on March 31 of that year.

In this Preliminary Placement Document, any discrepancies in any table between the total and the sums of the amounts listed are due to rounding off. All figures in decimals and all percentage figures have been rounded off to two decimal places.

Currency and Units of Presentation

All references to:

- "Rupees" or "₹" or "INR" or "Rs." are to Indian Rupee, the official currency of the Republic of India; and
- "USD" or "US$" are to United States Dollar, the official currency of the United States.

Except otherwise specified, certain numerical information in this Preliminary Placement Document have been presented in "million" units. One million represents 1,000,000 and one billion represents 1,000,000,000. One lakh represents 1,00,000 and one crore represents 1,00,00,000.

Unless the context requires otherwise, any percentage amounts, as set forth in this Preliminary Placement Document, have been calculated on the basis of the audited financial information, and the summary financial statements of the Sponsor.

Exchange Rates

This Preliminary Placement Document contains conversion of certain other currency amounts into Indian Rupees. These conversions should not be construed as a representation that these currency amounts could have been, or can be converted into Indian Rupees, at any particular rate.

The following table sets forth, for the dates indicated, information with respect to the exchange rate between the Rupee and the US$ (in Rupees per US$):

Currency	December 31, 2024	March 31, 2024	March 31, 2023	March 31, 2022
1 US$	₹ 85.62	₹83.37	₹82.22	₹75.81

Source: www.rbi.org.in and www.fbil.org.in

Note: In the event that any of the respective years/ period is a public holiday, the previous calendar day, not being a public holiday, has been considered.

The above exchange rates are for the purpose of information only and may not represent the rates used by the Trust for purpose of preparation or presentation of its financial statements. The rates presented are not a guarantee that any person could have on the relevant date converted any amounts at such rates or at all.

Industry and Market Data

Unless stated otherwise, industry and market data used in this Preliminary Placement Document has been obtained or derived from publicly available information, as well as from the Report titled "*Roads and Highways*" dated November 2024, prepared by CRISIL India ("**CRISIL Report**"). The CRISIL Report is subject to the following disclaimer:

"Crisil Intelligence, a division of Crisil Limited, provides independent research, consulting, risk solutions, and data & analytics to its clients. Crisil Intelligence operates independently of Crisil's other divisions and subsidiaries, including, Crisil Ratings Limited. Crisil Intelligence's informed insights and opinions on the economy, industry, capital markets and companies drive impactful decisions for clients across diverse sectors and geographies. Crisil Intelligence's strong benchmarking capabilities, granular grasp of sectors, proprietary analytical frameworks and risk management solutions backed by deep understanding of technology integration, makes it the partner of choice for public & private organisations, multi-lateral agencies, investors and governments for over three decades.

For the preparation of the Report, Crisil Intelligence has relied on third party data and information obtained from sources which in its opinion are considered reliable. Any forward-looking statements contained in the Report are based on certain assumptions, which in its opinion are true as on the date of the Report and could fluctuate due to changes in factors underlying such assumptions or events that cannot be reasonably foreseen. The Report does not consist of any investment advice and nothing contained in the Report should be construed as a recommendation to invest/disinvest in any entity. The Company will be responsible for ensuring compliances and consequences of non-compliances for use of the Report or part thereof outside India."

Although the Investment Manager believes that the industry and market data used in this Preliminary Placement Document is reliable, it has not been independently verified by the Investment Manager or any of their affiliates or advisors and their accuracy and completeness are not guaranteed and their reliability cannot be assured. The data used in these sources may have been re-classified by us for the purposes of presentation. Data from these sources may also not be comparable. Such data involves risks, uncertainties and numerous assumptions and is subject to change based on various factors, including those disclosed in the section entitled "*Risk Factors*" on page 43 . Accordingly, no investment decisions should be based on such information.

The extent to which the market and industry data used in this Preliminary Placement Document is meaningful depends on the reader's familiarity with and understanding of the methodologies used in compiling such data. There are no standard data gathering methodologies in the industry in which business of the Trust is conducted, and methodologies and assumptions may vary widely among different industry sources.

Traffic Consultants

The traffic reports in **Annexure C**, as well as the data used in this Preliminary Placement Document from those reports, have been prepared by the Traffic Consultants.

Disclaimers from the Traffic Consultants

Disclaimer from CRISIL India

"Crisil Intelligence, a division of Crisil Limited, provides independent research, consulting, risk solutions, and data & analytics to its clients. Crisil Intelligence operates independently of Crisil's other divisions and subsidiaries, including, Crisil Ratings Limited. Crisil Intelligence's informed insights and opinions on the economy, industry, capital markets and companies drive impactful decisions for clients across diverse sectors and geographies. Crisil Intelligence's strong benchmarking capabilities, granular grasp of sectors, proprietary analytical frameworks and risk management solutions backed by deep understanding of technology integration, makes it the partner of choice for public & private organisations, multi-lateral agencies, investors and governments for over three decades. For the preparation of the Report, Crisil Intelligence has relied on third party data and information obtained from sources which in its opinion are considered reliable. Any forward-looking statements contained in the Report are based on certain assumptions, which in its opinion are true as on the date of the Report and could fluctuate due to changes in factors underlying such assumptions or events that cannot be reasonably foreseen. The Report does not consist of any investment advice and nothing contained in the Report should be construed as a recommendation to invest/disinvest in any entity. The Company will be responsible for ensuring compliances and consequences of non-compliances for use of the Report or part thereof outside India."

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"Users of India Ratings and Research Pvt Ltd ("India Ratings") ratings should understand that neither an enhanced factual investigation nor any third-party verification can ensure that all of the information India Ratings relies on in connection with a rating will be accurate and complete. Ultimately, the issuer and its advisers are responsible for the accuracy of the information they provide to India Ratings and to the market in offering documents and other reports. In issuing its ratings India Ratings must rely on the work of experts, including independent auditors with respect to financial statements and attorneys with respect to legal and tax matters. Further, ratings are inherently forward-looking and embody assumptions and predictions about future events that by their nature cannot be verified as facts. As a result, despite any verification of current facts, ratings can be affected by future events or conditions that were not anticipated at the time a rating was issued or affirmed. Ratings are not a recommendation or suggestion, directly or indirectly, to you or any other person, to buy, sell, make or hold any investment, loan or security or to undertake any investment strategy with respect to any investment, loan or security of any issuer. Ratings do not comment on the adequacy of market price, the suitability of any investment, loan or security for a particular investor (including without limitation, any accounting and/or regulatory treatment), or the tax-exempt nature or taxability of payments made in respect of any investment, loan or security. The Rating Agency shall neither construed to be nor acting under the capacity or nature of an 'expert' as defined under Section 2(38) of the Companies Act, 2013. India Ratings is not your advisor, nor is India Ratings providing to you or any other party any financial advice, or any legal, auditing, accounting, appraisal, valuation or actuarial services. A rating should not be viewed as a replacement for such advice or services. Investors may find our ratings to be important information, and India Ratings notes that you are responsible for communicating the contents of this letter, and any changes with respect to the rating, to investors.

MARKET PRICE INFORMATION

In this section, all market price information provided for Fiscal 2022 refers to such information for the period beginning November 10, 2021 (i.e. the date of listing of the Units on the BSE and NSE) until March 31, 2022. Further, for Fiscal 2025, market price information has been included for a period from April 1, 2024 to February 28, 2025.

As on the date of this Preliminary Placement Document, 1,312,200,600 Units are issued, subscribed and are fully paid up. The units have been listed and are available for trading on BSE and NSE. The units have been listed and are available for trading on BSE and NSE.

The following tables set forth the reported high, low, average market prices and the trading volumes of the Units on the Stock Exchanges on the dates on which such high and low prices were recorded and the total trading volumes for Fiscals 2025 (up to February 28, 2025), 2024, 2023 and 2022;

BSE:

Fiscal Year	High (₹)	Date of high	Number of Units traded on date of high	Total turnover of Units traded on date of high (₹ million)	Low (₹)	Date of low	Number of Units traded on date of low	Total turnover of Units traded on date of low (₹ million)	Average price for the period (₹)	Units traded in the fiscal year	
										Volume	(in ₹ million)
2022*	116.10	March 7, 2022	200,000	23.22	101.99	November 18, 2021	400,000	40.80	107.02	1,800,000	187.62
2023	-	-	-	-	-	-	-	-	-	-	-
2024	126.00	March 20, 2024	3,600,000	448.80	116.45	August 08, 2023	2,200,000	256.19	121.08	20,000,000	2,433.17
2025 (up to February 28, 2025)	135.00	December 31, 2024	325,000	43.82	126.75	May 13, 2024	200,000	25.35	130.65	5,050,000	660.88

* *The market price data pertaining to the period from the date of listing of units i.e. with effect from November 10, 2021.*
(Source: www.bseindia.com)

Fiscal Year	High (₹)	Date of high	Number of Units traded on date of high	Total turnover of Units traded on date of high (₹ million)	Low (₹)	Date of low	Number of Units traded on date of low	Total turnover of Units traded on date of low (₹ million)	Average price for the period (₹)	Units traded in the fiscal year	
										Volume	(in ₹ million)
2022*	116.10	March 7, 2022	200,000	23.22	101.99	November 18, 2021	400,000	40.80	107.02	1,800,000	187.62
April 1, 2022 to October 13, 2022	-	-	-	-	-	-	-	-	-	-	-
October 14, 2022 to March 31 2023	-	-	-	-	-	-	-	-	-	-	-
April 1, 2023 to	118.75	June 7, 2023	3,000,000	356.25	116.45	August 08, 2023	2,200,000	256.19	118.07	9,000,000	1062.92

Fiscal Year	High (₹)	Date of high	Number of Units traded on date of high	Total turnover of Units traded on date of high (₹ million)	Low (₹)	Date of low	Number of Units traded on date of low	Total turnover of Units traded on date of low (₹ million)	Average price for the period (₹)	Units traded in the fiscal year	
										Volume	(in ₹ million)
March 18, 2024											
March 19, 2024 to 31 March, 2024	126.00	20 March, 2024	3,600,000	448.80	124.35	19 March, 2024	7,000,000	871.10	125.08	11,000,000	1,370.25
April 1, 2024 to February 28, 2025	135.00	December 31, 2024	325,000	43.82	126.75	May 13, 2024	200,000	25.35	130.65	5,050,000	660.88

* *The market price data pertaining to the period from the date of listing of units i.e. with effect from November 10, 2021.*
(Source: www.bseindia.com)

NSE:

Fiscal Year	High (₹)	Date of high	Number of Units traded on date of high	Total turnover of Units traded on date of high (₹ million)	Low (₹)	Date of low	Number of Units traded on date of low	Total turnover of Units traded on date of low (₹ million)	Average price for the period (₹)	Units traded	
										Volume	(in ₹ million)
2022*	109.00	February 17, 2022	2,000,000	218.00	101.25	November 11, 2021	8,000,000	81.00	103.64	35,200,000	3,609.01
2023	120.00	May 10, 2022	200,000	24.00	109.70	October 14, 2022	5,400,000	592.53	113.49	6,200,000	684.07
2024	126.62	March 22, 2024	2,200,000	277.32	113.00	April 20, 2023	600,000	67.80	120.14	70,400,000	8,607.35
2025 (up to February 28, 2025)	133.00	January 02, 2025	50,000	6.63	122.00	May 15, 2024	200,000	24.40	129.36	32,325,000	4,158.75

* *The market price data pertaining to the period from the date of listing of units i.e. with effect from November 10, 2021.*
(Source: www.nseindia.com)

Fiscal Year	High (₹)	Date of high	Number of Units traded on date of high	Total turnover of Units traded on date of high (₹ million)	Low (₹)	Date of low	Number of Units traded on date of low	Total turnover of Units traded on date of low (₹ million)	Average price for the period (₹)	Units traded	
										Volume	(in ₹ million)
2022*	109.00	February 17, 2022	2,000,000	218.00	101.25	November 11, 2021	8,000,000	81.00	103.64	35,200,000	3,609.01

Fiscal Year	High (₹)	Date of high	Number of Units traded on date of high	Total turnover of Units traded on date of high (₹ million)	Low (₹)	Date of low	Number of Units traded on date of low	Total turnover of Units traded on date of low (₹ million)	Average price for the period (₹)	Units traded	
										Volume	(in ₹ million)
April 1, 2022 to October 13 2022	120.00	May 10, 2022	200,000	24.00	114.00	April 20, 2022 and August 19, 2022*	200,000, 200,000*	24.00, 22.8	116.00	600,000	69.60
October 14,2022 to March 31 2023	109.75	October 14, 2022	5,400,000	592.53	109.70	October 14, 2022	5,400,000	592.53	109.72	5,600,000	614.47
April 1, 2023 to March 18, 2024	123.65	February 28, 2024	4,800,000	593.52	113.00	April 20, 2023	600,000	67.80	117.54	28,200,000	3345.45
March 19, 2024 to March 31, 2024	126.62	March 22, 2024	2,200,000	277.32	124.33	March 21, 2024	6,000,000	748.74	125.33	42,200,000	5261.91
April 1, 2024 to February 28, 2025	133.00	Jan 02 2023	50,000	6.63	122.00	May 15, 2023	200,000	24.40	129.36	32,325,000	4158.75

Notes:

1. *High, low are based on the daily high and low prices respectively.*
2. *Average prices are based on the daily closing prices.*
3. *In case of two days with the same high or low prices, the date with the higher volume of units has been considered.*

The following tables set forth the reported high, low and average market prices and the trading volumes of the Units on the Stock Exchanges on the dates on which such high and low prices were recorded during each of the last six months preceding the date of this Preliminary Placement Document:

BSE:

Month	High (₹)	Date of high	Number of Units traded on date of high	Total turnover of Units traded on date of high (in ₹ million)	Low (₹)	Date of low	Number of Units traded on date of low	Total turnover of Units traded on date of low (in ₹ million)	Average price for the month (₹)	Units traded in the month	
										Volume	(in ₹ million)
September 2024	131.5	Sep 11 2024	200,000	26.30	131.5	Sep 11 2024	200,000	26.30	131.50	200,000	26.30
October 2024	132.50	Oct 23 2024	400,000	53.00	132.40	Oct 29 2024	600,000	79.44	132.45	1,000,000	132.44
November 2024	131.00	Nov 19 2024	1,000,000	131.00	131.00	Nov 19 2024	1,000,000	131.00	131.00	1,000,000	131.00
December 2024	135.00	Dec 31 2024	325,000	43.82	129.00	Dec 09 2024	50,000	6.46	130.91	450,000	60.09
January 2025	132.00	Jan 17 2025	75,000	9.90	131.00	Jan 30 2025	450,000	58.95	131.33	725,000	95.05

Month	High (₹)	Date of high	Number of Units traded on date of high	Total turnover of Units traded on date of high (in ₹ million)	Low (₹)	Date of low	Number of Units traded on date of low	Total turnover of Units traded on date of low (in ₹ million)	Average price for the month (₹)	Units traded in the month	
										Volume	(in ₹ million)
February 2025	132.65	Feb 10 2025	475,000	63.00	132.65	Feb 10 2025	475,000	63.00	132.65	475,000	63.00

(Source: www.bseindia.com)

NSE:

Month	High (₹)	Date of high	Number of Units traded on date of high	Total turnover of Units traded on date of high (in ₹ million)	Low (₹)	Date of low	Number of Units traded on date of low	Total turnover of Units traded on date of low (in ₹ million)	Average price for the month (₹)	Units traded in the month	
										Volume	(in ₹ million)
September 2024	131.50	Sept 05 2024	2,000,000	263.00	131.50	Sept 05 2024	2,000,000	263.00	131.50	3,200,000	420.80
October 2024	131.00	Oct 22 2024	400,000	52.40	130.00	Oct 24 2024	800,000	104.54	130.95	1,200,000	156.94
November 2024	131.00	Nov 19 2024	1,000,000	131.00	131.00	Nov 19 2024	1,000,000	131.00	131.00	1,000,000	131.00
December 2024	132.00	Dec 03 2024	200,000	26.30	130.00	Dec 03 2024	200,000	26.30	132.00	200,000	26.30
January 2025	133.00	Jan 02 2025	50,000	6.63	129.00	Jan 23 2025	525,000	68.33	130.85	4,600,000	602.00
February 2025	132.10	Feb 11 2025	50,000	6.61	128.85	Feb 03 2025	50,000	6.44	130.41	525,000	68.48

(Source: www. nseindia.com)

Notes:

1. *High, low are based on the daily High and Low prices respectively.*
2. *Average prices are based on the daily closing prices.*
3. *In case of two days with the same high or low prices, the date with the higher volume of units has been considered.*
4. *Since the units of the Trust have not been traded, no such data is available for the specific months.*
5. *The data disclosed above has not resulted in any change in the capital structure of the Trust.*

The market price on the Stock Exchanges on February 6, 2025, the first working day following the approval of the Board of the Investment Manager for the Issue, is 130.60.

FORWARD-LOOKING STATEMENTS

Certain statements contained in this Preliminary Placement Document that are not statements of historical fact constitute "forward-looking statements". Bidders can generally identify forward-looking statements by terminology such as "aim", "anticipate", "believe", "continue", "can", "could", "estimate", "expect", "intend", "may", "objective", "plan", "potential", "project", "pursue", "seek to", "shall", "should", "will", "would", or other words or phrases of similar import. Similarly, statements that describe the strategies, objectives, plans or goals of the Trust are also forward-looking statements. However, these are not the exclusive means of identifying forward-looking statements.

All statements regarding the Trust's expected financial conditions, results of operations and cash flows, business plans and prospects are forward-looking statements. These forward-looking statements include statements as to the Trust's, planned projects, revenue and profitability (including, without limitation, any financial or operating projections or forecasts), new business and other matters discussed in this Preliminary Placement Document that are not historical facts.

The Valuation Reports included in this Preliminary Placement Document, is based on certain projections and accordingly, should be read together with assumptions and notes thereto. For further details, please see the "*Valuation Reports*" attached as **Annexure B**. The Traffic Reports and Technical Reports include projections and estimates in relation to traffic growth and operation and maintenance expenses respectively, and accordingly, should be read in conjunction with the relevant notes and assumptions thereto.

Actual results may differ materially from those suggested by the forward-looking statements due to certain known or unknown risks or uncertainties associated with the Investment Manager's expectations with respect to, but not limited to, the actual growth in the infrastructure sector, the Investment Manager's ability to successfully implement the, growth and expansion plans, cash flow projections, exposure to market risks, the outcome of any legal or regulatory proceedings, the future impact of new accounting standards, regulatory changes pertaining to the infrastructure sector in India and our ability to respond to them, general economic and political conditions in India which have an impact on our business activities or investments, changes in competition, and the Project Manager's ability to operate and maintain the Project SPVs and successfully implement any technological changes. By their nature, certain of the market risk disclosures are only estimates and could be materially different from what actually occurs in the future. As a result, actual future gains, losses or impact on net interest income and net income could materially differ from those that have been estimated.

Factors that could cause actual results, performance or achievements of the Trust to differ materially include, but are not limited to, those discussed in the sections entitled "*Risk Factors*", "*Industry Overview*", "*Our Business*" and "*Management's Discussion and Analysis of Factors by the Directors of the Investment Manager affecting the Financial Condition, Results of Operations and Cash Flows*", on pages 43, 124, 134 and 380, respectively. Some of the factors that could cause the Trust's actual results, performance or achievements to differ materially from those in the forward-looking statements and financial information include, but are not limited to, the following:

- We have no operating history or financial information for the Target Toll Roads. Accordingly, the information disclosed in this Preliminary Placement Document in relation to the Target Toll Roads is limited;
- We must maintain certain investment ratios, which may present additional risks to us;
- NSPPL may not be able to claim depreciation in relation to toll collection rights acquired from the Sponsor;
- We may not be able to make future distributions to Unitholders or the level of distributions may fall;
- Project SPVs may not be able to claim depreciation in relation to toll collection rights acquired from the Sponsor.

Forward-looking statements, Valuation Reports, Traffic Reports and Technical Reports reflect current views as of the date of the respective reports included in this Preliminary Placement Document and are not a guarantee of future performance or returns to Bidders. These statements and projections are based on certain beliefs and assumptions, which in turn are based on currently available information. Although, the Investment Manager believes that the expectations and the assumptions upon which such forward-looking statements are based are reasonable at this time, the Investment Manager does not assure Bidders that such expectations will prove to be correct or accurate. Given these uncertainties, Bidders are cautioned not to place undue reliance on such forward-looking statements. In any event, these statements speak only as of the date of this Preliminary Placement Document or the respective dates indicated in this Preliminary Placement Document. The Trust and the Investment Manager or any of their affiliates or advisors, undertake no obligation to update or revise any of the statements reflecting circumstances arising after the date hereof or to reflect the occurrence of underlying events, whether as a result of new information, future events or otherwise after the date of this Preliminary Placement Document. If any of these risks and uncertainties materialize, or if any of the Investment Manager's underlying assumptions prove to be incorrect, the actual results of operations or financial condition or cash flow of the Trust could differ materially from that described herein as anticipated, believed, estimated or expected. All subsequent forward-looking statements attributable to the Trust are expressly qualified in their entirety by reference to these cautionary statements.

THE ISSUE

The following is a general summary of the terms of this Issue. This summary should be read in conjunction with, and is qualified in its entirety by, the detailed information appearing elsewhere in this Preliminary Placement Document:

Trust	National Highways Infra Trust is a contributory irrevocable trust set up under the Indian Trusts Act, 1882, and registered as an infrastructure investment trust under the InvIT Regulations on October 28, 2020, having registration number IN/InvIT/20-21/0014
Issue	Issue of [●] Units by way of an institutional placement to Eligible Investors, representing an undivided beneficial interest in the Trust through an institutional placement aggregating up to ₹ [●] million by the Trust
Floor Price	₹ 133 per Unit
Issue Price	₹ [●] per Unit
Bid Lot/ Minimum Bid Size	A minimum of 1,900,000 Units and in multiples of 10 Units thereafter
Bid/ Issue Opening Date	March 18, 2025
Bid/ Issue Closing Date	March 19, 2025
Sponsor	National Highways Authority of India
Trustee	IDBI Trusteeship Services Limited
Investment Manager	National Highways Infra Investment Managers Private Limited
Project Manager	National Highways InvIT Project Managers Private Limited
Eligible Investors	Institutional Investors subject to applicable law
Authority for this Issue	This Issue was authorised and approved by the IM Board pursuant to its resolution dated February 5, 2025 and by the Unitholders, pursuant to their resolution dated March 10, 2025.
Tenure of the Trust	The Trust shall remain in force perpetually until it is dissolved or terminated in accordance with the Trust Deed. For details, please see the section entitled "*Parties to the Trust*" on page 75.
Units issued and outstanding immediately prior to this Issue	1,312,200,600 Units
Units issued and outstanding immediately after this Issue	[●] Units
Sponsor and Sponsor Group Units as on the date of this Preliminary Placement Document	203,072,000 Units. The Units held by the Sponsor will rank *pari passu* with, and have the same rights as the Units to be Allotted to other Bidders pursuant to the Issue.
Distribution	Please see the section entitled "*Distribution*" on page 393.
Indian Taxation	Please see the section entitled "*Taxation"* on page 451.
Use of Proceeds	Please see the section entitled *"Use of Proceeds*" on page .
Listing	The Units are proposed to be listed on NSE and BSE. The Trust has received the in-principle approvals from NSE and BSE pursuant to their letters, each dated March 17, 2025 for the listing of the Units. The Investment Manager shall apply to NSE and BSE for the final listing and trading approvals, after the Allotment and after the credit of the Units to the beneficiary accounts with the Depository Participants and the Units shall be listed within two working days from the date of Allotment. The Trust shall also file the Placement Document, along with the allotment report, containing the details of the allottees and allotment made, with SEBI within seven days of Allotment.
Closing Date	The date on which Allotment of the Units pursuant to this Issue shall be made, i.e. on or about March 24, 2025

Ranking	The Units being issued will rank *pari passu* in all respects, including rights in respect of distribution. The Unitholders will be entitled to participate in distribution, if any, declared by the Trust after the date of Allotment. Please see the section entitled "*Rights of Unitholders*" on page 435.
Lock-in and Rights of Unitholders	For details, please see the sections entitled "*Information concerning the Units*" and "*Rights of Unitholders*" on pages 352 and 435, respectively.
Risk Factors	Prior to making an investment decision, Bidders should consider carefully the matters discussed in the section entitled "*Risk Factors*" on page 43.

The Units, on Allotment, shall be traded only in the dematerialized segment of the Stock Exchanges.

In accordance with the InvIT Regulations, no Unitholder shall enjoy superior voting or any other rights over another Unitholder. Further, there shall not be multiple classes of Units.

None of the respective members of the Sponsor or promoters or partners or directors of the Investment Manager or Trustee is a fugitive economic offender declared under Section 12 of the Fugitive Economic Offenders Act, 2018.

For further details in relation to this Issue, including the basis for the calculation of Issue Price and method of application, please see the section entitled "*Issue Procedure*" on page 441 and the Valuation Reports as set out in **Annexure B** to this Preliminary Placement Document.

OVERVIEW OF THE TRUST

The following overview is qualified in its entirety by, and is subject to, the more detailed information contained in or referred to elsewhere in this Preliminary Placement Document. Statements contained in this summary that are not historical facts may be forward-looking statements. Such statements are based on certain assumptions and are subject to certain risks, uncertainties and assumptions that could cause actual results of the Trust to differ materially from those forecasted or projected in this Preliminary Placement Document. Investment in Units involves risks. Bidders are advised not to rely solely on this overview, and, should read this Preliminary Placement Document in its entirety and, in particular, the sections entitled "Risk Factors" and "Forward-Looking Statements" on pages 43 *and 25 , respectively.*

Structure and description of the Trust

The Sponsor settled the Trust on October 19, 2020, as a contributory irrevocable trust, pursuant to the Trust Deed, under the provisions of the Indian Trusts Act, 1882. The Trust was registered with SEBI on October 28, 2020, as an infrastructure investment trust under Regulation 3(1) of the InvIT Regulations having registration number IN/InvIT/20-21/0014. The Sponsor has settled the Trust for an initial sum of ₹ 10,000.

For details of the registered office and contact person of the Sponsor, please see the section entitled "*General Information*" on page 70. For the contact details of the Trust, please see the cover page.

Further, NHIIMPL is the investment manager, and NHIPMPL is the project manager to the Trust. For further details please see the section entitled "*Parties to the Trust*" on page 75.

Investment Objectives

The investment objectives of the Trust are to carry on the activity of and to make investments as an infrastructure investment trust as permissible in terms of the InvIT Regulations. The investment of the Trust shall only be in any manner permissible under, and in accordance with, the InvIT Regulations and applicable law, including in such holding companies and/or special purpose vehicles and/or infrastructure projects and/or securities in India as permitted under the InvIT Regulations. The investment by the Trust shall be in compliance with the provisions of the InvIT Regulations.

As on the date of this Preliminary Placement Document, the Trust is not permitted to carry out any other principal activity unless specifically provided under applicable law.

Fee and expenses

Annual Expenses

The expenses in relation to the Trust, other than such expenses incurred in relation to operations of Project SPVs, would broadly include fees and expenses payable to (i) Trustee; (ii) Investment Manager; (iii) Project Manager; (iv) Auditor; (v) Valuer; and (vi) other intermediaries and consultants.

The estimated recurring expenses on an annual basis are as follows:

(₹ in million)

Particulars	**Estimated Expenses**
Trustee fee	0.96
Investment Manager fee	198.00^
Project Manager fee	120.00
Fee payable to the credit rating agencies	1.44
Auditor fee, Valuer fee, other intermediaries and consultants and others	18.17**

^ *Effective from April 1, 2024 with annual escalation as per the amended terms of the Investment Management Agreement.*

** *Estimated fee for the financial year ended March 31, 2025.*

Issue Expenses

The total expenses of this Issue are estimated to be approximately ₹ [●] million which will be incurred by the Trust. For details in relation to the expenses for this Issue, please see the section entitled *"Use of Proceeds"* on page 354.

Details of credit ratings

The Trust has been given a rating by Care Ratings Limited of

(a) 'Care AAA/Stable' issuer rating,
(b) 'Care AAA/Stable' for long-term facilities of ₹10,724.15 crore,
(c) 'Care AAA/Stable' for Zero Coupon Bond of ₹ 2031.68 crore
(d) 'Care AAA/Stable' for Non-Convertible debentures of ₹ 968.32 crore (proposed to be issued)
(e) 'Care AAA/Stable' for Non-Convertible debentures of ₹ 1500 crore

As on March 12, 2025 the Trust has been assigned rating by Care Ratings Limited for proposed borrowings of

(f) 'Care AAA/Stable' for Rupee Term Loan of ₹ 10470 crore
(g) 'Care AAA/Stable/ Care A1+' for Short Term Facilities of ₹ 30 crore

The rationale for which is available at https://www.careratings.com/upload/CompanyFiles/PR/202503130347_National_Highways_Infra_Trust.pdf*; and*

As on March 12, 2025 the Trust has been Reaffirmed rating by India Ratings & Research Private Limited of

(a) 'IND AAA/Stable' issuer rating,
(b) 'IND AAA/Stable' for long-term facilities of ₹108.5 bn,
(c) 'IND AAA/Stable' for Non Convertible debentures of ₹ 30 bn (including ₹ 20.32 bn of Zero Coupon Bond redeemed at face value and proposed non-convertible debentures of INR9.68 billion to be issued)
(d) 'IND AAA/Stable' for Non Convertible debentures of ₹ 15 bn

As on March 12, 2025 the Trust has been assigned rating by India Ratings & Research Private Limited for proposed borrowings of

(a) 'IND AAA/Stable' for Rupee Term Loan of ₹ 104.70 bn
(b) 'IND AAA/Stable' for Non Fund Based facility of ₹ 0.30 bn

The rationale for which is available at India Ratings and Research: Credit Rating and Research Agency India *and* https://www.indiaratings.co.in/pressrelease/75408*"*

FORMATION TRANSACTIONS IN RELATION TO THE TRUST

Details of arrangement pertaining to the Trust

The Trust's portfolio comprises our Project SPVs namely NHIT Western Projects Private Limited (*formerly known as National Highways Infra Projects Private Limited*), NHIT Eastern Projects Private Limited and NHIT Southern Projects Private Limited. The details of the Project SPVs are as provided below:

NHIT Western Projects Private Limited (formerly known as National Highways Infra Projects Private Limited) ("NWPPL")

NWPPL is a private limited company incorporated on July 23, 2020, at New Delhi, under the Companies Act, 2013, having obtained a certificate of incorporation from the Registrar of Companies, Delhi and Haryana. The CIN of NWPPL is U45201DL2020PTC366737.

Capital structure of NWPPL

Particulars	Number of equity shares of ₹ 10 each
Authorised capital	1,294,100,000
Issued, subscribed and paid-up capital	1,294,100,000

NHIT Eastern Projects Private Limited ("NEPPL")

NEPPL is a private limited company incorporated on April 19, 2023, at New Delhi, under the Companies Act, 2013, having obtained a certificate of incorporation from the Registrar of Companies, Delhi and Haryana. The CIN of NEPPL is U42101DL2023PTC412707.

Capital structure of NEPPL

Particulars	Number of equity shares of ₹ 10 each
Authorised capital	2,500,000,000
Issued, subscribed and paid-up capital	2,406,100,000

NHIT Southern Projects Private Limited ("NSPPL")

NSPPL is a private limited company incorporated on March 8, 2025, at New Delhi, under the Companies Act, 2013, having obtained a certificate of incorporation from the Registrar of Companies, Delhi and Haryana. The CIN of NSPPL is U42101DL2025PTC444254.

Capital structure of NSPPL

Particulars	Number of equity shares of ₹ 10 each
Authorised capital	1,000,000
Issued, subscribed and paid-up capital	100,000

The Trust (jointly with its nominee) holds 100% of the issued, subscribed and paid-up share capital of the Project SPVs as on the date of this Preliminary Placement Document.

In light of the fact that the Project SPVs will constitute tolling rights and not underlying land, the requirement for conducting land diligence in respect of the Project SPVs does not arise.

The Investment Manager confirms that not less than 80% of the projects are 'eligible infrastructure projects' (as defined in the InvIT Regulations) in terms of Regulation 18(4) of the InvIT Regulations.

The Investment Manager confirms that not less than 80% of the value of the InvIT assets are invested in completed and revenue generating assets (as defined in the InvIT Regulations), in terms of the InvIT Regulations.

For further details in relation to the Project SPVs, please see the section entitled "*Our Business*" on page 134.

Borrowings of the Trust

The Trust has entered into a loan agreement dated September 29, 2021, with certain lenders for availing loans amounting to ₹ 20,000.00 million ("**Trust Loan 1**"). With respect to Trust Loan 1, as on December 31, 2024, the Trust has drawn down an amount equivalent to ₹ 14,800.00 million for payment of concession fee for R1 Toll roads and an amount equivalent to ₹ 3,646.60 million for capex and non-fund-based facility equivalent to ₹ 62.60 million as bank guarantees.

In October 25, 2022, the Trust has issued secured, rated, listed, redeemable non-convertible debentures aggregating to an amount of upto Rs. 15,000.00 million ("**NCDs**") through public issuance for payment of concession fee for R2 Toll roads.

Additionally, the Trust has entered into a facility agreement dated October 18, 2023, with certain lenders for availing loans amounting to ₹ 8,770.00 million ("**Trust Loan 2**"). With respect to the Trust Loan 2, as of December 31, 2024, the Trust has drawn down an amount equivalent to ₹ 2,620.00 million and non-fund-based facility equivalent to ₹ 49.25 million.

Further the Trust has entered into a loan agreement dated March 22, 2024, with certain lenders for availing loans amounting to ₹ 90,000.00 million ("**Trust Loan 3**"). With respect to Trust Loan 3, as on December 31, 2024, the Trust has drawn down an amount equivalent to ₹ 86,580.00 million for payment of concession fee for R3 Toll roads and an amount equivalent to ₹ 150.00 million for capex and ₹ 139.26 million as bank guarantees.

In January 2025, the Trust has raised ₹ 9,999.93 million through zero coupon bonds and utilised the same for partial repayment of Trust Loan 1, IDBI Bank Limited has taken over the loan of Bank of Maharashtra through assignment and Novation agreement on February 26, 2025. For details of indebtedness in relation to the Trust Loans, please see the section entitled "*Financial Indebtedness and Deferred Payments*" on page 357.

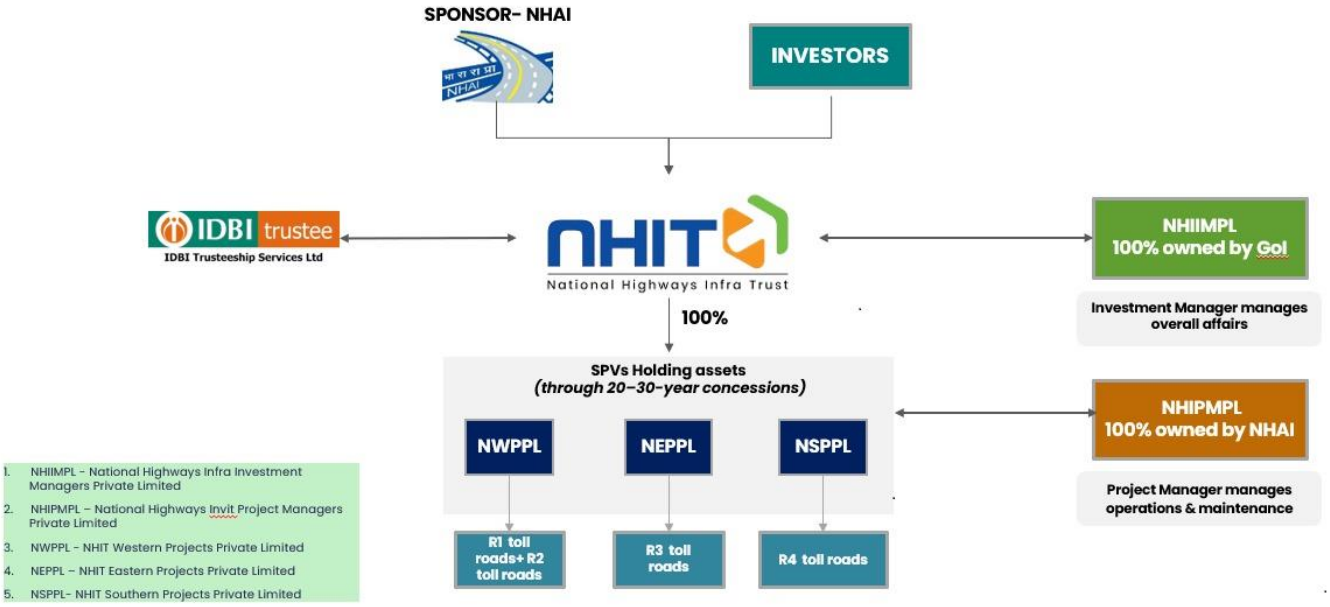
Utilisation of Net Proceeds

Further, upon the listing of the Units, the Trust shall utilize the Net Proceeds aggregating to an amount of ₹ [●] million. For further details, please see the section entitled "*Use of Proceeds*" on page 354.

Proposed post- Issue structure

For details of the pre- Issue and post- Issue unitholding structure of the Trust, please see the section entitled "*Information concerning the Units*" on page 352.

The following structure illustrates the proposed relationship between the Trust, the Trustee, the Sponsor, the Investment Manager, the Project Manager and the Unitholders post- Issue:



SUMMARY FINANCIAL INFORMATION OF THE TRUST

For summary financial information of the Trust please refer to Annexure F

SUMMARY FINANCIAL INFORMATION OF THE SPONSOR

For summary financial information of the Sponsor please refer to Annexure G

SUMMARY FINANCIAL INFORMATION OF THE INVESTMENT MANAGER

For summary financial information of the Investment Manager please refer to Annexure H

SUMMARY OF BUSINESS

Overview

We are a registered infrastructure investment trust under the InvIT Regulations. We currently have a right to toll, operate and maintain a portfolio of fifteen (15) Existing Toll Roads (*defined below*) in the Indian states of Gujarat, Rajasthan, Telangana, Karnataka, Maharashtra, Uttar Pradesh, Madhya Pradesh, West Bengal, and Assam and intend to toll, operate and maintain a portfolio of eleven (11) Target Toll Roads (*defined below*) in the Indian states of, Andhra Pradesh, Uttar Pradesh, Gujarat, Uttarakhand, and Chhattisgarh under the Toll Operate Transfer ("**TOT**") model conceived by NHAI. These Toll Roads (*defined below*) are operated and maintained pursuant to concessions granted by the NHAI. The Existing Toll Roads comprise 15 stretches spanning a total length of approximately 1523.7 kms and the Target Toll Roads comprise eleven stretches spanning a total length of approximately 818.83 kms.

Our Sponsor is NHAI, an autonomous authority of the GoI under the MoRTH constituted on June 15, 1989 NHAI Act. NHAI was operationalised in February 1995 with the appointment of a full-time Chairman and other members of the board. The functioning of NHAI is governed by the NHAI Act and the rules, and regulations framed thereunder. NHAI from time to time, may divest a portion of its unitholding in the InvIT.

The Project SPVs have entered into 26 independent Concession Agreements with the NHAI for concessions of each of the Toll Roads. We have satisfied all conditions precedent and commenced our concessions on December 16, 2021, October 29, 2022 and 1 April, 2024 in accordance with the terms of the Initial Concession Agreements for the Existing Toll Roads and expect to satisfy all conditions precedent and commence our concessions for the Target Toll Roads in accordance with the terms of the R4 Concession Agreements for the Target Toll Roads. For further details, please see the section entitled "*Summary of the Concession Agreements*", "*Management's Discussion and Analysis of Financial Position and Results of Operations*" and "*Use of Proceeds*" on pages 293 , 380 and 354, respectively

The Concession Agreements provide the Project SPVs the right to collect tolls for a period of 20 years or 30 years (as applicable under the relevant Concession Agreement) from users of each Toll Road, with certain overlay activities and the construction work which may include any other improvement work, such as construction, renovation, refurbishing, augmentation, upgradation, etc., of any road, structure, etc., in respect of certain of the Toll Roads (the "**Initial Improvement Works**") to be completed by the Project SPVs within 12 to 18 months from the Appointed Date (as defined in the section entitled "*Summary of the Concession Agreements*"). Responsibility for the supervision of the operations and maintenance of the Toll Roads also vests with us. In return, the Project SPVs is required to pay the concession fee to the NHAI prior to the commencement of the concession, as set out in the respective Concession Agreements. For further information on the provisions of the Concession Agreements, see "*Summary of the Concession Agreements"* on page 293.

NWPPL and NEPPL has a right to toll, operate and maintain the following toll road assets: ("**Existing Toll Roads**")

- Palanpur/Khemana Abu Road Project ("**Asset 1**"): Abu Road section of NH 27 with a total length of 45.000 kms, connecting the states of Gujarat and Rajasthan;
- Abu Road – Swaroopganj Project ("**Asset 2**"): Swaroopganj section of NH 27 with a total length of 31.000 kms, in the state of Rajasthan;
- Maharashtra/ Karnataka Border (Kagal) – Belgaum Project ("**Asset 3**"): Belgaum – Kagal section of NH 48 with a total length of 77.700 kms, connecting the states of Karnataka and Maharashtra;
- Chittorgarh – Kota & Chittorgarh Bypass Project ("**Asset 4**"): Chittorgarh – Kota section of NH 27 with a total length of 160.500 kms, in the state of Rajasthan;
- Kothakota Bypass – Kurnool Project ("**Asset 5**"): Kothakota bypass – Kurnool section of NH 44 with a total length of 74.600 kms, connecting the states of Telangana to Andhra Pradesh;
- Agra Bypass Project ("**Asset 6**"): Agra Bypass section with a total length of 32.800 kms, connecting NH19 (old NH2) to NH44 (old NH7) in Uttar Pradesh;
- Borkhedi – Kelapur Project ("**Asset 7**"): Borkhedi-Kelapur-Maharashtra/Telangana border section of NH44 (old NH7) with a total length of 138.150 kms, in the state of Maharashtra;
- Shivpuri Jhansi Project ("**Asset 8**"): Jhansi-Shivpuri section of NH 27 with a total length of 75.300 kms, connecting the districts of Jhansi in the state of Uttar Pradesh and Shivpuri in the state of Madhya Pradesh;
- Chichra – Kharagpur Project ("**Asset 9**"): Chichra – Kharagpur section of NH 49 with a total length of 56.120 kms, in the state of West Bengal;

- Rewa –Lakhnadon Project ("**Asset 10**"): Rewa – Katni – Jabalpur – Lakhnadon section of NH 30 and NH 34 with a total length of 306.340 kms, in the state of Madhya Pradesh;

- Kachugaon – Kaljhar Project ("**Asset 11**"): Kachugaon – Rakhaldubi Bus Junction – Kaljhar section of NH 27 with a total length of 114.170 kms, in the state of Assam;

- Kaljhar – Patacharkuchi Project ("**Asset 12**"): Kaljhar – Patacharkuchi section of NH 27 with a total length of 27.300 kms, in the state of Assam;

- Lakhnadon – Mahagaon (Mohgaon) – Khawasa ("**Asset 13**"): Lakhnadon – Mahagaon (Mohgaon) – Khawasa section of NH 44 with a total length of 107.350 kms, in the state of Madhya Pradesh;

- Orai – Barah Project ("**Asset 14**"): Orai – Barah section of NH 27 with a total length of 62.900 kms, in the state of Uttar Pradesh; and

- Chitradurga Bypass – Hubli Project/ Karnataka Project ("**Asset 15**"): Chitradurga Bypass – Chitradurga – Davanagere – Haveri – Hubli section of NH 48 with a total length of 214.470 kms, in the state of Karnataka.

From the Appointed Date, NSPPL will have the right to toll, operate and maintain the following toll road assets (the "**Target Toll Roads**"):

- Narasannapeta to Ranasthalam Project ("**Asset 16")** Narasannapeta to Ranasthalam section of NH-16 with a total length of 53.799 kms in the state of Andhra Pradesh;

- Ranasthalam to Hanumanthavaka Project ("**Asset 17**") Ranasthalam to Anandapuram section of NH 16 with a total length of 66.544 kms in the State of Andhra Pradesh;

- Anandapuram – Pendurthi – Anakapalle Project ("**Asset 18** Anandapuram-Pendurthi-Anakapalle of NH-16 with a total length of 48.605 kms in the state of Andhra Pradesh;

- Gundugolanu-Devarapalli-Kovvuru Project ("**Asset 19**") Gundugolanu-Devarapalli-Kovvuru section of NH-16 with a total length of 69.884 kms in the state of Andhra Pradesh;

- Chittoor to Mallavaram Project ("**Asset 20**") Chittoor to Mallavaram section of NH-140 with a total length of 61.128 kms in the state of Andhra Pradesh;

- TN/AP – Border to Nalagampalli to AP/Karnataka Border Project ("**Asset 21**") TN/AP – Border to Nalagampalli to AP/Karnataka Border Section of NH 4 with a total length of 84.797Km in the State of Andhra Pradesh;

- Bareilly – Sitapur Project ("**Asset 22**") Bareilly - Sitapur Section of NH-30 (Old NH-24) with a total length of 157.590 kms in the State of Uttar Pradesh;

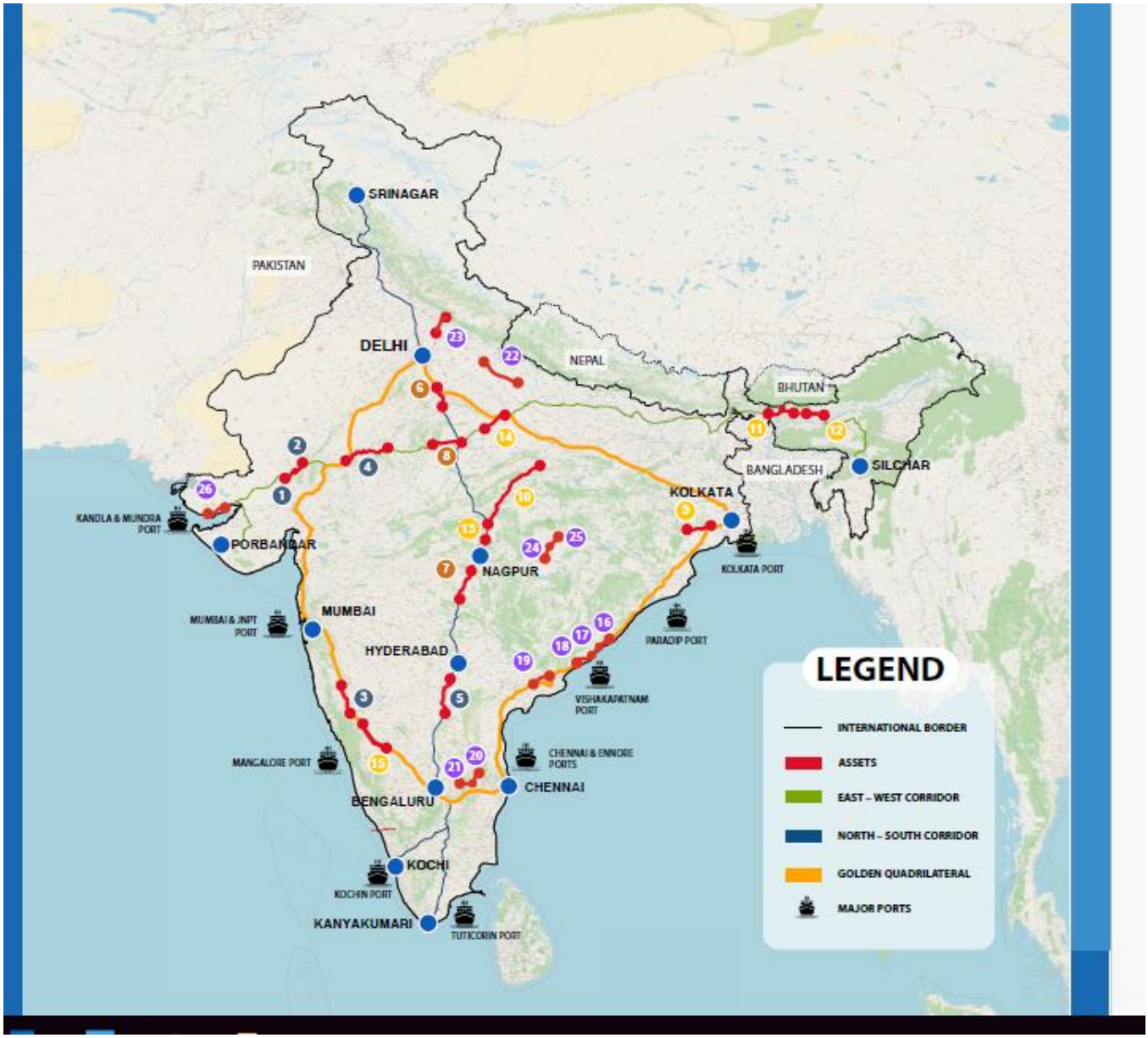
- Muzaffarnagar – Haridwar Project ("**Asset 23**") Muzaffarnagar to Haridwar section from of Old NH 58 (New NH-334) with a total length of 78.560 kms in the State of Uttar Pradesh & Uttarakhand;

- Raipur to Simga Project ("**Asset 24**") Raipur to Simga Section of NH-30 (Old NH 200) with a total length of 48.580 kms in the State of Chhattisgar;

- Simga to Bilaspur Project ("**Asset 25**") Simga to Bilaspur Section of NH-130 (Old NH-200) & NH-49 with a total length of 77.945 kms in the State of Chhattisgarh; and

- Gandhidham (Kandla) to Mundra Port Project ("**Asset 26**") Gandhidham (Kandla) to Mundra Port section of NH-41 with total length of 71.400 kms in the State of Gujarat.

The following map depicts locations of the Toll Roads:



Note: This map is for illustrative purposes only, is not to scale and is subject to change at any time.

Strengths of the Trust

The strengths of the Trust are:

- Experienced Sponsor with consistent track record in operating and maintaining projects in the roads and highways sector in India;
- Sizeable portfolio of diversified long-term revenue generating Toll Road assets;
- Presence in strategic regions/ Strategic geographic location of portfolio assets;
- Experienced management team with industry experience;
- Growth opportunities and access to Sponsor's portfolio; and
- Favourable Concession Agreement terms with Low Counterparty Risk and Inflation Passthrough.

The information contained in this section is derived from the report by Crisil India*, dated 2025 ("**Crisil Report**"). Neither we nor any other person connected with the Issue has independently verified this information. Industry sources and publications generally state that the information contained therein has been obtained from sources generally believed to be reliable, but that their accuracy, completeness and underlying assumptions are not guaranteed, and their reliability cannot be assured. Industry publications are also prepared based on information available as of specific dates and may no longer be current or reflect current trends. Accordingly, investment decisions should take these limitations into account. All references to years refer to calendar years except as otherwise stated. References to Indian financial years ("**FY**") are to the one-year period ending March 31 of the named year.*

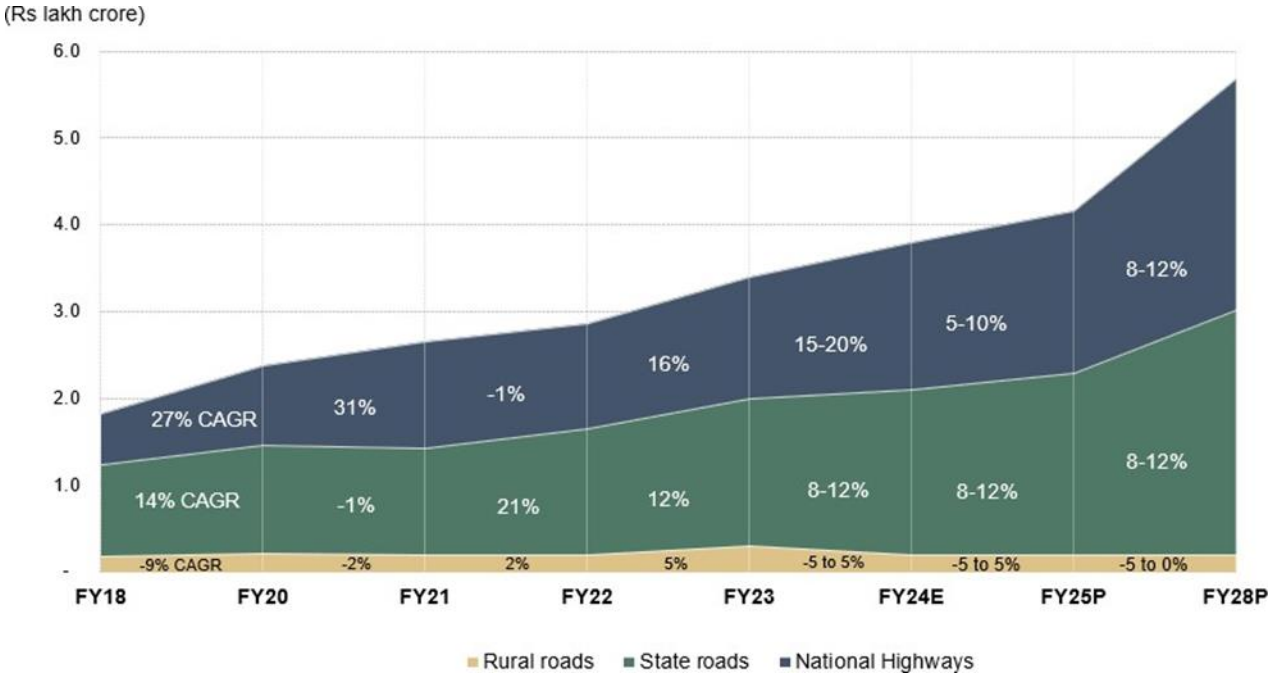
Continued government focus and increased private interest likely to aid growth in Fiscal 2025

Our Sponsor is also involved in the Bharatmala Pariyojana ("**Bharatmala**") project. Between fiscals 2018 & 2023 overall road sector capex, comprising of National Highways, State Highways & rural roads is estimated to have grown at a CAGR of 14%. This growth, driven by *Bharatmala Pariyojana* and increased state spends on roads has been achieved despite brief hiccups such as the *Covid Pandemic* and hampered construction due to elongated monsoons. The outlook for the sector remains firm, supported by higher awarding of new projects from previous fiscals, steady-state capex, the NIP pipeline of DPR-ready projects, and Bharatmala project.

The NH segment contributes around 40-45% of the overall capex. While the execution remained flattish in fiscal 2023 vis--vis fiscal 2022, capex grew by 16% due to a rise in construction of high value projects and high commodity prices. In fiscal 2024, the national highway capex further grew by 18% driven primarily by much improved execution during the fiscal. High volume projects (4-8 lanes) still in the pipeline in the construction/pre-construction phase are going to be the key area of focus for governments capital expenditure.

On the low base of fiscal 2021, the state spends grew by 21% in fiscal 2022 and are estimated to have grown further by 10-13% in fiscal 2023 largely in line with the growth in budgetary outlay. In fiscal 2024, state spends are expected to go up further by 8-12% as their percentage achievement of budgetary allocations are expected to be largely in line with historical average.

Momentum to continue, supported by Bharatmala Pariyojana and NIP pipeline



Note: Capex excludes the land-acquisition costs
Source: NHAI, MoRTH, State budget documents, PMGSY, CRISIL MI&A Research

Investments: National highways

NHAI awarding to revive marginally in fiscal 2025 with the revamped BOT model likely to account for a improved share

NHAI has already offered more than 1500 kms of roads to NHIT in last 3 years. Our Sponsor's awarding had witnessed a rise from merely 2,222 km in fiscal 2019 to 6,003 km in fiscal 2023 . However, in fiscal 2024, awarding momentum was marred by various roadblocks. NHAI's flagship Bharatmala Pariyojana Programme (BMP) Phase-1 witnessed significant cost overrun on account of costlier land acquisition and high inflation. Currently, the estimated cost of the BMP phase-1 is

almost twice and the initial estimate and the ministry is awaiting cabinet approval for a revamped programme and additional funds in order to undertake rapid awarding of projects in the pipeline. As a result, NHAI awarding was ~3,339 kms in fiscal 2024.

Notably, the share of HAM dipped significantly due to the aforementioned issues regarding the BMP. Going forward, the share of HAM is expected to revive to around 25-30% in fiscal 2025. Further, on account of amendments in the BOT MCA, the awarding under the BOT model is also likely to increase. This is likely to be supported by the interest of developers in the revamped BOT model due to the following factors:

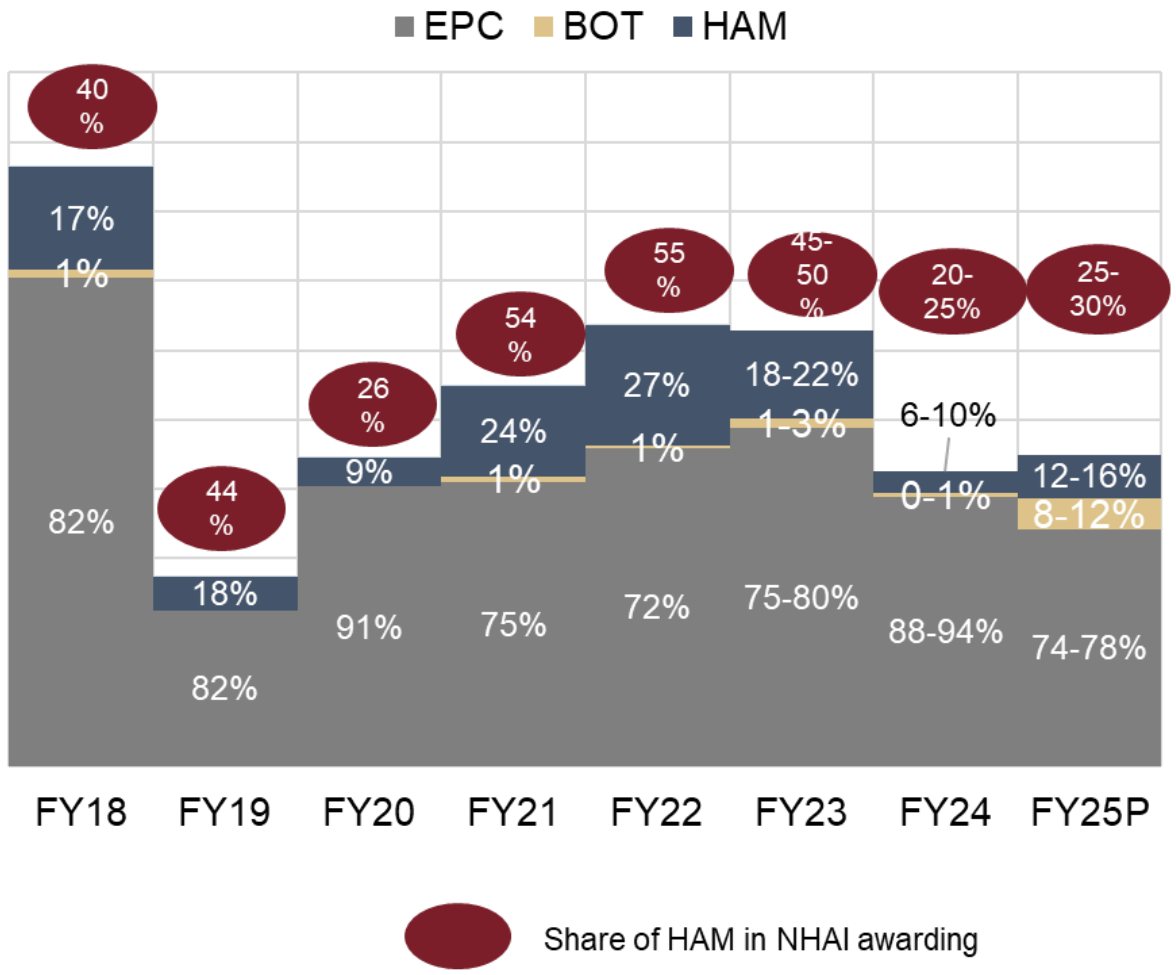
- HAM was favored by the road developers due to lower risk and higher profitability. However, the competition in HAM awarding has increased substantially leading to average bid premiums tumbling from a peak of 15-20% to around 4-6% in the last few fiscals. As a result, share of the larger developers have dropped substantially since many large developers have refrained from bidding aggressively for HAM projects in order to protect their margins. Given the amendment in BOT MCA and the scope of higher profitability due to lower bidding competitiveness in the BOT space many large developers are keen on taking up BOT projects.

- Furthermore, owing to the healthy balance sheets the developers are also in a comfortable position to undertake BOT projects with high funding requirements.

- The increased traffic visibility vis--vis earlier years also augurs well for the BOT projects.

The shift towards the BOT model comes against the backdrop of NHAI facing funding challenges and moderation in growth in the central government's budgetary outlay towards the roads & highways sector. Thus, the shift will have a two-pronged benefit by not only alleviating funding challenges to a great extent but also increasing the private investments in the sector.

Share of BOT in NHAI awarding to be around 8-12% in fiscal 2025 on the back of amendments in the BOT MCA



Source: NHAI, CRISIL MI&A Research

NHAI execution is also rising steadily with focus on swifter execution

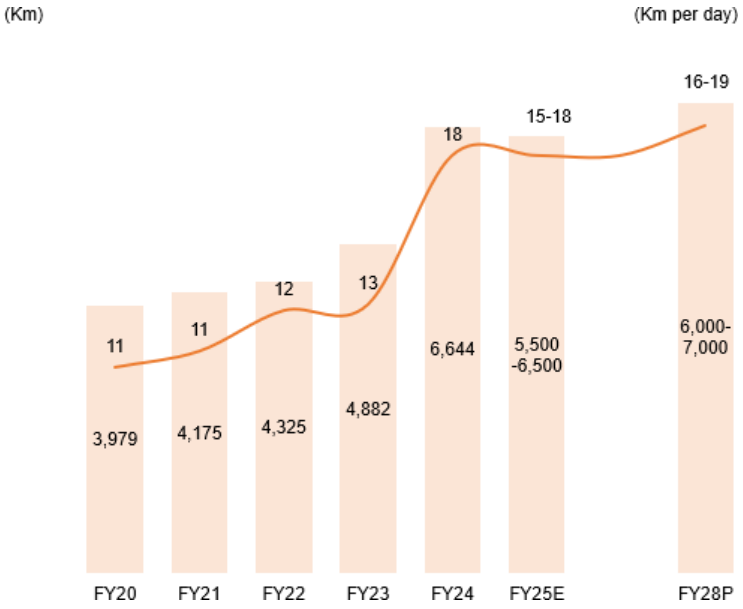
Even though overall national highways construction at the MoRTH level had remained flattish in fiscals 2022 and 2023, NHAI execution witnessed strong momentum. NHAI execution sequentially rose from 4,175 km in fiscal 2021 to 4,882 km in fiscal 2023.

Acceleration in project awards, sharper focus on resolving land acquisition issues, and the Atmanirbhar Bharat initiatives to ease liquidity (monthly milestone payments, release of retention money, reduction in performance security & extension of 3-6 months in milestones & SCODs) for EPC road players augured well for the pace of execution of NHAI projects.

Higher awarding of the previous years (FY21-23) and many of those projects receiving appointed dates in a timely manner have further boosted NHAI execution in fiscal 2024. As a result, 6,644 kms of NHAI projects were executed during the year. In other words, the construction per day stood at around 18 km. Given the healthy orderbooks of the developers, the momentum in the pace of execution is likely to continue in fiscal 2025 as well. CRISIL MI&A Research expects NHAI execution to be between 5,000-6,000 kms in fiscal 2025.

Over the medium term, the pace of construction is expected to rise steadily to reach ~19 km per day by fiscal 2028. NHAIs pace of construction rising steadily with continued focus on swifter execution.

NHAIs pace of construction rising steadily with continued focus on swifter execution



Source: NHAI, CRISIL MI&A Research

Policy push for HAM enabled higher share in awarding

NHAI awards roads & highway projects under:

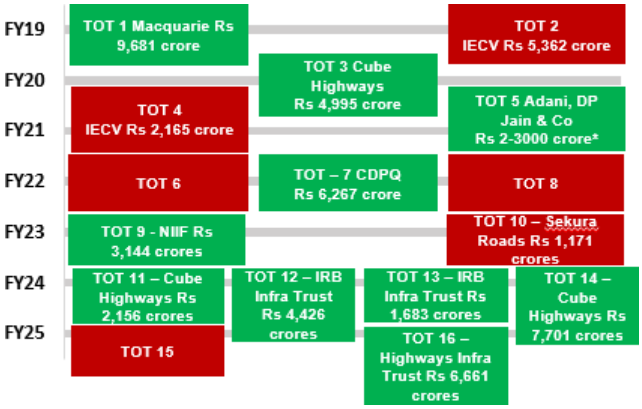
- EPC
- BOT
- HAM

The Ministry and NHAI, post multiple suggestions from various stakeholders have amended the HAM Model Concession Agreement across the below mentioned parameters in Oct 2020. These are largely aimed to protect developers' returns and ease their liquidity.

Recent changes in HAM MCA incorporate developers' concerns.

	Old Clause	Revised Clause	Impact
Annuity Payments	Interest on annuity payment linked to **RBI determined Bank Rate + 3%**	Interest on annuity payment linked to **average of one year MCLR of top 5 Scheduled Commercial Banks + 1.25%**	Differential between cost of borrowing and interest on annuity reduced thus preventing erosion of developers' returns due to RBI repo rate changes
Milestone Payments	**5** instalments, each equal to **8%** of the Bid Project Cost	**10** instalments, each equal to **4%** of the Bid Project Cost	Quicker payments helping developers' liquidity
Change in ownership	Original sponsor/ concessionaire shall hold at least 26% of equity during construction period and **2 years thereafter**	Original sponsor/ concessionaire shall hold at least 26% of equity during construction period and **6 months thereafter**	Quicker stake sell-off would ease up developers' balance sheets to bid for new projects
Financial Closure	No clarity on amount on FC	FC to be undertaken for an amount no lower than either: 1. Total Project Cost (60% of BPC); or 2. 10% less than (Estimated Project Cost minus 40% of Bid Project Cost)	Would likely prevent termination of projects due to inadequate financing
Dispute resolution board	In case of a dispute, either party may call upon the Independent Engineer to mediate.	Failing mediation by the IE, either party may require such dispute to be referred to the **Dispute Resolution Board (DRB).**	Quicker dispute resolution mechanism to prevent stuck projects.
Others	Interest mobilization advance linked to bank rate. Termination payments based on previous milestone payments.	Interest on mobilization advance linked to MCLR. Termination payments based on new milestone payments.	NA

Financing: Public Funding

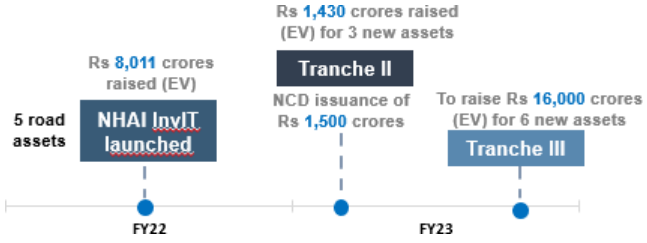


Success of TOT critical to meet ambitious Bharatmala targets

Source: NHAI, CRISIL MI&A Research

The authority has also tied up debt via SPV level funding for the Delhi-Mumbai expressway where it has already raised Rs 9,731 crores.

InVITs & SPV financing



Source: NHAI, CRISIL Research

Financing: Private Funding

Investment by private sector to grow 3x times over the next 5 years

CRISIL MI&A expects private construction investments in national highways to increase 2x to Rs 2.7 trillion over fiscals 2024 to 2028 compared with the previous five years. This is expected to be mainly through the hybrid annuity model (HAM) mode, as the build-operate-transfer (BOT) toll mode may have only a few takers.

A policy push in the form of changes in Model Concession Agreements (MCA) for HAM and BOT projects and reduction in bid eligibility criteria across all national highway projects would bode well for private participation. However, the share of HAM in total awarding is constrained by the cautious approach employed by banks in lending to HAM projects.

Amidst the COVID-19 pandemic, NHAI and the ministry have taken various steps under the Atmanirbhar package to ease issues faced by developers. Releasing monthly payments, instead of milestone based payments; extension of timelines for completion of projects, etc have sustained private participation in the sector. While these have been extended till Oct 2020, they are likely to fade from next fiscal onwards.

Asset monetisation, equity infusion key to support private investment in the long run

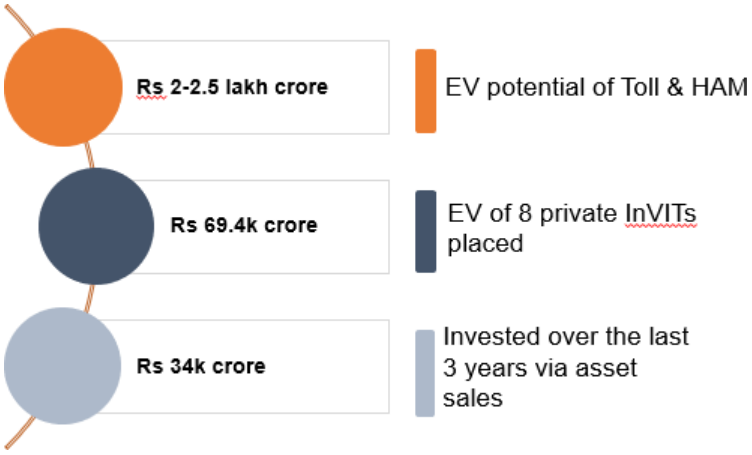
Currently, there are two broad drivers of asset sales in the roads sector - rationalisation of financial position to improve balance sheet strength and asset churning to be able to participate in the upcoming projects. The erstwhile major BOT players are selling off assets to reduce their debt burden and free up equity, which can be infused in under-execution projects.

The players present in HAM are currently selling off HAM assets to participate further in upcoming HAM projects. Some players intend to sell off under-construction projects to financial investors with projects being executed by the same player. Thus, they are able to convert HAM projects to EPC without facing the cut-throat competition they deal with currently in the EPC mode.

This will help them retain margins.

About Rs 70,000 - 80,000 crore has already been invested through these modes. CRISIL's analysis of BOT and HAM projects indicates a potential of ~Rs 2-2.5 lakh crore in terms of Enterprise Value.

Asset monetisation has a lot of potential to free up developers' balance sheets



Source: Industry, CRISIL MI&A Research

RISK FACTORS

An investment in the Units involves a high degree of risk. Before investing in the Units, prospective investors should pay particular attention to the fact that the Trust, the Parties to the Trust, the Project SPVs and each of their activities are governed by the legal, regulatory and business environment in India, which differs from that which prevails in other countries. Prospective investors should carefully consider the risks and uncertainties described below and the information contained elsewhere in this Preliminary Placement Document before making an investment in the Units. In making an investment decision, each investor must rely on its own examination of us and the terms of the offering of the Units. The risks and uncertainties described in this section may not be the only risks and uncertainties the Trust currently faces. Additional risks and uncertainties not presently known to the Trustee or the Investment Manager, or that the Trustee or the Investment Manager currently deem immaterial, may arise or may adversely affect our business, financial condition, cash flows and results of operations. If any of the following risks, or other risks that are not currently known or are now deemed immaterial, actually occur, our business prospects, results of operations, cash flows and financial condition could suffer, the price of the Units could decline and prospective investors may lose all or part of their investments. Unless otherwise stated in the relevant risk factors set forth below, the Trustee and the Investment Manager are not in a position to specify or quantify the financial or other risks mentioned herein.

The financial and other related implications of the risk factors, wherever quantifiable, have been disclosed in the risk factors mentioned below. However, there are certain risk factors where the financial impact is not quantifiable and, therefore, cannot be disclosed in such risk factors. Unless specified or quantified in the relevant risk factors below, we are not in a position to quantify the financial or other implication of any of the risks described in this section.

Investors should be aware that the price of the Units, and the income from them, may be subject to volatility. If any of the risks described below occurs, our business and prospects could be materially and adversely affected, the trading price of the Units could decrease, and investors could lose all or part of their original investment.

This Preliminary Placement Document also contains forward-looking statements that involve risks, assumptions, estimates and uncertainties. Our actual results could differ materially from those anticipated in such forward-looking statements as a result of certain factors including the considerations described below and elsewhere in this Preliminary Placement Document.

In making an investment decision, prospective investors must rely upon your own examination and the terms of the Issue, including the merits and the risks involved. You should consult your tax, financial and legal advisors about the particular consequences of investing in the Issue.

In this section, unless specified otherwise, a reference to "we", "us" and "our" refers to the Trust and the Project SPVs on a consolidated basis.

Risks Related to the Structure of the Trust

1. ***We have no operating history or financial information for the R4 Toll Roads. Accordingly, the information disclosed in this Preliminary Placement Document in relation to the R4 Toll Roads is limited.***

NSPPL was incorporated on March 8, 2025, to acquire tolling rights from the Sponsor for undertaking tolling, operation, and maintenance of certain national highways in India. Currently, we do not operate the R4 Toll Roads and accordingly NSPPL does not have any operating history. Furthermore, in accordance with Paragraph 11 of Annexure 6 of the Master Circular, the Investment Manager, by way of its letters dated February13, 2025, communicated to SEBI a request for relaxation of strict application of financial disclosure rules per the InvIT Regulations for the R4 Toll Roads ("**SEBI Exemption Request**").

SEBI *vide* its letter dated March 7, 2025 read with the email dated March 12, 2025 acceded to our request in relation to (i) the financials disclosures of R4 Toll Roads and has accordingly mandated us to disclosure the Asset Revenue Information for R4 Toll Roads for the previous three financial years and for the period from April 1, 2024 till the completed month prior to the filing of this Preliminary Placement Document; and (ii) the financial disclosures of the Sponsors and has accordingly mandated us to disclosure of unaudited financial results of the sponsor for the quarters ending June 2024 and September 2024. Further, we have indicated to SEBI that the unaudited financial results for December 31, 2024 may be disclosed only if the same is disclosed by NHAI to the stock exchanges in accordance with Regulations 52(8) and 54(2) of the SEBI LODR Regulations, 2015 and SEBI further acknowledged this vide their email dated March 12, 2025. Accordingly, we have included the requisite revenue data for R4 Toll Roads basis the information provided by the Sponsor by way of its letter dated March 12, 2025. For further details, see "*Asset Revenue Information*" on page 469 of this Preliminary Placement Document.

The absence of meaningful historical operating data in respect of R4 Toll Roads or financial statements may make it difficult for investors to evaluate our ability to operate, manage and maintain the R4 Toll Roads and assess our financial position or future prospects or results of operations. Our inability to successfully operate and manage the R4 Toll Roads or to operate

and manage the R4 Toll Roads in an efficient and cost-effective manner could have an adverse effect on our results of operations and our ability to meet our payment obligations under the Units.

2. ***Reliance on Unaudited and Limited Review Financial Information.***

The financial information presented in this Placement Document is derived from the financial statements of the Trust for the period from April 1, 2024, to September 30, 2024, and includes unaudited financial information of the trust for the nine month period ended December 31, 2024, which have been subject to a limited review. Since these nine months financial statements have not been audited, they may be subject to adjustments, modifications, or revisions upon final audit.

Investors should be aware that reliance on unaudited and limited review financial information carries inherent risks, including the possibility of material changes that could impact the Trust's financial position, results of operations, or future projections. Any such adjustments could affect the Trust's valuation and may influence investor perception and decision-making.

3. ***We must maintain certain investment ratios, which may present additional risks to us.***

Pursuant to the InvIT Regulations, we are required to invest not less than 80% of the value of our assets in eligible infrastructure projects as defined under the InvIT Regulations, such as the Project SPVs. In addition, we must not invest more than 20% of the value of our assets in certain financial instruments prescribed under the InvIT Regulations. If these conditions are breached on account of market movements of the price of the underlying assets or securities, the Investment Manager must inform the Trustee and ensure that these conditions are satisfied within six months of such breach (or within one year with Unitholders' approval). Failure to comply with these conditions may present additional risks to us, including divestment of certain assets, delisting and other penalties, which could have a material, adverse effect on our business, financial condition and results of operations.

4. ***We may not be able to make future distributions to Unitholders or the level of distributions may fall.***

The Trust's distributions are based on the cash flows generated from the operations undertaken by the underlying Project SPVs held by the Trust and not on whether the Trust makes an accounting profit or loss. The InvIT Regulations provide that not less than 90% of net distributable cash flows of the Project SPVs are required to be distributed to the Trust in proportion of its holding in the Project SPVs subject to applicable provisions of the Companies Act. Not less than 90% of distributable cash flows of the Trust shall be distributed to the Unitholders. Such distributions are required to be declared and made not less than once in every year and shall be made not later than fifteen days from the date of such declaration. The Trust has made distributions of ₹ 19.39 per unit through 13 distributions for upto December 31, 2024. Additionally, on March 12, 2025, the Trust announced an additional distribution of ₹ 1.652 per unit for the period from January 1, 2025 to February 28, 2025.For more details, see the section entitled "*Distribution*" on page 393 of this Preliminary Placement Document.

The Trust substantially relies on the receipt of interest, dividends, and principal repayments (net of applicable taxes and expenses) from the Project SPVs in order to make distributions to Unitholders. The distributions to Unitholders are in the form of dividends, interest and any other means permitted by law. There can be no assurance or guarantee that the Trust will have sufficient distributable or realised profits or surplus in any future period to make distributions every year in any amount or at all. The ability of the Project SPVs to pay dividends, make interest payments and repay shareholder loans may be affected by a number of other risks including but not limited to:

- business and financial position of the Project SPVs;
- insufficient cash flows received from the Project SPVs;
- loss of revenue due to traffic divergence;
- delays in handover takeover of toll plazas;
- applicable laws and regulations, which may restrict the payment of dividends by the Project SPVs;
- ability of the Project SPVs to borrow funds and access capital markets;
- operating losses incurred by the Project SPVs in any financial year;
- fluctuations in the working capital needs of the Project SPVs;
- changes in accounting standards, taxation laws and regulations, laws and regulations in respect of foreign exchange repatriation of funds, corporation laws and regulations relating thereto; and
- the terms of agreements, including the Concession Agreements or financing agreements, to which the Project SPVs are, or may become, a party.

Further, the method of calculation of the net distributable cash flows may change subsequently due to regulatory changes. Any change in applicable laws in India or elsewhere (including, for example, tax laws and foreign exchange controls) may limit our ability to pay or maintain distributions to our Unitholders. Furthermore, no assurance can be given that we will be able to pay or maintain the levels of distributions at all, or that the level of distributions will increase over time, or that future acquisitions will increase our distributable cash flow to our Unitholders. Any reduction in, or delay/ default in payments of distributions could materially and adversely affect the market price of our Units.

In addition, the financing agreements entered into by Project SPVs with banks, financial institutions and/or other lenders contains certain restrictive covenants, including, but not limited to, requirements that they obtain consent from the lenders prior to making any dividend payments to the Trust. Any failure to obtain such consents in a timely manner or at all would impede our ability to make distributions to Unitholders on a regular basis or at all, which could materially and adversely affect the market price of the Units. Additionally, following a default under our financing agreements, lenders may take coercive actions as per the rights available to them under applicable law, which may restrict our ability to conduct business and operations.

5. **Project SPVs may not be able to claim depreciation in relation to toll collection rights acquired from the Sponsor.**

Considering the diverse judicial precedents and the surrounding controversy as to whether the expenditure incurred on development and construction of infrastructural facilities like roads/ highways on BOT basis with right to collect toll is entitled for depreciation under section 32(1)(ii) of the Act or the same can be amortized by treating it as an allowable expenditure under the relevant provisions of the Act, the CBDT issued the Circular to clarify its position for tax treatment under BOT arrangements (where ownership is not vested with the taxpayer).

The Circular clarifies that cost of construction on development of infrastructure facility of roads/highways under BOT projects may be amortized evenly over the concessionaire period (excluding time take for creation of such facility).

Further, the Circular explicitly clarifies that the applicability is restricted to BOT arrangements where ownership is not vested with the taxpayer.

Under TOT projects, the concessionaire does not undertake construction, but only collects toll and operates and maintains the highway/ road. We believe that upfront concessional payment made by the SPV which corresponds to acquisition of toll right may be considered akin to acquisition of business or commercial rights and SPV is likely to be eligible to claim depreciation under Section 32 under the head 'intangible asset'.

However, tax authorities may interpret and take a contrary view on the above which may adversely affect our business and profitability.

Risks Relating to Our Business and the Concession Agreements

6. ***Any payment by the Project SPVs, including in the event of the termination of the Concession Agreements, is subject to a mandatory escrow arrangement which restricts its flexibility to utilise the available funds.***

The escrow arrangement mandated under the Concession Agreements requires all monies that are received by the Project SPVs, including funds constituting the financial package, the fees and any other revenues collected from or in respect of the Project Highway (including the proceeds of any rentals, deposits, capital receipts or insurance claims) and all payments by the Sponsor (including, if any, in relation to the change of scope), to be deposited in an escrow account and utilised only in accordance with the order prescribed under the escrow agreement. The consent of NHAI, in its capacity as the concessioning authority (the "**Authority**"), and lenders, is required to amend the order of outflow of payments from such escrow account.

The escrow arrangements prioritise the payment of all taxes due, followed by payment of the concession fee to the Authority, expenses in connection with the construction of the project, operation and maintenance expenses, other costs and expenses incurred by the Sponsor, debt service payments, any payments and damages due and payable to the Sponsor, and balance, if any, in accordance with the instructions of the concessionaire. For details of the escrow arrangement, please see the section headed "*Summary of the Concession Agreements*" on page 293 of this Preliminary Placement Document.

The debt financing provided by the Trust to the Project SPVs and any future debt financing proposed to be provided comprises of certain secured or unsecured interest-bearing loans (collectively, the "**Trust Financing**") which will be classified as senior debt under the Concession Agreements. In accordance with the escrow arrangement, the amounts payable to the Trust in respect of the Trust Financing, will be subordinated to the amounts payable in respect of taxes due, concession fees, construction expenses, operation, maintenance and other costs and expenses. Further, any reduction in the cash flows of the Project SPVs and/or an unanticipated increase in any of the abovementioned payments to be made by the Project SPVs from the escrow accounts may result in decreased and/or delayed payment to the Trust, materially and adversely impacting the ability of the Project SPVs to meet their payment obligations to the Trust. Any inability on the part of the Project SPVs to meet their payment obligations to the Trust may adversely impact the ability of the Trust to make distributions to the Unitholders in the manner described in this Preliminary Placement Document or at all.

In case of withdrawals from the escrow account on termination, the escrow arrangement prioritises the payment of all taxes due and payable, followed by the payment due to senior lenders (which includes the Trust), any payments and damages due and payable to the Sponsor, retentions and payments arising out of liability for any defects and deficiencies, incurred or accrued operation and maintenance expenses and any other payments under the Concession Agreements, after which the

balance may be withdrawn by the Project SPVs for its own purposes. Therefore, in case of termination, the amounts payable to the Trust in respect of the Trust Financing may be recovered only after payment of all taxes.

7. ***The Sponsor, whose interests may be different from the other Unitholders, will be able to exercise significant influence over certain activities of the Trust, and under the InvIT Regulations, it has the ability to divest its holdings in the Units three years following the Initial Offer Issue.***

As of December 31, 2024, the Sponsor holds 15.48 % of the Units of the Trust. After the completion of the Issue, i.e. on a post- Issue basis, while the Sponsor's unitholding may change, the Sponsor will still be entitled to vote as a Unitholder on all matters other than matters where it is a related party and not permitted to vote under the InvIT Regulations. Thus, the Sponsor may be in a position to exercise significant influence in matters which require the approval of Unitholders by virtue of its ownership of Units in the Trust. The interests of the Sponsor may conflict with the interests of our other Unitholders and the Sponsor may, for business considerations or otherwise, seek to benefit itself instead of the Trust or the interests of the other Unitholders. The Sponsor will also exercise significant influence over the Project Manager, which is a wholly owned subsidiary of the Sponsor. Accordingly, the Project Manager may also be subject to conflicts of interest with respect to the Trust.

In addition, under the InvIT Regulations, the Sponsor was required to hold a minimum of 15% of our Units for a minimum period of three years from the date of listing pursuant to the initial offer Issue and the balance of its unitholding in the Trust was required to be locked in for a period of one year from the date of listing of the Units. Further, in accordance with the InvIT Regulations, the Sponsor and the Sponsor Group, collectively, are required to lock-in our Units as follows:

Period of unitholding	**Percentage (%)**
From the beginning of 4th year after the date of listing pursuant to the initial offer and till the end of 5th year from the date of listing pursuant to the initial offer	5% of total Units or ₹ 500 crores, whichever is lower
From the beginning of 6th year after the date of listing pursuant to the initial offer and till the end of 10th year from the date of listing pursuant to the initial offer	3% of total Units or ₹ 500 crores, whichever is lower
From the beginning of 11th year after the date of listing pursuant to the initial offer and till the end of 20th year from the date of listing pursuant to the initial offer	2% of total Units or ₹ 500 crores, whichever is lower
After completion of the 20th year from the date of listing pursuant to the initial offer	1% of total Units or ₹ 500 crores, whichever is lower

Moreover, the Sponsor and the Sponsor Group are also subject to additional lock in obligation pursuant to preferential issue or institutional placement of Units. However, Sponsor unitholding may reduce in the future or Sponsor may not subscribe, leading to dilution of its stake.

Given the influence that the Sponsor exerts on the Investment Manager and the Project Manager, and consequently the operations and credibility of the Trust, any material divestiture by the Sponsor in the Units, or any conflict of interest that it has compared to that of other Unitholders, could have a material adverse impact on our business, financial condition and results of operations.

8. ***The cost of implementing new technologies for collection of tolls and monitoring our projects could materially and adversely affect our business, financial condition and results of operations.***

Our future success will depend in part on our ability to respond to technological advances and emerging standards and practices on a cost-effective and timely basis. In addition, rapid and frequent technology and market-demand changes can often render existing technologies and equipment obsolete, requiring substantial new capital expenditures or write-downs of assets. Any failure by us to successfully adopt such technologies in a cost-effective and timely manner could increase our costs. Additionally, governmental authorities may require adherence with certain technologies in the execution of projects, tolling, operations and maintenance etc. and there can be no assurance that we would be able to implement the same in a timely manner, or at all. The FASTag is a device which is fitted on the front windscreen of vehicles to indicate online toll payment. The proper functioning of such technology infrastructure is essential to the conduct of our business. There can be no assurance that we would be able to replace or refurbish such equipment and further such replacement or refurbishment might not be undertaken in a cost-effective manner and any increased costs to us as a result of such replacement or refurbishment will adversely affect our profit margins and cash flows. Moreover, any digital security breach affecting our technology infrastructure, including toll payments systems, could result in financial loss, operational disruption and reputational damage.

Currently NHAI is in process of adopting new technologies in order to improve the toll operations, such as satellite-based tolling (GNSS) & Multi Lane Free Flow, which may have impact on the tolling length & consequently revenues from the projects across industry and concessionaires. It is pertinent to note that certain protection mechanisms are available in the concession agreement and attendant fee notifications. However, Project SPVs/ concessionaires may not be able to secure full implementations of such protections and may not be able to mitigate full losses arising from adoption of such newer technologies.

9. ***We may face limitations and risks associated with debt financing and refinancing.***

We are subject to regulatory restrictions in relation to our debt financing and refinancing. We may from time to time require debt financing and refinancing to carry out the Investment Manager's investment strategy and to cover maintenance costs. In the event that we undertake debt financing or refinancing, we may be limited by Indian law as to the form of financing or refinancing that we may undertake. As an InvIT, we may be unable to access certain debt capital available to companies.

In the event that we undertake debt financing or refinancing, we may also be subject to risks associated with debt financing and refinancing, including the risk that our cash flow may be insufficient to meet required payments of principal and interest under such financing and to make distributions to Unitholders. Our ability to generate sufficient cash to satisfy our debt obligations will depend on our future operating performance, which may be affected by prevailing economic conditions and financial, business and other factors beyond our control. There is no assurance that we will be able to generate sufficient cash flow to meet all of our debt obligations. If we are unable to make payments due under our debt facilities, the lenders may be able to declare an event of default and initiate enforcement proceedings relating to any security provided in respect of the loan facilities, and/or call upon any guarantees, and this may materially and adversely affect our ability to make distributions to Unitholders. Such default may also result in the termination of the Concession Agreements by the Sponsor.

10. ***Certain actions of the Project SPVs require the prior approval of NHAI, and no assurance can be given that NHAI will approve such actions in a timely manner or at all.***

Certain terms and conditions in the Project SPV's Concession Agreements, financing agreements, and our other approvals require the Authority's prior written approval to be obtained for one or more of the following actions, among others, such as:

- assignment of the Concession Agreements to any persons, the creation of any encumbrance over, or transfer or disposal of rights and benefits of the Project SPVs under the Concession Agreements or any project agreements;
- the selection or replacement of any operation and maintenance contractor and execution of the operation and maintenance agreements;
- securing refinancing; and
- any change in ownership of the Project SPVs.

Furthermore, the Concession Agreements with NHAI typically require the submission to NHAI, for its review and comments, all project agreements to which the Project SPVs is a party prior to entry, amendment or replacement of such agreements. In terms of the R4 Concession Agreements, in the event NHAI does not provide any comments within 15 days of such submission, the project agreement may be executed and submitted to NHAI within 7 days of such execution.

The restrictions described above may impose constraints on our flexibility to conduct our business. Furthermore, if as a result of these restrictions, we are unable to pursue a favourable course of action or to respond to an unfavourable event, condition or circumstance, then our business, financial condition and results of operations may be materially and adversely affected. For further details on the terms of the Concession Agreements, section headed "*Summary of the Concession Agreements*" on page 293 of this Preliminary Placement Document.

11. ***Any delay in determination of appointed date (as defined in the R4 Concession Agreements) by the Authority may adversely impact our cashflows and revenue.***

The rights, privileges, liberties and obligations of NSPPL, shall commence from the date on which all conditions precedents, as stipulated in the R4 Concession Agreements, would have been satisfied. NSSPL shall enter into commercial service on the Appointed Date whereupon NSPPL shall be entitled to demand and collect fee and perform its O&M obligations, subject to and in accordance with the provisions of the R4 Concession Agreements. The determination of the Appointed Date by the Authority shall be final, conclusive and binding on NSPPL. Any delay in such determination of the Appointed Date may adversely affect our revenue generation, toll collection and cash flows and would have a material impact on our business and operations.

12. ***The regulatory framework governing infrastructure investment trusts in India is evolving and the interpretation and enforcement thereof involve uncertainties, which may have a material, adverse effect on the ability of certain categories of investors to invest in the Units, our business, financial condition and results of operations and our ability to make distributions to Unitholders.***

The SEBI issued the InvIT Regulations with effect from September 26, 2014. These regulations have been amended and supplemented with additional guidelines and circulars.

the regulatory framework governing infrastructure investment trusts in India comprises a separate set of regulations. The interpretation and enforcement of these regulations by regulators and courts can be uncertain. Additionally, various regulations and processes impact certain aspects of infrastructure investment trusts, including, but not limited to, follow-on public offers, bonus issues, the liabilities of the Unitholders, and the procedure for dissolution of infrastructure investment trusts, where detailed guidelines are yet been issued.

For example, infrastructure investment trusts are not classified as "companies" or "bodies corporate" within the meaning of the Companies Act, 2013, and various SEBI regulations., These include the Securities and Exchange Board of India (Buy-back of Securities) Regulations, 2018 and the Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeovers) Regulations, 2011.

Moreover, letters to SEBI for grant of exemptions from the stringent application of certain regulations is made by the Investment Manager on behalf of the Trust from time to time. However, there is no assurance that such exemptions will be granted. If the Trust is unable to comply with stringent regulations or process, it may have a consequential impact on the business of the Trust and results of operations of the Trust. While efforts will be made to comply with all regulatory changes, we cannot assure you, that this will always be possible. Non- compliance may result in reputational or material impact on our business and operations. We will strive to mitigate such risks by managing any adverse reports or other disclosures effectively, including clearly communicating the reasons for any non-compliance to relevant authorities.

In addition, new costs may arise from audit, certification and/or self-assessment standards required to maintain compliance with the InvIT Regulations. Such changes in regulation, interpretation and enforcement may have a material, adverse effect on our business, financial condition and results of operations.

As we will be operating in a new and relatively unclear regulatory environment, it is difficult to forecast how any new laws, regulations or standards or future amendments to the InvIT Regulations will affect infrastructure investment trusts and this could have any consequential impact on the infrastructure sector in India. For instance, pursuant to amendments to the InvIT Regulations on February 14, 2023 the Investment Manager was required to include an independent woman director on the board of the Investment Manager under Regulation 26(H) of the InvIT Regulations. SEBI by way of exemption letter dated February 21, 2024 exempted the Investment Manager from the requirement till March 31, 2024. While we are now complying with the aforementioned requirement, there is no assurance that the regulatory system will remain unchanged or that future changes will not impair our ability to comply with the regulations, conduct our business, compete effectively or make distributions effectively. Considering that the regulatory framework is ever evolving, if we are unable to comply with the regulatory changes or requirements, it could have an adverse reputational or business impact on us. For further information, please see section entitled *"Corporate Governance"* on page 101.

13. ***The Project SPV's toll-road concessions may be terminated prematurely under certain circumstances.***

The Toll Roads concessions of the Project SPVs are our principal assets. We will be unable to continue the operation of a particular road concession without a continuing concession right from the Sponsor, in its capacity as Authority. A concession may be terminated by the Authority for certain reasons set forth in the Concession Agreements, including, but not limited to, one or more of the following:

- any failure by the Project SPVs to comply with the change of ownership requirements;
- any failure by the Project SPVs to make any payments, to the Sponsor in a timely manner;
- any failure by the Project SPVs to comply with maintenance requirements;
- in the event the Project SPVs abandons or manifests intention to abandon the operation and maintenance of the Project Highway;
- any occurrence of an event of default under any financing document;
- any continuation of a force majeure event, such as an act of God, act of war, expropriation or compulsory acquisition of any project assets by the government, strikes, civil commotions, boycotts and political agitations, beyond a specified time; and
- any failure by the Project SPVs to comply with the Concession Agreements if such default causes a material adverse effect on the Sponsor.

If the Concession Agreements are terminated by the NHAI due to a default by the Project SPVs, or by the Project SPVs due to a default by the NHAI, the Project SPVs are entitled to termination payments or otherwise from the NHAI in accordance with the terms of the relevant Concession Agreements. If the Concession Agreements are terminated prematurely, our business, financial condition and results of operations may be materially and adversely affected. For further details on the termination of the relevant Concession Agreements, the termination payments, and the definition of "default" as contemplated under the Concession Agreements, see the section headed "*Summary of the Concession Agreements*" on page 293, of this Preliminary Placement Document.

14. ***Toll collections and Toll Road traffic volumes may be affected by existing or new competing roads and bridges and other modes of transportation, and any improvements to, or construction of, such roads, bridges and other modes of transportation.***

Upon commencement of the concessions, our principal source of revenue will be derived from the collection of toll fees from users of the Toll Roads. However, the level of toll collections may be affected by various factors, including the presence of existing or newly developed competing routes and alternative modes of transportation. These alternatives may include adjacent free roads, newly constructed or existing toll roads, shifting of toll plazas or other transportation networks such as national highways or state toll roads, railways or air transport. Although the Concession Agreements contain certain restrictions on the ability of the Sponsor to construct or cause to be constructed any competing roads within 15 km of the

Toll Roads, the Authority is not prohibited from constructing such competing free or toll roads if the average traffic on the Toll Road exceeds 90 per cent of its stipulated designed capacity for three consecutive years. Furthermore, the Sponsor is not restricted under the Concession Agreements from constructing alternative modes of travel which service the same areas as are serviced by the Toll Roads.

In particular, the Sponsor has entrusted the Project SPVs with the role of development, operation, maintenance and management of the Toll Roads mentioned hereinbelow.

S. No.	Toll Road	Length of Toll Road (in kms)	Connecting States/ in the State of
R1 Toll Roads			
1.	Abu road – Swaroopganj	31.000	Rajasthan to Gujarat
2.	Chittorgarh – Kota & Chittorgarh Bypass	160.500	Madhya Pradesh -Rajasthan
3.	Kothakota Bypass – Kurnool Highway	74.620	Telangana – Andhra Pradesh
4.	Palanpur/Khemana – Abu Road	45.000	Gujarat – Rajasthan
5.	Maharashtra Border – Belgaum	77.700	Maharashtra -Karnataka
R2 Toll Roads			
1.	Agra Bypass	32.800	Uttar Pradesh
2.	Borkhedi Kelapur Project Highway	138.150	Maharashtra – Telanagna
3.	Shivpuri Jhansi Project Highway	75.300	Madhya Pradesh – Uttar Pradesh
R3 Toll Roads			
1.	Chichra – Kharagpur Project	56.120	–West Bengal
2.	Rewa– Lakhnadon Project	306.340	Madhya Pradesh
3.	Kachugaon – Kaljhar Project	114.170	Assam
4.	Kaljhar – Patacharkuchi Project	27.300	Assam
5.	Lakhnadon – Mahagaon (Mohgaon) – Khawasa Project	107.350	Madhya Pradesh
6.	Orai – Barah Project	62.900	Uttar Pradesh
7.	Chitradurga Bypass – Hubli Project/ Karnataka Project	214.470	Karnataka
R4 Toll Roads			
1.	Narasannapeta to Ranasthalam Project	53.799	Andhra Pradesh
2.	Ranasthalam to Hanumanthavaka Project	66.544	Andhra Pradesh
3.	Anandapuram – Pendurthi – Anakapalle Project	48.605	Andhra Pradesh
4.	Gundugolanu-Devarapalli-Kovvuru Project	69.884	Andhra Pradesh
5.	Chittoor to Mallavaram Project	61.128	Andhra Pradesh
6.	TN/AP – Border to Nalagampalli to AP/Karnataka Border Project	84.797	Andhra Pradesh
7.	Bareilly – Sitapur Project	157.590	Uttar Pradesh
8.	Muzaffarnagar – Haridwar Project	78.560	Uttar Pradesh & Uttarakhand
9.	Raipur to Simga Project	48.580	Chhattisgarh
10.	Simga to Bilaspur Project	77.940	Chhattisgarh
11.	Gandhidham (Kandla) to Mundra Port Project	71.399	Gujarat

Additionally, given the renewed focus of the GoI, at the national, state and local levels, on the development and strengthening of the highway network across India, subject to the aforementioned restriction, there can be no assurance that there will not be any construction, widening or improvement of any free or toll roads, or construction of other modes of transportation, in the proximity of the Toll Roads or which provide an alternative or more direct routing to locations served by the Toll Roads. Any such construction, widening or improvement may divert traffic away from the Toll Roads, which may adversely affect toll collections and, therefore, our ability to meet our payment obligations under the Units.

15. ***Our business will be subject to seasonal fluctuations and routine maintenance that may affect our cash flows.***

Our cash flows will be affected by seasonal factors and/or routine maintenance leading to traffic diversion, which may materially and adversely affect traffic volumes. Traffic volumes tend to decrease during the monsoon season and conversely tend to increase during holiday seasons. The monsoon season may also restrict our ability to carry on activities related to our operation and maintenance of the Toll Roads. Further, extreme weather conditions, such as floods, incessant or torrential rain, acts of God, or any other force majeure event, could impair the safe operation of and traffic movement on the Toll Roads by causing events such as overtopping of structures on the carriageway, amongst others. This may also result in stoppage or diversion of traffic on Toll Roads or delays in periodic maintenance and may also reduce productivity. Additionally, anticipated traffic diversions could be higher for certain projects due to disruptions caused by capacity augmentation construction, as seen in past projects, thereby materially and adversely affecting our business, financial condition and operational results.

16. ***Toll rates and collections and Toll Road traffic volumes are dependent on factors beyond our control and are subject to significant fluctuations.***

Revenue from toll receipts is affected by traffic volume and toll rates, both of which are beyond our control. The toll rate structure is laid down under National Highways Fee (Determination of Rates and Collection) Rules, 2008, as amended from time to time (the "**Fee Rules**"). The Fee Rules specify that the applicable toll rates specified thereunder shall be increased by three per cent. Each year along with an adjustment based on an increase in the wholesale price index (the "**WPI**"). We are not provided with any flexibility to adjust the toll rates as the rates are explicitly changed by the GOI in accordance with the Fee Rules. See "*—Toll collections are affected by applicable toll rates and revisions to such rates and the number of road users subject to such rates.*"

Traffic volumes on the Toll Roads and toll collections are directly and indirectly affected by a number of other factors beyond our control, including but not limited to:

- the growth of the Indian economy and the economic development of the states in which the Toll Roads are located as well as neighbouring states (the "**Project Influence Area**");
- restrictions on mining, or a decline in manufacturing or exports of commodities plying on the Toll Roads due to regulatory clampdowns or other reasons;
- the number and type of motor vehicles in operation and the cost of purchasing and operating motor vehicles, including financing costs, environmental law compliance costs, exchange rate fluctuations and fuel prices, in the Project Influence Areas;
- weather conditions, such as floods or torrential rain, acts of God, strikes or any other force majeure event, including epidemics, such as COVID-19, that could impair the safe operation of, restrict traffic access to, or prevent use of the Toll Roads;
- traffic on the roads providing access to and from the Toll Roads, or the physical condition of such roads, which hampers the ability of road users to gain access to and from the Toll Roads;
- the capacity and physical condition of the Toll Roads, or any structure forming part of the Toll Roads, such as bridges, bypasses or tunnels, and the need for maintenance and repair of parts or all of the Toll Roads, or any structure forming part of the Toll Roads, which may result in restricted or no access to the Toll Roads for material periods of time;
- overall security of the Toll Roads as managed by the relevant security contractors, including the possible threat of terrorist attacks on the Toll Roads or any of their free-standing structures;
- a change in the applicable toll policies or other applicable laws which affects any category of vehicle or fuel;
- changes to axle load norms in order to further increase the permissible axle load limits in India, which may adversely impact traffic growth along Indian national and state highways and cause accelerated deterioration of the condition of the pavement of the Toll Roads;
- the reactions of the public or other national or state government institutions to toll rate increases; and
- seasonal holidays.

In the event there is a significant decrease in traffic volume or change in toll rates on the Toll Roads, there may be a corresponding decrease in toll collections which could have a material adverse effect on our ability to meet our payment obligations under the Units.

17. ***We are subject to environmental, social and safety risks associated with the operation of the Toll Roads which could adversely affect our business, cashflows and our results of operations.***

We are subject to laws and government regulations, including those related to safety, health, environmental protection, and other environmental and social risks concerning our Toll Roads. Environmental laws and regulations in India are becoming more stringent, and their impact on our operations cannot be predicted with certainty. Any failure on our part to comply with existing laws may result in legal proceedings, third-party claims, or regulatory fines. Further, the operation and maintenance of Toll Roads may require certain permissions and regulatory approvals. For instance, approvals from the Ministry of Environment, Forest, and Climate Change of India may be necessary for activities such as cutting down trees. However, there is no assurance that these permissions and regulatory approvals will be granted in every case, which may adversely impact the concessionaire's ability to operate and maintain the Toll Roads. Additionally, safety and other operational and maintenance risks may arise from environmental and social factors. For instance, in relation to the TN/AP Nadian project, approximately 10 km of the highway runs along the outskirts of the Pattikonda and Palamaner Reserved Forests, predominantly consisting of eucalyptus plantations. Furthermore, the stretch passes partially along the Rayala Elephant Reserve near Palamaner. Consequently, certain areas near these stretches are known to have elephant crossings, leading to potential human-animal conflict risks. The Authority, in consultation with Forest Officials, has identified three locations with a higher probability of elephant movement for constructing elephant passes. Additionally, one of the R3 toll roads i.e. the Lakhnadon-Khawasa project faces potential operational challenges due to its location within a wildlife protection area, with risks of wildlife roadkill despite mitigation measures. Additionally, obtaining prior permissions from the Forest Department for routine maintenance has lead to restricted operational hours, impacting the discharge of O&M obligations and potentially resulting in penalties.

18. ***Leakage of the tolls collected on the Toll Roads may adversely affect toll collections.***

Toll collections are primarily dependent on the integrity of our toll collection system. Upon commencement of the concessions, the Toll Roads will be operated on an "open" toll collection system with different toll rates applicable to

certain classes of vehicles; each motorist using a particular class of vehicle is charged a flat rate at the point of entry to the toll road regardless of the actual distance travelled.

Additionally, the Anandapuram- Pendurthi- Anakapalle Project is proposed for closed tolling in the next 4 years due to which collection may be impacted post transitioning from open tolling to closed tolling mechanism. The level of toll collections may be also reduced by leakage through toll evasion, fraudulent acts on the part of road users or our toll collection operators, theft, technical faults in our toll collection systems, or unlawful roadway entries or exits by road users to avoid paying the required toll.

To the extent we become aware of any routes available to road users to bypass the toll plazas, we may face delays in obtaining approval from the Sponsor to implement additional toll plazas to prevent such unauthorized entry or exit to the Toll Roads, which may adversely affect our revenue and our ability to meet our payment obligations under the Units. If toll collection is not adequately monitored, leakage may reduce toll collections. Although we expect to put in place systems and software, as well as deploy a number of toll plaza supervisors and security manpower, to minimize leakage through fraud and theft, if there is any significant failure in the efficiency or effectiveness of our collection practices or of the installed system software or any significant failure by us or our contractors to control leakage in toll collection, there could be a material adverse effect on our toll collections.

Furthermore, there may be situations where toll collection is disrupted or stopped, for example, due to public disturbances, or strikes or work stoppages as a result of disputes with local labour unions. Any such disruption or other stoppage of toll collection may interfere with our collection practices, resulting in increased leakage and reduced toll collections by us, which may adversely affect our revenue and our ability to meet our payment obligations under the Units.

19. ***The termination payment due to us upon termination of the Concession Agreements may not adequately compensate us for the actual costs and investments associated with the Toll Roads in a timely manner or at all and thus may not provide us with sufficient funds to repay the Units.***

The Concession Agreements may be terminated by us or the NHAI prior to their expiration for a number of reasons. For details, see "*—The Project SPVs Toll-Road Concession may be terminated prematurely under certain circumstances.*" On page 48. In the event that the early termination of the Concession Agreements is due to a breach by us, we are entitled to receive a termination payment equal to 70 per cent of the Unexpired Cash Flow (*as defined in the Concession Agreements*) in addition to remaining liable for costs and liabilities in relation to the Toll Roads. In the event that the early termination of the Concession Agreements is due to a breach by the NHAI, we are entitled to receive a contractually agreed termination amount equal to 105% of the the Unexpired Cash Flow (*as defined in the Concession Agreements*). As the termination payment payable to us in the event of a breach by us would be lower than what we would have otherwise been entitled to receive in the event that the Concession Agreements had not been terminated, we may not be adequately compensated for the actual costs and investments associated with the Toll Roads and, therefore, may not be able to meet our payment obligations in relation to the Units or proposed debt issuance.

There is no assurance that any termination payment due to us will be paid in a timely manner or at all. Further, there are no precedents of termination payments being triggered in respect any other TOT projects in India. In the event of a delay in the disbursement of a termination payment by the Sponsor, in particular, if any dispute arises in respect of such payment, or in the event the Sponsor fails to make the termination payment at all, there may be insufficient funds available for us to meet our payment obligations under the Units.

20. ***Toll collections are affected by applicable toll rates and revisions to such rates and the number of road users subject to such rates.***

Under the terms of the Concession Agreements, toll rates applicable to the Toll Roads are determined in accordance with the Fee Rules. Toll rates are increased annually by a fixed percentage and adjusted based on the Wholesale Price Index (WPI). The adjustment considers the change in WPI between the week ending on January 6, 2007, and the corresponding week of each adjustment year. However, the WPI Adjustment is capped at 40% of the WPI change. While a correlation exists between WPI and factors like wage and material costs, toll rate increases may not fully offset operational costs, especially in high WPI fluctuation periods.

Additionally, toll collections can be influenced by exemptions granted under Concession Agreements, such as for non-commercial road users or discounted fee users. Any increase in exemptions or inability to implement revised toll rates promptly can reduce toll collections. This impact can be compounded by factors like reduced traffic volume, changes in consumer preferences, or exchange rate fluctuations.

Further, the annual toll rate revisions, typically effective from April 1, are critical to ensuring revenue growth and aligning toll collections with operational costs. However, delays in implementing these revisions can lead to significant financial and operational risks. For instance, in the current financial year, toll rates were revised from June 3, 2024, due to procedural delays. Such delays can lead to revenue losses, affecting debt servicing capabilities and financial projections.

Additionally, delayed revisions can also impact investor sentiment and asset valuations, particularly when uncertainties arise around revenue forecasts. These uncertainties may influence the valuation of toll assets, potentially affecting ratings from financial institutions and agencies.

21. ***Our revenues under the Transitional Support Agreement are dependent on successful continuation of underlying tolling contracts.***

The Sponsor, Project Manager and NSPPL ("**Project SPV 3**") have entered into a transitional support agreement dated March 13, 2025 for the purpose of the Sponsor providing transitional support to (i) the Project SPV 3 in respect of its O&M obligations and tolling obligations in relation to the R4 Concession Agreements; and (ii) the Project Manager in respect of its obligations under the Project Implementation and Management Agreement. As a result, the Sponsor is obligated, during the term of the Transitional Support Agreement, to undertake the tolling obligations/ tolling related responsibilities under and in compliance with the R4 Concession Agreement(s) on behalf of the Concessionaire. In furtherance of this, the Sponsor has entered into tolling contracts with certain third-party contractors in respect of the project highways under which these contractors pay the Sponsor a fixed contracted fee on a regular basis irrespective of the actual quantum of fee collected in respect of the project highway.

The Sponsor shall continue to operate tolling contracts on "as is basis" during the transition period from appointed date. Further, the remittance (which would be due to the Sponsor) under such tolling contracts would be credited directly to NSPPL upon consummation of the transaction. These tolling contracts have a defined period and have set expiry dates. However, some contracts may expire during the transaction period or upon its completion, potentially delaying the handover over of the tolling operations. Additionally, tolling contracts contain provisions for pre-mature termination in cases of default by third-party contractors. In such scenarios, the Sponsor may need to enter into new contracts or extend existing ones, with the remittance from such renewed tolling contracts possibly being lower than the currently contracted amounts, posing a risk of lower revenue. Moreover, toll contracts are periodically awarded by NHAI to various tolling contractors with the understanding that they may be terminated for various reasons including, taking over of the operations of the relevant Toll Roads by Project SPV 3. However, such tolling contractors may contest termination of the tolling contracts, delay in handover of the toll plazas of the Toll Roads, fail to transfer the required amounts under the tolling contracts. Such uncertainties could materially impact the expected revenue, financial condition, and overall business prospects of Project SPV 3.

22. ***The operation of the Toll Roads and the revenues generated from them may be impacted as a result of any capacity augmentation or other works required to be carried out in accordance with the terms of the Concession Agreements or any RFPs floated by the Sponsor.***

The Sponsor has the right under the terms of the Concession Agreements to undertake, through a contractor, at its own cost, capacity augmentation of the Toll Roads. In connection with any capacity augmentation work in respect of the Toll Roads, the toll fees shall be reduced to 75% during the period of construction in terms of the applicable fee rules. While in the case of R2 Toll Roads, R3 Toll Roads and R4 Toll Roads, any financial loss incurred by the concessionaire, during the period of such capacity augmentation, will be compensated for by the Authority on a quarterly basis to place the concessionaire in the same financial position that it would have enjoyed had there been no reduction in toll rates due to capacity augmentation, the same compensation shall not be provided to R1 Toll Roads. Considering there can be no assurance that construction work in relation to such capacity augmentation work will be completed in the expected time frames, any delay in capacity augmentation works shall have an adverse impact on the R1 Toll Roads, in turn, adversely impacting the revenue of the Trust. The project's toll revenue is significantly dependent on the traffic volume. Any Capacity augmentation construction may incentivize toll roads users to shift to the alternate routes. Such diversion could lead to reduction in traffic on the project highway, thereby adversely impacting toll collections and overall revenue system.

In exercise of its rights relating to capacity augmentation under the Concession Agreements, the Sponsor may from time to time release Request for Proposals ("**RFPs**") for construction activities on the Toll Roads. For example, in August 2021, the Sponsor had released RFPs inviting bids for construction works on certain sections of the Belgaum Kagal Project. The RFPs contained the timeframe within which the construction would be completed and details of works to be completed during augmentation including the proposed structures like flyovers and bridges. There can be no assurance that the capacity augmentation or construction under future RFPs would be completed within the expected time frames. Further, the length of these structures would determine the permitted increase in Toll Fees that the concerned Project SPV would be entitled to charge upon successful completion of the construction. The actual increase in length of the structures and in turn, permitted increase in Toll Fees is dependent on several factors beyond our control, such as, the final length of the structures constructed under the RFPs.

Moreover, there can be no assurance that the criteria for capacity augmentation of any stretch shall be strictly in accordance with the Concession Agreements. In addition to the criteria stipulated in the Concession Agreements, capacity augmentation may also be carried out by the government of India based on economic and strategic requirements. As such, the capacity augmentation may be commenced prior to the stipulated time period as per the Concession Agreements. For instance, the capacity augmentation for a stretch of road that forms part of Kothakota Bypass – Kurnool Project is proposed prior to the stipulated time period as per the Kothakota Bypass – Kurnool Concession Agreement by the Government of

India as part of its strategic initiative of Bharatmala Pariyojana. Accordingly, the Concessionaire will have to bear the additional cost of operation and maintenance of the widened road and the same may or may not be reimbursed by the Authority. Further, in terms of Kotha Kurnool Concession Agreement, the Concessionaire is required to complete certain initial improvement works within a timeframe of 24 months from the Appointed Date. Considering the apparent advancement of the capacity augmentation, the Concessionaire is not required to undertake works envisaged in the Concession Agreement. Instead, the Concessionaire has remitted an amount equivalent to 80% of the estimated amount of initial improvement works to the Authority, in accordance with the negative change of scope provisions of the Concession Agreement.

Further, in terms of the R2, R3 and R4 Concession Agreements, the detailed project report for capacity augmentation may be commenced immediately once the average daily traffic has met the target traffic. Additionally, any increase in revenue due to increase in Equivalent Tollable Length (*as defined in the R2 R3 and R4 Concession Agreements*) of the project highways shall be paid to NHAI on a quarterly basis. For further details in relation to the differences in the terms of R1 Concession Agreements, R2 Concession Agreements, R3 Concession Agreements and R4 Concession Agreements, see "*Summary of Concession Agreements – Differences amongst the R1 Concession Agreements, R2 Concessions Agreements, R3 Concession Agreements and R4 Concession Agreements*" on page 269.

23. ***Changes in the policies adopted by governmental entities or in the relationships of any member of the Trust with the Government or State Governments could materially and adversely affect our business, financial performance and results of operations.***

The Project SPV would be deriving almost all of its revenue from the Concession Agreements with the NHAI and must maintain good relationships and strategic alliances with the Sponsor, the Government and State Governments. We expect that we will continue to depend on, and benefit from, policies relating to the terms of the concessions in respect of the Project SPV's existing projects and any future projects. In addition, we expect to benefit from, and depend on, the Sponsor and various Government and State Government entities in terms of policies, incentives, budgetary allocations and other resources provided by these entities for the road industry in general. Any adverse change in any existing governmental policies, incentives, allocations or resources, or any change in our relationships with governmental entities, could materially and adversely affect our business, financial condition and results of operations.

Additionally, the Toll Roads may be subject to delays, extensive internal processes, policy changes, changes due to local, national and internal political pressures and changes in governmental or external budgetary allocation and insufficiency of funds. Since governmental entities are responsible for awarding concessions and are a party to the development and operation of the awarded projects, our business will be directly and significantly dependent on their support. Any withdrawal of support or adverse changes in their policies, even if not quantifiable monetarily, may lead to the Project SPV's agreements being restructured or renegotiated or the concession period being decreased, which could materially and adversely affect the Project SPV's financing, capital expenditure, revenues, development or operations.

24. ***The Valuation Reports, and any underlying reports, are not opinions on the commercial merits of the Trust or the Project SPVs, nor are they opinions, expressed or implied, as to the future trading price of the Units or the financial condition of the Trust upon listing, and the valuation contained therein may not be indicative of the true value of the Project SPV's assets.***

Ernst & Young Merchant Banking Service LLP has been appointed as the independent valuer (the "**Valuer**") to undertake independent appraisals of the Toll Roads. The Valuer have issued the Valuation Report in relation to the Target Toll Roads as at February 28, 2025, included in **Annexure B** to this Preliminary Placement Document, In order to issue their Valuation Reports, the Valuer based their assumptions regarding the traffic volume, toll rates, operation and maintenance costs, amortization, debt repayments and non-cash net working capital projections amongst other things, on information provided by and discussions with or on behalf of the Investment Manager, and which reflects current expectations and views regarding future events and, therefore, necessarily involves known and unknown risks and uncertainties. Please see the Valuation Report included in Annexure B to this Preliminary Placement Document for a more detailed description of all assumptions relied upon in the preparation thereof. The Valuation Report contains forecasts, projections and other "forward-looking" statements that relate to future events, which are, by their nature, subject to significant risks and uncertainties. The future events referred to in these forward-looking statements involve risks, uncertainties and other factors which may cause the actual results or performance to be materially different from any future results or performance expressed or implied by the forward-looking statements.

The Valuation Reports are not an opinion on the commercial merits and structure of the Trust or the Project SPVs, nor is it an opinion, expressed or implied, as to the future trading price of the Units in or the financial condition of the Trust upon listing. The Valuation Reports does not purport to contain all the information that may be necessary or desirable to fully evaluate the Trust or the Project SPVs or an investment in the Trust or the Units. The Valuation Reports is not based on a comprehensive review of the business, operational or financial condition of the Project SPVs and, accordingly, makes no representation or warranty, expressed or implied, in this regard. The Valuation Reports does not confer rights or remedies upon investors or any other person, and does not constitute and should not be construed as any form of assurance as to the financial condition or future performance of the Trust or as to any other forward-looking statements included therein,

including those relating to certain macro-economic factors, by or on behalf of the Investment Manager, the Project Manager, the Trust. Further, we cannot assure you that the valuation prepared by the Valuer reflects the true value of the net future revenues of the Project SPVs or that other valuers would arrive at the same valuation. Accordingly, the valuation contained therein may not be indicative of the true value of the Project SPV's assets. The Valuation Reports have been issued as on February 28, 2025, but does not take into account any subsequent developments and should not be considered as a recommendation by the Investment Manager, the Project Manager, the Trust or the Lead Manager or any other party that any person should take any action based on the Valuation Reports. Accordingly, investors should not completely place on reliance on the Valuation Reports in making an investment decision to purchase Units in the Trust.

25. ***We have referred to the data derived from (i) Technical Consultant Report commissioned from the Technical Consultants, and (ii) Traffic Reports commissioned from the Traffic Consultants which are based on certain bases, estimates and assumptions that are subjective in nature and may not be accurate.***

We have appointed Samarth Infraengg Technocrats Private Limited, Ramboll India Private Limited and Egis India Consulting Engineers Private Limited, independent third-party research agencies for undertaking technical due diligence of the R4 Toll Roads, as our technical consultants (the "**Technical Consultants**"). The Technical Consultants have prepared technical reports on the R4 Toll Roads, which are set out in **Annexure D** to this Preliminary Placement Document (the "**Technical Report**").

We have appointed IBI Group India Private Limited, Ramboll India Pvt Ltd, and CRISIL India Limited as our traffic consultants ("**Traffic Consultants**") to prepare the detailed Traffic Consultant Reports and provide their analysis and forecast of traffic volumes for the R4 Toll Roads. The traffic reports are set out in **Annexure C** to this Preliminary Placement Document (the "**Traffic Reports**").

Furthermore, we have also commissioned valuation reports dated February 18, 2025 in relation to NWPPL, and NEPPL and the valuation report dated December 31, 2024 in relation to NSPPL issued by the Valuer, sets out their opinion as to the fair enterprise value of the Toll Roads as on February 28, 2025. All of the Technical Reports, the Traffic Reports and the Valuation Reports (together referred to as "**Industry Expert Reports**") are subject to various limitations and are based upon certain bases, estimates and assumptions that are subjective in nature and that are based, in part, on information provided by and discussions with or on behalf of the Investment Manager. In particular, certain of the information we have provided the Traffic Consultants for the purposes of the Traffic Reports has been aggregated from data collected by third-party service providers. Although we believe such data to be accurate, we have not verified the information and cannot assure you that it is free from error. The Industry Expert Reports reflect current expectations and views regarding future events, and therefore, necessarily involve known and unknown risks and uncertainties. The Industry Expert Reports contain forecasts, projections and other "forward-looking" statements that relate to future events, which are, by their nature, subject to significant risks and uncertainties, including population growth, gross domestic product growth, vehicle ownership rates, per capita income, agricultural output and fuel consumption. The future events referred to in the Industry Expert Reports involve risks, uncertainties and other factors which may cause the actual traffic volumes to be materially different from any future traffic volumes expressed or implied by the Industry Expert Reports. There can be no assurance that the bases, estimates and assumptions adopted by the Technical Consultants, Valuer or the Traffic Consultants for the purposes of preparing their respective reports will prove to be accurate. If any of these traffic assumptions are incorrect, future traffic volumes for the R4 Toll Roads could be materially different from those that are set forth in these reports and this Preliminary Placement Document.

26. ***Certain provisions of the standard form of Concession Agreements may be untested, and the Concession Agreements may contain certain restrictive terms and conditions which may be subject to varying interpretations.***

The Concession Agreements that we have entered into is substantially based on a model concession agreement prescribed by the Sponsor. For example, the toll fees under the Concession Agreements is fixed, subject to annual adjustments to account for inflation as specified in the Concession Agreements. In addition, the operation and maintenance standards and specifications require the Project SPVs to incur operation and maintenance costs on a regular and periodic basis. The Concession Agreements also provide for a fixed term concession and, although our Concession Agreements provide for an extension or reduction of the concession period based on certain factors, including actual average toll collection on specified target dates, the Concession Agreements do not provide for renewal of the Concession Agreements after the expiry of the term.

The form of the Concession Agreements has evolved within the last decade and there is limited guidance available on the interpretation of a number of terms and conditions of the Concession Agreements. In addition, certain terms of the Concession Agreements, such as those related to an augmentation in the capacity of the toll roads, substitution of the Sponsor in any or all of the project agreements, termination payments by the Sponsor, construction of additional competing roads by the Sponsor, the Government or State Governments and payment of compensation by the Sponsor for changes in law are untested. Accordingly, the interpretation of certain terms and conditions in the Concession Agreements of the Project SPVs by the Sponsor, the courts or regulators may be different from our interpretation of such terms and conditions.

The terms and conditions of the Concession Agreements contain restrictive terms and conditions. For example, the Concession Agreements contain provisions that mandate substitution clauses in the project agreements. Such substitution

clauses allow the Sponsor to step into project agreements in place of the Project SPVs in the event of suspension of the Project SPVs or termination of the Concession Agreements due to a breach or default by the Project SPVs. The Concession Agreements also provides that the lenders to a Project SPV may substitute the Project SPV with new entities approved by the Sponsor in the event of a default by the Project SPV under the relevant Concession Agreements or financing agreements. The terms of the Project SPV's Concession Agreements requires the Project SPV to indemnify the Sponsor for losses arising out of breach of the obligations of the Project SPV under the Concession Agreements.

In the event the Sponsor or a lender invokes any restrictive term or condition in the Concession Agreements, or the Sponsor, a court, or regulator interprets any term or condition in an adverse manner, such invocation or interpretation may materially and adversely affect our business, financial condition and results of operations.

27. ***We may be subject to increases in costs, including operation and maintenance costs, which we cannot recover by increasing toll fees under the Concession Agreements.***

The terms and conditions of the Concession Agreements are fixed and are not negotiable during the concession period. The costs of operating and maintaining the InvIT Assets may increase due to factors beyond the Project SPV's control, including, among other things:

- increase in the cost of labour, materials and insurance;
- the Project SPV being required to install intelligent toll-collection systems at their own costs;
- the Project SPV being required to restore their project roads in the event of any landslides, floods, road subsidence, other natural disasters, accidents or other events causing structural damage or compromising safety;
- increase in electricity tariff rates or other fuel costs resulting in an increase in the cost of energy;
- adverse weather conditions;
- unforeseen legal, tax and accounting liabilities relating to acquired assets; and
- other unforeseen operational and maintenance costs.

In the event that our costs increase, we may be unable to offset such increases with higher revenues by increasing toll fees due to the restrictions of the Concession Agreements.

Any significant increase in operation and maintenance costs beyond the amounts budgeted for by us, or any failure to meet quality standards, may reduce our profits, could expose us to penalties imposed by the concessioning authorities and could have a material, adverse effect on our business, financial condition and results of operations. Such events may also impact the ability of the Project SPVs to service the debt obtained from the Trust and our ability to make distributions to Unitholders. As such, the inability to change the terms and conditions, including the toll fees of the concession during the concession period, may materially and adversely affect our operational and financial flexibility.

28. ***We will depend on certain directors, executive officers and key employees of the Investment Manager, the Project Manager and the Project SPVs, and such entities may be unable to appoint, retain such personnel or to replace them with similarly qualified personnel, which could have a material, adverse effect on the business, financial condition, results of operations and prospects of the Trust.***

Our performance will depend, in part, upon the continued service and performance of certain directors, executive officers and key personnel of the Investment Manager, the Project Manager and the Project SPVs. The continued operations and growth of our business will be dependent upon the Investment Manager, the Project Manager and the Project SPVs being able to attract and retain personnel who have the necessary and required experience and expertise. There is a probability that the target talent pool may misrepresent about their experience and expertise. We cannot assure you that the parties to the Trust shall be able to identify such misrepresentation, if it occurs in future, in a timely manner.

Further, competition for qualified personnel with relevant industry expertise in India is intense due to the scarcity of qualified individuals in the toll-road business, and the aforesaid entities may not be able to retain their executive officers and key employees or attract and retain fresh talent in the future. Any inability by the Investment Manager, the Project Manager and the Project SPVs to retain their directors, executive officers and key employees, or the inability to replace such individuals with similarly qualified personnel, could have a material, adverse effect on the business, financial condition, results of operations and prospects of the Trust.

Additionally, there is a risk associated with willful misconduct, malpractice, or fraudulent activities by directors, executive officers, or key employees. Such actions could lead to financial misrepresentation, operational inefficiencies, regulatory penalties, or reputational damage. Instances of fraud, embezzlement, or mismanagement may not always be detected promptly, potentially leading to financial losses or legal consequences. Any such misconduct, if not identified and addressed effectively, could have adversely impact the Trust's financial stability and long-term viability.

29. ***There can be no assurance that we will be able to successfully undertake future acquisitions of road assets or efficiently manage the infrastructure road assets we have acquired or may acquire in the future.***

We may in the future acquire toll roads and other road assets. We may not be able to identify or conclude appropriate or viable acquisitions in a timely manner. The success of our past acquisitions and any future acquisitions will depend upon several factors, including:

- our ability to identify, finance and acquire operational toll roads and other road assets on a cost-effective basis;
- our ability to integrate acquired personnel, operations, products and technologies into our organisation effectively;
- unanticipated problems or legal liabilities of the acquired businesses; and
- tax or accounting issues relating to the acquired businesses.

There can be no assurance that we will be able to achieve the strategic purpose of such acquisitions or operational integration or an acceptable return on such investments, which may materially and adversely affect our profits, financial condition and distributions.

Furthermore, Concession Agreements for future toll-road projects may also contain terms and conditions that are more restrictive than those under the current Project SPV's Concession Agreements for the Toll Roads. These restrictions may restrict our flexibility in managing our business or projects and could in turn materially and adversely affect our business prospects, financial condition and results of operations.

30. ***The Project SPVs may not be able to comply with their maintenance obligations under the Concession Agreements, which may result in the termination of the Concession Agreements, the suspension of the Project SPV's rights to collect tolls or the requirement that the Project SPV pay compensation or damages to the Sponsor.***

The Project SPVs are required to undertake operation and maintenance of the Toll Roads within periods and in the manner as specified in the Concession Agreements. There can be no assurance that the Project SPVs will not breach the maintenance obligations under the Concession Agreements on account of the Project Manager's failure to undertake the stipulated maintenance work in a timely manner, or at all.

If any Project SPV is in breach or default of its obligations, then the NHAI has the right to (a) suspend the right of the Project SPV, including the right to collect tolls and other fees, (b) claim compensation for all direct, additional costs suffered or incurred by the Sponsor arising out of such default, or (c) terminate the Concession Agreements. Further, the Gundugolanu-Devarapalli-Kovvuru project, Partial portion of TN/AP – Border to Nalagampalli - AP/Karnataka Border Project, Chittoor to Mallavaram Project, Narasannapeta to Ranasthalam Project, Ranasthalam to Hanumanthavaka Project and Anandapuram – Pendurthi – Anakapalle Project are those projects that are currently being operated and maintained by various concessionaires/ EPC contractors under their respective contractual agreements. These projects shall be handed over to the Trust as per the O&M handover schedule stipulated under the respective concession agreements. While the subsisting agencies/ EPC contractors are required to ensure compliance of the performance obligations relating to each of the projects mentioned above, above and the NHAI is obligated to handover the asset as per the stipulated specifications, at the time of O&M Handover, however there is no assurance that the subsisting agencies and concessionaires/EPC contractors will not default in discharging their obligations. In such an event, the Trust could incur additional costs to remedy such defects and deficiencies to meet its performance obligations under the respective concession agreement(s). Accordingly, there may be a potential claims against the non-fulfilment of divesture or defect liability period obligations by the existing engineering, procurement and construction contractors which may have an impact on the results of operations and business of the Trust.

If the Concession Agreements are terminated, the right to collect tolls is suspended or the Project SPV is required to pay compensation or damages, our business, financial condition and results of operations may be materially and adversely affected. For further details of the maintenance obligations, suspension and termination events under the Concession Agreements, see the section headed "*Summary of the Concession Agreements*" on page 293 of this Preliminary Placement Document.

31. ***The insurance policies for the R4 Toll Roads are currently not in place for any protection against various risks and any future insurance coverage obtained may be inadequate.***

The Investment Manager, on behalf of the Trust, has obtained relevant insurance policies for the R1 Toll Roads, the R2 Toll Roads and the R3 Toll Roads. However, we cannot assure that the policies that have been obtained shall adequately cover attendant risks. We also cannot assure that we will be able to renew the policies from time to time.

In relation to the R4 Toll Roads, the insurance policies are currently not in place. Under the terms of the R4 Concession Agreements entered into for the tolling rights for the R4 Toll Roads, such tolling rights would be granted as on and with effect from the appointed date which shall occur upon the conditions specified in the R4 Concession Agreements which would be subsequent to the allotment of the Units pursuant to the Issue. As such, obtaining adequate insurance would only be undertaken on or after the appointed date under the R4 Concession Agreements and we have currently not obtained insurance for the R4 Toll Roads.

There can be no assurance that all risks in relation to R4 Toll Roads shall be adequately insured against or that we will be able to procure adequate insurance coverage at commercially reasonable rates in the future.

Further the Toll Roads/InvIT Assets are subject to various risks that we may not be insured against, adequately or at all, including:

- changes in governmental and regulatory policies;
- shortages of, or adverse price movement for, construction materials;
- design and engineering defects;
- breakdown, failure or substandard performance of the road assets and other equipment;
- improper installation or operation of the road assets and other equipment;
- labour disturbances;
- terrorism and acts of war;
- inclement weather and natural disasters;
- environmental hazards, including earthquakes, flooding, tsunamis and landslides; and
- adverse developments in the overall economic environment in India.

Further, we are subject to various risks in the operation of the Toll Roads, including on account of accidents on the Toll Roads. Any insurance obtained for R4 Toll Roads may not provide adequate coverage in certain circumstances and is subject to certain deductibles, exclusions and limits on coverage. To the extent we suffer damage or loss which is not covered by insurance, or exceed our insurance coverage, such damage or loss would have to be borne by us. We can make no assurance that material losses in excess of insurance proceeds (if any at all) will not occur in the future, which could materially and adversely affect our financial condition, business and results of operations.

32. ***The project SPVs, Sponsor and the Trustee are involved in certain legal and other proceedings, which may not be decided in their favour.***

The project SPVs, Sponsor, certain of its Associates and the Trustee are involved in legal proceedings or claims which are pending at different levels of adjudication before various courts, tribunals and regulatory authorities. For details of certain material outstanding legal proceedings, see the section headed "*Legal and Other Information"* on page 408 of this Preliminary Placement Document. There is no assurance that these legal proceedings and regulatory matters will be decided in favour of the respective entities. Decisions in any of the aforesaid proceedings adverse to our interests may have a material adverse effect on our or their business, future financial performance and results of operations. If the courts or tribunals rule against the project SPVs, Sponsor or its Associates or the Trustee, we or the Sponsor may face monetary and/or reputational losses and may have to make provisions in our financial statements, which could increase expenses and liabilities.

33. ***We do not own the "NHAI" trademark and logo. Our license to use the "NHAI" trademark and logo may be terminated under certain circumstances and our ability to use the trademark and logo may be impaired.***

We do not own the "NHAI" trademark and "NHAI" logo, which is a trademark currently applied for by the Sponsor and which has been accepted and advertised by the Trademark Registry, Government of India. However, pursuant to a separate trademark license agreement dated March 12, 2025, the Sponsor has granted to the Trust, the non-transferable and non-assignable right to use the name of NHAI as part of the trade name of the Trust, as well as the Sponsor's trademarks ("**Trademarks**") in connection with the business of the Trust, on a non-exclusive basis, for the use in the Republic of India and globally. The license granted to the Trust in terms of the Trademark License Agreement shall be for a term of 1 (one) year from March 12, 2025. The Trust's right to use the Trademarks shall stand terminated with immediate effect if any of the terms of the license are breached. The Trust is permitted to use the Sponsor's logo pursuant to the terms of the aforesaid trademark license agreement, and does not separately hold any trademarks in its name. However, as on date the Trust has applied for registration of the logo being, 

and the application dated October 30, 2024 bearing application no. 6692243 is currently being processed by the Registrar of Trade Marks, Delhi. We cannot assure you the timeframe within which the registration certificate will be received. If the Sponsor terminates the licensing agreement, before the certificate is obtained, it may have a material, adverse effect on the operations of the Trust and require management's time and attention.

34. ***We could depend on NHAI and various third parties to undertake certain activities in relation to the operation and maintenance of the InvIT Assets. Any delay, default or unsatisfactory performance by these third parties could materially and adversely affect our ability to effectively operate or maintain the InvIT Assets.***

We could be dependent on the availability and skills of NHAI and third-party employees and contractors pertaining to the operation and maintenance of the InvIT Assets. Under the Transitional Support Agreement, NHAI will provide support pertaining to the operation and maintenance of the Target Toll Roads. When the Transitional Support Agreement expires, i.e. after a period of six months for all Target Toll Roads and 12 months for Gandhidham (Kandla) Mundra Port Project, commencing from the appointed date as per the respective Concession Agreements, we will need to appoint third-party entities to undertake operations and maintenance and tolling, and the terms of these future contracts may not be favourable to us. We can also make no assurance that the services of such third parties will continue to be available at reasonable rates

in the areas in which we conduct our operations. We may also be exposed to risks relating to the ability of such third parties to obtain requisite approvals for the operation and maintenance activities, as well as the quality of their services, equipment and supplies. In particular, failure to ensure the reliability and sustainability of toll collectors who are required to man the toll booths continuously may materially and adversely affect our overall level of net revenue. We may also be exposed to civil and criminal liability in relation to the actions of other third parties, including our employees and contractors.

Further, if we undertake limited development, while we may sub-contract our construction work, we may still be liable for accidents on our projects due to defects in design and quality of construction of our projects during their construction and operation. In addition, we can make no assurance that such contractors or their sub- contractors will continue to hold or renew valid registrations under the relevant labour laws in India or be able to obtain the requisite approvals for undertaking such construction and operation. Any delay, default or unsatisfactory performance by these third parties could materially and adversely affect our ability to manage the operation and maintenance of the InvIT Assets under the Concession Agreements in a timely manner or at all. Any of the foregoing factors could have a material, adverse effect on our business, financial condition, reputation and results of operations.

35. ***The completion certificate and provisional completion certificate in respect of one of the R1 Toll Roads and potentially R4 Toll Roads are not traceable. Accordingly, alternate documents have been relied upon in relation to certain disclosures made in this Preliminary Placement Document.***

The Authority is unable to trace the completion certificate and provisional completion certificate in respect of one of the R1 Toll Roads. Under these circumstances, we have relied on alternative documents such as the defects liability certificate dated May 17, 2010, issued by M/s Stanley Consultants Inc. in joint venture with M/s RITES Limited, certifying completion of all works on April 27, 2010, and the Technical Reports in respect of Chittorgarh to Kota section in Rajasthan for upgrading of NH-76 of east west corridors undertaken by NHAI ("**Chittorgarh – Kota Project Highway**"). Further, in relation to R2 Toll Roads and R3 Toll Roads, we have relied on the certification from the Sponsor for the completion certificate and provisional completion certificate. Additionally, there is a possibility that there may be similar uncertainty for R4 Toll Roads. We cannot assure you that the information relating to completion of the works in connection with the aforementioned toll roads are true and accurate.

36. ***The Trust and the Project SPVs are subject to government regulation and if there is a failure to obtain, maintain or renew statutory and regulatory licenses, permits, and approvals required to operate the business, results of operations and cash flows may be adversely affected.***

The Trust and the Project SPVs may be required to obtain and maintain a number of statutory and regulatory licenses, permits and approvals for carrying out the business and acquiring new projects, including consents to establish and operate under environmental laws, which are granted for a limited duration and require renewal. We cannot assure you that such approvals will be issued or granted to us in a timely manner, or will be granted at all. The R4 Toll Roads to be acquired by the Trust are completed and revenue generating assets. The Sponsor, by way of its letter dated March 12, 2025 in relation to the R4 Toll Roads has confirmed that it had obtained all the necessary approvals and clearances required during the construction stage of the R4 Toll Roads.

Further, we shall obtain all other material permits, registrations, licenses, approvals, consents and other authorizations as may be required upon acquisition of the R3 Toll Roads. For details, see "*Regulatory Approvals*" on page 407. If we do not receive such approvals or are not able to renew the approvals in a timely manner, our business and operations may be materially adversely affected.

37. ***Significant differences exist between Indian GAAS used to prepare the Sponsor's audited financial information and other accounting principles, such as Ind-As and IFRS, with which investors may be more familiar.***

The Sponsor has prepared its audited financial information in accordance with Indian GAAS in accordance with the NHAI Act and the rules thereunder. The Sponsor has not attempted to quantify the impact of Ind-As or International Financial Reporting Standards ("**IFRS**") on the audited financial information, nor has it provided a reconciliation of its financial statements to those of IFRS or Ind-As.

If the Sponsor were to prepare its audited financial information in accordance with such other accounting principles, the Sponsor's results of operations, financial condition and cash flows may be substantially different. Accordingly, the degree to which the Sponsor's audited financial information will provide meaningful information is entirely dependent on your level of familiarity with Indian accounting practices under Indian GAAS. Any reliance by persons not familiar with such accounting practice on the Sponsor's financial disclosures presented in this Preliminary Placement Document should accordingly be limited. Persons not familiar with Indian accounting practices should, accordingly, consult their own professional advisors before relying on the financial disclosures presented in this Preliminary Placement Document.

38. ***The Trust has received the approval of its unitholders to undertake a preferential issue of up to 249,860,000 Units to the Sponsor or the EPFO, or both. Such preferential issue or an inability to do so could have consequences for existing unitholders, prospective investors in the issue or the Trust.***

The unitholders of the Trust have approved a preferential issue of up to 249,860,000 Units (the "**Preferential Issue**") to the Sponsor or EPFO, or both. If such Preferential Issue is successfully completed (fully or partially), it could result in additional dilution of existing unitholders or successful Bidders in the issue.

However, if the Trust is unable to successfully complete the Preferential Issue, it may have to fund the payment of concession fee for the Target Toll Roads through other sources. There is no assurance that the cost of such alternative funding would not adversely impact the commercial attractiveness or returns from the Target Toll Roads. There is no assurance that the Trust will be avail such alternative funding on commercially attractive terms or at all.

Risks Related to the Trust's Relationships with the Sponsor and the Investment Manager

39. ***The Investment Manager may not be able to implement its investment or corporate strategies and the fees payable to the Project Manager are dependent on various factors.***

The Investment Manager's strategies focus on three main areas:

- managing the underlying assets of the Trust;
- managing the Trust's acquisitions and disposals; and
- managing the Trust's capital structure to maximize distributions.

There is no assurance that the Investment Manager will be able to implement these strategies successfully or that it will be able to expand our portfolio at any specified rate or to any specified size or to maintain distributions at projected levels. The Investment Manager may not be able to make acquisitions or investments on favourable terms or within a desired time frame, and it may not be able to manage the operations of its underlying assets in a profitable manner. Factors that may affect this risk may include, but are not limited to, changes in the regulatory framework in India, competition for assets, partial award of concessions or licenses favouring local or other competitors of the Trust, changes in the Indian regulatory or legal environment or macro-economic conditions. If the Investment Manager is unable to implement these strategies successfully or expand our portfolio, we will nonetheless be required to pay the Investment Manager an annual management fee, exclusive of taxes, in accordance with the terms of appointment of the Investment Manager.

Even if the Investment Manager is able to successfully grow the operating business of the underlying assets and to acquire toll roads and other eligible infrastructure projects in India as desired, there can be no assurance that the Investment Manager will achieve its intended return on such acquisitions or capital investments. Furthermore, the Investment Manager's investment mandate involves a higher level of risk as compared to a portfolio which has a more diverse range of investments. As the Trust or the size of the Trust grows, the fees payable to the Investment Manager may also increase. Additionally, any such payment of fees will require the approval of Unitholders. The Investment Manager may only be removed by a resolution of Unitholders (excluding the Sponsor) such that the votes cast in favour of the resolution are not less than one-and-a-half times the votes cast against the resolution.

Further, the fees payable to the Project Manager may vary periodically based upon the operating and maintenance work undertaken concerning the Project SPV. These fees cannot be fixed or decided upfront for all periods. The current fees payable to the Project Manager commensurate with the existing operating assets. However, with the addition of assets, it may attract increase in Project Manager fees subject to prior approvals of the parties to the PIMA. This could lead to potential disagreements between Trust and Project Manager or it may result in the increase in the fees. Additionally, as the Trust grows, the fees paid to the Project Manager also grows. For further information, please see "*Overview of the Trust*" on page 28 of this Preliminary Placement Document.

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40. ***While the Sponsor may intend to transfer certain road assets in the future, the Trust may be unable to bid effectively for them***

The Sponsor may, from time to time, consider offering additional road assets to the Trust as per the Sponsor's monetization targets. However, there can be no assurance that the Trust will be able to accurately or effectively assess such future assets within the available timeframe, and its bids may consequently be uncompetitive. Furthermore, the Sponsor retains the discretion to accept or reject any binding offer made by the Trust based on factors beyond the Trust's control.

Access to future toll road assets sourced by the Sponsor or its existing or future subsidiaries will be an important source of growth in the future for the Trust, and any inability to bid competitively for Future Assets or the inability to win contracts from the Sponsor for their operation for any reason could have a material adverse effect on the Trust's operations, financial condition or prospects. Further, there is no guarantee that Sponsor may offer additional road assets to Trust for monetization in future.

41. ***Parties to the Trust are required to maintain the eligibility conditions specified under Regulation 4 of the InvIT Regulations on an ongoing basis. The Trust may not be able to ensure such ongoing compliance by the Sponsor, the Sponsor Group, the Investment Manager, the Project Manager and the Trustee, which could result in the cancellation of the registration of the Trust.***

Each of the parties to the Trust are required to maintain the eligibility conditions specified under Regulation 4 of the InvIT Regulations on an ongoing basis. These eligibility conditions include, among other things, that (a) the Sponsor, Investment Manager and Trustee are separate entities, (b) the Sponsor has a net worth of not less than ₹ 1,000 million and has a sound track record in the development of infrastructure or fund management in the infrastructure sector, (c) the Investment Manager has a net worth of not less than Rs. 100 million and has not less than five years' experience in fund management or advisory services or development in the infrastructure sector or the combined experience of the directors, partners and employees of the investment manager in fund management or advisory services or development in the infrastructure sector is not less than 30 years, (d) the Trustee is registered with the SEBI under Securities and Exchange Board of India (Debenture Trustees) Regulations, 1993 and is not an associate of the Sponsor or Investment Manager and I each of the Sponsor, Sponsor Group, Investment Manager, Project Manager and Trustee are "fit and proper persons" as defined under Schedule II of the Intermediaries Regulations on an ongoing basis. The Trust may not be able to ensure such ongoing compliance by the Sponsor, the Investment Manager, the Project Manager and the Trustee, which could result in the cancellation of the registration of the Trust.

Further, in terms of Regulation 4(2)(e)(v) of the InvIT Regulations, the Investment Manager should, inter-alia, have not less than half of its directors as independent directors. As on the date of this Preliminary Placement Document, the IM Board consists of ten directors out which five are independent directors. For details, please see "*Parties to the Trust – The IM Board*" on page 85.

42. ***The Investment Manager is required to comply with certain ongoing reporting and management obligations in relation to the Trust. There can be no assurance that the Investment Manager will be able to comply with such requirements.***

The Investment Manager is required to comply with certain ongoing reporting and management obligations in relation to the Trust in accordance with the InvIT Regulations. These requirements include, among other things, (a) making investment decisions with respect to the underlying assets or projects of the Trust, (b) overseeing the activities of the Project Manager, (c) investing and declaring distributions in accordance with the InvIT Regulations, (d) submitting reports to the Trustee, (e) ensuring the audit of the Trust's accounts. There can be no assurance that the Investment Manager will be able to comply with such requirements in a timely manner or at all, which could subject the Investment Manager, the other parties to the Trust, the Trust or any person involved in the activity of the Trust to applicable penalties under the InvIT Regulations, the Intermediaries Regulations and/or the SEBI Act. Any such failure to comply or the imposition of any penalty could have a material adverse effect on our business, financial condition and results of operations. Under the InvIT Regulations, the SEBI also has the right to inspect documents, accounts and records relating to the activity of the Trust, Project SPVs or parties to the InvIT and may issue directions in the nature of, *inter alia*, (i) requiring the Trust to delist its Units and surrender its certificate of registration; (ii) requiring the Trust to wind-up; (iii) requiring the Trust to sell its assets; (iv) requiring the Trust or parties to the Trust to take such action as may be in the interest of investors; or (v) prohibiting the Trust or parties to the Trust from operating in the capital market or from accessing the capital market for a specified period.

43. ***Our Investment Manager is wholly-owned and controlled by the GoI, which makes us susceptible to changes to its policies.***

The Investment Manager is currently wholly-owned and controlled by the President of India acting through the Ministry of Road Transport and Highways ("**MORTH**"). Accordingly, the GoI will be able to exercise significant influence over the Investment Manager, its policies and affairs. Although, by way of its letter dated July 12, 2022, MORTH has communicated that the Investment Manager can manage its affairs as per its corporate governance framework and may recruit, compensate and remove the human resources as per the policies approved by the Nomination and Remuneration Committee of the IM Board, we cannot assure that the GoI will not change its policies in the times to come. Further, the GoI may require the Investment Manager to take actions aimed at serving the public interest, which may not be aligned with the commercial objectives of the unitholders.

44. ***Impact of change in ownership of Investment Manager.***

Currently, the Investment Manager is wholly owned by the President of India. However, in the future, the government may decide to privatize the entity, leading to a change in ownership and control. Such a transition would require the Investment Manager to undergo a conversion process, which would be subject to regulatory approvals and compliance with applicable laws and stakeholder consent.

This potential privatization could introduce uncertainties regarding corporate governance, decision- making processes, and strategic direction. A change in ownership may also lead to modifications in management policies, operational strategies, and investment decisions, which could impact the overall stability and performance of the Investment Manager. Additionally, any delays or challenges in obtaining necessary approvals could disrupt ongoing operations and create regulatory risks.

Furthermore, the privatization process may attract scrutiny from regulatory bodies, investors, and other stakeholders, existing lender approvals, potentially leading to legal or procedural hurdles. Changes in ownership could also influence the

Investment Manager's risk appetite, financial policies, and contractual obligations, thereby affecting the Investment Trust's performance and long-term financial stability.

Risks related to India

45. ***Changing laws, rules and regulations and legal uncertainties may materially and adversely affect our business, financial condition and results of operations.***

Our business, financial condition and results of operations could be materially and adversely affected by any change in laws or interpretations of existing, or the promulgation of new, laws, rules and regulations applicable to us and our business. There can be no assurance that the Government or State Governments will not implement new regulations and policies which will require the Trust Group to obtain additional approvals and licenses from governmental and other regulatory bodies or impose onerous requirements and conditions on our operations. The Investment Manager cannot predict the terms of any new policy, and there can be no assurance that such policy will not be onerous.

46. ***Significant increases in the price or shortages in the supply of crude oil and products derived there from, including petrol and diesel fuel, could materially and adversely affect the volume of traffic at the projects operated by the Project SPVs and the Indian economy in general, including the infrastructure sector.***

India imports a significant majority of its requirements of crude oil. Crude oil prices are volatile and are subject to a number of factors, including the level of global production and political factors, such as war and other conflicts, particularly in the Middle East, where a substantial proportion of the world's oil reserves are located. Any significant increase in the bitumen price or shortages in the supply of crude oil could materially and adversely affect the volume of traffic at the projects operated by the Project SPVs and materially and adversely affect the Indian economy in general, including the infrastructure sector, which could have a material, adverse effect on our business, financial condition and results of operations. Further, any increase in the prices of bitumen may lead to a potential increase in the cost of repairs, maintenance and major maintenance works carried out by the Project SPVs and adversely affect the financial conditions and results of operations of the Trust.

47. ***We may be affected by competition law in India and any adverse application or interpretation of the Competition Act could materially and adversely affect our business.***

The Competition Act, 2002, as amended (the "**Competition Act**"), regulates practices having an appreciable adverse effect on competition in the relevant market in India. Under the Competition Act, any formal or informal arrangement, understanding or action in concert, which causes or is likely to cause an appreciable adverse effect on competition is considered void and results in the imposition of substantial monetary penalties. Further, any agreement among competitors which directly or indirectly involves the determination of purchase or sale prices, limits or controls production, supply, markets, technical development, investment or provision of services, shares the market or source of production or provision of services by way of allocation of geographical area, type of goods or services or number of customers in the relevant market or directly or indirectly results in bid-rigging or collusive bidding is presumed to have an appreciable adverse effect on competition. The Competition Act also prohibits abuse of a dominant position by any enterprise.

On March 4, 2011, the Government issued and brought into force the combination regulation (merger control) provisions under the Competition Act with effect from June 1, 2011. These provisions require acquisitions of shares, voting rights, assets or control or mergers or amalgamations that cross the prescribed asset-and turnover-based thresholds to be mandatorily notified to and pre-approved by the Competition Commission of India (the "**CCI**"). Additionally, on May 11, 2011, the CCI issued the Competition Commission of India (Procedure in regard to the transaction of business relating to combinations) Regulations, 2011, as amended, which set out the mechanism for implementation of the merger control regime in India. The Competition Act aims to, among other things, prohibit all agreements and transactions which may have an appreciable adverse effect on competition in India. Further, the CCI has extra-territorial powers and can investigate any agreements, abusive conduct or combination occurring outside India if such agreement, conduct or combination has an appreciable adverse effect on competition in India.

In the event, the Project SPVs or the Trust enters into any agreements or transactions that have an appreciable adverse effect on competition in the relevant market in India, the provisions of the Competition Act will be applicable. Further, in order to facilitate the transaction the Trust had sought the automatic system of approval for combinations through a 'Green Channel' route and the same has been acknowledged by CCI. Under this process, a combination is deemed to have been approved upon filing the notice in the prescribed format and acknowledgement thereof, subject to Commission's finding that the combination falls under the 'Green Channel' scheme. In the event such applications are not made, or such approvals are not granted, in a timely manner or at all, it may result in, amongst other things, penalties being imposed against the Trust. Any penalties levied under the Competition Act or adverse orders issued could materially and adversely affect our financial condition and results of operations. Any adverse impact on our financial condition or operations due to the Competition Act may have a material adverse impact on our business, financial condition, results of operations and prospects and our ability to make distributions to the Unitholders.

48. ***Any downgrading of India's debt rating by rating agencies could have a negative impact on our business.***

India's sovereign rating has been affirmed to Baa3 with a "stable" outlook by Moody's and BBB- with a "stable" outlook (Fitch); and BBB (low) "positive" by Dominion Bond Rating Service ("**DBRS**"). India's sovereign ratings from S&P is BBB-with a "positive" outlook. India's sovereign rating could be downgraded due to various factors, including changes in tax or fiscal policy or a decline in India's foreign exchange reserves, which are outside our control. Any adverse revisions to India's credit ratings by rating agencies may adversely affect our ability to raise additional financing, and the interest rates and other terms at which such additional financing is available. This could materially and adversely affect our ability to obtain financing for capital expenditure, which could in turn materially and adversely affect our business, prospects, financial condition, results of operations and cash flows. India's sovereign debt rating could be downgraded due to various factors, including changes in tax or fiscal policy or a decline in India's foreign exchange resources, which are outside our control.

49. ***We are subject to risks associated with outbreaks of diseases or similar pandemics or public health threats, which could have a material adverse impact on our business and our results of operations and financial condition.***

In the past, various contagious diseases have spread throughout the world, including India where the entire operations of Sponsor or the Toll Roads are located. In the past, beginning in late 2019 and continuing in 2020, 2021 and 2022, the global spread of COVID-19 had created significant economic and political volatility and uncertainty and business disruption. The spread of COVID-19 had led to governments around the world to take various measures such as the implementation of incoming and outgoing travel restrictions, voluntary and mandatory cessations of business operations, mandatory quarantines and work-from-home and other alternative working arrangements, curfews, limitations on social and public gatherings and partial lockdowns of cities or regions in order to limit the virus' spread. The spread of COVID-19 and governmental responses had resulted in worker absences, reduced business productivity, other business disruptions, reduced demand and stagnated economic activity in India and around the world. More generally, any epidemic, pandemic or other health crisis, whether similar to COVID-19, SARS, H1N1, MERS or other past global diseases, could materially and adversely affect our business, financial condition and results of our operations.

Risks Related to Ownership of the Units

50. ***The Trust may be dissolved, and the proceeds from the dissolution thereof may be less than the amount invested by the Unitholders.***

The Trust is an irrevocable trust registered under the Registration Act and it may only be extinguished (i) if it is impossible to continue with the Trust or if the Trustee, on the advice of the Investment Manager, deems it impracticable to continue with the Trust; (ii) on the written recommendation of the Investment Manager and upon obtaining the prior written consent of such number of the Unitholders as is required under the InvIT Regulations; (iii) if the Units of the Trust are delisted from the Stock Exchanges; (iv) if the SEBI passes a direction for the winding up of the Trust or the delisting of the Units; or (v) in the event the Trust becomes illegal. Under the Trust Deed, in the event of dissolution, the net assets of the Trust, remaining after settlement of all liabilities, and the retention of any reserves which the Trustee deems to be necessary to discharge contingent or unforeseen liabilities, shall be paid to the Unitholders. Should the Trust be dissolved, depending on the circumstances and the terms upon which assets of the Trust are disposed of, there is no assurance that a Unitholder will recover all or any part of his investment.

51. ***The reporting requirements and other obligations of infrastructure investment trusts post-listing are still evolving. Accordingly, the level of ongoing disclosures made to and the protection granted to Unitholders may be more limited than those made to or available to the shareholders of a company that has listed its equity shares upon a recognized stock exchange in India.***

The InvIT Regulations, along with the guidelines and circulars issued by the SEBI from time to time, govern the affairs of infrastructure investment trusts in India. However, as compared to the statutory and regulatory framework governing companies that have listed their equity shares upon a recognized stock exchanges in India, the regulatory framework applicable to infrastructure investment trusts is relatively nascent and thus, still evolving. Pursuant to a circular dated November 29, 2016, the SEBI has prescribed certain continuous disclosure requirements that will be applicable to an InvIT after listing of its units.

Accordingly, the ongoing disclosures made to Unitholders under the InvIT Regulations may differ from those made to the shareholders of a company that has listed its equity shares upon a recognized stock exchange in India in accordance with the Securities and Exchange Board of India (Listing Obligations and Disclosure Requirements) Regulations, 2015. Further, the rights of the Unitholders may not be as extensive as the rights of the shareholders of a company that has listed its equity shares upon a recognized stock exchange in India, and accordingly, the protection available to the Unitholders may be more limited than those available to such shareholders.

52. ***Any additional debt financing or issuance of additional Units may have a material, adverse effect on the Trust's distributions, and your ability to participate in future rights offerings may be limited.***

The Investment Manager may require additional debt financing or the issuance of additional Units in order to support the operating business or to make acquisitions and investments. If obtained, any such additional debt financing may decrease

distributable income, and any issuance of additional Units may dilute existing Unitholders' entitlement to distributions. Additionally, if there is unavailability of debt financing or unable raise debt to due to regulations, the same may impact the Trust's ability to execute major maintenance work in future.

We are not required to offer pre-emptive rights to existing Unitholders when issuing new Units. Compliance with securities laws or other regulatory provisions in some jurisdictions may prevent certain investors from participating in any future rights issuances and thereby result in dilution of their existing holdings in Units.

53. ***The Trust may be unable to dispose of its non-performing assets in a timely manner.***

Due to the nature of its structure, the Trust may be unable to dispose of its non-performing assets in a timely manner, or at all. As a result, no assurance can be given that the Trust may be able to adapt to market developments, changes in asset quality, or adverse macroeconomic factors in a way comparable to, or competitive with, its competitors or more traditional corporate entities in general. Any ability to dispose of non-performing assets may in turn adversely affect the financial condition, business and prospects of the Trust, as well as distributions that the holders of the Units may receive from the Trust.

54. ***Fluctuations in the exchange rate of the Indian Rupee with respect to the U.S. Dollar or other currencies will affect the foreign currency equivalent of the value of the Units and any distributions.***

Fluctuations in the exchange rates between the Indian Rupee and other currencies will affect the foreign currency equivalent of the Indian Rupee price of the Units. Such fluctuations will also affect the amount that holders of the Units will receive in foreign currency upon conversion of any cash distributions or other distributions paid in Indian Rupees by us on the Units, and any proceeds paid in Indian Rupees from any sale of the Units in the secondary trading market.

55. ***Unitholders are unable to require the redemption of their Units.***

Unitholders will not have the right to redeem Units or request or require the redemption of Units by the Investment Manager while the Units are listed on the Stock Exchanges, although the Trust Deed provides that the Investment Manager may repurchase Units at its sole discretion if it has obtained the prior approval of Unitholders in a general meeting by passing an ordinary resolution in accordance with the Trust Deed but subject to other requirements of the relevant laws, regulations and guidelines imposed by authorities in India.

56. ***The units of the Trust have a limited history of being publicly traded and the listing of the Units, pursuant to this Issue, on the Stock Exchanges may not result in an active or liquid market for the Units.***

The Units of the Trust are currently not frequently traded. There is a limited public market for the Units prior to the Issue and an active public market for the Units may not develop or be sustained after the Listing Date. Listing and quotation does not guarantee that a trading market for the Units will develop or, if a market does develop, that there will be liquidity of that market for the Units. Accordingly, prospective Unitholders should view the Units as illiquid and must be prepared to hold their Units for an indefinite length of time. To enhance investor participation and improve liquidity in InvITs, SEBI has reduced the minimum trading lot size for privately placed InvITs from Rs. 2 crore to Rs 25 lakh and Stock Exchanges have set trading lot as 25,000 units. However, the impact of this change on trading volume or any potential adverse effects remains uncertain.

57. ***Any future issuance of Units by us or sales of Units by the Sponsor or any of other significant Unitholders may materially and adversely affect the trading price of the Units.***

The Trust proposes to undertake the issue of Units on a preferential basis ("**Preferential Issue**"), in accordance with the SEBI Institutional Placement Guidelines and the InvIT Regulations and in accordance with the resolution passed by the IM Board at its meeting held on February 5, 2025 and the resolution passed by the Unitholders of the Trust dated March 10, 2025.

The Preferential Issue by us could dilute investors' holdings of Units. Any such future issuance of Units may also materially and adversely affect the trading price of the Units, and could impact our ability to raise capital through an offering of our securities. There can be no assurance that we will not issue further Units. In addition, any perception by investors that such issuances might occur could also affect the trading price of the Units.

Further, the Units are tradable on the Stock Exchanges. If the Sponsor (following the lapse of its lock-up arrangements or pursuant to any applicable waivers), directly or indirectly, sells or is perceived as intending to sell a substantial number of its Units, or if a secondary offering of the Units is undertaken, the market price for the Units could be materially and adversely affected. These sales may also make it more difficult for us to raise capital through the issue of new units at a time and at a price we deem appropriate.

58. ***Our rights and the rights of the Unitholders to recover claims against the Investment Manager or the Trustee are limited.***

Under the Investment Management Agreement, the Investment Manager is not liable for, among other things, any action or omission, if it has carried out its duties and exercised its powers with reasonable skill and care expected of an investment manager (except in the case of fraud, negligence or wilful misconduct). Pursuant to the Trust Deed, the Trustee is not liable for anything done or omitted to be done or suffered by the Trustee in good faith. Further, the Trustee is not liable for any action or omission that results in any depletion in the value of the trust fund and consequent losses of the Unitholder, except in situations where such depletion is a result of the gross negligence or wilful default on the part of the Trustee. The Investment Management Agreement provides that the Investment Manager is entitled to be indemnified out of the Trust Fund against all taxes and other liabilities, claims, costs, losses, damages and expenses (including reasonable attorney's fees and costs) ("**Losses**") incurred in connection with the Trust, unless arising out of gross negligence, dishonest acts or commissions or omissions, wilful misfeasance, reckless disregard of duty or breach of duties under the Investment Management Agreement. As a result, the Trust's rights and the rights of the Unitholders to recover claims against the Investment Manager are limited. Furthermore, recourse to the Trustee may be limited under the Trust Deed. The Trust Deed provides for the indemnification of the Trustee and the Investment Manager for all Losses, except Losses incurred due to any gross negligence, default, breach of duty or trust, or a failure to show a requisite degree of diligence and care. Accordingly, the liability of the Investment Manager and the Trustee are limited under the terms of these agreements and the Unitholders may not be able to recover claims against the Trustee or the Investment Manager, including claims with respect to any offer documents relating to the Issue.

Further, pursuant to the Trust Deed, the Trustee is not under any obligation to institute, acknowledge the service of, appear in, prosecute or defend any action, suit, proceeding or claim, which in its opinion might involve it in expense or liability that exceeds the value of the fund. The Trust (acting through the Trustee) and the Investment Manager intend to apply the proceeds of the Issue towards the objects set out in this Preliminary Placement Document. Accordingly, the Net Proceeds may not be sufficient to recover claims, including claims with respect to any offer documents in relation to the Issue.

59. ***Information and the other rights of Unitholders under Indian law may differ from such rights available to equity shareholders of an Indian company or under the laws of other jurisdictions.***

The Trust Deed and various provisions of Indian law govern our corporate affairs. Legal principles relating to these matters and the validity of corporate procedures, fiduciary duties and liabilities, and Unitholders' rights may differ from those that would apply to a company in India or a trust in another jurisdiction. Unitholders' rights and disclosure standards under Indian law may also differ from the laws of other countries or jurisdictions. See the section headed "*Rights of Unitholders*" on page 435 of this Preliminary Placement Document.

60. ***Under Indian law, foreign investors are subject to restrictions that limit their ability to transfer or redeem Units, which may adversely impact the trading price of the Units.***

Under foreign exchange regulations currently in force in India, transfers of Units between non-residents and residents are permitted, subject to certain limited exceptions, if they comply with the pricing and reporting requirements specified by RBI. If a transfer of Units is not compliant with such pricing or reporting requirements and does not fall under any of the exceptions specified by RBI, then RBI's prior approval is required.

Additionally, Unitholders who seek to convert Indian rupee proceeds from a sale of Units in India into foreign currency and repatriate that foreign currency from India require a no-objection or a tax clearance certificate from the Indian income tax authorities.

We cannot assure you that any required approval from RBI or any other Governmental agency can be obtained on any particular terms or in a timely manner, or at all.

Our Unitholders will not have the right to redeem or request the redemption of our Units while our Units are listed on the Stock Exchanges. In terms of the InvIT Regulations, an infrastructure investment trust may redeem Units only by way of a buyback or at the time of delisting of Units and may be subject to additional conditions and restrictions under Indian regulations.

61. ***There is no assurance that our Units will remain listed on the Stock Exchanges. There is a risk pertaining to low or no trading of Units on stock exchanges which directly affects any investor's ability to either sell their units entirely, or sell/exit in a timely manner.***

Although it is currently intended that the Units will remain listed on the NSE and the BSE, there is no guarantee of the units of the Trust not being compulsorily delisted due to among other factors, us not continuing to satisfy the listing requirements of the Stock Exchanges. Accordingly, Unitholders will not be able to sell their Units through trading on the Stock Exchanges if the Units are no longer listed on the Stock Exchanges. In accordance with the InvIT Regulations and Chapter 11 of the Master Circular for Infrastructure Investment Trusts dated May 15, 2024 issued by the SEBI in relation to the manner and mechanism of providing exit option to dissenting Unitholders pursuant to Regulation 22(5C) and Regulation 22(7) of the InvIT Regulations, we are required to provide investors with an exit prior to delisting. Further, under the InvIT Regulations, we are required to maintain a minimum of 20 Unitholders at all times after the listing of the

Units and certain minimum public holding. Failure to maintain such minimum number of Unitholders or public holding may result in action being taken against us by SEBI and the Stock Exchanges, including the compulsory delisting of our Units. Further, Investors in this Issue are not permitted to sell the Units allotted to them for a period of one year from the date of Allotment, except on a recognized stock exchange. An active trading market for the Units may not sustain and there may be low or no active market for our Units on the Stock Exchanges, including due to factors beyond our control. In such an event, an investor may not be able to sell their Units, acquired through this Issue or otherwise, in a timely manner or at all.

62. ***The price of the Units may decline after the Listing Date.***

The Issue Price has been determined by the Investment Manager in consultation with the Lead Managers. The Issue Price may not be indicative of the market price of the Units upon completion of the Listing. The market price of the Units may also be highly volatile and could be subject to wide fluctuations. If the market price of the Units declines significantly, investors may be unable to resell their Units at or above their purchase price, if at all. There can be no assurance that the market price of the Units will not fluctuate or decline significantly in the future. The market price of the Units will depend on many factors, including, among others:

- the perceived prospects of our business and investments and the market for toll roads and other infrastructure projects;
- differences between our actual financial and operating results and those expected by investors and analysts;
- the perceived prospects of future toll roads and other infrastructure projects that may be added to our portfolio in accordance with our investment mandate;
- changes in research analysts' recommendations or projections;
- changes in general economic or market conditions;
- the market value of our assets;
- the perceived attractiveness of the Units against those of other business trusts, equity or debt securities;
- the balance of buyers and sellers of the Units;
- the size and liquidity of the Indian business trusts market;
- any changes to the regulatory system, including the tax system, both generally and specifically in relation to India business trusts;
- the ability of the Investment Manager to implement successfully its investment and growth strategies;
- foreign exchange rates;
- broad market fluctuations, including increases in interest rates and weakness of the equity and debt markets;
- variations in our quarterly operating results;
- difficulty in assessing our performance against either domestic or international benchmarks, as there are few listed comparables;
- publication of research reports about us, other road businesses, the road industry in general or other relevant sectors, or the failure of securities analysts to cover the Units after the Total Issue;
- additions or departures of key management personnel of the Trust and/or the Trust Group;
- changes in the amounts of our distributions, if any, and changes in the distribution payment policy or failure to execute the existing distribution policy;
- actions by Unitholders;
- changes in market valuations of similar business entities or companies;
- announcements by us or our competitors of significant contracts, acquisitions, disposals, strategic partnerships, joint ventures or capital commitments;
- speculation in the press or investment community; and
- changes or proposed changes in laws or regulations affecting the road industry and infrastructure development in India or enforcement of these laws and regulations, or announcements relating to these matters.

To the extent that we retain operating cash flow for investment purposes, working capital reserves or other purposes, these retained funds, while increasing the value of our underlying assets, may not correspondingly increase the market price of the Units. Our failure to meet market expectations with regard to future earnings and cash distributions may materially and adversely affect the market price of the Units.

Where new Units are issued at less than the market price of the Units, the value of an investment in the Units may be affected. In addition, Unitholders who do not, or are not able to, participate in the new issuance of Units may experience a dilution of their interest in the Trust. In addition, the Units are not capital-safe products and there is no guarantee that Unitholders can regain the amount invested, in full or in part. If the Trust is extinguished, it is possible that investors may lose a part or all of their investment in the Units.

Risks Related to Tax

63. ***Unitholders should consider the impact of U.S. Foreign Account Tax Compliance Act withholding.***

Pursuant to certain provisions of the U.S. Internal Revenue Code of 1986, commonly known as FATCA, a "foreign financial institution" may be required to withhold on certain payments it makes ("foreign passthru payments") to persons that fail to meet certain certification, reporting, or related requirements. A number of jurisdictions, including India, have entered into, or have agreed in substance to, intergovernmental agreements with the United States to implement FATCA ("**IGAs**"), which modify the way in which FATCA applies in their jurisdictions. Certain aspects of the application of the FATCA provisions and IGAs to instruments such as the Units, including whether withholding would ever be required pursuant to FATCA or an IGA with respect to payments on instruments such as the Units, are uncertain and may be subject to change. Even if withholding would be required pursuant to FATCA or an IGA with respect to payments on instruments such as the Units, proposed regulations have been issued that provide that such withholding would not apply prior to the date that is two years after the date on which final regulations defining "foreign passthru payments" are published in the U.S. Federal Register. In the preamble to the proposed regulations, the U.S. Treasury Department indicated that taxpayers may rely on these proposed regulations until the issuance of final regulations. Holders should consult their own tax advisors regarding how these rules may apply to their investment in the Units.

64. ***The Trust may be classified as a passive foreign investment company for U.S. federal income tax purposes, which could subject U.S. holders of Units to significant adverse tax consequences.***

The Trust may be classified as a passive foreign investment company ("**PFIC**") for a particular taxable year if, after the application of certain "look-through" rules, either (i) 75% or more of its gross income is "passive income" as that term is defined in the relevant Code provisions or (ii) 50% or more of the value (determined on the basis of a quarterly average) of its assets are considered "passive assets" (generally, assets that generate "passive income" or are held for the production of "passive income"). The determination of PFIC status is an annual determination, cannot be made until the close of a taxable year, involves extensive factual investigation, including ascertaining the fair market value of all assets on a quarterly basis and the character of each item of income earned, and is subject to uncertainty in several respects. The Trust has not made, and does not expect to make, any determination as to its potential classification as a PFIC during any taxable year. If the Trust were to be treated as a PFIC, material adverse tax consequences could result for U.S. Holders (as defined below under "Tax Considerations—United States"), including with respect to any gain realized on the sale, exchange or disposition of the Units and on the receipt of certain "excess distributions" received with respect to the Units, and certain additional reporting requirements may apply. U.S. Holders should consult their own tax advisers regarding the potential application of the PFIC rules.

65. ***Tax laws are subject to changes and differing interpretations, which may materially and adversely affect our operations.***

The current tax laws and regulations in India provide certain exemptions to interest income earned by business trusts from a special purpose vehicle as a result of which the InvIT and subsequently the Unitholders would be subject to relatively lower tax liabilities. These exemptions could be modified or removed at any time or clarified in a manner adverse to Unitholders, which could adversely affect our profitability and the amount available for distribution to Unitholders.

Tax laws and regulations are subject to differing interpretations by tax authorities. Differing interpretations of tax and other fiscal laws and regulations may exist within governmental ministries, including tax administrations and appellate authorities, thus creating uncertainty and potential unexpected results. The degree of uncertainty in tax laws and regulations, combined with significant penalties for default and a risk of aggressive action by the governmental or tax authorities, may result in tax risks in the jurisdictions in which we operate being significantly higher than expected. For instance, while the Investment Manager intends to take measures to ensure that it is in compliance with all relevant tax laws, there is no assurance that the tax authorities will not take a position that differs from the position taken by us with regard to our tax treatment of various items. Any of the above events may result in a material, adverse effect on our business, financial condition, results of operations and/or prospects and our ability to make distributions to the Unitholders. Tax authorities in India may also introduce additional or new regulations applicable to our business which could adversely affect our business and profitability.

Further, the tax authorities in India may not agree with the positions adopted by the Project SPVs or by the Trust, and may take a divergent view with respect to allowability of any expense (including interest payment) or in relation to taxability of any income during the assessment proceedings, if any. This may adversely affect the profitability of Project SPVs and Trust, and may affect the ability to make distributions to the Unitholders.

66. ***Changes in legislation or the rules relating to such tax regimes and surcharges could materially and adversely affect our business, prospects and results of operations.***

Tax and other levies imposed by the Government and state governments may include: (i) income tax (including withholding tax and tax collection at source); (ii) goods and service tax; (iii) stamp duty; and (iv) other special taxes and surcharges that are introduced on a temporary or permanent basis from time to time. In some cases, these taxes and other levies may be changed from year to year. Also, the Government, in certain situations, has the authority to change tax laws retrospectively.

Further, by way of the Finance Act, 2021 the GoI, amongst others, amended the Securities Contracts (Regulation) Act, 1956 (SCRA) to recognise pooled investment vehicles and recognise the units, debentures, other marketable securities and

other instruments issued by InvITs as "securities". The Finance Act, 2021 exempted the payment of tax deducted at source on dividends paid to InvITs.

The Finance Act, 2020 amended the definition of 'business trusts', and also abolished the dividend distribution tax regime as applicable to companies and shifted the incidence of taxation of dividend on the shareholder or unitholders.

There had been two key reforms in Indian tax laws, namely the introduction of the Goods and Services Tax ("**GST**") and provisions relating to general anti-avoidance rules ("**GAAR**"). The GST regime came into effect on July 1, 2017, combining taxes and levies by the Government and State Governments into a unified rate structure.

Additionally, there is limited clarity on the availability of input tax credit, and any unfavourable orders in this regard may have a material adverse impact on our financial position and cash flows. Further, any application of existing law or future amendments may affect our overall tax efficiency, and may result in significant additional taxes becoming payable.

Tax laws and regulations are subject to differing interpretations by tax authorities. Differing interpretations of tax and other fiscal laws and regulations may exist within governmental ministries, including tax administrations and appellate authorities, thus creating uncertainty and potential unexpected results. The degree of uncertainty in tax laws and regulations, combined with significant penalties for default and a risk of aggressive action by the governmental or tax authorities, may result in tax risks being significantly higher than expected.

The GAAR regime came into effect on April 1, 2017. The GAAR regime is a broad set of provisions which grant powers to India tax authorities to invalidate any arrangement for tax purposes in the event, the main purpose of entering into the transaction by the taxpayer is to obtain a tax benefit. Besides the "tax benefit", the transaction should meet any one of the following specified additional tests: (i) creates rights, or obligations, which are not ordinarily created between persons dealing at arm's length; (ii) results, directly or indirectly, in the misuse, or abuse, of the provisions of the IT Act; (iii) lacks commercial substance or is deemed to lack commercial substance as prescribed under the IT Act in whole or in part; and (iv) is entered into, or carried out, by means which are, or in a manner which is, not ordinarily employed for bona fide purposes.

Such transactions are declared as impermissible avoidance arrangements and the consequence in relation to tax arising from such arrangements, including denial of a tax benefit or a benefit under a tax treaty, shall be determined according to the circumstances of the case. The rules notified with respect to GAAR prescribe that these shall not be applicable to FIIs who have made investments in accordance with the SEBI (Foreign Institutional Investors) Regulations, 1995 subject to the fulfilment of certain conditions. In the absence of any precedents on the subject, the application of these provisions is uncertain. GAAR may have a material adverse tax impact on the Trust, the Sponsor and the Unitholders.

In respect of non-residents, the tax rates and the consequent taxation mentioned under Statement of Tax Benefits shall be further subject to any benefits available under the applicable DTAA, if any, between India and the country in which the non-resident has fiscal domicile. Further, it is pertinent to meet the terms and condition viz. Principal purpose test, beneficial ownership test etc. as enacted in DTAAs entered into by India with various countries based on Multilateral Convention to implement tax treaty related measures to prevent Base Erosion and Profit Shifting ('MLI').

Further, pursuant to amendments introduced by Finance Act, 2022, the applicability of section 94(7) of the IT Act has been extended to the units of business trust (with effect from Financial Year 2022-23), which provides in certain situation, loss, if any, arising from the sale and purchase of securities and units, to the extent of dividend or income received or receivable on such securities or unit, shall be ignored for computing income chargeable to tax. The Finance Act, 2022 has also extended the applicability of section 94(8) of the IT Act (commonly known as bonus stripping) to the units of business trusts (with effect from Financial Year 2022-23), which provides certain other situations where loss, if any, arising from the sale and purchase of all or any of the units shall be ignored for computing income chargeable to tax and notwithstanding anything contained in any other provision of the IT Act, the amount of loss so ignored shall be deemed to be the cost of purchase or acquisition of such additional units referred to in clause (ii) above as are held on the date of such sale or transfer.

Further, the Government of India has announced the union budget 2025 and has introduced the Finance Bill, 2025.While the union budget has been announced, we continue to analyse the impact of proposals of the union budget 2025 on tax laws or other regulations, which may adversely affect our business, financial condition, or results of operations.

The Investment Manager has not determined the impact of such existing or proposed legislations on our business. We may incur increased costs relating to compliance with any new requirements, which may also require management time and other resources, and any failure to comply may adversely affect our business, results of operations and prospects. Uncertainty in the applicability, interpretation or implementation of any amendment to, or change in, governing law, regulation or policy, including by reason of an absence, or a limited body, of administrative or judicial precedent may be time consuming as well as costly for us to resolve, and may impact the viability of our current business or restrict our ability to grow our business in the future. We intend to take measures to ensure that it is in compliance with all relevant tax laws. However, the tax authorities might take a position that differs from the position taken by us with regard to our tax treatment of various items.

For further details on the litigation and implications related to the alleged deficit stamp duty under the Karnataka Stamp Act, 1957, see the section headed "*Legal and Other Information*" on page 408, of this Preliminary Placement Document.

67. ***The Ministry of Finance, GoI, has introduced Income Tax Bill 2025 before Lok Sabha, the provisions of which may have an unfavourable implication for us.***

The Ministry of Finance, GoI has recently tabled the Income Tax Bill 2025 before the Lok Sabha, with the aim of overhauling the existing Income Tax Act 1961. The proposed bill seeks to simplify the tax laws, reduce litigation, and eliminate redundant provisions under existing Income Tax Act, 1961. While newly introduced Income Tax Bill aims to maintain consistency with Income Tax Act, 1961 on key policy matters, the simplification and litigation reduction efforts may lead to certain changes that could significantly influence the Indian tax landscape.

The provisions of the Income Tax Bill 2025 could have unfavourable implications on us, as well as the investors. Presently, the Income Tax Bill 2025 is under review by the Parliamentary Select Committee, and its preliminary draft awaits endorsement by this committee, followed by ratification from both the houses of Parliament and its subsequent assent from the President. Consequently, the provisions of the nascently proposed bill are too preliminary for comprehensive analysis and consideration.

It is recommended that investors stay informed about the progress of the bill and consult with their tax advisors to understand the specific tax implications on their investments.

68. ***Investors may be subject to Indian taxes arising out of capital gains on the sale of Units and on any dividend or interest component of any returns from the Units.***

Under current Indian tax laws, units of a business trust held for more than 12 months are considered as long term capital assets. In case of sale of such units through a recognised stock exchange in India and payment of securities transaction tax ("**STT**"), any gain arising in excess of ₹ 0.125 million is subject to long term capital gains tax at a concessional rate of 12.5% (plus applicable surcharge and cess). However, if the said units are sold in any other manner, the entire gain shall be subject to long term capital gains tax at the rate of 12.5% with indexation benefit (plus applicable surcharge and cess).

In case the units are held for less than or up to 12 months, the same shall be regarded as short term capital asset. Any gain arising in case of sale of such units through a recognised stock exchange in India and subject to payment of STT, is subject to short term capital gains tax at concessional rate of 20% (plus applicable surcharge and cess). However, if the said units are sold in any other manner, the same shall be subject to short term capital gains tax at applicable tax rates of the holder (plus applicable surcharge and cess).

The aforesaid taxability in India is subject to tax treaty benefits in the case of a non-resident holder. Further, the applicable taxes on the sale of Ordinary Units, and on any dividend or interest component of any returns from the Unit will also be subject to the category of investor holding or selling the Ordinary Units.

The Finance Act, 2020 amended the Income Tax Act to abolish the dividend distribution tax regime and shift the incidence of taxation of dividend (declared or distributed on or after April 1, 2020) to shareholder. Under the Finance Act, 2020, a distribution made by a business trust, being in nature dividend income received from a special purpose vehicle, will not be subject to tax in the hands of a unitholder, so long as the special purpose vehicle has not opted to pay corporate tax under the beneficial regime introduced under Section 115BAA of the Income Tax Act. Similarly, a business trust (which includes an infrastructure investment trust) will not be required to withhold tax on any distributions which are in the nature of dividend income received from a special purpose vehicle, so long as such special purpose vehicle has not opted to pay corporate tax under the beneficial regime introduced under Section 115BAA of the Income Tax Act. However, where the special purpose vehicle opts to pay tax under Section 115BAA of the Income Tax Act, dividend income distributed by the business trust would be taxed in the hands of a non-resident unitholder at 20% (plus applicable surcharge and cess) or the applicable treaty rate and at the applicable rate for a resident unitholder. Further, the business trust would be required to withhold tax on such distributions made from dividend received from the special purpose vehicle. Thus, the taxability of dividends distributed by the Trust will depend on the taxation regime opted by the Project SPVs.

It may also be noted that in terms of Section 194LBA (1) of the IT Act, any distributable income in the nature of interest income and dividend income (where the Project SPV has opted to pay corporate tax under the beneficial regime introduced under Section 115BAA of the IT Act) in the hands of a resident investor is subject to deduction of tax at the rate of 10%. Similarly, in terms of Section 194LBA (2) of the IT Act, any distributable income in the nature of interest income and dividend income (where the SPV has opted to pay corporate tax under the beneficial regime introduced under Section 115BAA of the IT Act) in the hands of a non-resident is subject to deduction of tax at the rate of 5% (plus applicable surcharge and cess) and 10% (plus applicable surcharge and cess) respectively. The ultimate tax liability in the hands of the Unitholder may depend on various factors/ considerations.

The Finance Act 2023, provides for tax the unitholders for such portion of distribution received by them that is not covered under section 10(23FC) or 10(23FCA) of the IT Act and that which is not chargeable to tax under section 115UA(2) of the IT Act. Any distribution not covered under the aforementioned clauses will be taxed in the hands of the unitholders as

'income' under section 56(2)(xii) of the IT Act, provided the amount received (including similar distributions in earlier years to the same unitholder or any other unitholder who held such unit(s) previously) is in excess of the amount at which units were issued by the InvIT, as reduced by the amount which would have been charged to tax earlier under this provision. The aforementioned amounts received by a unitholder being a specified person covered under section 10(23FE) of the IT Act shall not be subject to taxes upon the fulfilment of certain conditions set out in the IT Act. Further, any such distribution received by a unitholder to the extent not chargeable to tax under section 56(2)(xii) and not covered under sections 10(23FC), 10(23FCA) or 115UA(2) shall be reduced from the cost of units. We cannot assure you that there will be no adverse impact on the tax incidence to the unitholders pursuant to the Finance Act 2023. For details, please see section entitled "Statement of Tax Benefits" on Page 451.

Further, the treatment of buy-back proceeds has undergone significant changes due to amendments to tax laws, specifically under Section 2(22)(f) of the Income Tax Act introduced vide Finance (No. 2) Act, 2024. These changes have reclassified certain buy-back proceeds as dividends, which may affect the tax implications for investors. The reclassification could result in a higher tax liability for investors who receive buy-back proceeds, as these are now potentially subject to dividend taxation. Investors should be aware that future legislative amendments or changes in tax interpretation could further affect the tax treatment of buy-back proceeds in the hands of InvIT and its investors. Such changes could impact the after-tax returns for InvIT and/ or its investors and may influence investment decisions. It is important for investors to consult with their tax advisors to understand the specific implications of these changes on their individual tax positions.

Furthermore, the Trust might not be able to pay or maintain the levels of distributions or ensure that the level of distributions will increase over time, or that future acquisitions will increase the Trust's distributable free cash flow to the Unitholders. Any reduction in, or elimination or taxation of, payments of distributions could materially and adversely affect the market price of the Units.

69. ***The income of the Trust in relation to which pass through status is not granted under the IT Act may be chargeable to Indian taxes.***

Under the provisions of the IT Act, the total income of the Trust other than capital gains, interest and dividend income from the Project SPVs would be taxable at the maximum marginal rate ("**MMR**"). MMR is defined under the provisions of the IT Act to mean the rate of income-tax (including surcharge on income-tax, if any) applicable in relation to the highest slab of income.

In accordance with Section 115UA of the IT Act, the MMR applicable to the Trust, a separately assessable resident entity, is 30.0% (plus applicable surcharge and cess). However, the tax authorities may view the Trust as a "pass through" entity and the applicable tax rate will be the MMR applicable to its beneficiaries. If any beneficiary is chargeable to MMR at a rate higher than the rate applicable to other beneficiaries, the income of the Trust attributable to the share of such beneficiary will be taxed at a higher applicable rate. For example, if any Unitholder is a non-resident, the MMR of 40.0% (plus applicable surcharge and cess) would apply. As there are divergent views, there is a possibility that the matter may be litigated if the tax authorities subscribe to the latter view.

GENERAL INFORMATION

National Highways Infra Trust

National Highways Infra Trust ("**Trust**") was settled on October 19, 2020, in New Delhi pursuant to the Trust Deed as a contributory irrevocable trust in accordance with the Indian Trusts Act, 1882. The Trust was registered with SEBI on October 28, 2020, under Regulation 3(1) of the InvIT Regulations and has obtained a certificate of registration from SEBI bearing number IN/InvIT/20-21/0014. The principal place of business of the Trust is situated at G - 5 & 6, Sector 10, Dwarka, New Delhi – 110 075.

The Trust is an infrastructure investment trust established for making investments in special purpose vehicles as defined under Regulation 2(1)(zy) of the InvIT Regulations, or infrastructure projects or securities of Indian companies engaged in the infrastructure sector, as may be permitted in terms of Regulation 18(5) of the InvIT Regulations. For information on the background of the Trust and the description of the InvIT Assets, please see the sections entitled "*Overview of the Trust*" and "*Our Business*" on pages 28 and 134, respectively.

Compliance Officer of the Trust

The Compliance Officer is Gunjan Singh. Her contact details are as follows:

Gunjan Singh
Address: Unit No. 324 3rd Floor
D-21 Corporate Park Sector – 21,
Dwarka New Delhi – 110077
Tel: +91 11 49253927 Extn: 245
E-mail: cs.nhim@nhit.co.in

Bidders can contact the Compliance Officer or the Registrar to the Issue in case of any pre- Issue or post- Issue related problems such as non-receipt of Allotment Advice/letter of Allotment, non-credit of Allotted Units in the respective beneficiary account, non-receipt of refund orders and non-receipt of funds by electronic mode.

The Sponsor – National Highways Authority of India

Head office and address for correspondence:
G-5 & 6
Sector – 10, Dwarka
New Delhi 110 075

Contact Person of the Sponsor

NRVVMK Rajendra Kumar is the contact person of the Sponsor. His contact details are as follows:

NRVVMK Rajendra Kumar
Address: G-5 & 6
Sector – 10, Dwarka
New Delhi 110 075
Tel: + 91 11 2507 4100/1620/1624/25093542
Email: memberfinance@nhai.org
Website: www.nhai.gov.in

The Investment Manager - National Highways Infra Investment Managers Private Limited

Registered office:
G - 5 & 6,
Sector 10, Dwarka,
New Delhi – 110075
Tel: +91 11 2507 6536
Email: nhiimpl@nhit.co.in
Contact Person: Suresh Goyal

Corporate Office

Unit No. 324
3rd Floor D-21 Corporate Park
Sector – 21, Dwarka New Delhi – 110077
Tel: +9111-49253927

The Project Manager – National Highways InvIT Project Managers Private Limited

Registered office and address for correspondence
G - 5 & 6,
Sector 10, Dwarka,
New Delhi – 110075
Tel: +91 11 2507 4100/1318
Contact Person: Shri Akhil Khare

The Trustee – IDBI Trusteeship Services Limited
Registered Office address
Universal Insurance Building,
Ground Floor,
Sir P.M. Road,
Fort,
Mumbai 400 001

Correspondence Office address

1009, 10th Floor,
Ansal Bhawan, KG Marg,
New Delhi – 110 001
Tel: +91 11 4513 8885
E-mail: itsl@idbitrustee.com/ delhiitsl@idbitrustee.com
Contact Person: Deepak Kumar/ Mahendra Singh Chouhan
Website: www.idbitrustee.com

Other Parties involved in the Trust

Auditors

A.R. & Co.
C-1, II Floor, RDC, Raj Nagar
Ghaziabad- 201001 Delhi-NCR
National Capital region Of Delhi
Tel: 9810195084, 9810444051
Email: ar_co1981@yahoo.co.in
Contact Person: CA. Pawan K Goel
Firm Registration Number: 002744C
Peer Review Certificate Number: 014737

Valuer

M/s Ernst & Young Merchant Banking Service LLP

14th Floor, The Ruby,
29 Senapati Bapat Marg,
Dadar West,
Mumbai – 400 028,
Contact Person: Nilesh Jain
Tel: +91 22 61920000
Email: jain.nilesh@in.ey.com
Website: www.ey.com

Technical Consultants

EGIS India Consulting Engineers Private Limited

Plot 80, Sector 32, Gurgaon, Haryana - 122001
Contact Person: Kumar Reetesh
Tel: +91 1244249200
Email: egis-india@egis-india.com
Website: www.egis-group.com

Samarth Infraengg Technocrats Private Limited
#6-3-1100/5,2nd Floor, Rajbhavan Road,
Somajiguda Hyderabad – 500082
Contact person: D V Sridhar Murthy
Tel: 040-23412731

Email: Sridhar@samarth-infraengg.com
Website: www.Samarth-infraengg.com

Ramboll India Private Limited

Ramboll The Epitome Building No.5,
Tower–B, Floor-17 DLF Cyber Terrace
Phase-III Gurgaon-122 002
Contact person: Sanjay Kumar Srivastava
Tel: +91-124 - 4611999
Email: SKSR@ramboll.com
Website: www.ramboll.com

Traffic Consultants

CRISIL Limited

IBI Group India Private Limited

#101, 1st Floor, 1-8-384 & 385,
Gowra Grand, Sardar Patel Road,
Begumpet Secunderabad,
Telangana, 500003, India
Contact Person: Venkata Siva Ramakrishna, Paduchuri
Tel: +91 40 4851 6258
Email: ramakrishna.paduchuri@arcadis.com
Website: www.arcadis.com

Ramboll India Private Limited

Floor-17, The Epitome, Building No.5, Tower–B,
DLF Cyber Terrace Phase-III,
Gurgaon, Haryana -122 002, India
Contact person: Srinivas Chekuri
Tel: +91 124 4611 999
Email: srch@ramboll.com
Website: www.ramboll.com

Lead Managers to this Issue

SBI CAPITAL MARKETS LIMITED
1501, 15th Floor, A & B Wing,
Parinee Crescenzo Building, G Block,
Bandra Kurla Complex, Bandra (East),
Mumbai – 400 051
Tel: +91 22 4196 8300
E-mail: project.ascent@sbicaps.com
Investor Grievance E-mail: investor.relations@sbicaps.com
Contact person: Mandeep Singh
SEBI Registration No: INM000003531

AXIS CAPITAL LIMITED
1st Floor, Axis House
Wadia International Centre
Pandurang Budhkar Marg, Worli
Mumbai 400 025
Maharashtra, India
Tel: +91 22 4325 2183
E-mail: nhaiinvit@axiscap.in
Investor Grievance E-mail: compliants@axiscap.com
Contact Person: Harish Patel
Website: www.axiscapital.co.in
SEBI Registration Number: INM000012029

HDFC Bank Limited

Investment Banking Group, Unit no. 701, 702 and 702-A,

7th floor, Tower 2 and 3, One International Centre,
Senapati Bapat Marg, Prabhadevi,
Mumbai – 400013
Tel: +91 22 3395 8233
E-mail: hitinvit@hdfcbank.com
Investor Grievance E-mail: Investor.redressal@hdfcbank.com
Contact Person: Bharti Ranga/ Souradeep Ghosh
Website: www.hdfcbank.com
SEBI Registration Number: INM000011252

ICICI SECURITIES LIMITED
ICICI Venture House,
Appasaheb Marathe Marg,
Prabhadevi, Mumbai – 400 025,
Maharashtra, India
Tel: +91 22 6807 7100
E-mail: nhitinvit@icicisecurities.com
Investor Grievance E-mail: customercare@icicisecurities.com
Contact Person: Aboli Pitre/ Sumit Singh
Website: www.icicisecurities.com
SEBI Registration Number: INM000011179

Escrow Bank

Axis Bank Limited
1st Floor, Axis House,
Pandurang Budhkar Marg, Worli,
Mumbai 400 025, Maharashtra, India
Email: cbbnewdelhi.branchhead@axisbank.com
Website: www.axisbank.com
Contact Person: Sudhansu Sekhar Das
SEBI Registration No.: INBI00000017

Legal counsel to the Trust as to Indian law

Cyril Amarchand Mangaldas
5th Floor, Peninsula Chambers
Peninsula Corporate Park
Ganpatrao Kadam Marg
Lower Parel
Mumbai 400 013
Maharashtra, India
Tel: +91 22 2496 4455

Legal counsel to the Lead Managers as to Indian Law

J. Sagar Associates
One Lodha Place, 27th Floor,
Senapati Bapat Marg, Lower Parel,
Mumbai 400 001
Maharashtra, India
Tel: +91 22 4341 8600

International Legal counsel to the Trust and the Sponsor as to United States Federal Securities law

Linklaters Singapore Pte. Ltd.
One George Street #17-01,
Singapore 049145
Tel: +65 6692 5700

Registrar and Transfer Agent

KFin Technologies Limited

Selenium, Tower B
Plot No- 31 and 32, Financial District
Nanakramguda, Serilingampally

Hyderabad, Rangareddy 500 032
Telangana, India
Tel.: +91 18003094001/ +91 406716 2222
E-mail: nhit.invit @kfintech.com
Investor Grievance E-mail: einward.ris@kfintech.com
Website: www.kfintech.com
Contact Person: M. Murali Krishna
SEBI Registration No.: INR000000221

Credit Rating Agencies

CARE Ratings Limited
32, Titanium, Prahaladanagar Corporate Road,
Satellite, Ahmedabad- 380015
Tel.: 079-40265656, 91-85111 90079
Fax: 079-40265657
Email: Maulesh.desai@careedge.in
Website: www.careratings.com
Contact Person: Maulesh Desai
SEBI Registration No.: IN/CRA/004/1999

India Ratings and Research Private Limited
Wockhardt Towers, 4th Floor, West Wing,
Bandra Kurla Complex, Bandra (E)
Mumbai-400 051
Tel.: 022-40001700
Fax: 022-40001701
Email: infogrp@indiaratings.co.in
Website: www.indiaratings.co.in
Contact Person: Bharath Kumar Reddy A
SEBI Registration No.: IN/CRA/002/1999

Details of credit ratings

The Trust has been given a rating by Care Ratings Limited of

- *(a) 'Care AAA/Stable' issuer rating,*
- *(b) 'Care AAA/Stable' for long-term facilities of ₹10,724.15 crore,*
- *(c) 'Care AAA/Stable' for Zero Coupon Bond of ₹ 2031.68 crore*
- *(d) 'Care AAA/Stable' for Non-Convertible debentures of ₹ 968.32 crore (proposed to be issued)*
- *(e) 'Care AAA/Stable' for Non-Convertible debentures of ₹ 1500 crore*

As on March 12, 2025 the Trust has been assigned rating by Care Ratings Limited for proposed borrowings of

- *(a) 'Care AAA/Stable' for Rupee Term Loan of ₹ 10470 crore*
- *(b) 'Care AAA/Stable/ Care A1+' for Short Term Facilities of ₹ 30 crore*

, The rationale for which is available at 202503130347_National_Highways_Infra_Trust.pdf *And* https://www.bseindia.com/xml-data/corpfiling/AttachHis/c232a427-b868-4dd7-b481-4c154542e578.pdf*; and*

As on March 12, 2025 the Trust has been Reaffirmed rating by India Ratings & Research Private Limited of

- *(a) 'IND AAA/Stable' issuer rating,*
- *(b) 'IND AAA/Stable' for long-term facilities of ₹108.5 bn,*
- *(c) 'IND AAA/Stable' for Non Convertible debentures of ₹ 30 bn (including ₹ 20.32 bn of Zero Coupon Bond redeemed at face value and proposed non-convertible debentures of INR9.68 billion to be issued)*
- *(d) 'IND AAA/Stable' for Non Convertible debentures of ₹ 15 bn*

As on March 12, 2025 the Trust has been assigned rating by India Ratings & Research Private Limited for proposed borrowings of

- *(a) 'IND AAA/Stable' for Rupee Term Loan of ₹ 104.70 bn*
- *(b) 'IND AAA/Stable' for Non Fund Based facility of ₹ 0.30 bn*

The rationale for which is available at India Ratings and Research: Credit Rating and Research Agency India *and* https://www.bseindia.com/xml-data/corpfiling/AttachHis/c232a427-b868-4dd7-b481-4c154542e578.pdf*"*

It is clarified that the details available on these websites do not form a part of this Preliminary Placement Document.

PARTIES TO THE TRUST

A. The Sponsor and Sponsor Group – National Highways Authority of India

History and Certain Corporate Matters

NHAI is an autonomous body under MoRTH, and was established on June 15, 1989, by the NHAI Act, as a body corporate, having a perpetual succession and common seal. It was made operational in February, 1995, with the appointment of the Chairman and other Members. NHAI is responsible for the development, maintenance and management of the national highways in India entrusted to it by the Central Government.

NHAI has all India presence through its different offices (regional offices/project implementation units/corridor management units) in different cities. The functioning of NHAI is governed by NHAI Act, and the rules and regulations framed thereunder.

Background of the Sponsor

NHAI is an autonomous body under Ministry of Road, Transport and Highways. It is established and governed by the NHAI Act. NHAI is not a company in terms of the Companies Act, 2013 (or in terms of the Companies Act, 1956), and accordingly, does not have a share capital.

Pursuant to Section 17 of the NHAI Act, NHAI may receive additional capital and grants from the Central Government to discharge its functions. Additionally, NHAI has not issued any shares against such capital or grants invested by the Central Government.

As per Section 3(3) of the NHAI Act, NHAI shall consist of: (i) a chairman; (ii) not more than six full-time members; and (iii) not more than six part-time members, and each of the above shall be appointed by the Central Government by notification in the official gazette.

In accordance with the eligibility criteria specified under the InvIT Regulations, NHAI had a shareholders' fund of not less than ₹ 1,000 million as on March 31, 2024.

Further, none of the members of the Sponsor are fugitive economic offenders as declared under section 12 of the Fugitive Economic Offenders Act, 2018.

Sponsor Group

Since the Sponsor is a body corporate whose capital is funded by the Central Government and whose members are appointed, and executive decisions taken by the President of India (acting through the Department of Personnel and Training and MoRTH), certain persons or entities that may be classified as "sponsor group" in terms of Regulation 2(1)(zxc) and Regulation 4(2)(d)(i) of the InvIT Regulations, have not been identified as the 'sponsor group'.

B. The Trustee – IDBI Trusteeship Services Limited

History and Certain Corporate Matters

IDBI Trusteeship Services Limited is the Trustee of the Trust. The Trustee is a registered intermediary with SEBI under the Securities and Exchange Board of India (Debenture Trustees) Regulations, 1993, as a debenture trustee. The Trustee has obtained a certificate of registration dated February 14, 2017 (having registration code IND000000460), which is valid until suspended or cancelled by SEBI. The Trustee was incorporated in India under the Companies Act, 1956 with corporate identity number U65991MH2001GOI131154. The Trustee was originally incorporated on March 8, 2001 at Mumbai, Maharashtra. The Trustee's registered office is situated at Ground Floor, Universal Insurance Building, Sir P. M. Road, Fort, Mumbai, Maharashtra, India, 400001. The Trustee is jointly promoted by IDBI Bank Limited, Life Insurance Corporation and General Insurance Corporation for providing corporate and other trusteeship services.

Background of the Trustee

The Trustee is permitted to engage in the following activities: (a) to act as (i) a debenture or bond trustee; (ii) a security trustee or facility agent; (iii) a securitization trustee; (iv) a share pledge trustee or share monitoring agent; (v) an escrow agent; (vi) a venture capital fund trustees, trustee of an infrastructure investment trust or a trustee to an AIF; and (b) providing services including (i) safe keeping or locker services; (ii) management of private trusts or execution of wills; and (iii) special corporate services.

The Trustee confirms that it has maintained, and undertakes to ensure that it will at all times maintain, adequate infrastructure personnel and resources to perform its functions, duties and responsibilities with respect to the Trust, in accordance with the Trust Deed, the InvIT Regulations and other applicable law.

The Trustee is not an Associate of the Sponsor or the Investment Manager. Further, neither the Trustee nor any of the promoters or directors of the Trustee (i) are debarred from accessing the securities market by SEBI; (ii) are promoters, directors or persons in control of any other company or a sponsor, investment manager or trustee of any other infrastructure investment trust or an infrastructure investment trust which is debarred from accessing the capital market under any order or direction made by SEBI; or (iii) are in the list of wilful defaulters published by the RBI.

Board of Directors of the Trustee

The board of directors of the Trustee is entrusted with the responsibility for the overall management of the Trustee. Please see below the details in relation of the board of directors of the Trustee:

Sr. No.	*Name*	*DIN*
1.	*Pradeep Kumar Malhotra*	*09817764*
2.	*Balkrishna Variar*	*10661169*
3.	*Arun Kumar Agarwal*	*00063359*
4.	*Baljinder Kaur Mandal*	*06652016*
5.	*Jayakumar S. Pillai*	*10041362*
6.	*Hare Krushna Dandapani Panda*	*00479786*
7.	*Soma Nandan Satpathy*	*10899299*

Key Terms of the Trust Deed

The Trustee has entered into the Trust Deed, in terms of the InvIT Regulations, the key terms of which, are provided below:

1. *Powers of the Trustee*

The Trustee has been provided with various powers under the Trust Deed in accordance with the Indian Trusts Act, 1882 and the InvIT Regulations, including but not limited to:

(i) The Trustee shall, in relation to the Trust, have every and all powers that a person competent to contract and acting as a legal and beneficial owner of such property has.

(ii) The Trustee shall have the power to determine, in accordance with the Investment Management Agreement and the investment objectives of the Trust, distributions to Unitholders and other rights attached to the Units in compliance with the InvIT Regulations and applicable law.

(iii) The Trustee shall oversee voting of the Unitholders in accordance with the InvIT Regulations.

(iv) The Trustee shall have the power to do the following, which may be delegated to the Investment Manager:

(a) cause offering of the Units through any placement documents;

(b) cause any placement documents to be provided to the Bidders;

(c) issue and allot Units;

(d) summon and conduct meetings of the Unitholders; and

(e) approve transfer of the Units.

(v) The Trustee shall be empowered to make investment decisions with respect to the underlying assets or projects of the Trust including any further investments or divestment, subject to InvIT Regulations. Further, the Trustee is also empowered to:

(a) acquire, hold, manage, trade and dispose of shares, stocks, convertibles, debentures, bonds and other equity or equity-related securities and other debt or mezzanine securities of all kinds issued by any SPVs, infrastructure projects in India, falling within the investment objectives, whether in physical or dematerialised form, including power to hypothecate, pledge or create encumbrances of any kind to be used as collateral security for any borrowings by the Trust;

(b) avail commercial loans, including the power to hypothecate, pledge or create encumbrances of any kind on the InvIT Assets as collateral security for any such loans availed by the InvIT;

(c) keep the capital and monies of the Trust on deposit with banks or other institutions whatsoever;

(d) accept contributions;

(e) collect and receive the profit, interest, repayment of principal of debt or debt like or equity or equity like, mezzanine securities, dividend, return of capital as and when the same may become due and receivable;

(f) invest in securities or in units of mutual funds in accordance with the InvIT Regulations and applicable law;

(g) invest in money market instruments including government securities, treasury bills, certificates of deposit and commercial paper in accordance with applicable law;

(h) to give, provide and agree to provide to any SPV financial assistance in the form of investment in the Trust's debt securities or share capital of any class including ordinary, preference, participating, non-participating, voting, non-voting or other class, and in the form of investment in securities convertible into share capital; and

(i) to invest, acquire, purchase, hold, divest, sale, hypothecate, pledge or otherwise transfer land and building and immovable property of any kind including any rights and interest therein.

(vi) The Trustee shall have the power to make such reserves out of the income or capital as the Trustee may deem proper and any decisions of the Trustee whether made in writing or implied from its acts, so far as the applicable law may permit, shall be conclusive and binding on the Unitholders. Any distribution made by the Trust from such reserves shall be in terms of the Trust Deed;

(vii) The Trustee shall have the power to employ and pay at the expense of the Trust, any agent in any jurisdiction whether attorneys, solicitors, brokers, banks, trust companies or other agents whether associated or connected in any way with the Trustee or not, without being responsible for the default of any agent if employed in good faith to transact any business, including without limitation, the power to appoint agents to raise funds, or do any act required to be transacted or done in the execution of the trusts hereof including the receipt and payment of moneys and the execution of documents.

(viii) The Trustee shall, on behalf of the Trust, appoint an Investment Manager to manage the Trust.

(ix) The Trustee shall oversee the activities of the Investment Manager in the interest of the Unitholders, ensure that the Investment Manager complies with the InvIT Regulations and applicable laws including in relation to the appointment of Unitholder Nominee Directors by Eligible Unitholders as per SEBI InvIT Amendment 2023 read with Nomination Circular, and shall obtain a Compliance Certificate or such other reports and information as may be prescribed under the InvIT Regulations from time to time from the Investment Manager on a quarterly basis or such other time period as prescribed by Applicable law, in the form prescribed by SEBI, if any.

(x) The Trustee shall, on behalf of the Trust, appoint a Project Manager for the operation and management of the InvIT Assets.

(xi) The Trustee shall oversee the activities of the Project Manager and shall obtain a compliance certificate from the project manager on a quarterly basis or such other time period as prescribed by applicable law.

(xii) The Trustee may appoint any custodian in order to provide custodian services.

(xiii) The Trustee shall have the power and duty to pay all such duties, fees or taxes (and any interest or penalty chargeable thereon) as well as to create any reserves for future potential tax liability out of the Trust or the income thereof, as may be permitted under applicable law.

(xiv) The Trustee shall, subject to the advice of the Investment Manager, have the power to pay Trust expenses out of the funds held by the Trust in accordance with the Trust documents.

(xv) The Trustee shall have the power to take the opinion of legal or tax counsel in any jurisdiction concerning any disputes or differences arising under the Trust Deed or any matter relating to the Trust and the fees of such counsel shall be paid out of the funds held in the Trust.

(xvi) The Trustee may sell, rent or buy any property, or borrow property from or carry out any other transaction with the trustees of any other trust or the executors or administrators of any estate provided that such power is delegated to, and exclusively exercised by the Investment Manager pursuant to the Investment Management Agreement.

(xvii) The Trustee, in consultation with the Investment Manager, shall have the power to accept any property before the time at which it is transferable or payable, pay or allow any claim on any evidence, accept any security payable or immovable in lieu of any amounts payable to it, alter the dates for payment of any amounts payable to it and compromise, compound, abandon or otherwise settle any claim or thing whatsoever relating to the Trust of the Trust Deed.

(xviii) The Trustee shall, subject to the advice of the Investment Manager, have the power to cause the Trust to borrow funds, including any subordinated equity, bonds or other fund from any person or authority on such terms and conditions and for such periods and for the purpose of the Trust and the InvIT Assets, subject to any approval of the Unitholders, and the power to provide such security for funds borrowed including by way of hypothecation, pledge or creation of encumbrances of any kind on the InvIT Assets as collateral security for any such borrowings.

(xix) The Trustee may, subject to any advice of the Investment Manager, retain the proceeds received by the Trust from any InvIT Assets.

(xx) The Trustee, in consultation with the Investment Manager, may make rules to give effect to and carry out the investment objectives. The Trustee may provide, not inconsistent with the provisions of the Trust Deed and the InvIT Regulations, for all or any of the following matters:

(a) manner of maintaining of the records and particulars of the Unitholders;

(b) norms of investment by the Trust in accordance with the investment objectives of the Trust and in accordance with the powers and authorities of the Trustee;

(c) matters relating to entrustment / deposit or handing over of any securities or SPVs of the Trust to any one or more custodians and the procedure relating to the holding thereof by the custodian;

(d) such other administrative, procedural or other matters relating to the administration or management of the affairs of the Trust and which matters are not by the very nature required to be included or provided for in the Trust Deed or by the management thereof;

(e) procedure for seeking the vote of the Unitholders either by calling a meeting or through postal ballot or otherwise; and

(f) procedure for summoning and conducting meetings of Unitholders.

(xxi) The Trustee, whether by itself or through the Investment Manager, shall cause the depository to maintain the depository register in accordance with applicable law.

(xxii) The Trustee shall advise the Investment Manager in relation to the appointment of valuer, auditors, registrar and transfer agent, merchant bankers, custodian, credit rating agency and any other intermediary or service provider or agent with respect to the activities pertaining to the Trust.

(xxiii) The Trustee shall review the reports required in terms of InvIT Regulations and applicable law, as submitted by the Investment Manager including, without limitation, in relation to Eligible Unitholder(s), as prescribed from time to time, in the event such reports are not submitted in timely manner, the trustee, after due follow up, shall intimate the same to SEBI as required in terms of the InvIT Regulations, any circular thereunder and Applicable Law.

(xxiv) The Trustee shall have the power to open one or more bank accounts for the purposes of the Trust, to deposit and withdraw money and fully operate the same.

(xxv) The Trustee shall have the power to take up with SEBI or with the stock exchange(s) as applicable, any matter which has been approved in any meeting of Unitholders, if the matter requires such action, including any reorganisation or restructuring or rearrangement of the assets of the InvIT.

(xxvi) The Trustee shall also have the following powers and authorities:

(a) to institute, conduct, compromise, compound, or abandon any legal proceedings for or on behalf of or in the name of the Trust or the Trustee, and to defend, compound or otherwise deal with any such proceedings against the Trustee or Trustee or its officers or concerning the affairs of the Trust, and also to compound and allow time for payment or satisfaction of any equity due and of any claims or demands by or against the Trust and observe and perform in relation to any decisions thereof;

(b) to make and give receipts, releases and other discharges for moneys payable to the Trust and for the claims and demands of the Trust;

(c) to enter into all such negotiations and contracts, and, execute and do all such acts, deeds and things for or on behalf of or in the name of the Trust as the Trustee may consider expedient;

(d) to sign, seal, execute, deliver and register according to law all deeds, documents, agreements, and assurances;

(e) to negotiate, sign, seal, execute and deliver the Trust documents, including but not limited to, any issue agreement, share purchase agreement, services agreement, deed of right of first offer, debenture subscription agreement, escrow agreement, underwriting agreement, loan documentation, placement documents or any other deed, agreement or document;

(f) take into their custody and/or control all the capital, assets, property of the Trust and hold the same in trust for the Unitholders in accordance with this Deed, the InvIT Regulations and applicable law; and

(g) generally to exercise all such powers as it may be required to exercise under the InvIT Regulations and applicable law for the time being in force and do all such matters and things as may promote the Trust or as may be incidental to or consequential upon the discharge of its functions and the exercise and enforcement of all or any of the powers and rights under the Trust Deed.

(xxvii) The Trustee may at any time, buy-back the Units from the Unitholders, subject to applicable law.

(xxviii) The Trustee may, delegate to any committee or any other person, any powers set out above and the duties set out below, provided, however, that the Trustee shall remain responsible and liable for any such persons' acts of commission or omission as determined by a court of competent jurisdiction whose decision is final, binding and non-appealable, except the roles and responsibilities delegated by the Trustee to Investment Manager, Project Manager or any third party expert, or any sub-delegation by the Investment Manager or the Project Manager.

2. *Duties of the Trustee*

The Trustee shall perform its duties as required under the Trust Deed in accordance with the Indian Trusts Act, 1882 and the InvIT Regulations, including but not limited to:

(i) The Trustee shall carry on and conduct its business in a proper and efficient manner in the best interest of the Unitholders.

(ii) The Trustee shall appoint an investment manager and project manager in accordance with the InvIT Regulations and applicable law.

(iii) The Trustee shall, on behalf of the Trust, enter into the Investment Management Agreement with the Investment Manager.

(iv) The Trustee shall ensure that the Investment Manager performs its obligations as specified below:

(a) The Trustee shall ensure that the Investment Manager complies with reporting and disclosure requirements in accordance with InvIT Regulations and in case of any delay or discrepancy, require the Investment Manager to rectify such delay or discrepancy on an urgent basis;

(b) The Trustee shall review the transactions carried out between the Investment Manager and its associates and where the Investment Manager has advised that there may be a conflict of interest, it shall obtain a certificate from a practising chartered accountant or valuer, as applicable, that such transaction is on arm's length basis;

(c) The Trustee shall review the valuation report submitted by the Investment Manager;

(d) The Trustee shall require the Investment Manager to set up such systems and procedures and submit such reports to the Trustee, as may be necessary for effective monitoring of the functioning of the Trust; and

(e) The Trustee shall ensure that the Investment Manager convenes meetings of the Unitholders in accordance with the InvIT Regulations and oversee the voting by Unitholders. The Trustee shall ensure that the Investment Manager convenes meetings of Unitholders not less than one every year and the period between such meetings shall not exceed 15 months.

(v) The Trustee shall provide SEBI and the stock exchange(s), where applicable, such information as may be sought by SEBI or by the stock exchange(s) pertaining to the activity of the Trust. The Trustee shall comply with intimation requirements under the InvIT Regulations and applicable law, including in relation to intimating SEBI in case of any discrepancy in the operation of the InvIT with the InvIT Regulations and any placement documents. The Trustee shall also immediately inform SEBI in case any act which is detrimental to the interest of the Unitholders is noted.

(vi) The Trustee shall at all times exercise due diligence in carrying out its duties and protecting the interests of the Unitholders.

(vii) The Trustee shall delegate all such powers to the Investment Manager and the Project Manager as may be required to carry out obligations under the Investment Management Agreement, Project Implementation and Management Agreement and applicable law.

(viii) The Trustee shall delegate all such powers to the Project Manager as may be required by the Project Manager to carry out its obligations under the Project Implementation and Management Agreement and under Applicable Law.

(ix) The Trustee shall appoint a new investment manager in accordance with the InvIT Regulations and Applicable Law, in case of change in Investment Manager due to removal or otherwise, within the time period prescribed under the InvIT Regulations. The Trustee shall ensure that the new investment manager shall stand substituted as a party in all the documents to which the earlier investment manager was a party. The Trustee shall also ensure that the earlier investment manager continues to be liable for all its acts of omissions and commissions for the period during which it served as investment manager, notwithstanding its termination.

(x) The Trustee shall appoint a new project manager in accordance with the InvIT Regulations and applicable law in case of change in Project Manager due to removal or otherwise. The Trustee shall appoint a new project manager within the time period prescribed under the InvIT Regulations. The Trustee may, either *suo moto* or based on the advice of the concessioning authority(ies) appoint an administrator in connection with an infrastructure project for such terms and on such conditions as it deems fit. The Trustee shall ensure that the new project manager shall stand substituted as a party in all the documents to which the earlier project manager was a party. The Trustee shall also ensure that the earlier project manager continues to be liable for all its acts of omissions and commissions for the period during which it served as project manager, notwithstanding its termination.

(xi) The Trustee shall obtain the prior approval from the Unitholders in accordance with the InvIT Regulations and from SEBI in case of change in control of the Investment Manager.

(xii) The Trustee shall ensure that in case of change in control of the Project Manager, written consent is obtained from the concessioning authority(ies) in terms of the concession agreement(s), prior to such change, if applicable.

(xiii) The Trustee shall ensure that subscription amount is kept in a separate bank account in name of the Trust and is only utilised for adjustment against allotment of Units or refund of money to the applicant till the time such Units are listed and the same will be utilised for objectives of the offering as will be mentioned in the relevant placement documents.

(xiv) The Trustee shall cause the books of accounts of the InvIT to be in accordance with the Trust Deed.

(xv) The Trustee shall ensure that all acts, deeds and things are done for the attainment of the investment objective of the Trust and in compliance with the InvIT Regulations and applicable law and to secure the best interests of the Unitholders.

(xvi) The Trustee shall file such reports as may be required by SEBI or any other regulatory authority or as required under the InvIT Regulations and applicable law with regard to the activities carried on by the Trust.

(xvii) The Trustee shall periodically review the status of the Unitholders' complaints and their redressal undertaken by the Investment Manager, in accordance with the InvIT Regulations.

(xviii) The Trustee and its directors, officers, employees and agents shall at all times maintain the greatest amount of confidentiality as regards the activities and assets of the Trust and such other matters connected with them and the Trust generally and shall not disclose any confidential information to any other person, other than the Investment Manager, or the Project Manager, unless such information is required to be disclosed to some regulatory authority, court or any other person under any order of court or any law in force in India.

(xix) The assets and liabilities of the Trust shall at all times be segregated from the assets and liabilities of the Trustee and the assets and liabilities of other trusts managed by the Trustee.

(xx) The Trustee shall ensure that the Investment Manager shall ensure that a detailed valuation is undertaken of the InvIT assets by a valuer at such intervals and in the manner as may be prescribed under the InvIT Regulations and applicable law. The Trustee shall ensure that the remuneration of the valuer is not linked to or based on the value of the asset being valued.

(xxi) The Trustee of the InvIT shall not invest in Units of the Trust.

(xxii) The Trustee shall fulfil its obligations in terms of the InvIT Regulations.

(xxiii) The Trustee shall ensure that the activity of the Trust is being operated in accordance with the provisions of the Trust Deed, the InvIT Regulations, applicable law and the Trust documents and in case of any discrepancy, it shall inform SEBI immediately in writing.

(xxiv) The Trustee shall immediately inform SEBI in case any act which is detrimental to the interest of the Unitholders is noted.

(xxv) The Trustee shall maintain records in accordance with the InvIT Regulations and applicable law.

(xxvi) The Trustee shall wind up the Trust in accordance with the InvIT Regulations and applicable law. Upon winding up of the Trust, the Trustee shall surrender the certificate of registration to SEBI.

3. *Rights of the Trustee*

The Trustee shall have the following rights:

(i). The Trustee may, in the discharge of its duties, act upon any advice obtained in writing from any bankers, accountants, brokers, lawyers, professionals, consultants, or other experts acting as advisers to the Trustee.

(ii). Subject to applicable law, no Unitholder shall be entitled to inspect or examine the Trust's premises or properties (including any holding company and SPVs) without the permission of the Trustee, who shall give such permission, if necessary, in consultation with the Investment Manager. Further, no Unitholder shall be entitled to require discovery of any information respecting any detail of the Trust's activities or any matter which may relate to the conduct of the business of the Trust and which information may, in the opinion of the Trustee and the Investment Manager adversely affect the interest of the Unitholder.

(iii). The Trustee shall be entitled to reimburse itself and shall be entitled to charge the Trust, and shall be entitled to be indemnified and be kept indemnified from the Trust and from any distributions made by the Trust to the Unitholders, with the expenses, outgoings, taxes, levies, and liabilities (including indemnity obligations of the Trust, if any).

(iv). The Trustee may accept as sufficient evidence for the value of any investment or for the cost price or sale price thereof or for any other fact within its competence, a certificate by a valuer or any other professional person appointed by the Investment Manager for the purpose.

4. *Liabilities of the Trustee*

The liabilities of the Trustee in terms of the Trust Deed are as follows:

(i). The Trustee shall only be chargeable for such monies, stocks, funds and securities as the Trustee shall have actually received and shall not be liable or responsible for any banker, broker, custodian or other person in whose hands the same may be deposited or placed, nor for the deficiency or insufficiency in the value of any investments of the Trust nor otherwise for any involuntary loss. Any receipt signed by the Trustee for any monies, stocks, funds, shares, securities, investment or property, paid, delivered or transferred to the Trustee under or by virtue of the Trust Deed or in exercise of the duties, functions and powers of the Trustee shall effectively discharge the Trustee or the person or persons paying, delivering or transferring the same therefrom or from being bound to see to the application thereof, or being answerable for the loss or misapplication thereof provided that the Trustee and such persons shall have acted in good faith, without negligence and shall have used their best efforts in connection with such dealings and matters.

(ii). The Trustee shall not be under any liability on account of anything done or omitted to be done or suffered by the Trustee in good faith if the Trustee is able to establish that it performed its rights and duties and exercised its powers, as a reasonable person in such a position would have, in compliance with the provisions of the Trust Deed and applicable law.

(iii). The Trustee shall not be under any obligation to institute, acknowledge the service of, appear in, prosecute or defend any action, suit, proceedings or claim in respect of the provisions hereof or in respect of the InvIT assets or any part thereof or any corporate action which in its opinion would or might involve it in expense or liability unless the Investment Manager shall so request in writing and the Trustee is satisfied that the value of the investment is sufficient to provide adequate indemnity against costs, claims, damages, expenses or demands to which it may be put as Trustee as a result thereof. The costs in relation to such action, suit, proceedings or claims (whether undertaken upon request of Investment Manager or otherwise) incurred by the Trustee in connection with or arising out of the Trust, shall be borne by the Trust.

(iv). The Trustee shall not be liable in respect of any action taken or damage suffered by it on reliance upon any notice, resolution, direction, consent, certificate, affidavit, statement, certificate of stock, plan of reorganization or (without being limited in any way by the foregoing) other paper or document believed to be genuine and to have been passed, sealed or signed by appropriate authorities or entities.

(v). The Trustee shall not be liable to the Unitholders for doing or failing to do any act or thing which by reason of any provision of any present or future law or regulation made pursuant thereto, or of any decree, order or judgment of any court, or by reason of any request announcement or similar action (whether of binding legal effect or not) which may be taken or made by any person or body acting with or purporting to exercise the authority of any government (which legally or otherwise) it shall be directed or requested to do or perform or to forbear from doing or performing. If for any reason it becomes impossible or impracticable to carry out any of the provisions of these presents the Trustee shall not be under any liability therefore or thereby.

(vi). The Trustee shall not be responsible to any Unitholder for the authenticity of any signature affixed to any document or be, in any way, liable for any forged or unauthorized signature on or for acting upon or giving effect to any such forged or unauthorized signature. The Trustee shall be entitled but not bound to require that the signature of any Unitholder to any document required to be signed by him under or in connection with these presents shall be verified to the Trustee's reasonable satisfaction.

(vii). If the Trustee is required by the InvIT Regulations or any applicable law to provide information regarding the Trust or the Sponsor or the Unitholders, the investments made by the Trust and income therefrom and provisions of these presents and complies with such request in good faith, whether or not it was in fact enforceable, the Trustee shall not be liable to the Unitholders or to any other party as a result of such compliance or in connection with such compliance.

(viii). The Trustee shall not incur any liability for any act or omission or (as the case may be) failing to do any act or thing which may result in a loss to a Unitholder (by reason of any depletion in the value of the InvIT assets or otherwise), except in the event that such loss is a direct result of fraud, gross negligence or wilful default on the part of the Trustee or results from a breach by the Trustee of this Deed, as determined by a court of competent jurisdiction.

(ix). If the Trustee engages any external advisors or experts to discharge its obligations or undertakes any work (in consultation with the Investment Manager, in the interest of the Unitholders) which is not covered within the scope of work of the Trustee and such additional work is beyond the obligations of the Trustee under applicable law, the Trustee shall be entitled to recover such

costs, charges and expenses which the Trustee may incur in this regard, from the funds of the Trust.

(x). The liability of the Trustee shall be limited to the extent of the fees received by it, in all circumstances whatsoever except (a) in case of any negligence or misconduct or fraud on the part of the Trustee as may be determined by a court of competent jurisdiction, or (b) any failure on the part of the Trustee to protect the interests of the Unitholders.

(xi). The exercise of all power and discretion by the Trustee shall be valid only if the same are carried out upon the approval of a majority of the directors on the board of the Trustee to any officer of the Trustee, if the exercise of such powers is within the parameters of such delegated authority.

5. *Provisions relating to Unitholders*

(i). The aggregate liability of each Unitholder shall be limited to making the capital contribution payable by it in respect of the Units subscribed by it.

(ii). Each Unit allotted to the Unitholders shall have one vote for any decisions requiring a vote of Unitholders and shall carry such rights as provided in the InvIT Regulations.

(iii). No Unitholder shall enjoy preferential voting or any other rights over another Unitholder except as permitted under applicable law.

(iv). In no event shall the Trustee or the Investment Manager be bound to make payment to any Unitholder, except out of the funds held by it for that purpose under the provisions of the Trust Deed.

(v). A Unitholder whose name and account details are entered in the depository register shall be the only person entitled to be recognised by the Trustee as having a right, title, interest in or to the Units registered in his name and the Trustee shall recognise such holder as an absolute owner and shall not be bound by any notice to the contrary and shall also not be bound to take notice of or to see to the execution of any trust, express or implied, save as expressly provided or as required by any court of competent jurisdiction to recognise any trust or equity or interest affecting the title of the Units.

(vi). The Unitholders shall not give any directions to the Trustee or the Investment Manager (whether in a meeting of Unitholders or otherwise) if it would require the Trustee or the Investment Manager to do or omit doing anything which may result in:

(a) the Trust or the Trustee, in its capacity as the trustee of the Trust or the Investment Manager, in its capacity as the investment manager of the Trust ceasing to comply with applicable law;

(b) interference with the exercise of any discretion expressly conferred on the Trustee by the Trust Deed or the Investment Manager by the Investment Management Agreement, or the determination of any matter which requires the agreement of the Trustee or the Investment Manager, provided that nothing shall limit the right of the Unitholder to require the due administration of the Trust in accordance with the Trust Deed.

(vii). The depository register shall (save in case of manifest error) be conclusive evidence of the number of Units held by each depositor and in the event of any discrepancy between the entries of the depository register and any statement issued by the depository, the entries in the depository register shall prevail unless the depositor proves to the satisfaction of the Trustee and the depository that the depository register is incorrect.

(viii). The Unitholders shall have the right to call for certain matters to be subject to their consent, in accordance with the InvIT Regulations and applicable law.

(ix). The Unitholders may, in accordance with the provisions of the Trust documents and applicable law, transfer any of the Units to an investor where such investor accepts all the rights and obligations of the transferor and the Trustee or the Investment Manager shall give effect to such transfer in accordance with applicable law.

(x). The Trustee shall and shall ensure that the Investment Manager obtains the consent of the Unitholders for the matters prescribed under the InvIT Regulations in accordance with the provisions of the InvIT Regulations, including Regulation 22 of the InvIT Regulations.

(xi). The Unitholders shall have the right to receive income or distributions in respect of the Units, as provided in the placement documents.

(xii). The Eligible Unitholders shall have the right to appoint Unitholder Nominee Directors on the board of directors of the Investment Manager from time to time, in the manner prescribed under the InvIT Regulations. The Trustee shall supervise and ensure that the Investment Manager takes all such actions and compliances, as may be prescribed under the InvIT Regulations from time to time, in relation to the right of Eligible Unitholders to appoint Unitholder Nominee Directors on the board of directors of the Investment Manager.

6. *Indemnity*

In addition to the fees, distributions and expense reimbursements herein described, the InvIT Assets shall be utilized to indemnify and hold harmless the Trustee, the Sponsor and any of their respective officers, directors, shareholders, sponsors, partners, members, employees, advisors and agents ("**Indemnified Parties**") from and against any claims, losses, costs, damages, liabilities and expenses, including legal fees ("**Losses**") suffered or incurred by them by reason of their activities on behalf of the Trust, unless such Losses resulted from fraud, gross negligence, wilful default or wilful misconduct or breach of any obligations or duties under applicable law by the relevant Indemnified Party, as determined by a court of competent jurisdiction.

7. *Termination*

The InvIT is subject to dissolution and termination in accordance with and subject to the InvIT Regulations and applicable law:

(i). if the Trust fails to make any offer of Units by way of private placement, within the time period stipulated in the InvIT Regulations or any other time period as specified by SEBI, the Trust shall surrender its certificate to SEBI and cease to operate as an investment infrastructure trust, unless the period is extended by SEBI;

(ii). upon the liquidation of InvIT Assets;

(iii). if there are no projects remaining under the Trust and the Trust does not invest in any project for six months thereafter;

(iv). delisting of the Units in accordance with the InvIT Regulations; or

(v). illegality of the InvIT under applicable law.

C. The Investment Manager – National Highways Infra Investment Managers Private Limited

History and Certain Corporate Matters

National Highways Infra Investment Managers Private Limited was incorporated as a private limited company on July 25, 2020, under the Companies Act, 2013. The Investment Manager was initially incorporated as a wholly owned subsidiary of NHAI. Subsequently, NHAI transferred its entire shareholding in the Investment Manager to the President of India, acting through the Ministry of Road Transport and Highways, Government of India. Accordingly, at present, the Investment Manager is a government company as defined under the Companies Act, 2013, as amended. The CIN of the Investment Manager is U65929DL2020GOI366835.

The principal business of the Investment Manager in terms of its memorandum of association is, *inter alia*:

(a) to carry on the business of acting as investment manager investment adviser, trustee, settler, sponsor, promoter, portfolio manager, manager, administrator, attorney, agent, consultant, representative or nominee of or for any collective investment schemes, trusts, special purpose vehicles, infrastructure investment trusts, real estate investment trusts, properties and/or assets of any kind, including any fund set up, formed or established in India or in any other country by the Company or by any other person including bodies corporate, limited liability partnerships, partnerships, trusts, societies, associations of persons or by government, state or local authority (whether incorporated or not) of any other agency or organisation with respect to any class of assets, and to thereby settle, administer, manage, deploy funds, acquire, take up, manage, invest, hold, sell, deal or dispose of all or any property, investments, securities or other assets of any kind whatsoever, acting in such capacity;

(b) to negotiate and obtain concessions from the appropriate Government/ s for the rights to build, operate and own or transfer highways, interchangers, viaducts and bridges and any other structures, buildings and services that are ancillary thereto in India and upon such terms for such benefits as may be set forth in the concessions or negotiated from time to time and generally to carry on the business of owners, operators or toll collectors or concessionaires of highways, bridges, tunnels, railways, ports, airports, public utilities, telecommunication facilities and any other rights, properties, utilities and services wherever situated; and

(c) to carry on the business of builders and contractors for the construction, upgradation, maintenance and repairs of roads, highways, bridges, viaducts, buildings, interchangers, tunnels, railways, ports, airports, public utilities, telecommunication and other related works and generally to carry on the business of engineers, contractors, consultants, advisors, managers and administrators in all its branches, mechanical, electrical and telecommunication, engineering and incidental thereto, to provide financing or act as guarantors for project financing to owner where to required.

Background of the Investment Manager

The Trustee, *vide* their letter dated July 31, 2020, appointed NHIIMPL as the investment manager of the proposed Trust, based on the recommendation of the Sponsor.

The Investment Manager confirms that it has, and undertakes to ensure that it will at all times maintain, adequate infrastructure, personnel and resources to perform its functions, duties and responsibilities with respect to the management of the Trust, in accordance with the InvIT Regulations, the Investment Management Agreement and applicable law.

In accordance with the eligibility criteria specified under the InvIT Regulations, the Investment Manager had a consolidated net worth of not less than ₹ 100 million as on the date of this Preliminary Placement Document.

Neither the Investment Manager nor the promoter or directors of the Investment Manager (i) are debarred from accessing the securities market by SEBI; (ii) are promoters, directors or persons in control of any other company or a sponsor, investment manager or trustee of any other infrastructure investment trust or an infrastructure investment trust which is debarred from accessing the capital market under any order or direction made by SEBI; or (iii) are in the list of wilful defaulters published by the RBI.

The IM Board

The IM Board is entrusted with the responsibility for the overall management of the Investment Manager. The Sponsor, acting together with MoRTH, have the right to nominate up to two directors on the Board of the IM. Please see below the details in relation of the IM Board:

Sr.No.	Name	DIN
1.	Sumit Bose	03340616
2.	Suresh Goyal	02721580
3.	N.R.V.V.M.K. Rajendra Kumar	09494456
4.	Mahavir Parsad Sharma	03158413
5.	Shailendra Narain Roy	02144836
6.	Pushkar Kulkarni	00090996
7.	Debapratim Hajara	09804007
8.	Pradeep Singh Kharola	05347746
9.	Vinay Kumar	02174687
10.	Usha Rao Monari	08652684

Brief Biography of the Directors of the Investment Manager

Please see below a brief biography of the directors of the Investment Manager:

Suresh Goyal is Managing Director and Chief Executive Officer of the Investment Manager. He has a bachelor's degree in electrical engineering from Shri Govindram Seksaria Institute of Technology and Science, Indore, and a post-graduate diploma in management from the Indian Institute of Management, Lucknow. He has over several years of experience in the corporate and asset management sector. He was employed with the Macquarie group for over ten years wherein he was involved in various infrastructure investment management projects. At Macquarie, he spent over five years in managing investments in the toll road sector. He was previously associated with Macquarie Infrastructure & Real Assets, Singapore, and has served as Executive Director within Macquarie Asset Management.

Note: Rakshit Jain has been appointed as the managing director & chief executive officer of the Investment Manager, and the successor to Suresh Goyal, the current managing director & chief executive officer for a term not exceeding 3 years commencing from his date of joining, who shall join on or before June 1, 2025.

N.R.V.V.M.K. Rajendra Kumar is a Nominee Director of the Investment Manager. He holds a doctorate degree in Economics from Hyderabad Central University. He also has a master's in public management from Harvard Kennedy School and Lee Kuan Yew School of Public Policy. He has been the Chief General Manager of the Internal Debt Management Department, Mumbai at the Reserve Bank of India since 2021. He is also the member (finance) of NHAI since 2022.

Mahavir Parsad Sharma is an Independent director of the Investment Manager. He has a bachelor's degree in law from the University of Delhi, and has passed the institution examinations of the Institution of Engineers, India.

He also worked as Chief Engineer and Additional Director General in the Ministry of Road transport and Highways. He has previously served as a technical advisor in the Ministry of Road Transport and Highways, Government of India.

Shailendra Narain Roy is an Independent director of the Investment Manager. He has a bachelor's degree in engineering from the Indian Institute of Technology (BHU), and is a graduate of the Wharton Advanced Management Program. He has previously served as a whole-time director of Larsen & Toubro Limited for over eight years, and was on the board of several and associate companies of the L&T Group. He was also a former chief executive officer and managing director of L&T Power Limited. He was associated with the setting up India's first ultra-supercritical thermal power plant at Khargone for NTPC, the first supercritical power plant, Nabha Power Ltd. and five supercritical power plants across the country.

Pushkar Kulkarni is a unitholder Nominee Director of the Investment Manager. He holds a bachelor's degree in electronics engineering from V.J. Technical Institute, Mumbai University and a master's degree in management studies from Jamnalal Bajaj Institute of Management Studies, Mumbai University. He has been associated with Canada Pension Plan Investment Board ("CPPIB") since 2016. He has over 11 years of experience in the infrastructure investment sector. He was previously associated with Serco India Private Limited as a director.

Debapratim Hajara is a Unitholder Nominee Director of the Investment Manager. He holds a postgraduate diploma in management from Xavier Institute of Management, Bhubaneswar and a master's degree in physics from Indian Institute of Technology, Kanpur. He is currently the managing director, Infrastructure & Natural Resources at Ontario Teachers' Pension Plan ("Ontario Teachers'"). He has over 11 years of experience in infrastructure investment and was previously associated with SBI Capital Markets Limited, IDFC Alternatives Limited and Macquarie Infrastructure and Real Assets (India) Private Limited. He is currently also a director on the board of directors of National Investment and Infrastructure Fund Limited, Mahindra Susten Private Limited, Sustainable Energy Infra Investment Managers Private Limited and Green Energy Infra Project Managers Private Limited.

Pradeep Singh Kharola is an Independent Director of the Investment Manager. He has a bachelor's degree in mechanical engineering from Shri Govindram Seksaria Institute of Technology and Science, Indore and holds a master's degree in technology (industrial engineering) from Indian Institute of Technology, Delhi. He also holds a doctorate basis his thesis titled "Systems approach to estimate the optimal modal mix of passenger transport" from Indian Institute of Technology, Delhi. He is an Indian Administrative Officer of the Karnataka cadre. He has previously served as the Principal Secretary to the Chief Minister of Karnataka, and Commissioner of Commercial Taxes, Karnataka. He has also served as Secretary, Civil Aviation, government of India and as the managing director of Air India. He has won the Prime Minister's Award for Excellence in Public Administration for transforming the tax regime in Karnataka.

Sumit Bose is an Independent Director of the Investment Manager. He was an IAS officer of the Madhya Pradesh cadre. He retired as the Union Finance Secretary in 2014. He holds a master's degree in social policy and planning from the London School of Economics and a master's degree in history from St. Stephen's College, University of Delhi. He has 38 years of experience in administration, fiscal management, and corporate sector. He has served as an independent director at Coromandal International Limited, Tata AIG General Insurance Company, HDFC Life Insurance Company Limited, HDFC Pensions, JB Chemicals & Pharmaceuticals and J.M Financial Services Limited. He has also previously served as the public interest director at BSE Limited.

Vinay Kumar is the Nominee Director of the Ministry of Road Transport and Highways (MoRTH) on the Board of the Investment Manager. He is an I.A.S. Officer of the Bihar Cadre of 1999 Batch holds a Post Graduate Degree in Physics. He is holding the post of Additional Secretary in the Ministry of Road Transport and Highways, Government of India and is responsible for the administration of National Highways in India (Planning, Financing, Construction and Operations) and also heads the Land Acquisition and Logistics Divisions of the Ministry. In addition to this, he also holds the post of Chairman, National Highways Logistics Management Limited. He has worked in the State Government of Bihar in various senior positions including those of Secretary in Food &Consumer Protection Department, Department of Public Health Engineering, Rural Works Department, Animal Husbandry & Fisheries Department and Mission Director, Bihar Vikas Mission, Cabinet Secretariat Department. He has also served as the District Magistrate of several districts in Bihar. During his service, he has received many national level awards conferred by the Union Government of India on issues like providing connectivity to rural habitations, constructing maximum rural road length and mobilizing and motivating women learners under special programme for improving female literacy.

Usha Rao-Monari is an Independent Director of Investment Manager. She was the Under-Secretary General and Associate Administrator of United Nations Development Programme from April 05, 2021 till April 04, 2023. She has over 30 years of experience in the finance sector and was previous associated as senior adviser to the infrastructure group with the Blackstone Group LP. She was also associated with the International Bank for Reconstruction and Development, a part of the World Bank Group as a director and was subsequently also associated as a short-term consultant post her retirement from the organization. She is on the Board of UPL Limited and Fortescue Metals Group.

Key Terms of the Investment Management Agreement

The Investment Manager has entered into the Investment Management Agreement, in terms of the InvIT Regulations, the key terms of which, are provided below.

1. *Powers of the Investment Manager*

The Investment Manager has been provided with various powers under the Investment Management Agreement in accordance with the InvIT Regulations, including but not limited to:

(i). The Investment Manager shall take all decisions in relation to the day-to-day management and administration of InvIT Assets and the investments of the Trust as may be incidental or necessary for the advancement or fulfilment of the investment objectives of the Trust in accordance with the InvIT Regulations and other applicable law. The Investment Manager shall ensure that all investments shall be registered in the name of the Trustee (acting on behalf of the InvIT) or the Trust.

(ii). The Investment Manager shall, subject to such approval as may be required from the Unitholders, make the investment decisions with respect to the underlying assets or projects of the Trust, including any further investments or divestments, subject to InvIT Regulations and in accordance with the Preliminary Placement Document, and in this regard is also empowered to do the following acts including:

(a) acquire, hold, manage, trade and dispose of shares, stocks, convertibles, debentures, bonds and other equity or equity-related securities and other debt or mezzanine securities of all kinds issued by any SPVs, infrastructure projects in India, whether in physical or dematerialised form, including power to hypothecate, pledge or create encumbrances of any kind on such securities held by the Trust in such holding companies, and/or SPVs, or infrastructure projects to be used as collateral security for any borrowings by the Trust;

(b) keep the capital and monies of the Trust in deposit with banks or other institutions, whatsoever;

(c) accept contributions;

(d) collect and receive the profit, interest, repayment of principal of debt or debt like, or equity or equity like, mezzanine securities, dividend, return of capital of any type by the holding companies, or SPVs, or infrastructure projects and income of the Trust as and when the same may become due and receivable;

(e) invest in securities or in units of mutual funds in accordance with the InvIT Regulations and other applicable law;

(f) invest in money market instruments including government securities, treasury bills, certificates of deposit and commercial paper in accordance with applicable law;

(g) to give, provide and agree to provide to any holding companies, or SPVs financial assistance in the form of investment in the Trust's debt securities or share capital of any class including ordinary, preference, participating, non-participating, voting, non-voting or other class, and in the form of investment in securities convertible into share capital; and

(h) to invest, acquire, purchase, hold, divest, sale, hypothecate, pledge or otherwise transfer land and building and immovable property of any kind including any rights and interest therein.

(iii). The Investment Manager along with the Trustee shall, within a reasonable time from the date of execution of the Investment Management Agreement, appoint a Project Manager for the Trust, by execution of the Project Implementation and Management Agreement.

(iv). The Investment Manager shall oversee activities of the Project Manager with respect to compliance with the InvIT Regulations and the Project Implementation and Management Agreement and in terms of the InvIT Regulations and applicable law. The Investment Manager shall obtain a compliance certificate from the Project Manager in the form as may be specified by SEBI, on a quarterly basis or such other intervals as may be prescribed, under applicable law.

(v). The Trustee authorizes the Investment Manager to do all such other acts, deeds and things as may be incidental or necessary for the advancement or fulfilment of the investment objectives of the Trust, as set out in the Placement Document, in accordance with the InvIT Regulations and applicable law.

(vi). The Investment Manager shall have the power to issue and allot Units in accordance with the InvIT Regulations. The Investment Manager shall have the power to accept subscriptions to Units of the InvIT and issue and allot Units to Unitholders or such other persons and undertake all related activities under applicable law. Further, if the Investment Manager fails to allot or list the Units or refund subscription money within the time specified in the InvIT Regulations, it shall pay necessary interest to the Unitholders thereon, in accordance with applicable law. Further, the Investment Manager shall, subject to and only in accordance with the terms of the Trust documents and applicable law, have the power to transfer the Units.

(vii). The Investment Manager, acting on behalf of the Trustee, shall cause the depository to maintain a depository register.

(viii). The Investment Manager shall make such reserves out of the income or capital as it may deem proper, and any directions of the Trustee in this behalf whether made in writing or implied from their acts shall, so far as the applicable law may permit, be conclusive and binding.

(ix). The Investment Manager shall have the power to cause the Trust to borrow funds, including any subordinated equity, bonds or other fund from any person or authority (whether Government or otherwise, whether Indian or overseas) on such terms and conditions and for such periods and for the purpose of the Trust and the InvIT Assets, and shall have the power to hypothecate, pledge or create encumbrances, including any assignment of rights, of any kind on such securities held by the InvIT in such Holding Companies, and/or SPVs, or road infrastructure projects to be used as collateral security for any borrowings by the InvIT, subject to any approval of the Unitholders.

(x). The Investment Manager shall have the power to exercise all rights of the Trust in the InvIT Assets, including voting rights, rights to appoint directors, whether pursuant to securities held by it, or otherwise, in such manner as it deems to be in the best interest of the InvIT, and in accordance with the InvIT Regulations and applicable law. Additionally, if the InvIT has invested in infrastructure projects through the holding company or SPVs, then the Investment Manager, in consultation with the Trustee, shall appoint the majority of the directors of the Holding Company(ies) and/or the SPV(s), in accordance with the applicable law, as well as ensure that in every general meeting including the annual general meeting of any SPV or holding company, the voting of the InvIT is exercised, in accordance with the InvIT Regulations and applicable law.

(xi). The Investment Manager may use the services of external advisors and rely on the information provided in the due diligence process of assessing investment proposals as it deems necessary in its sole discretion.

(xii). The Investment Manager shall have the power to employ and pay at the expense of the Trust, any agent in any jurisdiction whether attorneys, solicitors, brokers, banks, trust, companies or other agents, without being responsible for the default of any agent if employed in good faith to transact any business.

(xiii). The Investment Manager may appoint any custodian in order to provide custodian services, and may permit any property comprised in the Trust to be and remain deposited with a custodian or with any person or persons in India or in any other jurisdiction subject to such deposit as authorised by the Trustee and permissible under the applicable law.

(xiv). The Investment Manager, in consultation with the Trustee, shall appoint and have the power to appoint, determine the remuneration and enter into, execute, deliver and terminate all documents and agreements, any contracts, agreements, including share purchase agreement, deed of right of first offer and refusal, escrow agreements, debt documentation, underwriting agreements and other Trust documents, any investment pooling agreement, agreement relating to strategic investments, co-investment agreements and other any and all documents and instruments containing customary terms including any amendments or supplements thereto as may be applicable with respect to the activities pertaining to the Trust in a timely manner and as per the provisions of the InvIT Regulations and applicable law.

(xv). The Investment Manager shall have the power and duty to pay all such duties, fees or taxes (and any interest or penalty chargeable thereon) as well as to create any reserves for future potential tax liability (and any such interest or penalty) out of the Trust's income, in accordance with

Applicable Law. The Investment Manager shall exercise due care and prudence in payment of duties and taxes of the Trust and shall endeavour to ensure that there are no material outstanding dues in that behalf, except for any claim or demand made by any tax department or authority subsequently, or any amounts disputed in good faith.

(xvi). The Investment Manager shall have the power to pay Trust expenses out of the funds of the Trust, or all or any of the InvIT Assets, in such proportion as may be determined from time to time, and the Investment Manager shall be entitled to reimbursement of any such expenditure duly incurred.

(xvii). The Investment Manager shall have the power to take the opinion of legal / tax counsel in any jurisdiction concerning any difference arising under the Investment Management Agreement or any matter in any way relating to the Investment Management Agreement or to its duties in connection with the Investment Management Agreement.

(xviii). Subject to applicable law, the Investment Manager shall have the power to:

(a) accept any property before the time at which it is transferable or payable;

(b) pay or allow any equity or claim on any evidence that it thinks sufficient;

(c) accept any composition or any security, movable or immovable, for any equity or other property;

(d) allow any time for payment of any equity; and

(e) subject to such approval as may be required from the Unitholders, compromise, compound, abandon, submit to arbitration or otherwise settle any equity account, claim or thing whatsoever relating to the Trust or the Investment Management Agreement.

(xix). Subject to the conditions laid down in any placement document and applicable law, the Investment Manager may retain or reinvest the invested capital portion of any proceeds received by the Trust from any holding company or SPV.

(xx). The Investment Manager may make rules to give effect to, and carry out the investment objectives, subject to applicable law. In particular, and without prejudice to the generality of such power, the Investment Manager may provide for all or any of the following matters, namely:

(a) manner of maintaining of the records and particulars of Unitholders;

(b) norms of investment by the Trust in accordance with the investment objectives of the Trust and in accordance with the powers and authorities of the Trustee as set out in the Trust Deed;

(c) matters relating to entrustment, deposit or handing over of any securities or SPVs of the Trust to any one or more custodians and the procedure relating to the holding thereof by the custodian;

(d) such other administrative, procedural or other matters relating to the administration or management of the affairs of the Trust and which matters are not, by their very nature, required to be included or provided for in the Trust Deed or by the management thereof and which matters are not inconsistent with the investment objectives;

(e) procedure for seeking the vote of the Unitholders either by calling a meeting or through postal ballot or otherwise; and

(f) procedure for summoning and conducting of meetings of Unitholders.

(xxi). Subject to applicable law, no Unitholder shall be entitled to inspect or examine the Trust's premises or properties without the prior permission of the Investment Manager. Further, no Unitholder shall be entitled to require discovery of any information with respect to any detail of the Trust's activities or any matter which may be related to the conduct of the business of the Trust and which information may, in the opinion of the Investment Manager, adversely affect the interest of other Unitholders.

(xxii). Investment Manager, on behalf of the InvIT, may buyback the Units from the Unitholders at the end of the term of the Trust or any other time or in any other manner in accordance with applicable law.

(xxiii). The Investment Manager shall provide the Trustee with advice and recommendations regarding the extension of loans from the Trust to the holding company and SPV and also subscription to debt securities or quasi-debt securities or any similar kind of securities issued by the holding company and SPV from the Trust or extension of loans from the Trust in compliance with applicable law.

(xxiv). The Investment Manager shall at all times comply with the SEBI circular dated September 11, 2023 in letter and spirit, as amended from time to time.

(xxv). The Investment Manager shall facilitate the appointment of Unitholder Nominee Directors by Eligible Unitholders in the manner prescribed under the InvIT regulations from time to time.

(xxvi). The Investment Manager shall also have the following powers and authorities:

(a) to institute, conduct, compromise, compound, or abandon any legal proceedings for or on behalf of or in the name of the Trust, and to defend, compound or otherwise deal with any such proceedings against the Trust or the Investment Manager or their officers or concerning the affairs of the Trust, and also to compound and allow time for payment or satisfaction of any equity due and of any claims or demands by or against the Trust and to refer any differences to arbitration and observe and perform any awards thereof;

(b) to make and give receipts, releases and other discharges for moneys payable to the Trust and for the claims and demands of the Trust;

(c) to enter into all such negotiations and contracts, and, execute or terminate and do all such acts, deeds and things for or on behalf of or in the name of the Trust as it may consider expedient for or in relation to any of the matters or otherwise for the purposes of the Trust;

(d) to ascertain, appropriate, declare and distribute or reinvest the surplus generally or under the Trust, to determine and allocate income, profits and gains in respect of the Trust to and amongst the Unitholders, to carry forward, reinvest or otherwise deal with any surplus and to transfer such sums, as it may deem fit, to one or more reserve funds which may be established by it;

(e) to open one or more bank accounts and demat accounts for the purposes of the Trust, to deposit and withdraw money, and fully operate and manage any such account fully;

(f) to sign, seal, execute, deliver and register according to applicable law all deeds, documents, and assurances in respect of the Trust;

(g) pay out of the income of the Trust, after deducting all expenses, the income and other distributions in accordance with the InvIT Regulations and applicable law;

(h) take into their custody or control all the capital, assets, property of the Trust and hold the same in trust for the Unitholders in accordance with the Trust Deed, applicable law and the InvIT Regulations;

(i) generally to exercise all such powers as it may be required to exercise under the InvIT Regulations and applicable law for the time being in force and do all such matters and things as may promote the investment objectives of the Trust or as may be incidental to or consequential upon the discharge of its functions and the exercise and enforcement of all or any of the powers and rights under the Investment Management Agreement, Applicable Law and the InvIT Regulations;

(j) in accordance with applicable law, individually or collectively, with the Trustee, initiate, prosecute or defend any action or other proceedings in any court of law or through arbitration or in any other manner for recovery of debts or sums of money, right, title or interest, property, claim, matter or thing whatsoever now or hereafter to become due or payable or in any way and belonging to the Trust by any means or on any account whatsoever in respect of and pertaining to the investments made by it and the same actions or proceedings or suits to discontinue or settle, as it shall in its best judgment or discretion deem fit;

(k) to issue statement of accounts or Unit certificates (if requested) to the Unitholders on behalf of the Trustee in accordance with Applicable Law, to submit Units for

dematerialisation and to make all applications and execute all documents with the depositories and depository participants as may be necessary in this regard;

(l) to set up such systems and procedures, and submit such reports, as may be required by the Trustee as necessary for effective monitoring of the functioning of the Trust.

2. *Duties of the Investment Manager*

The Investment Manager shall perform its duties as required under the Investment Management Agreement in accordance with the InvIT Regulations, including but not limited to:

(i). The Investment Manager shall use best endeavours to carry on and conduct its business in a proper and efficient manner in the best interest of the Unitholders. Further, it shall at all times exercise due diligence in carrying out its duties and protecting the interest of the Unitholders.

(ii). The Investment Manager shall coordinate with the Trustee, as may be necessary, with respect to the operations of the InvIT.

(iii). The Investment Manager shall ensure that the valuation of the InvIT Assets is done by the valuer(s) and the valuer(s) acts in accordance with the InvIT Regulations. The Investment Manager shall further ensure that the valuer is not an associate of the Investment Manager and shall be eligible to act as a valuer in accordance with the InvIT Regulations or any clarifications, guidelines, notifications or exemptions issued by SEBI. The Investment Manager shall submit to the stock exchanges valuation reports as required under the InvIT Regulations within fifteen days of the receipt of the valuation report from the valuer. Further, in case of any material development that may have an impact on the valuation of the assets of the InvIT, the Investment Manager shall require the valuer to undertake full valuation of the infrastructure project under consideration within not more than two months from the date of such event and disclose the same to the Trustee and the designated stock exchanges within fifteen days of such valuation.

(iv). The Investment Manager shall arrange for adequate insurance coverage for the InvIT Assets in accordance with the InvIT Regulations. The Investment Manager shall ensure that the InvIT Assets held by the holding companies or the SPVs are adequately insured.

(v). The Investment Manager shall maintain proper books of accounts, documents and records with respect to the Trust, to give a true, fair and accurate account of the investments, expenses, earnings, profits etc. of the Trust. The Investment Manager shall ensure that audit of the accounts of the Trust by the auditors is undertaken in accordance with the InvIT Regulations and such report is submitted to the stock exchange(s) within the time stipulated by the stock exchange(s), if any, and in accordance with the InvIT Regulations.

(vi). The Investment Manager shall declare distributions to Unitholders in accordance with the InvIT Regulations. Subject to applicable law, such percentage of the net distributable cash flows of the SPVs shall be distributed to the Trust in terms of the InvIT Regulations. Such declared distributions shall be made within the time period prescribed by the InvIT Regulations.

(vii). The Investment Manager shall convene meetings of the Unitholders and maintain records pertaining to the meetings in accordance with the InvIT Regulations and other applicable law.

(viii). The Investment Manager shall intimate the Trustee prior to any change in control of the Investment Manager to enable the Trustee to seek prior approval from the Unitholders and SEBI, if required under applicable law in this regard, and shall ensure that no such change is given effect to until the approval of the Unitholders and SEBI has been obtained, or the Investment Management Agreement is terminated and a new investment manager has been appointed.

(ix). The Investment Manager will monitor the Trust, including monitoring current and projected financial position of the Trust and the InvIT Assets, including the SPVs. The Investment Manager shall place before its board of directors, a report on the activity and performance of the Trust, in accordance with the InvIT Regulations. The Investment Manager shall designate an employee or a director as the compliance officer for monitoring of compliance with the InvIT Regulations and any circulars or guidelines issued thereunder and intimating SEBI in case of non-compliance.

(x). The Investment Manager shall maintain records pertaining to the activity of the Trust in terms of the InvIT Regulations.

(xi). The Investment Manager shall manage the Trust in accordance with the InvIT Regulations and the investment objectives of the Trust, and shall ensure that the investments made by the Trust are in accordance with the investment conditions enumerated in the InvIT Regulations, applicable Law and in accordance with the investment objectives and the investment strategy set out in the placement documents. The Investment Manager may review, revise, amend, vary or alter the investment objectives or the investment strategy set out in the placement documents.

(xii). The Investment Manager shall review the transactions carried out between the Project Manager and its associates and where the Project Manager has advised that there may be a conflict of interest, shall obtain confirmation from a practising chartered accountant or a valuer, as applicable, that such transaction is on an arm's length basis.

(xiii). The Investment Manager shall ensure adequate and timely redressal of all Unitholders' grievances pertaining to the activities of the InvIT in accordance with the InvIT Regulations.

(xiv). The Investment Manager shall submit to the Trustee:

(a) quarterly reports on the activities of the Trust including receipts for all funds received by it and for all payments made, status of compliance with the InvIT Regulations, performance report, status of development of under-construction projects, within the time period specified under the InvIT Regulations;

(b) valuation reports as required under the InvIT Regulations within the time period specified under the InvIT Regulations;

(c) proposal/decision to acquire, sell or develop, or bid for any asset or project or expand existing completed assets or projects along with rationale for the same;

(d) details of any action which requires approval from the Unitholders as may be stipulated under the InvIT Regulations;

(e) details of transactions it enters into with its associates;

(f) details of any other material fact including change in its directors, change in its shareholding, any legal proceedings that may have a significant bearing on the activity of the Trust, within such period as stipulated under applicable law;

(g) such information, document and records as pertaining to the activities of the Trust as may be reasonably necessary for, and sought by, the Trustee with respect to its responsibilities under the Trust Deed, the InvIT Regulations and Applicable Law; and

(h) such other information, document and records as pertaining to its activities, obligations, duties and responsibilities under the Investment Management Agreement, the InvIT Regulations and applicable law, as may be reasonably necessary for, and sought by, the Trustee.

(xv). The Investment Manager shall be responsible for all activities pertaining to any issue and listing of the Units of the InvIT in accordance with applicable law, including:

(a) filing the placement document with SEBI and/or the stock exchange(s) within the prescribed time period;

(b) dealing with all matters up to the allotment of Units to the Unitholders;

(c) obtaining in-principle approval and final listing and trading approvals from the designated stock exchange; and

(d) dealing with all matters relating to the issue and listing of the Units.

(xvi). The Investment Manager shall also ensure that all relevant provisions of the InvIT Regulations and applicable law have been complied with and all statements and disclosures made in any placement document are material, true, correct, not misleading and are adequate disclosures in order to enable the investors to make an informed decision and are in accordance with the InvIT Regulations and applicable law, and such placement document should not contain any untrue statement of a material fact or omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading.

(xvii). In terms of the InvIT Regulations, the Investment Manager shall apply for delisting of units of the Trust to SEBI and the designated stock exchange in accordance with the InvIT Regulations and applicable law.

(xviii). The Investment Manager shall within the time period prescribed under the InvIT Regulations, submit an annual report to all the Unitholders electronically or provide physical copies and to the designated stock exchange.

(xix). The Investment Manager shall submit half-yearly reports within the time period prescribed under the InvIT Regulations to the stock exchange(s) and provide any information having bearing on the operation or performance of the Trust, as well as price sensitive information and other information that is required in terms of the InvIT Regulations and applicable law.

(xx). Subject to applicable law, the Investment Manager shall ensure that it shall discharge its obligations under the agreement and the InvIT Regulations in accordance with the corporate governance policies adopted by the Investment Manager in relation to the InvIT.

(xxi). The Investment Manager shall ensure that prior written consent of the trust lenders is obtained in accordance with the provisions of the trust financing documents.

(xxii). The Investment Manager will also have the following duties and obligations:

(a) ensure that computation and declaration of Net Asset Value of the Trust is based on the valuation done by the valuer in accordance with the InvIT Regulations and applicable law;

(b) maintain regular interaction with the Trustee regarding performance of the Trust and providing the Trustee with any information in relation to the operations of the Trust as maybe required under applicable law;

(c) conducting its affairs and the affairs of the Trust in such a manner that no Unitholder will have any personal liability (except to the extent of their Unitholding, where such Unit is partly paid) with respect to any liability or obligation of the Trust;

(d) keeping the Unitholders of the Trust informed and updated on investment activities of the Trust in accordance with the terms of the InvIT Documents;

(e) collecting all dividends, fees, property and other payments due and receivable by the Trust declaring distribution to the Unitholders in the manner set out in the Deed and in terms of the InvIT Regulations and applicable law;

(f) to ensure that no commission or rebate or any other remuneration, by whatever name called, arising out of transactions pertaining to the Trust is collected by it or its associates for the purpose of the issue of the Units;

(g) to ensure that the InvIT Assets including the holding companies and the SPVs, have proper legal titles, to the extent applicable, and that all the material contracts entered into on behalf of the Trust or the InvIT Assets are legal, valid, binding and enforceable by and on behalf of the Trust or the InvIT assets, as applicable;

(h) to ensure that all the activities of the intermediaries or agents or service providers appointed by it are in accordance with the InvIT Regulations or any guidelines or circulars issued thereunder;

(i) to ensure that any possible conflict of interest involving its role as Investment Manager is reported to the Trustee;

(j) to ensure that disclosures or reporting to Unitholders, SEBI, the Trustee and the designated stock exchange(s) are in accordance with the InvIT Regulations and applicable law;

(k) provide SEBI, the designated stock exchange(s) and Trustee, where applicable, such information as may be sought by SEBI or by the designated stock exchange(s) or Trustee pertaining to the activity of the Trust;

(l) submit a compliance certificate to the Trustee, in the form and at such intervals as may be specified under the InvIT Regulations and applicable law;

(m) to inform the Trustee in writing about any change in the representations and warranties provided under the Investment Management Agreement; and

(n) take any other actions reasonably incidental to any of the foregoing, or necessary or convenient in order to fully effect or evidence any action or transaction contemplated under the Investment Management Agreement.

(xxiii). Related Party Transactions: The Investment Manager shall provide such assistance to ensure that all related party transactions shall be on an arms-length basis in accordance with relevant accounting standards, in the best interest of the Unitholders, consistent with the strategy and investment objectives of the InvIT and in accordance with the InvIT Regulations.

(xxiv). The Investment Manager shall provide to the Trustee such assistance as may be required by the Trustee in fulfilling its obligation towards the Trust under applicable law or as may be required by any regulatory authority with respect to the Trust.

(xxv). The Investment Manager shall rectify any delay or discrepancy or non-compliance of reporting or disclosures requirements under the InvIT Regulations and applicable law on an urgent basis.

(xxvi). Disclose to the Trustee any pending business transactions, contracts under negotiation and other arrangements with the valuer and any other factors that may interfere with the valuer's ability to give an independent and professional valuation of the assets.

3. *Liabilities of the Investment Manager*

The liabilities of the Investment Manager in terms of the Investment Management Agreement are as follows:

(i). The Investment Manager shall not be liable in respect of any action taken or damage suffered by it on reliance upon any notice, resolution, direction, consent, certificate, affidavit, statement, certificate of stock, plan of reorganization or, without being limited in any way by the foregoing, other paper or document believed to be genuine and to have been passed, sealed or signed by appropriate authorities or entities.

(ii). The Investment Manager shall not be liable to the Unitholders for doing or failing to do any act or thing which by reason of any provision of any present or future law or regulation made pursuant thereto, or of any decree, order or judgment of any court, or by reason of any request, announcement or similar action, whether of binding legal effect or not, which may be taken or made by any person or body acting with or purporting to exercise the authority of any government (legally or otherwise) it shall be directed or requested to do or perform or to forbear from doing or performing. If for any reason it becomes impossible or impracticable to carry out any of the provisions of the Investment Management Agreement, the Investment Manager shall not be under any liability.

(iii). The Investment Manager shall not be liable to the Unitholder or any of them or to any other party as a result of such compliance or in connection with such compliance if the Investment Manager is required by the InvIT Regulations or applicable law to provide information regarding the Trust or the Unitholders, the Trust investments and income therefrom and provisions of these presents and complies with such request in good faith, whether or not it was in fact enforceable. If permitted under Applicable Law and if reasonably practicable, the Investment Manager shall provide prior written notice to the Trustee and the relevant Unitholders of such disclosure requirement.

(iv). The Investment Manager shall not incur any liability for any act or omission which may result in a loss to a Unitholder by reason of any depletion in the value of the InvIT Assets or otherwise, except in the event that such loss is a result of fraud or gross negligence or wilful default on the part of the Investment Manager.

(v). The Investment Manager shall be liable to pay interest to the Unitholders at the rate as may be prescribed in the InvIT Regulations until the distribution is made, and such interest shall not be recovered in the form of fees or any other form payable to the Investment Manager by the Trust.

(vi). The Investment Manager shall continue to be liable for all of its acts of omission and commission with respect to the activities of the InvIT, notwithstanding surrender of registration of the InvIT to SEBI.

(vii). The Investment Manager shall be liable to any Unitholder for the authenticity of any signature or of any seal affixed to any endorsement or other document affecting the title to or the

transmission of Units or interests in the Trust or of any investments of the Trusts or be in any way liable for any forged or unauthorized signature or seal affixed to such endorsement, transfer or other document, or for acting upon or giving effect to any such forged or unauthorized signature or seal. The Investment Manager shall be bound to require that the signature of any Unitholder to any document required to be signed by such Unitholder, under or in connection with these presents shall be verified to its reasonable satisfaction.

4. *Indemnity*

In addition to the fees, distributions and expense reimbursements herein described, the Trustee shall, from the Trust assets, indemnify and hold harmless the Investment Manager and its respective officers, directors, shareholders, partners, members, employees, advisors and agents ("**Indemnified Parties**") from and against any claims, losses, costs, damages, liabilities, suits, proceedings and expenses, including legal fees ("**Losses**") suffered or incurred by them by reason of their activities on behalf of the Trust, unless such Losses resulted from fraud, gross negligence, wilful default or wilful misconduct or breach of any obligations or duties under applicable law by the relevant Indemnified Party, as determined by a court of competent jurisdiction.

The Trustee, its directors, employees and officers ("**Trustee Party**") shall be indemnified by the Investment Manager against any and all direct and actual losses, actions, claims, suits, proceedings, damages, liabilities, costs and expenses including legal fees, incurred or suffered by the Trustee Party in connection with the breach of any of the terms of the Investment Management Agreement by the Investment Manager, or failure in furnishing information required by SEBI or any regulatory authority with respect to the Trust, or furnishing incorrect information by the Investment Manager under the InvIT Regulations or related to Trust including in any placement document, or arising out of gross negligence, wilful default or misconduct or fraud on part of the Investment Manager, in carrying out its obligations under the Investment Management Agreement, Trust Deed, the other Trust documents, any information memorandum, placement document and applicable law. The Trustee acknowledges and agrees that the aggregate maximum liability of the Investment Manager in each financial year, shall be limited to the aggregate fees paid to the Investment Manager for the immediately preceding one financial year, in accordance with the terms of the Investment Management Agreement, provided that such aggregate maximum liability shall not be applicable in the event such liability of the Investment Manager to indemnify the Trustee Party for losses or damages suffered arises out of any gross negligence, wilful default or misconduct or fraud of the Investment Manager, as determined by a court of competent jurisdiction.

5. *Termination*

The Investment Management Agreement shall be effective from the date of execution of the Investment Management Agreement and shall terminate in accordance with the terms of the Investment Management Agreement. The appointment of the Investment Manager may be terminated by the Trustee or the Unitholders in accordance with the procedure specified under the InvIT Regulations.

(i). The Unitholders, other than any party related to the transactions and its associates holding not less than such percentage by value as specified under the InvIT Regulations, may apply in writing to the Trustee for removal of the Investment Manager.

(ii). Subject to the approval of Unitholders (if required) and compliance with other requirements under Applicable Law, the Investment Management Agreement may be terminated:

(a) by the Investment Manager by delivery of a prior written notice of 30 (thirty) business days to the Trustee, subject to appointment of new Investment Manager in accordance with the Investment Management Agreement and the InvIT Regulations;

(b) by the Trustee by delivery of a written notice to the Investment Manager at any time, upon breach of any of the terms, covenants, conditions or provisions of the Investment Management Agreement by the Investment Manager and a failure of the Investment Manager to cure the said breach within a period that is earlier of: (a) the period stipulated under applicable law, or (b) 90 business days; or such other period as may be mutually agreed to cure such breach;

(c) by the InvIT (acting through the Trustee) pursuant to a resolution of Unitholders; or

(d) by any Party by delivery of a written notice to the other Party upon the bankruptcy of such other Party, or if winding up or liquidation proceedings are commenced against such other Party, and such proceedings persist for a period of more than three months.

(iii). After approval from the Unitholders in accordance with the InvIT Regulations, the Trustee shall appoint a new investment manager and execute a new investment management agreement within three months from the termination of the previous investment management agreement in accordance with applicable law. The Trustee shall also ensure that the new investment manager stands substituted as a party in all documents to which the Investment Manager was a party, in relation to the Trust in its capacity as the Investment Manager. The Investment Manager shall remain in office until the appointment of a new investment manager. The Investment Manager shall continue to be liable for all of its acts, omissions and commissions during its tenure as Investment Manager, notwithstanding the termination of the Investment Management Agreement.

(iv). Upon removal or replacement of the Investment Manager, the Investment Manager shall, within a period of 90 (ninety) business days, transfer custody of the Trust to the Trustee and give the Trustee all books of accounts, correspondence, documents and records relating to the InvIT which the Investment Manager has in its possession. In the event of removal or resignation of the Investment Manager, the Investment Manager shall be entitled to receive Management Fees only up to the date of such removal or resignation.

(v). Notwithstanding anything contained hereinabove, (i) in the event that the offer of Units does not occur within the time period stipulated in the InvIT Regulations or such other date as may be mutually agreed to between the Investment Manager and the Trustee, or (ii) in the event of cancellation of registration of the Trust by SEBI, or (iii) winding up of the Trust, then the Investment Management Agreement shall automatically terminate without any liability on any party.

D. The Project Manager – National Highways InvIT Project Managers Private Limited

History and Certain Corporate Matters

National Highways InvIT Project Managers Private Limited was incorporated as a private limited company on March 9, 2021, under the Companies Act, 2013. The CIN of the Project Manager is U45201DL2021GOI378178.

Background of the Project Manager

The Project Manager is a wholly-owned subsidiary of NHAI.

The Project Manager shall (directly through the appointment of appropriate agents) undertake operations and management of the Trust, including making arrangements for the maintenance of assets held under the Trust. The Project Manager has been appointed as per the terms of the Project Implementation and Management Agreement.

Neither the Project Manager nor any of the promoters or directors of the Project Manager (i) is debarred from accessing the securities market by SEBI; (ii) is a promoter, director or person in control of any other company or a sponsor, investment manager or trustee of any other infrastructure investment trust or an infrastructure investment trust which is debarred from accessing the capital market under any order or direction made by SEBI; or (iii) is in the list of wilful defaulters published by the RBI.

Key terms of the Amended and Restated Project Implementation and Management Agreement

The Project Manager has entered into the Amended and Restated Project Implementation and Management Agreement, in terms of the InvIT Regulations, the key terms of which, are provided below.

1. *Scope of Services*

The scope of services of the Project Manager are as follows:

i. Whilst the primary obligation under the Concession Agreements remains with the SPV in the manner contemplated therein, the Project Manager shall ensure that the InvIT Assets are operated, maintained and managed as per the terms and conditions of the Concession Agreements, respective O&M Agreements and the InvIT Regulations, either directly or through the appointment and supervision of appropriate agents or contractors or consultants by the SPV or by the Project Manager, and perform obligations as stipulated therein. The Project Manager shall provide and/cause to procure and ensure procurement of all such services as are required to enable the SPV to perform its operation and maintenance related obligations under and in compliance with the Concession Agreements. The responsibilities and the scope of services of the Project Manager include, but not limited to, those specifically provided which may be modified from time to time.

ii. Costs and expenses to be paid to any third party (engaged by the SPV or Project Manager, on behalf of the Project SPV, with the consent of the Investment Manager) shall be borne by the SPV in accordance with the terms and conditions of the contract entered into between the SPV and such third party.

2. *Duties of the Project Manager*

The duties of the Project Manager in terms of the Project Implementation and Management Agreement and the InvIT Regulations are as follows:

i. The Project Manager shall undertake implementation, development, maintenance, operation and management of the InvIT Assets including making arrangements for the appropriate maintenance, either directly or through the appointment and supervision of agents or consultants, if any, as may be necessary for discharge of its duties under the terms of the Project Implementation and Management Agreement, the O&M Agreements and under the InvIT Regulations.

ii. The Project Manager shall facilitate and ensure, either directly or through appropriate agents or consultants engaged either by them or through the SPV, the progress of development, approval status and other aspects of the InvIT Assets that may be under development or, of any new projects, until its completion in accordance with any agreement that may be entered into in this regard, including the supervision of agents or consultants appointed for such purpose.

iii. The Project Manager shall discharge all obligations in respect of achieving timely completion of the infrastructure projects, wherever applicable, implementation, development, operation, maintenance and management of the infrastructure projects in terms of the O&M Agreements, the Project Implementation and Management Agreement and the InvIT Regulations.

iv. The Project Manager acknowledges that the Trustee and the Investment Manager will be overseeing the activities of the Project Manager in accordance with the InvIT Regulations and accordingly, the Project Manager shall extend complete coordination to enable the Trustee and the Investment Manager to perform such obligations in accordance with the InvIT Regulations. Further, the Project Manager shall provide relevant documents in connection with the Projects, including reports and compliance certificate(s), as may be specified, to the Investment Manager and the Trustee in accordance with the InvIT Regulations, in the form prescribed by SEBI or the Investment Manager, if any.

v. The Project Manager shall provide the Investment Manager with details of transactions carried out between itself and its associates in relation to the Trust, and disclose any conflict of interest in such cases to the Investment Manager, in accordance with the InvIT Regulations.

vi. The Project Manager shall intimate the Trustee prior to any Change in Control of the Project Manager to enable the Trustee to seek approval from the relevant authority in accordance with the Concession Agreements or other project documents pertaining to the InvIT Assets, if applicable.

vii. The Project Manager shall provide to the Trustee and Investment Manager, or to such other person as the Trustee and/or the Investment Manager may authorise and direct, all information that may be necessary for each of them to maintain the records of the InvIT and as may be required for making submissions to SEBI or any other Governmental Authority, including with respect to relevant approvals, consents and other documents required in relation to the Projects and the reporting requirements under the InvIT Regulations, in a proper and timely manner, and in the format prescribed (if any), as required by the Trustee and /or Investment Manager.

viii. The Project Manager shall appoint one of its qualified employees acceptable to the Investment Manager and the SPV with adequate and appropriate experience as a principal contact for the board of directors of the SPV, the Trustee and the Investment Manager in relation to the Projects and the Services. The Project Manager shall receive directions and instructions from the Investment Manager, which directions or instructions shall have been issued by the Investment Manager on its own or on behalf of the Project SPV, and to take actions in relation to and ensure compliance with such directions and instructions and report back to the Trustee and the Investment Manager.

ix. The Project Manager shall at all times ensure that the transactions or arrangements entered into by the Project Manager with a related party are on an arm's length basis.

x. The Project Manager shall promptly inform the Parties in writing of any act, occurrence or event, which the Project Manager believes is reasonably likely to increase the cost of or the time

for implementation taken in relation to any InvIT Asset, or materially to change the financial viability, quality or function of any InvIT Asset.

xi. If any defects are found in the maintenance, materials and workmanship of the Services provided under the Project Implementation and Management Agreement by the Project Manager and/or by the PM Agents, the Project Manager shall promptly, in consultation and agreement with the other Parties, regarding appropriate remedying of the defects, and at its own cost, repair, replace or otherwise make good (as any SPV shall, at its discretion, determine) such defects as well as any damage caused by such defect.

xii. The Project Manager shall be liable to the other Parties for any direct loss or damage attributable to the non-performance or breach of the obligations of the Project Manager including those of the PM Agents, under the Project Implementation and Management Agreement The Trustee and the Investment Manager acknowledge and agree that the aggregate maximum liability of the Project Manager shall be limited to the fees payable to the Project Manager in accordance with the terms of the Project Implementation and Management Agreement.

xiii. The duties of Project Manager shall also include the following:

a. providing the necessary certification as may be required under applicable laws and the InvIT Regulations;

b. facilitate and ensure execution and completion of activities in relation to any InvIT Assets under development in accordance with and in the manner contemplated in any agreement entered into by any or all the InvIT Assets;

c. exercising diligence and vigilance in carrying out its duties directly or through its agents/ contractors of the SPV and protecting the InvIT Assets;

d. keeping the Investment Manager informed on all matters which have a material bearing on the operations of the InvIT Assets, and attending meetings with the Investment Manager and/or the SPV, as may be required;

e. liaising with Governmental Authorities in respect of its obligations under the Project Implementation and Management Agreement and the O&M Agreements;

f. taking appropriate measures to mitigate the risks which may be encountered by the InvIT in respect of the InvIT Assets, including creation of risk registers and periodic risk auditors either directly or through its agents;

g. keeping proper records for actions taken in respect of the InvIT Assets; and

h. complying with the instructions of the Investment Manager and the Trustee and the provisions of the InvIT Regulations.

xiv. The Parties may, from time to time, agree to the provision of certain additional services to be rendered by the Project Manager. If, in the assessment of the Project Manager, such additional services are required for the purposes of carrying out its duties and obligations under the Project Implementation and Management Agreement, the O&M Agreements, and Applicable Law, the Project Manager shall notify the Parties in writing of such requirement, including the fee payable and the terms and conditions for such additional services, and obtain prior written approval of the Parties in this regard.

xv. In case of any inconsistency or discrepancy between the Project Implementation and Management Agreement and the O&M Agreements, the Project Manager shall bring the same into the notice of the Investment Manager. The Investment Manager shall issue instructions (in writing) for resolving the inconsistency, to the Project Manager. The Project Manager shall be bound to comply with the instructions of the Investment Manager.

xvi. Notwithstanding anything to the contrary contained in the Project Implementation and Management Agreement, nothing contained in the Project Implementation and Management Agreement shall be construed to limit or restrict the performance of any duties or obligations of the Project Manager, Investment Manager or the Trustee contained in the InvIT Regulations and other Applicable Law.

xvii. During the term of the Project Implementation and Management Agreement, in the event the representations provided by the Project Manager under the Project Implementation and Management Agreement, become untrue or incorrect or incomplete in any respect, the Project

Manager shall, within a reasonable time, inform the Trustee and Investment Manager of such event.

xviii. The Project Manager shall promptly and periodically notify the Investment Manager regarding any deficiency in the services of the SPV Team or any third party contractor or service provider engaged either directly by the Project Manager or through the SPV, along with an assessment report covering, amongst others, the details of deficiency in service, remedial measures and financial impact on the Project SPV. Any such deficiency shall be remedied in the manner provided in the Project Implementation and Management Agreement.

xix. Other than on account of any non-compliance or deficiency, the Project Manager shall promptly notify the Investment Manager regarding any proposed change in the SPV Team along with an assessment report covering, amongst other things, rationale for the change and its assessment of the same and professional competence of the persons proposed to be appointed to the SPV Team. The Project Manager shall not grant consent for any change in the SPV Team without prior consultation with, and approval of, the Investment Manager, in accordance with the Project Implementation and Management Agreement.

3. *Indemnity*

The Trustee, the Investment Manager, the Project SPV and their respective directors, employees, officers and the InvIT ("**Indemnified Parties**") shall be indemnified by the Project Manager against any claims, suits, proceedings, losses, costs, damages, liabilities and expenses, including legal fee from and incurred or suffered by the Indemnified Parties in connection with the breach of any of the terms of the Project Implementation and Management Agreement by the Project Manager, or failure in furnishing information required by SEBI or any regulatory authority with respect to the InvIT, or furnishing wrong information by the Project Manager under the InvIT Regulations or related to InvIT including in any offer documents, or arising out of gross negligence, wilful default, wilful misconduct or fraud on part of the Project Manager, in carrying out its obligations under the Project Implementation and Management Agreement, the other InvIT Documents and Applicable Law. The Trustee and the Investment Manager acknowledge and agree that the aggregate maximum liability of the Project Manager in each financial year shall be limited to the fees payable to the Project Manager in such financial year in accordance with the terms of the Project Implementation and Management Agreement, provided that such maximum aggregate liability shall not be applicable in the event such liability of the Project Manager arises out of any gross negligence, wilful default, wilful misconduct or fraud on the part of the Project Manager, as determined by a court of competent jurisdiction.

4. *Termination*

(i). The Project Implementation and Management Agreement shall remain effective, unless terminated by the parties in accordance with the provisions hereto or extended by mutual consent expressed in writing by the parties, for the period that the concession agreement is in force or such other period as may be mutually agreed between the Parties ("**Validity Period**").

(ii). Prior to the expiry of its Validity Period, the Project Implementation and Management Agreement, may be terminated:

(a) by the Investment Manager after consultation with the Trustee by delivery of a written notice of 30 (thirty) business days, specifying the reasons for such termination, to the Project Manager at any time, subject to appointment of new project manager in accordance with the Project Implementation and Management Agreement and the InvIT Regulations; or

(b) by the Investment Manager after consultation with the Trustee by delivery of a written notice to the Project Manager at any time, upon breach of any of the terms, covenants, conditions or provisions of the Project Implementation and Management Agreement by the Project Manager and a failure of the Project Manager to remedy the said breach within a period of 60 Business Days or such other period as may be mutually agreed by the parties; or

(c) by any party by delivery of a written notice to the other party upon the bankruptcy of such other party or if insolvency resolution process, winding up or liquidation proceedings, whether voluntary or involuntary, are commenced against such other party (and such proceedings persist for a period of more than three months).

(iii). Notwithstanding anything contained hereinabove, the Trustee in consultation with the Investment Manager shall appoint a new project manager having satisfactory credentials and execute a new project implementation and management agreement within three months from

the termination of the earlier project implementation and management agreement in accordance with applicable law. The Trustee and Investment Manager shall also ensure that the new project manager stands substituted as a party in all documents (including the O&M Agreements) to which the Project Manager was a party. The Project Manager shall remain in office until the appointment of a new project manager. The Project Manager shall continue to be liable for all its acts and omissions and commissions notwithstanding its termination until the appointment of a new project manager.

(iv). The termination of the Project Implementation and Management Agreement shall not affect the rights and obligations of the parties accrued prior to such termination.

(v). In case of early termination prior to the expiry of the Validity Period, the Project Manager shall be entitled to and the Trust shall be liable to pay (from the funds of the InvIT or the SPV) to the Project Manager the reimbursement of all out of pocket expenses incurred by the Project Manager while performing services in terms of the Project Implementation and Management Agreement up to that date. The fees shall be paid to the Project Manager within a period of 60 business days from the date of receipt of demand in this regard from the Project Manager failing which the fees, or any part thereof, which remains outstanding shall attract interest at the rate of 10% per annum on the outstanding amount.

(vi). Notwithstanding anything contained hereinabove, the termination of any of the O&M Agreements, as the case may be, will not result in the termination of Project Implementation and Management Agreement, and the Project Implementation and Management Agreement shall continue to be in force in respect of the other O&M Agreements that are not terminated and the InvIT Assets.

(vii). Notwithstanding anything herein contained, in the event of:

(a) any amendment or supplement or restatement of any of the O&M agreements or execution of a new O&M agreement;

the same shall be deemed to have been incorporated in the Project Implementation and Management Agreement and the Agreement shall stand modified to such extent.

(viii). Notwithstanding anything contained hereinabove, the Project Implementation and Management Agreement shall automatically terminate: (i) in the event the offer of the Units does not occur within the time period stipulated in the InvIT Regulations, or such other date as may be mutually agreed to between the parties; (ii) in the event of cancellation of the registration of the Trust by SEBI; or (iii) upon winding up of the Trust, in accordance with the InvIT Regulations.

In case of any inconsistency between the Project Implementation and Management Agreement or any InvIT Documents, and the InvIT Regulations or any applicable law, the InvIT Regulations or applicable law shall prevail.

CORPORATE GOVERNANCE

The section below is a summary of the corporate governance framework in relation to the Trust, adopted by the Investment Manager.

1. Investment Manager

1.1. Board of Directors

Composition of the Board of Directors of the Investment Manager

In addition to applicable provisions of the Companies Act, 2013, the board of directors should adhere to the following:

(a) The Board of Directors shall comprise of not less than six directors and have not less than one woman independent director;

(b) Not less than 50% of the board of directors shall comprise of independent directors and not directors or members of the governing board of the Investment Manager of another infrastructure investment trust registered under the Securities and Exchange Board of India (Infrastructure Investment Trust) Regulations, 2014, as amended;

(c) the chairman of the board of directors should be a non-executive independent director; and

(d) collective experience of directors should cover a broad range of commercial experience, particularly experience in infrastructure sector (including the applicable sub-sector), investment management or advisory and financial matters.

Quorum

The quorum shall be 1/3rd of total strength or three directors whichever is higher including atleast 1(one) independent director.

Frequency of meetings

The board of directors should meet at least four times every year, with a maximum gap of 120 days between any two successive meetings. Additionally, the board of directors should meet prior to any meeting of the unitholders and approve the agenda for unitholders' meetings.

1.2. Remuneration of directors

Remuneration including sitting fees of the directors will be decided by the board of directors, from time to time.

1.3. Independent Directors

Independent Directors shall mean the independent directors who complies with requirements of SEBI InvIT Regulations, as amended from time to time.

1.4. Committees of the board of directors

(a). Audit Committee

Composition of the Audit Committee

The audit committee should comprise at least 2/3rd of independent directors and will comprise of at least three members. The chairperson of the audit committee should be an independent director. All members of the audit committee should be financially literate and at least one member should have accounting or related financial management expertise. The company secretary shall act as the secretary to the audit committee.

Quorum

The quorum shall either be 2 (two) members or 1/3rd of the members of the audit committee, whichever is greater, with at least two independent directors.

Frequency of meetings

The audit committee should meet at least four times every year, with a maximum gap of 120 days between any two successive meetings. Additionally, the audit committee should meet prior to any

declaration of distributions and provide recommendations to the board of directors regarding any proposed distributions.

Scope of the Audit Committee

The terms of reference of the audit committee should include the following:

(i). recommending to the board of directors the appointment, re-appointment and replacement, remuneration and terms of appointment of the statutory auditor of the Trust and the audit fee, subject to the approval of the unitholders;

(ii). Approving the payment to statutory auditors for any other services rendered by the statutory auditors;

(iii). Discussion with statutory auditors before the audit commences, about the nature and scope of audit as well as post-audit discussion to ascertain any area of concern;

(iv). Evaluation of internal financial controls and risk management systems;

(v). reviewing and monitoring with the management, the independence and performance of statutory and internal auditors of the Trust, and adequacy and effectiveness of the audit process and internal control systems, as necessary;

(vi). Reviewing the adequacy of internal audit function, if any, including the structure of the internal audit department, staffing and seniority of the official heading the department, reporting structure coverage and frequency of internal audit;

(vii). Reviewing management letters/letters of internal control weaknesses issued by the statutory auditors and the findings of any internal investigations in relation to the Trust, into matters where there is suspected fraud or irregularity or a failure of internal control systems of a material nature, discussing such findings with internal and statutory auditors and follow ups thereon and reporting the matter to the board of directors;

(viii). Oversight of the Trust's financial reporting process and the disclosure of its financial information to ensure that the financial statement is correct, sufficient and credible;

(ix). Reviewing the annual financial statements and auditor's report thereon of the Trust and the Investment Manager, before submission to the board of directors for approval, with particular reference to:

- matters required to be included in the director's responsibility statement to be included in the board's report of the Investment Manager in terms of clause (c_) of sub-section (3) of Section 134 of the Companies Act, 2013;
- changes, if any, in accounting policies and practices and reasons for such change;
- major accounting entries involving estimates based on the exercise of judgment by management;
- significant adjustments made in the financial statements arising out of audit findings;
- compliance with listing and other legal requirements relating to financial statements;
- disclosure of any related party transactions; and
- modified opinions or qualifications in the draft audit report;

(x). reviewing, with the management, the Trust's financial disclosure and reporting process and all periodic financial statements, including but not limited to quarterly, half-yearly and annual financial statements of the Trust, whether standalone or consolidated or in any other form as may be required under applicable law, before submission to the board of directors for approval;

(xi). Reviewing the management's discussion and analysis of financial condition and results of operations;

(xii). Reviewing and evaluating the adequacy of financial controls, risk management systems and internal audit function if any of the Trust, including the structure of the internal audit department, staffing and seniority of the official heading the department, reporting structure coverage and frequency of internal audit;

(xiii). Reviewing, with the management, the statement of uses/application of funds raised through an issue of units by the Trust (including but not limited to public issue, rights issue, preferential issue, private placements, etc.) and any issue of debt securities, and the statement of funds utilised for purposes other than those stated in the offer documents/ notice, and making appropriate recommendations to the board of directors for follow-up action;

(xiv). (a) reviewing the procedures put in place by the Investment Manager for reviewing related party transactions, the indemnification of expenses or liabilities incurred by the Investment Manager, and the setting of fees or charges payable out of the Trust's assets, (b) reviewing the statement of significant related party transactions, submitted by the management; and (c) approving or any subsequently modifying transactions of the Trust with related parties, and recommending such transactions to the board of directors or the unitholders, as may be required, in terms of the InvIT Regulations;

(xv). Scrutiny of inter-corporate loans and investments of the Trust, including (a) reviewing the investment decisions with respect to the underlying assets or projects of the Trust from the Sponsor including any further investments or divestments and (b) approving any proposal in relation to acquisition of assets, further issue of units including in relation to acquisition or assets; and undertaking other functions to ensure protection of the interest of unitholders;

(xvi). Reviewing the utilization of loans and/ or advances from/investment by the Trust in the SPVs exceeding rupees 100 crore or 10% of the asset size of the SPVs, whichever is lower including existing loans / advances / investments;

(xvii). Valuation of undertakings or assets of the Trust, wherever it is necessary

(xviii). Giving recommendations to the board of directors regarding appointment, re-appointment and replacement, remuneration and terms of appointment of the valuer of the Trust; as well as reviewing and monitoring the independence and performance of the valuer of the Trust;

(xix). Providing recommendations to the board of directors regarding any proposed distributions, and evaluating any defaults or delay in payment of distributions to the unitholders or dividends by the Project SPV to the Trust and payments to any creditors or debenture holders of the Trust or the Project SPV, and recommending remedial measures; and

(xx). To review the functioning of the whistle blower mechanism;

(xxi). Approval of appointment of chief financial officer after assessing the qualifications, experience and background, etc. of the candidate;

(xxii). Consider and comment on rationale, cost-benefits and impact of schemes involving merger, demerger, amalgamation etc., on the Trust and its unitholders or Investment Manager and its shareholders.

(xxiii). Formulating any policy for the Investment Manager as necessary, in relation to its functions, as specified above.

(b). *Stakeholders' Relationship Committee*

Composition of the Stakeholders' Relationship Committee

The stakeholders' relationship committee should comprise at least three members. At least one member of the committee shall be an independent director. The chairperson of this committee shall be a non-executive director.

Quorum

The quorum shall be at least 50% of the members of the committee.

Frequency of meetings

The stakeholders' relationship committee should meet at least four times every year, or as frequently as determined by the board of directors or as directed by the trustee of the Trust, with a maximum gap of 120 days between any two successive meetings.

Scope of the Stakeholders' Relationship Committee

The terms of reference of the stakeholders' relationship committee should include the following:

(i) Consider and resolve grievances of the unitholders or debenture holders, including complaints related to the transfer/transmission of units, non-receipt of annual report, non-receipt of declared distributions and non-receipt of interest or principal repayment on debentures, general meetings;

(ii) Review of measures taken for effective exercise of voting rights by shareholders;

(iii) Review of any litigation related to unitholders' grievances;

(iv) Review of adherence to the service standards adopted by the listed entity in respect of various services being rendered by the Registrar & Share Transfer Agent;

(v) Review of the various measures and initiatives taken by the Trust or Investment Manager for reducing the quantum of unclaimed distributions and ensuring timely receipt of distribution warrants/annual reports/statutory notices by the unitholders of the Trust;

(vi) update unitholders on acquisition / sale of assets by the Trust and any change in the capital structure of the Project SPV;

(vii) Reporting specific material litigation related to unitholders' grievances to the board of directors;

(viii) Approve report on investor grievances to be submitted to the Trustee;

(ix) Undertaking all functions in relation to resolution of any conflicts of interest;

(x) Coordination with the unitholders on matters in connection with voting (including in respect of actions which require approval of the unitholders in accordance with applicable law); and

(xi) provide the unitholders with regular updates and information on the operation or performance of the Trust.

(c). *Nomination and Remuneration Committee*

Composition of the Nomination and Remuneration Committee[5]

The nomination and remuneration committee should comprise at least three members. All the members of the Committee shall be Independent directors. The chairperson of this committee shall be an independent director. Provided that the chairperson of the Board, may be appointed as a member of the Nomination and Remuneration Committee and shall not chair such Committee.

Quorum

The quorum shall be either 2(two) members or 1/3rd of the members of the Nomination and Remuneration Committee whichever is greater.

Frequency of meetings

The nomination and remuneration committee should meet atleast once or at a frequency as determined by the board of directors or as directed by the trustee of the Trust, with a maximum gap of 120 days between any two successive meetings.

Scope of the Nomination and Remuneration Committee

The terms of reference of the nomination and remuneration committee should include the following:

(i) ensuring compliance with the requirements of the Companies Act, 2013, Invit Regulations;

(ii) formulation of the criteria for determining qualifications, positive attributes and independence of a director, key managerial persons and other employees;

(iii) formulation of criteria for evaluation of performance of independent directors and the board of directors;

(iv) recommending to the board, all remuneration, in whatever form, payable to senior management;

(v) identifying persons who are qualified to become directors and who may be appointed in senior management in accordance with the criteria laid down, and recommend to the board of directors their appointment and removal;

(vi) making all recommendation in relation to appointment or re-appointment or replacement or removal of (a) independent directors; (b) any key managerial personnel; and (c) directors on the board of directors of the Project SPV;

(vii) formulating the following policies:

(a) the policy for appointment of independent directors (including the skills, knowledge, qualification and experience requirements, compensation model, performance parameters, process for appointment, evaluation and removal);

(b) the policy for nomination of directors on the board of directors of the Project SPV (including qualification and experience requirements, compensation model, performance parameters, process for appointment and removal);

(c) the human resources policy (in relation to employment terms including remuneration) for the key managerial personnel; and

(d) devising a policy on diversity of board of directors.

(viii) whether to extend or continue the term of appointment of the independent director, on the basis of the report of performance evaluation of independent directors.

(d). Risk Management Committee

The board of directors shall define the role and responsibility of the Risk Management Committee and may delegate monitoring and reviewing of the risk management plan to the committee and such other functions as it may deem fit such function shall specifically cover cyber security.

The Risk Management Committee shall have powers to seek information from any employee, obtain outside legal or other professional advice and secure attendance of outsiders with relevant expertise, if it considers necessary.

Composition of the Risk Management Committee

The Risk Management committee should comprise at least three members with majority of them being members of the board of directors, including at least one independent director. The chairperson of this committee shall be a member of the Board of Directors and senior executives may be member of committee

Quorum

The quorum shall be either 2 members or 1/3rd of the members of the committee, whichever is higher, including at least one member of the board of directors in attendance.

Frequency of meetings

The Risk Management committee should meet at least twice in a year or as frequently as determined by the board of directors or as directed by the trustee of the Trust, with a maximum gap of 180 days between any two successive meetings.

Scope of the Risk Management Committee

The terms of reference of the Risk Management committee should include the following:

(i) To formulate a detailed risk management policy which shall include:

(a) A framework for identification of internal and external risks specifically faced by the listed entity, in particular including financial, operational, sectoral, sustainability (particularly, ESG related risks), information, cyber security risks or any other risk as may be determined by the Committee.

(b) Measures for risk mitigation including systems and processes for internal control of identified risks.

(c) Business continuity plan.

(ii) To ensure that appropriate methodology, processes and systems are in place to monitor and evaluate risks associated with the business;

(iii) To monitor and oversee implementation of the risk management policy, including evaluating the adequacy of risk management systems;

(iv) To periodically review the risk management policy, at least once in two years, including by considering the changing industry dynamics and evolving complexity;

(v) to keep the board of directors informed about the nature and content of its discussions, recommendations and actions to be taken;

(vi) The appointment, removal and terms of remuneration of the Chief Risk Officer (if any) will be done as per the extant HR Policies of the Company by MD &CEO in consultation with the Risk Management Committee.

1.5. Operating Committee(s) of the Investment Manager

(a) *Sustainability and Safety Committee*

Composition of the Sustainability and Safety Committee

Chair: Independent Director appointed by the Board of the Company.

Member: The Committee will comprise the Chair, at least 2 (two) Nonexecutive/ Independent Directors of the Company. On recommendation of the Chair, Senior executive of the Company may also be appointed as member of the Committee.

Quorum

The quorum shall be at least 2 (two) members of the Sustainability and Safety Committee.

Frequency of meetings

The Sustainability and Safety committee should meet at least twice in a year or as may be determined by the Committee suiting to the requirement of the business

Scope of the Sustainability and Safety Committee

The role of the "Sustainability and Safety Committee" is to provide ongoing oversight of climate matters and the sustainability agenda, road user and occupational health and safety. References in these terms of reference to 'sustainability' shall mean sustainability matters where relevant to climate or other environmental matters and shall include Community, Diversity and Environment. References in these terms of reference to "Safety" shall mean promotion of positive health and safety culture, provide safe and healthy workplaces, appropriate training to inculcate environment, health, and safety consciousness, protection of environment, biodiversity and ecosystems in our operations

The terms of reference of the Sustainability and Safety Committee should include the following:

(i). Support and advise the Board in its oversight of sustainability and safety related matters relating to:

a. the services provided to the users of the assets of the National Highways Infra Trust ("NHIT") and entities of NHIT including Special Purpose Vehicles (SPVs);

b. particular sectors, and

c. its own corporate activities;

(ii). Support the Board in monitoring the implementation of the Company's sustainability and safety strategy and, if appropriate, make recommendations to the Board as to how to further develop these strategies;

(iii). Review and make recommendations to the Board on the suitability of NHIT's sustainability and safety strategy, position statements, frameworks, ambitions, metrics, and targets;

(iv). Report to the Board on the sustainability and safety matters for which it is responsible, escalating issues and making recommendations to the Board where appropriate.

Authority and Delegation

(i). The Committee may sub-delegate any or all of its powers and authority as it sees fit, including, without limitation, the establishment of sub-committees to analyze particular issues or themes and to report back to the Committee.

(ii). The Committee is established by the Board of the Company and its authority extends to all matters relating to its responsibilities below for the Company, NHIT and SPVs under NHIT, save to the extent that matters relate solely to the Company, NHIT and/or SPVs under NHIT and fall solely within the remit of the terms of reference of the Board Sustainability Committee of the Company, in which event such matters shall be dealt with by such committee within the parameters set by this Committee.

(iii). The Committee has authority to investigate any matter relating to the Company, NHIT and SPVs under NHIT within its Terms of Reference and to obtain such information as it may require from any Director, officer or employee of the Company and SPVs under NHIT.

Responsibilities:

(i). Review at regular intervals and at least once a year, the implementation of the NHIT's sustainability and safety strategy and regularly review progress against any measurable objectives that the Board has set in respect of this strategy.

(ii). Receive and review regular business updates and reports across the NHIT and entities of NHIT, on performance against its sustainability and safety strategy as well as its Sustainable Finance and ESG Reporting Frameworks.

(iii). Monitor and receive updates on developments, emerging best practice and regulatory changes in relation to sustainability and safety matters which impact the business of the Company, NHIT and entities of NHIT, and its sustainability and safety strategy, as well as the implementation of this strategy.

(iv). Be informed on the formulation of the NHIT's approach to engagement with stakeholders and external communications pertaining to sustainability and safety matters.

(v). Review the NHIT's public sustainability strategy materials prior to their release, to the extent these materials do not otherwise fall within the remit of the Audit Committee.

(vi). Escalate to the Board any sustainability and safety matters under its responsibility where it considers that material action or improvement additional to any proposed by management is required to help the Company, NHIT and SPVs under NHIT deliver its sustainability and safety ambitions; and

(vii). Work and liaise, as necessary, with other committees of the Board. In particular, the Committee shall:

a. notify the Board Audit Committee of any matters that may be relevant to ESG and Task Force on Climate-Related Financial Disclosures ("TCFD") disclosures and at the request of the Board Audit Committee, provide any support required in assessing the adequacy of the Company's Sustainable Finance and ESG Reporting Frameworks;

b. notify the Risk Committee of any matters within the Committee's remit that may require consideration in relation to Climate Risk, Conduct Risk and/or Legal Risk as defined in the Enterprise Risk Management Framework and/or in relation any matters within the Committee's remit that may be relevant in the context of the Reputation Risk Management Framework; and

Reporting and Disclosure:

The Chair of the Committee shall report to the Board on the proceedings of each meeting.

(i). The Committee shall compile a report of the work of the Committee in discharging its responsibilities for inclusion in the Annual Report, including a description its activities and the significant issues dealt with by the Committee.

(ii). The Chair of the Committee, or a deputy chosen from the Committee membership, shall attend and will be prepared to answer questions at the Annual General Meeting of the Company which relate to any matter within the remit of the Committee.

Governance and Resources:

(i). periodically review these Terms of Reference and recommend to the Board for approval any amendments the Committee considers necessary.

(ii). work and liaise as necessary with all other committees of the Board.

(iii). conduct an annual self-assessment and report any conclusions and recommendations to the Board and, as part of this assessment, shall consider whether it has performed in accordance with its responsibilities and whether or not it receives adequate and appropriate support in fulfilment of its role and whether or not its current workload is manageable.

(iv). in its decision making, give due regard to any relevant legal or regulatory requirements, and associated best practice guidance, as well as to the risk and risk management implications of its decisions.

(v). have access to sufficient resources in order to carry out its duties, including access to the Company Secretary, who shall have independent access to the Chair of the Committee and to the services of the Company, Corporate Secretariat on Committee matters; and have the power to engage independent counsel and other professional advisers at the expense of the Company or NHIT or SPVs under NHIT and to invite them to attend meetings.

1.6. Articles of Association of the Investment Manager

The articles of association should not include any affirmative rights for the Sponsor.

1.7. Policies to be adopted by the Board of Directors of the Investment Manager

The Investment Manager, through its Board or Committees, should adopt, among others, the following policies in relation to management of the Trust:

(i). Code of Conduct

(ii). Borrowing Policy

(iii). Policy in relation to related party transactions and conflict of interests - In relation to periodic reporting of associates of (i) Trustee and (ii) Sponsor, to Investment Manager, (i) the investment management agreement will include an obligation on the Trustee to report its list of associates to the Investment Manager; and (ii) the agreement in relation to transfer for assets to the Trust will include an obligation on the Sponsor to report its list of associates to the Investment Manager, respectively.

(iv). Distribution Policy

(v). Policy on appointment and removal of other Intermediaries

(vi). Policy on appointment of Auditor and Valuer of the Trust

(vii). Policy on Unpublished Price-Sensitive Information and Dealing in Units by the Parties to the Trust and Insider Trading

(viii). Policy on Materiality for periodic disclosures to the Stock Exchanges

(ix). Anti-bribery and Anti-corruption Policy

(x). Anti-money laundering policy

(xi). Environment, Health and Safety Policy

(xii). Hedging Policy

(xiii). Policy for Preservation of Documents

(xiv). Vigil Mechanism Policy including Whistle Blower policy

(xv). Familiarisation Programme for Independent Directors

(xvi). Nomination and Remuneration Policy

(xvii). Policy on Qualifications and Criteria for the Appointment of Unitholders Nominee Directors on the Board of National Highways Infra Investment Managers Private Limited ("IM" or "Company")

(xviii). Investor Protection and Education Fund policy for Units ("IPEF Policy for units")

2. Project SPV

2.1. Board of Directors of Project SPV

The Investment Manager, in consultation with the Trustee, shall appoint majority of the board of directors of the Project SPVs.

Summary of certain policies, amongst others, as adopted by the board in relation to the management of the Trust:

(i). Code of conduct

The Trust and the Investment Manager ("**IM**") shall comply with the Code at all time, in accordance with the InvIT Regulations, for all matters for which they are dealing / acting on behalf of the Trust, including that:

a. the Directors and Senior Management Personnel of the IM are expected to comply with the code in letter and spirit.

b. the Directors and Senior Management Personnel of the IM shall comply with all applicable laws, regulations, confidentiality obligations and other corporate policies.

c. the Directors and Senior Management Personnel of the IM shall not enter into any transaction or engage in any practice, directly or indirectly, that would tend to influence him/her to act in any manner other than in the best interests of the Trust or IM.

d. the Directors and Senior Management Personnel of the IM should make a full disclosure to the IM Board of any transaction that they reasonably expect, could give rise to actual conflict of interest with the Trust or the IM and seek authorization to pursue such transaction.

e. the Directors and Senior Management Personnel of the IM should endeavor to ensure that they use the assets, proprietary information and resources of the Trust or IM only for legitimate business purpose and not for personal gains.

f. any information concerning the IM's /Trust's business, performance, its customers, suppliers, etc., which is not in the public domain and to which the Directors/Senior Management personnel have access or possesses such information must be considered confidential and held in confidence, unless authorized to do so and when disclosure is required under any law.

g. the Directors and Senior Management Personnel shall neither receive nor offer or make, directly or indirectly, any illegal payments, remuneration, gifts, donations or comparable benefits which are intended to or perceived to obtain business or uncompetitive favours for the conduct of its business.

h. the Directors and Senior Management Personnel should endeavor to deal fairly and not seek to take unfair advantage through manipulation, concealment, abuse of privileged information, misrepresentation of material facts or other unfair dealing.

i. The Directors and Senior Management Personnel shall respect safety and health of all employees and provide working conditions, which are safe and healthy. They shall strive for maintaining a safe workplace by following safety and health rules and practices.

j. The Directors and Senior Management Personnel shall endeavor to provide equal opportunities to all employees and aspirants for employment in the IM or Trust irrespective of gender, caste, religion, race or colour, merit being the sole differentiating factor.

k. The Directors and Senior Management Personnel shall endeavor to make all efforts to establish cordial relationships with all stakeholders of the Company with whom they interface while carrying out their duties for the Company and would try to make positive contributions to the communities in which they perform such duties.

l. None of the Directors or the Senior Management Personnel shall derive any benefit nor assist to derive any benefit by giving investment advice from access to and possession of information about the IM or Trust, which is not in public domain or constitutes insider information.

m. Every Director of the IM shall endeavor to comply with the provisions of Section 166 of the Companies Act, relating to the duties of directors.

(ii). Anti-Bribery And Corruption Policy

a. The Trust maintains and promotes the highest ethical and legal standards in its business, especially in relation to bribery and corruption, and expect employees of the Trust and those with whom the Trust does business to do the same.

b. The policy on bribery and corruption applies to the Trust's dealings in both the public and the private sectors, and any violation of this policy is a matter of serious concern.

Management oversight and leadership:

a. The Trust's audit committee, together with its chief executive officer, chief financial officer and Compliance Officer, are responsible for providing leadership, resources and active support for the implementation of the policy.

b. The compliance officer appointed to ensure compliance of the policy ("**Compliance Officer**"), who may be a person other than the compliance officer of the Trust appointed as per the requirements of Companies Act, 2013, as amended, will communicate the policy to all levels of the Trust, project SPVs of the Trust ("**Project SPV**") and relevant external parties at least annually, and at such other times as he considers appropriate, such as when the policy is amended or updated.

Definitions of bribery and corruption:

a. "ABC" means anti-bribery and corruption.

b. "Anti-Bribery Laws" means the ABC laws and regulations , which shall include, the Prevention of Corruption Act, 1988, relevant portions of the Indian Penal Code, 1860, the Central Vigilance Commission Act, 2003, applicable to, the Trust and its employees.

c. "Bribe / Bribery" means the giving, acceptance, solicitation or facilitation of a financial advantage to or by any person which (i) does or might induce, influence or reward the improper performance or non performance of any activity or function in either the public or private sector, (ii) which in itself constitutes the improper performance of a relevant function or activity, or (iii) is intended to obtain or retain business or a business advantage.

d. A promise or offer to give, accept, solicit or facilitate a financial advantage will also constitute Bribery. Equally, a violation may occur if you do anything which is prohibited through another person, as much as if you did it yourself.

e. A financial advantage may be anything of value. It can be a payment, payoff, influence payment or a 'kickback'. Equally, it may also take the form of a gift, hospitality or entertainment, or be something intangible, like an offer of employment.

f. "Corruption" means dishonest or fraudulent conduct by those in power, typically involving Bribery.

g. The term "Official" includes any person who holds a legislative, judicial or administrative position of any kind; any official, employee or representative of, or any other person acting in an official capacity or performing a public function on behalf of: a government (including any entity it owns or controls) or any government authority or agency; the legislature; the judiciary; a political party or political candidate; or a public international organization.

Prohibition on bribery:

a. The Trust prohibits:

(i) Giving Bribes including:

- Bribing someone to get a contract or other business advantage such as a license, consent or permit (including from that person or by using that person's influence);
- Bribing any Official in order to influence any official decision, or to induce them to use their influence to affect any act or decision of a governmental authority; or
- Bribing any officer, employee or agent of a company or body corporate with which the Trust interacts in the conduct of Trust's activities and operations for the purpose of influencing any act or decision of that company or body corporate.

(ii) Receiving Bribes including:

- Asking, agreeing to or receiving a Bribe from anyone in exchange for giving or continuing to give a person any business, or any business advantage, or for otherwise improperly performing any activity or function.

b. Circumstances which may suggest an increased risk of Bribery or Corruption and which should therefore be discussed with the Compliance Officer include:

(i) Intermediaries (as defined below) engaged by the Trust which is accused of improper practices;

(ii) A party with whom the Trust does business requests payment in cash or to offshore accounts;

(iii) Requests for payment, entertainment or hospitality at a time when the recipient is making an important decision that affects or could be perceived to affect the operations of the Trust;

(iv) Refusal by any Intermediary to use written agreements;

(v) Requests or directions to record (or issue receipts) for payments or fees in a manner which does not reflect their true nature;

(vi) Previous relationships between Trust's employees or Intermediaries and a government office or Official;

(vii) Requests for special payments, such as a 'special acceleration fee' or any other payment to reduce delay or remove the need to comply with applicable procedures.

c. The above examples are not exhaustive and any matters which give you cause for concern should be promptly raised with the Compliance Officer.

d. Practices that may appear typical or customary may still be unlawful and in breach of the policy.

e. The Trust should always consider whether any conduct may give an appearance that it creates an obligation on, or may influence, the recipient (or a third party) to act in a way that may be improper, or which may be perceived as being capable of influencing an Official exercise of discretionary authority, even where this is not the intention. Such conduct should be discussed with the Compliance Officer.

Dealing with intermediaries:

a. The term intermediaries ("**Intermediaries**") refers to an associate's representatives, vendors, contractors, sub-contractors, consultants and any other persons engaged by an associate, or who are engaged to act for the associate in its business dealings with any government or official, or in obtaining governmental approvals.

b. The Trust engages Intermediaries only for ordinary and legitimate business purposes and only on arms-length, commercially reasonable terms.

c. Any contracts between associates and Intermediaries must be in writing and must be signed by the parties.

d. Different types of Intermediaries are subject to different ABC risk assessment and risk mitigation measures. It is clarified that such provisions and procedures would be prepared by the Trust in consultation with the Compliance Officer which are to be followed when engaging an Intermediary and for the Trust's standard anti-bribery related contractual provisions which are to be included in the Trust's contracts with Intermediaries.

In general:

a. The Trust expects that Intermediaries and vendors with which it does business to either formally acknowledge and abide by relevant aspects of the policy by way of an undertaking, or to have adequate anti-bribery and corruption policies and procedures of its own in place.

b. When engaging an Intermediary, an associate should:

(i) perform proportionate and risk-based due diligence checks on the Intermediary based on an understanding of the potential relationship (e.g. the sector in which the Intermediary operates, the type of services it will be providing and the level of interaction it will have with Officials or private sector parties); and

(ii) consider and respond appropriately to the findings of that due diligence, particularly where areas of high concern are identified.

Charitable donations:

a. The Trust supports the work of registered and reputable charities.

b. However, unless appropriate procedures are adopted, there is a risk that charitable donations given by the Trust or its employees may be perceived as seeking to improperly influence decisions which affect the Trust, or to induce those who have authority to make such decisions to give an improper business advantage to the Trust.

c. The key principles regarding donations are as follows:

(i) donations must not be made using Trust's funds, under the Trust's name, or in connection with the Trust, without first obtaining specific approval from the Compliance Officer;

(ii) where making a donation as a private citizen, Trust's employee should ensure it is made clear to the recipient and in any publicly available material that the donation is not being made for or on behalf of the Trust, or in connection with the activities of the Trust; and

(iii) A donation should not be made either privately or by the Trust if the intent or possible effect of the donation is or may be to influence the decisions of any Official or other person on matters affecting the Trust.

d. All donations must be properly recorded and accounted for in the central register of political and charitable donations maintained by the Compliance Officer.

Gifts, Hospitality and Entertainment ("GH&E"):

a. The Trust recognizes that constructive business relationships may include occasional, incidental provision of gifts, hospitality and entertainment.

b. However, gifts, hospitality and entertainment which are or may be seen as exceptional, lavish or disproportionate, or given to certain individuals who have the ability to make decisions affecting the Trust, may be regarded as improper or unlawful.

c. As a general rule, gifts, hospitality and entertainment must:

(i) be reasonable and proportionate in terms of frequency, value and the status/seniority of the recipient;

(ii) be provided in an open and transparent manner; and

(iii) always be provided for legitimate business purposes and in kind only.

d. The Trust and its employees must not:

(i) offer gifts, hospitality and entertainment, or anything else of value, which might influence the decisions of counterparties or Officials in connection with the business of the Trust; or

(ii) accept any gifts, hospitality and entertainment, or anything else of value, which might influence their own decisions.

e. The Trust shall comply with GH&E at all time, in accordance with the InvIT Regulations, including that:

- GH&E which is or may be regarded as, exceptional, lavish or disproportionate and/or intended to induce or reward improper conduct is prohibited.

- Trust and its employees must not offer, provide, accept or solicit gifts in the form of cash, cash equivalents, commissions, loans, securities or goods/services at below-market value.

- The Trust must pay all costs associated with GH&E (e.g. transport, accommodation and meals) directly to suppliers and not to the recipients of the GH&E.

- GH&E must not be offered or provided to family members or friends of the recipient.

- Approval of GH&E, including GH&E relating to Officials, is required in accordance with the policy and must be obtained in advance of any offer or acceptance of GH&E. If circumstances clearly prevent obtaining advance approval, the GH&E must be reported to the Compliance Officer at the earliest available opportunity.

- Failure to comply with the policy may result in disciplinary action, including possible termination of employment.

- All GH&E must be properly recorded and accounted for in the books and records and must be supported by original receipts.

- All GH&E approval forms (whether approved or declined) must be held on file by the Compliance Officer for a period of five years.

- GH&E with a value in excess of Rs. 5,000 must be approved by the Compliance Officer and in excess of Rs. 10,000 must be approved by the managing director of the Trust, and all such GH&E shall be recorded by the Compliance in the annual GH&E central register.

- The annual GH&E central register must be submitted to, and reviewed annually by, the Audit Committee.

f. Trust's employees should consider the above guidelines in respect of all gifts, hospitality and entertainment which they propose to offer or accept.

Facilitation Payments:

a. The Trust is committed to complying with the laws applicable to its business. The trust acknowledges that facilitation payments, which usually are small payments made to obtain or expedite routine actions for specific performance, are not permitted under the laws of many jurisdictions and that authorities in many parts of the world are seeking to eliminate such practices.

b. If an employee of the Trust becomes aware that a facilitation payment may be made, this must be referred to the Compliance Officer, who will consider, consult as necessary and recommend action.

c. The Compliance Officer will report to the Audit Committee on any matters relating to facilitation payments.

Conflict of Interest:

a. Employees of the Trust must seek to avoid any real or perceived conflict between their private interests and the performance of their duties to the Trust.

b. A conflict of interest arises when an individual's private interests influence, or may appear to influence, the objective exercise of his or her duties to the Trust. Conflicts of interest can arise where, for example, an employee and/or the Trust is considering business arrangements involving the Trust which may provide the employee with a private benefit, or where an employee position within the Trust gives them an opportunity to provide special advantages or benefits to a partner, child or friend.

c. If a situation arises which may give rise to a conflict of interest involving an employee, another employee or an external party in connection with matters affecting the Trust, the employee must promptly raise this with the Compliance Officer.

Books and Records:

a. The books and records of the Trust must reflect, accurately and fairly, the transactions of the Trust and dispositions of its assets, including ensuring that a transaction is accurately described in its books and records and the amount of each transaction is accurately recorded.

b. No payment on behalf of the Trust is to be approved or made with the express or implied agreement or the intention that any part of it is to be used for a purpose other than that described by the documents supporting the payment.

c. Employees should never agree to requests for false invoices or for payments of expenses that are unusual, excessive, inadequately or improperly described, or otherwise raise questions under the policy.

d. No undisclosed or unrecorded funds or assets are to be established or used for any purpose.

Training:

a. Employees of the Trust will receive regular (at least annual) training relevant to their role to ensure that they:

   (i) understand the Anti-Bribery Laws applicable to them;

   (ii) are aware of and understand the policy;

   (iii) are equipped to respond to the specific risks which relate to their particular role; and

   (iv) know what the Trust expects of them.

b. Where appropriate Intermediaries will also receive training appropriate to their role. The nature of such training and those Intermediaries who are to be subject to it will be determined by the Compliance Officer.

c. Employees of the Trust should check with the Compliance Officer in connection with engaging Intermediaries and any training obligations which apply.

Whistle-blowing, investigations and non-retaliation:

a. Employees and Intermediaries (anonymously or by name) who are aware of possible or suspected corrupt acts by colleagues, demands for Bribes or other violations of Anti-Bribery Laws or the policy must report these to the Compliance Officer or head of department. Any such reports will be promptly investigated by the Trust.

b. An employee of the Trust or Intermediary will not suffer demotion or any other adverse consequences for refusing to pay Bribes or for reporting in good faith possible corrupt acts by colleagues, demands for Bribes or other suspected violations of Anti-Bribery Laws applicable where the Trust operates or the policy, even if it may result in the Trust losing business.

c. Any Trust employee who retaliates, or attempts to retaliate, against a person who has made a report relating to a violation of Anti-Bribery Laws or the policy will be subject to disciplinary action, which may include termination of their employment with the Trust.

Compliance:

a. Any employee of the Trust who violates any Anti-Bribery Law or any aspect of the policy will be subject to disciplinary action, which may include termination of their employment with the Trust.

b. Employees of the Trust should understand that additionally, they could be subject to civil and criminal liability for violations of applicable law.

c. Violations of any Anti-Bribery Laws or the policy should be reported.

Continuous monitoring and improvement:

a. The Audit Committee and Compliance Officer are responsible for monitoring the implementation of, compliance with and periodic review and updating of the policy, including to comply with changes in Anti-Bribery Laws.

b. In line with this, the Compliance Officer will report:

- on a regular basis, on general compliance by the Trust with the policy and its effectiveness; and
- to the Audit Committee annually on the above matters in connection with the annual ABC risk assessment and audit.
- The Compliance Officer will also notify the Audit Committee should he/she become aware of any particular instance of non-compliance (or suspicion of non-compliance) with Anti-Bribery Laws or the policy.
- The Trust carries out an annual ABC risk assessment and audit to assess the effectiveness of the policy. The terms of reference of such audits are set annually by the Audit Committee, which will also oversee the annual audit. Where issues are identified, the Audit Committee will prescribe appropriate remedial measures to be implemented by the Trust in order to address these.
- Any material deficiencies in the policy which are identified by employees of the Trust during the year should be reported to the Compliance Officer for an appropriate action to be taken.

The Compliance Officer:

The Trust employs a Compliance Officer who is responsible for day to day implementation and oversight of the policy. Their responsibilities also include:

a. receiving and investigating reports of ABC-related incidents;

b. escalating known ABC issues to the Audit Committee, as appropriate;

c. reporting to the Audit Committee as set out above;

d. ensuring employees of the Trust complete ABC questionnaires and certifications (as relevant) in a timely manner;

e. maintenance of the central donations register and annual gifts, hospitality and entertainment register; conducting regular spot checks of compliance with the policy and the Trust's books and records;

f. providing guidance to Trust's employees on the policy; and

g. Record keeping in connection with the policy and associated training.

Advice and Assistance:

Employees should contact the Compliance Officer for advice and assistance on any matters relating to the policy.

Minimum Due Diligence Requirements:

In the event that the InvIT considers any new investment opportunity, independent and reputable consultants shall be engaged to conduct the respective due diligence for all key workstreams. The key workstreams include: (i) traffic, (ii) technical, (iii) financial and tax, (iv) legal and (v) anti-corruption and anti-bribery aspects, environmental health safety aspects and compliance as well as (vi) reputational risk assessment of a remaining existing minority unitholder in an asset, if any.

KYC Compliances:

Any person who is a unitholder in the Trust or any Project SPV holding the Trust assets would be required to comply with the stringent KYC norms that is in line with international market standards and customary policies of global financial institutions of repute, including sanctions enacted by OFAC or the European Union or other similar bodies. Any person who does not meet these requirements is not eligible to become a unitholder/shareholder of these entities or be appointed as Investment Manager or Project Manager.

Reporting of Litigation:

Relevant information (e.g. parties, forum, nature of dispute/claim, monetary amount involved and status) pertaining to all litigations/disputes (matters above a monetary threshold of ₹ 80 million) of all Project SPVs shall be prepared on a quarterly basis, and be made available to all the unitholders, if requested for by any unitholder.

Compliance with InvIT Documents and InvIT Regulations:

All current and future Project SPVs shall amend their respective Articles of Association to include a requirement that the Project SPVs shall, at all times, conduct their affairs in compliance with the provisions of the Trust documents and the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014, as amended.

(iii). Borrowing Policy

The Investment Manager is required to ensure that all funds borrowed in relation to the Trust are in compliance with the InvIT Regulations. Accordingly, the Investment Manager, has adopted the Borrowing Policy pursuant to the resolution of the IM Board dated February 3, 2021. The Borrowing Policy was subsequently amended pursuant to resolution of the IM Board dated September 27, 2021.

(iv). Distribution policy

The Investment Manager has adopted the Distribution Policy pursuant to a resolution of its board of directors dated February 3, 2021, in relation to Trust. The Distribution Policy was subsequently amended pursuant to the resolution of the IM Board dated September 27, 2021 and thereafter on March 4, 2024. For details of the Distribution Policy, please see the section entitled "*Distribution*" on page 393 .

(v). Policy on appointment of auditor and valuer of the Trust

For details on the Policy on appointment of the auditor and the valuer of the Trust, adopted by the IM Board pursuant to its resolution dated February 3, 2021, see "*Other Parties Involved in the Trust – Policy on Appointment of Auditor and Valuer*" on page 116.

(vi). Policy on unpublished price-sensitive information and dealing in units by the parties to the Trust

The Investment Manager has adopted the UPSI Policy pursuant to a resolution of the IM Board on February 3, 2021. The UPSI Policy was subsequently amended pursuant to resolutions of the IM Board dated September 27, 2021, March 30, 2022, January 4, 2023 and October 24, 2024. The purpose of the policy is, inter alia, to ensure that the Trust complies with applicable law, including the InvIT Regulations or such other Indian laws, regulations, rules or guidelines prohibiting insider trading and governing disclosure of material, unpublished price sensitive information ("**UPSI**").

The key principles of the UPSI Policy are set out below:

a) The Investment Manager shall promptly disclose to the relevant stock exchanges all UPSI that would impact price discovery no sooner than credible and concrete information comes into being in order to make such information generally available;

b) The Investment Manager shall follow uniform and universal dissemination of UPSI to avoid selective disclosure;

c) The Company Secretary and Compliance officer shall be designated as a Chief Investor Relations Officer who shall be responsible for dissemination of information and disclosure of UPSI. The Chief Investor Relations Officer shall oversee and co-ordinate disclosure and dissemination of UPSI in a timely, adequate, uniform and universal manner to avoid selective disclosure, and shall educate employees on disclosure policies and procedures.

d) The Investment Manager shall promptly disseminate UPSI that gets disclosed out of accidental omission, selectively, inadvertently or otherwise to make such information generally available.

e) The Compliance Officer shall be responsible for deciding whether a public announcement is necessary for verifying or denying rumours and then making the disclosure, in accordance with the procedure specified in the Policy for Determining Materiality of Information for Periodic Disclosures and applicable law;

f) The Compliance Officer shall also make an appropriate and fair response to the queries, rumours or requests by the regulatory authorities, in accordance with the procedure specified in the Policy for Determining Materiality of Information for Periodic Disclosures. The Chief Investor Relations Officer should not comment on market rumours except when requested by regulatory authorities to verify such rumours;

g) The Compliance Officer shall make transcripts or records of proceedings of meetings with analysts and other investor relations conferences on the official website to ensure official confirmation and documentation of disclosures made; and

h) The Investment Manager shall handle all UPSI on a "need to know basis", provided that UPSI may be disclosed to persons who need such information for furtherance of legitimate purposes, performance of duties or discharge of legal obligations in relation to the Trust.

Further, the UPSI Policy also provides the process and procedures for closure of the trading window for dealing in Securities, pre-clearance of dealing in securities and approval requirements, disclosure by insiders, inquiry into leak of any UPSI and handling and investigation into complaints by whistleblowers.

(vii). Policy on Vigil Mechanism and Whistleblower

The Board has adopted the Vigil Mechanism and Whistle Blower Policy pursuant to a resolution of its board of directors dated December 15, 2022 and subsequently amended on February 12, 2025, in relation to the Trust. Trust and the parties to the Trust shall comply with the Vigil Mechanism and Whistle Blower Policy at all times, in accordance with the InvIT Regulations. The key principles of the Vigil Mechanism and Whistle Blower Policy are set out below:

a) formulate a vigil mechanism for directors and employees to report genuine concerns;

b) provide adequate safeguards against victimization of directors or employees or any other person

c) who avail such mechanism;

d) provide for direct access to the chairperson of the audit committee in appropriate or exceptional cases;

e) An independent service provider may be engaged by the Investment Manager for providing or operating the vigil mechanism who shall report to the Audit Committee; and

f) The Audit Committee shall review the functioning of the vigil mechanism.

(viii). Employment, Safety, Environment and Governance ("ESG") Policy

The key principles of the ESG Policy are set out below:

Employment, Health and Safety ("EHS"):

In connection with EHS, the Investment Manager shall:

- Promote a positive EHS culture.
- Comply with all statutory and other applicable legal and regulatory requirements with respect to EHS and seeks to ensure its Intermediaries do the same.
- Incorporate EHS considerations in business processes, including by ensuring appropriate health and safety measures are adopted, ensuring employees are provided with, and use, protective equipment when dealing with potential hazards, and by the provision of regular occupational health and safety training for employees.
- Identify, monitor and control EHS risks which arise in connection with its projects and operations, including in subcontracted works.
- Record and review all accidents, occupational health and safety related incidents and lost time days and investigate all serious occupational health and safety incidents, including in subcontracted works.
- Ensure that all of its workplaces which are exposed to high-risk hazards have appropriate emergency plans in place.
- Screen, evaluate and engage Intermediaries based on its EHS management systems and practice.
- Encourage communication, consultation and collaboration with all employees and stakeholders.

Workers' Rights:

To achieve the Trust's objective in connection with workers' rights, the Investment Manager shall:

- Respect the rights of its employees, including by providing fair and timely wages, supporting their work-life balance, providing safe working conditions, fostering worker engagement,

including by the provision to employees of information on workers' rights and of mechanisms to raise employment related grievances, and permitting freedom of association.

- Prohibit the use of any child or young workers and the use of any form of forced or compulsory labour in connection with its business.
- Prohibit all forms of discrimination and abuse in its work place.
- Complies with all statutory and other applicable legal and regulatory requirements with respect to workers' rights.
- Have in place policies governing the provision to its employees of overtime, vacation and public holidays and maternity, sickness and disability benefits.
- Protect the rights of migrant workers in accordance with applicable statutory and other legal requirements.
- Screen, evaluate and engage Intermediaries based on their respect for workers' rights.
- Monitor compliance with and risks to workers' rights in connection with Projects, including in subcontracted works.
- Encourage communication, consultation and collaboration with all employees and stakeholders.

The Environment:

To achieve the Trust's objective in connection with the environment, the Investment Manager shall:

- Seek to adopt sustainable and resource-efficient processes and to conserve natural resources, reduce adverse environmental impacts (such as waste and environmental emissions) and enhance energy efficiency.
- Comply with all statutory and other applicable legal and regulatory requirements with respect to the environment (including by seeking all required environmental clearances, permits, and licenses, and maintaining a register of these) and seek to ensure Intermediaries do the same.
- Seek to identify, monitor and control environmental risks which arise in connection with its projects and operations, including in subcontracted works.

Dealing with Intermediaries:

The term intermediaries ("**Intermediaries**") refers to an associate's representatives, vendors, contractors, sub-contractors, consultants and any other persons engaged by an associate, or who are engaged to act for the associate in its business dealings with any government or official, or in obtaining governmental approvals.

In general:

- The Trust expects that Intermediaries and vendors with which it does business either formally acknowledge and abide by relevant aspects of this policy by way of an undertaking, as suitably incorporated in their appointment terms, or to have adequate ESG policies and procedures of their own in place.
- When engaging an Intermediary, the associate should:
  - perform proportionate and risk-based due diligence checks on the Intermediary; and
  - consider and respond appropriately to the findings of that due diligence, particularly where areas of high concern are identified.

Training:

The Trust's employees will receive training to ensure they understand applicable ESG law, are aware of and understand this policy, are equipped to respond to specific risks which relate to their particular role and know what the Trust expects of them. Where appropriate, Intermediaries will also receive training appropriate to their role.

Process for reporting possible violations of applicable law or this policy:

The Trust will promptly investigate reports of possible or suspected violations of applicable ESG law or this policy in accordance with this policy. Employees or Intermediaries will not be demoted or suffer any other unfavourable treatment as a result of making a good faith report of a possible violation of applicable law or this policy, even if it may result in the Trust losing business. If any employee of the Trust violates this policy or retaliates against another employee who has reported a possible violation of applicable law or this policy then they will be subject to disciplinary action, which may include termination of employment.

Management leadership, oversight, implementation and review:

The Audit Committee, together with its chief executive officer, chief financial officer and compliance officer are responsible for providing leadership, resources and active support for the implementation of this policy. The compliance officer appointed to ensure compliance of the ESG Policy ("**Compliance Officer**"), who may be a person other than the compliance officer of the Trust appointed as per the requirements of Companies Act, 2013, as amended, will communicate this policy to the Trust and relevant external parties at least annually, and at other appropriate times, such as when this policy is amended or updated. The Audit Committee will oversee compliance with this policy. The Compliance Officer is responsible for its day to day implementation. The Trust shall have an annual ESG risk assessment and audit to assess the effectiveness of this policy. The terms of reference of such audits are set annually by the Audit Committee, which will also oversee the annual audit. Where issues are identified, the Audit Committee will prescribe solutions to be implemented by the Trust. The Compliance Officer will report on general compliance with this policy and its effectiveness on a regular basis to the Audit Committee annually in connection with the annual ESG risk assessment and audit. The Compliance Officer will also notify the Audit Committee should they become aware of any non-compliance (or potential non-compliance) with applicable law or this policy. If an employee identifies a deficiency in this policy they should report it to the Compliance Officer who will initiate appropriate action.

Advice and assistance:

Employees should contact the Compliance Officer for advice and assistance on any matters relating to this policy.

OTHER PARTIES INVOLVED IN THE TRUST

The Auditor

Background and terms of appointment

The Investment Manager, in consultation with the Trustee, has appointed A.R. & Co., Chartered Accountants (Firm Registration No. 002744C), as the statutory auditors of the Trust for a period of three years commencing from Fiscal financial year 2022-23 till financial year 2024-25. The Auditors have audited the Audited Financial Information, and their reports in relation to such Audited Financial Information dated May 23, 2022, May 22, 2023, May 27, 2024, and December 19, 2024 have been included in this Preliminary Placement Document.

Functions, Duties and Responsibilities of the Auditor

The functions, duties and responsibilities of the Auditor will be in accordance with the InvIT Regulations. Presently, in terms of the InvIT Regulations, the Auditor is required to comply with the following conditions at all times:

1. the Auditor shall conduct audit of the accounts of the Trust and draft the audit report based on the accounts examined and after taking into account the relevant accounting and auditing standards, as may be specified by SEBI;

2. the Auditor shall, to the best of his information and knowledge, ensure that the accounts and financial statements give a true and fair view of the state of the affairs of the Trust, including profit or loss and cash flow for the period and such other matters as may be specified;

3. the Auditor shall have a right of access at all times to the books of accounts and vouchers pertaining to activities of the Trust; and

4. the Auditor shall have a right to require such information and explanation pertaining to activities of the Trust as he may consider necessary for the performance of his duties as auditor from the employees of the Trust or holding company or Parties to the Trust or holding company or the special purpose vehicles or any other person in possession of such information.

The Valuer

Background and terms of appointment

The Investment Manager, in consultation with the Trustee, has appointed Ernst & Young Merchant Banking Service LLP with effect from December 1, 2024, as the valuers of the Trust for a period of two years. In accordance with the InvIT Regulations, the Valuers have undertaken a full valuation of the Target Toll Roads as at December 31, 2024 which is proposed to be acquired by the Trust, and their report in relation to such valuation dated February 28, 2025, has been included in this Preliminary Placement Document.

Functions of the Valuer

The functions, duties and responsibilities of the Valuer will be in accordance with the InvIT Regulations. Presently, in terms of the InvIT Regulations, the Valuer is required to comply with the following conditions at all times:

1. the Valuer shall ensure that the valuation of the Trust assets is impartial, true and fair and is in accordance with Regulation 21 of the InvIT Regulations;

2. the Valuer shall ensure that adequate and robust internal controls to ensure the integrity of its valuation reports;

3. the Valuer shall ensure that it has sufficient key personnel with adequate experience and qualification to perform valuations;

4. the Valuer shall ensure that it has sufficient financial resources to enable it to conduct its business effectively and meet its liabilities;

5. the Valuer and any of its employees involved in valuing of the assets of the Trust, shall not, (i) invest in units of the Trust or in the assets being valued; and (ii) sell the assets or units of the Trust held prior to being appointed as the Valuer, until the time such person is designated as valuer of the Trust and not less than six months after ceasing to be valuer of the Trust;

6. the valuer shall conduct valuation of the Trust's assets with transparency and fairness and shall render, at all times, high standards of service, exercise due diligence, ensure proper care and exercise independent professional judgment;

7. the valuer shall act with independence, objectivity and impartiality in performing the valuation;

8. the valuer shall discharge its duties towards the Trust in an efficient and competent manner, utilizing its knowledge, skills and experience in best possible way to complete given assignment;

9. the valuer shall not accept remuneration, in any form, for performing a valuation of the Trust's assets from any person other than the Trust or its authorized representative;

10. the valuer shall before accepting any assignment, from any related party of the InvIT, disclose to the Trust any direct or indirect consideration which the valuer may have in respect of such assignment;

11. the valuer shall disclose to the Trust any pending business transactions, contracts under negotiation and other arrangements with the investment manager or any other party whom the Trust is contracting with and any other factors that may interfere with the valuer's ability to give an independent and professional valuation of the assets;

12. the valuer shall not make false, misleading or exaggerated claims in order to secure assignments;

13. the valuer shall not provide misleading valuation, either by providing incorrect information or by withholding relevant information;

14. the valuer shall not accept an assignment which interferes with its ability to do fair valuation; and

15. the valuer shall, prior to performing a valuation, acquaint itself with all laws or regulations relevant to such valuation.

Further, in accordance with the InvIT Regulations, a full valuation shall be conducted by the valuer not less than once every financial year. However, the Investment Manager shall conduct a valuation through a SEBI registered valuer for any quarter, based on the specific request of any unitholder.

Policy on Appointment of Auditor and Valuer

The Investment Manager has adopted a policy on the appointment of auditor and valuer of the Trust, which will stand amended, to the extent of any amendment to the InvIT Regulations or applicable law, details of which are provided below:

Appointment and Role of Auditor of the Trust

(i). The Investment Manager, in consultation with the trustee to the Trust (the "**Trustee**"), shall appoint the auditor of the Trust (the "**Auditor**"), in a timely manner and in accordance with the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014, as amended or supplemented, including any guidelines, circulars, notifications and clarifications framed or issued thereunder (the "**InvIT Regulations**").

(ii). The Investment Manager shall ensure that the appointment of the Auditor and the fees payable to the Auditor is approved by the unitholders of the Trust ("**Unitholders**") in accordance with the InvIT Regulations.

(iii). The Investment Manager shall appoint an Auditor for a period of not more than five consecutive years; provided that the Auditor, not being an individual, may be reappointed for a period of another five consecutive years, subject to approval of Unitholders in the annual meeting in accordance with the InvIT Regulations.

(iv). The Auditor shall conduct the audit of the accounts of the Trust and draft the audit report based on the accounts examined by it after taking into account the relevant accounting and auditing standards under applicable law, including the InvIT Regulations and any guidelines, circulars, notifications and clarifications framed or issued by the Securities and Exchange Board of India ("**SEBI**"), as may be specified from time to time.

The Auditor shall comply with the conditions prescribed under the InvIT Regulations at all times, including the following:

(a). The accounts of the Trust shall be subjected to audit by the Auditors and shall be accompanied by a report of the Auditors in such manner and at such intervals as may be prescribed under applicable law, including InvIT Regulations;

(b). the Auditor shall, to the best of his information and knowledge, ensure that the accounts and financial statements give a true and fair view of the state of the affairs of the Trust, including profit or loss and cash flow for the period and such other matters as may be specified by SEBI;

(c). the Auditor shall have a right of access at all times to the books of accounts and vouchers pertaining to activities of the Trust;

(d). the Auditor shall have a right to obtain such information and explanation pertaining to activities of the Trust as he may consider necessary for the performance of his duties as auditor from the employees of Trust or any holding company or parties to the Trust or any holding company or the special purpose vehicle(s) or any other person in possession of such information; and

(e). The auditor should have subjected itself to the Peer review process of ICAI and holds such a valid certificate.

(v). The Investment Manager, in consultation with the Trustee, shall have the right to take all necessary steps to remove the Auditor who ceases to comply with the eligibility criteria required under the InvIT Regulations and applicable law. In case of removal of the auditor and appointment of another auditor to the Trust, approval from the Unitholders shall be required in accordance with Regulation 22(5)(f) of the InvIT Regulations. Additionally, any change in the auditor of the Project SPVs shall be made in accordance with the Companies Act, 2013, as amended.

Appointment and Role of Valuer of the Trust

(i). The Investment Manager, in consultation with Trustee, shall appoint the valuer of the Trust ("**Valuer**"), in a timely manner and shall determine the remuneration of such Valuer, in accordance with the InvIT Regulations. A 'Valuer' shall have the meaning provided under the InvIT Regulations.

(ii). The remuneration of the Valuer shall not be linked to or based on the value of the assets being valued.

(iii). The Valuer shall not be an associate of any of the Sponsor or the Investment Manager or Trustee.

(iv). The Valuer shall be eligible to act as a valuer in accordance with the InvIT Regulations or any clarifications, guidelines, notifications or exemptions issued by SEBI.

(v). A Valuer shall not undertake valuation of the same project for more than four years consecutively, provided that the Valuer may be reappointed after a period of not less than two years from the date it ceases to be the Valuer of the Trust.

(vi). The Valuer shall not undertake valuation of any assets in which it has either been involved with the acquisition or disposal within the last twelve months other than such cases where the Valuer was engaged by the Trust for such acquisition or disposal.

(vii). The Valuer shall comply with the following conditions at all times:

(a) the Valuer shall ensure that the valuation of the Trust assets is impartial, true and fair and is in accordance with the InvIT Regulations;

(b) the Valuer shall ensure adequate and robust internal controls to ensure the integrity of its valuation reports;

(c) the Valuer shall ensure that it has sufficient key personnel with adequate experience and qualification to perform valuations;

(d) the Valuer shall ensure that it has sufficient financial resources to enable it to conduct its business effectively and meet its liabilities;

(e) the Valuer and any of its employees involved in valuing of the assets of the Trust, shall not:

- invest in units of the Trust or in the assets being valued; and
- sell the assets or units of the Trust held prior to being appointed as the Valuer,

until the time such person is designated as Valuer of the Trust and not less than six months after ceasing to be Valuer of the Trust;

(f) the Valuer shall conduct valuation of the Trust assets with transparency and fairness and shall render, at all times, high standards of service, exercise due diligence, ensure proper care and exercise independent professional judgment;

(g) the Valuer shall act with independence, objectivity and impartiality in performing the valuation;

(h) the Valuer shall discharge its duties towards the Trust in an efficient and competent manner, utilizing its knowledge, skills and experience in best possible way to complete given assignment;

(i) the Valuer shall not accept remuneration, in any form, for performing a valuation of the Trust assets from any person other than the Trust or its authorized representative;

(j) the Valuer shall before accepting any assignment, from any related party of the Trust, disclose to the Trust, by disclosing to the Investment Manager or the Trustee, any direct or indirect consideration which the Valuer may have in respect of such assignment;

(k) the Valuer shall disclose to the Trust, through the Investment Manager, any pending business transactions, contracts under negotiation and other arrangements with the Investment Manager or any other party whom the Trust is contracting with and any other factors that may interfere with the Valuer's ability to give an independent and professional valuation of the assets, and other necessary disclosures required under the InvIT Regulations;

(l) the Valuer shall not make false, misleading or exaggerated claims in order to secure assignments;

(m) the Valuer shall not provide misleading valuation, either by providing incorrect information or by withholding relevant information;

(n) the Valuer shall not accept an assignment which interferes with its ability to do fair valuation; and

(o) the Valuer shall, prior to performing a valuation, acquaint itself with all laws or regulations relevant to such valuation.

(viii). The Investment Manager in consultation with the Trustee shall have the right to take all necessary steps to remove the Valuer who ceases to comply with the eligibility criteria required under the InvIT Regulations and applicable law. If the removal of the Valuer and appointment of another valuer to the Trust is taken up at a meeting of the Unitholders at the request of the Unitholders, such removal of the Valuer shall be approved by the Unitholders in accordance with the InvIT Regulations.

*The information contained in this section is derived from the report by Crisil India, dated 2024 ("**Crisil Report**"). Industry sources and publications generally state that the information contained therein has been obtained from sources generally believed to be reliable, but that their accuracy, completeness and underlying assumptions are not guaranteed, and their reliability cannot be assured. Industry publications are also prepared based on information available as of specific dates and may no longer be current or reflect current trends. Accordingly, investment decisions should take these limitations into account. All references to years refer to calendar years except as otherwise stated. References to Indian financial years ("**FY**") are to the one-year period ending March 31 of the named year.*

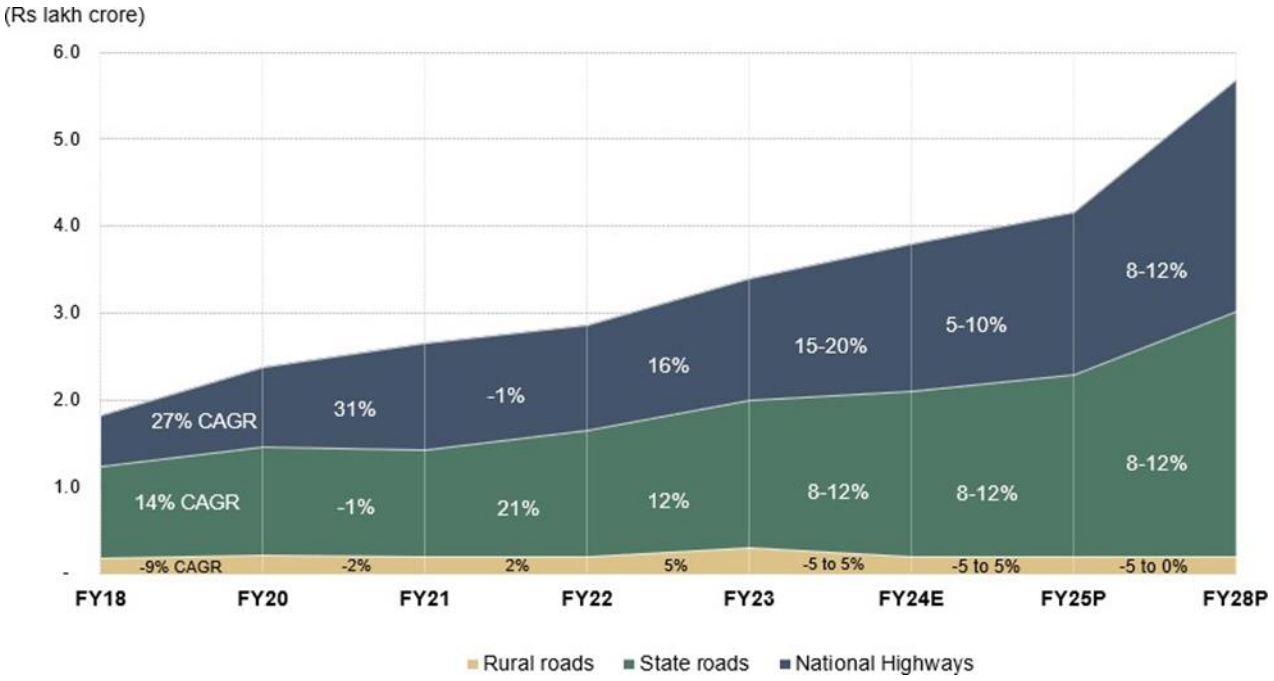
Continued government focus and increased private interest likely to aid growth in Fiscal 2025

Our Sponsor is also involved in the Bharatmala Pariyojana ("Bharatmala") project. Between fiscals 2018 & 2023 overall road sector capex, comprising of National Highways, State Highways & rural roads is estimated to have grown at a CAGR of 14%. This growth, driven by Bharatmala and increased state spends on roads has been achieved despite brief hiccups such as the pandemic and hampered construction due to elongated monsoons. The outlook for the sector remains firm, supported by higher awarding of new projects from previous fiscals, steady-state capex, the NIP pipeline of DPR-ready projects, and Bharatmala project.

The NH segment contributes around 40-45% of the overall capex. While the execution remained flattish in fiscal 2023 vis--vis fiscal 2022, capex grew by 16% due to a rise in construction of high value projects and high commodity prices. In fiscal 2024, the national highway capex further grew by 18% driven primarily by much improved execution during the fiscal. High volume projects (4-8 lanes) still in the pipeline in the construction/pre-construction phase are going to be the key area of focus for governments capital expenditure.

On the low base of fiscal 2021, the state spends grew by 21% in fiscal 2022 and are estimated to have grown further by 10-13% in fiscal 2023 largely in line with the growth in budgetary outlay. In fiscal 2024, state spends are expected to go up further by 8-12% as their percentage achievement of budgetary allocations are expected to be largely in line with historical average.

Momentum to continue, supported by Bharatmala and NIP pipeline



Note: Capex excludes the land-acquisition costs
Source: NHAI, MoRTH, State budget documents, PMGSY, CRISIL MI&A Research

Investments: National highways

NHAI awarding to revive marginally in fiscal 2025 with the revamped BOT model likely to account for an improved share

NHAI has already offered more than 1500 kms of roads to NHIT in last 3 years. Our Sponsor's awarding had witnessed a rise from merely 2,222 km in fiscal 2019 to 6,003 km in fiscal 2023. NHAI's flagship Bharatmala Pariyojana Programme (BMP) Phase-1 witnessed significant cost overrun on account of costlier land acquisition and high inflation. Currently, the estimated cost of the BMP phase-1 is almost twice and the initial estimate and the ministry is awaiting cabinet approval for a revamped programme and additional funds in order to undertake rapid awarding of projects in the pipeline. As a result, NHAI awarding was ~3,339 kms in fiscal 2024.

Notably, the share of HAM dipped significantly due to the aforementioned issues regarding the BMP. Going forward, the share of HAM is expected to revive to around 25-30% in fiscal 2025. Further, on account of amendments in the BOT MCA, the awarding under the BOT model is also likely to increase. This is likely to be supported by the interest of developers in the revamped BOT model due to the following factors:

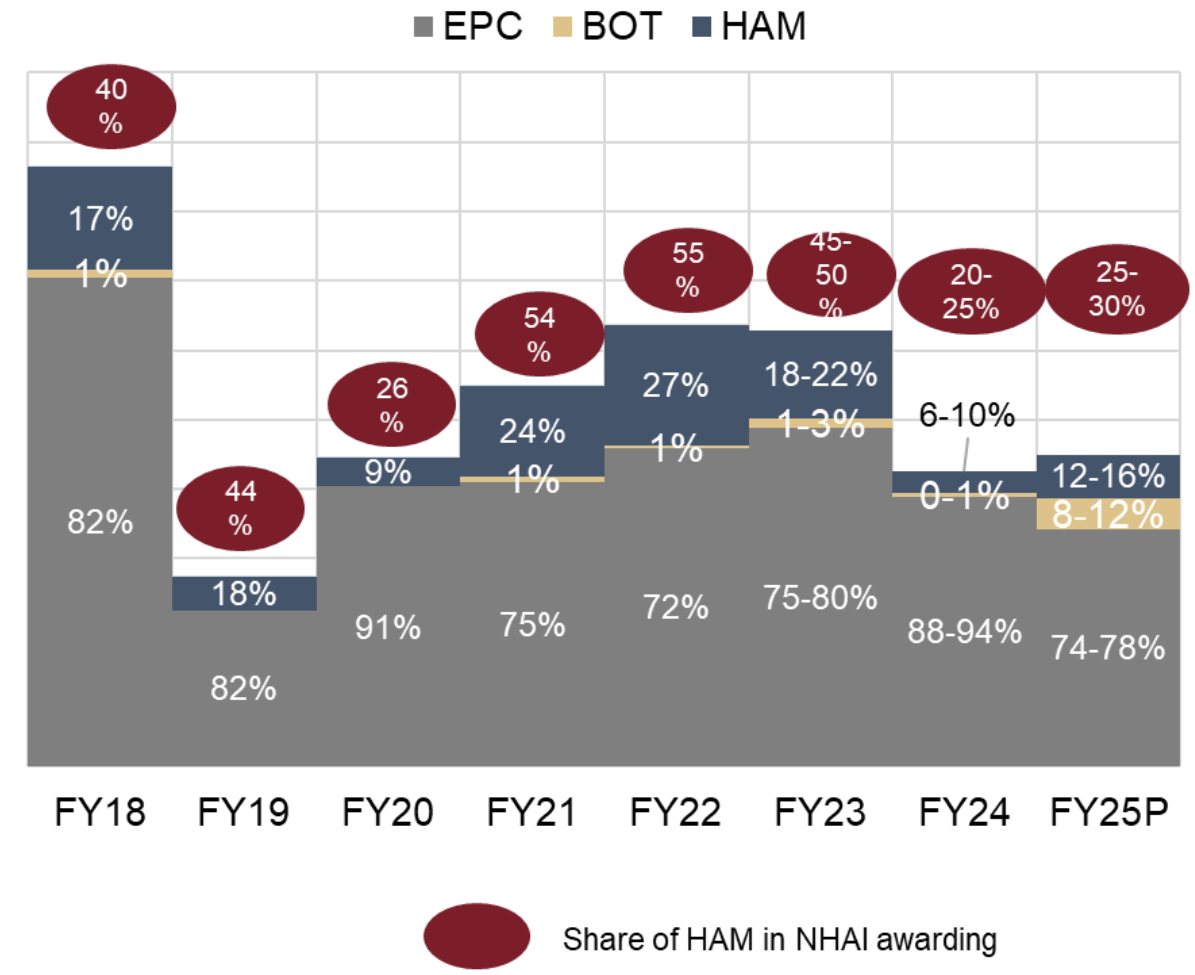
- HAM was favored by the road developers due to lower risk and higher profitability. However, the competition in HAM awarding has increased substantially leading to average bid premiums tumbling from a peak of 15-20% to around 4-6% in the last few fiscals. As a result, share of the larger developers have dropped substantially since many large developers have refrained from bidding aggressively for HAM projects in order to protect their margins. Given the amendment in BOT MCA and the scope of higher profitability due to lower bidding competitiveness in the BOT space many large developers are keen on taking up BOT projects.

- Furthermore, owing to the healthy balance sheets the developers are also in a comfortable position to undertake BOT projects with high funding requirements.

- The increased traffic visibility vis--vis earlier years also augurs well for the BOT projects.

The shift towards the BOT model comes against the backdrop of NHAI facing funding challenges and moderation in growth in the central government's budgetary outlay towards the roads & highways sector. Thus, the shift will have a two-pronged benefit by not only alleviating funding challenges to a great extent but also increasing the private investments in the sector.

Share of BOT in NHAI awarding is likely to be around 8-12% in fiscal 2025 on the back of amendments in the BOT MCA



Source: NHAI, CRISIL MI&A Research

NHAI execution is also rising steadily with focus on swifter execution

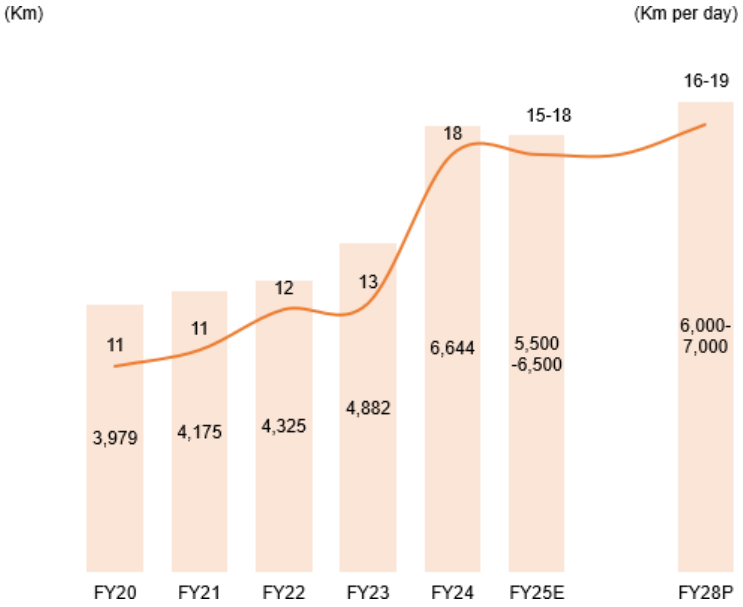
Even though overall national highways construction at the MoRTH level had remained flattish in fiscals 2022 and 2023, NHAI execution witnessed strong momentum. NHAI execution sequentially rose from 4,175 km in fiscal 2021 to 4,882 km in fiscal 2023.

Acceleration in project awards, sharper focus on resolving land acquisition issues, and the Atmanirbhar Bharat initiatives to ease liquidity (monthly milestone payments, release of retention money, reduction in performance security & extension of 3-6 months in milestones & SCODs) for EPC road players augured well for the pace of execution of NHAI projects.

Higher awarding of the previous years (FY21-23) and many of those projects receiving appointed dates in a timely manner have further boosted NHAI execution in fiscal 2024. As a result, 6,644 km of NHAI projects were executed during the year. In other words, the construction per day stood at around 18 km. Given the healthy orderbooks of the developers, the momentum in the pace of execution is likely to continue in fiscal 2025 as well. CRISIL MI&A Research expects NHAI execution to be between 5,000-6,000 km in fiscal 2025.

Over the medium term, the pace of construction is expected to rise steadily to reach ~19 km per day by fiscal 2028. NHAIs pace of construction rising steadily with continued focus on swifter execution.

NHAIs pace of construction rising steadily with continued focus on swifter execution



Source: NHAI, CRISIL MI&A Research

Policy push for HAM enabled higher share in awarding

NHAI awards roads & highway projects under:

- EPC
- BOT
- HAM

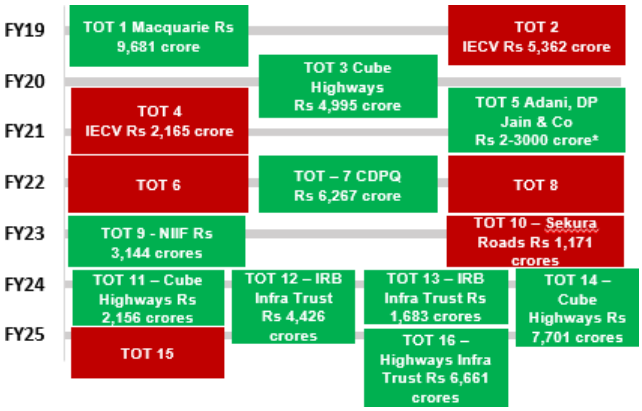
The Ministry and NHAI, post multiple suggestions from various stakeholders have amended the HAM Model Concession Agreement across the below mentioned parameters in Oct 2020. These are largely aimed to protect developers' returns and ease their liquidity.

Recent changes in HAM MCA incorporate developers' concerns.

	Old Clause	Revised Clause	Impact
Annuity Payments	Interest on annuity payment linked to **RBI determined Bank Rate + 3%**	Interest on annuity payment linked to **average of one year MCLR of top 5 Scheduled Commercial Banks + 1.25%**	Differential between cost of borrowing and interest on annuity reduced thus preventing erosion of developers' returns due to RBI repo rate changes
Milestone Payments	**5** instalments, each equal to **8%** of the Bid Project Cost	**10** instalments, each equal to **4%** of the Bid Project Cost	Quicker payments helping developers' liquidity
Change in ownership	Original sponsor/ concessionaire shall hold at least 26% of equity during construction period and **2 years thereafter**	Original sponsor/ concessionaire shall hold at least 26% of equity during construction period and **6 months thereafter**	Quicker stake sell-off would ease up developers' balance sheets to bid for new projects
Financial Closure	No clarity on amount on FC	FC to be undertaken for an amount no lower than either: 1. Total Project Cost (60% of BPC); or 2. 10% less than (Estimated Project Cost minus 40% of Bid Project Cost)	Would likely prevent termination of projects due to inadequate financing
Dispute resolution board	In case of a dispute, either party may call upon the Independent Engineer to mediate.	Failing mediation by the IE, either party may require such dispute to be referred to the **Dispute Resolution Board (DRB).**	Quicker dispute resolution mechanism to prevent stuck projects.
Others	Interest mobilization advance linked to bank rate. Termination payments based on previous milestone payments.	Interest on mobilization advance linked to MCLR. Termination payments based on new milestone payments.	NA

Financing: Public Funding

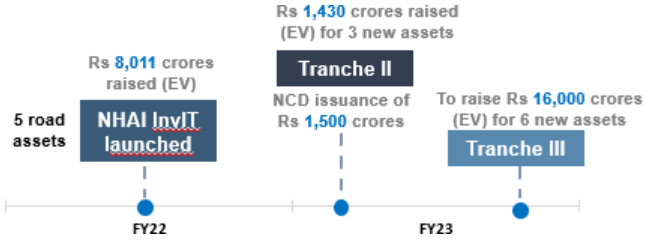
Success of TOT critical to meet ambitious Bharatmala targets



Source: NHAI, CRISIL MI&A Research

The authority has also tied up debt via SPV level funding for the Delhi-Mumbai expressway where it has already raised Rs 9,731 crores.

InVITs & SPV level financing



Source: NHAI, CRISIL Research

Financing: Private Funding

Investments by private sector to grow 3x times over the next 5 years

CRISIL MI&A expects private construction investments in national highways to increase 2x to Rs 2.7 trillion over fiscals 2024 to 2028 compared with the previous five years. This is expected to be mainly through the hybrid annuity model (HAM) mode, as the build-operate-transfer (BOT) toll mode may have only a few takers.

A policy push in the form of changes in Model Concession Agreements (MCA) for HAM and BOT projects and reduction in bid eligibility criteria across all national highway projects would bode well for private participation. However, the share of HAM in total awarding is constrained by the cautious approach employed by banks in lending to HAM projects.

Amidst the COVID-19 pandemic, NHAI and the ministry have taken various steps under the Atmanirbhar package to ease issues faced by developers. Releasing monthly payments, instead of milestone based payments; extension of timelines for completion of projects, etc have sustained private participation in the sector. While these have been extended till Oct 2020, they are likely to fade from next fiscal onwards.

Asset monetisation, equity infusion key to support private investment in the long run

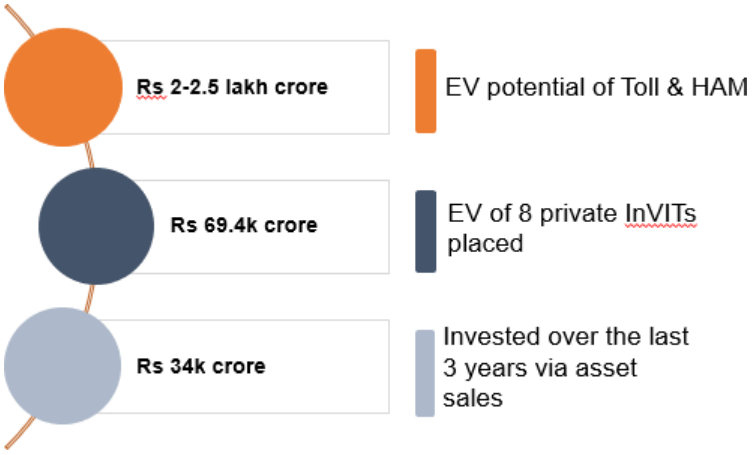
Currently, there are two broad drivers of asset sales in the roads sector - rationalisation of financial position to improve balance sheet strength and asset churning to be able to participate in the upcoming projects. The erstwhile major BOT players are selling off assets to reduce their debt burden and free up equity, which can be infused in under-execution projects.

The players present in HAM are currently selling off HAM assets to participate further in upcoming HAM projects. Some players intend to sell off under-construction projects to financial investors with projects being executed by the same player. Thus, they are able to convert HAM projects to EPC without facing the cut-throat competition they deal with currently in the EPC mode.

This will help them retain margins.

About Rs 70,000 - 80,000 crore has already been invested through these modes. CRISIL's analysis of BOT and HAM projects indicates a potential of ~Rs 2-2.5 lakh crore in terms of Enterprise Value.

Asset monetisation has a lot of potential to free up developers' balance sheets



Source: Industry, CRISIL MI&A Research

Overview: Road Network in India

Extensive Road Network

India has the second-largest road network in the world, spanning a total of ~6.7 million kilometres (kms). This road network transports 64.5% of all goods in the country and 90% of Indias total passenger traffic uses road network to commute. Road transportation has gradually increased over the years with improvement in connectivity between cities, towns and villages in the country.

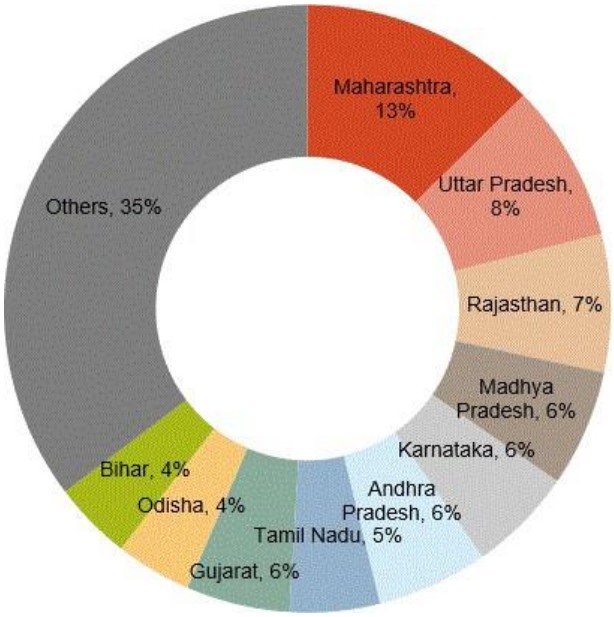
- National Highway (NH) network increased by 60% from 91,287 km in 2014 to 1,46,114 km in year 2024.

Road Network in India can be divided into the following categories: Road Network in India as in fiscal 2024.

Road Network	Length (Km)	Percentage of Total		Connectivity to
		Length	Traffic	
National Highway	146,114	2%	40	Union capital, State capitals, major ports, Foreign highways
State Highway	179,535	3%	60	Major centres within the states, national highways
Other roads	6,019,723	95%		Main roads, rural roads, production centres, markets
Total	6,345,372	100	100	

Source: MoRTH Annual report 2023-2024, CRISIL Research

State-wise length of National Highways in India as in fiscal 2024

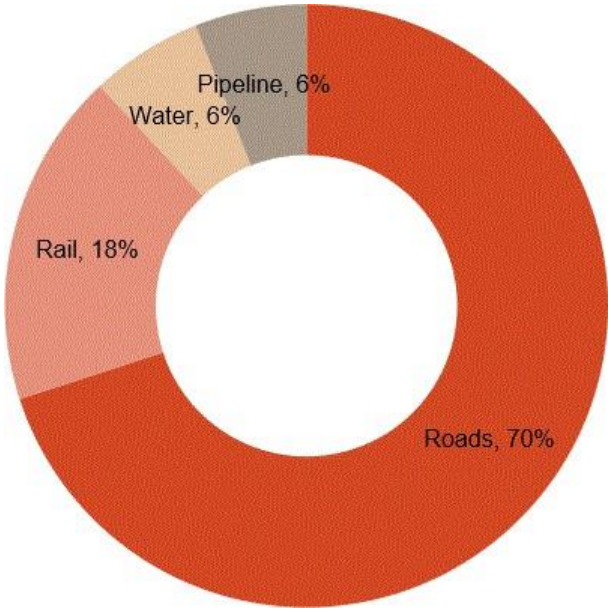


Source: MoRTH, CRISIL Research

Roads account for 67% of total freight traffic

Road transport is the most frequently used mode of transport for both freight and passengers. For fiscal 2021, it is estimated that ~67% of total freight (in terms of BTKM) will be carried by roads when compared with railways. In 2009-10, roads accounted for approximately 58% of the total freight traffic.

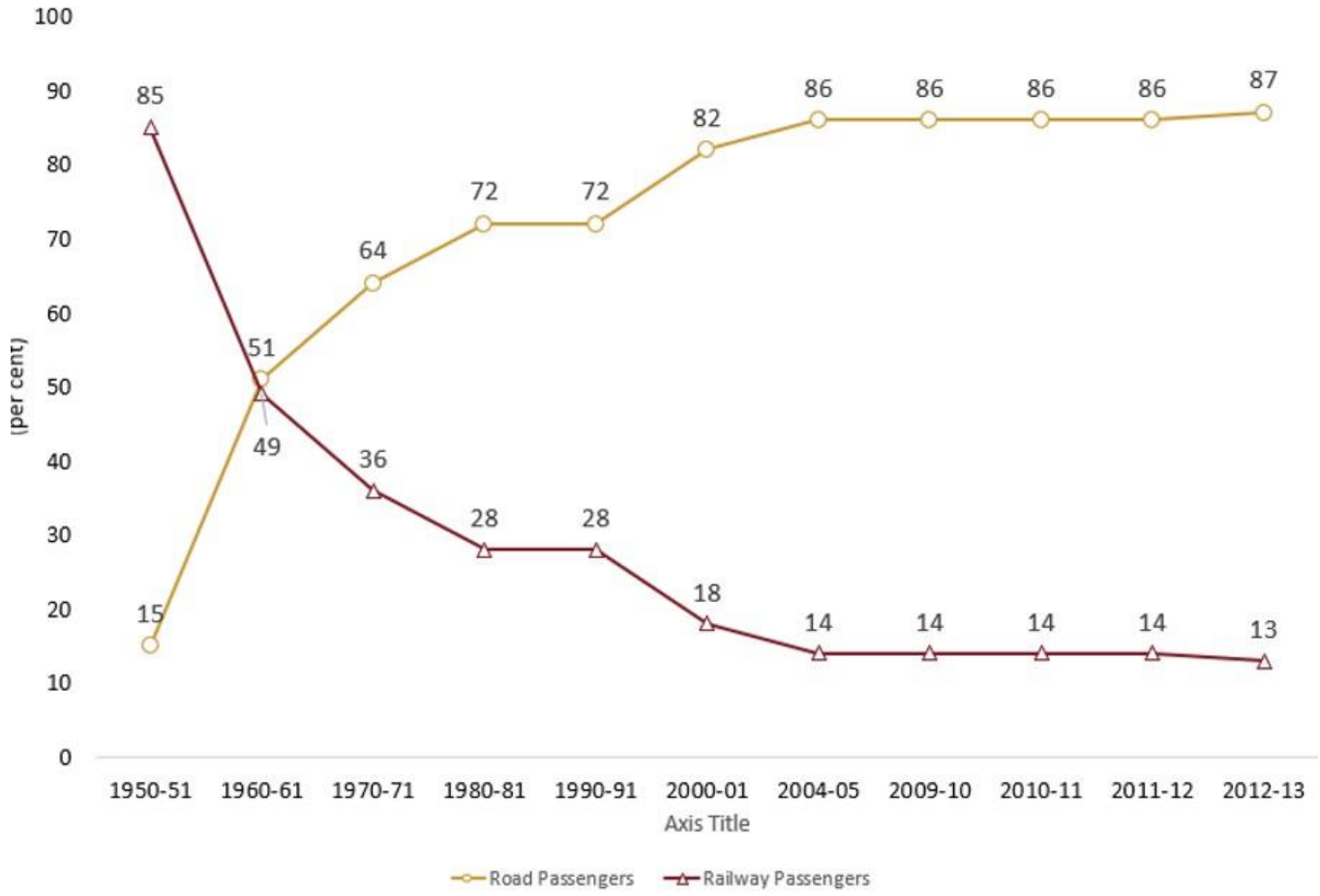
Proportion of freight traffic across modes of transport - Fiscal 2022.



Source: CRISIL Research

Higher passenger traffic on roads than railways

Passenger traffic - Roads v/s railways



Note: FY13 is the latest available data
Source: Working Group Report on Road Transport for Eleventh Five-Year Plan, Industry

Overview: National Highways

National Highways Development Project

The NHDP encompasses building, upgradation, rehabilitation and broadening of existing NHs. The project is executed by the NHAI, in coordination with the public works departments of various states. The NHAI also collaborates with the Border Roads Organisation for the development of certain stretches. The NHDP is being implemented in seven phases.

NHDP projects are awarded to private players either on EPC (cash) or build-operate-transfer (BOT) basis, and now on the newly introduced hybrid annuity model (HAM). NHDP cash contracts are mainly financed through budgetary allocations from the Central Road Fund, negative grants/premium received, and toll revenue. Loans and grants are also received from the World Bank and the Asian Development Bank.

Projects under existing the NHDP phases of 5,000-5,500 km to be awarded completely by fiscal 2021. These residual projects would dominate 50% of investments over the next five years. According to CRISIL estimates, Bharatmala awarding was

~5,500-6,000 km over fiscals 2018 and 2019. Investments under Bharatmala would be slow to pick up and contribute ~30% of total investments. As projects awarded under Bharatmala are 60% EPC and 40% HAM, NHAIs ability to raise funds to execute these projects would be a key monitorable.

Bharatmala Pariyojana

Bharatmala Pariyojana is an umbrella project of the central government since 2015, that aims to improve efficiency in the roads sector. It is expected to supersede the National Highways Development Project (NHDP) and envisages the construction of 65,000 km of highways under the following categories: national corridor (north-south, east-west, and golden quadrilateral), economic corridor, inter-corridor roads, and feeder roads. As per the ministry, Bharatmala, along with the schemes currently undertaken, could require a total outlay of Rs 6.9 trillion.

The Government of India had approved Bharatmala Pariyojana Phase-I in October, 2017 with an aggregate length of about 34,800 km (including 10,000 km residual NHDP stretches) at an estimated outlay of Rs. 5,35,000 crore for development of about 9,000 km length of Economic corridors, about 6,000 km length of Inter-corridor and feeder roads, about 5,000 km length of National Corridors Efficiency improvements, about 2,000 km length of Border and International connectivity roads, about 2,000 km length of Coastal and port connectivity roads, and about 800 km length of Expressways. Total of 255 road projects with an aggregate length of about 10,699 km have been approved till October, 2019 under Bharatmala Pariyojana with total Cost of Rs. 2,64,916 crore approximately. Bharatmala Pariyojana Phase-I is targeted for completion by 2021-22.

Components of Bharatmala Pariyojana (Phase-1)

Sr. No.	Scheme	Length (km)	Cost (Rs. crore)
1	Economic Corridors	9,000	120,000
2	Inter-Corridors & feeder roads	6,000	80,000
3	National Corridor Efficiency improvement	5,000	1,00,000
4	Border & International connectivity roads	2,000	25,000
5	Coastal & port connectivity roads	2,000	20,000
6	Expressways	800	40,000
	Sub Total	24,800	3,85,000
7	Ongoing Projects, including NHDP*	10,000	1,50,000
	Total	34,800	5,35,000

Source: NHAI, CRISIL Research

State-wise projects constructed under Bharatmala

Bharatmala Pariyojana received approval from the Government of India in 2017, encompassing a total length of 34,800 km aimed at enhancing connectivity and lowering logistics costs across the nation. As of October 31, 2024, projects covering 26,425 km have been awarded, with 18,714 km already constructed. Detailed progress reports for Phase-I of Bharatmala, categorized by State and Union Territory, are attached. It is important to note that no specific fund allocation is being made to the National Highways Authority of India (NHAI) for the Bharatmala Pariyojana. Additionally, the total expenditure incurred by NHAI under this initiative amounts to Rs. 4.72 lakh crore as of November 30, 2024. To date, 18 projects totalling 424 km have been awarded, with 189 km constructed under the Port and Coastal Connectivity Roads Category. The various projects under the Bharatmala Scheme are designed to enhance connectivity to both major and minor ports in several coastal states, including Gujarat, Maharashtra, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha, and West Bengal.

State	Total Length (km)	Length Awarded (km)	Length Constructed till 31st Oct'24 (km)
Andhra Pradesh	2,525	1,936	994
Assam	433	431	378
Bihar	1,572	1,159	641
Chhattisgarh	571	471	221
Delhi	203	203	178
Goa	26	26	26
Gujarat	1,577	1,194	923
Haryana	1,058	1,058	870
Himachal Pradesh	167	167	113
Jammu & Kashmir	433	251	115
Jharkhand	1,000	801	440
Karnataka	2,059	1,603	1,043
Kerala	1,126	708	396
Madhya Pradesh	3,063	2,017	1,407
Maharashtra	3,029	2,174	1,837
Manipur	635	635	394
Meghalaya	170	170	107
Mizoram	593	593	451
Nagaland	208	208	155
Odisha	1,586	967	871
Punjab	1,764	1,553	603
Rajasthan	2,503	2,360	2,241
Tamil Nadu	2,414	1,476	1,185
Telangana	1,719	1,026	746
Tripura	94	94	68
Uttar Pradesh	3,127	2,496	1,854
Uttarakhand	273	264	146
West Bengal	874	385	314
Total	**34,800**	**26,425**	**18,714**

Source: NHAI, CRISIL Research

OUR BUSINESS

Overview

We are a registered infrastructure investment trust under the InvIT Regulations. We currently have a right to toll, operate and maintain a portfolio of fifteen (15) Existing Toll Roads (*defined below*) in the Indian states of Gujarat, Rajasthan, Telangana, Karnataka, Maharashtra, Uttar Pradesh, Madhya Pradesh, West Bengal, and Assam and intend to toll, operate and maintain a portfolio of eleven (11) Target Toll Roads (*defined below*) in the Indian states of Andhra Pradesh, Uttar Pradesh, Gujarat, Uttarakhand, and Chhattisgarh under the Toll Operate Transfer ("**TOT**") model conceived by NHAI. These Toll Roads (*defined below*) are operated and maintained pursuant to concessions granted by the NHAI. The Existing Toll Roads comprise 15 stretches spanning a total length of approximately 1523.70 kms and the Target Toll Roads comprise eleven stretches spanning a total length of approximately 818.83 kms.

Our Sponsor is NHAI, an autonomous authority of the GoI under the MoRTH constituted on June 15, 1989 by NHAI Act. NHAI was operationalised in February 1995 with the appointment of a full-time Chairman and other members of the board. The functioning of NHAI is governed by the NHAI Act and the rules, and regulations framed thereunder. NHAI from time to time, may divest a portion of its unitholding in the InvIT.

The Project SPVs have entered into 26 independent Concession Agreements with the NHAI for concessions of each of the Toll Roads. We have satisfied all conditions precedent and commenced our concessions on December 16, 2021, October 29, 2022 and 1 April, 2024 in accordance with the terms of the Initial Concession Agreements for the Existing Toll Roads and expect to satisfy all conditions precedent and commence our concessions for the Target Toll Roads in accordance with the terms of the R4 Concession Agreements for the Target Toll Roads. For further details, please see the section entitled "*Summary of the Concession Agreements*", "*Management's Discussion and Analysis of Financial Position and Results of Operations*" and "*Use of Proceeds*" on pages 293, 380 and 354, respectively.

The Concession Agreements provide the Project SPVs the right to collect tolls for a period of 20 years or 30 years (as applicable under the relevant Concession Agreement) from users of each Toll Road, with certain overlay activities and the construction work which may include any other improvement work, such as construction, renovation, refurbishing, augmentation, upgradation, etc., of any road, structure, etc., in respect of certain of the Toll Roads (the "**Initial Improvement Works**") to be completed by the Project SPVs within 12 to 18 months from the Appointed Date (as defined in the section entitled "*Summary of the Concession Agreements*"). Responsibility for the supervision of the operations and maintenance of the Toll Roads also vests with us. In return, the Project SPVs is required to pay the concession fee to the NHAI prior to the commencement of the concession, as set out in the respective Concession Agreements. For further information on the provisions of the Concession Agreements, see "*Summary of the Concession Agreements".*

NWPPL and NEPPL has a right to toll, operate and maintain the following toll road assets (the "**Existing Toll Roads**")

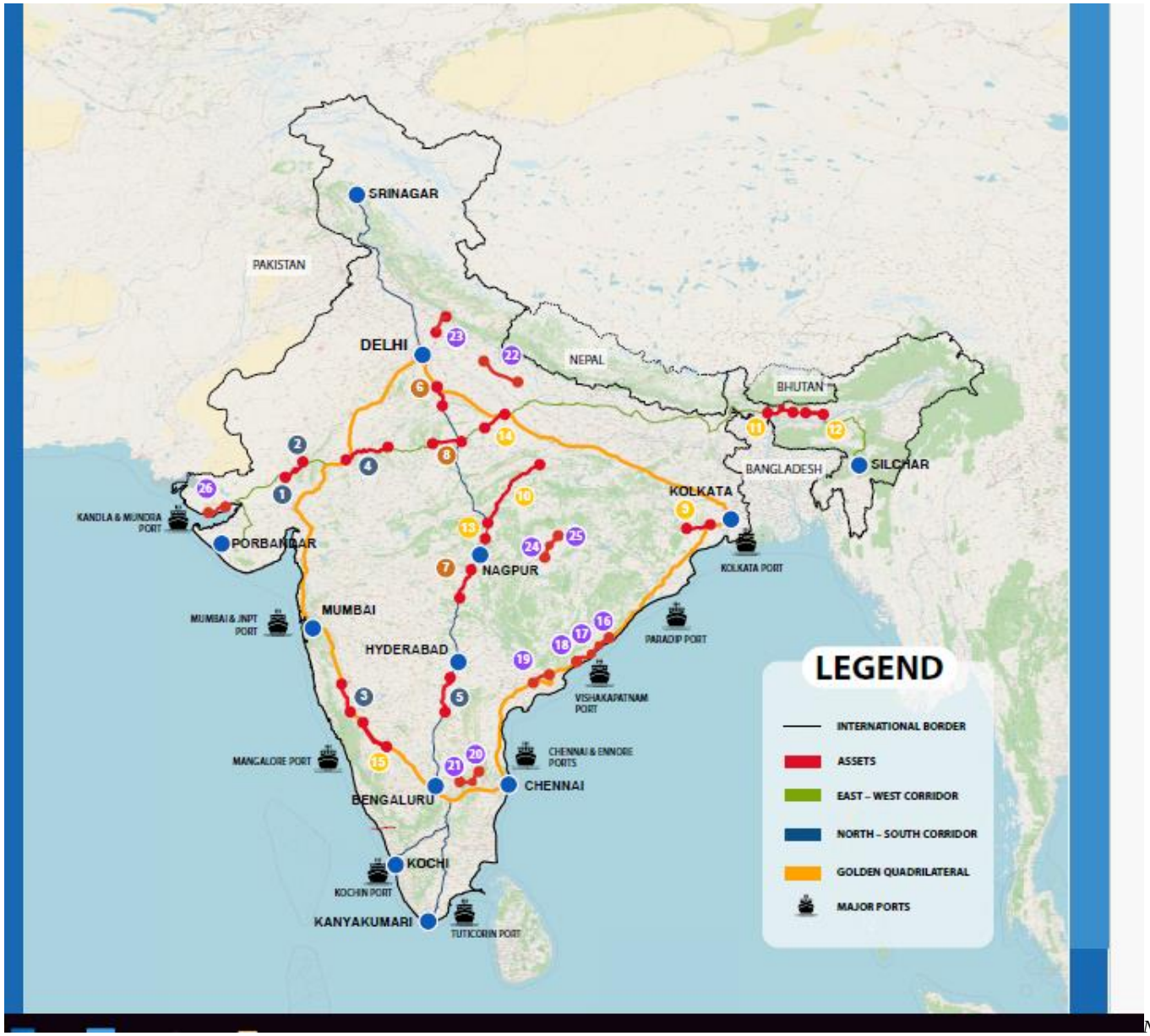
- Palanpur/Khemana Abu Road Project ("**Asset 1**"): Abu Road section of NH 27 with a total length of 45.000 kms, connecting the states of Gujarat and Rajasthan;
- Abu Road – Swaroopganj Project ("**Asset 2**"): Swaroopganj section of NH 27 with a total length of 31.000 kms, in the state of Rajasthan;
- Maharashtra/ Karnataka Border (Kagal) – Belgaum Project ("**Asset 3**"): Belgaum – Kagal section of NH 48 with a total length of 77.700 kms, connecting the states of Karnataka and Maharashtra;
- Chittorgarh – Kota & Chittorgarh Bypass Project ("**Asset 4**"): Chittorgarh – Kota section of NH 27 with a total length of 160.500 kms, in the state of Rajasthan;
- Kothakota Bypass – Kurnool Project ("**Asset 5**"): Kothakota bypass – Kurnool section of NH 44 with a total length of 74.600 kms, connecting the states of Telangana to Andhra Pradesh;
- Agra Bypass Project ("**Asset 6**"): Agra Bypass section with a total length of 32.800 kms, connecting NH19 (old NH2) to NH44 (old NH7) in Uttar Pradesh;
- Borkhedi - Kelapur Project ("**Asset 7**"): Borkhedi-Kelapur-Maharashtra/Telangana border section of NH44 (old NH7) with a total length of 138.150 kms, in the state of Maharashtra;

- Shivpuri – Jhansi Project ("**Asset 8**"): Jhansi-Shivpuri section of NH 27 with a total length of 75.300 kms, connecting the districts of Jhansi in the state of Uttar Pradesh and Shivpuri in the state of Madhya Pradesh.
- Chichra - Kharagpur Project ("**Asset 9**"): Chichra - Kharagpur section of NH 49 with a total length of 56.120 kms, in the state of West Bengal;
- Rewa –Lakhnadon Project ("**Asset 10**"): Rewa – Katni – Jabalpur – Lakhnadon section of NH 30 and NH 34 with a total length of 306.340 kms, in the state of Madhya Pradesh;
- Kachugaon - Kaljhar Project ("**Asset 11**"): Kachugaon - Rakhaldubi Bus Junction – Kaljhar section of NH 27 with a total length of 114.170 kms, in the state of Assam;
- Kaljhar – Patacharkuchi Project ("**Asset 12**"): Kaljhar – Patacharkuchi section of NH 27 with a total length of 27.300 kms, in the state of Assam;
- Lakhnadon – Mahagaon (Mohgaon) – Khawasa ("**Asset 13**"): Lakhnadon – Mahagaon (Mohgaon) – Khawasa section of NH 44 with a total length of 107.350 kms, in the state of Madhya Pradesh;
- Orai – Barah Project ("**Asset 14**"): Orai – Barah section of NH 27 with a total length of 62.900 kms, in the state of Uttar Pradesh; and
- Chitradurga Bypass – Hubli Project/ Karnataka Project ("**Asset 15**"): Chitradurga Bypass - Chitradurga - Davanagere - Haveri – Hubli section of NH 48 with a total length of 214.470 kms, in the state of Karnataka.

From the Appointed Date, NSPPL will have the right to toll, operate and maintain the following toll road assets (the "**Target Toll Roads**"):

- Narasannapeta to Ranasthalam Project ("**Asset 16"**): Narasannapeta to Ranasthalam section of NH-16 with a total length of 53.799 kms in the state of Andhra Pradesh;
- Ranasthalam to Hanumanthavaka Project ("**Asset 17**"): from Ranasthalam to Anandapuram section of NH 16 with a total length of 66.544 kms in the State of Andhra Pradesh;
- Anandapuram – Pendurthi – Anakapalle Project ("**Asset 18**"): from Anandapuram-Pendurthi-Anakapalle of NH-16 with a total length of 48.605 kms in the state of Andhra Pradesh;
- Gundugolanu-Devarapalli-Kovvuru Project ("**Asset 19**"): Gundugolanu-Devarapalli-Kovvuru section of NH-16 with a total length of 69.884 kms in the state of Andhra Pradesh;
- Chittoor to Mallavaram Project ("**Asset 20**"): Chittoor to Mallavaram section of NH-140 with a total length of 61.128 kms in the state of Andhra Pradesh;
- TN/AP – Border to Nalagampalli to AP/Karnataka Border Project ("**Asset 21**"): TN/AP – Border to Nalagampalli to AP/Karnataka Border Section of NH 4 with a total length of 84.797 kms in the State of Andhra Pradesh;
- Bareilly – Sitapur Project ("**Asset 22**"): Bareilly - Sitapur Section of NH-30 (Old NH-24) with a total length of 157.590 kms in the State of Uttar Pradesh;
- Muzaffarnagar – Haridwar Project ("**Asset 23**"): Muzaffarnagar to Haridwar section of Old NH 58 (New NH-334) with a total length of 78.560 kms in the State of Uttar Pradesh & Uttarakhand;
- Raipur to Simga Project ("**Asset 24**"): Raipur to Simga Section of NH-30 (Old NH 200) with a total length of 48.580 in the State of Chhattisgarh;
- Simga to Bilaspur Project ("**Asset 25**"): Simga to Bilaspur Section of NH-130 (Old NH-200) & NH-49 with a total length of 77.945 kms in the State of Chhattisgarh; and
- Gandhidham (Kandla) to Mundra Port Project ("**Asset 26**"): Gandhidham (Kandla) to Mundra Port section of NH-41 with a total length of 71.400 kms in the State of Gujarat.

The following map depicts locations of the Toll Roads:



Note: This map is for illustrative purposes only, is not to scale and is subject to change at any time.

Strengths of the Trust

Experienced Sponsor with consistent track record in operating and maintaining projects in the roads and highways sector in India

Our Sponsor, NHAI is India's national agency responsible for the development, maintenance and management of India's national highways network. Our Sponsor has a consistent track record of growth and operational performance. Our Sponsor has been entrusted with National Highways Development Project ("**NHDP**"), which along with other minor projects, has vested in national highways for development, maintenance and management. As part of the NHDP, our Sponsor infuses funds into immediate areas of development and enables private sector participation bringing about a healthy participatory economy.

Our Sponsor is also involved in the *Bharatmala Pariyojana* project ("Bharatmala"). Between fiscals 2018 & 2023 the overall road sector capex, comprising of National Highways, State Highways & rural roads is estimated to have grown at a CAGR of 14%. This growth, driven by Bharatmala and increased state spends on roads has been achieved despite brief hiccups such as the Covid pandemic and hampered construction due to elongated monsoons. The outlook for the sector remains firm, supported by higher awarding of new projects from previous fiscals, steady-state capex, the NIP pipeline of DPR-ready projects, and Bharatmala. *(Source: NHAI, MoRTH, State budget documents). (More information available in the Industry Overview section)*

NHAI has already offered more than 1500 kms of roads to NHIT in last 4 years. Our Sponsor's awarding had witnessed a rise from merely 2,222 km in fiscal 2019 to 6,003 kms in fiscal 2023. However, in fiscal 2024, awarding momentum was marred by various roadblocks. NHAI's flagship Bharatmala Pariyojana Programme (BMP) Phase-1 witnessed significant cost overrun on account of costlier land acquisition and high inflation. Currently, the estimated cost of the BMP phase-1 is almost twice and the initial estimate and the ministry is awaiting cabinet approval for a revamped programme and additional funds in order to undertake rapid awarding of projects in the pipeline. As a result, NHAI awarding was ~3,339 kms in fiscal 2024.

Even though overall national highways construction at the MoRTH level had remained flattish in fiscals 2022 and 2023, our Sponsor's execution witnessed strong momentum. NHAI execution sequentially rose from 4,175 km in fiscal 2021 to 4,882 km in fiscal 2023. Acceleration in project awards, sharper focus on resolving land acquisition issues, and the Atmanirbhar Bharat initiatives to ease liquidity (monthly milestone payments, release of retention money, reduction in performance security & extension of 3-6 months in milestones & SCODs) for EPC road players augured well for the pace of execution of NHAI projects.

Having NHAI as our Sponsor, we believe we are well positioned to drive new initiatives in the road sector in India. For more details about our Sponsor and the projects, please see *"Industry Overview"* on page 124 of this Preliminary Placement Document.

Sizeable portfolio of diversified long-term revenue generating Toll Road assets

We own 100% of the Project SPVs. The Project SPVs toll, operates and maintains the Existing Toll Roads and will toll, operate and maintain the Target Toll Roads. The Concession Agreements provide the Project SPVs the right to collect toll for the respective concession periods. The R1 Toll Roads have concession periods of 30 years. The R2, R3 Toll Roads and the Target Toll Roads have concession periods of 20 years. We believe the Toll Roads currently have a healthy mix of passenger and commercial traffic. For details of the project traffic for each of the Toll Roads, please see Annexure C. We also believe that the Toll Roads possess a good mix of captive short distance traffic and long-distance traffic. In addition, the range of commodities transported by commercial traffic across the Toll Roads varies from agricultural products and other perishable goods to steel, cement, coal, containers and multiple industrial products, representing a broad cross-section of the Indian economy. Each Toll Road has a distinct set of users based on its local economy, which results in significant independence of traffic across the Toll Roads. As a result, we expect the geographical diversification of the Toll Roads to reduce our reliance on the local economy of any single state or district. The diversified composition of traffic along the Toll Roads is expected to provide us with stable cash flows.

We believe that the Toll Roads have revenue growth potential due to expected growth in traffic volumes as a result of regional and national growth and expected increases in toll fees as a result of inflation adjustments.

Presence in strategic regions/ Strategic geographic location of portfolio assets

The Toll Roads comprise 26 toll roads stretches of toll roads located in the Indian states of Gujarat, Rajasthan, Telangana, Karnataka, Uttar Pradesh, Maharashtra, Uttarakhand, Andhra Pradesh, Chhattisgarh, West Bengal, Assam and Madhya Pradesh. Nine (9) Toll Roads are located in southern India, four (4) are located in central – western India, two (2) in western India, four (4) in central India, three (3) in eastern India and four (4) in northern India. According to the Traffic Consultants, these corridors are among the primary corridors for long distance commercial traffic movement and have witnessed high traffic growth rates in the past few years.

- ***Asset 1 – Palanpur/Khemana Abu Road Project***: This project stretch starts at Palanpur in the State of Gujarat and ends at Abu Road in the state of Rajasthan.

- ***Asset 2 – Abu Road – Swaroopganj Project***: This project stretch starts at the end of Asset 1 and mainly falls in the state of Rajasthan, India. As per the Traffic Consultant, this project is one of the main highway corridors connecting Gujarat with an important tourist destination of Mount Abu. Palanpur, Ahmedabad, Mount Abu and Udaipur are some of the important cities in the vicinity of this stretch.

- ***Asset 3 – Maharashtra/ Karnataka Border (Kagal) – Belgaum Project***: This project stretch starts at Belgaum in the State of Karnataka and ends at the Maharashtra/ Karnataka Border and is a part of the corridor between Mumbai-Pune and Bengaluru.

- ***Asset 4 – Chittorgarh – Kota & Chittorgarh Bypass Project***: This project stretch starts from Chittorgarh and ends at Kota Bypass about 10 km short of Chambal River Hanging Bridge. This project is divided into three sections based on toll plaza junctions. The project road is short in length and reduces travel time between Kota and Chittorgarh, providing congestion free services.

- ***Asset 5 – Kothakota Bypass – Kurnool Project***: This project stretch connects the state of Telangana with Andhra Pradesh. The project road offers the shortest itinerary, in length and travel time between Kothakota and Kurnool, and is a part of the corridor between Hyderabad and Bengaluru.

- ***Asset 6 – Agra Bypass Project*:** This project stretch is a 32.80 km four-lane road, forming part of the section connecting NH19 (old NH2) to NH44 (old NH7) in Uttar Pradesh, branches out to NH52 (old NH3) and NH44 (old NH7) at Gwalior.

- ***Asset 7 - Borkhedi – Kelapur Project*:** This project is located on NH44 and is about 138.15 kms long section between Borkhedi and Maharashtra/ Telangana Border (at Penganga River bridge) traversing through the districts of Nagpur, Wardha and Yavatmal in the state of Maharashtra. This stretch is a part of the corridor between Nagpur and Hyderabad.

- ***Asset 8 - Shivpuri - Jhansi Project***: This project is a 4-lane, 75.3 kms long stretch, on national highways NH - 27 which connects the districts of Jhansi and Shivpuri in the state of Uttar Pradesh and Madhya Pradesh, respectively.

- ***Asset 9 – Chichra – Kharagpur Project***: This project is a 4-lane, 56.12 kms long stretch, on NH 49 which connects Chichra and Kharagpur in West Bengal.

- ***Asset 10 - Rewa –Lakhnadon Project***: This project is a 4-lane, 306.34 km long stretch, on NH 30 and NH 34 which connects Rewa, Katni, Jabalpur and Lakhnadon districts of Madhya Pradesh.

- ***Asset 11 – Kachugaon - Kaljhar Project***: This project is a 4-lane, 114.17 kms long stretch on NH 27, in the state of Assam.

- ***Asset 12 - Kaljhar – Patacharkuchi Project***: This project is a 4-lane, 27.30 kms long stretch on NH 27, in the state of Assam.

- ***Asset 13 - Lakhnadon – Mahagaon (Mohgaon) – Khawasa Project***: This project is a 4-laned, 107.35 kms divided section between Lakhnadon and Khawasa traversing through the districts of Mandai, Chhapara and Seoni in the state of Madhya Pradesh.

- ***Asset 14 - Orai – Barah Project***: The project road section Orai-Barah, with approximate length of 62.90 km, starts near Orai in Jalaun district and ends near Barah in Kanpur Dehat district.

- ***Asset 15 - Chitradurga Bypass – Hubli Project/ Karnataka Project*** : This project is a 214.47 km long stretch on NH 48 in the state of Karnataka.
- ***Asset 16 - Narasannapeta to Ranasthalam:*** This project is 53.799 Km on NH-16 six lane with paved shoulder from Narasannapeta to Ranasthalam in the state of Andhra Pradesh;
- ***Asset 17 - Ranasthalam to Hanumanthavaka Project:*** This project is a six lane with paved shoulder from Ranasthalam to Anandapuram section of NH 16 and four lane with paved shoulders from Anandapuram to Hanumanthavaka (Visakhapatnam) with total length of 66.544 km on NH 16 in the State of Andhra Pradesh;
- ***Asset 18*** – ***Anandapuram – Pendurthi – Anakapalle Project:*** This project is six lane with paved shoulder from Anandapuram-Pendurthi-Anakapalle with a total length of 48.605Km on NH-16 in the state of Andhra Pradesh;
- ***Asset 19 – Gundugolanu-Devarapalli-Kovvuru Project***: This project is a 69.884 km long stretch on NH-16 in the state of Andhra *Pradesh;*
- ***Asset 20 – Chittoor to Mallavaram Project:*** This project is 61.128 km long stretch on NH-140 in the state of Andhra Pradesh;
- ***Asset 21 – TN/AP – Border to Nalagampalli to AP/Karnataka Border Project***: This project is 84.797 km long stretch on NH 4 in the State of Andhra Pradesh;
- ***Asset 22 - Bareilly – Sitapur Project*:** This project is a 157.590 km long stretch in the State of Uttar Pradesh (From Km 262.000 to Km 419.590 of NH-24);
- ***Asset 23*** – ***Muzaffarnagar - Haridwar Project****:* This project is a section from of Old NH 58 (New NH-334) with a total length of 78.56 km in the State of Uttar Pradesh & Uttarakhand;
- ***Asset 24 - Raipur to Simga Project****:* This project is a 48.580 km stretch on NH-30 (Old NH 200) in the State of Chhattisgarh;
- ***Asset 25 - Simga to Bilaspur Project****:* This is a 77.945 km long stretch on NH-130 (Old NH-200) & NH-49 in the State of Chhattisgarhh.
- ***Asset 26- Gandhidham (Kandla) to Mundra Port Project:*** This project is a 71.400 km section of NH-41 in the State of Gujarat;

We believe that future development of highways along the Toll Roads as highlighted by the Traffic Consultant in their Traffic Reports and the increased government initiatives such as *Bharatmala Pariyojana* to improve efficiency across roads in India, will provide an impetus to the growth in traffic on the Toll Roads. Furthermore, each of the Toll Roads lie upon significant inter-city connection routes within the populous states of Maharashtra, Madhya Pradesh, Uttar Pradesh, Karnataka, Rajasthan, Telangana and Andhra Pradesh, with captive passenger and commercial traffic.

Experienced management team with industry experience

We are managed by qualified personnel of the Investment Manager who have management and operational experience in the roads and highways sector. In addition, qualified personnel of the Project Manager manage our projects. For further details, see the section entitled "*Parties to the Trust*" on page 75 of this Preliminary Placement Document. We believe that the experience and leadership of these teams will contribute to our growth and success and will position the Toll Road assets to be operated and managed in an efficient manner.

Growth opportunities and access to Sponsor's portfolio

The process of identification of Future Assets, offer of Future Assets to Trust and completion of transfer of Future Assets to the Trust including valuation mechanism may be refined and/or modified in line with the internal policies of NHAI. NHAI has already offered >1,500 km of roads to NHIT in last 3 years. Beyond this there is no commitment available from NHAI, however it has been a practice that NHAI at start of each financial year, identifies and publishes list of stretches to be monetized through InvIT and TOT route in the respective financial year.

We believe that this access to future toll road assets of the Sponsor or its existing or future subsidiaries will be an important source of growth in the future.

Favourable Concession Agreements terms with Low Counterparty Risk and Inflation Passthrough

We believe that we have balanced Concession Agreements terms with low counterparty risk due to the creditworthiness of our Sponsor. We believe this, along with the following factors, provide for promising prospects for our business:

- *Long Concession Life with the possibility for an extension.* Our Concession Agreements are for a period of 20 years and/or 30 years (as applicable) from the relevant Appointed Date. We believe this is a sufficiently long period that provides us with ample opportunity to refinance the assets on a fully amortized basis. For details, see "*Summary of the Concession Agreements*".

- *Termination Payments.* Furthermore, our Concession Agreements provide for termination payments under various default scenarios such as NHAI events of default or *force majeure* events. Under the Concession Agreements, NHAI is obligated to make termination payments in the case of a concessionaire event of default. NHAI's strong track record of meeting its obligations when they become due gives us confidence that any termination payments will be made in a timely manner. Such termination payments may be used to compensate our creditors. For details, see "*Summary of the Concession Agreements*".

- *Minimal Price Risk.* The toll rates for all Toll Roads are determined with reference to published base toll rates and are adjusted annually at the beginning of each fiscal year equal to 40% of the movement in the wholesale price index measured in December of the preceding year plus a fixed 3% as per NHAI Fee Rules. Given India's long track record of relatively higher inflation rates as well as the 3% fixed portion of the increase, we anticipate a continuing increase in toll rates over the life of the concession. We expect that this formula will minimize any risk of increasing operating costs over time.

- *Prohibition Against Additional Tollways.* Subject to certain exemptions, NHAI is prohibited from constructing, or permitting the construction of, any competing expressway or other toll road ("**Additional Tollway**") between specified stretches of each Toll Road at any time during the relevant Concession Period. We will be compensated in line with the terms of the Concession Agreement if our toll collection activities are impacted by the Additional Tollway. NHAI is also obligated to use its best efforts to ensure that the tolls to be levied on vehicles using the Additional Tollway are at least 25% higher than the toll rates of the impacted Toll Road.

- *Prohibition Against Competing Roads.* Subject to certain exemptions, NHAI is prohibited from constructing a Competing Road (as such term is defined in the Concession Agreements) of each of the Toll Roads during the respective Concession Periods.

- *Compensation for reduced toll rates.* In terms of the Concession Agreements for the Target Toll Roads, if the Project SPVs suffer a loss in revenue owing to reduction in the Equitable Tollable Length (*as defined in the relevant Concession Agreement*) pursuant to Capacity Augmentation (*as defined in the relevant Concession Agreement*), NHAI shall compensate the Project SPVs for such loss incurred by the Project SPVs, on a quarterly basis.

- *Installation of Additional Check Plazas.* Under the Concession Agreements, subject to certain restrictions we are permitted to install temporary or permanent fee collection booths to prevent fee evasion by users of the Toll Roads. We believe the installation of these check plazas will significantly decrease leakage in the Toll Roads, increasing cash collections and performance.

Investment Objectives

For details in relation to the investment objectives of the Trust, please see the section entitled "*Overview of the Trust- Investment Objectives*" on page 28.

Summary of our existing Toll Roads

	AP	AS	KGK	MH-B	CK	BWK	AB	SJ	CHK	OB	RL	KK	KP	LMMK	CDHH
Highway	NH27	NH27	NH44	NH48	NH27	NH 44	Connecting NH 19 and NH44	NH 27	NH 49	NH 27	NH 30 & NH 34	NH 27	NH 27	NH 44	NH 48
State	Gujarat /Rajasthan	Rajasthan	Telangana	Karnataka	Rajasthan	Maharashtra/ Telangana	Uttar Pradesh	Uttar Pradesh – Madhya Pradesh	West Bengal	Uttar Pradesh	Madhya Pradesh	Assam	Assam	Madhya Pradesh	Karnataka
Original COD	Mar-09	Mar-09	Dec-09	Jul-04	Mar-09	Apr-11	Mar-17	Jul-09	13-Feb-20	13-Aug-21	**	Patgaon: February 2020 Dahalapara: January 2020	Novembe r 2021	P1: Khawasa: Sept 2010 TP2: Allonia: June 2010 TP2: Madai: 2021	14.02.2023 (COD) 24.06.2021 (PCOD) 28.05.2021 (PCOD) 27.04.2022 (COD) 23.09.2020 (PCOD)
Length (km)	45.0	31.0	74.6	77.7	160.5	138.4	32.8	75.3	56.12	62.9	306.34	114.17	27.3	107.35	214.47
No. of Lanes	4	4	4	^^4	4	4	4	4	4	4	4	4	4	4	6
Km Chainag e (km)	601-646	646 – 677	135.5 - 211	515 – 592.240	891.9 – 1052.4	36.6-175	0 – 32.8	1305.08 – 1380.38	185+15 0 to 129+00 0	KM 1515.71 3 TO km 1578.87 2 (LHS) & km 1578.36 0 (RHS)	Km 656+000 to Km 725+185 of NH-30, Km 725+185 to km. 813+257, 4 Km 813+257 to Km 880+600 of NH-30, Km 880+600 of NH-30 (old NH-7) to Km 1428+557 of NH-34	Patgaon: KM 30+000 – KM 92+671 Dahalapara: KM 961+500 – KM 1013+000	KM 1013+00 0 – KM 1040+30 0	m 546+420 to Km 653+770	0+000 to 20+700 208+000 to260+000 260+000 to338+923 340+000 to 403+000
Toll Plaza (Kilomet ric point location)	Khemana (602.75)	Undvaria (670.75)	Pullur (200.95)	Hattargi (537.77), Kognoli (591.24)	Bassi (929.63), Aroli (986.63),	Darodha (92.50) Kelapur (150.45)	Raibha (10.80)	Raksha (1374.65)	Balibha sa 157+91 5	Usaka TP km 1519.88 0	km 840.567 (Mohtara Toll plaza), km 1362+780 (Boharipar Toll plaza), r km	Patgaon: KM 49+600, Dahalapara: KM 971+200	Galia: KM 1017+35 0	Khawasa (km 651+718) Madai (km 549+200)	(Hebbalu at Existing Ch. 237+650 (Design Ch.

	AP	AS	KGK	MH-B	CK	BWK	AB	SJ	CHK	OB	RL	KK	KP	LMMK	CDHH
					Dhaneshwar (1032.63)						739+000 (Kherwasani Toll plaza), km 675.700 (Odhaki Toll Plaza)				239+330), Chalageri at Ch. 286+110 (Design Ch. 287+845), Bankapur at Existing Ch.352+550 (Design Ch. 353+090) for the Project length of 214.470 Km.
Pavement Type	Flexible	Flexible	Flexible	Rigid/ Flexible	Rigid/ Flexible	Flexible	Flexible	Flexible	Rigid/ Flexible	Rigid/ Flexible	Rigid/ Flexible	Flexible	Flexible	Rigid/ Flexible	Rigid/ Flexible
Initial Development Model	Annuity	Annuity	Annuity	Annuity	EPC	EPC	EPC	EPC	EPC	Annuity	EPC	EPC	EPC	BOT	HAM
Annuity Concession End	Mar-24	Mar-24	Sep-26	Dec-19	-	-	-	-	-	Apr-26	-	-	-	-	September 23, 2035 May 28, 2036 June 24, 2036
Current Concessionaire(1)	L&T IDPL*	L&T IDPL*	APEL^	-	-	-	-	-	-	O B Infrastructure Ltd	-	-	-	Malaxmi Highway Pvt. Ltd, Indinfravit, Dilip Buildcon	PNC Chitradurga highways, IRCON Davangere Haveri Highways Ltd, Monte Carlo Hubli Haveri Highways Pvt Ltd, URS Scott

	AP	AS	KGK	MH-B	CK	BWK	AB	SJ	CHK	OB	RL	KK	KP	LMMK	CDHH
															Wilson, L.N. Malviya Infra Projects Pvt. Ltd.
Tolling Handover date(2)	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	29-Oct-22	29-Oct-22	29-Oct-22	1-April-24	1-April-24	1-April-24	1-April-24	1-April 2024	1-April-24	1-April-24
O&M Handover date	Mar-24	Mar-24	Sep-26	16-Dec-21	16-Dec-21	29-Oct-22	29-Oct-22	29-Oct-22	13th Feb, 2024 and Appointed date	13-Dec-24	13th Feb, 2024 and Appointed date	-	-	28th March, 2027, Appointed date, 29th November, 2027, 7th February, 2025	September 23, 2035 May 28, 2036 June 24, 2036
InvIT - Concession period	30 Years	30 Years	30 Years	30 Years	30 Years	20 Years	20 Years	20 Years	20 Years	20 Years	20 Years	20 Years	20 Years	20 Years	20 Years
FasTag enablement date	16-Feb-21	16-Feb-21	16-Feb-21	16-Feb-21	16-Feb-21	16-Feb-21	16-Feb-21	16-Feb-21	16-Feb-21	16-Feb-21	16-Feb-21	16-Feb-21	16-Feb-21	16-Feb-21	16-Feb-21

Source: Traffic reports, National Highways Infra Trust

^^ *6 laning of the highway is underway*

* *L&T Interstate Road Corridor Limited*

^ *Andhra Pradesh Expressway Limited*

**

RKJL		PCOD/COD
Odhaki		30-Oct-19
Kherwasani	1 Pkg - 2A 725+185 774+068	18-Aug-19
	2 Katni Bypass 774+068 793+065	Work is completed, NHAI is in process for awarding COD
	3 Pkg - 2B 793+065 813+257	18-Aug-19
Mohtara		04-Sep-19
Boharipar		14-Aug-20

Notes:

(1) Maintenance for project stretches to continue under scope of existing concessionaire until end of current concession.

(2) Appointed date as per the relevant Concession Agreements. Transitional support agreement has been entered into between NHAI and the Trust to manage tolling and O&M for the 6 months for all Target Toll Roads except for Asset No. 26 where it is 12 months.

Summary of new Toll roads

	NR	RH	APA	GDK	CM	TN/AP	BS	MH	RS	SB	GM
Highway	NH-16	NH-16	NH-16	NH-16	NH-140	NH-4	NH-30(old NH-24)	NH-334 & NH-34 (Old NH-58)	NH-30 (Old NH-200)	NH-130 (Old NH-200) & NH-49	NH-41
State	Andhra Pradesh	Andhra Pradesh	Andhra Pradesh	Andhra Pradesh	Andhra Pradesh	Andhra Pradesh	Uttar Pradesh	Uttar Pradesh and Uttarakhand	Chhattisgarh	Chhattisgarh	Gujarat
Original COD	6Lane PCOD: 20.01.2022 COD: 16.02.2023	6 Lane PCOD: 24.09.2020 COD: 30.06.2021	6Lane: PCOD: 08.11.2021	PCOD: 10.07.2021 COD: 30.09.2022	PCOD: 10.05.2021 COD: 08.06.2023	Pkg-1 Under Construction Pkg-2 31-07-2019 (COD)	Faridpur – April, 23 Maigalganj – October 23	16-06-2021	17-12-2021 (PCOD)	28-01-2020 (PCOD) 01-11-2018 (COD) (Bilaspur Bypass)	07-11-2015 (COD)
Length (km)	53.799 Km	66.544 Km	48.605 Km	69.884 Km	61.128 Km	84.797 Km	157.590 Km	78.560 Km	48.580 Km	77.945 Km	71.400 Km
No. of Lanes	six	Four/Six	six	Four	six	Four	Four	Four	Four/Six	Four	Four
Km Chainage (km)	580+671 to 634+470	634+000 to 700+544	682+98 to 731+585	15+320 Km to 85+204 Km	Km 0+000 to Km 61+128	134+890 to Km 219+687	262+00 Km to 419+590 Km	130+560 Km to 209+120 Km	Km.0+000 to Km.48+580	48+580 to Km.126+525	Km 0+000 to Km 71+400
Toll Plaza (Kilometric point location)	Madapam Toll Plaza (589+554)	Nathavalasa Toll Plaza 656+704	Dukkavanipalem Toll Plaza (686+540) Marripalem Toll Plaza (722+170)	Veeravalii Toll Plaza- (53+700)	Gadanki Toll Plaza (37+350)	Mahasamudram Staggered Toll Plaza Km 164+100 (RHS) and Km 164+360 (LHS)	Km 267.000 Faridpur Maigalganj Km 372.100	Chhapar Toll Plaza (Km 138+552 (NH-334) Bahadrabad Toll Plaza (Km 187+370 (NH-334))	Tarpongi Toll Plaza Ch:31.72 (RHS) & 32.00 (LHS) Staggered Toll Plaza	Bhojpuri Toll Plaza (Ch:97.520) Mudipar Toll Plaza (Ch:110.290)	Mokha (km 44+500)`
Pavement Type	Flexible	Flexible	Rigid	Flexible	Flexible	Rigid	Flexible	Flexible	Rigid	Rigid	Flexible
Initial Development Model	HAM	HAM	HAM	HAM	HAM	EPC	DBFOT	DBFOT	EPC	EPC	DBFOT
Annuity Concession End	19.01.2037	23.09.2035	07.11.2036	09.07.2036	09.05.2036	NA	Terminated on 13.04.2019	Terminated	NA	NA	Terminated on 25.07.2019
Current Concessionaire(1)	M/s APCO Arasavalli Expressway	M/s Ashoka Ranasthalam Anandapura	M/s DBL Anandapuram Anakapalle Highways	M/s GR Gundugolanu Devarapalli Highway Pvt.	M/s KNR Tirumala Infra Pvt.	NA	NA	NA	NA	NA	NA

	s Pvt. Ltd.	m Road Ltd.	Ltd.	Ltd.	Ltd.						
Tolling Handover date(1)	Appointed Date	Appointed Date	Appointed Date	Appointed Date	Appointed Date	Appointed Date	Appointed Date	Appointed Date	Appointed Date	Appointed Date	Appointed Date
O&M Handover date	Narasannapeta-Ranasthalam 20.01.2037 Ranasthalam Elevated-section,- 31.03.2037	(Ranasthalam to Anandapuram – 24.09.2035) (Anandapuram - 08.11.2036) (Anandapuram to Hanumanthavaka- PBMC ending 01.09.2029)	08.11.2036	10.07.2036	10.05.2036	18.12.2034	Appointed Date	51.51 – Appointed date 6.83 -- 19.02.2040 (Estimated Date of handover by HAM Contractor) 20.22 -- Appointed date	16-12 - 2025	Appointed Date	Date of end of concession of to be appointed HAM Concessionaire
InvIT - Concession period	20 years	20 years	20 years	20 years	20 years	20 years	20 years	20 years	20 years	20 years	20 years

(1) Appointed date as per the relevant Concession Agreements. Transitional support agreement has been entered into between NHAI and the Trust to manage tolling and O&M for the first 6 months for all Target Toll Roads but Asset no. 26 for which the same shall be 12 months.

DESCRIPTION OF OUR TOLL ROADS

Palanpur/Khemana – Abu Road Project ("Asset 1") and Abu Road –Swaroopganj Project ("Asset 2")

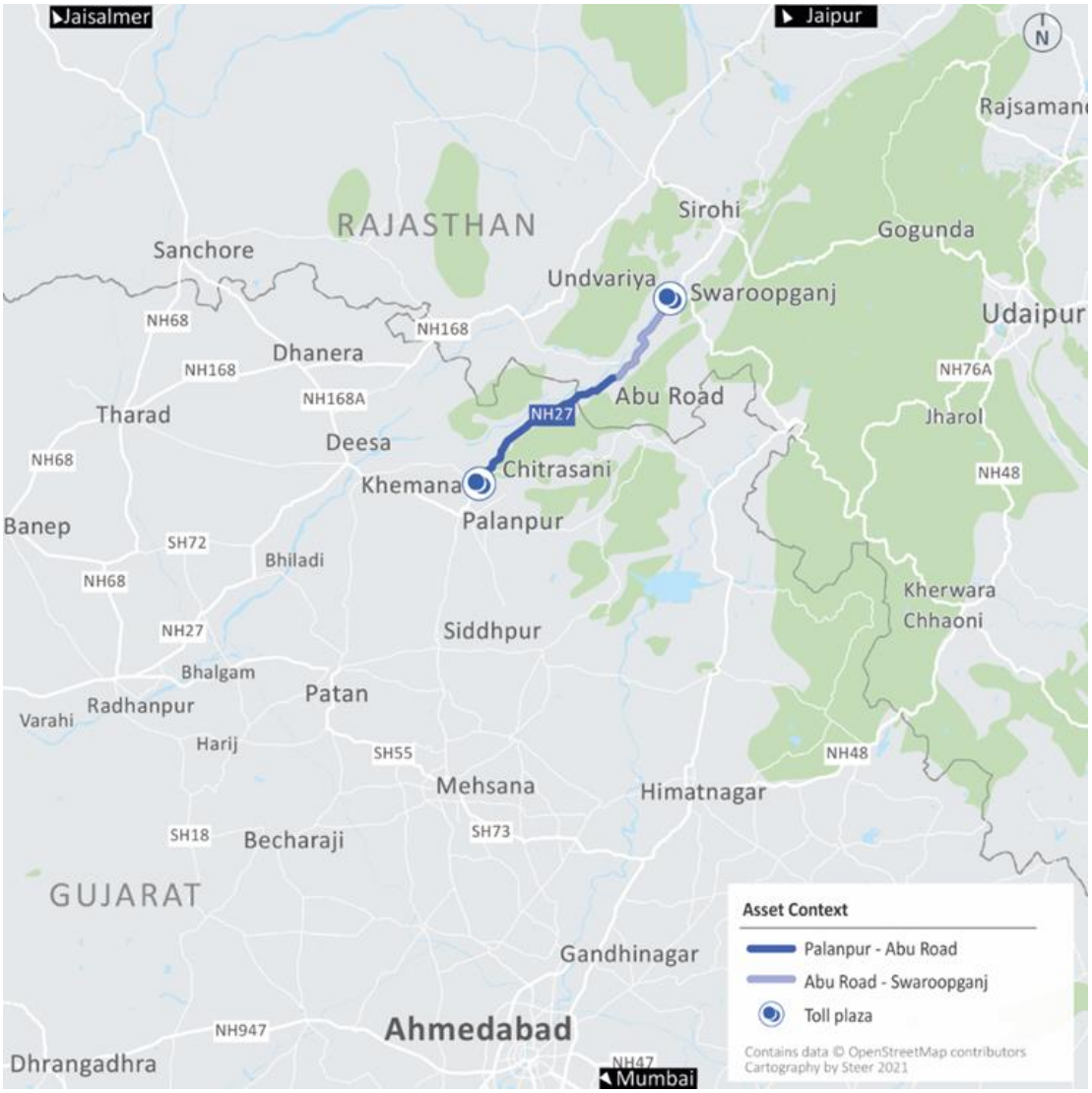
Project overview

According to the Traffic Consultant the assets are located on NH 27 in the states of Rajasthan and Gujarat and has one toll plaza each in the respective states namely Undavariya and Khemana. Both the toll plazas lie on the continuous section of NH 27 as shown in the map below and are located at:

Undavariya (KM 670.750): Four-laned Asset starts near Swaroopganj on the NH 27 and ends near Abu Road.

Khemana (KM 602.750): Four-laned Asset starts south of Abu Road and ends just south of Chitrasani village.

Figure: Asset context



Source: Steer cartography using OpenStreetMap data

Salient growth features and traffic generators

Undavariya (Rajasthan), Khemana (Gujarat) Toll Plazas lie on NH 27 which is the second longest highway in India. This section is one of the key connectors between Gujarat, Rajasthan and Eastern India and catering to East-West movement.

The Assets cater to the demands generated by the states connected through the National Highway. NH 27 runs over 3,507 kms completing the East-West movement and connects some of the major states and industrial centres of Western states of Gujarat, Rajasthan with Eastern states of West Bengal, Assam, UP etc. The traffic profile is largely goods vehicles undertaking long distance movements and CJV traffic between Rajasthan & Gujarat.

The key industries in this region include dairy, textile, diamond polishing, and marble processing. Palanpur is a major hub for dairy production, having one of the largest dairies in the State – Banas Dairy. Mehsana is a town located south of Palanpur and is also known for its dairy production and related processing services.

Udaipur in the east and Jodhpur in the north of the asset, are popular tourist destinations in the state of Rajasthan. Tourism constitutes most of the state's tertiary sector and Rajasthan is one of the key tourist destinations in India which has attracted over 17.9 crore domestic tourists in 2023[1].

CJV movements on these Assets are predominantly local and of a short distance between Palanpur, Swaroopganj, Deesa and other small towns. MAV traffic on the other hand is long-distance in nature, connecting Rajasthan, Punjab, Delhi, and Haryana in the north to industrial cities in Gujarat. The toll plazas also cater port-bound traffic including Gandhidham industrial cluster while connecting the regional centres, i.e., Bhilwara, Jodhpur, etc., with the port towns Kandla and Mudra in the Kutch region. There is also an amount of traffic carrying powder and other inputs to ceramic-based industry located in the Morbi area in Gujarat.

Traffic volume and composite of vehicles

Historical traffic data

Based on detailed review of historic trends of trip segmentation, Consultant has recommended that, the toll plaza data is available from 1st Apr 2021 till 29th Feb 2024 for Undavariya TP and Khemana TP.

The Assets trend at 37,000 PCU levels in FY24YTD. In FY24YTD, the Asset observed ~14,858 and ~14,548 vehicles at Undavariya and Khemana respectively, dominated by CJV/ MAVs. The Asset has shown growth at Undavariya but degrowth at Khemana compared to FY23 mostly due to local construction activities like RTO Circle near Palanpur which has caused congestion and resultant diversion to a state highway local road. On an average, the daily revenue collection at Undavariya and Khemana are ~INR 18.7 lakhs and ~INR 26.5 lakhs respectively in FY24YTD. **Table: Historical MADT and PCU - AS: Undavariya**

Vehicle Category	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23
CJV	6,234	7,608	6,908	6,171	6,069	6,529
LCV	375	357	322	341	350	358
Bus/2A	1,763	1,741	1,577	1,557	1,588	1,640
3A	788	720	699	686	696	679
MAV	5,392	5,108	4,816	4,839	5,302	5,059
OSV	4	4	3	3	5	5

[1] https://www.cnbctv18.com/travel/destinations/over-17-lakh-foreigners-and-18-crore-indian- tourists-visited-this-state-in-2023-18970441.htm

Total	**14,557**	**15,537**	**14,324**	**13,598**	**14,009**	**14,271**
PCU	**38,735**	**38,527**	**35,904**	**35,202**	**37,324**	**36,813**

Vehicle Category	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24
CJV	6,171	8,622	7,086	6,564	7,247
LCV	369	356	362	335	363
Bus/2A	1,655	1,561	1,736	1,650	1,812
3A	750	598	718	685	778
MAV	5,636	4,799	5,528	5,611	6,214
OSV	7	6	6	5	7
Total	**14,587**	**15,942**	**15,436**	**14,850**	**16,421**
PCU	**39,331**	**37,254**	**39,894**	**39,343**	**43,556**

Source: Steer analysis of client toll plaza data

Table: Historical MADT and PCU – PA: Khemana

Vehicle Category	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23
CJV	7,636	8,536	7,053	6,465	7,154	7,341
LCV	337	331	285	277	311	327
Bus/2A	1,541	1,514	1,331	1,255	1,381	1,472
3A	768	679	631	625	672	659
MAV	4,927	4,675	4,181	3,964	4,567	4,559
OSV	4	4	4	3	4	5
Total	**15,213**	**15,740**	**13,485**	**12,589**	**14,089**	**14,364**
PCU	**37,259**	**36,668**	**32,198**	**30,374**	**34,350**	**34,764**

Vehicle Category	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24
CJV	6,439	9,071	7,705	7,151	7,550
LCV	327	279	308	309	340
Bus/2A	1,433	1,341	1,492	1,431	1,557
3A	704	568	665	640	708
MAV	4,992	4,290	4,927	4,977	5,399
OSV	6	5	7	5	6
Total	**13,901**	**15,555**	**15,104**	**14,513**	**15,560**
PCU	**35,831**	**34,547**	**36,840**	**36,245**	**39,179**

Source: Steer analysis of client toll plaza data

Source: Steer analysis of client toll plaza data

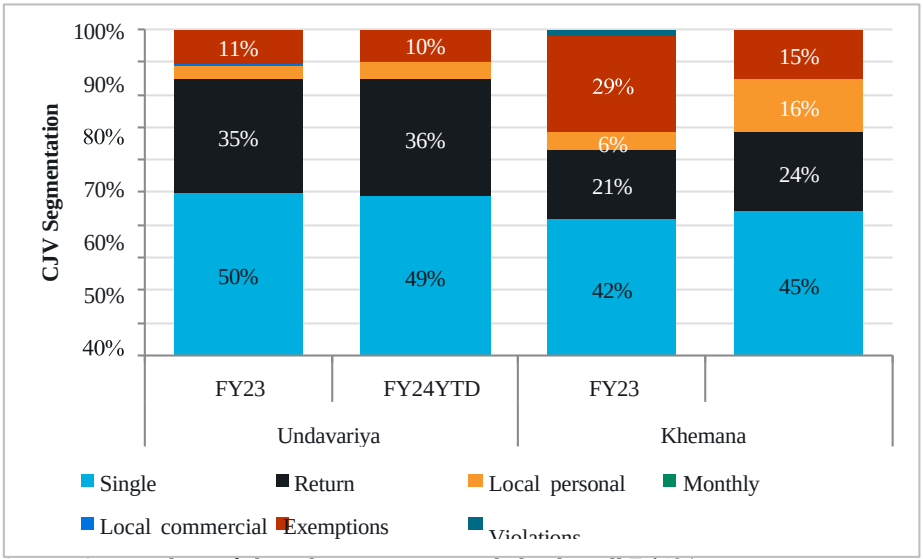
Figure: PCU and Adjusted MADT for FY23 – PA: Khemana

Source: Steer Analysis of client toll plaza data

Toll segmentation

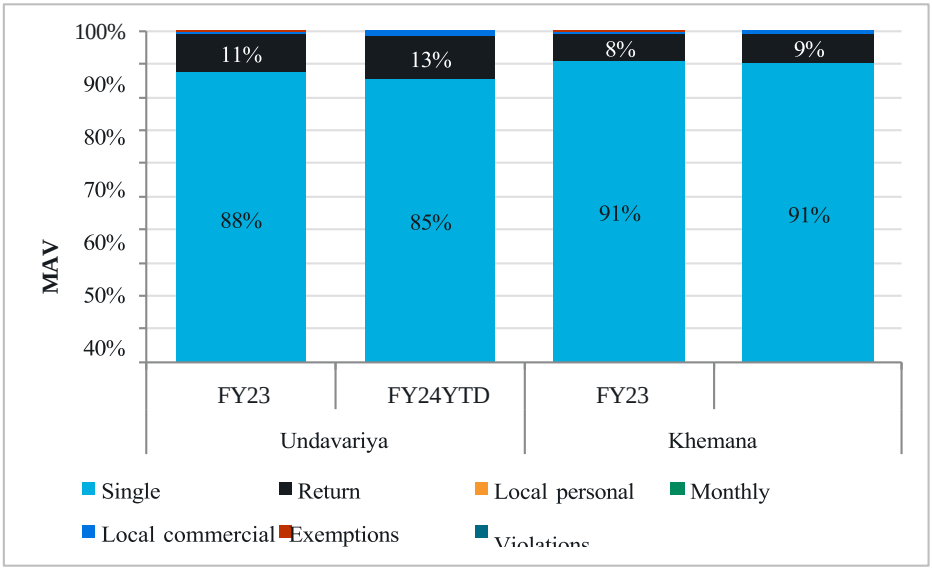
Based on detailed review of historic trends of trip segmentation, Consultant has recommended that the 85%-90% of the commercial vehicles (3A/ MAV) plying on the Asset are observed to buy single tickets as the Asset caters to long-distance movements. Return trips are primarily attributed to the short distance trips in the vicinity of the Asset.

Figure: Segmentation CJV



Source: Steer analysis of client data; FY24YTD includes data till Feb'24

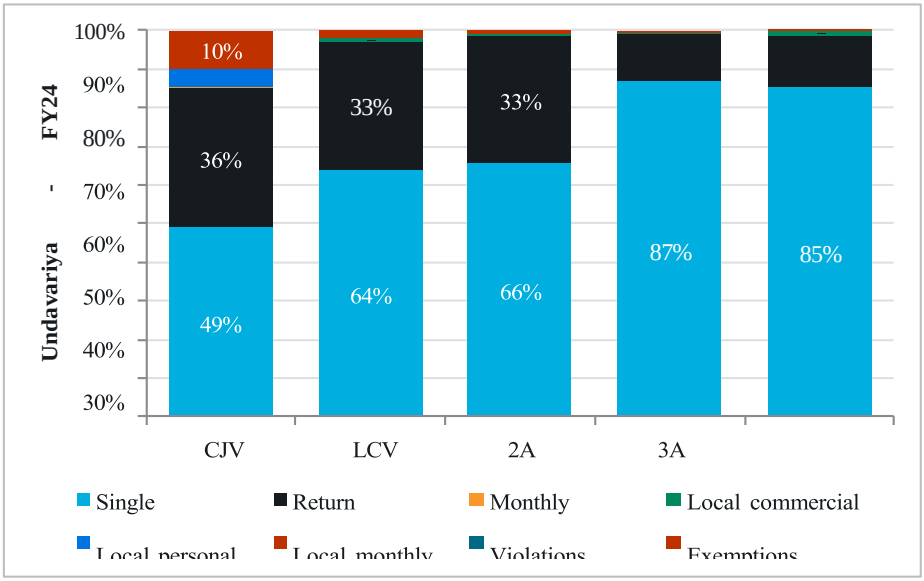
Figure: Segmentation MAV



Source: Steer analysis of client data; FY24YTD includes data till Feb'24

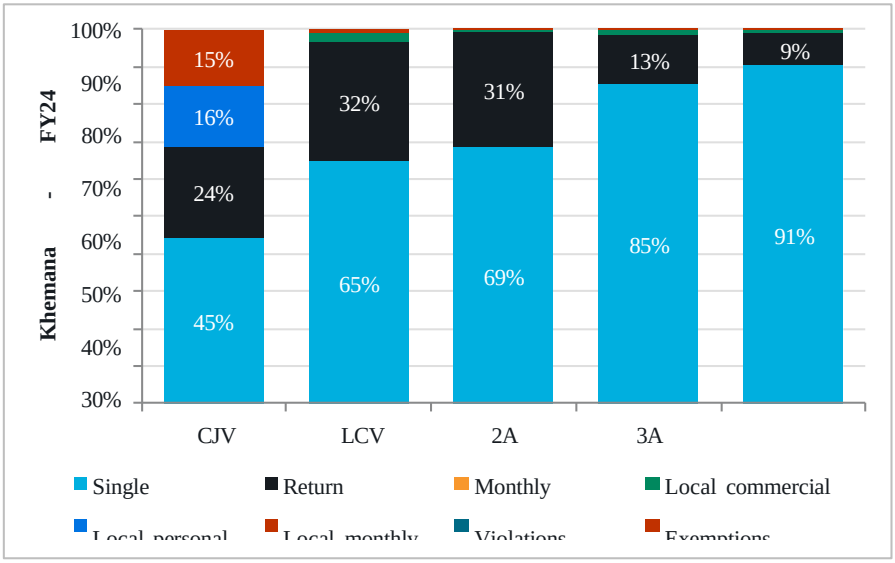
The final forecast segmentation is shown in the charts below. We believe the that average of the segmentation in actual traffic data for FY24 is representative of the travel patterns on the Assets.

Figure: Toll segmentation (%) at AS: Undavariya



Source: Steer analysis

Figure: Toll segmentation (%) at PA: Khemana



Source: Steer analysis

Traffic forecast

According to the traffic consutant the increase of traffic on any existing road alignment depends on how fast the background travel demand (background growth) will grow; and on how successfully the project road is in attracting that traffic (traffic capture). Background travel demand is driven by the prevalent socio-economic conditions in the region, which include:

- Changes in factors such as population, employment, and income distribution
- Economic growth (GSDP, and GDP).
- Growth of local industries near the Asset.

The model uses India GDP and GSDP of Rajasthan & Gujarat as the two macro-economic inputs which operate as growth drivers on our base year forecasts.

The network developments near the Assets' alignment which Steer believes would affect traffic on the Asset during the concession period are Amritsar Jamnagar Expressway, completion of Wester Dedicated Freight Corridor (WDFC), Two laning of Udaipur-Sirohi-Tharad road sections; Six Laning & LoS Improvement and Construction dampener & recovery post construction.

Steer has developed traffic and revenue forecasts for the Assets by taking into consideration all inputs discussed above – base year estimates, macro-economic assumptions, growth drivers, elasticities, and forecast ticket segmentation. The table below provides the final (background plus impacts) traffic growth on the Assets.

Table: Final (background plus impacts) AADT forecast – AS: Undavariya

Undavariya	FY24	FY25	FY30	FY35	FY40	FY43	FY52
CJV	5,801	6,200	8,765	11,752	15,389	17,882	26,672
Mini LCV	918	949	1,120	1,299	1,489	1,606	1,966

Undavariya	FY24	FY25	FY30	FY35	FY40	FY43	FY52

LCV	352	364	420	487	559	603	738
Bus	623	644	760	881	1,010	1,090	1,334
2 Axle	1,046	1,056	1,211	1,445	1,692	1,849	2,351
3 Axle	707	688	726	799	865	905	1,021
MAV	5,328	5,370	6,734	8,726	11,039	12,598	18,014
OSV	5	5	7	9	11	13	19
Total	**14,779**	**15,276**	**19,743**	**25,399**	**32,055**	**36,545**	**52,114**
PCU	**38,371**	**39,047**	**48,940**	**62,467**	**78,148**	**88,672**	**125,008**

Table: Final (background plus impacts) AADT CAGR (%) – AS: Undavariya

Undavariya	FY24-FY25	FY25-FY30	FY30-FY35	FY35-FY40	FY40-FY43	FY24-FY52
CJV	6.9%	7.2%	6.0%	5.5%	5.1%	5.6%
Mini LCV	3.4%	3.4%	3.0%	2.8%	2.6%	2.8%
LCV	3.4%	2.9%	3.0%	2.8%	2.6%	2.7%
Bus	3.4%	3.4%	3.0%	2.8%	2.6%	2.8%
2 Axle	0.9%	2.8%	3.6%	3.2%	3.0%	2.9%
3 Axle	(2.7%)	1.1%	1.9%	1.6%	1.5%	1.3%
MAV	0.8%	4.6%	5.3%	4.8%	4.5%	4.4%
OSV	5.6%	5.6%	5.1%	4.8%	4.5%	4.8%
Total	**3.4%**	**5.3%**	**5.2%**	**4.8%**	**4.5%**	**4.6%**
PCU	**1.8%**	**4.6%**	**5.0%**	**4.6%**	**4.3%**	**4.3%**

Source: Steer analysis

Table: Final (background plus impacts) AADT forecast – PA: Khemana

Khemana	FY24	FY25	FY30	FY35	FY40	FY43	FY52
CJV	6,598	6,809	10,262	13,797	18,067	20,993	31,312
Mini LCV	629	650	768	890	1,020	1,100	1,347
LCV	310	321	369	431	494	533	652
Bus	479	495	584	677	776	838	1,025
2 Axle	959	969	1,150	1,377	1,612	1,762	2,240
3 Axle	662	648	700	774	838	876	989
MAV	4,697	4,660	6,206	8,054	10,189	11,627	16,626
OSV	5	5	7	9	11	12	18
Total	**14,339**	**14,558**	**20,045**	**26,008**	**33,007**	**37,741**	**54,209**
PCU	**35,151**	**35,273**	**46,843**	**60,098**	**75,407**	**85,698**	**121,296**

Table: Final (background plus impacts) AADT CAGR (%) – PA: Khemana

Khemana	FY24-FY25	FY25-FY30	FY30-FY35	FY35-FY40	FY40-FY43	FY24-FY52
CJV	3.2%	8.5%	6.1%	5.5%	5.1%	5.7%
Mini LCV	3.4%	3.4%	3.0%	2.8%	2.6%	2.8%
LCV	3.4%	2.8%	3.2%	2.8%	2.6%	2.7%
Bus	3.4%	3.4%	3.0%	2.8%	2.6%	2.8%
2 Axle	1.1%	3.5%	3.7%	3.2%	3.0%	3.1%
3 Axle	(2.2%)	1.5%	2.0%	1.6%	1.5%	1.4%
MAV	(0.8%)	5.9%	5.4%	4.8%	4.5%	4.6%
OSV	5.6%	5.6%	5.1%	4.8%	4.5%	4.8%
Total	**1.5%**	**6.6%**	**5.3%**	**4.9%**	**4.6%**	**4.9%**
PCU	**0.3%**	**5.8%**	**5.1%**	**4.6%**	**4.4%**	**4.5%**

Source: Steer analysis

Tollable Length and Toll Rates

Based on detailed review of historic trends of trip segmentation, Consultant has recommended that in terms of tollable length, Undavariya currently (FY24) comprises 32.59 km whereas at Khemana the tolling length is 50.92 km. In India, toll rates are as per notification by the Ministry of Road Transport and Highways in the National Gazette. The present toll rates are determined with reference to the published base toll rates and are adjusted annually at the beginning of each fiscal year equal to 40% of the movement in the wholesale price index in December of the preceding year plus a fixed 3%.

According to the NHAI's toll notification for FY24, i.e., April 1, 2023, onwards, the toll rates at the Undavariya and Khemana toll plazas for Assets are as follows:

Table: FY24 toll rates – AS: Undavariya

Vehicle Type	Single	Return	Monthly
CJV	45	70	1555
LCV	75	115	2510
Bus/Truck	160	235	5260
3A	170	260	5735
MAV/ HCM/EME	245	370	8245
OSV	300	450	10040

Table: FY24 toll rates – PA: Khemana

Vehicle Type	Single	Return	Monthly
CJV	75	110	2425
LCV	120	175	3920
Bus/Truck	245	370	8215
3A	270	405	8960
MAV/ HCM/EME	385	580	12885
OSV	470	705	15685

Maharashtra Border – Belgaum Project ("Asset 3")

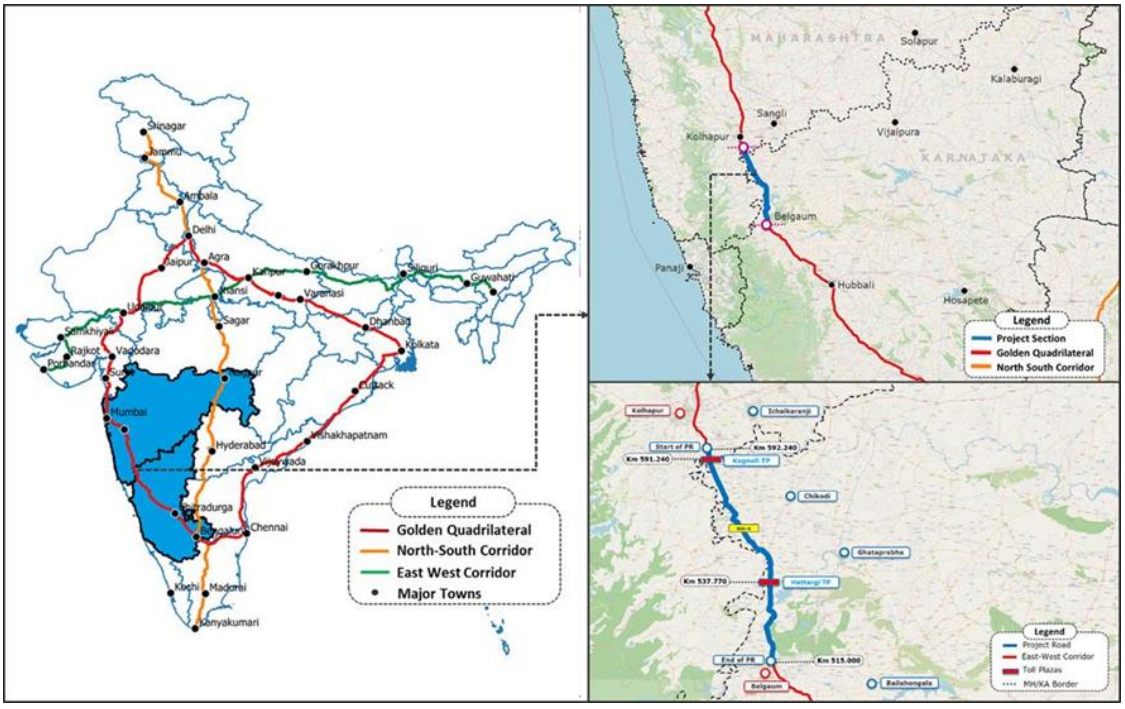
Project overview

According to the Traffic Consultant the project highway, NH-4, is part of the Golden Quadrilateral connecting many of the major industrial, agricultural, and cultural centres of India. The total length of NH-4 is roughly 1,235 km starting from Chennai in the state of Tamil Nadu and ending at Mumbai in the state of Maharashtra. NH-4 acts as a primary conduit for transportation of freight as well as passenger traffic in these states as well as various other important states in India. NH–4 connects important cities and towns like Pune, Satara, Karad, Sangli, Kolhapur, Belgaum, Dharwad, Hubli, Bangalore etc.

The project road section, Kagal-Belgaum, a part of the NH-4 in the state of Maharashtra/Karnataka, starts at km 592.240 of NH-4 near Kagal and ends at km

515.000 of NH-4 near Belgaum with a length of about 77.24 km. There are two operational toll plazas on the project road, one near Kognoli (km 591.240) and other near Hattargi (km 537.770). Both Kognoli and Hattargi toll plaza have 12 tolling lanes (6 in each direction).

Below figure shows the context and alignment of project road with major places along the highway.



Source: Traffic Report

Salient growth features and traffic generators

According to the Traffic Consultant, the project road, in wider context, serves the long-distance traffic for the freight vehicles, which is majorly plying between Mumbai/ Pune/ Delhi and Goa/ Bangalore/ Chennai/ Vellore. Apart from long distance traffic, it also serves the short distance traffic for both passenger and freight which is mainly generated between Kolhapur/Sangli/ Goa/Belgaum/ Khanapur/Hubbali/Dharwad and nearby places.

The project road section is located in the districts of Kolhapur and Belagavi (Belgaum).

Kolhapur district is situated in the southern side of the Maharashtra state with an area of 7,692 sq.km. It is one of the industrialised districts in Maharashtra. Due to the presence of abundant water and fertile soil, the district is prominent in cultivation of sugarcane, paddy, banana, soyabean and several vegetables. It is the major producer of jaggery and sugar. The district also houses many dairy and poultry farms. It is one of the prime centres of the textile industry, cotton mills and arts and handicrafts industry. The district also has the highest number of sugar refineries in the country and is also known as the sugar bowl of India. The district has emerged to be one of the highest per capita income districts in India.

Belagavi district is situated in northwest of Karnataka State with an area of 13,433 sq. km, sharing borders with Goa and Maharashtra states. The district with different agro climatic conditions and soil types has vast agricultural potential. Major crops grown in the district are paddy, maize, jowar, oil seeds, cotton, onion, tomato and sugarcane. Belgaum has 16 industrial estates, 6 industrial areas and 1 SEZ. District is important centre for manufacturing of valves, pumps, and its accessories, heavy machine tools and high-pressure oil hydraulics. It has 58 export-oriented units and 22 sugar industries in different parts of district. Rich deposits of natural resources like bauxite, uranium, silica sand, aluminium, laterite, limestone, dolomite, quartzite, and china clay are also found in the district.

Traffic volume and Vehicle Composition – AADT for FY24

The toll data for both the toll plazas was made available by the client from Jan 2021- February 2024. The month-on-month mode wise traffic for this period April 2023 to February 2024 for both the toll plazas is presented in

Figure 2**:**

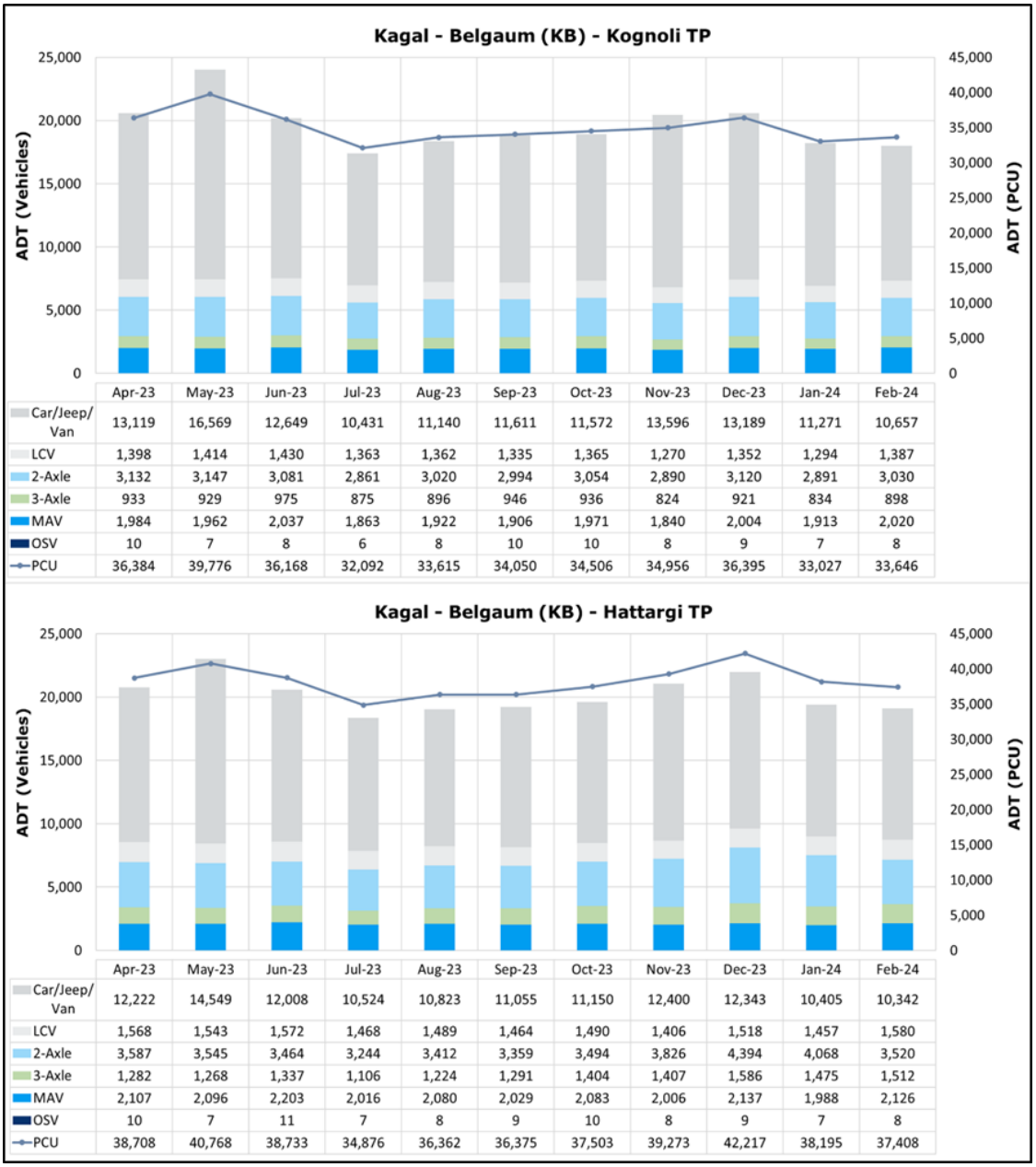


Figure 2: Source: Traffic Report

According to the Traffic Consultant the estimation for FY24 AADT is done after annualising the behaviour of April 2023-February 2024 traffic. For this purpose, a ratio/factor of average of eleven months (April to February) to twelve-month average derived from FY23 was adopted. FY24 AADT derived from the toll traffic data along with 11 months to yearly factors is presented in table below:

AADT/ Mode	Car/Jeep/ Van/Taxi	LCV	2A	3A	MAV	OSV	PCUs
Kognoli TP01							
ADT (Average Apr 2023 – Feb 2024)	12,346	1,361	3,020	885	1,940	8	34,870
Eleven-to-twelve-month factor (FY23)	0.99	1.00	1.00	1.00	1.01	1.06	
AADT FY24	12,264	1,365	3,031	888	1,954	9	34,902
Hattargi TP02							
ADT (Average April 2023 – Feb 2024)	11,620	1,505	3,605	1,048	2,066	9	37,174
Eleven-to-twelve-month factor (FY23)	0.99	1.00	0.99	1.00	1.00	1.04	
AADT (without construction vehicles)	11,550	1,517	3,601	1,052	2,081	10	37,194

Source: Traffic Report

Travel pattern

- The car traffic originating from Kagal/Kolhapur/Sangli & surroundings to Belgaum & surroundings is about 14-16 percent at TP01 & TP02
- About 23-24 percent of Bus traffic at TP01 & TP02 were found to be travelling from/to Kagal/Kolhapur/Sangli & surroundings to/from Belgaum & surroundings
- The local car and bus traffic at TP01 is about 48-60 percent travelling between Kagal/Kolhapur/Sangli & beyond to zones between TP01 & TP02
- The local car and bus traffic at TP02 is about 54-60 percent travelling between Zones between TP01 & TP02 to Belgaum & beyond.
- In case of MAV, around 22-23 percent at both the toll plazas were found to be plying from/to Mumbai/Pune& surroundings-Bangalore & surroundings

Network Impact - Pune – Bangalore Expressway

Pune – Bangalore Expressway is a proposed 8 lane access-controlled highway connecting Pune, Maharashtra and Bengaluru, Karnataka via Satara, Sangli, Belgavi (Belgaum), Dharwad, Hubli, Devanagere and Tumakuru.

In context of the project road, two road network developments which may impact the traffic on the project road are:

Impact of Pune - Bangalore Expressway

The assessment for the route between Pune and Bangalore/Chennai has been done for the four traffic streams:

- Traffic plying between Mumbai/Pune/Nashik & surroundings and Bangalore & beyond
- Traffic from/to Mumbai/Pune/Nashik & surroundings to/from Chennai & beyond

The total diverted traffic after the operation of Pune Bangalore Expressway at the two toll plazas is presented in **Table 0-2**.

Toll Plaza	Car	2A	3A	MAV
TP01	1.2%	12.3%	30.2%	26.6%
TP02	1.3%	10.3%	25.4%	25.0%

Table 0-2: Potential Divertible Traffic to the Expressway

The proposed expressway will be a greenfield alignment and considering the usual timelines for a long greenfield expressway project, the diversion impact is considered from FY31 onwards under Base Case. Owing to the gradual shift of traffic away from the project road, the traffic impacts have been assumed to take place in phases with about 50 percent in FY31, 75 percent in FY32 and 100 percent from FY33 onwards.

Impact of Completion of 6 laning construction activities on National Highway 48 (Old NH-4 – Route via PR)

The long-distance traffic stream commuting between Pune & beyond and Bengaluru & beyond has two routes to follow one via NH-48 (Project Road) and other one via Solapur (NH-65/NH-52/NH-50).

The traffic travelling on NH-65 (Pune-Solapur section) is able to bypass the toll plazas between Tembhurni-Solapur-Bijapur if it travels via Tembhurni-Pandharpur- Mangalwedha-Umadi-Arakeri and meet directly at Bijapur.

The traffic from/to Pune/Nashik/Mumbai and surroundings to/from Bengaluru/Chitradurga and beyond is the potential traffic which is likely plying on this route via NH65/NH52/NH50 due to the 6 laning construction activities ongoing on NH-

48. The gain to the PR after completion of six laning has been estimated using the ODs conducted on Nagarhalla TP.

The cost-ratio based analysis indicates gain of 57 2A trucks, 24 3A trucks and 196 MAV trucks resulting in a total PCU gain of 1,125. As the 6 laning is expected to be completed by March 2025, the impact has been considered in phases with 50 percent in FY26 and 100 percent in FY27.

Traffic Growth Rates

The estimated traffic growth rates for the project road based on the elasticity approach have been presented in **Table 0-3**.

FY/Modes	Car/MLCV	M Bus/ LCV	Bus/2A	3A	MAV/OSV
TP01 & TP02					
2025		2.4	2.4	1.8	6.1
2026	6.2	2.5	2.5	1.9	6.5
2027	6.0	2.5	2.4	1.9	6.3
2028	5.9	2.4	2.4	1.8	6.2
2029	5.6	2.3	2.3	1.8	5.9
2030	5.3	2.2	2.2	1.7	5.6
2031	5.3	2.2	2.2	1.7	5.0
2032	5.3	2.2	2.2	1.7	5.0
2033	5.3	2.2	2.2	1.7	5.0
2034	5.2	2.1	2.1	1.6	4.9
2035	5.2	2.1	2.1	1.6	4.9
2036	4.6	2.1	2.1	1.6	4.3
2037	4.5	2.1	2.0	1.6	4.2
2038	4.4	2.0	2.0	1.5	4.1
2039	4.4	2.0	2.0	1.5	4.1
2040	4.3	2.0	2.0	1.5	4.0
2041	4.2	1.9	1.9	1.5	3.9
2042	4.2	1.9	1.9	1.5	3.9
2043	4.1	1.9	1.9	1.4	3.8
2044	4.0	1.8	1.8	1.4	3.8
2045	4.0	1.8	1.8	1.4	3.7
2046	3.9	1.8	1.8	1.4	3.6
2047	3.8	1.7	1.7	1.3	3.6
2048	3.8	1.7	1.7	1.3	3.5
2049	3.7	1.7	1.7	1.3	3.4
2050	3.6	1.6	1.6	1.3	3.4
2051	3.4	1.5	1.5	1.2	3.1
2052	3.4	1.5	1.5	1.2	3.1

Table 0-3: Projected Traffic Growth Rates for Project Road (%)

The implied traffic growth rates for freight vehicles of 2A/3A and MAV after considering the impact of traffic gain due to completion of six laning of route via HHC and diversion to Pune-Bangalore Expressway under the base case have been presented in **Table 0-4**.

FY/Modes	TP01			TP02		
	2A	3A	MAV	2A	3A	MAV
2026	3.5	3.3	11.8	3.3	3.1	11.5
2027	3.4	3.2	11.4	3.3	3.0	11.1
2031	-4.1	-13.7	-9.0	-3.1	-11.3	-8.1
2032	-1.2	-7.4	-3.0	-0.6	-5.7	-2.5
2033	-1.3	-8.2	-3.7	-0.7	-6.3	-3.1

Table 0-4: Implied Traffic Growth Rates for Project Road (%)

Projected Traffic Data: Growth in PCUs

Total traffic in PCUs at the project road under the base case scenario after considering diversion impacts is presented in **Table 0-5**.

FY end	TP01-Kognoli	TP02- Hattargi	Average
2024	34,902	37,194	36,048
2025	35,752	38,134	36,943
2026	38,081	40,518	39,300
2027	40,519	43,011	41,765
2028	42,399	44,946	43,673
2029	44,286	46,887	45,586
2030	46,170	48,823	47,496
2031	44,902	47,618	46,260
2032	45,118	47,891	46,505
2033	45,291	48,123	46,707
2034	47,161	50,044	48,603
2035	49,091	52,024	50,557
2036	50,904	53,888	52,396
2037	52,763	55,798	54,281
2038	54,668	57,754	56,211
2039	56,614	59,750	58,182

FY end	TP01-Kognoli	TP02- Hattargi	Average
2040	58,605	61,791	60,198
2041	60,639	63,875	62,257
2042	62,717	66,002	64,360
2043	64,838	68,172	66,505
2044	67,000	70,383	68,692
2045	69,203	72,634	70,919
2046	71,447	74,925	73,186
2047	73,723	77,249	75,486
2048	76,037	79,609	77,823
2049	78,386	82,004	80,195
2050	80,769	84,433	82,601
2051	83,059	86,765	84,912
2052	85,418	89,167	87,293
CAGR (%) (FY24 to FY51)	3.3%	3.2%	3.2%

Table 0-5: Projected Traffic at PR in PCUs (after diversion)

Tolling Segmentation

The tolling stream distribution under the present study has been derived from the toll data taking an average of FY24 and the same is presented in **Table 0-6**.

Type	Car	LCV	Bus/2A Truck	3A Truck	4-6 A Truck	OSV
TP01 - Kognoli						
Single	45.5	77.7	63.7	87.8	88.9	100.0
Return	44.1	21.2	35.7	11.5	10.9	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	5.8					
Local commercial	0.0	0.0	0.0	0.0	0.0	
Exempt	4.6	1.1	0.6	0.7	0.2	
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
TP02 - Hattargi						
Single	42.9	72.9	58.2	80.6	86.9	100.0
Return	51.9	24.4	37.2	19.0	12.8	
Monthly	0.0	0.0	0.1	0.0	0.0	
Local personal	1.4	0.0	0.0	0.0	0.0	
Local commercial	0.1	0.4	4.3	0.1	0.0	
Exempt	3.7	2.3	0.2	0.2	0.2	
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 0-6: Tolling Distribution

Tollable length and Toll rates

The normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being charged at toll plazas along with the length which will be charged post augmentation to six lane configurations are presented in **Table 0-7**.

Toll Plazas	TP01	TP02
Existing Tolling Length till FY24	60.73	23.74
Tolling Length post six laning from FY25	79.39	41.83

Table 0-7: Tolling Lengths (in km) for Kagal-Belgaum

The stream of toll rates to be charged at two toll plazas of the project road till FY52 is presented in **Table 0-8**. The toll fee has been rounded to nearest 5 Rupees as per toll fee rules.

FY End	Car	LCV/ M Bus	Bus/ 2A Truck	3-axle Truck	MAV	O/size/HME	Car Local
TP01 - Kognoli							
2024*	60	100	210	230	330	400	235
2025*	60	100	210	230	330	400	235
2030	145	235	490	535	770	935	420
2035	175	285	600	655	940	1,145	515
2040	215	350	730	800	1,150	1,395	630
2045	265	425	895	975	1,405	1,710	770
2050	325	520	1,095	1,195	1,715	2,085	940
2052	350	565	1,185	1,295	1,860	2,260	1,020
TP02 - Hattargi							
2024*	25	40	80	90	130	155	235
2025*	25	40	80	90	130	155	235

FY End	Car	LCV/ M Bus	Bus/ 2A Truck	3-axle Truck	MAV	O/size/HME	Car Local
2030	75	125	260	280	405	495	420
2035	95	150	315	345	495	605	515
2040	115	185	385	420	605	735	630
2045	140	225	470	515	740	900	770
2050	170	275	575	630	905	1,100	940
2052	185	300	625	680	980	1,190	1,020

* *Toll rates at 75% during six laning*

Table 0-8: Toll Rates at Toll Plazas (in Rs)

For further details in relation to Asset 3, please refer to **Annexure C** of this Preliminary Placement Document.

Chittorgarh – Kota & Chittorgarh Bypass Project ("Asset 4")

Project Overview

According to the Traffic Consultant the project highway, NH-27, is part of the East – West corridor envisaged under National Highway Development Program (Phase – II). The total length of NH-27 is roughly 3,530 km starting from Porbandar in the state of Gujarat and ending at Silchar in the state of Assam while passing through the states of Rajasthan, Madhya Pradesh, Uttar Pradesh, Bihar and West Bengal. NH–27 connects important tourist and industrial cities and towns like Porbandar (port city), Rajkot, Palanpur, Udaipur, Chittorgarh, Jhansi, Kanpur, Lucknow, Muzaffarpur, Purnea, Siliguri, Jalpaiguri etc.

The project road section Chittorgarh-Kota, with approximate length of 160.5 km, starts near Chittorgarh in Chittorgarh district and ends near Kota in Kota district. There are three operational toll plazas on the project road, one near Bassi (TP01), one near Aroli Bassi (TP02), and another near Dhaneshwar Bassi (TP03). **Figure 0-1** shows the network context and alignment of project road with major places along the highway.

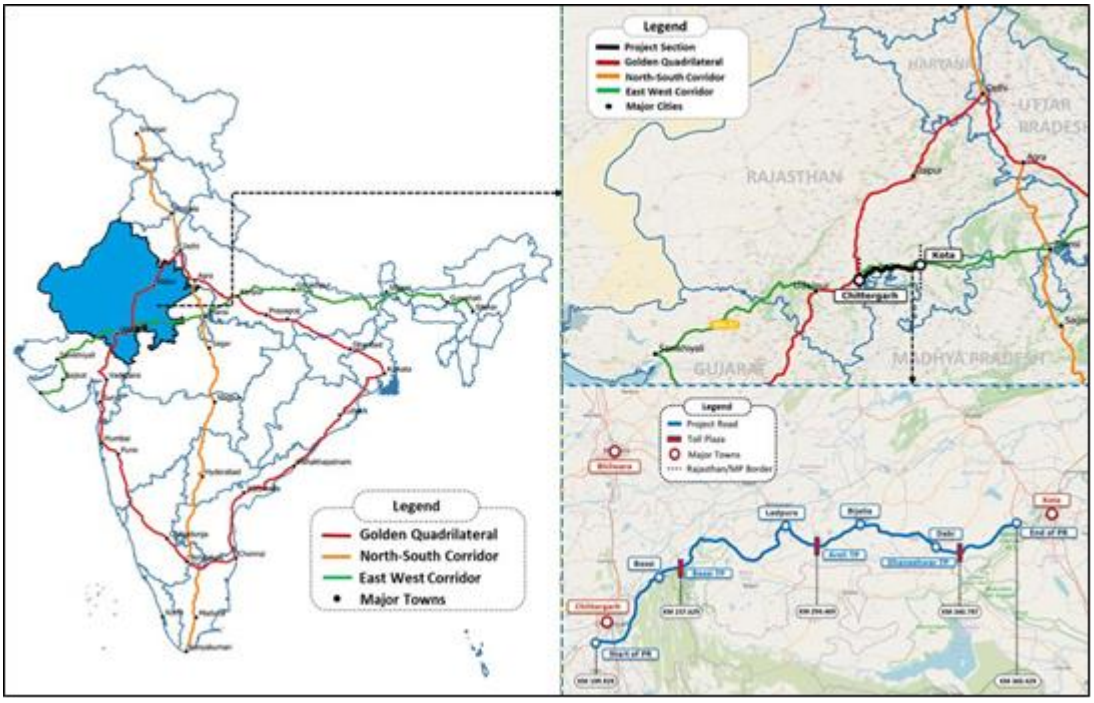


Figure 0-1: Chittorgarh-Kota Section and Location of Toll Plazas

Salient Growth Feature and Traffic Generators

The project road serves as a major route for east-west long-distance traffic which is majorly plying between Lucknow/Gorakhpur/eastern region and Palanpur/Rajkot/ western region, while also catering to short-distance traffic between Bundi/ Kota/ Baran and Udaipur/ Chittorgarh areas. The project road section is located in the districts of Chittorgarh, Bhilwara, Bundi and Kota districts in the state of Rajasthan.

The economy of Chittorgarh district is predominated by agriculture with major crops grown in the district are maize, soyabean, groundnut, sorghum, cotton and black gram in kharif season and wheat, mustard, gram, barley and opium in rabi season. The district is rich in mineral resources like barytes, china clay, limestone, sandstone and ochre.

Bhilwara district is located in south-eastern part of Rajasthan and its economy driven by agriculture with major crops grown in the district being maize, oil seeds, wheat, pulses, jowar, bajra and some fruits and vegetables. The district is also well established in textile industry along with several agro based industries. The district is also rich in mineral resources like lead, zinc, soap stone, china clay, feldspar, quartz, mica, marble, granite, asbestos and garnet.

Bundi district is also mainly dependent on agriculture for its economic growth with major agricultural crops include pulses, wheat, gram, barley, cotton, tobacco and oil seeds. Important fruit trees in Bundi include orange, pomegranate, lemon, guava and mango. Textile, tourism, handicrafts and small-scale industries play a pivotal role in the economic prosperity of Bundi in Rajasthan.

Kota district is trade centre for cotton, millet, wheat, coriander and oilseeds. Major cultivated crops include soybean, paddy and maize in kharif season while rapeseed & mustard, wheat, coriander and gram in rabi season. The industries prevalent in the district include cotton and oilseed milling, textile weaving, distilling, dairying, and the manufacture of metal handcrafts. Kota city is known as the “Education hub of India” with the presence of several coaching institutes for engineering and medical entrance exams. Kota is one of the industrial hubs in northern India, with chemical, cement, engineering, and power plants. Kota is rich in Kota stone, limestone, red clay, glass sand, dolomite and kankar along with reported occurrence of iron ore, fire clay, red and yellow ochre.

Traffic Volume and Vehicle Composition - AADT for FY24

The past toll traffic data for all the toll plazas was made available by the client from January 2021 to February 2024. The month-on-month mode wise traffic for the period from April 2023 to February 2024 for all three toll plazas is presented in **Figure 0-1**

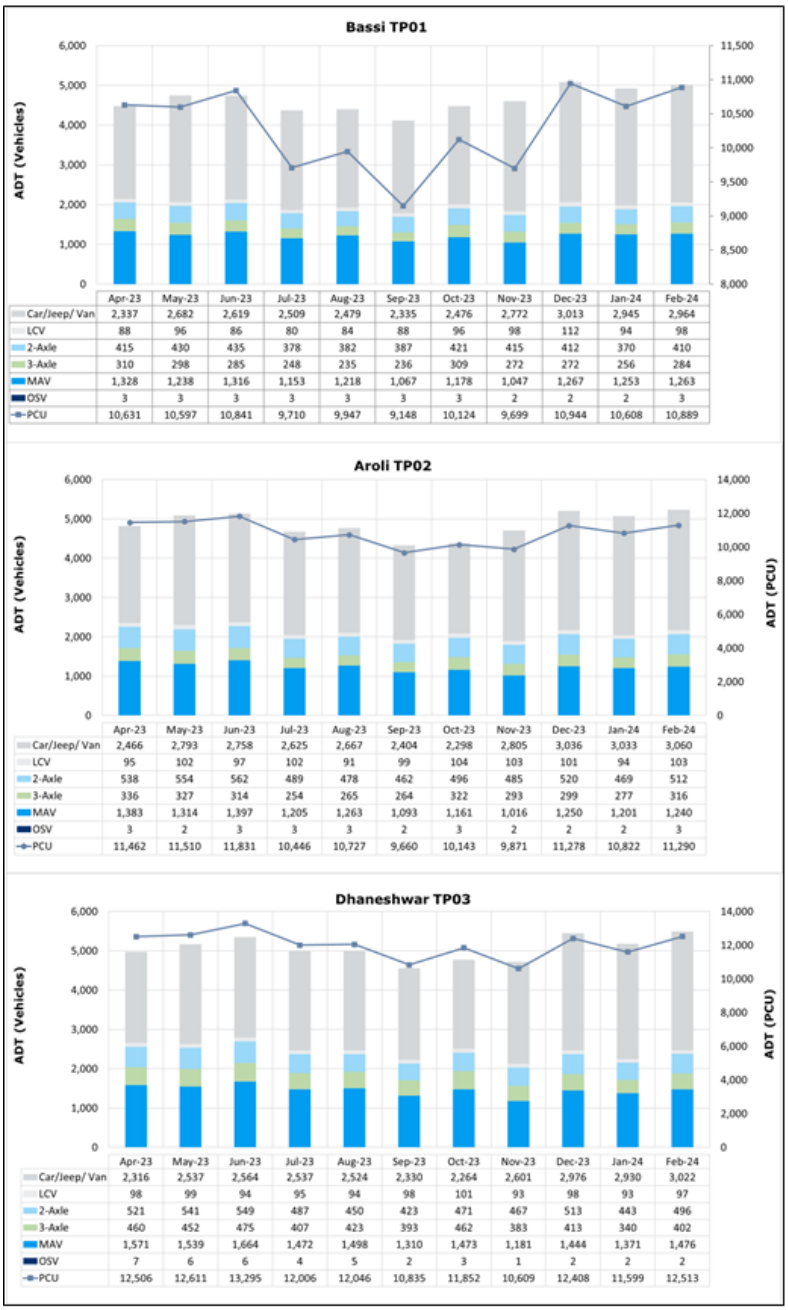


Figure 0-2: Month on Month Traffic Data for TP01, TP02 and TP03

The estimation for FY24 AADT is done after annualising the behaviour of April 2023- February 2024 traffic. For this purpose, a ratio/factor of average of April-February to twelve-month average derived from FY23 was adopted. FY24 AADT derived from the toll traffic data along with 11 months to yearly factors is presented in **Table 0-1**.

AADT/ Mode	Car/Jeep/ Van/Taxi	LCV	2A	3A	MAV	OSV	PCUs
Bassi (TP01)							
ADT (Average Apr 2023 – Feb 2024)	2,648	93	405	273	1,212	3	10,285
Eleven-to-twelve-month factor (FY23)	1.005	0.976	1.000	1.009	1.008	1.010	
AADT FY24	2,662	90	405	276	1,221	3	10,348
Aroli (TP02)							
ADT (Average Apr 2023 – Feb 2024)	2,722	99	506	297	1,229	2	10,822
Eleven-to-twelve-month factor (FY23)	0.999	0.971	0.998	1.007	1.007	1.009	
AADT FY24	2,718	96	505	299	1,238	2	10,854
Dhaneshwar (TP03)							
ADT (Average Apr 2023 – Feb 2024)	2,600	97	487	419	1,454	4	12,026

AADT/ Mode	Car/Jeep/ Van/Taxi	LCV	2A	3A	MAV	OSV	PCUs
Eleven-to-twelve-month factor (FY23)	0.997	0.973	0.992	0.993	1.003	1.018	
AADT FY24	2,593	94	483	416	1,459	4	12,015

Table 0-1: AADT for FY24

Travel pattern

- The car traffic originating from/to Chittorgarh & surroundings to/from Kota & surroundings is about 12-13 percent at all the toll plazas.
- In case of car traffic, about 13.6-16.8 percent at TP02 and TP03 were found to be traveling between Bhilwara & surroundings and Kota & beyond. It may be noted that the traffic originating/destined from/to Bhilwara takes an entry/exit from Ladpura town (located between Bassi TP and Aroli TP).
- In case of Bus, about 11.1-21.6 percent at TP01, TP02 and TP03 were found to be travelling between Udaipur & surroundings and Kota & surroundings.
- In case of MAV, 12.4-15.2 percent of MAV at TP02 and TP03 were found to be travelling between Bhilwara & surroundings and Kota & beyond.
- The MAV traffic originating from/to Chittorgarh & surroundings to/from Kota & surroundings is about 20-25.9 percent at all the toll plazas.

Network Impact

According to the traffic consultant the Delhi–Mumbai Expressway is an under-construction greenfield (8 lane facility) 1,380 km long controlled-access highway connecting the national capital Delhi with India's commercial capital Mumbai and will cut down the travel time between the two cities from 25 hours to 12 hours.

The estimation of traffic diversion away or to the project road has been done for three different streams of traffic which are listed below:

- Diversion away from PR for the traffic plying between Gandhidham/ Ahmedabad/ rest of Gujarat to Kota & beyond (towards Jhansi/ Lucknow/ Kanpur) - Stream A
- Diversion away from PR for the traffic plying between Vadodara & surroundings to Kota & beyond (towards Jhansi/ Lucknow/ Kanpur) - Stream B
- Diversion to PR for the traffic plying between Haryana/ Delhi & beyond to Chittorgarh/ Udaipur & surroundings currently using the route via Delhi – Jaipur – Kishangarh – Chittorgarh (via NH8/NH76/NH79A)

The impacts for both the cases have been derived separately and their net impact has been presented in **Table 0-2**

Modes	3A	MAV
A. Loss from PR- Stream A		
Potential Traffic	63	144
% Diversion from PR	61.1	68.0
Diversion from PR	-39	-97
B. Loss from PR- Stream B		
Potential Traffic	40	150
% Diversion from PR	96.5	97.0
Diversion from PR	-39	-145
C. **Total Loss from PR (A+B)**		
Expected loss from PR (Stream A+ Stream B)	-77	-243
D. Gain to PR		
Potential Traffic	312	842
% Gain in PR Traffic	31.8	34.3
Expected Gain to PR	99	289
E. Net gain to the PR (C+D)		
Net Gain to PR	22	47
F. As Percentage of AADT		
TP01	7.95%	3.75%
TP02	7.33%	3.70%
TP03	5.27%	3.14%

Modes	3A	MAV
G. Adopted – 50% gain		
TP01	4.0%	1.9%
TP02	3.7%	1.8%
TP03	2.6%	1.6%

Table 0-2: Impacts due to Delhi - Mumbai Expressway (DME)

The DME is likely to be fully operational by FY25. The adopted total divertible traffic corresponds to about 4 percent of 3A Trucks and about 2 percent of MAVs across all the toll plazas. The traffic shift is likely to happen gradually and hence the traffic gain has been considered in phases with 50 percent in FY25, 75 percent in FY26 and 100 percent from FY27 onwards.

Traffic Growth Rates

The estimated traffic growth rates for the project road have been presented in **Table 0-3**.

FY/Modes	Cars/MLCV	LCV/M Bus	2A	3A	MAV/OSV
2025	6.3	3.1	3.6	4.4	6.1
2026	6.7	3.3	3.9	4.7	6.5
2027	6.5	3.2	3.7	4.5	6.3
2028	6.4	3.1	3.7	4.5	6.2
2029	6.1	3.0	3.5	4.3	5.9
2030	5.8	2.8	3.3	4.0	5.6
2031	5.3	2.8	3.3	4.0	5.1
2032	5.3	2.8	3.3	4.0	5.1
2033	5.3	2.8	3.3	4.0	5.1
2034	5.2	2.8	3.3	4.0	5.0
2035	5.1	2.7	3.2	3.9	4.9
2036	5.0	2.7	3.2	3.9	4.8
2037	4.9	2.7	3.1	3.8	4.8
2038	4.9	2.6	3.1	3.7	4.7
2039	4.8	2.6	3.0	3.7	4.6
2040	4.7	2.5	3.0	3.6	4.6
2041	4.6	2.5	2.9	3.6	4.5
2042	4.6	2.5	2.9	3.5	4.4
2043	4.5	2.4	2.8	3.5	4.3
2044	4.4	2.4	2.8	3.4	4.3
2045	4.3	2.3	2.8	3.3	4.2
2046	4.3	2.3	2.7	3.3	4.1
2047	4.2	2.2	2.7	3.2	4.0
2048	4.1	2.2	2.6	3.2	4.0
2049	4.0	2.2	2.6	3.1	3.9
2050	4.0	2.1	2.5	3.0	3.8
2051	3.7	2.0	2.3	2.8	3.6
2052	3.7	2.0	2.3	2.8	3.6

Table 0-3: Projected Traffic Growth Rates for Project Road (%)

There has been a ban on sand mining in Rajasthan from November 2023 due to which the truck traffic on the PR is impacted in the H2 of FY24. Once the ban on mining is removed, the project road may witness an increase in freight vehicles. For estimation of the gain in traffic post lifting the ban, pre mining ban AADT for FY24 is estimated annualising behaviour of April 2023-October 2023 traffic using the factor of 6 to 12 month derived from FY23.

Comparing the pre mining ban AADT with FY24 AADT suggests a likely increase in traffic if the ban is lifted. **Table 3-14** presents the potential implications of removal of sand mining ban in the state of Rajasthan.

Description/Mode	3A	MAV
TP01 - Bassi TP		
A. ADT FY24 (April-October)	274	1,214
B. 7-to-12-month Factor (FY23)	1.06	1.06
C. AADT (Pre mining Ban) = (A*B)	291	1,284
D. AADT FY24 (April-February annualized)	276	1,221
E. Likely gain in traffic, if ban is lifted = (C-D)	16	63
TP02 - Aroli TP		
A. ADT FY24 (April-October)	297	1,259
B. 7-to-12-month Factor (FY23)	1.06	1.07
C. AADT (Pre mining Ban) = (A*B)	316	1,342
D. AADT FY24 (April-February annualized)	299	1,238
E. Likely gain in traffic, if ban is lifted = (C-D)	17	104

Description/Mode	3A	MAV
TP03 - Dhaneshwar TP		
A. ADT FY24 (April-October)	439	1,504
B. 7-to-12-month Factor (FY23)	1.07	1.07
C. AADT (Pre mining Ban) = (A*B)	469	1,604
D. AADT FY24 (April-February annualized)	416	1,459
E. Likely gain in traffic, if ban is lifted = (C-D)	53	145

Table 0-4: Gain in Traffic After Removal of Sand Mining Ban

There could be a potential traffic gain of around 16 to 18 3A trucks and 63 to 104 MAVs at TP01 & TP02 and an additional 53 3A trucks and 145 MAVs at TP03. 50 percent of this gain has been considered in FY25 and 100 percent in FY26.

The implied traffic growth rates for freight vehicles of 2A/3A and MAV after considering the impact of diversion from DME in FY25 to FY27 and gain of freight vehicles after removal of mining ban under the base case have been presented in **Table 0-5**.

FY/Modes	TP01		TP02		TP03	
	3A	MAV	3A	MAV	3A	MAV
2025	9.4	9.7	9.0	11.4	7.7	12.0
2026	8.4	9.4	8.1	10.8	7.2	11.4
2027	5.6	6.8	5.5	6.8	5.2	6.7

Table 0-5: Implied Traffic Growth Rates for Project Road After Diversion to DME (%)

Projected Mode-wise Traffic

Mode-wise projected traffic for the three toll plazas of the project road under the base case after considering diversion impacts till FY52 is presented in **Table 0-6**, **Table 0-7**, and **Table 0-8**.

FY	Car	LCV	Bus/2A	3A Truck	MAV	OSV	PCU
2024	2,662	90	405	276	1,221	3	10,348
2025	2,829	93	420	302	1,340	3	11,178
2026	3,019	96	436	328	1,466	3	12,065
2027	3,214	99	452	346	1,566	4	12,820
2028	3,420	102	469	361	1,664	4	13,567
2029	3,628	105	485	376	1,763	4	14,320
2030	3,837	108	501	392	1,862	4	15,077
2031	4,039	111	518	408	1,957	5	15,807
2032	4,251	114	535	424	2,056	5	16,573
2033	4,474	117	553	441	2,160	5	17,377
2034	4,705	121	571	459	2,268	5	18,205
2035	4,944	124	590	477	2,380	5	19,062
2036	5,192	127	608	495	2,495	6	19,946
2037	5,448	131	627	514	2,614	6	20,858
2038	5,713	134	647	533	2,737	6	21,799
2039	5,987	137	666	553	2,863	7	22,765
2040	6,268	141	686	573	2,994	7	23,760
2041	6,559	144	706	593	3,128	7	24,783
2042	6,858	148	727	614	3,266	8	25,833
2043	7,166	152	748	635	3,408	8	26,911
2044	7,482	155	769	657	3,553	8	28,016
2045	7,807	159	790	679	3,702	9	29,147
2046	8,140	162	811	701	3,855	9	30,305
2047	8,480	166	833	724	4,011	9	31,487
2048	8,829	170	854	746	4,170	10	32,693
2049	9,185	173	876	770	4,333	10	33,924
2050	9,549	177	898	793	4,498	10	35,178
2051	9,901	181	919	816	4,659	11	36,389
2052	10,266	184	941	839	4,825	11	37,642
AADT CAGR (%)							
FY25 - FY30	6.3	3.1	3.6	5.3	6.8	6.1	6.2
FY30 - FY35	5.2	2.8	3.3	4.0	5.0	5.0	4.8
FY35 - FY40	4.9	2.6	3.1	3.7	4.7	4.7	4.5
FY40 - FY45	4.5	2.4	2.8	3.5	4.3	4.3	4.2
FY45 - FY50	4.1	2.2	2.6	3.2	4.0	4.0	3.8
FY50 - FY52	3.7	2.0	2.3	2.8	3.6	3.6	3.4
FY25 - FY52	4.9	2.6	3.0	3.9	4.9	4.7	4.6

Table 0-6: Projected Mode-wise Traffic at TP01

FY	Car	LCV	2A Truck	3A Truck	MAV	OSV	PCU
2024	2,718	96	505	299	1,238	2	10,854
2025	2,889	99	523	326	1,379	2	11,799
2026	3,082	102	543	353	1,528	2	12,811
2027	3,282	105	564	372	1,632	2	13,604
2028	3,492	109	585	389	1,734	3	14,389
2029	3,704	112	605	405	1,837	3	15,182
2030	3,918	115	625	421	1,941	3	15,977
2031	4,124	118	646	438	2,039	3	16,745
2032	4,340	122	668	456	2,143	3	17,551
2033	4,568	125	690	475	2,252	3	18,397
2034	4,804	129	712	493	2,364	3	19,268
2035	5,048	132	735	513	2,480	4	20,168
2036	5,301	136	759	533	2,600	4	21,098
2037	5,563	139	782	553	2,725	4	22,056
2038	5,834	143	807	574	2,853	4	23,044
2039	6,113	147	831	595	2,985	4	24,060
2040	6,400	150	856	616	3,121	5	25,105
2041	6,697	154	881	638	3,260	5	26,178
2042	7,002	158	906	661	3,404	5	27,281
2043	7,317	162	932	683	3,552	5	28,412
2044	7,640	165	958	707	3,703	5	29,572
2045	7,971	169	985	730	3,859	6	30,759
2046	8,311	173	1,011	754	4,018	6	31,974
2047	8,659	177	1,038	778	4,180	6	33,213
2048	9,015	181	1,065	803	4,346	6	34,478
2049	9,378	185	1,092	828	4,516	7	35,769
2050	9,750	189	1,120	853	4,689	7	37,084
2051	10,109	193	1,146	878	4,856	7	38,353
2052	10,482	196	1,173	902	5,029	7	39,666
AADT CAGR (%)							
FY25 - FY30	6.3	3.1	3.6	5.3	7.1	6.1	6.3
FY30 - FY35	5.2	2.8	3.3	4.0	5.0	5.0	4.8
FY35 - FY40	4.9	2.6	3.1	3.7	4.7	4.7	4.5
FY40 - FY45	4.5	2.4	2.8	3.5	4.3	4.3	4.1
FY45 - FY50	4.1	2.2	2.6	3.2	4.0	4.0	3.8
FY50 - FY52	3.7	2.0	2.3	2.8	3.6	3.6	3.4
FY25 - FY52	4.9	2.6	3.0	3.8	4.9	4.7	4.6

Table 0-7: Projected Mode-wise Traffic at TP02

FY	Car	LCV	2A Truck	3A Truck	MAV	OSV	PCU
2024	2,593	94	483	416	1,459	4	12,015
2025	2,756	97	500	448	1,634	4	13,118
2026	2,940	100	520	480	1,821	5	14,304
2027	3,131	103	539	505	1,944	5	15,187
2028	3,331	106	559	528	2,065	5	16,066
2029	3,533	110	579	550	2,187	5	16,953
2030	3,738	113	598	573	2,311	6	17,843
2031	3,934	116	618	596	2,428	6	18,702
2032	4,141	119	638	620	2,551	6	19,604
2033	4,358	123	660	645	2,681	7	20,550
2034	4,583	126	681	671	2,815	7	21,524
2035	4,816	129	703	697	2,953	7	22,532
2036	5,057	133	726	724	3,096	8	23,571
2037	5,307	136	748	751	3,244	8	24,644
2038	5,565	140	771	779	3,396	8	25,749
2039	5,831	144	795	808	3,553	9	26,886
2040	6,106	147	819	837	3,715	9	28,054
2041	6,389	151	843	867	3,882	10	29,255
2042	6,680	155	867	898	4,053	10	30,489
2043	6,980	158	892	929	4,229	10	31,754
2044	7,288	162	917	960	4,409	11	33,051
2045	7,604	166	942	992	4,594	11	34,380
2046	7,929	170	967	1,025	4,784	12	35,739
2047	8,261	173	993	1,058	4,977	12	37,125
2048	8,600	177	1,019	1,091	5,175	13	38,540
2049	8,947	181	1,045	1,125	5,377	13	39,983

FY	Car	LCV	2A Truck	3A Truck	MAV	OSV	PCU
2050	9,302	185	1,071	1,160	5,582	14	41,454
2051	9,644	189	1,096	1,192	5,781	14	42,874
2052	10,000	192	1,122	1,226	5,987	15	44,342
AADT CAGR (%)							
FY25 - FY30	6.3	3.1	3.6	5.0	7.2	6.1	6.3
FY30 - FY35	5.2	2.8	3.3	4.0	5.0	5.0	4.8
FY35 - FY40	4.9	2.6	3.1	3.7	4.7	4.7	4.5
FY40 - FY45	4.5	2.4	2.8	3.5	4.3	4.3	4.2
FY45 - FY50	4.1	2.2	2.6	3.2	4.0	4.0	3.8
FY50 - FY52	3.7	2.0	2.3	2.8	3.6	3.6	3.4
FY25 - FY52	4.9	2.6	3.0	3.8	4.9	4.7	4.6

Table 0-8: Projected Mode-wise Traffic at TP03

Projected Traffic in PCUs

Total traffic in PCUs at the project road under the base case after considering diversion impacts at respective toll plaza locations till FY52 is presented in **Table 0-9**.

FY	TP01 - Bassi	TP02 - Aroli	TP03 - Dhaneshwar	Average
2024	10,348	10,854	12,015	11,072
2025	11,178	11,799	13,118	12,032
2026	12,065	12,811	14,304	13,060
2027	12,820	13,604	15,187	13,870
2028	13,567	14,389	16,066	14,674
2029	14,320	15,182	16,953	15,485
2030	15,077	15,977	17,843	16,299
2031	15,807	16,745	18,702	17,085
2032	16,573	17,551	19,604	17,909
2033	17,377	18,397	20,550	18,774
2034	18,205	19,268	21,524	19,666
2035	19,062	20,168	22,532	20,587
2036	19,946	21,098	23,571	21,538
2037	20,858	22,056	24,644	22,520
2038	21,799	23,044	25,749	23,531
2039	22,765	24,060	26,886	24,570
2040	23,760	25,105	28,054	25,640
2041	24,783	26,178	29,255	26,739
2042	25,833	27,281	30,489	27,868
2043	26,911	28,412	31,754	29,026
2044	28,016	29,572	33,051	30,213
2045	29,147	30,759	34,380	31,429
2046	30,305	31,974	35,739	32,673
2047	31,487	33,213	37,125	33,941
2048	32,693	34,478	38,540	35,237
2049	33,924	35,769	39,983	36,559
2050	35,178	37,084	41,454	37,905
2051	36,389	38,353	42,874	39,205
2052	37,642	39,666	44,342	40,550
CAGR (%) (FY24 to FY51)	4.8%	4.8%	4.8%	4.8%

Table 0-9: Projected Traffic on PR in PCUs (After Diversion)

Tolling Segmentation

Tolling distribution considered from FY25 onwards for the respective toll plaza locations across the project road is based on the average ticket distribution of FY24 (Dec-Feb) toll data and the same has been presented in **Table 0-10**.

Ticket Type/Modes	Car	LCV	Bus/2A Truck	3A Truck	MAV	OSV
TP01 - Bassi						
Single	38.2	61.3	47.9	65.5	78.0	100.0
Return	41.2	35.3	50.4	33.7	14.5	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	1.6					
Local commercial	0.2	0.5	0.7	0.3	7.1	
Exempt	18.8	2.9	0.9	0.5	0.4	
Total	100.0	100.0	100.0	100.0	100.0	100.0

Ticket Type/Modes	Car	LCV	Bus/2A Truck	3A Truck	MAV	OSV
TP02 - Aroli						
Single	41.0	58.2	41.0	63.5	76.2	100.0
Return	42.5	40.6	58.5	36.2	23.7	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	3.0					
Local commercial	0.0	0.0	0.0	0.0	0.0	
Exempt	13.4	1.2	0.5	0.4	0.1	
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP03 - Dhaneshwar						
Single	35.6	53.9	40.4	48.6	57.4	100.0
Return	40.9	41.8	55.8	49.9	39.1	
Monthly	0.0	2.4	0.0	0.0	0.0	
Local personal	11.2					
Local commercial	0.0	0.0	3.4	1.3	3.2	
Exempt	12.3	1.9	0.4	0.2	0.2	
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 0-10: Tolling Distribution from FY25 onwards

Tollable Length and Toll Rates

The details of normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being charged at toll plazas are presented in **Table 0-11**.

Toll Plazas	TP01-Bassi	TP02-Aroli	TP03-Dhaneshwar
A. Normal length	36.627	53.909	53.5
B. Bypass length @ 1.5 times	16.021	0	0
C. Equivalent Structure length	3.52	0.91	0
D. Total tolling length=(A+1.5*B+C)	64.1785	54.819	53.5

Table 0-11: Tolling Lengths (in km) for Chittorgarh-Kota

The stream of toll rates to be charged at the toll plaza of the project road in cardinal years till FY52 is presented in **Table 0-12**.

FY End	Car	LCV	Bus/ 2A Truck	3A Truck	MAV	OSV	Car Local
TP01-Bassi							
2024	90	150	310	340	485	595	330
2025	95	150	320	350	500	610	340
2030	115	190	395	430	620	755	420
2035	145	230	485	530	760	925	515
2040	175	280	590	645	930	1,130	630
2045	215	345	725	790	1,135	1,380	770
2050	260	420	885	965	1,385	1,685	940
2052	285	455	960	1,045	1,500	1,830	1,020
TP02-Aroli							
2024	80	125	265	290	415	505	330
2025	80	130	270	295	425	520	340
2030	100	160	340	370	530	645	420
2035	120	195	415	450	650	790	515
2040	150	240	505	550	795	965	630
2045	180	295	620	675	970	1,180	770
2050	225	360	755	825	1,185	1,440	940
2052	240	390	820	895	1,285	1,560	1,020
TP03-Dhaneshwar							
2024	75	125	260	280	405	495	330
2025	80	125	265	290	415	505	340
2030	100	160	330	360	520	630	420
2035	120	195	405	440	635	770	515
2040	145	235	495	540	775	940	630
2045	180	290	605	660	945	1,150	770
2050	220	350	735	805	1,155	1,405	940
2052	235	380	800	870	1,250	1,525	1,020

Table 0-12: Toll Rates at Toll Plazas (in Rs)

For further details in relation to Asset 4, please refer to **Annexure C** of this Preliminary Placement Document.

Kothakota Bypass – Kurnool Highway Project ("Asset 5")

Project Overview

According to the Traffic Consultant, the project highway, NH-44, is the longest highway in India connecting Srinagar with Kanyakumari and is part of North-South corridor envisaged under National Highway Development Program (Phase – II). The NH 44 highway covers a huge distance of 4,112 kilometres and passes through the states of Jammu and Kashmir, Punjab, Haryana, Delhi, Uttar Pradesh, Madhya Pradesh, Maharashtra, Telangana, Andhra Pradesh, Karnataka, and Tamil Nadu.

The project road section, Kothakota-Kurnool starts at km 135.469 near Kothakota and ends at km 211.061 at Kurnool with a length of about 74.6 km. There is one operational toll plaza on the PR near Pullur (km 200.95).

Figure 0-1 shows the context and alignment of project road with major places along the highway.

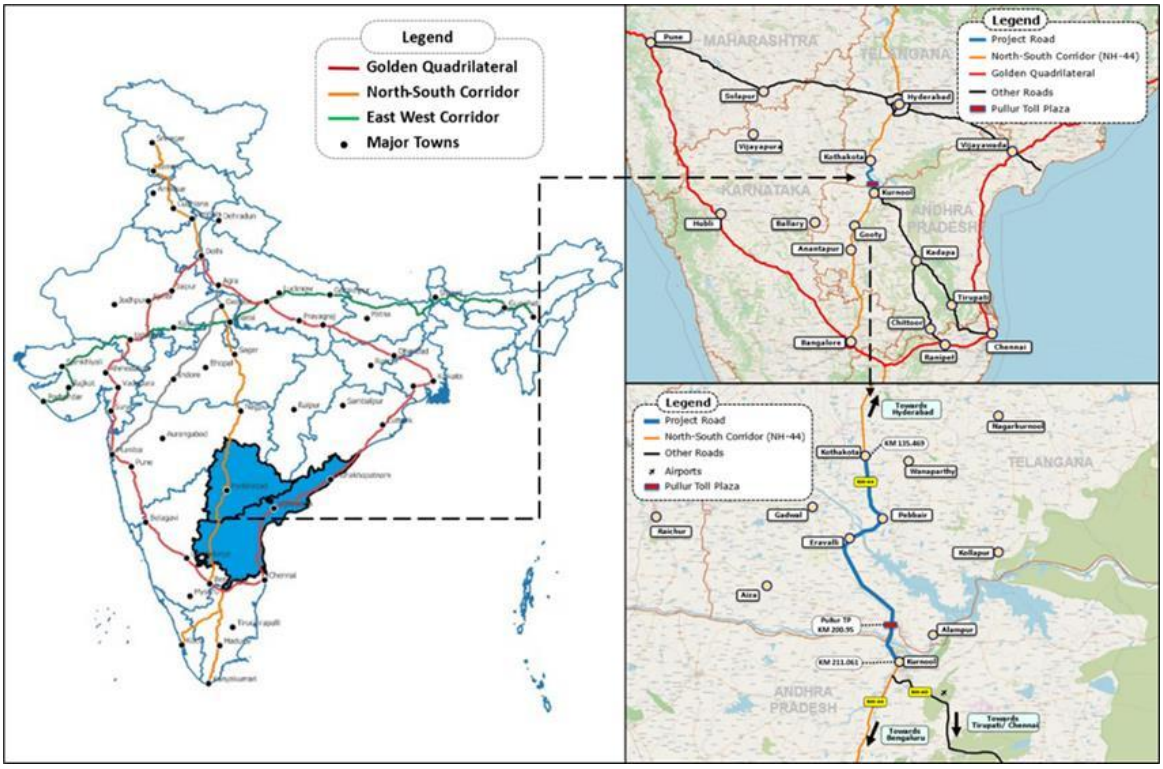


Figure 0-1: Kothakota-Kurnool Section and Location of Toll Plaza

Project Road Characteristics and Profile of Influencing Districts

The project road serves for long distance traffic, which is majorly plying between Hyderabad/ Nagpur/ northern region and Bengaluru/ Chennai/ southern region. Apart from long distance traffic, it also serves the short distance traffic which is mainly generated between Mahbubnagar/ Kothakota/ Wanaparthy/ Pebbair/ Gadwal located on the north of toll plaza and Kurnool/ Anantapur/ Nandyal areas located on the south of toll plaza. The project road section is located in the districts of Wanaparthy and Jogulamba Gadwal in the state of Telangana and Kurnool in the state of Andhra Pradesh.

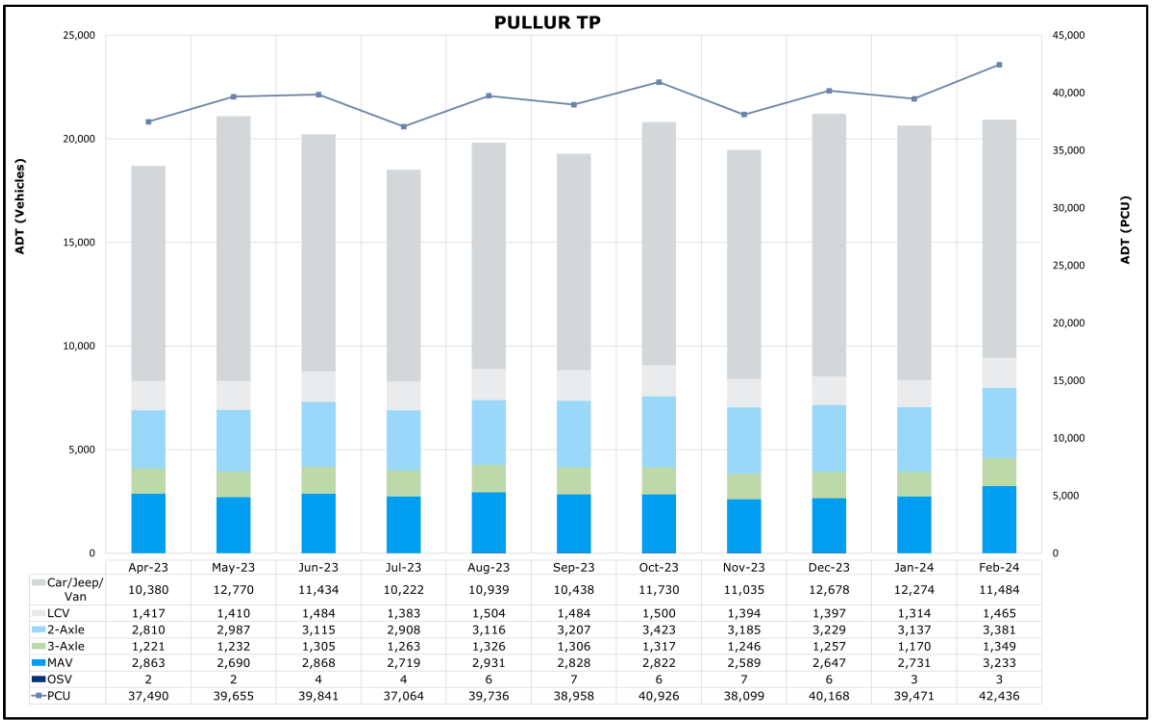
Jogulamba Gadwal district is situated in south-western part of Telangana state. Agriculture is the main livelihood of the people in Wanaparthy district with 75% total workers engaged in agro-based labour. Red sandy soil and sandy loam soil covers 89% of the area. Paddy, groundnut, jowar, maize, red gram, castor, cotton, and chili are the major crops cultivated within the district.

Jogulamba Gadwal district is renowned all over the world for its exclusive handloom Zari sarees and other useful fabrics and materials.

Kurnool district is situated in Western part of Andhra Pradesh. Almost half of the geographical area is under agriculture use. Paddy, cotton, tomato, and onion are the major crops grown in the district. Mining/quarrying is the prevailing industry in the district.

Traffic Volume and Vehicle Composition - AADT for FY24

The past toll traffic data for the toll plaza was made available by the client from April 2023 to February 2024 is presented in **Figure 0-2**.



	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24
Car/Jeep/ Van	10,380	12,770	11,434	10,222	10,939	10,438	11,730	11,035	12,678	12,274	11,484
LCV	1,417	1,410	1,484	1,383	1,504	1,484	1,500	1,394	1,397	1,314	1,465
2-Axle	2,810	2,987	3,115	2,908	3,116	3,207	3,423	3,185	3,229	3,137	3,381
3-Axle	1,221	1,232	1,305	1,263	1,326	1,306	1,317	1,246	1,257	1,170	1,349
MAV	2,863	2,690	2,868	2,719	2,931	2,828	2,822	2,589	2,647	2,731	3,233
OSV	2	2	4	4	6	7	6	7	6	3	3
PCU	37,490	39,655	39,841	37,064	39,736	38,958	40,926	38,099	40,168	39,471	42,436

Figure 0-2: Month on Month Traffic Data for Pullur TP

AADT for FY24

The old tolling system/ETC reading issues at Pullur Toll Plaza have been resolved. The estimation for FY24 AADT is done after annualising the behaviour of April 2023-February 2024 traffic. For this purpose, a ratio/factor of average of 11 months (April to February) to twelve-month average derived from FY23 was adopted. FY24 AADT derived from the toll traffic data along with 11 months to yearly factors is presented in **Table 0-1**.

Particulars	Car/ Jeep/ Van	LCV	2-Axle	3-Axle	MAV	OSV	PCUs
Pullur TP							
ADT FY24 (April-February)	11,399	1,432	3,136	1,272	2,811	5	39,441
Eleven - to - twelve- month factor (FY23)	0.99	1.004	1.002	1.002	1.01	1.02	
AADT FY24	11,339	1,437	3,144	1,275	2,837	5	39,541

Table 0-1: AADT for FY24 for the Project Road

Travel Pattern

Passenger Traffic:

- Majority of the passenger traffic travels from/to Hyderabad/ Nizamabad/ Adilabad to/from Kurnool/ Anantapur/ Bangalore/ Tamil Nadu. About 51.5 percent cars (5,037 vehicles) and buses (932 vehicles) ply along this route.
- Similarly, high share of passenger traffic was observed to flow between areas of Mahabubnagar/ Gadwal/ Rest of Telangana and Kurnool/ Anantapur/ Bangalore/ Tamil Nadu areas. About 25 percent cars (2,437 vehicles) and about 24 percent buses (424 vehicles) ply along this route.
- Highest share of freight traffic travels from/to Hyderabad/ Nizamabad/ Adilabad to/from Kurnool/ Anantapur/ Bangalore/ Tamil Nadu. About 56-57 percent of MLCVs and LCVs and about 36-49 percent of larger freight like 2A, 3A and MAVs ply along this route accounting for about 790-870 MLCV and LCVs, 510-665 2A and 3A trucks and about 1030 MAVs.
- Long distance movement is preferred over larger vehicles which is evident from the traffic movement between Nanded/ MP/ Delhi/ UP/ Northern India and Kurnool/ Anantapur/ Bangalore/ Tamil Nadu. About 21 percent (279 vehicles) of 2A trucks and about 27-28 percent of 3A trucks and MAVs accounting for about 356 and 758 vehicles of respectively categories ply along this route.

- The traffic movement between Solapur/ Pune/ Mumbai/ Gujarat/ Rajasthan and Kurnool/ Nandyal/ Southern Andhra Pradesh/ Chennai is the potential traffic for Surat – Chennai Expressway between Akkalkot and Kurnool.

- Primarily larger freight vehicles ply along this route which include about 2-3 percent of 2A and 3A trucks (accounting for 39 2A trucks and 25 3A trucks) and about 3 percent of MAVs (accounting for 77 MAVs).

Network Impacts

In the context of the project road of Kothakota – Kurnool section, there are two proposed alternative routes i.e., Surat-Chennai Economic Corridor and Hyderabad – Tirupati Highway which can impact the traffic plying on the project road. The potential divertible traffic and diverted traffic for each of the network developments is presented in **Table 0-2**.

Alternate Routes / Modes	Car	LCV	2A	3A	MAV
Surat – Chennai Economic Corridor					
Potential Traffic as % of AADT	0.3	1.6	1.2	1.9	2.7
Divertible traffic as % of AADT	0.3	1.6	1.2	1.8	2.6
Hyderabad – Tirupati Highway					
Potential Traffic as % of AADT	12.9	14.0	6.4	16.4	18.8
Divertible traffic as % of AADT	10.1	11.0	5.0	13.8	12.7
Combined Impact (%)					
Total Potential Traffic	13.2	15.6	7.7	18.3	21.5
Total Divertible Traffic	10.4	12.5	6.2	15.6	15.3

Table 0-2: Impact due to Alternate Routes for Project Road

According to the Traffic Consultant the two proposed alternate routes are likely to result in net traffic diversion of about 10.4 percent in cars and 12.5 percent in LCVs and about 15 percent in 3A and MAV traffic. Presently, the two routes are in the initial stages of implementation and are likely to be completed by FY26. To account for the gradual build-up of traffic on the alternate routes, the traffic shift is assumed to take place in phases with about 50 percent in FY27, 75 percent in FY28 and 100 percent from FY29 onwards.

Traffic Growth Rates

The estimated traffic growth rates for the project road using elasticity approach have been estimated for each year till FY52 and is presented in Table 0-3.

FY/Modes	Car/MLCV	LCV/M Bus	Truck	3A	MAV
2025	7.2	3.5	2.1	2.1	6.1
2026	7.7	3.7	2.3	2.2	6.5
2027	7.4	3.6	2.2	2.1	6.3
2028	7.3	3.6	2.2	2.1	6.2
2029	7.0	3.4	2.1	2.0	5.9
2030	6.6	3.2	2.0	1.9	5.6
2031	6.0	2.6	2.0	1.9	5.0
2032	6.0	2.6	2.0	1.9	5.0
2033	6.0	2.6	2.0	1.9	5.0
2034	5.9	2.5	1.9	1.9	4.9
2035	5.8	2.5	1.9	1.8	4.8
2036	5.7	2.5	1.9	1.8	4.8
2037	5.6	2.4	1.8	1.8	4.7
2038	5.5	2.4	1.8	1.7	4.6
2039	5.4	2.4	1.8	1.7	4.6
2040	5.3	2.3	1.7	1.7	4.5
2041	5.3	2.3	1.7	1.7	4.4
2042	5.2	2.2	1.7	1.6	4.3
2043	5.1	2.2	1.7	1.6	4.3
2044	5.0	2.2	1.6	1.6	4.2
2045	4.9	2.1	1.6	1.6	4.1
2046	4.8	2.1	1.6	1.5	4.1
2047	4.7	2.1	1.6	1.5	4.0
2048	4.7	2.0	1.5	1.5	3.9
2049	4.6	2.0	1.5	1.4	3.8
2050	4.5	2.0	1.5	1.4	3.8
2051	4.2	1.8	1.4	1.3	3.5
2052	4.2	1.8	1.4	1.3	3.5

Table 0-3: Projected Traffic Growth Rates for Project Road (%)

The implied traffic growth rates for freight vehicles after considering the impact of diversion under the base case have been presented in **Table 0-4**.

FY/Modes	TP01		
	2A	3A	MAV
2027	-1.0	-5.8	-1.8
2028	0.5	-2.2	1.8
2029	0.4	-2.5	1.3

Table 0-4: Implied Traffic Growth Rates for Project Road After Diversion (%)

Projected Mode-wise Traffic

Mode-wise projected traffic for the toll plaza of the project under the base case after considering diversion impacts till FY52 is presented in Table 0-5.

FY/Modes	Car	LCV	Bus/2A	3A	MAV	OSV	PCU
2024	11,339	1,437	3,144	1,275	2,837	5	39,541
2025	12,156	1,488	3,211	1,301	3,011	5	41,494
2026	13,088	1,543	3,283	1,330	3,207	6	43,697
2027	13,334	1,499	3,251	1,252	3,149	6	43,286
2028	13,919	1,500	3,268	1,224	3,206	6	44,101
2029	14,472	1,498	3,280	1,193	3,249	7	44,792
2030	15,430	1,546	3,344	1,216	3,432	7	46,907
2031	16,350	1,586	3,409	1,239	3,604	7	48,925
2032	17,324	1,627	3,476	1,262	3,784	8	51,044
2033	18,357	1,669	3,544	1,286	3,973	8	53,267
2034	19,431	1,712	3,612	1,310	4,169	9	55,562
2035	20,553	1,754	3,680	1,334	4,371	9	57,934
2036	21,722	1,798	3,748	1,358	4,579	10	60,387
2037	22,939	1,841	3,817	1,382	4,795	10	62,919
2038	24,206	1,886	3,886	1,406	5,017	10	65,533
2039	25,519	1,930	3,955	1,430	5,245	11	68,223
2040	26,882	1,975	4,024	1,454	5,481	11	70,994
2041	28,296	2,020	4,093	1,479	5,723	12	73,847
2042	29,761	2,065	4,163	1,503	5,971	12	76,781
2043	31,276	2,111	4,232	1,527	6,226	13	79,797
2044	32,842	2,156	4,301	1,551	6,488	14	82,893
2045	34,460	2,203	4,371	1,575	6,756	14	86,069
2046	36,128	2,249	4,440	1,599	7,031	15	89,325
2047	37,843	2,295	4,509	1,624	7,311	15	92,651
2048	39,607	2,342	4,578	1,647	7,597	16	96,054
2049	41,421	2,388	4,646	1,671	7,889	16	99,532
2050	43,283	2,435	4,715	1,695	8,187	17	103,083
2051	45,094	2,479	4,779	1,718	8,474	18	106,516
2052	46,980	2,524	4,845	1,740	8,772	18	110,076
AADT CAGR (%)							
FY24 - FY30	5.3	1.2	1.0	-0.8	3.2	6.1	2.9
FY30 - FY35	5.9	2.6	1.9	1.9	5.0	5.0	4.3
FY35 - FY40	5.5	2.4	1.8	1.7	4.6	4.6	4.1
FY40 - FY45	5.1	2.2	1.7	1.6	4.3	4.3	3.9
FY45 - FY50	4.7	2.0	1.5	1.5	3.9	3.9	3.7
FY50 - FY52	4.2	1.8	1.4	1.3	3.5	3.5	3.3
FY24 - FY52	5.2	2.0	1.6	1.1	4.1	4.7	3.7

Table 0-5: Projected Mode-wise Traffic

Projected Traffic in PCUs

Total traffic in PCUs at the project road under the base case after considering diversion impacts is presented in

FY end	Total Traffic
2024	39,541
2025	41,494
2026	43,697
2027	43,286
2028	44,101
2029	44,792
2030	46,907

FY end	Total Traffic
2031	48,925
2032	51,044
2033	53,267
2034	55,562
2035	57,934
2036	60,387
2037	62,919
2038	65,533
2039	68,223
2040	70,994
2041	73,847
2042	76,781
2043	79,797
2044	82,893
2045	86,069
2046	89,325
2047	92,651
2048	96,054
2049	99,532
2050	103,083
2051	106,516
2052	110,076
CAGR (%) (FY24 to FY51)	3.7

Table 0-6.

Table 0-6: Projected Traffic at PR in PCUs (after diversion)

Tolling Segmentation

The tolling stream distribution for FY24 is presented in Table 0-7.

Ticket Type/Modes	Car	LCV	Bus/ 2A Truck	3A Truck	MAV	OSV
Single	51.2	68.3	56.0	80.4	90.6	100.0
Return	38.3	31.0	42.7	19.3	9.2	
Monthly	0.0	0.4	1.0	0.1	0.0	
Local personal	8.3					
Local commercial	0.0	0.0	0.0	0.0	0.0	
Exempt	2.2	0.3	0.2	0.2	0.1	
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 0-7: Tolling Distribution based on toll data of FY24

Tollable Length and Toll Rates

In case of the project road, the details of normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being charged at Pullur toll plaza are presented in Table 0-8.

Pullur (TP01) at km 200.95	Existing Length
A. Normal length	69.857
B. Bypass length @ 1.5 times	2.950
C. Equivalent Structure length	18.150
D. Total tolling length=(A+1.5*B+C)	92.432

Table 0-8: Tolling Lengths (in km) for the Project Road

The stream of toll rates to be charged at the toll plaza of the project road in cardinal years till FY52 is presented in **Table 0-9**.

FY End	Car	LCV/ M Bus	Bus/2A	3A	MAV	OSV	Car Local
2024	130	215	445	490	700	855	330
2025	135	220	460	500	720	875	340
2026*	105	175	360	395	570	690	265
2027*	105	175	360	395	570	690	265
2028	135	215	450	495	710	865	335
2029	160	260	550	600	860	1,045	405
2030	170	270	570	625	895	1,090	420
2035	205	335	700	760	1,095	1,330	515
2040	250	405	850	930	1,335	1,625	630
2045	310	495	1,040	1,135	1,635	1,990	770

FY End	Car	LCV/ M Bus	Bus/2A	3A	MAV	OSV	Car Local
2050	375	610	1,275	1,390	1,995	2,430	940
2052	410	660	1,380	1,505	2,165	2,635	1,020

* Toll rates at 75% during six-laning

Table 0-9: Toll Rates at Toll Plaza (in Rs)

For further details in relation to Asset 5, please refer to **Annexure C** of this Preliminary Placement Document.

Agra Bypass Project ("Asset 6")

Project overview

According to the Traffic Consultant, the Asset is a 32.8 km four-lane road, forming part of the section connecting NH19 (old NH2) to NH44 (old NH7) in Uttar Pradesh, branches out to NH52 (old NH3) and NH44 (old NH7) at Gwalior. The Asset lies on the outskirts of Agra, bypassing the city and acting as a key connection between Delhi to the regions of Gwalior and south. It further connects the traffic originating from west from areas such as Gujarat and Jaipur to the cities in the East (Kanpur, Lucknow and beyond), thereby supporting the east-west movement.

There is one toll plaza on the asset and is located at and is shown in the map below:

- TP1 Raibha (KM 10.800)

Figure: Asset context - AB: Raibha



Source: Steer cartography using OpenStreetMap data

Salient growth features and traffic generators

According to The Consultant, the Asset is present in the agrarian state of Uttar Pradesh, the most populous state in India with a population of nearly 200 million people. AB forms part of the section connecting NH19 to NH44, later branching out to NH52 and NH44 at Gwalior.

The Asset caters to the demands generated by the states connected through the above- mentioned highways. NH19 runs over 1,465 kms completing the east – west movement and connects some of the major states and industrial centres of Delhi, Haryana, Uttar Pradesh with the eastern states of Bihar, Jharkhand, and West Bengal. On the contrary, NH44 completes the north-south movement of the country as it connects the northern states/UTs of Jammu and Kashmir, Punjab, Haryana, Delhi, Uttar Pradesh, Rajasthan, Madhya Pradesh, Maharashtra with the southern states of Telangana, Andhra Pradesh, Karnataka, and Tamil Nadu. Following a parallel route with NH44, NH52 starts in Punjab and ends in Karnataka.

The Asset lies on the outskirts of Agra which has several small and medium-scale industries and is one of the prime centres of the handloom, plastic pallets, and automotive spares, in addition to being a key tourist destination because of the Taj Mahal. Numerous major tourist attractions also exist in the vicinity of the Asset. Agra, Mathura, Fatehpur Sikri and other towns in the region are home to several historical monuments, places of worship and heritage sites.

Mathura, in north of the Asset, is a popular tourist place because of its religious importance. There are several industries in Mathura in the sectors of chemicals, manufacturing, production. It also has a refinery which is owned and operated by the state-run Indian Oil Corporation (IOCL) in Uttar Pradesh since 1982. IOCL has recently announced a future strategic plan to use the wind power generated electricity from Rajasthan to produce green hydrogen units in Mathura refinery. The refinery is a vital source of petroleum and related commodities carrying traffic on the Asset.

The Asset acts as a key connection between Delhi NCR and cities in Madhya Pradesh such as Gwalior and Indore, a city in south of the Asset in the state of Madhya Pradesh. Gwalior has an existing industrial area where the economy is driven by textile mills, artificial silk manufacturing plants, handicraft, and hand loom industries, tanning industries, and chemical industries. The city is also home to Gwalior Chemical Industries Limited. The group is primarily into the business of manufacturing and marketing of specialty chemicals, catering to both the domestic and exports customers in the agrochemical, paints and coatings, dyes, and flavour & fragrance industries. Indore has large industrial cluster for automobile and other ancillary industries. Pithampur industrial area is one of the biggest industrial clusters in the country and support large industrial activity.

Several major tourist attractions exist in and around the Asset, with both Delhi and Agra being two of the three nodes part of the Golden Triangle (Delhi, Agra, Jaipur) – one of India's most popular tourist packages for international tourists. Delhi, Agra, Fatehpur Sikri and other towns in the region are home to several historical monuments and heritage sites, including the famed Taj Mahal (Agra).

Religious tourism and pilgrimage sites include Surajkund, Badkhal Lake, ISKON temple (all in and around Central NCR), and Banke Bihari, and other major temples of Mathura and Vrindavan.

Traffic volume and composite of vehicles

Historical traffic data

The toll plaza data was available from 1st Apr 2021 till 29th Feb 2024. The corresponding revenue for the stated period was also provided by the Client. Therefore, to build the base estimates for FY24, we have considered:

- The Electronic Toll Collection (ETC) and cash data provided by NHAI.
- This data set has been considered for historical analysis and revenue reconciliation.

The Asset trends at 31,000 PCU levels in FY24YTD with robust truck performance continuing in FY24YTD.

On an average, the daily revenue collection on the Asset is ~INR 28 lakhs.

Table: PCU and MADT for FY24YTD - AB: Raibha

Vehicle Category	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23
CJV	2,443	2,665	2,930	2,523	2,491	2,299
LCV	438	446	466	494	483	509
Bus/2A	2,029	1,950	1,963	2,062	2,105	2,239
3A	1,880	1,815	1,764	1,780	1,856	1,922
MAV	3,643	3,645	3,493	3,404	3,427	3,561
OSV	3	2	3	2	3	5
Total	**10,437**	**10,524**	**10,618**	**10,265**	**10,365**	**10,534**
PCU	**31,237**	**31,042**	**30,538**	**30,119**	**30,533**	**31,589**

Vehicle Category	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24
CJV	2,108	2,802	2,815	2,426	2,709

Vehicle Category	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24
LCV	573	494	576	529	561
Bus/2A	2,353	2,010	2,238	2,078	2,335
3A	1,939	1,650	1,784	1,684	1,909
MAV	4,001	3,556	3,920	3,613	4,041
OSV	5	4	5	4	6
Total	**10,979**	**10,517**	**11,337**	**10,334**	**11,562**
PCU	**33,871**	**30,546**	**33,405**	**30,782**	**34,497**

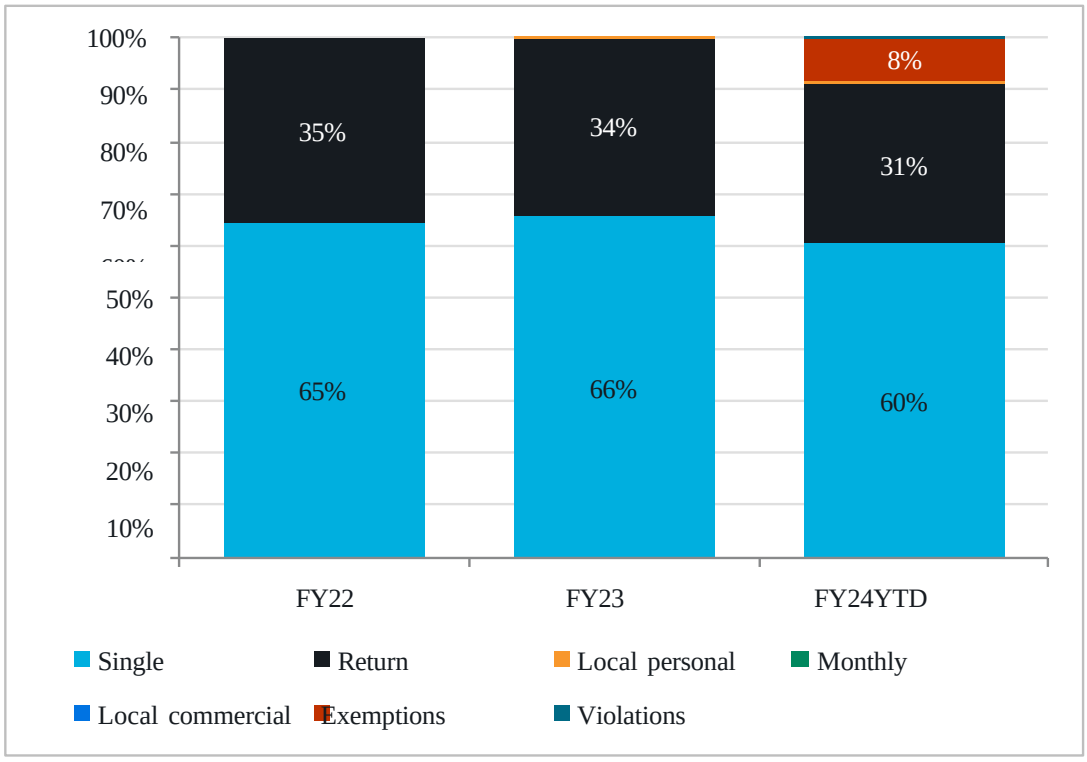
Source: Steer analysis of client toll plaza data

Toll segmentation

Based on detailed review of historic trends of trip segmentation, Consultant has recommended that on the Asset, CJVs have a considerable share of Return tickets as they primarily cater to short to medium distance movements which might lead to a user crossing the plaza several times in a day.

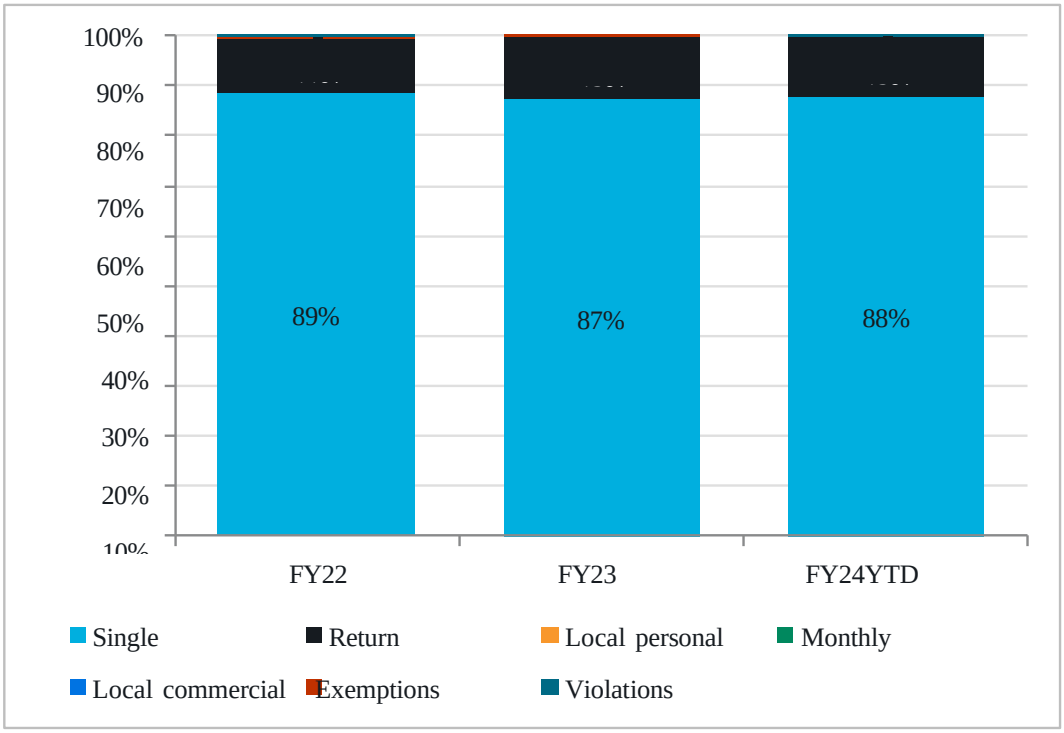
2A, 3A and MAV's report high proportion of single trips, this is further validated by the long trip length of the vehicles as observed in our OD data. More than 85% of the commercial vehicles plying on the Asset are observed to buy single tickets as the Asset caters to strategic long-distance movements. Return trips are primarily attributed to the short distance trips in the vicinity of the Asset.

Figure: Segmentation CJV -AB: Raibha



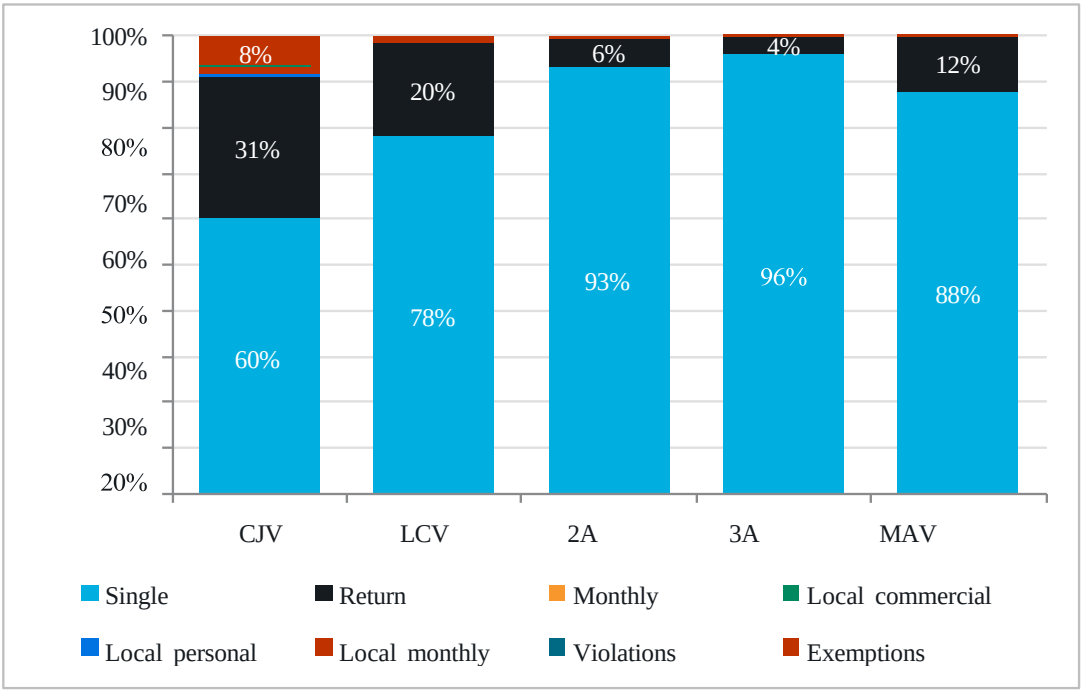
Source: Steer analysis, FY24YTD includes data till Feb'24

Figure: Segmentation MAV – AB: Raibha



Source: Steer analysis, FY24YTD includes data till Feb'24

Figure: Toll segmentation (%) FY24 onwards– Raibha



Source: Steer analysis

Traffic forecast

The increase of traffic on any existing road alignment depends on how fast the background travel demand (background growth) will grow; and on how successfully the project road is in attracting that traffic (traffic capture). Background travel demand is driven by the prevalent socio-economic conditions in the region, which include:

– Changes in factors such as population, employment, and income distribution

– Economic growth (GSDP, and GDP).

– Growth of local industries near the Asset.

The model uses India GDP and Uttar Pradesh GSDP as the two macro-economic inputs which operate as growth drivers on our base year forecasts.

The network developments near the Asset's alignment which Steer believes would affect

traffic on the Asset during the concession period are DME, WDFC and Agra Bypass completion.

Steer has developed traffic and revenue forecasts for the Asset by taking into consideration all inputs discussed above – base year estimates, macro-economic assumptions, growth drivers, elasticities, and forecast ticket segmentation. The table below provides the final (background plus impacts) traffic growth on the Asset.

Table: Final (background plus impacts) AADT forecast – AB: Raibha

Vehicle Type	FY24	FY25	FY30	FY35	FY40	FY43
CJV	2,342	2,483	3,333	4,372	5,653	6,533
Mini LCV	233	239	270	301	334	354
LCV	503	503	540	603	669	710
Bus	67	69	75	81	88	92
2A	2,056	2,001	2,454	3,065	3,779	4,251
3A	1,817	1,774	2,014	2,382	2,790	3,048
MAV	3,688	3,663	4,816	6,349	8,239	9,538
OSV	4	4	5	7	8	10
AADT	**10,711**	**10,736**	**13,507**	**17,160**	**21,561**	**24,536**
PCUs	**31,765**	**31,510**	**39,738**	**50,763**	**64,076**	**73,090**

Table: Final (background plus impacts) AADT CAGR (%) – AB: Raibha

Vehicle Type	FY24-FY25	FY25-FY30	FY30-FY35	FY35-FY40	FY40-FY43	FY24-FY43
CJV	6.0%	6.1%	5.6%	5.3%	4.9%	5.5%
Mini LCV	2.4%	2.4%	2.2%	2.1%	2.0%	2.2%
LCV	(0.0%)	1.4%	2.2%	2.1%	2.0%	1.8%
Bus	1.8%	1.8%	1.7%	1.6%	1.5%	1.7%
2A	(2.7%)	4.2%	4.5%	4.3%	4.0%	3.9%
3A	(2.4%)	2.6%	3.4%	3.2%	3.0%	2.8%
MAV	(0.7%)	5.6%	5.7%	5.3%	5.0%	5.1%
OSV	5.6%	5.6%	5.1%	4.8%	4.5%	5.1%
AADT	**0.2%**	**4.7%**	**4.9%**	**4.7%**	**4.4%**	**4.5%**
PCU's	**(0.8%)**	**4.7%**	**5.0%**	**4.8%**	**4.5%**	**4.5%**

Source: Steer analysis

Tollable Length and Toll Rates

Tolling length of the Asset currently (FY24) comprises of 7.055 km + 32.094 km bypass length. In India, toll rates are as per notification by the Ministry of Road Transport and Highways in the National Gazette. The present toll rates are determined with reference to the published base toll rates and are adjusted annually at the beginning of each fiscal year equal to 40% of the movement in the wholesale price index in December of the preceding year plus a fixed 3%.

According to the NHAI's toll notification for FY24, i.e., April 1, 2023, onwards, the toll rates at the Raibha toll plaza for Asset are as follows:

Table: FY24 toll rates – AB: Raibha

Vehicle Type	Single	Return	Monthly
CJV	80	120	2,630
LCV	130	190	4,250
Bus/Truck	265	400	8,905
3A	290	435	9,715
MAV/ HCM/EME	420	630	13,965
OSV	510	765	17,000

For further details in relation to Asset 6, please refer to **Annexure C** of this Preliminary Placement Document.

Borkhedi – Kelapur Project ("Asset 7")

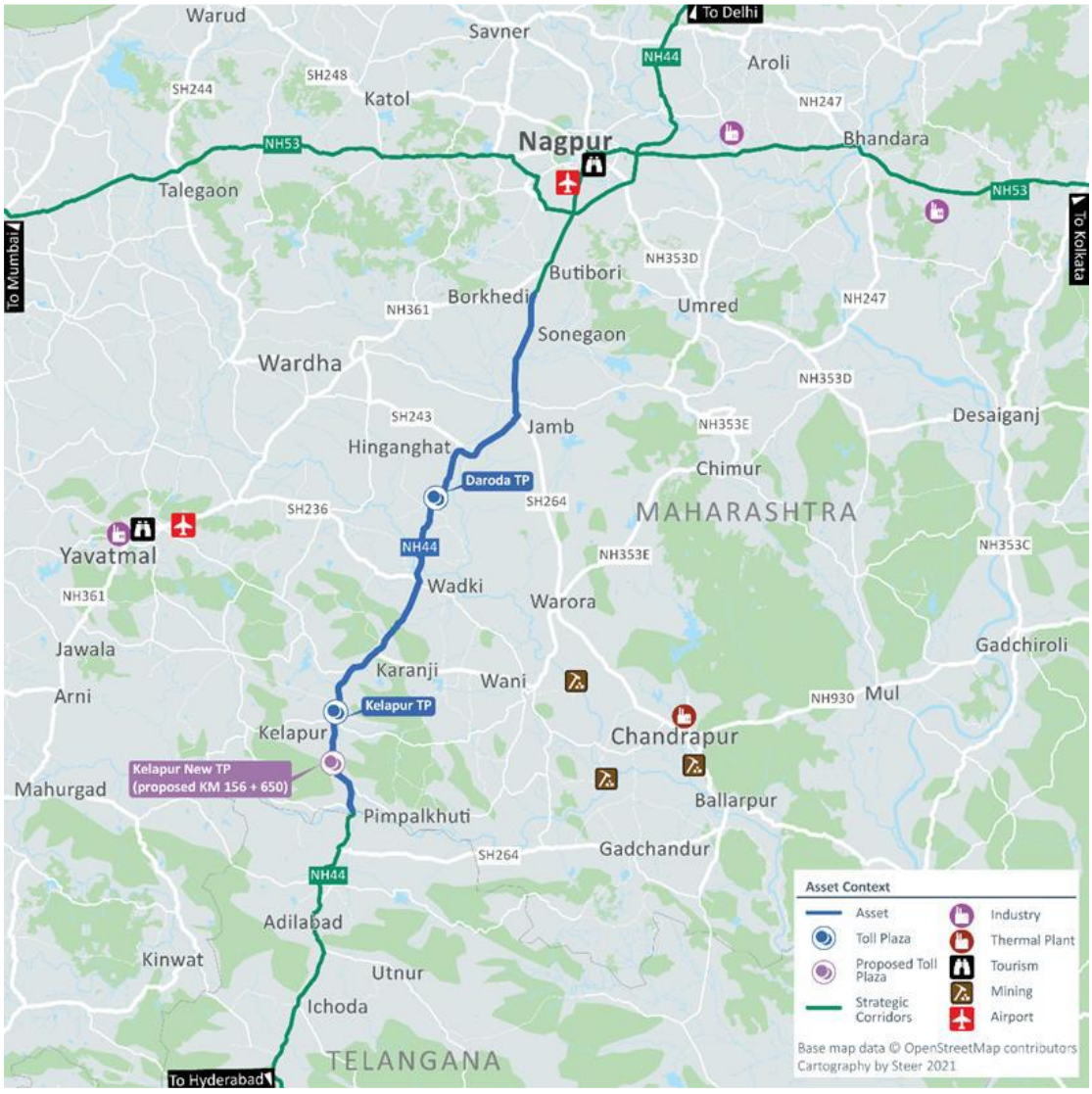
Project overview

According to the Traffic Consultant, Asset 7 is located on NH 44 and is about 139 km four-laned section between Borkhedi and Maharashtra/Telangana Border stretching across Nagpur, Wardha, and Yavatmal districts in the state of Maharashtra.

There are two toll plazas on the asset and are located at and is shown in the map below:

- Daroda (KM 92.500)
- Kelapur (KM 150.000)

Kelapur toll plaza is proposed to be relocated to a new location, approximately 6 km south of the existing location in absence of adequate land to construct proper toll plaza at the present location. This is named as Kelapur New TP (KM 156.650) in the map below. .



Source: Traffic Report

Salient growth features and traffic generators

The Asset is present in the state of Maharashtra, the second-most populous state in India with a population of nearly 124 million people. The Asset forms part of the strategic NH44 corridor catering to the north-south movement.

The Asset caters to the demands generated by the states connected through the above- mentioned highway. NH44 runs over 4,112 kms completing the north-south movement and connects some of the major states and industrial centres of

northern states/UTs of Jammu and Kashmir, Punjab, Haryana, Delhi, Uttar Pradesh, Rajasthan, Madhya Pradesh, Maharashtra with the southern states of Telangana, Andhra Pradesh, Karnataka, and Tamil Nadu. The traffic profile is predominantly goods vehicles undertaking long distance movements between the locations mentioned.

The Asset lies on the outskirts of Nagpur which is the third largest city in Maharashtra. It is known for medium to large scale industries alongside agriculture. The key industries are manufacturing and food processing as described below.

- Manufacturing segment includes products ranging from agriculture equipment, aluminium products, castings, cement, chemicals, paper and packaging, electrical equipment and fittings, textile engineering goods, tools manufacturing, fabrication and machining, ferro alloys, paints, furniture, plastic and moulding products, etc.

- Food processing giants having presence at Nagpur includes Haldiram, Dinshaw, Patanjali and other medium scales orange and spices processing units, etc.

Apart from the above-mentioned industrial segments present in Nagpur, the following are some additional developments announced by the government for the region:

- Government of Maharashtra has set-up Multi-Modal International Passenger and Cargo Hub Airport at Nagpur (MIHAN). That will upgrade existing domestic airport along with a Special Economic Zone which is abutting to the boundary of the airport. MIHAN houses plant of Tata Aeronautics which manufactures parts for Boeing and Air India and Dassault's assembly plants.

- Container Corporations of India Limited (CONCOR) constructed Multi Modal Logistic Park along with a rail terminal connecting MIHAN with different ports in country.

Butibori industrial area established by Maharashtra Industrial Development Corporation (MIDC), north of the Asset, is one of the country's largest industrial hubs. It houses textile, machine and metal fabrication and manufacturing units and is home to industrial giants like KEC, Hyundai, and Unitech. Koradi Thermal Power Station and Khaparkheda Thermal Power Station are the two major thermal power stations located in vicinity of the hub. Yavatmal industrial area, in west of the Asset, has textile and cotton processing industries including Raymond India's garment plant. The industrial hub is also home to export units of machineries, cement, medicines, limestones, and clothes.

Chandrapur is key coal mining centre in close vicinity of the Asset and has thermal plant, cement, paper and ferro alloy manufacturing industries.

The agricultural stretches present along the Asset as well as in Nagpur generate a considerable share of traffic on the Asset. Nagpur, also known as Orange City, is famous for the production of oranges in addition to being home to large number of paddy, jowar, cotton, tur and soyabean fields.

Long-distance goods traffic has seen an increase in proportion in recent years due to the shift of traffic from other corridors to NH44 as this is the shortest route between Hyderabad/Bengaluru and Delhi.

Traffic volume and composite of vehicles

Historical traffic data

The toll plaza data, segmented with ticket categories, is available from 01st Apr-21 to 29th Feb- 24 , which has been used for FY24 base year estimation. Therefore, to build the base estimate for FY24, we have considered:

- The Electronic Toll Collection (ETC) and cash data provided by NHAI.

- This data set has been considered for historical analysis and revenue reconciliation.

The Asset trends at 21,049 PCU levels in FY24YTD. Daroda plaza observed an average of ~7,633 AADT in FY24YTD as compared to ~6,868 AADT on Kelapur. The traffic is dominated by 3A/MAVs.

The average monthly collection at Daroda and Kelapur plazas is ~ INR 83.00 million and ~ INR 77.00 Cr respectively in FY24YTD. The daily collection in the same period was ~INR 2.7 milllon ~INR 2.5 million respectively. Revenue collection is lower at Kelapur due to lower traffic volumes as well as lower tollable length than Daroda.

Vehicle Category	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23
CJV	2,160	2,454	2,188	1,670	1,669	1,560
LCV	431	436	420	394	392	403
Bus/2A	1,728	1,816	1,730	1,676	1,759	1,830

Vehicle Category	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23
3A	1,449	1,507	1,423	1,367	1,409	1,414
MAV	2,100	2,124	1,973	1,946	2,065	2,077
OSV	2	2	3	2	2	3
Total	**7,870**	**8,339**	**7,737**	**7,055**	**7,295**	**7,287**
PCU	**21,798**	**22,642**	**21,168**	**20,155**	**21,060**	**21,257**

Vehicle Category	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24
CJV	1,652	2,029	2,232	2,240	2,354
LCV	419	376	411	395	450
Bus/2A	1,880	1,695	1,857	1,754	1,948
3A	1,420	1,288	1,385	1,301	1,466
MAV	2,033	1,871	1,930	1,893	2,121
OSV	3	2	3	2	3
Total	**7,405**	**7,261**	**7,818**	**7,585**	**8,341**
PCU	**21,339**	**19,970**	**21,273**	**20,527**	**22,827**

Source: Steer analysis of client toll plaza data

Table: PCU and MADT for FY24YTD - BK: Kelapur

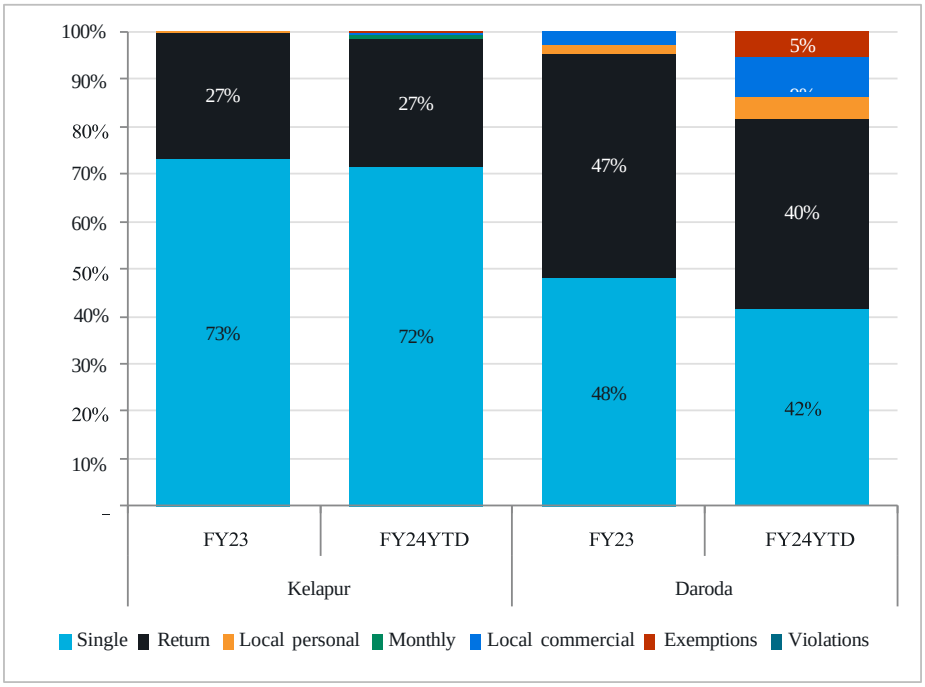
Vehicle Category	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23
CJV	1,252	1,393	1,262	947	980	913
LCV	397	388	392	372	374	390
Bus/2A	1,788	1,845	1,751	1,717	1,818	1,901
3A	1,417	1,472	1,399	1,352	1,410	1,416
MAV	2,141	2,143	2,010	2,008	2,125	2,128
OSV	2	2	3	2	2	3
Total	**6,996**	**7,242**	**6,817**	**6,399**	**6,711**	**6,751**
PCU	**21,102**	**21,576**	**20,357**	**19,760**	**20,801**	**21,039**

Vehicle Category	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24
CJV	1,177	1,201	1,283	1,123	1,126
LCV	402	364	392	375	428
Bus/2A	2,053	1,840	1,979	1,822	1,997
3A	1,440	1,293	1,367	1,286	1,445
MAV	2,105	1,935	2,069	1,953	2,172
OSV	3	2	3	2	3
Total	**7,181**	**6,635**	**7,093**	**6,562**	**7,171**
PCU	**21,748**	**19,863**	**21,233**	**19,810**	**21,883**

Source: Steer analysis of client toll plaza data

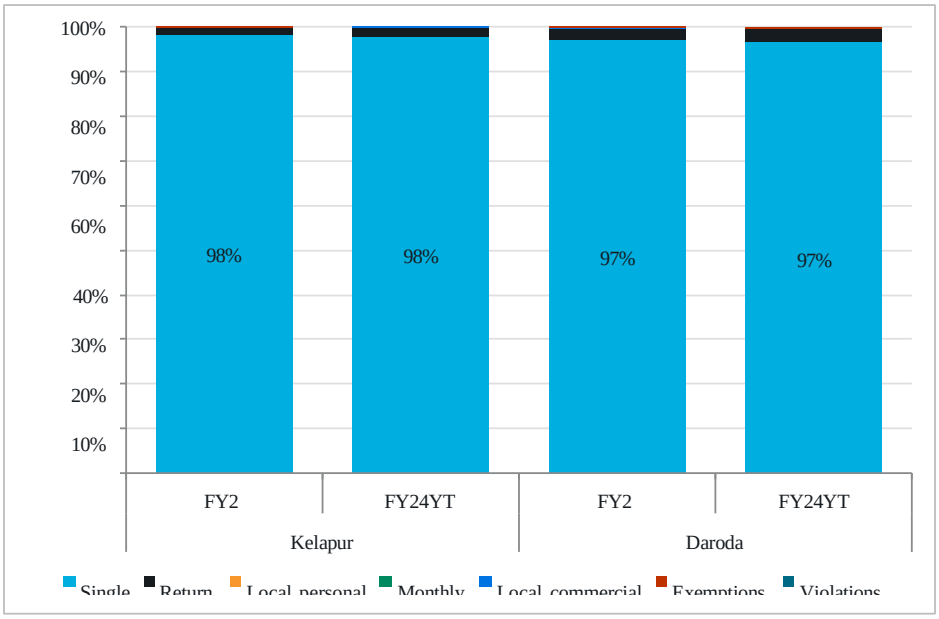
Toll Segmentation

Based on detailed review of historic trends of trip segmentation, according to the Consultant on the Asset, CJVs observe approximately equal split between single and return tickets on Daroda as the plaza caters to inter-urban movement influenced by Nagpur and sizeable split between single and return tickets at Kelapur given its proximity to Telangana.



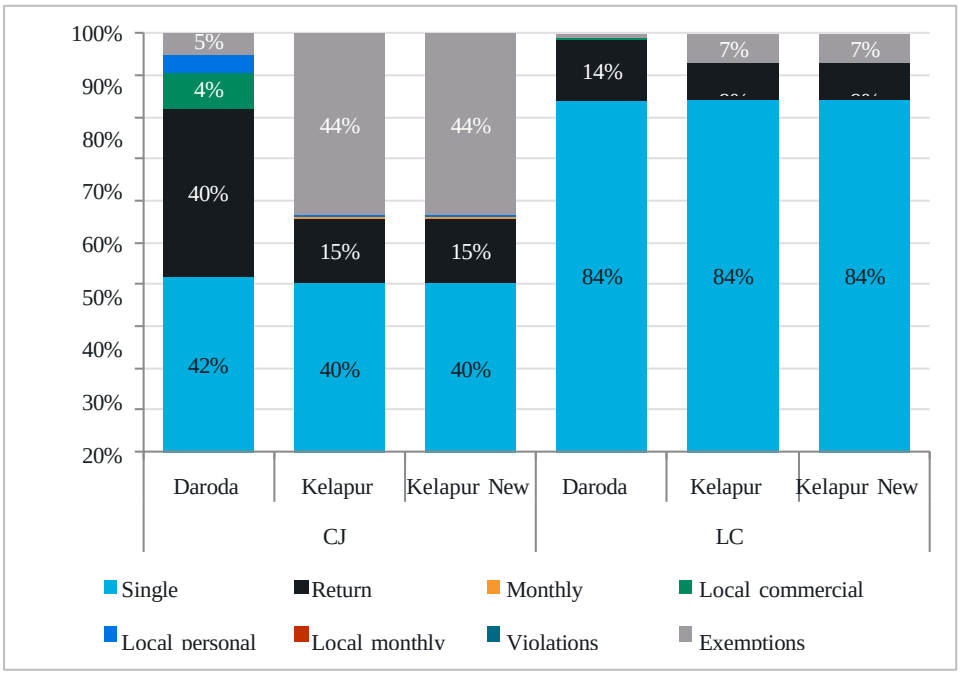
Source: Steer analysis

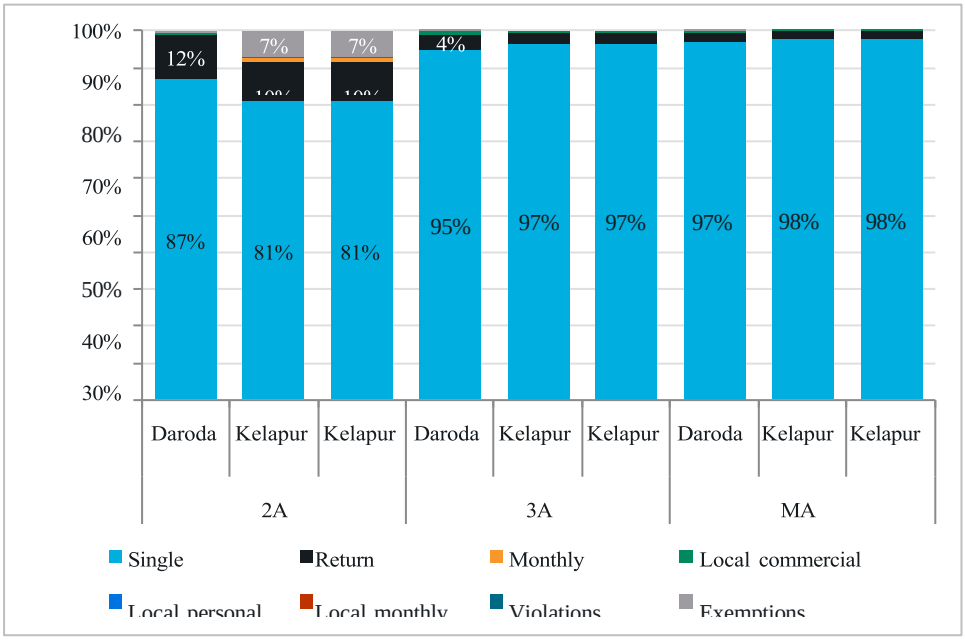
More than 85% of the commercial vehicles (2A/3A/MAVs) plying on the Asset are observed to buy single tickets suggesting through-movement on the Asset. The observation is in line with the fact that the Asset is key connector for Delhi/NCR and Maharashtra/neighbouring zones and hence caters to long-distance traffic.



However, as the above-mentioned segmentation doesn't correctly reflect the share of non-toll paying traffic, i.e., violations and exemptions at Kelapur, the same has been assessed based on the difference between TMS and TVC dataset in the final adopted segmentation.

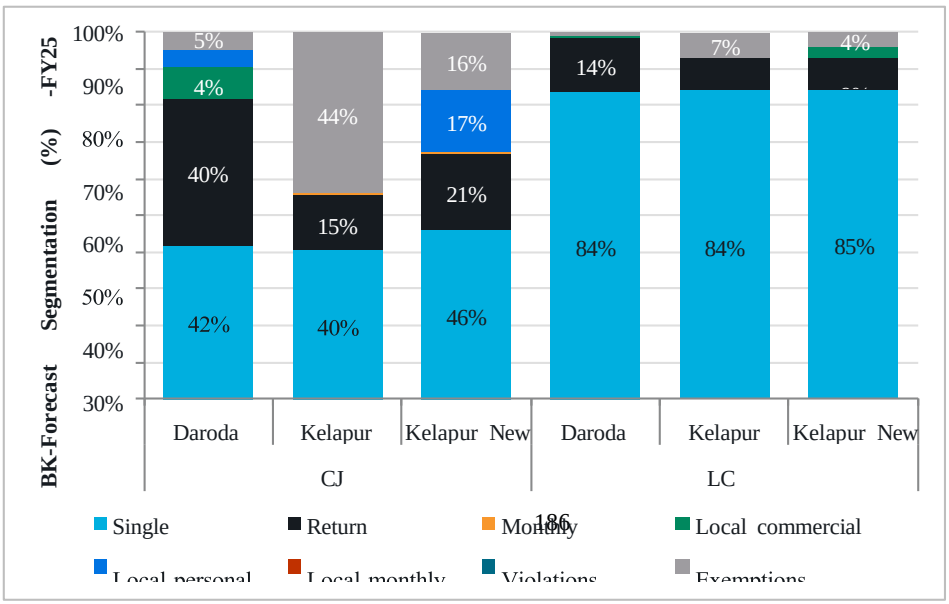
The final forecast segmentation is shown in the charts below.

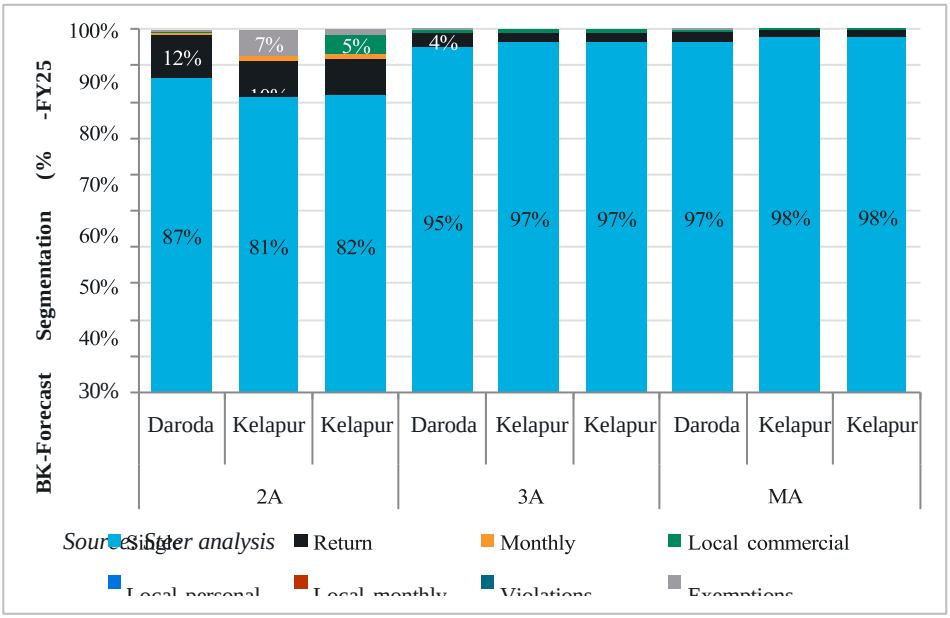




Source: Steer analysis

Figure: Toll segmentation (%) FY25 Onwards





Source: Steer analysis

Kelapur the change in segmentation will be aided by the relocation of the toll plaza. Currently, the toll plaza is located within the city, once it shifts to its new location, the urban characteristic of the plaza will shrink resulting in lesser traffic exemptions.

Traffic forecast

The increase of traffic on any existing road alignment depends on how fast the background travel demand (background growth) will grow; and on how successfully the project road is in attracting that traffic (traffic capture). Background travel demand is driven by the prevalent socio-economic conditions in the region, which include:

- Changes in factors such as population, employment, and income distribution
- Economic growth (GSDP, and GDP).
- Growth of local industries near the Asset.

The model uses India GDP and GSDP of Maharashtra & Telangana as the two macro-economic inputs which operate as growth drivers on our base year forecasts.

The network developments near the Asset's alignment which Steer believes would affect traffic on the Asset during the concession period are Nagpur Vijayawada Expressway, Raipur- Hyderabad Economic Corridor, four-laning of existing Indore-Hyderabad Alignment and DME & SCE put together.

The consultant has developed traffic and revenue forecasts for the Asset by taking into consideration all inputs discussed above – base year estimates, macro-economic assumptions, growth drivers, elasticities, and forecast ticket segmentation. The table below provides the final (background plus impacts) traffic growth on the Asset.

Table: Final (background plus impacts) AADT forecast – BK: Daroda

Vehicle Type	FY24	FY25	FY30	FY35	FY40	FY43
CJV	1,407	1,494	2,019	2,662	3,455	4,000
Mini LCV	644	665	783	906	1,037	1,118
LCV	414	428	489	565	647	697
Bus	208	212	234	255	277	290
2A	1,587	1,666	1,843	2,243	2,766	3,111
3A	1,407	1,451	1,490	1,665	1,900	2,046
MAV	2,019	2,144	2,571	3,270	4,243	4,912

Vehicle Type	FY24	FY25	FY30	FY35	FY40	FY43
OSV	2	3	3	4	6	7
AADT	**7,688**	**8,063**	**9,431**	**11,570**	**14,330**	**16,180**
PCU	**21,374**	**22,446**	**25,817**	**31,637**	**39,408**	**44,635**

Table: Final (background plus impacts) AADT CAGR (%) – BK: Daroda

Vehicle Type	FY24-FY25	FY25-FY30	FY30-FY35	FY35-FY40	FY40-FY43	FY24-FY43
CJV	6.2%	6.2%	5.7%	5.4%	5.0%	5.7%
Mini LCV	3.3%	3.3%	3.0%	2.7%	2.5%	2.9%
LCV	3.3%	2.7%	2.9%	2.7%	2.5%	2.8%
Bus	2.0%	2.0%	1.8%	1.6%	1.5%	1.8%
2A	5.0%	2.0%	4.0%	4.3%	4.0%	3.6%
3A	3.1%	0.5%	2.2%	2.7%	2.5%	2.0%
MAV	6.2%	3.7%	4.9%	5.3%	5.0%	4.8%
OSV	6.2%	6.2%	5.7%	5.3%	5.0%	5.6%
AADT	**4.9%**	**3.2%**	**4.2%**	**4.4%**	**4.1%**	**4.0%**
PCU's	**5.0%**	**2.8%**	**4.1%**	**4.5%**	**4.2%**	**4.0%**

Source: Steer analysis

Table: Final (background plus impacts) AADT forecast – BK: Kelapur

Vehicle Type	FY24	FY25	FY30	FY35	FY40	FY43
CJV	1,429	1,518	2,051	2,705	3,510	4,064
Mini LCV	643	665	782	905	1,036	1,117
LCV	421	435	496	574	656	708
Bus	250	255	281	307	333	348
2A	1,765	1,852	2,063	2,514	3,100	3,487
3A	1,395	1,439	1,476	1,648	1,881	2,026
MAV	2,079	2,208	2,657	3,384	4,391	5,083
OSV	2	3	3	5	6	7
AADT	7,985	8,374	9,810	12,040	14,913	16,839
PCU	22,301	23,420	27,008	33,124	41,257	46,729

Table: Final (background plus impacts) AADT CAGR (%) – BK: Kelapur

Vehicle Type	FY24-FY25	FY25-FY30	FY30-FY35	FY35-FY40	FY40-FY43	FY24-FY43
CJV	6.2%	6.2%	5.7%	5.4%	5.0%	5.7%
Mini LCV	3.3%	3.3%	3.0%	2.7%	2.5%	2.9%
LCV	3.3%	2.7%	2.9%	2.7%	2.5%	2.8%
Bus	2.0%	2.0%	1.8%	1.6%	1.5%	1.8%
2A	5.0%	2.2%	4.0%	4.3%	4.0%	3.6%
3A	3.1%	0.5%	2.2%	2.7%	2.5%	2.0%
MAV	6.2%	3.8%	5.0%	5.3%	5.0%	4.8%
OSV	6.2%	6.2%	5.7%	5.3%	5.0%	5.6%
AADT	**4.9%**	**3.2%**	**4.2%**	**4.4%**	**4.1%**	**4.0%**
PCU's	**5.0%**	**2.9%**	**4.2%**	**4.5%**	**4.2%**	**4.0%**

Source: Steer analysis

Table: Final (background plus impacts) AADT forecast – BK: Kelapur (New)

Vehicle Type	FY26	FY30	FY35	FY40	FY43
CJV	1,491	1,889	2,491	3,233	3,743
Mini LCV	634	720	833	954	1,028
LCV	444	489	565	647	697
Bus	220	237	259	281	294
2A	1,921	2,032	2,477	3,054	3,435
3A	1,486	1,476	1,648	1,881	2,026
MAV	2,339	2,640	3,362	4,363	5,051
OSV	3	3	5	6	7
AADT	**8,537**	**9,488**	**11,641**	**14,419**	**16,282**
PCU	**24,210**	**26,477**	**32,477**	**40,468**	**45,844**

Table: Final (background plus impacts) AADT CAGR (%) – BK: Kelapur (New)

Vehicle Type	FY26-FY30	FY30-FY35	FY35-FY40	FY40-FY43	FY26-FY43
CJV	6.1%	5.7%	5.4%	5.0%	5.6%
Mini LCV	3.2%	3.0%	2.7%	2.5%	2.9%
LCV	2.5%	2.9%	2.7%	2.5%	2.7%
Bus	1.9%	1.8%	1.6%	1.5%	1.7%
2A	1.4%	4.0%	4.3%	4.0%	3.5%
3A	(0.2%)	2.2%	2.7%	2.5%	1.8%
MAV	3.1%	5.0%	5.3%	5.0%	4.6%
OSV	6.1%	5.7%	5.3%	5.0%	5.6%
AADT	**2.7%**	**4.2%**	**4.4%**	**4.1%**	**3.9%**
PCU's	**2.3%**	**4.2%**	**4.5%**	**4.2%**	**3.8%**

Tollable Length and Toll Rates

According to the traffic Consultant The current tolling length at Daroda and Kelapur (in FY24) is 80.08 km and 75.16 km respectively. FY25 onwards, tolling length at Daroda will be revised to 80.18 km whereas tolling length at Kelapur will remain same as in FY24. In India, toll rates are as per notification by the Ministry of Road Transport and Highways in the National Gazette. The present toll rates are determined with reference to the published base toll rates and are adjusted annually at the beginning of each fiscal year equal to 40% of the movement in the wholesale price index in December of the preceding year plus a fixed 3%.

According to the NHAI's toll notification for FY24, i.e., April 1, 2023, onwards, the toll rates at the toll plazas for Asset are as follows:In line with the NHAI's toll notification dated March 25, 2022, the toll rates at the Darodha toll plaza for Asset 7 for FY2024 are as follows:

Vehicle Type	Single Journey	Multiple Journey	Monthly Pass
Car/Jeep/Van	115	170	3835
LCV	185	275	6165
Bus/Truck	390	580	13000
Vehicles with up to 3 axles	425	635	14165
HCM/EME (Vehicles with 4 to 6 axles)	610	910	20335
Vehicles with 7 or more axles	740	1110	24665
Source: NHAI			

In line with the NHAI's toll notification dated March 25, 2022, the toll rates at the Kelapur toll plaza for Asset 7 for FY2024 are as follows:

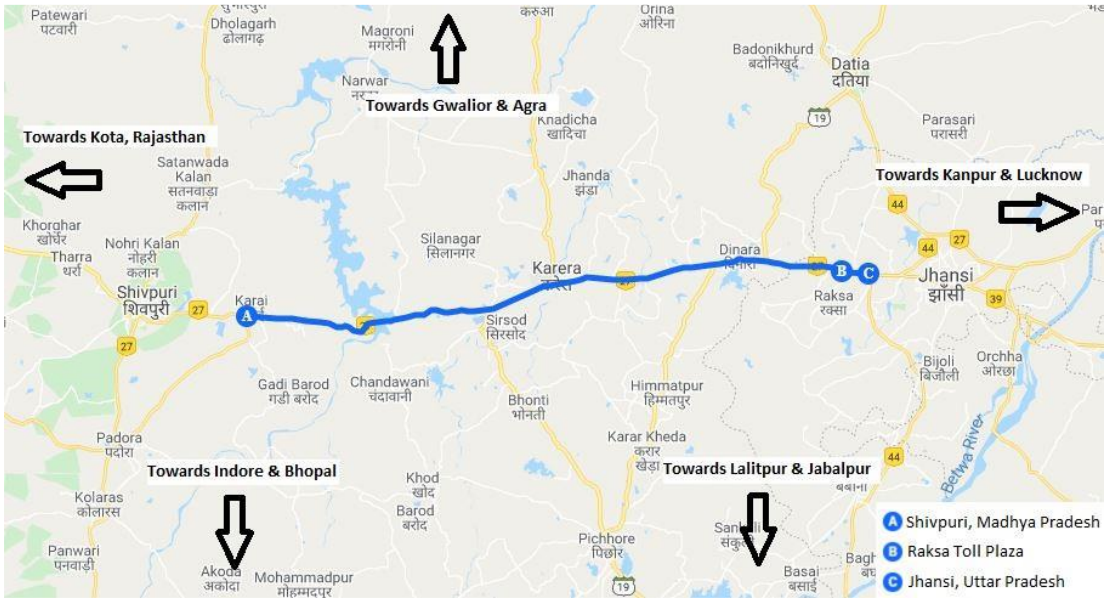
Vehicle Type	Single Journey	Multiple Journey	Monthly Pass
Car/Jeep/Van	105	160	3585
LCV	175	260	5785
Bus/Truck	365	545	12125
Vehicles with up to 3 axles	395	595	13230
HCM/EME (Vehicles with 4 to 6 axles)	570	855	19015
Vehicles with 7 or more axles	695	1040	23150
Source: NHAI			

For further details in relation to Asset 7, please refer to **Annexure C** of this Preliminary Placement Document.

Jhansi – Shivpuri Project ("Asset 8")

Project overview

According to the Traffic Consultant, Asset 8 is a 4-lane, 75.3 kms long stretch, on national highways (NH) 27 which connects the districts of Jhansi and Shivpuri in the state of Uttar Pradesh and Madhya Pradesh, respectively. The two states Uttar Pradesh and Madhya Pradesh form the two key project stretch influence states. The project stretch has one toll plaza by the name of Raksha toll plaza which lies at the chainage of km 1374+650 near Jhansi. In the larger road network, the project stretch is a part of East-West corridor (NH-27) which connects Porbandar in Gujarat to Silchar in Assam. Hence, the project stretch witnesses higher proportion of long route traffic between the eastern and western regions.



Source: CRISIL Research

Salient growth features and traffic generators

According to the Traffic Consultant, the project stretch is used by the traffic originating and destined in regions such as Kanpur-Lucknow cluster, Indore cluster, Maharashtra and Gujarat. Lucknow and Indore are the key regions where the east-west traffic converges. Currently, the traffic between Indore-Lucknow uses the project stretch which takes them 13-14 hours and travels ~793 km. There exists an alternate route between Lucknow and Indore which passes through Chhatarpur and Sagar. This route takes 16-17 hours and the distance is 801 km. The key reason for this longer travel time is that the alternate route is a mix of 2 lane and 4 lanes. Kanpur to Bhopal section of the alternate route which is nearly 527 km is 2 lanes. Under the Bharatmala program, the section from Lucknow to Sagar and Sagar to Kandla are proposed for augmentation. Hence, the Traffic Consultant has assumed FY33 to be start year for the alternate road stretch.

Further, there is a greenfield expressway coming up in the region. The 4-lane access controlled Atal progress-way (Chambal expressway) will connect Etawah (UP) to Kota (Rajasthan). The connection point is likely to be the Agra-Lucknow expressway on one end and the Delhi-Mumbai expressway on the Kota side. Thus, the traffic from eastern region converging at Lucknow will have an alternative to the project stretch. The traffic can travel on the Agra-Lucknow expressway and Atal progress-way to reach Rajasthan. They also have Delhi-Mumbai expressway connectivity to Gujarat and Maharashtra. The Delhi-Mumbai expressway is expected to begin operations in mid-2024 and for the Atal progress-way, the Traffic Consultant has assumed FY29 to be start year for the road stretch.

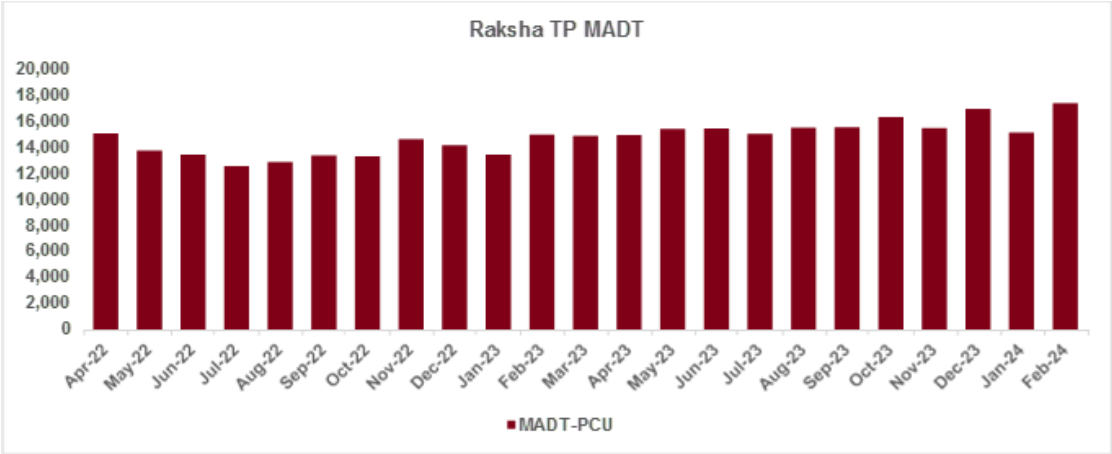
Agri produce forms the key commodity travelling on the project stretch, followed by courier & parcels, construction material, consumer items, and iron and steel. Kanpur, Lucknow, Jhansi, Indore, Mumbai and Rajkot are the major contributors to the goods traffic on the project stretch. Project stretch and its vicinity regions such as Kanpur, Lucknow, Indore etc. are the key origin-destination for the passenger traffic.

The Shivpuri-Jhansi Project is a part of the East-West Corridor, which includes industrialised districts such as Kanpur and Lucknow. These districts form the origination and destination points of the traffic. Other key consumption/industrial centres include Indore, Jhansi, Ahmedabad, Mumbai, and Pune. These are also catered by the stretch. Shivpuri and Jhansi districts, immediately adjacent to the stretch, have witnessed an economic growth greater than the national average (8.4% vs 7.1%).

Traffic volume and composite of vehicles

Historical traffic data

The chart below shows the historical traffic for the project stretch:



Source: Toll Plaza data, CRISIL MI&A

Toll Segmentation

Based on detailed review of historic trends of trip segmentation, Consultant has recommended that the trip segmentation has been derived based on the average share of a single journey, return journey and categories over April 2023 to Feb 2024. For revenue calculation, the trip factor used for a return journey is two, and for a monthly pass it is 50. The trip segmentation has been assumed to remain constant throughout the projection period i.e., over fiscals 2025 to 2043:

Vehicle	Single	Return	Monthly Pass	Local Non-commercial	Local commercial	Exemption	Total
Car, Jeep, Van or Light Motor Vehicle	42.9%	36.6%	0.6%	0.2%	9.5%	10.1%	100.0%
Light Commercial Vehicle, Light Goods Vehicle or Mini Bus	56.5%	33.5%	0.2%	8.3%	0.0%	1.5%	100.0%
Bus or Truck (Two Axles)	80.1%	17.6%	0.1%	1.2%	0.0%	1.0%	100.0%
Three- axle commercial vehicles	90.5%	6.7%	0.5%	1.2%	0.0%	1.1%	100.0%
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (four to six axles)	92.9%	5.1%	0.3%	1.4%	0.0%	0.3%	100.0%
Over Sized Vehicles	96.3%	3.5%	0.0%	0.0%	0.0%	0.2%	100.0%

Note: The trip segmentation provided in the table is as per the values recorded in toll plaza data. Local non-commercial is local monthly pass. Toll rate for cars is Rs 315 in fiscal 2023.
Source: Toll plaza data, CRISIL MI&A

Growth Rates

The table below provides the traffic growth rates considering diversions to expressway and other alternative routes, as provided by the Traffic Consultant:

Post-Diversion Growth Rates-Feb 2024					
CAGR	**FY24-25**	**FY25-30**	**FY30-35**	**FY35-42**	**FY24-43**
Car	8.0%	7.2%	5.6%	4.1%	5.5%
Bus	3.8%	3.6%	3.2%	2.0%	2.8%

Post-Diversion Growth Rates-Feb 2024					
CAGR	**FY24-25**	**FY25-30**	**FY30-35**	**FY35-42**	**FY24-43**
Minibus	3.8%	3.6%	3.2%	2.0%	2.8%
LCV	4.8%	-3.7%	4.4%	4.2%	2.1%
2-axle	5.2%	2.2%	4.7%	4.4%	3.9%
3-axle	4.8%	0.1%	4.2%	3.9%	3.0%
MAV	5.5%	1.9%	5.1%	4.8%	4.1%
Total PCU	5.7%	2.6%	5.0%	4.5%	4.2%

Source: CRISIL MI&A

Projected Traffic Data: Growth in Passenger Car Unit (PCU)

Year	FY24	FY25	FY30	FY35	FY40	FY43
Car/Jeep/Van	2,505	2,705	3,830	5,031	6,221	6,902
Minibus	49	51	61	72	80	84
2 Axle Bus	133	138	165	193	216	226
3 Axle Bus	0	0	0	0	0	0
LCV	320	336	278	345	424	478
Truck	736	774	864	1,085	1,349	1,529
3 Axle Truck	520	544	546	672	816	912
MAV	1,911	2,017	2,212	2,836	3,598	4,130
OSV	2	2	2	3	4	4
Total Veh.	6,176	6,567	7,959	10,236	12,707	14,265
Total PCU	15,832	16,738	19,030	24,279	30,328	34,351

Source: CRISIL MI&A

Tollable Length and Toll Rates

In terms of tollable length, the Jhansi – Shivpuri Project comprises 89.5794 kms of roads. In India, toll rates are as per notification by the Ministry of Road Transport and Highways in the National Gazette. The present toll rates are determined with reference to the published base toll rates and are adjusted annually at the beginning of each fiscal year equal to 40% of the movement in the wholesale price index in December of the preceding year plus a fixed 3%. Single toll rates in INR at the Raksha toll plaza, applicable from April 2023 until March 2024 are as provided below:

Year	Car/Jeep/Van	Minibus	2 Axle Bus	3 Axle Bus	LCV	Truck	3 Axle Truck	MAV	OSV
2024	130	205	435	475	205	435	475	680	830

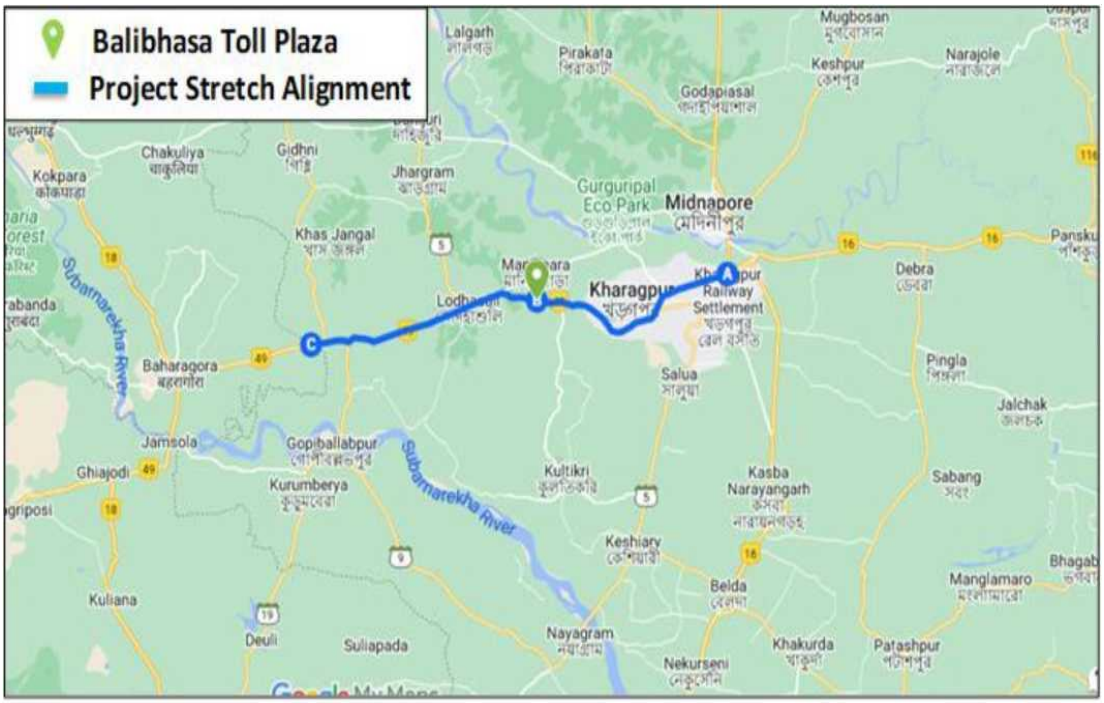
Source: NHAI-TIS, Standard categorisation of vehicles is adopted for toll rates representation

For further details in relation to Asset 8, please refer to **Annexure C** of this Preliminary Placement Document.

Chichra – Kharagpur Project ("Asset 9")

Project overview

According to the Traffic Consultant, Chichra-Kharagpur is a 4-lane, 56.120 kms long stretch, on national highways (NH) 49 which connects Chichra and Kharagpur to Jharkhand and Odisha states in the vicinity. The two states Jharkhand and Odisha form the two key project stretch influence states. The project stretch has one toll plaza by the name of Balibhasa Toll Plaza which lies at the chainage of km 157+915 near Guptamoni. In the larger road network, the project stretch is a part of East-West connectivity which connects Mumbai and Kolkata. Due to presence of sand mining blocks near Gopiballapur, which is in the vicinity of project stretch, the traffic is mostly West Bengal state bound, with construction materials like sand being the top commodity plying on the project stretch.



Source: CRISIL MI&A

Salient growth features and traffic generators

According to the Traffic Consultant, the project stretch is used by the traffic originating and destined in regions such as Gopiballapur (sand mining), Kolkata, Jhargram in West Bengal. For the traffic travelling in Chichra to Kharagpur direction, though West Bengal dominates as the origin state (~59% share), Jharkhand and Odisha are amongst the other states responsible for the originating traffic with almost combined share of ~29%. Sand mining is prevalent in the vicinity of stretch, due to which, sand is the topmost commodity plying on the project stretch which originates majorly from Gopiballapur belt and destined at Kolkata and nearby areas.

There exists an alternate route between Lodhasuli and Kharagpur which could have been a potential route to bypass the Toll Plaza, however the route is majorly under construction in patches, also it passes through multiple small villages, and moreover it is a 2L road which increases the travel time by almost 2x, in comparison to the equivalent road stretch that passes through the Project Stretch. Thus, for commercial vehicles, this route is unfavourable over the project stretch route, which shall continue to be the preferred route owing to better condition of roads, which will result in saving time too.

Further, there is a greenfield expressway coming up in vicinity of project stretch. Varanasi-Kolkata Expressway connects West Bengal and Uttar Pradesh states which is anticipated to improve the connectivity between these two states. The expressway passes through Jharkhand, which is one of the neighbouring states of West Bengal. Tatanagar, Chaibasa, Ranchi are amongst the originating points for the traffic on the project stretch. Commodities like Iron and Steel products is plying on the vehicles originating from these cities and destinated at West Bengal. However, the overall impact shall be marginal as the Traffic plying on the project stretch is mostly West Bengal bound. The impact of Varanasi-Kolkata Expressway is assumed partially from FY27 and fully from FY28 onwards.

Construction Materials forms the key commodity travelling on the project stretch, followed by Agri Produce, Iron and Steel, and courier and parcel. Gopiballapur, Mahapal, Jhargram are the major contributors to the goods traffic on the project stretch. Project stretch and its vicinity regions such as Jhargram, Midnapore, Kolkata etc. are the key origin-destination places for the passenger traffic. Sand is the topmost commodity plying on the project stretch. There are sand blocks located near Subarnarekha River, which is in the vicinity of Chichra-Kharagpur stretch. Gopiballapur, Sankrail and Mahapal are amongst the key areas where sand mining blocks are located. However, Gopiballapur belt dominates amongst the three regions with more than ~70% mining leases in the region. West Bengal government have been taking vital decisions to regulate the sand mining processes and put a cap on illegal sand mining, the impact of which could be seen in the years to come.

Rashmi Metallics plant is situated near Kharagpur district, which is one of the important industries on the project stretch responsible for the traffic movement on the project stretch. Odisha and Kolkata are amongst the key OD pairs for the traffic due to Rashmi Metallics plant.

Traffic volume and composite of vehicles

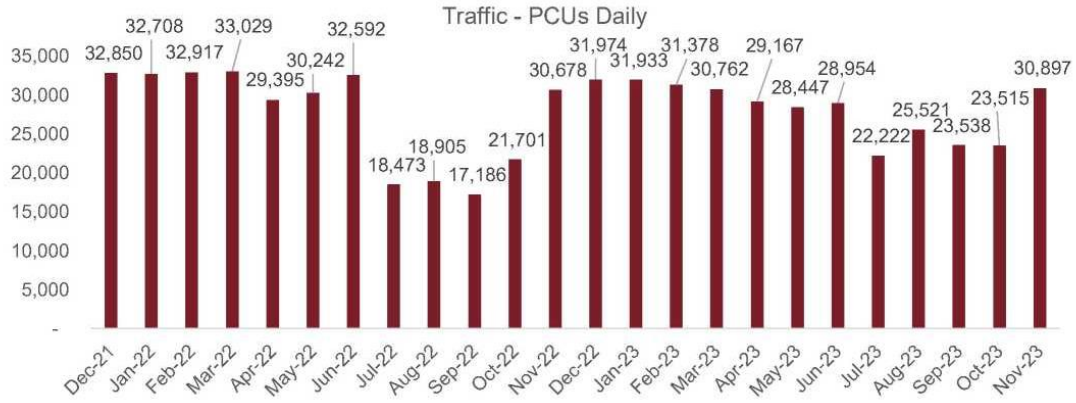
Historical traffic data

The following table shows the TVC seven-day traffic count of Chichra-Kharagpur stretch according to the Traffic Consultant:

Date	Days	Car	LCV + 2 Axle	3- axle	MAV	Total	Total (PCUs)
11/23/2022	Wednesday	2,381	3,298	1,094	3529	10,302	30,268
11/24/2022	Thursday	2,367	3,000	1,161	3865	10,393	31,197
11/25/2022	Friday	2,783	2,938	1,208	3725	10,654	30,937
11/26/2022	Saturday	2,828	2,810	1,181	3961	10,780	31,607
11/27/2022	Sunday	2,887	2,921	1,206	3767	10,781	31,237
11/28/2022	Monday	2,675	2,810	949	2968	9,402	26,453
11/29/2022	Tuesday	2,651	3,077	1,059	3607	10,394	30,164
ADT		**2,653**	**2,979**	**1,123**	**3,632**	**10,387**	**30,266**

Source: CRISIL MI&A

The chart below shows the average daily traffic on Chichra-Kharagpur stretch over December 2021 to November 2023.



Source: CRISIL MI&A

Overloading scenario on the project stretch

To ascertain the quantum of overloading, a seven day axle load survey was done by the technical consultants of the client. The results of axle load survey provided by the client, reveal that overloaded vehicles form a sizeable share of vehicles across categories. As per the survey, 49% of the MAVs, 33% of 3 axle and 11% of the 2 Axle vehicles are overloaded (considering more than 5% overload than permissible limits).

Sand, iron, steel, and coal are key commodities which are overloaded. Overloading is also prevalent in Chichra to Kharagpur direction primarily.

As per discussions with the client, it is proposed that overloading will be levied on 25% of MAV and 3 Axle vehicles which are overloaded for more than 20% of the threshold. The quantum of vehicles for charging overloading penalty is decided after considering the practical numbers which can be charged per lane per hour. The revenue potential is arrived at, by considering an overloading levy equivalent to 1x of single journey toll rates.

Following table shows the overloading scenario for commercial vehicles on the stretch.

Direction	Vehicle Category	Sample	>5% overload	>20% overload	>5% overload	>20% overload
Overall	MAV	571	281	171	49%	30%
Overall	2A	403	46	5	11%	1%
Overall	3A	286	95	44	33%	15%
Chichra-Kharagpur	MAV	286	216	147	76%	52%
Chichra-Kharagpur	2A	212	42	4	20%	2%
Chichra-Kharagpur	3A	136	79	42	58%	31%
Kharagpur-Chichra	MAV	285	65	24	23%	8%

Direction	Vehicle Category	Sample	>5% overload	>20% overload	>5% overload	>20% overload
Kharagpur-Chichra	2A	191	4	0	2%	0%
Kharagpur-Chichra	3A	150	16	3	10%	2%

Source: CRISIL MI&A

Toll Segmentation

Based on detailed review of historic trends of trip segmentation, according to the Consultant the table below presents a segmentation of total traffic assessed from the toll data from January 2023 to November 2023 (based on available data) for the Balibhasa toll plaza of Chichra-Kharagpur stretch. The trip segmentation has been assumed to remain constant throughout the projection period i.e., over fiscals 2024 to 2044 as follows:

Vehicle category	Single journey	Return Journey	Local monthly pass	Local commercial vehicles	Exemption
Car, jeep, van or LMV	34.59%	62.72%	1.63% (local non-commercial)	-	1.07%
LCV, light goods vehicle, or minibus	37.05%	61.55%	-	-	1.40%
Bus or truck (2-axle)	34.34%	65.14%	-	0.15%	0.37%
3-axle CV	64.99	34.85	-	-	0.16%
HCM, EME or MAV (4-6 axle)	53.60%	46.18%	-	-	0.22%

Source: CRISIL MI&A

The table below provides the traffic growth rates considering diversions to expressway and other alternative routes and other impact factors, as provided by the Traffic Consultant:

CAGR	FY24-25	FY25-30	FY30-40	FY24-44
Car	4.9%	4.1%	4.0%	3.9%
Bus	2.5%	2.4%	2.0%	2.1%
Minibus	2.0%	1.8%	1.6%	1.6%
LCV	4.2%	3.2%	3.0%	3.1%
2-axle	6.8%	5.0%	3.9%	4.2%
3-axle	6.5%	4.8%	4.0%	4.2%
MAV	6.0%	4.6%	3.9%	4.1%
Total PCU	**6.0%**	**4.6%**	**3.9%**	**4.1%**
Revenue growth	**8.1%**	**9.3%**	**8.1%**	**8.3%**

Note: Revenue growth includes overloading levies
Source: CRISIL MI&A

Vehicle Type	FY24	FY25	FY30	FY40	FY43
Car	2,949	3,094	3,782	5,583	6,185
Bus	120	123	138	168	177
Minibus	106	109	119	139	145
LCV	233	242	284	382	415
2-axle	1,679	1,793	2,287	3,360	3,730
3-axle	1,050	1,118	1,416	2,088	2,322
MAV	3,777	4,005	5,007	7,312	8,111
Total	9,915	10,484	13,033	19,031	21,086
Total PCU	29,003	30,744	38,440	56,115	62,214

Tollable Length and Toll Rates

In terms of tollable length, the Chichra - Kharagpur Project comprises 56.667 kms of 4-Lane equivalent length and 6.094 kms of 2-Lane equivalent length, which sums up to 62.761 kms of total tollable length. In India, toll rates are as per notification by the Ministry of Road Transport and Highways in the National Gazette. The present toll rates are determined with reference to the published base toll rates and are adjusted annually at the beginning of each fiscal year equal to 40% of the movement in the wholesale price index in December of the preceding year plus a fixed 3%.

Single toll rates in INR at the Balibhasa toll plaza, calculated as per schedule-M data, applicable until March 2024 are as provided below:

Type of Vehicle	SJ: Balibhasa
CJV	90
LCV	145
Bus/Truck	305

Type of Vehicle	SJ: Balibhasa
3A	330
MAV/ HCM/EME	475
OSV	580

Source: CRISIL MI&A

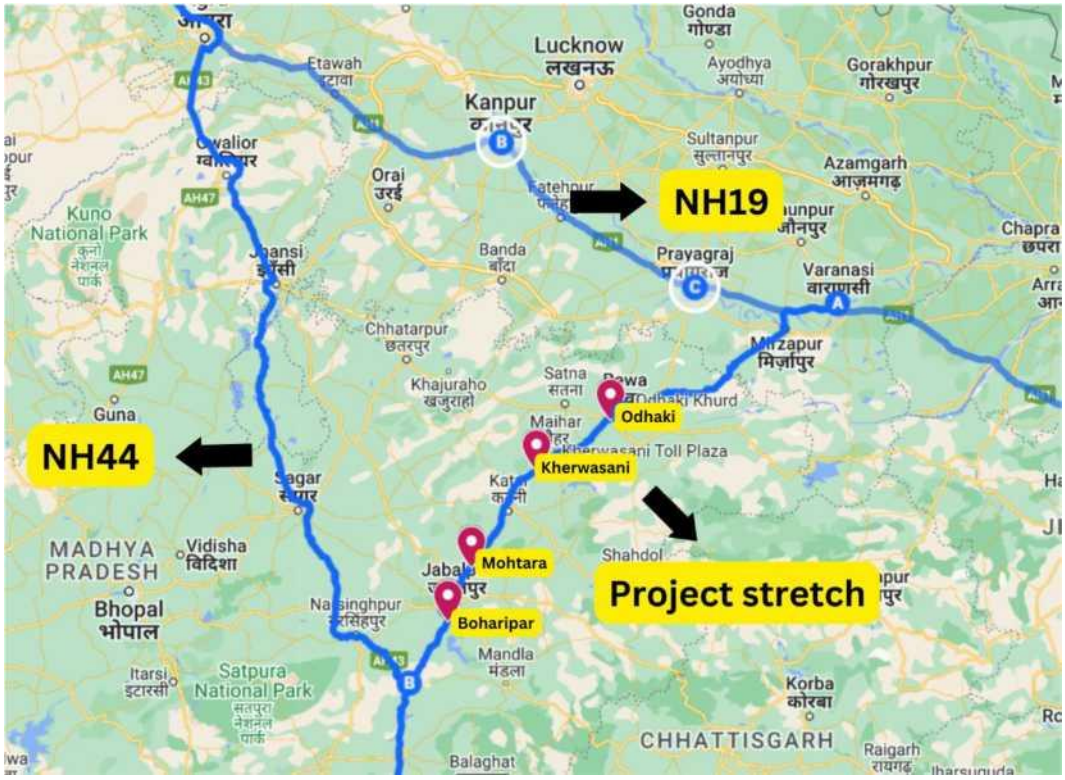
For further details in relation to Asset 9, please refer to **Annexure C** of this Preliminary Placement Document.

Rewa -Lakhnadon Project ("Asset 10")

Project overview

According to the Traffic Consultant, Rewa- Lakhnadon project is a 4-lane, 265 km long stretch, on national highways (NH) 30 & (NH) 34 which connects Rewa, Katni, Jabalpur and Lakhnadon districts of Madhya Pradesh. The project stretch has four toll plazas - Odhaki Paipkhar, Kherwasani, Mohtara, and Boharipar. In the larger road network, the project stretch connects East-West Corridor (NH-19), which connects Kolkata in West Bengal to Delhi and North-South corridor (NH44) towards south. The project stretch largely caters to the vehicle traffic within state only. Other prominent states with residual traffic are Uttar Pradesh, Gujarat, and Maharashtra.

Figure 1: Project and adjoining NH network map



Source: CRISIL MI&A CONSULTING

Salient growth features and traffic generators

According to the Traffic Consultant, the project stretch is used by the traffic originating and destined in regions such as the Prayagraj-Varanasi cluster, & Pune-Nashik cluster. Prayagraj-Varanasi & Pune-Nashik are the key regions where the north-south traffic converges. The traffic travelling between these two clusters uses the project stretch which takes them 23-24 hours and travels ~1321 km. There exists an alternative route between Pune and Varanasi that passes through Indore and uses Jhansi Shivpuri stretch and Bundelkhand expressway. This route takes 28 hours, and the distance is ~1506 km. However, due to both longer distance and time, the route is not a threat to a long haul through traffic.

There exists an alternative route between Lucknow and Indore which passes through Chhatarpur and Sagar. This route takes 16-17 hours, and the distance is 955 km. The key reason for this higher time is that the alternative route is a mix of two and four lanes. Banda to Bhopal section of the alternative route, of nearly 430 km, is 2-lane. The Maharashtra and Gujarat traffic can also use this road, as they converge at Indore, where they will have the option to go towards

the project stretch or towards Sagar and use the alternative road. Under the Bharatmala programme, the sections from Kandla to Sagar and Sagar to Lucknow are proposed for augmentation. Hence, in the future, when the augmentation gets completed, the alternative route will be a feasible route in competition to the project stretch. We have assumed the impact of this augmented road to begin in fiscal 2028. To assess the at-risk traffic for Kandla-Sagar corridor and Sagar-Lucknow corridor, traffic between Indore (Traffic originating from Gujarat and Northern Maharashtra could choose to come via Indore) and Eastern UP have been considered.

Agri produce is the largest category on the stretch, comprising mostly wheat, rice and vegetables (including onions) from MP and UP. MP state's Rabi crop production is growing at 4%+ over the last decade, while Kharif has grown at sub 1%, and horticulture has grown at 8.2% (Food grains & Horticulture have 50-50% share in total Agri production). Hence overall agriculture growth is expected to be in the range of ~3.0%. For Mohtara, the growth rate is 5% in the short term and 2.0-3.0% in the long term on account of higher horticulture share in the OD mix.

Cement (~40%) & Stone/limestones (~35-40%) form majority of construction materials, largely originated from MP with clusters of cement manufacturing in Maihar (Satna) aka Cement capital of India, Katni, Jabalpur, and Rewa districts and the availability of limestones in the districts across the stretch. MP cement growth to be higher than national average owing to election next year and large-scale irrigation projects underway. Cement to grow at 5-6% (Central region), historical limestones production is at 3-4%

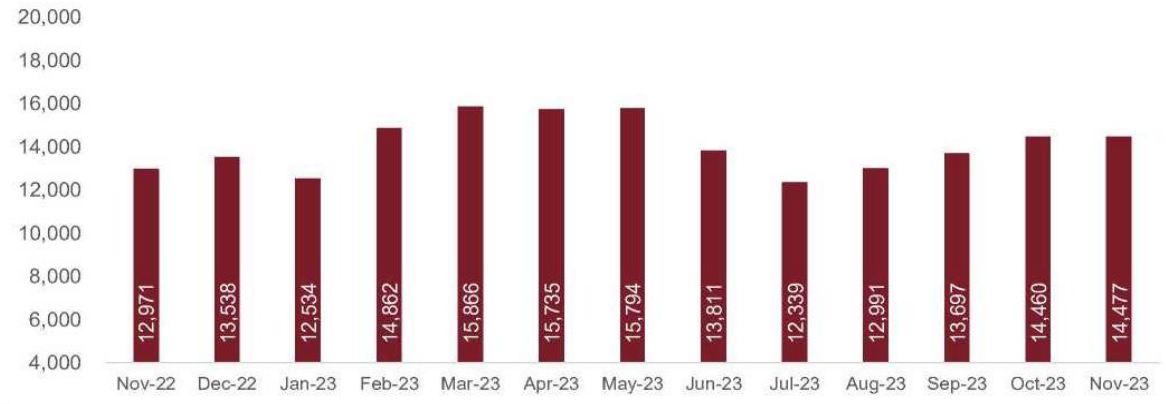
The key destination states are MP & UP owing to strong growth in housing development across schemes such as PMAY Urban and Rural. In the last five years, the central (MP and UP) and eastern (Odisha, Bihar, and West Bengal) regions exhibited strong demand led by a surge in infrastructure. construction and rural housing.

MP and UP are the key origination and destination states for the courier and parcel traffic of the project stretch. The stretch connects warehouse centres like Nagpur, Jabalpur at one end and Prayagraj & Patna at the other end. Proximity of these clusters and connectivity of consumption centres such as Jabalpur, Rewa, Satna, Prayagraj, and Varanasi is expected to lead strong growth for this category. The origination regions are key warehousing clusters such as Jabalpur, Indore, and Prayagraj. Smaller warehousing regions which have fair amount of origination on the stretch include Rewa, Katni and Varanasi.

The chart below shows the average daily traffic over Nov 2022 to Nov 2023:

Odhaki Toll Plaza

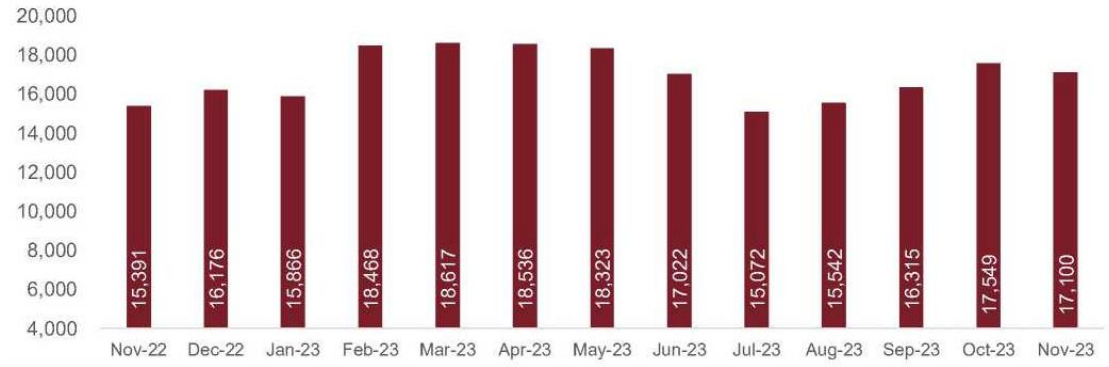
ETC Traffic - PCUs (Daily)



Source: CRISIL MI&A CONSULTING

Kherwasani Toll Plaza

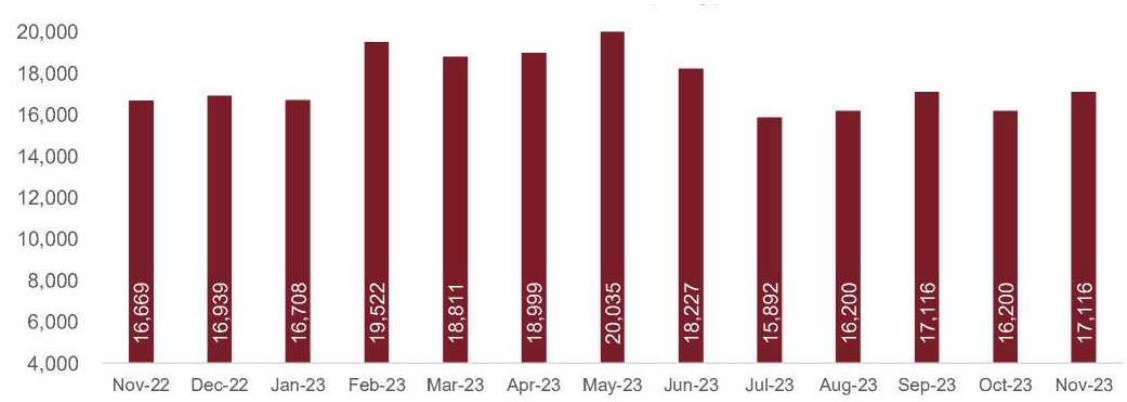
ETC Traffic - PCUs (Daily)



Source: CRISIL MI&A CONSULTING

Boharipar Toll Plaza

ETC Traffic - PCUs (Daily)



Source: CRISIL MI&A CONSULTING

Toll Segmentation

Based on detailed review of historic trends of trip segmentation, Consultant has recommended that the trip segmentation has been derived from the average share of a single journey, return journey and other categories, based on ETC, cash and exemption data. April 2023 - Nov 2023 period is considered for trip segmentation.

For revenue calculation, the trip factor used for a return journey is two, and for a monthly pass it is 45. Exemptions have been estimated based on the TMS dataset of the toll plazas data from Apr-22 to July-23. The trip segmentation has been assumed to remain constant throughout the projection period i.e., over fiscals 2024 to 2053.

Odhaki - Details of trip segmentation across vehicle categories

Vehicle Category	Single Journey	Return Journey	Local Monthly Pass	Local Commercial Vehicles	Exemption
Car, jeep, van or LMV	43.76%	45.60%	2.21%	0.00%	8.43%
LCV, light goods vehicle, or minibus	40.86%	44.69%	0.00%	3.80%	10.65%
Bus or truck (2-axle)	73.61%	24.95%	0.00%	0.00%	1.44%
3-axle CV	80.61%	18.24%	0.00%	0.00%	1.15%
HCM, EME or MAV (4-6 axle)	76.42%	23.40%	0.00%	0.00%	0.18%

Source: Toll Plaza data, CRISIL MI&A CONSULTING

Kherwasani - Details of trip segmentation across vehicle categories

Vehicle Category	Single Journey	Return Journey	Local Monthly Pass	Local Commercial Vehicles	Exemption
Car, jeep, van or LMV	46.25%	42.75%	0.33%	0.01%	10.66%

Vehicle Category	Single Journey	Return Journey	Local Monthly Pass	Local Commercial Vehicles	Exemption
LCV, light goods vehicle, or minibus	46.23%	41.56%	0.00%	2.75%	9.46%
Bus or truck (2-axle)	72.20%	26.84%	0.00%	0.09%	0.87%
3-axle CV	78.27%	20.17%	0.00%	0.00%	1.56%
HCM, EME or MAV (4-6 axle)	78.62%	21.00%	0.00%	0.06%	0.33%

Source: Toll Plaza data, CRISIL MI&A CONSULTING

Mohtara - Details of trip segmentation across vehicle categories

Vehicle Category	Single Journey	Return Journey	Local Monthly Pass	Local Commercial Vehicles	Exemption
Car, jeep, van or LMV	33.44%	47.07%	8.46%	1.93%	9.10%
LCV, light goods vehicle, or minibus	36.94%	31.93%	0.00%	17.32%	13.82%
Bus or truck (2-axle)	63.44%	28.97%	0.00%	6.14%	1.45%
3-axle CV	51.95%	26.33%	0.00%	21.51%	0.21%
HCM, EME or MAV (4-6 axle)	87.13%	11.62%	0.00%	1.08%	0.17%

Source: Toll Plaza data, CRISIL MI&A CONSULTING

Boharipar - Details of trip segmentation across vehicle categories

Vehicle Category	Single Journey	Return Journey	Local Monthly Pass	Local Commercial Vehicles	Exemption
Car, jeep, van or LMV	37.74%	40.70%	7.70%	0.05%	13.80%
LCV, light goods vehicle, or minibus	44.59%	38.94%	1.84%	0.91%	15.57%
Bus or truck (2-axle)	59.15%	37.23%	0.59%	0.73%	2.89%
3-axle CV	72.22%	20.97%	0.43%	4.25%	2.56%
HCM, EME or MAV (4-6 axle)	92.76%	6.71%	0.00%	0.07%	0.47%

Source: Toll Plaza data, CRISIL MI&A CONSULTING

The table below provides the traffic growth rates considering diversions to expressway and other alternative routes, as provided by the Traffic Consultant:

Odhaki Toll Plaza

CAGR	FY24-26	FY26-31	FY31-41	FY24-44
Car	7.4%	5.9%	4.3%	4.8%
Bus	3.7%	3.1%	2.1%	2.4%
Minibus	3.7%	3.1%	2.1%	2.4%
LCV	3.7%	2.8%	3.0%	3.0%
2 axles	4.0%	2.9%	3.4%	3.3%
3 axles	4.0%	1.9%	3.2%	2.9%
MAV	4.5%	3.2%	3.7%	3.6%
Total PCU	5.0%	3.7%	3.7%	3.8%
Revenue growth	9.1%	7.9%	7.9%	8.0%

Source: CRISIL MI&A CONSULTING

Kherwasani Toll Plaza

Note: FY24-26 revenue CAGR includes the increased toll collection due to addition of Katni bypass in the tollable length. The commencement of Katni Bypass is considered from 1st Jan 2025.

CAGR	FY24-26	FY26-31	FY31-41	FY24-44
Car	7.4%	5.9%	4.3%	4.8%
Bus	3.7%	3.1%	2.1%	2.4%
Minibus	3.7%	3.1%	2.1%	2.4%
LCV	3.5%	2.9%	2.9%	2.9%
2 axles	4.2%	3.3%	3.5%	3.4%
3 axles	3.7%	2.3%	2.9%	2.8%

CAGR	FY24-26	FY26-31	FY31-41	FY24-44
MAV	4.4%	3.2%	3.6%	3.6%
Total PCU	4.9%	3.7%	3.7%	3.7%
Revenue growth	27.2%	8.0%	7.9%	9.6%

Source: CRISIL MI&A CONSULTING

Mohtara Toll Plaza

CAGR	FY24-26	FY26-31	FY31-41	FY24-44
Car	7.4%	5.7%	4.3%	4.7%
Bus	3.7%	3.1%	2.1%	2.4%
Minibus	3.7%	3.1%	2.1%	2.4%
LCV	3.5%	3.0%	3.0%	3.0%
2 axles	3.8%	2.9%	3.1%	3.1%
3 axles	3.4%	2.2%	2.7%	2.6%
MAV	4.4%	3.1%	3.7%	3.6%
Total PCU	5.1%	3.9%	3.7%	3.8%
Revenue growth	8.7%	8.1%	7.9%	7.9%

Source: CRISIL MI&A CONSULTING

Boharipar Toll Plaza

CAGR	FY24-26	FY26-31	FY31-41	FY24-44
Car	7.4%	6.2%	4.3%	4.9%
Bus	3.7%	3.1%	2.1%	2.4%
Minibus	3.7%	3.1%	2.1%	2.4%
LCV	3.5%	3.2%	2.9%	3.0%
2 axles	3.9%	3.5%	3.3%	3.4%
3 axles	3.7%	3.3%	3.0%	3.1%
MAV	4.7%	4.3%	4.0%	4.1%
Total PCU	5.2%	4.6%	3.8%	4.1%
Revenue growth	8.8%	8.9%	8.1%	8.2%

Source: CRISIL MI&A CONSULTING

Projected Traffic Data: Growth in Passenger Car Unit (PCU)

Odhaki Toll Plaza

Vehicle Type	FY24	FY26	FY31	FY36	FY41	FY44
Car	3,324	3,835	5,107	6,457	7,749	8,473
Bus	130	140	163	184	201	211
Minibus	121	130	151	170	186	195
LCV	199	214	245	286	330	357
2-axle	557	603	694	823	967	1,058
3-axle	272	294	323	379	440	478
MAV	1,948	2,128	2,491	3,004	3,586	3,962
Total	**6,550**	**7,343**	**9,175**	**11,303**	**13,460**	**14,734**
Total PCU	**15,447**	**17,038**	**20,451**	**24,817**	**29,486**	**32,370**

Source: CRISIL MI&A CONSULTING

Kherwasani Toll Plaza

Vehicle Type	FY24	FY26	FY31	FY36	FY41	FY44
Car	3,693	4,261	5,674	7,174	8,610	9,414
Bus	180	194	226	254	278	291
Minibus	60	65	75	85	93	97
LCV	317	339	392	455	523	565
2-axle	771	837	985	1,173	1,383	1,516
3-axle	363	390	438	509	584	631
MAV	2,284	2,489	2,910	3,496	4,159	4,587
Total	**7,669**	**8,575**	**10,699**	**13,146**	**15,631**	**17,102**
Total PCU	**18,482**	**20,330**	**24,412**	**29,523**	**34,989**	**38,364**

Source: CRISIL MI&A CONSULTING

Mohtara Toll Plaza

Vehicle Type	FY24	FY26	FY31	FY36	FY41	FY44
Car	6,193	7,145	9,421	11,910	14,294	15,629

Vehicle Type	FY24	FY26	FY31	FY36	FY41	FY44
Bus	186	200	234	263	288	302
Minibus	96	103	120	135	148	155
LCV	391	419	486	565	650	703
2-axle	930	1,001	1,157	1,357	1,576	1,713
3-axle	587	627	701	805	916	983
MAV	1,664	1,812	2,114	2,545	3,033	3,349
Total	**10,047**	**11,308**	**14,233**	**17,580**	**20,906**	**22,834**
Total PCU	**19,520**	**21,570**	**26,119**	**31,686**	**37,480**	**40,982**

Source: CRISIL MI&A CONSULTING

Boharipar Toll Plaza

Vehicle Type	FY24	FY26	FY31	FY36	FY41	FY44
Car	3,626	4,184	5,653	7,147	8,578	9,379
Bus	173	186	216	243	267	279
Minibus	34	36	42	48	52	55
LCV	247	265	309	359	413	445
2-axle	739	798	949	1,120	1,310	1,429
3-axle	256	275	323	377	435	471
MAV	1,191	1,305	1,608	1,966	2,380	2,651
Total	**6,265**	**7,048**	**9,100**	**11,261**	**13,434**	**14,710**
Total PCU	**12,908**	**14,283**	**17,878**	**21,826**	**26,020**	**28,598**

Source: CRISIL MI&A CONSULTING

Tollable Length and Toll Rates

As per NHTIS, the Rewa-Lakhnadon project comprises 315.368 kms of tollable length. In India, toll rates are as per notification by the Ministry of Road Transport and Highways in the National Gazette. The present toll rates are determined with reference to the published base toll rates and are adjusted annually at the beginning of each fiscal year equal to 40% of the movement in the wholesale price index in December of the preceding year plus a fixed 3%.

Single toll rates in INR at four toll plazas, applicable from April 2023 until March 2024 are as provided below:

Single toll rates across toll plazas

Type of Vehicle	Odhaki	Kherwasani	Mohtara	Boharipar
CJV	110	115	120	150
LCV	180	185	195	245
Bus/Truck	375	390	415	515
3A	410	430	450	560
MAV/ HCM/EME	590	615	650	805
OSV	720	750	790	980

Source: NHTIS, CRISIL MI&A CONSULTING

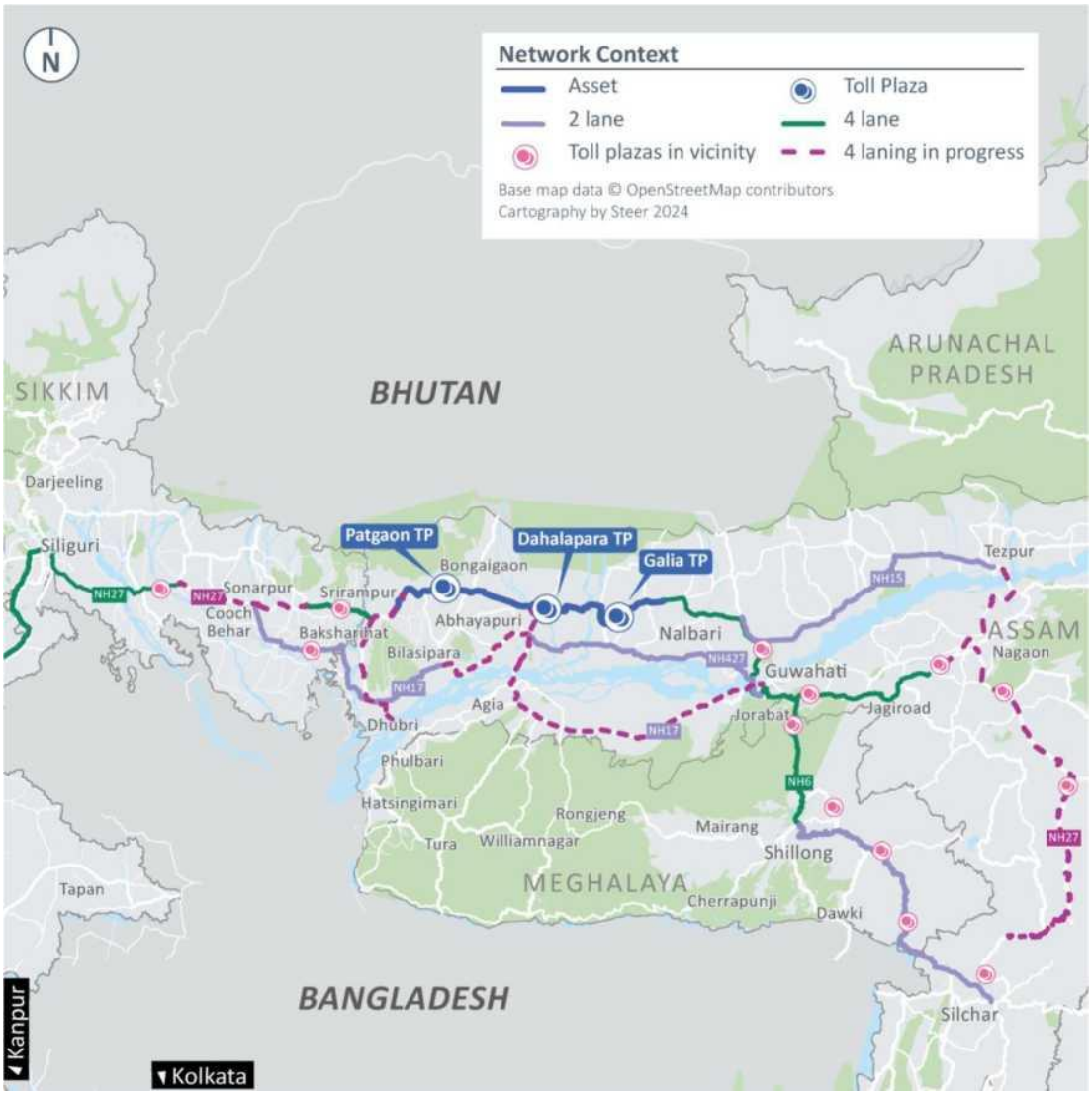
For further details in relation to Asset 10, please refer to **Annexure C** of this Preliminary Placement Document.

Kachugaon - Kaljhar Project ("Asset 11") and Kaljhar – Patacharkuchi Project ("Asset 12") (for the purposes of the summary provided below, collectively referred to as "Asset")

Project overview

According to the Traffic Consultant ,the Asset is located on the National Highway (NH) 27, the east-west corridor of India. The highway starts in Porbandar in Gujarat and ends in Silchar in Assam and passes though the states of Gujarat, Rajasthan, Madhya Pradesh, Uttar Pradesh, Bihar, West Bengal, and Assam.

The Asset consists of three toll plazas namely Patgaon (at KM 49+600, located 215km west of Guwahati), Dahalapara (at KM 971+200, located 160km west of Guwahati) and Galia (at KM 1017+350, located 120km west of Guwahati), as shown in the map below.



Source: Steer cartography using OpenStreetMap data

Salient growth features and traffic generators

The Asset is located in the state of Assam, which is the most industrialized state within northeast (NE) India. The growth observed in NE region is largely driven by the state of Assam which contributes ~ 65% to the region's economy. Some of the key industries in Assam include oil and gas, limestone and cement, and coal.

The Asset located on NH27, the east-west corridor of India, is connected via the Siliguri corridor, also called the Chicken Neck. The Siliguri Corridor and the Asset connects the seven states of northeast India to the rest of India. The Asset acts as a feeder for the NE India and caters to the long-distance traffic entering the region via Assam.

No major urban settlements are present near the Asset. Guwahati, one of the largest settlements in the northeast region, is located ~185 km from the Asset. It is a key manufacturing and industrial centre of the region and is home to numerous warehouse and storage depots. The traffic from rest of the country uses the Asset to reach Guwahati from where it is distributed to rest of northeast India, with Guwahati acting as a sink and as a source.

The north-eastern states of India, being consumption based in nature, depend heavily on the rest of India for their consumption needs. The commodities from West Bengal, central India, and north India are transported to the warehouses of Guwahati via the Asset, from where these goods are redistributed to the rest of northeast region. Key commodities observed are groceries, manufactured goods, industrial equipment, parcels and couriers, petroleum products etc. From Guwahati and rest of northeast region, trucks carry cement (from Jagiroad, Morigaon), petroleum products (from refineries in Bongaigaon, Guwahati), bamboo, tea, rubber, and groceries to the rest of country.

The state is famous for its tea cultivation and accounts for approximately half of India's tea production. Apart from tea cultivation, the state is also a major producer of rice, horticulture crops (mango, banana), spices (cardamom, ginger, and turmeric).

Assam is a major producer of crude oil and natural gas in India. Most of the oilfields in state are located in the upper Assan region with the refineries being located in Guwahati, Digboi, Numaligarh and Bongaigaon. Indian Oil Corporation Limited (IOCL) refinery at Bongaigaon is located on the Asset between Patgaon and Dahalapara plazas.

High-grade fossil limestone (Sylhet limestone) is found in Garo and Khasi hills of Assam and is majorly used for production of cement. The availability of raw material has facilitated the setting up of large cement industries in Assam. Guwahati/Kamrup district is home to the largescale industries of Purbanchal Cement, Topcem Cement, Star Cement, Dalmia Cement etc.

Traffic volume and composite of vehicles

Historical traffic data

ETC daily-level data, segmented with ticket categories, was available from December 2021 - November 2023 for Patgaon, from November 2021 - November 2023 for Dahalapara and from November 2021 - November 2023 for Galia. For Patgaon and Dahalapara, FY23 PCU is trending at 15,361 and 18,884 which grows to 15,932 and 18,937 in 8 months of FY24YTD. FY23 PCU at Galia is 19, 617 while 8 months FY24YTD is 19,102.

The revenue collection for FY23 is INR 61 million and INR 63 million for Patgaon and Dahalapara respectively. For FY24 YTD (Apr-Nov'23) it is INR 440 million and INR 435 million for Patgaon and Dahalapara respectively. For FY23, ETC collection including cash collection reported by Schedule V is INR 35Cr which for first 8 months of FY24 (Apr-Nov'23) is INR 237 million at Galia.

Figure: MADT, PCU Patgaon

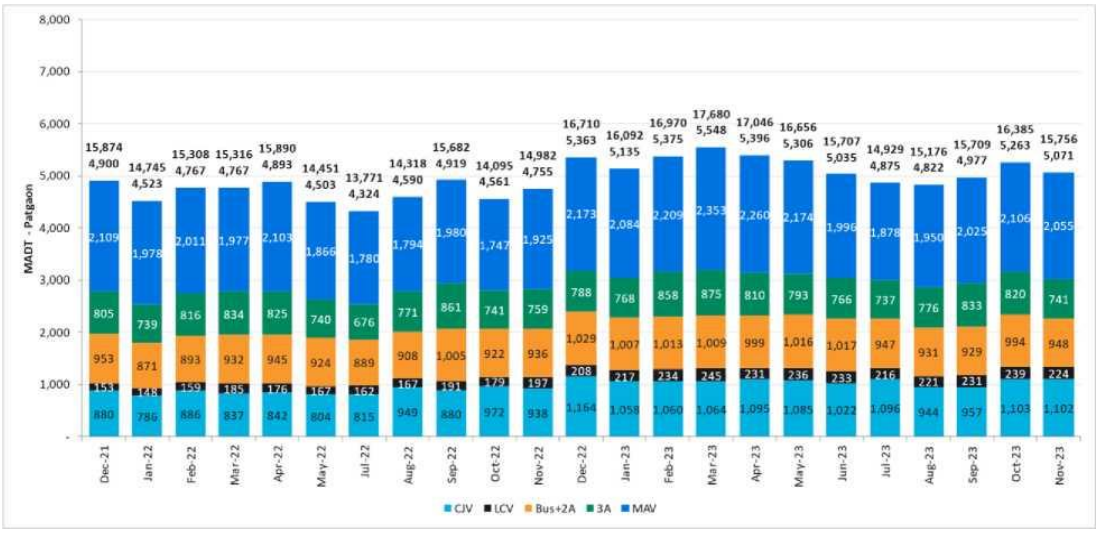


Figure: MADT, PCU Dahalapara

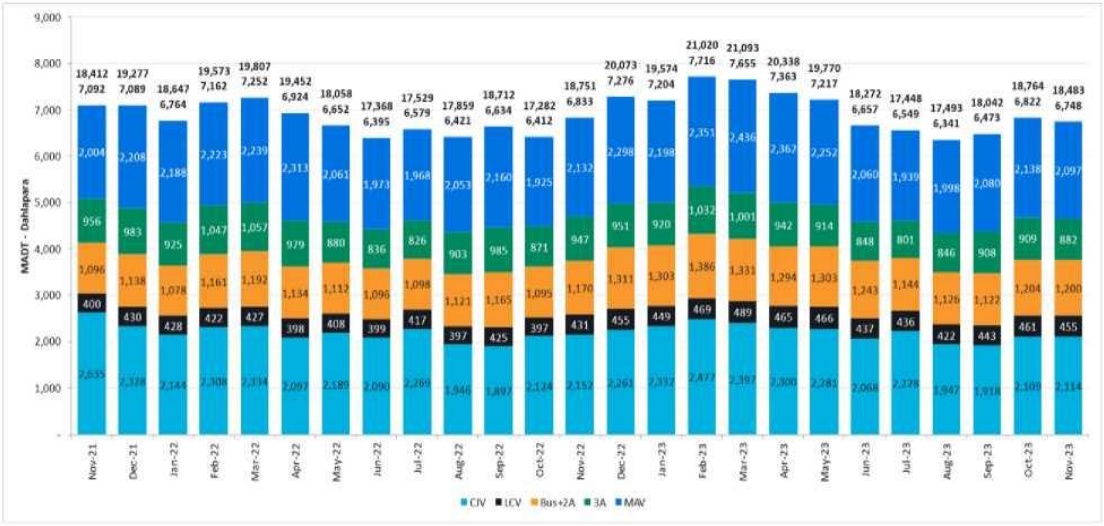
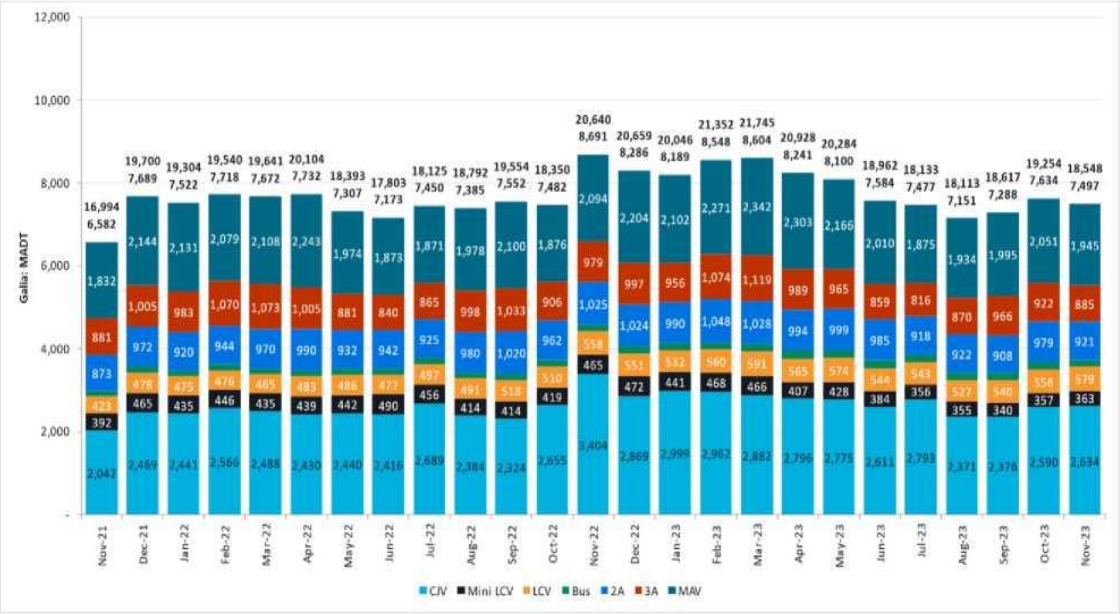


Figure: MADT, PCU Galia



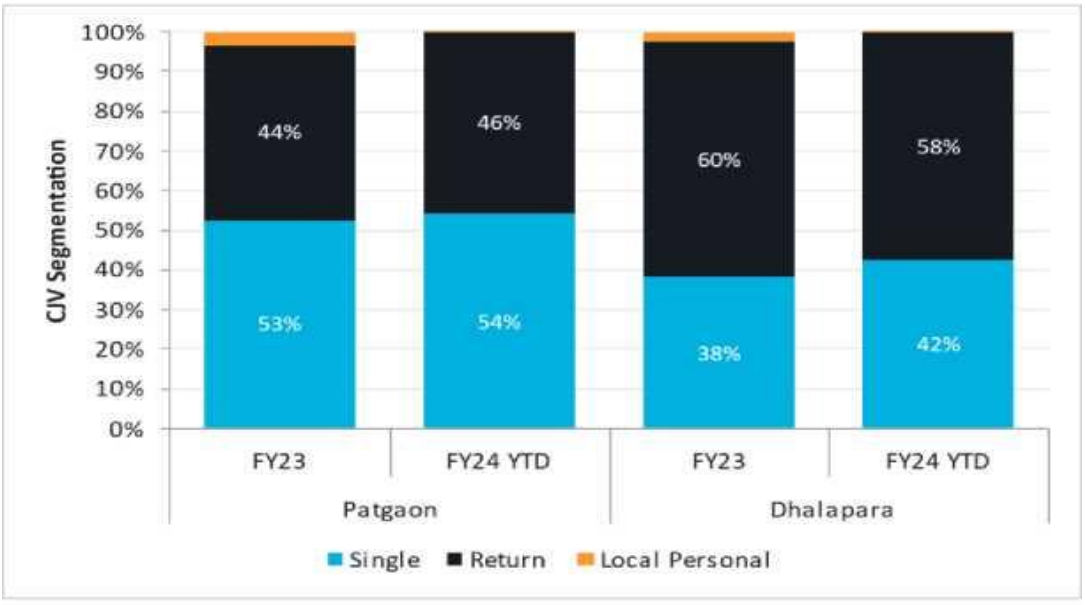
Source: Steer analysis

Toll segmentation

Based on detailed review of historic trends of trip segmentation, according to the Consultant on the Asset, CJV ticket segmentation observes a healthy share of 'return' trips due to the local nature of movement. This is observed across all three toll plazas on the Asset.

The majority of MAV traffic at Patgaon, Dahalapara and Galia is long-distance traffic which has one end in Guwahati/northeast and the other in the rest of the country (west of Patgaon). Patgaon has higher influence of long-distance traffic originating from West Bengal/Bihar and North India. Whereas moving east towards the Asset the influence of local traffic from Bongaigaon, Barpeta, Pathshala, Howly increases which is visible on Dahalapara and Galia. Overall, the travel patterns remain similar on all these plazas.

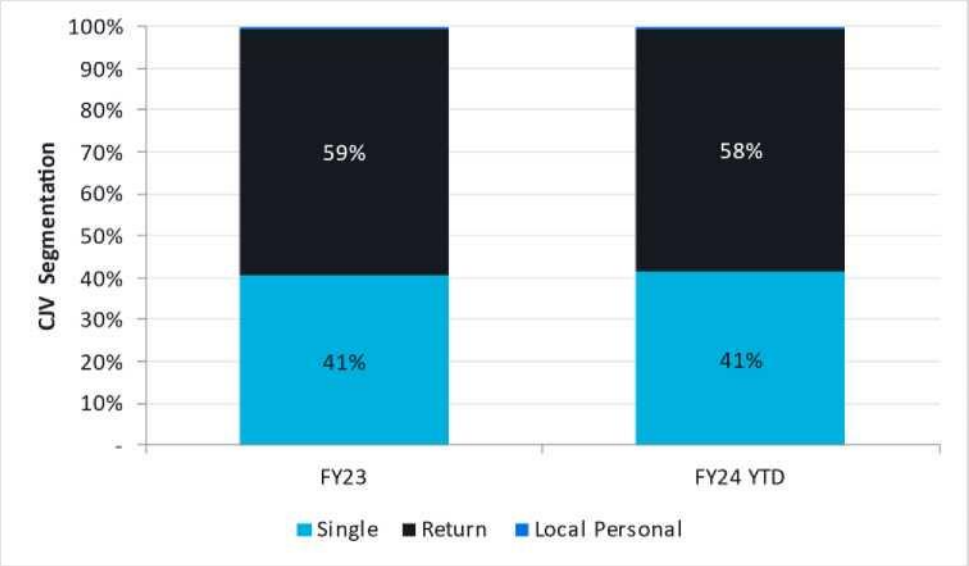
Figure: Segmentation CJV- Patgaon, Dahalapara



Source: Steer analysis

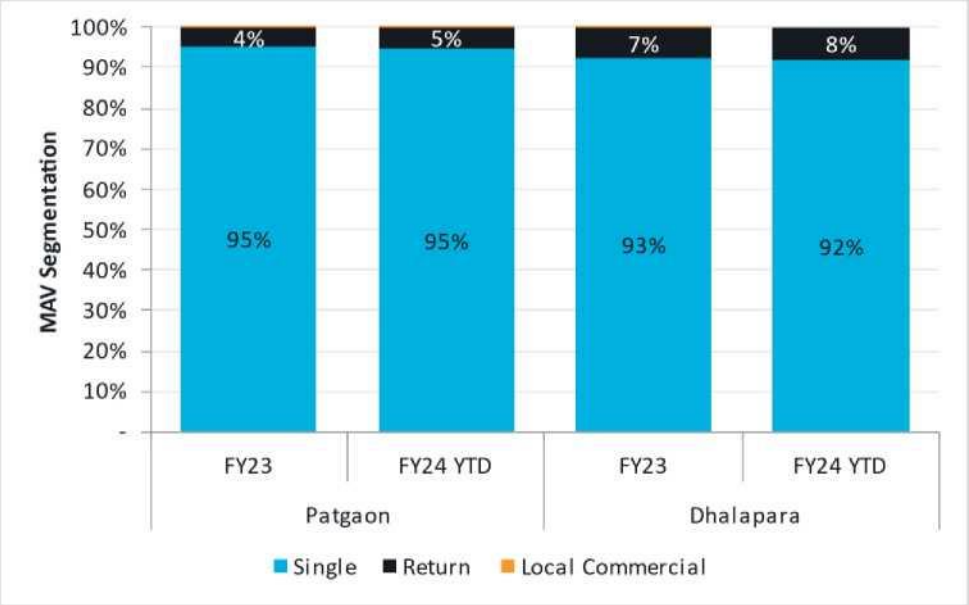
Source: Steer analysis

Figure: Segmentation CJV- Galia



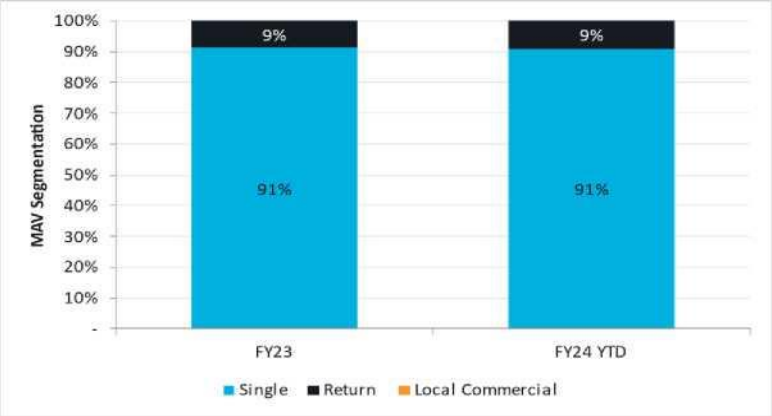
Source: Steer analysis

Figure: Segmentation MAV- Patgaon, Dahalapara



Source: Steer analysis

Figure: Segmentation MAV- Galia



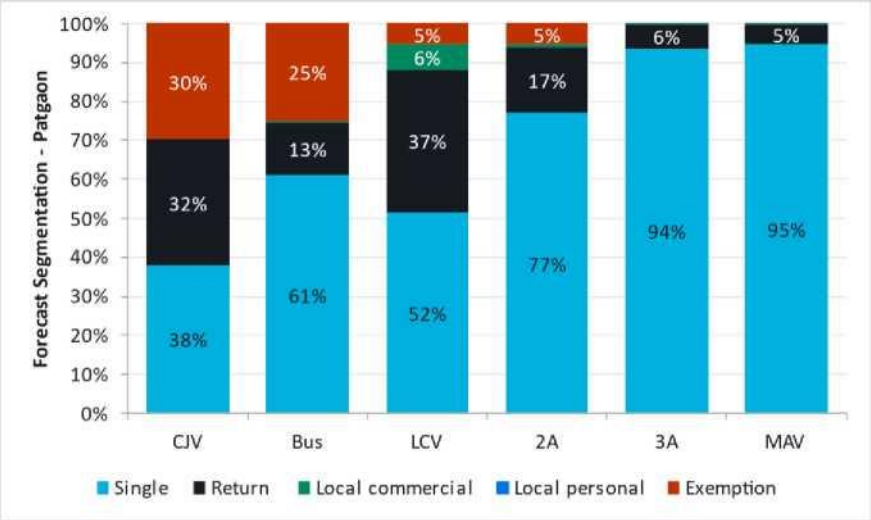
Source: Steer analysis

However, as the above-mentioned segmentation is sourced from the ETC (segmented) dataset Patgaon and Dahalapara the segmentation doesn't include information regarding cash/monthly pass-based trips and exemptions. Therefore, the difference between ETC (segmented) and TMS dataset is added (as a % of ETC traffic) as cash (single) and monthly pass-based trips. It should be noted that the TMS data had information regarding the number cash-based and the number of monthly passes sold per day.

While for Galia cash transactions at monthly were already provided. Additionally, for exemptions the difference between TVC and ETC dataset is added (as a % of ETC traffic) in the final adopted segmentation as non-paying traffic.

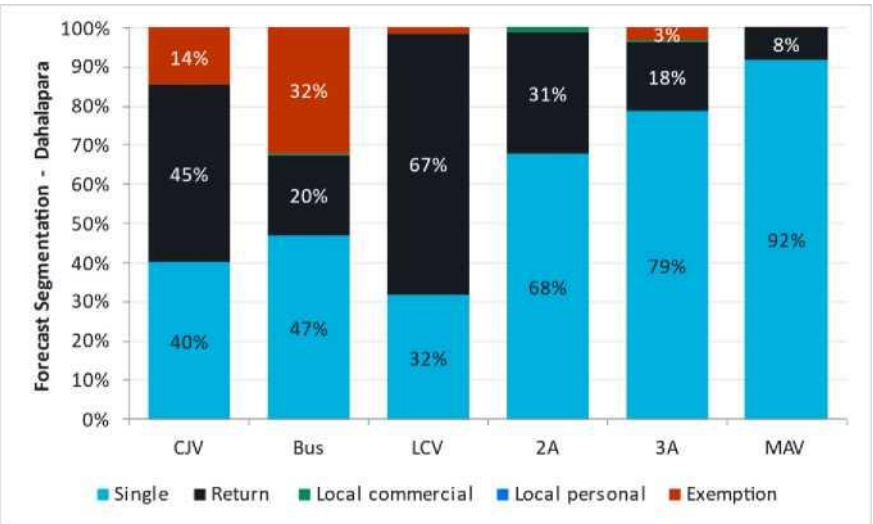
The adopted segmentation of FY24YTD is shown in the charts below. We have assumed the forecast segmentation to remain same across the concession life.

Figure: Toll segmentation (%) FY24 onwards- Patgaon



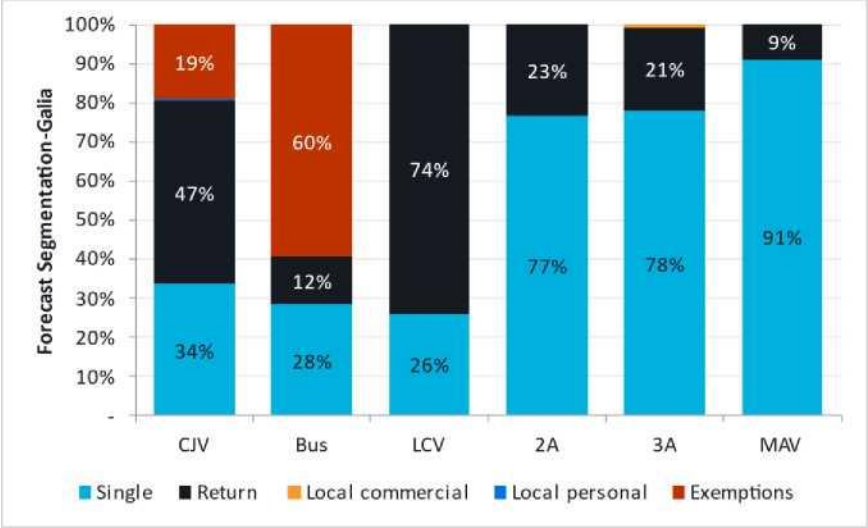
Source: Steer analysis

Figure: Toll segmentation (%) FY24 onwards- Dahalapara



Source: Steer analysis

Figure: Toll segmentation (%) FY24 onwards- Galia



Source: Steer analysis

Traffic forecast

The increase of traffic on any existing road alignment depends on how fast the background travel demand (background growth) will grow; and on how successfully the project road is in attracting that traffic (traffic capture). Background travel demand is driven by the prevalent socio-economic conditions in the region, which include:

- Changes in factors such as population, employment, and income distribution
- Economic growth (GSDP, and GDP).
- Growth of local industries near the Asset.

The model uses India GDP and Assam GSDP as the two macro-economic inputs which operate as growth drivers on our base year forecasts.

The network developments near the Asset's alignment which Steer believes would affect traffic on the Asset during the concession period are 4 Laning of NH17 (Hapachara to VIP Chowk) +New Goalpara bridge, Guwahati Ring Road, Flyover construction (Passenger), 4 laning of NH127B + Phulbari bridge and 4-laning of West Bengal Section (Cooch Bihar to Bilasparia to Guwahati).

Steer has developed traffic and revenue forecasts for the Asset by taking into consideration all inputs discussed above - base year estimates, macro-economic assumptions, growth drivers, elasticities, and forecast ticket segmentation. The table below provides the final (background plus impacts) traffic growth on the Asset.

Final (background plus impacts) AADT forecast - Patgaon

Vehicle Type	FY24	FY25	FY26	FY30	FY35	FY40	FY45
CJV	1,331	1,417	1,515	1,937	2,581	3,384	4,341
Mini LCV	314	320	327	352	384	418	451
Bus	133	135	138	147	158	169	180
LCV	265	270	276	297	324	351	379
2A	954	991	1,031	1,113	1,322	1,554	1,803
3A	807	827	850	893	1,002	1,117	1,234
MAV	2,178	2,297	2,429	2,768	3,529	4,437	5,477
OSV	2	2	2	2	3	3	4
AADT	**5,985**	**6,259**	**6,566**	**7,510**	**9,303**	**11,433**	**13,868**
PCU's	**17,536**	**18,345**	**19,249**	**21,661**	**26,789**	**32,828**	**39,675**

Final (background plus impacts) AADT CAGR (%) - Patgaon

Vehicle Type	FY24-FY25	FY25-FY26	FY26-FY30	FY30-FY35	FY25-FY26	FY26-FY30	FY30-FY35
CJV	6.4%	6.9%	6.3%	5.9%	5.6%	5.1%	5.8%
Mini LCV	1.9%	2.1%	1.9%	1.8%	1.7%	1.5%	1.7%

Vehicle Type	FY24-FY25	FY25-FY26	FY26-FY30	FY30-FY35	FY25-FY26	FY26-FY30	FY30-FY35
Bus	1.6%	1.7%	1.6%	1.5%	1.4%	1.3%	1.4%
LCV	1.9%	2.0%	1.9%	1.7%	1.6%	1.5%	1.7%
2A	3.8%	4.1%	1.9%	3.5%	3.3%	3.0%	3.1%
3A	2.5%	2.7%	1.3%	2.3%	2.2%	2.0%	2.0%
MAV	5.4%	5.8%	3.3%	5.0%	4.7%	4.3%	4.5%
OSV	5.5%	5.8%	5.4%	5.0%	4.7%	4.3%	4.9%
AADT	**4.6%**	**4.9%**	**3.4%**	**4.4%**	**4.2%**	**3.9%**	**4.1%**
PCU's	**4.6%**	**4.9%**	**3.0%**	**4.3%**	**4.1%**	**3.9%**	**4.0%**

Source: Steer analysis

Final (background plus impacts) AADT forecast - Dahalapara

Vehicle Type	FY24	FY25	FY26	FY30	FY35	FY40	FY45
CJV	2,382	2,454	2,710	3,466	4,619	6,055	7,768
Mini LCV	460	464	479	517	564	613	661
Bus	231	235	239	254	274	293	313
LCV	495	504	515	549	599	649	700
2A	1,129	1,172	1,219	1,250	1,483	1,744	2,024
3A	938	962	988	934	1,048	1,168	1,291
MAV	2,200	2,320	2,454	2,602	3,317	4,170	5,147
OSV	1	1	1	2	2	3	3
AADT	**7,837**	**8,112**	**8,605**	**9,573**	**11,905**	**14,695**	**17,906**
PCU's	**20,386**	**21,225**	**22,348**	**23,836**	**29,431**	**36,034**	**43,536**

Source: Steer analysis

Final (background plus impacts) AADT CAGR (%) - Dahalapara

Vehicle Type	FY24-FY25	FY25-FY26	FY26-FY30	FT30-FY35	FY35-FY40	FY40-FY45	FY24-FY45
CJV	3.0%	10.4%	6.3%	5.9%	5.6%	5.1%	5.8%
Mini LCV	0.8%	3.2%	1.9%	1.8%	1.7%	1.5%	1.7%
Bus	1.6%	1.7%	1.6%	1.5%	1.4%	1.3%	1.4%
LCV	1.9%	2.0%	1.6%	1.7%	1.6%	1.5%	1.7%
2A	3.8%	4.1%	0.6%	3.5%	3.3%	3.0%	2.8%
3A	2.5%	2.7%	(1.4%)	2.3%	2.2%	2.0%	1.5%
MAV	5.4%	5.8%	1.5%	5.0%	4.7%	4.3%	4.1%
OSV	5.5%	5.8%	5.4%	5.0%	4.7%	4.3%	4.9%
AADT	**3.5%**	**6.1%**	**2.7%**	**4.5%**	**4.3%**	**4.0%**	**4.0%**
PCU's	**4.1%**	**5.3%**	**1.6%**	**4.3%**	**4.1%**	**3.9%**	**3.7%**

Source: Steer analysis

Final (background plus impacts) AADT forecast - Galia

Vehicle Type	FY24	FY25	FY26	FY30	FY35	FY40	FY45
CJV	3,385	3,489	3,851	4,925	6,563	8,604	11,038
Mini LCV	392	394	405	431	464	497	530
LCV	574	585	597	644	703	764	824
Bus	465	474	483	521	569	618	667
2A	970	1,007	1,048	1,066	1,266	1,489	1,729
3A	941	965	991	956	1,072	1,195	1,320
MAV	2,113	2,227	2,354	2,436	3,099	3,890	4,794
OSV	2	2	2	2	3	3	4
AADT	**8,842**	**9,143**	**9,733**	**10,981**	**13,740**	**17,060**	**20,906**
PCU's	**21,283**	**22,128**	**23,324**	**24,922**	**30,764**	**37,673**	**45,542**

Source: Steer analysis

Final (background plus impacts) AADT CAGR (%) – Galia

Vehicle Type	FY24-25	FY25-FY26	FY26-FY30	FY30-FY35	FY35-FY40	FY40-FY45	FY24-FY45
CJV	3.1%	10.4%	6.3%	5.9%	5.6%	5.1%	5.8%
Mini LCV	0.6%	2.7%	1.6%	1.5%	1.4%	1.3%	1.4%
LCV	1.9%	2.1%	1.9%	1.8%	1.7%	1.5%	1.7%
Bus	1.9%	2.1%	1.9%	1.8%	1.7%	1.5%	1.7%
2A	3.8%	4.1%	0.4%	3.5%	3.3%	3.0%	2.8%
3A	2.5%	2.7%	(0.9%)	2.3%	2.2%	2.0%	1.6%
MAV	5.4%	5.7%	0.9%	4.9%	4.6%	4.3%	4.0%
OSV	5.4%	5.7%	5.3%	4.9%	4.6%	4.3%	4.8%
AADT	**3.4%**	**6.4%**	**3.1%**	**4.6%**	**4.4%**	**4.1%**	**4.2%**

Vehicle Type	FY24-25	FY25-FY26	FY26-FY30	FY30-FY35	FY35-FY40	FY40-FY45	FY24-FY45
PCU's	**4.0%**	**5.4%**	**1.7%**	**4.3%**	**4.1%**	**3.9%**	**3.7%**

Source: Steer analysis

Toll Rates

In India, toll rates are as per notification by the Ministry of Road Transport and Highways in the National Gazette. The present toll rates are determined with reference to the published base toll rates and are adjusted annually at the beginning of each fiscal year equal to 40% of the movement in the wholesale price index in December of the preceding year plus a fixed 3%.

According to the NHAI's toll notification for FY24, i.e., April 1, 2023, onwards, the toll rates at the toll plazas for Asset are as follows:

FY24 single toll rates Patgaon, Dahalapara and Galia

Type of Vehicle	Patgaon	Dahalapara	Galia
CJV	100	90	45
LCV	165	145	75
Bus/Truck	340	300	155
3A	370	325	170
MAV/ HCM/EME	535	470	245

Source: NHAI Revision of User fee Rate w.e.f 01.04.2023

For further details in relation to Asset 11 and 12, please refer to **Annexure C** of this Preliminary Placement Document.

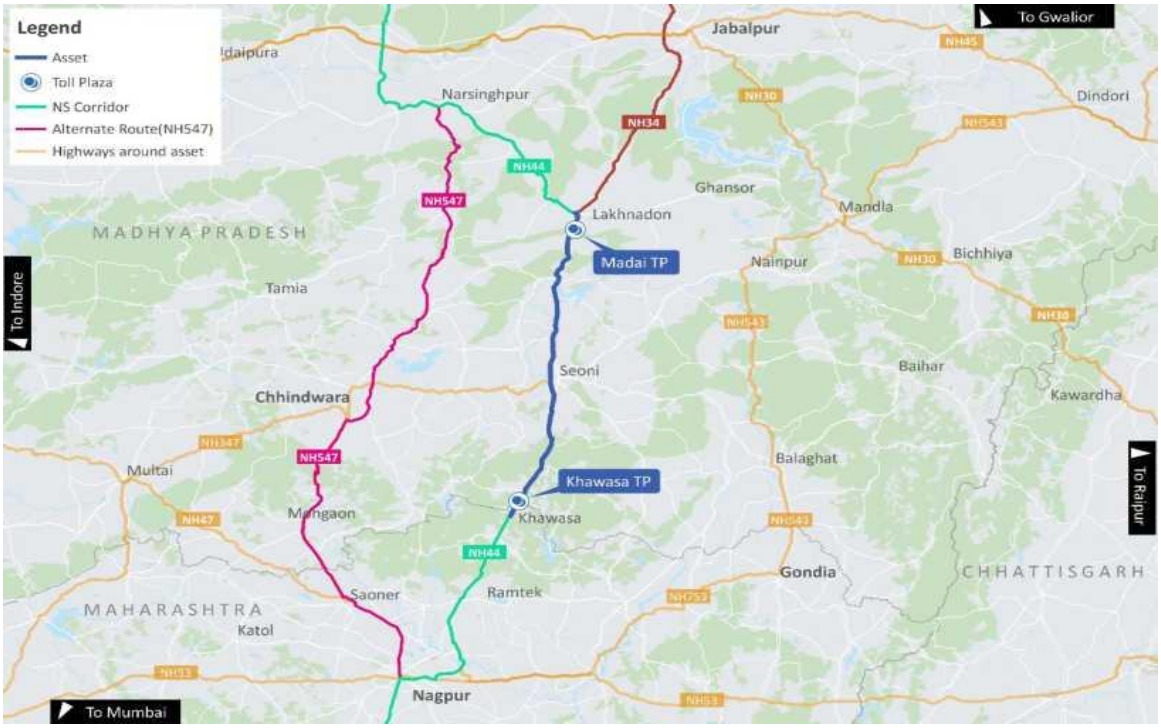
Lakhnadon – Mahagaon (Mohgaon) – Khawasa ("Asset 13")

Project overview

According to the Traffic Consultant, the Asset forms part of NH44 north-south long-distance strategic corridor. The Asset is a 4- laned divided section between Lakhnadon and Khawasa traversing through the districts of Mandai, Chhapara and Seoni in the state of Madhya Pradesh. There are two toll plazas on the asset and are located at and is shown in the map below:

- Khawasa (KM 651+718)
- Madai (KM 549+200)

Asset context – LK



Source: Steer cartography using OpenStreetMap data

Salient growth features and traffic generators

The Asset is present in the state of Madhya Pradesh close to Madhya Pradesh and Maharashtra border. The Asset forms part of the strategic NH44 corridor catering to the north-south movement.

The Asset caters to the demand generated by the states connected through the abovementioned highway. NH44 runs over 4,112 kms completing the north-south movement and connects some of the major states and industrial centres of northern states/UTs of Jammu and Kashmir, Punjab, Haryana, Delhi, Uttar Pradesh, Rajasthan, Madhya Pradesh, Maharashtra with the southern states of Telangana, Andhra Pradesh, Karnataka, and Tamil Nadu. The traffic profile is predominantly goods vehicles undertaking both medium and long-distance movements between Nagpur, Jabalpur, Chhindwara, Delhi, Bangalore, Hyderabad and more.

The Asset lies between the urban centres of Jabalpur and Nagpur. Jabalpur has medium to large scale industries alongside agriculture-based economy. Whereas Nagpur being the manufacturing and food processing hub has industries like Butibori, Umred generating goods demand. The key economic activities are detailed below:

- **Manufacturing** segment includes products ranging from agriculture equipment, aluminium products, castings, cement, chemicals, paper and packaging, electrical equipment and fittings, textile engineering goods, tools manufacturing, fabrication and machining, ferro alloys, paints, furniture, plastic and moulding products, etc.

- **Food processing** giants having presence at Nagpur includes Haldiram, Dinshaw, Patanjali and other medium scales orange and spices processing units, etc.

- **Agriculture production** In Jabalpur, some of the important commercial crops cultivated are cotton, pulses, sugarcane, oilseeds and medicinal crops. The fertile alluvial soil of Narmada basin also provides other crops like wheat, sorghum, millet and rice. Jabalpur is the largest producer of soyabeans in Madhya Pradesh.

Apart from the above-mentioned industrial segments present in Nagpur, the following are some additional developments announced by the government for the region:

- Government of Maharashtra has set-up Multi-Modal International Passenger and Cargo Hub Airport at Nagpur (MIHAN). That will upgrade existing domestic airport along with a Special Economic Zone which is abutting to the boundary of the airport. MIHAN houses plant of Tata Aeronautics which manufactures parts for Boeing and Air India and Dassault's assembly plants.

- Container Corporations of India Limited (CONCOR) constructed Multi Modal Logistic Park along with a rail terminal connecting MIHAN with different ports in country.

Butibori industrial area established by Maharashtra Industrial Development Corporation (MIDC), north of the Asset, is one of the country's largest industrial hubs. It houses textile, machine and metal fabrication and manufacturing units and is home to industrial giants like KEC, Hyundai, and Unitech. Koradi Thermal Power Station and Khaparkheda Thermal Power Station are the two major thermal power stations located in vicinity of the hub.

Yavatmal industrial area, in west of the Asset, has textile and cotton processing industries including Raymond India's garment plant. The industrial hub is also home to export units of machineries, cement, medicines, limestones, and clothes.

Chandrapur is key coal mining centre in close vicinity of the Asset and has thermal plant, cement, paper and ferro alloy manufacturing industries.

Chhindwara is home to brands like Raymond's & Hindustan Unilever. The city has rich market areas such as Mansarover Complex, Fawwara Chowk, Nagpur Road, Gole Gunj & Gandhi Gunj. The city is home to old industries of pottery, leather moots and ornaments of zinc, brass and bell metal. On the outskirts, vegetables, especially potatoes, are raised in large quantities for export to nearby districts. Western Coalfields Limited is the major company of Chhindwara approximate ten thousand people work together here.

Seoni railway station and its goods yard work as an important agricultural export hub. It is one of the 24 districts in Madhya Pradesh currently receiving funds from the Backward Regions Grant Fund Programme (BRGF). Railway connectivity to Seoni has increased the agricultural import export business from Seoni.

The agricultural stretches present along the Asset as well as in Nagpur generate a considerable share of traffic on the Asset. Nagpur, also known as Orange City, is famous for the production of oranges in addition to being home to large number of paddy, jowar, cotton, tur and soyabean fields. Also, Jabalpur is the largest producer of soyabeans in Madhya Pradesh. The city serves as a major wholesale market for food grains and other commodities. It is also a market center for its agricultural production of wheat, rice, green peas, maize, oil seeds and pulses.

Long-distance goods traffic has seen an increase in proportion in recent years due to the shift of traffic from other corridors to NH44 as this is the shortest route between Hyderabad/Bengaluru and Delhi.

Traffic volume and composite of vehicles

Historical traffic data

Toll plaza data from Oct-21 to Nov-23 and Dec'21 to Nov'23 for Khawasa and Madai, respectively, was shared by the Client. Therefore, to build the base estimate for FY24, we have considered:

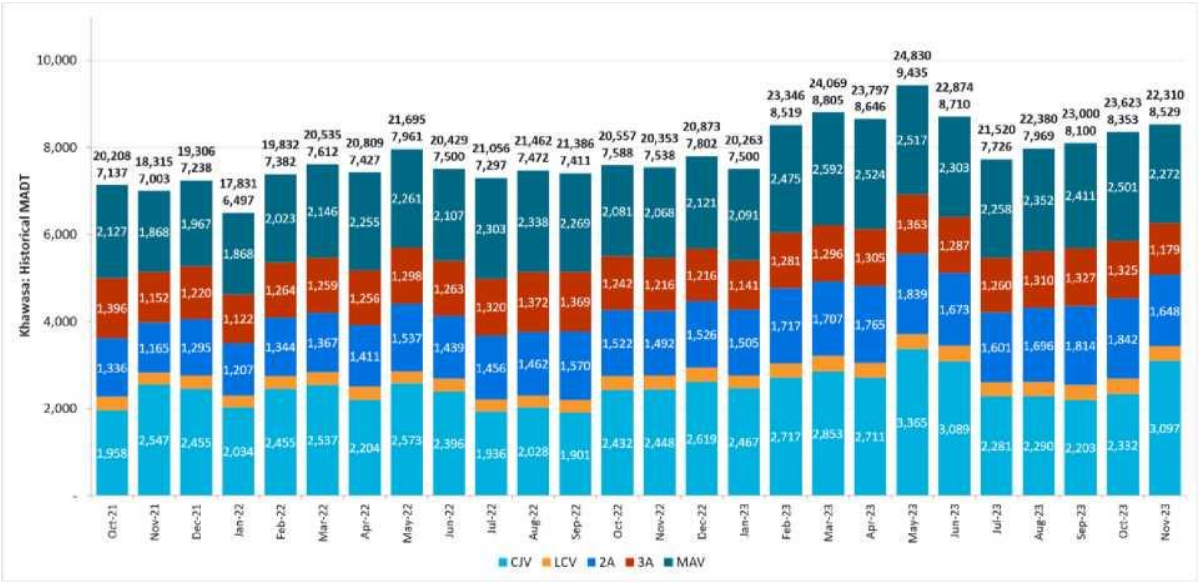
There are three data sources as mentioned in the table above, the Electronic Toll Collection (ETC) data provided by NHAI, IHMCL data and Schedule V data. For the purpose of base estimation and analysis of traffic trends ETC and cash data has been used. For the purpose for cash transactions Schedule V has been relied upon.

All these data sets together have been considered for historical analysis and revenue reconciliation.

The Asset is trending at ~23,000 PCU for 8 months of FY24. On both the plazas, traffic composition is majorly dominated by trucks (2A/3A/MAV) with over 2/3rd of total traffic on Khawasa and Madai each, as they primarily serve long-distance north-south traffic movement. Khawasa toll plaza observed an average of ~8,433 AADT and Madai ~9,303 AADT in FY24YTD.

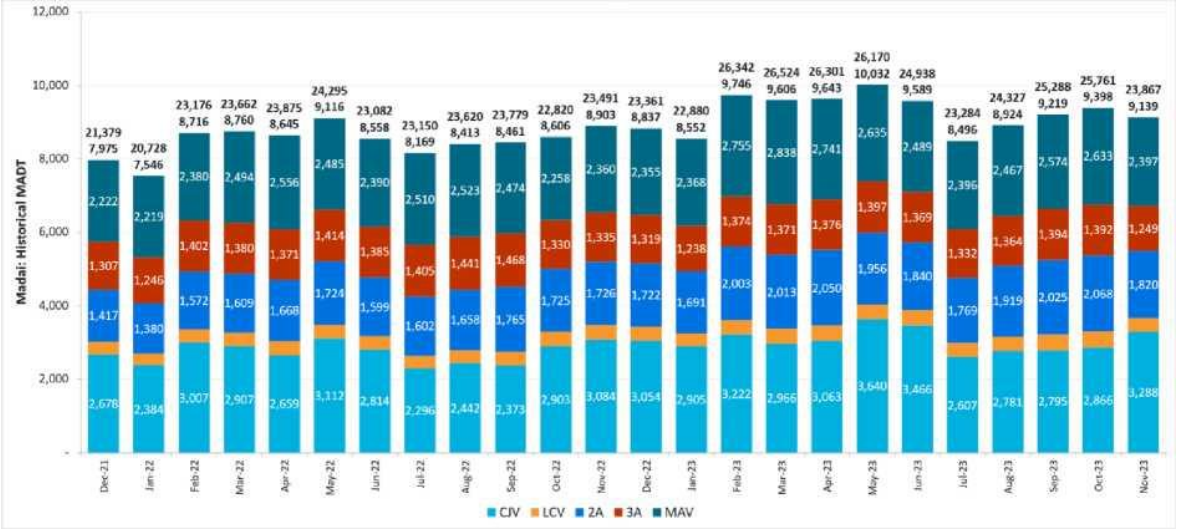
Per day Collection increased ~11% in FY24 compared to FY23 on the Asset. Total annual collection of 1,860 million in FY23 is increasing to 1,380 million in 8months for FY24YTD. On an average, the daily revenue collection on the Asset is ~INR 5.7 million.

Khawasa Historical Traffic (ETC + Cash MADT, PCU)



Source: Steer analysis of client toll plaza data

Madai Historical Traffic (ETC + Cash MADT, PCU)

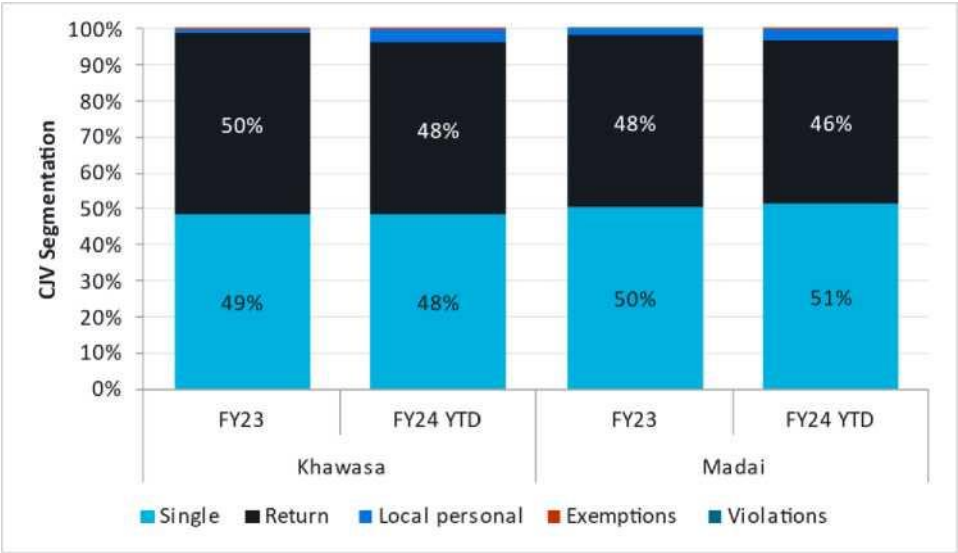


Source: Steer analysis of client toll plaza data

Toll segmentation

Based on detailed review of historic trends of trip segmentation, according to the Consultant on the Asset, CJVs observe approximately equal split between single and return tickets on both Khawasa and Madai as the plazas cater to inter-urban movement influenced by the presence of major consumption centres, Nagpur and Jabalpur on either ends of the asset.

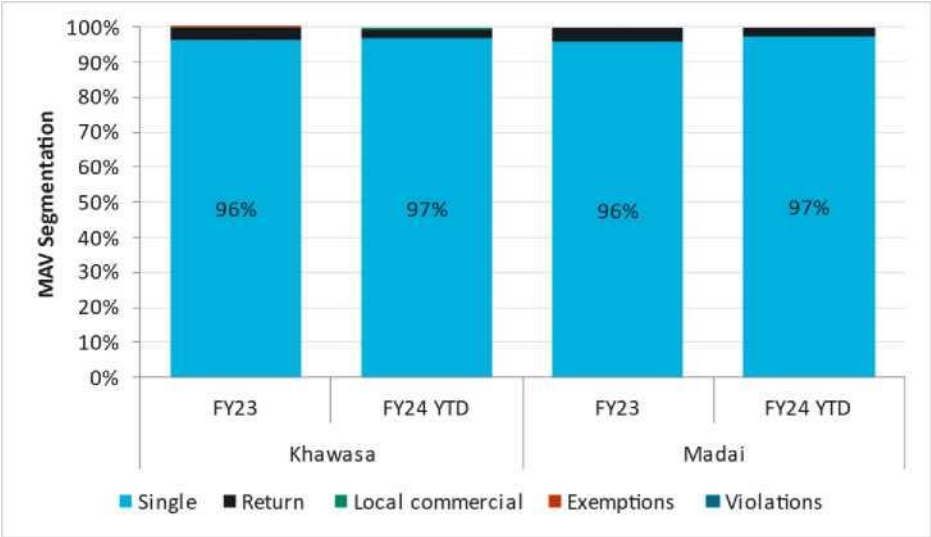
Segmentation CJV



Source: Steer analysis

Over ~95% of the commercial vehicles (2A/3A/MAVs) plying on the Asset are observed to buy single tickets suggesting through-movement on the Asset. The observation is in line with the fact that the Asset is key connector for Delhi/NCR and Maharashtra/neighbouring zones and hence caters to long-distance traffic. The Asset observed negligible level of exemptions and violations for trucks.

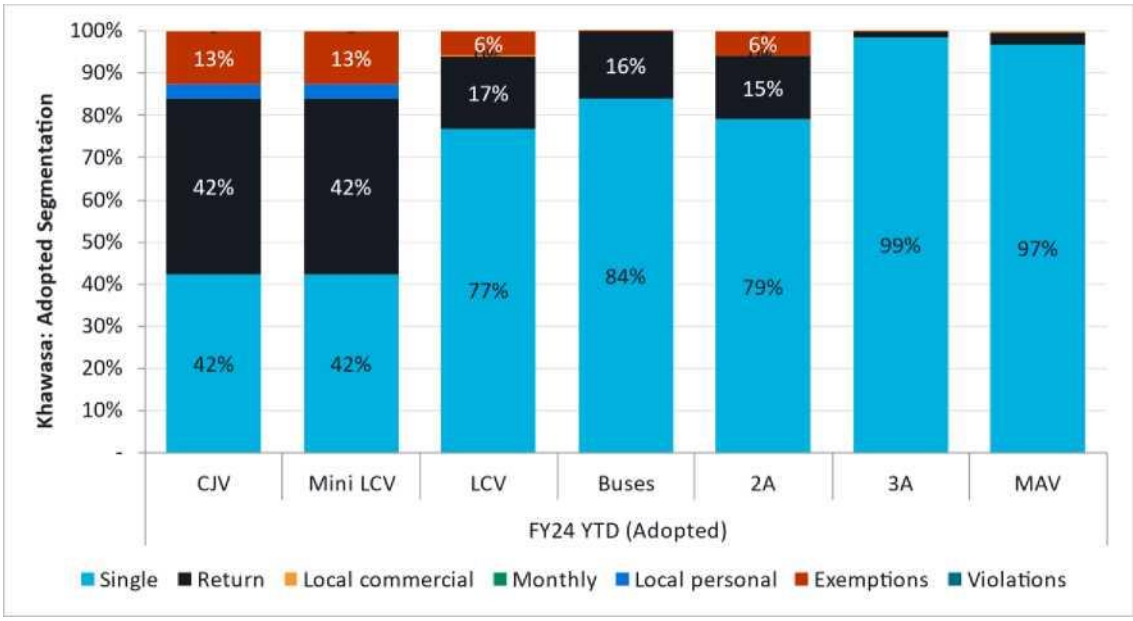
Segmentation MAV



Source: Steer analysis

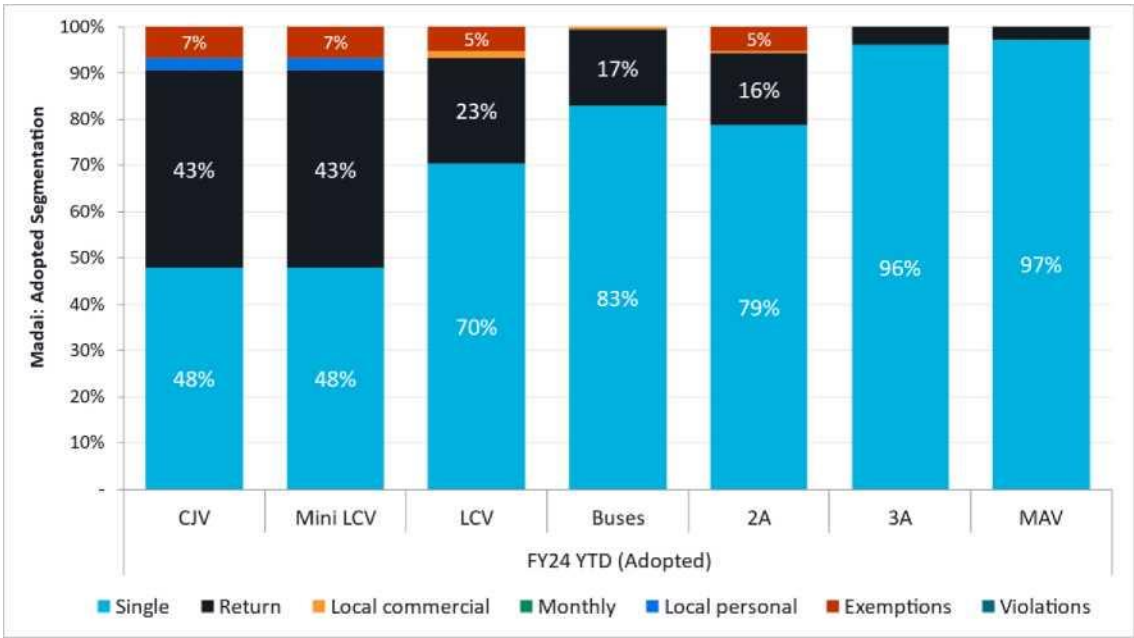
However, as the above-mentioned segmentation doesn't correctly reflect the share of non-toll paying traffic, i.e., violations and exemptions. The same has been assessed based on the difference between TMS and TVC dataset in the final adopted segmentation.

Adopted Toll segmentation (%) for Khawasa - FY24YTD



Source: Steer analysis

Adopted Toll segmentation (%) for Madai- FY24YTD



Source: Steer analysis

For Madai, Schedule V reported cash transactions at monthly were already provided for overlapping period from Nov'21 onwards. Additionally, for exemptions the difference between TVC and ETC+ Cash dataset is added (as a % of ETC traffic) in the final adopted segmentation as non-paying traffic. In data availability, same proportion of cash traffic is assumed on Khawasa as well considering their similar profile and travel pattern.

Traffic forecast

The increase of traffic on any existing road alignment depends on how fast the background travel demand (background growth) will grow; and on how successfully the project road is in attracting that traffic (traffic capture). Background travel demand is driven by the prevalent socio-economic conditions in the region, which include:

- Changes in factors such as population, employment, and income distribution
- Economic growth (GSDP, and GDP).
- Growth of local industries near the Asset.

The model uses India GDP and GSDP of Madhya Pradesh & Maharashtra as the two macroeconomic inputs which operate as growth drivers on our base year forecasts.

The network developments near the Asset's alignment which Steer believes would affect traffic on the Asset during the concession period are DME & SCE put together and 2 lane improvement of NH547+ Nagpur Ring Road.

Steer has developed traffic and revenue forecasts for the Asset by taking into consideration all inputs discussed above - base year estimates, macro-economic assumptions, growth drivers, elasticities, and forecast ticket segmentation. The table below provides the final (background plus impacts) traffic growth on the Asset.

Final (background plus impacts) AADT forecast - LK - Khawasa

Vehicle Type	FY24	FY25	FY26	FY30	FY35	FY40	FY45
CJV	2,962	3,172	3,407	4,394	5,859	7,632	9,712
Mini LCV	285	292	301	333	374	417	459
LCV	372	382	386	404	454	506	558
Bus	251	256	262	282	308	334	360
2A	1,633	1,714	1,781	1,965	2,454	3,026	3,670
3A	1,275	1,315	1,340	1,361	1,566	1,787	2,017
MAV	2,433	2,584	2,724	3,225	4,252	5,518	7,013
OSV	2	2	2	3	4	5	7
AADT	**9,213**	**9,718**	**10,203**	**11,968**	**15,272**	**19,225**	**23,796**
PCU	**24,241**	**25,530**	**26,705**	**30,687**	**39,053**	**49,105**	**60,738**

Final (background plus impacts) AADT CAGR (%) - LK - Khawasa

Vehicle Type	FY: FY: 2425	FY25- FY26	FY26- FY30	FY30- FY35	FY35- FY40	FY40-FY45	FY24- FY45
CJV	7.1%	7.4%	6.6%	5.9%	5.4%	4.9%	5.8%
Mini LCV	2.6%	2.8%	2.6%	2.4%	2.2%	2.0%	2.3%
LCV	2.6%	1.0%	1.2%	2.4%	2.2%	2.0%	1.9%
Bus	2.0%	2.1%	1.9%	1.8%	1.6%	1.5%	1.7%
2A	5.0%	3.9%	2.5%	4.5%	4.3%	3.9%	3.9%
3A	3.1%	1.9%	0.4%	2.8%	2.7%	2.5%	2.2%
MAV	6.2%	5.4%	4.3%	5.7%	5.3%	4.9%	5.2%
OSV	6.2%	6.6%	6.1%	5.7%	5.3%	4.9%	5.6%
AADT	**5.5%**	**5.0%**	**4.1%**	**5.0%**	**4.7%**	**4.4%**	**4.6%**
PCU's	**5.3%**	**4.6%**	**3.5%**	**4.9%**	**4.7%**	**4.3%**	**4.5%**

Source: Steer analysis

Final (background plus impacts) AADT forecast - LK - Madai

Vehicle Type	FY24	FY25	FY26	FY30	FY35	FY40	FY45
CJV	2,672	2,862	3,074	3,965	5,287	6,886	8,763
Mini LCV	741	760	782	866	973	1,084	1,195
LCV	434	445	446	457	514	572	631
Bus	264	269	274	296	324	351	378
2A	1,820	1,910	1,962	2,094	2,616	3,225	3,911
3A	1,337	1,379	1,398	1,399	1,610	1,837	2,074
MAV	2,588	2,749	2,890	3,396	4,477	5,810	7,385
OSV	3	3	3	4	5	6	8
AADT	**9,858**	**10,377**	**10,830**	**12,477**	**15,805**	**19,772**	**24,344**
PCU	**25,984**	**27,344**	**28,449**	**32,186**	**40,848**	**51,242**	**63,259**

Final (background plus impacts) AADT CAGR (%) - LK – Madai

Vehicle Type	FY24- FY25	FY25- FY26	FY26- FY30	FY30- FY35	FY35- FY40	FY40-FY45	FY24- FY45
CJV	7.1%	7.4%	6.6%	5.9%	5.4%	4.9%	5.8%
Mini LCV	2.6%	2.8%	2.6%	2.4%	2.2%	2.0%	2.3%
LCV	2.6%	0.3%	0.6%	2.4%	2.2%	2.0%	1.8%
Bus	2.0%	2.1%	1.9%	1.8%	1.6%	1.5%	1.7%
2A	5.0%	2.7%	1.6%	4.5%	4.3%	3.9%	3.7%
3A	3.1%	1.4%	0.0%	2.8%	2.7%	2.5%	2.1%
MAV	6.2%	5.1%	4.1%	5.7%	5.3%	4.9%	5.1%
OSV	6.2%	6.6%	6.1%	5.7%	5.3%	4.9%	5.6%
AADT	**5.3%**	**4.4%**	**3.6%**	**4.8%**	**4.6%**	**4.2%**	**4.4%**
PCU's	**5.2%**	**4.0%**	**3.1%**	**4.9%**	**4.6%**	**4.3%**	**4.3%**

Source: Steer analysis

Tollable Length and Toll Rates

In terms of tollable length, Khawasa currently (FY24) comprises 72.305 km whereas at Madai the tolling length is 74.086 km. In India, toll rates are as per notification by the Ministry of Road Transport and Highways in the National Gazette. The present toll rates are determined with reference to the published base toll rates and are adjusted annually at the beginning of each fiscal year equal to 40% of the movement in the wholesale price index in December of the preceding year plus a fixed 3%.

According to the NHAI's toll notification for FY24, i.e., April 1, 2023, onwards, the toll rates at the toll plazas for Asset are as follows:

Single toll rates on the Asset (INR), applicable for FY24

Type of Vehicle	Khawasa	Madai
CJV	105	105
LCV	165	170
Bus/Truck	350	360
3A	380	390
MAV/ HCM/EME	550	560
OSV	670	685

Source: NHAI Revision of User fee Rate w.e.f 01.04.2023

For further details in relation to Asset 13, please refer to **Annexure C** of this Preliminary Placement Document.

Orai – Barah Project ("Asset 14")

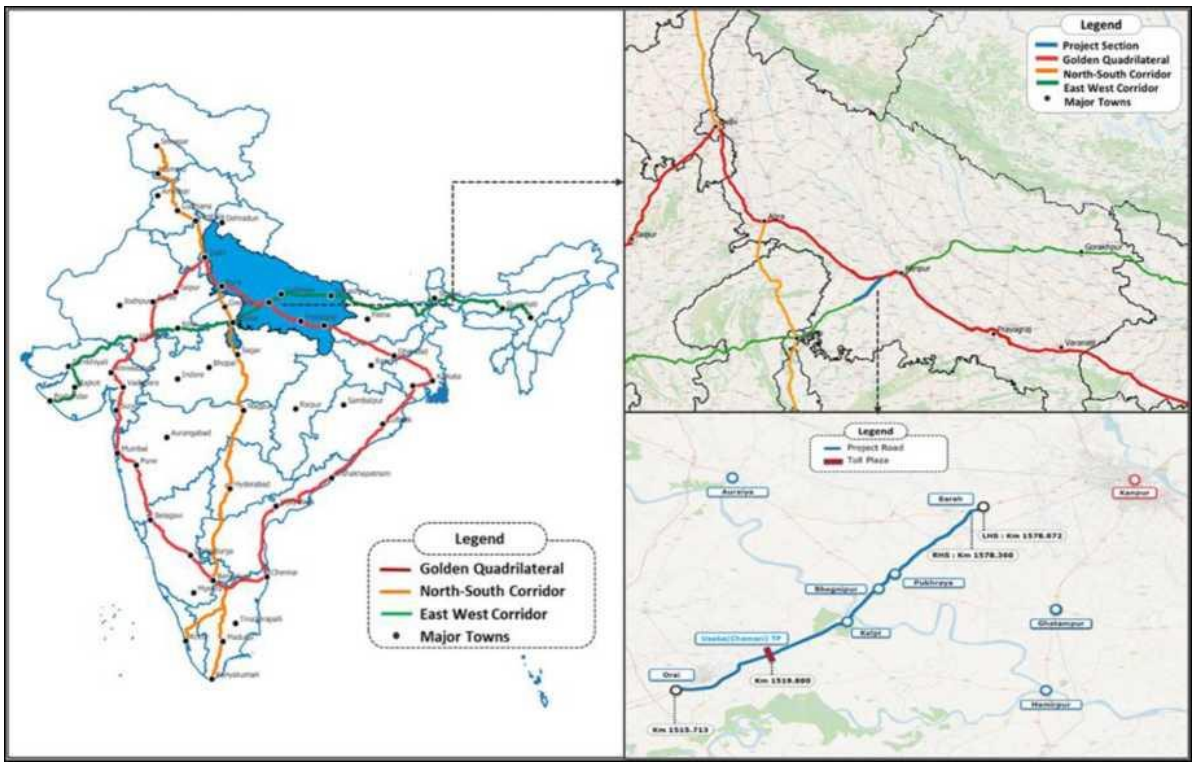
Project Overview

According to the Traffic Consultant the project highway, NH-27, is a crucial part of the East-West corridor, as envisioned in the National Highway Development Program (Phase-II). This project spans approximately 3,530 km, starting from Porbandar in Gujarat and ending in Silchar, Assam, passing through Rajasthan, Madhya Pradesh, Uttar Pradesh, Bihar, and West Bengal. The highway connects several prominent tourist and industrial cities, such as Porbandar (a port city), Rajkot, Palanpur, Udaipur, Chittorgarh, Jhansi, Kanpur, Lucknow, Muzaffarpur, Purnea, Siliguri, and Jalpaiguri etc.

The project road section Orai-Barah, with approximate length of 62.8 km, starts near Orai in Jalaun district and ends near Barah in Kanpur Dehat district. The project road has one operational toll plaza (Usaka TP) near Chamari.

Figure below shows the context and alignment of project road with major places along the highway.

Orai-Barah Section and Location of Toll Plaza



Project Road Characteristics and Profile of Influencing Districts

The project road serves as a major route for east-west long-distance traffic between the Lucknow/Gorakhpur/eastern region and Palanpur/Rajkot/western region, while also catering to short-distance traffic between Orai/Jhansi and Kanpur/Lucknow/Unnao areas. The project road section is located in the districts of Jalaun and Kanpur Dehat.

The economy of Jalaun district broadly relies on agriculture with wheat, pea, lentil, gram, different types of pulses, mango, mushrooms and other crops being major agricultural products. Despite being moderately industrialized, the district has a few industries of handloom, dairy, and agro food processing. Pea has been listed under the ODOP Programme by MOFPI, while handmade paper art has been listed by GoUP under its ODOP Programme.

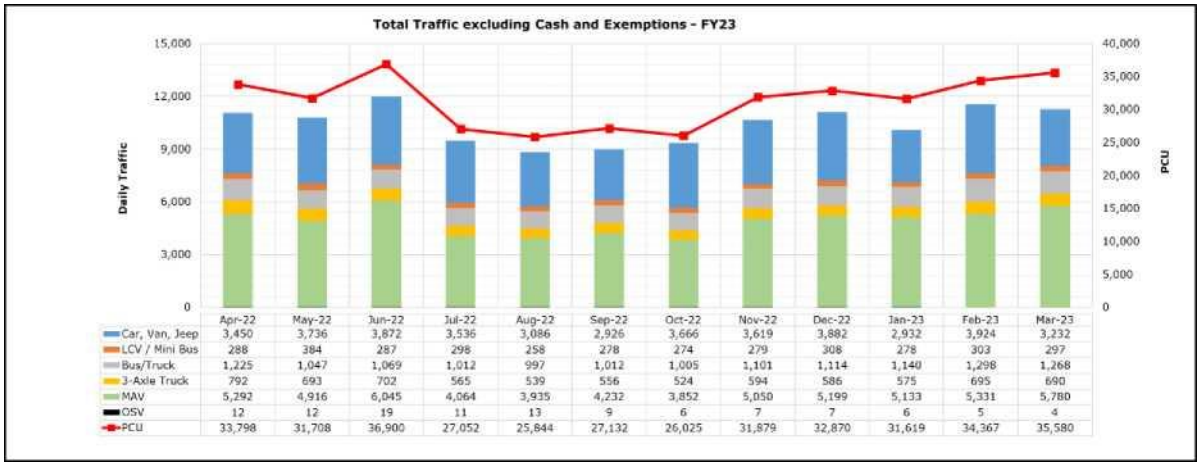
Kanpur Dehat district is located in the central plain zone, with fertile agricultural hinterland being its advantage. The staple agricultural produce includes wheat, paddy, rice, pulses, sugarcane, oil seeds, maize, and potato. Fisheries and animal husbandry also contribute to its economy. The district is moderately industrialized, with leather, iron, food grains, yarn, wood, cloth, and fertilizer being some of the important commodities exported. Milk products have been listed under the ODOP Programme by MOFPI, while aluminium utensils have been listed by GoUP under its ODOP Programme.

Annual Average Daily Traffic (AADT)

<u>Estimation of FY23 AADT</u>

The month-on-month mode wise ETC data (excluding cash and exemptions) for the period April 2022 to March 2023 for the toll plaza is presented below.

Month on Month Traffic Data for Usaka TP - FY23



	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23
Car, Van, Jeep	3,450	3,736	3,872	3,536	3,086	2,926	3,666	3,619	3,882	2,932	3,924	3,232
LCV / Mini Bus	288	384	287	298	258	278	274	279	308	278	303	297
Bus/Truck	1,225	1,047	1,069	1,012	997	1,012	1,005	1,101	1,114	1,140	1,298	1,268
3-Axle Truck	792	693	702	565	539	556	524	594	586	575	695	690
MAV	5,292	4,916	6,045	4,064	3,935	4,232	3,852	5,050	5,199	5,133	5,331	5,780
OSV	12	12	19	11	13	9	6	7	7	6	5	4
PCU	33,798	31,708	36,900	27,052	25,844	27,132	26,025	31,879	32,870	31,619	34,367	35,580

The AADT for FY23 has been derived using ETC data for the period of 12 months from the complete financial year data series of FY23 viz., April 2022 to March 2023. The daily cash and exemption data was available from the traffic count summary report of M/s PATH Ltd for the period of April 2022-December 2022. The FY23 AADT has been derived by adding these exemption and cash traffic to the estimated FY23 ETC AADT. The steps of derivation of FY23 AADT are presented below:

Estimation of FY23 AADT

Sr. No.	Particulars	Car/Jeep/Van	LCV	2 Axle	3 Axle	MAV	OSV	PCU
Daily Total Traffic without Cash and Exemptions								
A = April 2022-March 2023 Monthly Traffic/365	Total Traffic without Cash and exemption	3,485	294	1,106	625	4,896	9	31,192
Daily Cash and Exemptions from the Traffic Count Summary Report of PATH								
B	Daily Cash (Apr- Dec 2022 Avg)	72	4	2	1	1	0	-
C	Daily Exemptions (Apr-Dec 2022 Avg)	430	7	5	2	4	0	-
D = A+B+C	**Total Traffic with Cash and Exemption - AADT FY23**	3,987	304	1,112	628	4,901	9	31,760

Estimation of FY24 AADT

The month-on-month mode wise ETC data (excluding cash and exemptions) for the period April 2023 to November 2023 for the toll plaza is presented below:

Month on Month Traffic Data for Usaka TP - FY24



	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23
Car, Van, Jeep	3,111	3,843	3,663	2,983	2,944	2,926	3,189	3,908
LCV / Mini Bus	293	312	317	290	278	286	314	301
Bus/Truck	1,201	1,171	1,154	1,066	1,114	1,104	1,150	1,186
3-Axle Truck	686	640	611	565	567	582	596	543
MAV	5,762	5,408	5,355	4,274	3,954	4,578	4,640	3,915
OSV	5	5	5	4	4	3	4	5
PCU	35,162	34,102	33,553	27,559	26,211	29,027	29,795	27,185

The ETC data has been made available for the period of 9 months from April 2023 to November 2023. Based on the analysis of the traffic, FY24 AADT for cars and LCVs have been estimated by applying 8-12 months factor on April-November 2023 average ETC traffic. For other modes of 2A/3A and MAV, it is found appropriate that the base traffic from Aug to November is utilised for estimating the AADT for FY24 as these months present the actual trend of traffic after opening of Bundelkhand Eway. In view of this, 412 months factor has been applied on August-November 2023 average traffic of these modes. The correction factors were derived from average ETC traffic for FY23 of the adjacent toll plazas of Ait, Semri and project road TP of Usaka.

The steps of derivation of FY24 AADT are presented below:

Estimation of FY24 AADT

Sr. No.	Particulars	Car/Jeep/Van	LCV	2 Axle	3 Axle	MAV	OSV	PCU
Daily Total Traffic without Cash and Exemptions								
A. April-Nov 2023 Average	Total Traffic without Cash and exemption	3,823	309					
B. Aug-Nov 2023 Average				1,145	575	4,276	4	
C. 8-12 months (April-Nov)	SCF	1.02	1.01					
D. 4-12 months (Aug-Nov)				1.05	1.09	1.10	1.09	
E. ETC AADT		3,888	312	1,205	625	4,702	4	31,021
Daily Cash and Exemptions from the Traffic Count Summary Report of PATH								
F	Daily Cash (Apr-Dec 2022 Avg)	72	4	2	1	1	0	
G	Daily Exemptions (Apr-Dec 2022 Avg)	430	7	5	2	4	0	
AADT FY24 Including cash and Exemptions								
I = E+F+G	**AADT**	4,389	322	1,211	628	4,706	4	31,589

Travel Pattern as per November 2022 OD Survey

- Provides direct connectivity to Kanpur/Lucknow & beyond in the east and Jhansi/Gwalior/Indore & beyond in the west.
- Project road is majorly influenced by the stone mining units located near Jhansi. About 50 percent of freight and around 90 percent of passenger traffic on the project road has interactions between Jhansi/Orai and Kanpur/Lucknow. About 15 percent of freight traffic is to/from Indore/Bhopal from/to Kanpur/Lucknow.

- The majority of car traffic (around 37.9 percent) has trip lead between 100 to 200 km at toll plaza location. These trips are observed mainly from/to Orai/Jhansi to/from Kanpur/Unnao/Lucknow/Kalpi/Daulatpur. In addition, short distance trips (>25 & < = 50 km) of about 15.8 percent are found to be between Orai to Kalpi/ Daulatpur/Bhognipur/Pukhrayan.

Network Impacts

In context of the project road, two road network developments which may impact the traffic on the project road are:

- Improvement of Sagar-Kanpur-Lucknow corridor under Bharatmala Pariyojana - applicable traffic stream is from/to Indore/Bhopal & surroundings to/from Kanpur & beyond.
- Completion of Chambal Expressway (CE) and Delhi-Mumbai Expressway (DME) - Analysis done for two traffic streams:
- Ahmedabad & surroundings - Kanpur & beyond
- Mumbai & surroundings - Kanpur & beyond

The potential traffic and diverted traffic related to these two developments are presented below:

Diversion Analysis for Indore-Kanpur via Sagar Route

Modes	2A	3A	MAV
Potential Traffic as % of AADT			
Indore-Kanpur via Sagar Route			
Indore-Kanpur via Sagar traffic as % of AADT	4.6	5.8	8.1
Ahmedabad/Mumbai via DME & CE Route			
Ahmedabad-Kanpur Traffic via DME & CE	6.7	7.7	7.5
Mumbai-Kanpur Traffic via DME & CE	5.7	8.1	9.9
Loss as % of AADT			
Indore-Kanpur via Sagar Route	-0.9	-1.1	-1.7
Ahmedabad/Mumbai via DME & CE Route (A)	-8.7	-11.5	-11.6
Adopted Loss as % of AADT			
Indore-Kanpur via Sagar Route	-0.9	-1.1	-1.7
Ahmedabad/Mumbai via DME & CE Route			
B. Captive Traffic for PR (%)	33.3	33.3	33.3
C. Diverted to Expressway (%) = A*(1-B)	-5.8	-7.7	-7.7

The Kandla - Lucknow economic corridor is expected to be completed in FY28. Therefore, the impact of Indore - Kanpur via Sagar diversion has been considered under the base case from FY28 onwards and phased over three years with 50% diversion in FY28, 75 percent in FY29 and 100% in FY30 onwards.

Similarly, the impact of Ahmedabad/ Mumbai via DME & CE route has been considered under the base case from FY29 onwards and phased over three years with 50 percent diversion in FY29, 75 percent in FY30 and 100 percent in FY31 onwards.

Traffic Growth rates

The estimated traffic growth rates for the project road based on the elasticity approach along with the implied growth rates after considering the impact of diversions have been presented below:

Projected Traffic Growth Rates for Project Road (%)

Cars FY/Modes	LCV	Bus/ 2A Truck	3A	MAV	Cars	LCV	Bus/ 2A Truck	3A	MAV	
	Normal Growth Rates	Implied Growth Rates								
2025	8.1	3.1	3.1	3.8	6.2	8.1	3.1	3.1	3.8	6.2
2026	8.6	3.3	3.3	4.0	6.7	8.6	3.3	3.3	4.0	6.7
2027	8.3	3.2	3.2	3.9	6.4	8.3	3.2	3.2	3.9	6.4
2028	8.2	3.2	3.2	3.8	6.3	8.2	3.2	2.9	3.2	5.4
2029	7.8	3.0	3.0	3.6	6.0	7.8	3.0	1.2	-0.7	1.5
2030	7.4	2.9	2.9	3.5	5.7	7.4	2.9	1.9	1.1	3.1
2031	6.8	2.9	2.9	3.5	5.2	6.8	2.9	2.0	1.3	3.0
2032	6.8	2.9	2.9	3.5	5.2	6.8	2.9	2.9	3.5	5.2
2033	6.8	2.9	2.9	3.5	5.2	6.8	2.9	2.9	3.5	5.2

Cars FY/Modes	LCV	Bus/ 2A Truck	3A	MAV	Cars	LCV	Bus/ 2A Truck	3A	MAV	
2034	6.7	2.8	2.8	3.4	5.1	6.7	2.8	2.8	3.4	5.1
2035	6.6	2.8	2.8	3.3	5.0	6.6	2.8	2.8	3.3	5.0
2036	6.5	2.7	2.7	3.3	4.9	6.5	2.7	2.7	3.3	4.9
2037	6.4	2.7	2.7	3.2	4.9	6.4	2.7	2.7	3.2	4.9
2038	6.3	2.7	2.7	3.2	4.8	6.3	2.7	2.7	3.2	4.8
2039	6.2	2.6	2.6	3.1	4.7	6.2	2.6	2.6	3.1	4.7
2040	6.1	2.6	2.6	3.1	4.6	6.1	2.6	2.6	3.1	4.6
2041	5.5	2.0	2.0	2.5	4.1	5.5	2.0	2.0	2.5	4.1
2042	5.4	2.0	2.0	2.5	4.0	5.4	2.0	2.0	2.5	4.0
2043	5.4	2.0	2.0	2.5	3.9	5.4	2.0	2.0	2.5	3.9
2044	5.3	1.9	1.9	2.4	3.9	5.3	1.9	1.9	2.4	3.9

Mode-wise Traffic Projections

Mode-wise traffic at the project road under the base case scenario after considering diversion impacts is presented below:

Projected Traffic Mode-Wise for Project Road (After Diversion)

FY End	CJV	LCV	Bus/2A	3A	MAV	OSV	Total PCU
2024	4,389	322	1,211	628	4,706	4	31,584
2025	4,743	332	1,249	652	5,000	4	33,461
2026	5,150	343	1,290	678	5,332	5	35,585
2027	5,578	354	1,332	704	5,676	5	37,782
2028	6,035	366	1,370	727	5,985	5	39,832
2029	6,506	377	1,387	722	6,074	5	40,752
2030	6,988	387	1,412	730	6,263	6	42,206
2031	7,466	399	1,441	739	6,450	6	43,656
2032	7,976	410	1,482	765	6,783	6	45,886
2033	8,522	422	1,524	791	7,134	7	48,235
2034	9,095	434	1,567	818	7,496	7	50,667
2035	9,697	446	1,611	846	7,872	7	53,190
2036	10,330	458	1,655	873	8,260	8	55,806
2037	10,995	471	1,699	902	8,661	8	58,517
2038	11,691	483	1,744	931	9,076	9	61,322
2039	12,419	496	1,790	960	9,503	9	64,217
2040	13,181	509	1,836	990	9,944	9	67,209
2041	13,910	519	1,873	1,015	10,347	10	69,956
2042	14,668	529	1,910	1,040	10,760	10	72,777
2043	15,453	540	1,948	1,066	11,182	10	75,670
2044	16,268	550	1,985	1,092	11,614	11	78,634
CAGR (%) (FY24 to FY44)	6.8	2.7	2.5	2.8	4.6	5.1	4.7

Tolling Segmentation

The tolling stream distribution has been estimated from the ETC data of FY24 (August 2023 to November 2023) to which annualised Cash & Exemptions data available from April 2022 to December 2022 has been added. The resultant ticket distribution is presented below:

Tolling Distribution

Type	Car	LCV	Bus/ 2A Trucks	3A Trucks	MAV	OSV
Single	36.4	72.9	62.3	83.7	47.0	100.0
Return	44.5	24.9	36.5	15.0	51.9	
Monthly						
Local personal	2.7					
Local commercial	0.4	0.0	0.7	0.9	1.0	
Exemptions and Violations	16.0	2.3	0.4	0.4	0.1	
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Tollable Length and Toll Rates

The details of normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being charged at toll plaza as per the information in Schedule M for the project road are presented below:

Tolling Length (in km) for the Project Road

Usaka (TP01) at km 1519.880	FY24 onwards
A. Normal	61.729
B. Bypass	0.000
C. Eq. structure	11.74
Total Road Length	62.903
Tolling Length = A+(B*1.5) + (C*10)	73.469

The stream of toll rates to be charged at the toll plaza of the project road in cardinal years till FY44 is presented below:

Table 8: Toll Rates at Toll Plaza (in Rs)

FY	Car	LCV	Bus/ 2- axle Truck	3-axle Truck	MAV	O/size/ HME	Car Local
2024	105	170	355	390	560	680	330
2025	110	175	365	400	570	695	340
2030	135	215	455	495	710	865	420
2035	165	265	555	605	870	1,060	515
2040	200	325	675	740	1,060	1,290	630
2044	235	380	795	865	1,245	1,515	735

Note: The toll fee has been rounded to nearest 5 Rupees as per toll fee rules.

For further details in relation to Asset 14, please refer to **Annexure C** of this Preliminary Placement Document.

Chitradurga Bypass – Hubli Project/ Karnataka Project ("Asset 15")

Project Overview

According to the Traffic Consultant the project highway, NH-48 (Old NH-4), is part of the Golden Quadrilateral connecting many of the major industrial, agricultural and cultural centres of India. The total length of NH-48 (Old NH-4) is roughly 1,235 km starting from Chennai in the state of Tamil Nadu and ending at Mumbai in the state of Maharashtra. The highway acts as a primary conduit for transportation of freight as well as passenger traffic in these states as well as various other important states in India. NH-48 (Old NH-4) connects important cities and towns like Pune, Satara, Karad, Sangli, Kolhapur, Belgaum, Dharwad, Hubli, Bangalore etc.

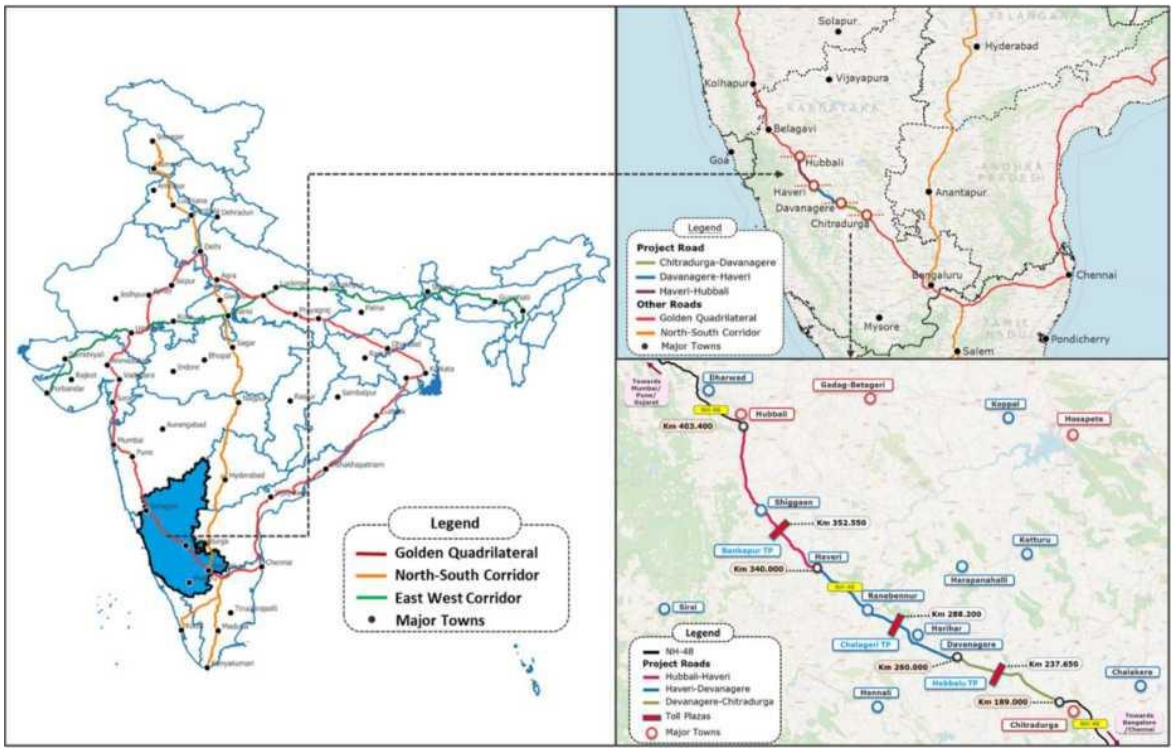
The project road section consists of three continuous toll roads and the details of the three project road sections, lengths, chainage, toll plazas and tolling lanes at the toll plaza locations are presented in the table below:

Details of Project Section

S No.	Project Section	Length (km)	Start km	End km	Toll Plaza	Tolling Lanes
1	Hubli-Haveri	71.0	Km 340.00	Km 403.40	Bankapur (km 352.550)	7+7
2	Haveri-Davangere	72.0	Km 260.00	Km 340.00	Chalageri (km 288.200)	7+7
3	Davanagere-Chitradurga	62.0	Km 189.00	Km 260.00	Hebbalu (km 237.650)	7+7

Figure 1 shows the context and alignment of project road with major places along the highway.

Figure 1: Alignment of Project Road and Location of Toll Plazas



Project Road Characteristics and Profile of Influencing Districts

The project road, in wider context, serves the long-distance traffic for the freight vehicles, which is majorly plying between Mumbai/ Pune/ Delhi Chitradurga/Bangalore/ Chennai/ Vellore. Apart from long distance traffic, it also serves the short distance traffic for both passenger and freight which is mainly generated between Hubli/Dharwad/Haveri/Davanagere/Ranebennur/Chitradurga and nearby places.

The project road falls under the jurisdiction of four districts in the state of Karnataka.

Dharwad is one of the emerging districts in North Karnataka region and its economy relies broadly on agriculture with jowar, wheat, Bengal gram, tur dal, ground nut, onion, maize, sunflower and cotton as the major produce. Dharwad district is fast developing as the commercial and industrial hub in the state. These industrial areas have several small, medium and scale industries present some of which include agro equipment and agro food processing industries, polymers, engineering works, steel and wire works, engineering and automobiles manufacturing, chemical and fertilizers industries, textiles, paper products, printing, and other consumer products-based industries.

Haveri district is majorly dependent on agriculture for its economy with major produce being maize, paddy, jowar, hybrid cotton, groundnut, chilly, pulses etc. It is rich in spice cultivation and the major spice industry in the district has chilly powder mills and processing facilities. The district also has an industrial base having several large and medium industries having Agriculture and allied industries, sericulture, animal husbandry, textile and handloom industries as potential industrial sectors in the district.

Davanagere district economically is dependent on agriculture primarily with major agricultural crops including paddy, maize, red gram, green gram, black gram, groundnut, sunflower, sugarcane, cotton etc. Davanagere is known as the Manchester of Karnataka and has a dominant textile sector that is set to grow along with the food processing sector which provides the highest employment in the district. The district has large industrial units, small and medium scale industries. Other notable sectors include agro and allied activities, wood and wood-based furniture manufacturing industries, horticulture units of marigold dye processing and arecanut processing.

Chitradurga district has agriculture as the backbone of the district economy having major agricultural produce of paddy, ragi, jowar, maize, red gram, horse gram, green gram, black gram, bengal gram, tur, groundnut, sunflower, cotton, tobacco and betul nut. The district also has several small-scale industrial units in the district are engaged in agro and food processing activities and textile constitutes second highest number of large & medium scale industries in the district. The district is rich in mineral reserves of iron ore, manganese, limestone, dolomite, gray granite and building stone. Chitradurga is the 4th largest producer of wind energy in the country.

Annual Average Daily Traffic (AADT)

The AADT for FY24 has been derived from the average of ETC toll data of FY24 from April 2023 to November 2023. The cash (April - November 2023) and exemption traffic (average of October and November 2023) has been added to the ETC traffic. This 8month traffic has been annualised by applying an 8-12 month factor from IHMCL for cars and for rest of the modes, factor has been adopted from the adjacent section of Belgaum Dharwad. The AADT for FY24 derived for all three toll plazas with 8 months to yearly factors is presented in the table below:

AADT for FY24

Mode	Car	LCV	Bus/Truck	3A	MAV	OSV	PCUs
Bankapur(TP01)							
A. Apr 23 - Nov 23 (ETC Traffic +Cash)	6,472	1,430	2,710	940	1,619	6	26,879
B. Oct 23 - Nov 23 Average Exempt	639	11	8	1	0	0	
C. ADT (A+B)	7,111	1,441	2,718	940	1,620	6	27,563
D. SCF (8-12-month factor)	1.03	1.05	1.06	1.03	1.03	1.03	
E. AADT FY24 (C*D)	**7,304**	**1,509**	**2,873**	**966**	**1,663**	**6**	**28,596**
Chalageri (TP02)							
A. Apr 23 - Nov 23 (ETC Traffic +Cash)	6,387	1,379	2,586	910	1,605	5	26,188
B. Oct 23 - Nov 23 Average Exempt	357	3	2	1	1	0	
C. ADT (A+B)	6,744	1,382	2,587	911	1,605	5	26,559
D. SCF (8-12-month factor)	1.02	1.05	1.06	1.03	1.03	1.03	
E. AADT FY24 (C*D)	**6,898**	**1,447**	**27,35**	**935**	**1,649**	**5**	**27,522**
Hebbalu (TP03)							
A. Apr 23 - Nov 23 (ETC Traffic +Cash)	7,432	1,435	2,491	922	1,594	6	27,025
B. Oct 23 - Nov 23 Average Exempt	360	8	1	1	1	0	
C. ADT (A+B)	7,792	1,444	2,492	924	1,595	6	27,406
D. SCF (8-12-month factor)	1.01	1.05	1.06	1.03	1.03	1.03	
E. AADT FY24 (C*D)	**7,900**	**1,512**	**2,634**	**948**	**1,638**	**6**	**28,311**

Travel Pattern

- Serves the long-distance traffic majorly plying between Mumbai/ Pune/ Delhi Chitradurga/Bangalore/ Chennai/ Vellore.
- The project road also serves the short distance traffic for both passenger and freight which is mainly generated between Hubli/Dharwad/Haveri/Davanagere/Ranebennur/Chitradurga and nearby places.
- The passenger traffic on the road were found to be for the purpose of work and business at the toll plaza locations.
- The MAV traffic is observed to be having Bangalore-Mumbai as top OD pair at all three toll plazas.

Network Impacts

In context of the project road, two road network developments which may impact the traffic on the project road are:

Impact of Pune - Bangalore Expressway

The assessment for the route between Pune and Bangalore/Chennai has been done for the four traffic streams:

- Traffic plying between Mumbai/Pune/Nashik & surroundings and Bangalore & beyond
- Traffic from/to Mumbai/Pune/Nashik & surroundings to/from Chennai & beyond
- Traffic plying between Hubli and surroundings and Bangalore & beyond
- Traffic from/to Hubli and surroundings to/from Chennai & beyond

The total diverted traffic after the operation of Pune Bangalore Expressway at the three toll plazas is presented in the table below

Total Impact Due to Pune-Bangalore Expressway

Modes	Car	2A	3A	MAV
Bankapur(TP01)	5.4%	15.0%	34.2%	33.1%
Chalageri (TP02)	5.7%	15.7%	35.3%	33.4%
Hebbalu (TP03)	5.0%	16.3%	34.8%	33.6%

The proposed expressway will be a greenfield alignment and considering the usual timelines for a long greenfield expressway project, the diversion impact is considered from FY31 onwards under Base Case. Owing to the gradual shift of traffic away from the project road, the traffic impacts have been assumed to take place in phases with about 50 percent in FY31, 75 percent in FY32 and 100 percent from FY33 onwards.

Impact of completion of 6 laning construction activities on National Highway 48 (Old NH-4- Route via PR)

The potential and divertible traffic (gain) due to completion of 6 laning construction activities on National Highway 48 (Old NH-4) is presented in the table below:

Potential and Divertible Traffic Due To Completion Of 6 Laning Construction Activities On NH-48 (Route via PR)

Potential Traffic (Nagarhalla TP)	2A	3A	MAV	2A/3A/MAV	PCU
A. Earlier study of Solapur-Bijapur (July-22) - FY23	156	80	197	434	1,598
B. Traffic on Solapur-Bijapur -FY24 (5% growth on earlier study) - A*(1+5%)	164	84	207	456	1,678
C. AR potential at Nagarhalla TP (FY24)	284	124	539	947	3,650
D. SCF Jan	0.90	0.99	0.93	-	-
E. AADT (C*D)	257	123	504	883	3,406
F. Absolute Increase (E-B)	93	39	297	428	1,728
G. % Shift to PR	61.4%	61.9%	66.2%	-	-
H. Traffic Shift to PR (F*G)	57	24	196	277	1,126

NH-48 may have a gain of about 57 2A trucks, 24 3A trucks and 196 MAV trucks resulting in a total PCU gain of 1,126. As the 6 laning is expected to be completed in FY25, the impact has been considered in phases with 50 percent in FY26 and 100 percent in FY27.

Traffic Growth rates

The estimated traffic growth rates for the project road based on the elasticity approach applicable across all the three toll plazas have been presented in the table below:

Projected Traffic Growth Rates for Project Road (%)

FY/Modes	Car	LCV	Bus/2A	3A	MAV/OSV
Normal Growth Rates					
2025	7.3	2.7	3.5	2.0	6.6
2026	7.8	2.9	3.7	2.1	7.0
2027	7.5	2.8	3.6	2.0	6.8
2028	7.4	2.8	3.5	2.0	6.7
2029	7.1	2.6	3.4	1.9	6.4
2030	6.7	2.5	3.2	1.8	6.0
2031	6.7	2.5	3.2	1.8	5.4
2032	6.7	2.5	3.2	1.8	5.4
2033	6.7	2.5	3.2	1.8	5.4
2034	6.6	2.5	3.1	1.8	5.3
2035	6.5	2.4	3.1	1.8	5.3
2036	5.8	2.4	3.0	1.7	4.6
2037	5.7	2.4	3.0	1.7	4.5
2038	5.6	2.3	3.0	1.7	4.5
2039	5.5	2.3	2.9	1.7	4.4
2040	5.4	2.2	2.9	1.6	4.3
2041	5.3	2.2	2.8	1.6	4.3
2042	5.2	2.2	2.8	1.6	4.2
2043	5.2	2.1	2.7	1.6	4.1
2044	5.1	2.1	2.7	1.5	4.1

Implied Traffic Growth rates

The implied traffic growth rates for the project road after considering the impact of diversions at all the three toll plazas have been presented in the table below:

Implied Traffic Growth Rates for Project Road After Diversion (%)

FY/ Mode	TP01-Bankapur		TP02-Chalageri			TP03-Hebbalu									
	Car	LCV	Bus/ 2A	3A	MAV /OSV	Car	LCV	Bus/ 2A	3A	MAV/ OSV	Car	LCV	Bus/ 2A	3A	MAV/ OSV
2025	7.3	2.7	3.5	2.0	6.6	7.3	2.7	3.5	2.0	6.6	7.3	2.7	3.5	2.0	6.6
2026	7.8	2.9	4.7	3.4	13.3	7.8	2.9	4.8	3.4	13.4	7.8	2.9	4.8	3.4	13.4
2027	7.5	2.8	4.6	3.3	12.7	7.5	2.8	4.7	3.3	12.8	7.5	2.8	4.7	3.3	12.8
2028	7.4	2.8	3.5	2.0	6.7	7.4	2.8	3.5	2.0	6.7	7.4	2.8	3.5	2.0	6.7
2029	7.1	2.6	3.4	1.9	6.4	7.1	2.6	3.4	1.9	6.4	7.1	2.6	3.4	1.9	6.4
2030	6.7	2.5	3.2	1.8	6.0	6.7	2.5	3.2	1.8	6.0	6.7	2.5	3.2	1.8	6.0
2031	3.8	2.5	-4.5	-15.6	-12.0	3.7	2.5	-4.9	-16.1	-12.2	4.0	2.5	-5.2	-15.9	-12.3
2032	5.2	2.5	-1.0	-8.7	-5.0	5.1	2.5	-1.2	-9.1	-5.1	5.3	2.5	-1.4	-8.9	-5.2
2033	5.2	2.5	-1.2	-9.9	-6.2	5.1	2.5	-1.4	-10.4	-6.3	5.3	2.5	-1.6	-10.2	-6.4
2034	6.6	2.5	3.1	1.8	5.3	6.6	2.5	3.1	1.8	5.3	6.6	2.5	3.1	1.8	5.3
2035	6.5	2.4	3.1	1.8	5.3	6.5	2.4	3.1	1.8	5.3	6.5	2.4	3.1	1.8	5.3
2036	5.8	2.4	3.0	1.7	4.6	5.8	2.4	3.0	1.7	4.6	5.8	2.4	3.0	1.7	4.6
2037	5.7	2.4	3.0	1.7	4.5	5.7	2.4	3.0	1.7	4.5	5.7	2.4	3.0	1.7	4.5
2038	5.6	2.3	3.0	1.7	4.5	5.6	2.3	3.0	1.7	4.5	5.6	2.3	3.0	1.7	4.5
2039	5.5	2.3	2.9	1.7	4.4	5.5	2.3	2.9	1.7	4.4	5.5	2.3	2.9	1.7	4.4
2040	5.4	2.2	2.9	1.6	4.3	5.4	2.2	2.9	1.6	4.3	5.4	2.2	2.9	1.6	4.3
2041	5.3	2.2	2.8	1.6	4.3	5.3	2.2	2.8	1.6	4.3	5.3	2.2	2.8	1.6	4.3
2042	5.2	2.2	2.8	1.6	4.2	5.2	2.2	2.8	1.6	4.2	5.2	2.2	2.8	1.6	4.2
2043	5.2	2.1	2.7	1.6	4.1	5.2	2.1	2.7	1.6	4.1	5.2	2.1	2.7	1.6	4.1
2044	5.1	2.1	2.7	1.5	4.1	5.1	2.1	2.7	1.5	4.1	5.1	2.1	2.7	1.5	4.1

Traffic Projections

Mode-wise projected traffic for the three toll plazas of the project road under the base case after considering diversion impacts till FY44 is presented in the tables below:

Projected Mode-wise Traffic at TP01

FY/Modes	Car	LCV	Bus/2A	3A	MAV	OSV	PCU
2024	7,304	1,509	2,873	966	1,663	6	28,595
2025	7,837	1,550	2,973	985	1,772	6	30,040
2026	8,445	1,595	3,113	1,018	2,008	7	32,300
2027	9,081	1,640	3,257	1,052	2,264	7	34,686
2028	9,754	1,685	3,372	1,073	2,415	8	36,517
2029	10,442	1,730	3,485	1,094	2,568	8	38,368
2030	11,143	1,773	3,597	1,113	2,723	9	40,227
2031	11,569	1,817	3,434	940	2,396	9	38,239
2032	12,174	1,863	3,400	858	2,275	10	38,027
2033	12,808	1,909	3,361	774	2,135	10	37,728
2034	13,652	1,956	3,466	787	2,249	11	39,515
2035	14,539	2,004	3,573	801	2,367	11	41,372
2036	15,376	2,052	3,682	815	2,476	12	43,143
2037	16,248	2,100	3,793	829	2,589	12	44,971
2038	17,157	2,149	3,905	843	2,705	13	46,855
2039	18,100	2,198	4,019	857	2,824	14	48,792
2040	19,079	2,247	4,134	871	2,946	14	50,786
2041	20,095	2,297	4,250	885	3,072	15	52,836
2042	21,148	2,347	4,368	899	3,201	15	54,943
2043	22,238	2,397	4,488	913	3,333	16	57,106
2044	23,366	2,447	4,608	927	3,468	17	59,324

Projected Mode-wise Traffic at TP02

FY/Modes	Car	LCV	Bus/2A	3A	MAV	OSV	PCU
2024	6,898	1,447	2,735	935	1,649	5	27,522
2025	7,401	1,486	2,830	953	1,757	5	28,913
2026	7,976	1,529	2,965	986	1,992	6	31,114
2027	8,576	1,572	3,103	1,019	2,246	6	33,439
2028	9,212	1,616	3,213	1,039	2,396	6	35,206

FY/Modes	Car	LCV	Bus/2A	3A	MAV	OSV	PCU
2029	9,862	1,659	3,321	1,059	2,549	7	36,992
2030	10,523	1,700	3,427	1,079	2,703	7	38,787
2031	10,909	1,743	3,258	904	2,374	8	36,727
2032	11,469	1,786	3,219	822	2,252	8	36,442
2033	12,056	1,831	3,174	737	2,109	9	36,065
2034	12,850	1,876	3,273	750	2,222	9	37,774
2035	13,684	1,922	3,375	763	2,339	10	39,549
2036	14,472	1,967	3,478	777	2,447	10	41,242
2037	15,294	2,014	3,582	790	2,558	10	42,988
2038	16,149	2,060	3,688	803	2,673	11	44,789
2039	17,036	2,107	3,795	816	2,790	11	46,640
2040	17,958	2,155	3,904	830	2,911	12	48,545
2041	18,914	2,202	4,014	843	3,035	12	50,503
2042	19,905	2,250	4,126	856	3,163	13	52,516
2043	20,932	2,298	4,238	870	3,293	13	54,583
2044	21,993	2,347	4,352	883	3,427	14	56,702

Projected Mode-wise Traffic at TP03

FY/Modes	Car	LCV	Bus/2A	3A	MAV	OSV	PCU
2024	7,900	1,512	2,634	948	1,638	6	28,312
2025	8,476	1,553	2,726	967	1,746	6	29,767
2026	9,134	1,598	2,857	1,000	1,979	7	32,040
2027	9,822	1,643	2,991	1,033	2,233	7	34,440
2028	10,550	1,689	3,097	1,054	2,382	8	36,289
2029	11,295	1,733	3,201	1,074	2,534	8	38,157
2030	12,052	1,776	3,303	1,093	2,687	9	40,036
2031	12,540	1,821	3,130	919	2,356	9	38,065
2032	13,210	1,867	3,087	838	2,233	10	37,876
2033	13,913	1,913	3,037	753	2,090	10	37,602
2034	14,830	1,960	3,132	766	2,201	11	39,420
2035	15,792	2,008	3,229	779	2,317	11	41,310
2036	16,702	2,056	3,328	793	2,424	12	43,110
2037	17,650	2,104	3,428	807	2,534	12	44,970
2038	18,637	2,153	3,529	820	2,648	13	46,888
2039	19,661	2,202	3,632	834	2,764	14	48,861
2040	20,724	2,251	3,736	847	2,884	14	50,893
2041	21,828	2,301	3,841	861	3,007	15	52,985
2042	22,972	2,351	3,948	874	3,133	15	55,135
2043	24,156	2,402	4,056	888	3,263	16	57,344
2044	25,381	2,452	4,165	902	3,395	17	59,611

Projections of the total vehicles based on the most likely growth rates before and after considering diversion impacts is presented in the table below:

Projected Traffic (in PCUs)

FY	Total Traffic After Diversion			Total Traffic Before Diversion		
	TP01	TP02	TP03	TP01	TP02	TP03
2024	28,595	27,522	28,312	28,595	27,522	28,312
2025	30,040	28,913	29,767	30,040	28,913	29,767
2026	32,300	31,114	32,040	32,300	31,114	32,040
2027	34,686	33,439	34,440	34,686	33,439	34,440
2028	36,517	35,206	36,289	36,517	35,206	36,289
2029	38,368	36,992	38,157	38,368	36,992	38,157
2030	40,227	38,787	40,036	40,227	38,787	40,036
2031	38,239	36,727	38,065	42,115	40,606	41,946
2032	38,027	36,442	37,876	44,102	42,523	43,960
2033	37,728	36,065	37,602	46,196	44,541	46,082
2034	39,515	37,774	39,420	48,364	46,630	48,281
2035	41,372	39,549	41,310	50,613	48,798	50,564
2036	43,143	41,242	43,110	52,755	50,862	52,735
2037	44,971	42,988	44,970	54,963	52,990	54,976
2038	46,855	44,789	46,888	57,238	55,182	57,286
2039	48,792	46,640	48,861	59,576	57,434	59,660

FY	Total Traffic After Diversion	Total Traffic Before Diversion				
2040	50,786	48,545	50,893	61,981	59,750	62,104
2041	52,836	50,503	52,985	64,452	62,131	64,618
2042	54,943	52,516	55,135	66,991	64,575	67,200
2043	57,106	54,583	57,344	69,595	67,084	69,851
2044	59,324	56,702	59,611	72,265	69,655	72,571
CAGR (FY24 to FY44)	3.7%	3.7%	3.8%	4.7%	4.8%	4.8%

Tolling Segmentation

The tolling stream distribution for the project road has been derived from the average of ETC toll data of FY24 from April 2023 to November 2023. The cash (April - November 2023) and exemption traffic (average of October and November 2023) has been added to the ETC traffic distribution and the resultant tolling segmentation is presented in the table below:

Tolling Distribution

Ticket Type/Modes	Car	LCV	Bus/ 2A Truck	3A Truck	MAV	OSV
TP01-Bankapur						
Single	51.9	80.7	58.9	85.8	93.5	100.0
Return	35.4	16.6	31.0	12.6	6.2	
Local personal	0.9					
Local commercial	2.7	2.0	9.8	1.6	0.3	
Exempt	9.0	0.8	0.3	0.1	0.0	
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP02-Chalageri						
Single	58.4	81.8	60.6	87.4	93.2	100.0
Return	32.0	16.0	33.5	11.6	6.3	
Local personal	3.1					
Local commercial	1.2	2.0	5.9	0.9	0.4	
Exempt	5.3	0.2	0.1	0.1	0.0	
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP03-Hebbalu						
Single	57.6	78.4	56.9	80.5	92.8	100.0
Return	34.9	17.5	34.9	10.3	6.6	
Local personal	2.3					
Local commercial	0.6	3.6	8.2	9.1	0.6	
Exempt	4.7	0.6	0.0	0.1	0.0	
Total	100.0	100.0	100.0	100.0	100.0	100.0

Tollable Length and Toll Rates

The details of normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being charged at Bankapur, Chalageri and Hebbalu are presented in the table below:

Existing Tolling Lengths at PR

	TP01 - Bankapur	TP02 - Chalageri			
Toll Plazas	**TP1 at 75%**	**TP1 at 100%**	**TP2 at Chalageri- 6 Lane**	**TP2 at Chalageri- 4 Lane**	**TP03- Hebbalu**
A. Normal length	62.339	62.339	42.799	4.943	44.714
B. Bypass length			28.227	2.242	27.698
C. Equivalent Structure length	5.380	5.38	7.120		2.680
D. Total tolling length=(A+1.5*B+C)	67.719	67.719	92.260	8.306	88.941

The Schedule M lengths have been considered from FY24 onwards for TP01 and TP03. However, for TP02, Schedule M lengths have been considered from January 2025 onwards. The details of tolling length as per Schedule M are presented in the table below:

Tolling Distribution from Toll Data for present study (in %)

Toll Plazas	Schedule M		
	TP01-Bankapur	**TP02-Chalageri**	**TP03-Hebbalu**
A. Normal length	62.339	47.732	44.714
B. Bypass length		30.469	27.698
C. Equivalent Structure length	5.38	7.12	2.68
D. Total tolling length=(A+1.5*B+C)	67.719	100.556	88.941

The stream of toll rates to be charged at the toll plaza of the project road in cardinal years till FY44 is presented in the table below:

Toll Rates at Toll Plaza (in Rs)

FY End	Car	LCV/ M Bus	Bus/2A Truck	3A	MAV	OSV	Car Local
TP01-Bankapur							
2024	95	155	330	360	515	625	330
2025	100	160	335	365	525	640	340
2030	125	200	420	455	655	795	420
2035	150	245	510	555	800	975	515
2040	185	300	625	680	980	1,190	630
2044	215	350	730	800	1,150	1,400	735
TP02-Chalageri							
2024	140	225	470	510	735	895	330
2025 Existing Length	140	230	480	525	755	915	340
2025 Schedule M Length	145	240	500	545	780	950	340
2030	185	295	620	675	975	1,185	420
2035	225	360	760	825	1,190	1,445	515
2040	275	440	925	1,010	1,455	1,770	630
2044	320	520	1,085	1,185	1,705	2,075	735
TP03-Hebbalu							
2024	125	205	430	470	675	820	330
2025	130	210	440	480	690	840	340
2030	160	260	550	600	860	1,045	420
2035	200	320	670	730	1,050	1,280	515
2040	240	390	820	895	1,285	1,565	630
2044	285	460	960	1,050	1,510	1,835	735

Note: The toll fee has been rounded to nearest 5 Rupees as per toll fee rules.

For further details in relation to Asset 16, please refer to **Annexure C** of this Preliminary Placement Document.

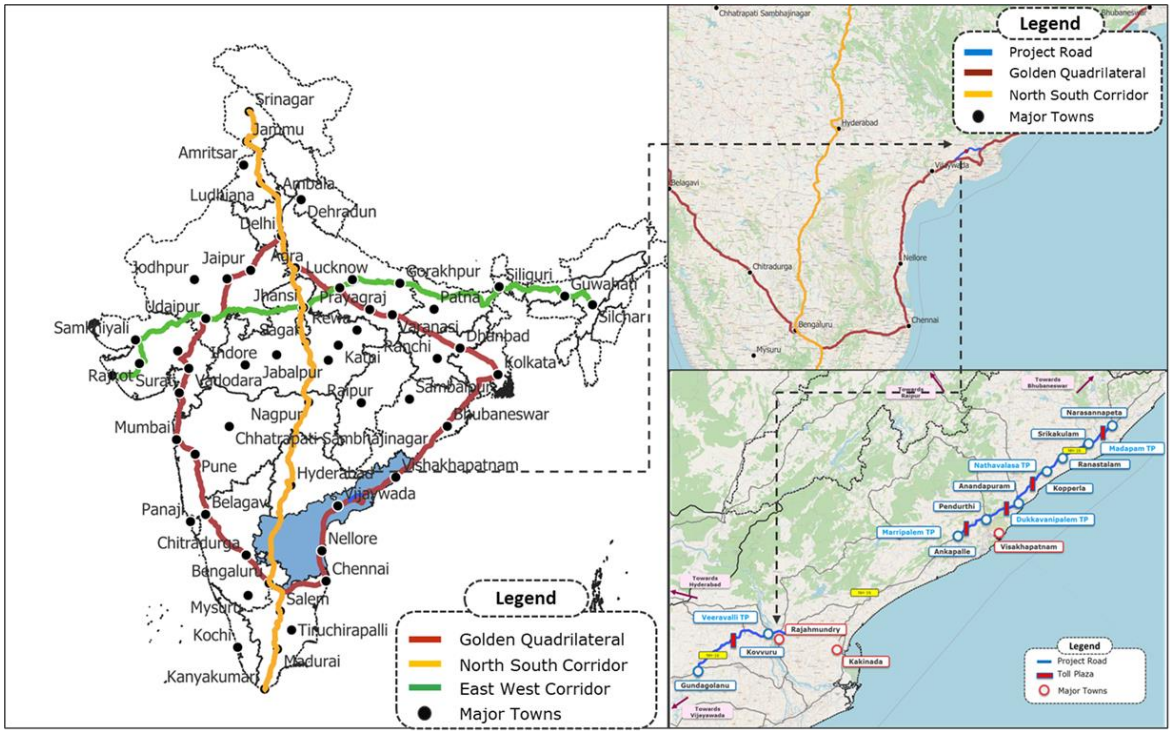
Narasannapeta to Ranasthalam section of NH-16 ("Asset 16"); Ranasthalam to Anandapuram section of NH 16 and Anandapuram to Hanumanthavaka (Visakhapatnam) section of NH-16 ("Asset 17"); and Anandapuram-Pendurthi-Anakapalle of NH-16 ("Asset 18")

Project Overview

According to the Traffic Consultant, the project highway, NH-16, runs parallel to the eastern coast of India envisaged under National Highway Development Program. The total length of NH-16 is roughly 1,764 km starting from Kolkata in West Bengal and ending at Chennai in Tamil Nadu while passing through the states of West Bengal, Odisha, Andhra Pradesh, and Tamil Nadu. NH–16 connects important tourist and industrial cities and towns like Kolkata, Bhubaneswar, Srikakulam, Vizianagaram, Visakhapatnam, Rajahmundry, Vijayawada, Bengaluru, and Chennai etc.

The Narsannapeta to Anakapalli road sections with an aggregate length of 170 kilometers of NH-16 (Old NH-5) in the state of Andhra Pradesh referred to as Project Road (PR), has been offered by NHAI to National Highways Infra Investment Managers Private Limited (NHIIMPL) for transfer to InvIT in the fourth round for a concession period of 20 years with maximum extension till 30 years.

Figure 0-1: Alignment of Project Road and Location of Toll Plazas



Project Road Characteristics and Profile of Influencing Districts

The project road in wider context serves the long-distance traffic, which is majorly plying from/to Anakapalli and beyond (towards Bengaluru/Tirupati/Chennai/rest of Tamil Nadu) to/from Bhubaneshwar/Cuttack and beyond (towards Kolkata/Kharagpur). Apart from long distance traffic, it also serves the short-distance traffic between Nandigama/ Srikakulam/ Kopperia and Anadapuram/ Visakhapatnam/ Anakapalli areas.

The project road traverses a diverse industrial landscape, marked by strategically positioned clusters that drive regional economic activity. A significant hub of industrial operations is located in Visakhapatnam, particularly near the Gangavaram Port area, where a mixed cluster of coal plants and metal industries thrives. Prominent companies in this region include Venkatadri Metal Industries, Jindal Stainless Steel Ltd, and various other metal processing units.

Additionally, Gajuwaka is a center for glass and metal manufacturing, with industries like Matrix Glass Industries and Om Glass & Ply Industries. Stone quarrying is concentrated in Kothavalasa above TP03 and Mamidipalem near Anakapalli, supporting firms such as Sri Siva Stones Exports and Sairam Kadapa & Granite Slabs, which contribute to the region's construction sector.

The project road falls under the jurisdiction of three districts in the state of Andhra Pradesh *viz.* Srikakulam, Vizianagaram and Vishakhapatnam district.

- Srikakulam's economy is primarily agricultural, with rice, maize, and pulses as major crops, and cashew designated as its One District One Product (ODOP). The district also has a presence of small-scale industries and fishing activities.

- Vizianagaram, known for its rice production and mango-based ODOP products, has growing industrial and handloom sectors.

- Visakhapatnam serves as a key economic hub with Visakhapatnam Port, shipbuilding, steel, petrochemicals, and a strong tourism industry.

Annual Average Daily Traffic (AADT)

The estimation for FY25 AADT is done after annualising the behaviour of April 2024 - November 2024 traffic. For Madapam and Nathavalasa, SCF is derived from the months of April to Nov of FY23 and FY24 of respective toll plazas and the average of both years has been adopted. However, for MAVs at Nathavalasa, the SCF of Madapam TP has been considered due to the MAVs being abnormally high in few months of FY24.

The MOM traffic pattern at TP03 and TP04 show initial ramp up of traffic after opening of Vizag bypass in April 2022. Therefore, for Dukkavanipalem and Marripalem, the SCF is derived from the traffic data of adjacent toll plazas

(Madapam and Vempadu). For this purpose, Average of FY23 and FY24 of Madapam TP and FY23 Vempadu TP is considered.

For TP02, TP03, and TP04, cash and exempt traffic from FY25 (Apr to Nov) have been added to the estimated ETC traffic of respective toll plaza. However, for TP01 cash and exempt traffic from Jan-2023 to Dec-2023 is used, considering the disruption in traffic since Jan 2024.

FY25 AADT derived from the ETC traffic data along with SCF, cash traffic, exempt traffic and ADT of April to November of FY25 is presented in Table 0 1.

Table 0-1: AADT for FY 25

	Traffic / Mode	CJV	LCV	2-Axle	3-Axle	MAV	OSV	PCU
TP01 – Madapam								
A.	ETC FY25(Apr - Nov)	5,402	397	1,773	1,026	2,894	3	27,431
B.	SCF (Avg of FY23 & FY24)	1.03	1.00	1.01	1.01	1.01	1.01	
C.	ETC * SCF	5,561	399	1,791	1,033	2,926	3	27,812
D.	Cash (Jan23 – Dec23)	75	3	3	2	1	1	104
E.	Exempt (Jan23 – Dec23)	339	7	2	11	13	1	452
F.	AADT FY25 (Estimated)= C+D+E	5,975	409	1,795	1,046	2,940	5	28,364
TP02 – Nathavalasa								
A.	ETC FY25(Apr - Nov)	6,368	504	2,055	1,123	3,605	4	32,899
B.	SCF (Avg of FY23 & FY24)	1.03	1.01	1.01	1.01	1.01	1.01	
C.	ETC * SCF	6,555	508	2,076	1,139	3,645	4	33,383
D.	Cash (Apr24 – Nov24)	651	16	15	22	2	2	804
E.	Exempt (Apr24 – Nov24)	0	0	0	0	0	0	0
F.	AADT FY25 (Estimated)= C+D+E	7,206	524	2,091	1,161	3,712	6	34,479
TP03 – Dukkavanipalem								
A.	ETC FY25(Apr - Nov)	2,867	453	1,299	1,054	2,987	4	24,065
B.	SCF (Avg of FY23-Vempadu and Avg of FY23 & FY24-Madapam)	1.02	1.00	1.00	1.00	1.02	1.02	
C.	ETC * SCF	2,937	452	1,303	1,050	3,036	4	24,354
D.	Cash (Apr24 – Nov24)	55	4	4	6	1	1	100
E.	Exempt (Apr24 – Nov24)	326	2	1	2	2	0	347
F.	AADT FY25 (Estimated)= C+D+E	3,318	457	1,308	1,058	3,039	5	24,800
TP04 – Marripalem								
A.	ETC FY25(Apr - Nov)	3,722	463	1,319	1,068	2,965	4	24,938
B.	SCF (Avg of FY23-Vempadu and Avg of FY23 & FY24-Madapam)	1.02	1.00	1.00	1.00	1.02	1.02	
C.	ETC * SCF	3,813	462	1,323	1,064	3,013	4	25,244
D.	Cash (Apr24 – Nov24)	96	3	2	2	1	1	122
E.	Exempt (Apr24 – Nov24)	644	2	1	4	1	0	667
F.	AADT FY25 (Estimated)= C+D+E	4,552	467	1,327	1,071	3,016	5	26,041

Travel Pattern

- Car traffic shows a strong local component across all toll plazas
- Freight traffic primarily exhibits the long-distance movement patterns with predominant movement between Kolkata/Jharkhand/East& North India and Bangalore/Chennai & beyond across all four toll plaza locations along the PR.
- The passenger traffic on the road were found to be for the purpose of work and business at the toll plaza locations.

Network Impacts

In context of the project road, three road network developments which may impact the traffic on the project road are:

1. *Impact of Raipur-Visakhapatnam (Vizag) Expressway & Sabbavaram to Sheela Nagar Port Connectivity Road*

The assessment for the traffic plying between Raipur/Salur & beyond and Vizag City/Port has been done to understand the impact of the completion of Raipur-Vizag Expressway coupled with Elevated Sabbavaram to Sheela Nagar port connectivity road.

The total diverted traffic estimated for FY25 after the operation of Raipur-Vizag Expressway and Elevated Sabbavaram to Sheela Nagar port connectivity under close tolling is presented below:

Table 0-2: Total Impact due to Raipur-Vizag Expressway and Sabbavaram-Sheela Nagar Port Connectivity Road – FY 25

Modes	Car	LCV	2A	3A	MAV	PCU
Adduru to Pinagadi Ticket type	2,219	150	59	132	779	6,523

This traffic has been grown and considered appropriately in the respective years of impact. In context of the timelines, the 100 percent of the considered diverted traffic is assumed to shift by FY30, following the implementation of close tolling and the completion of construction on the RVE and port connectivity road.

2. *Impact of Sabbavaram-Sheela Nagar Port connectivity road on Route Choice between Anandapuram/Anakapalli & beyond to Vizag port*

The impact of completion of port connectivity road has been studied for two streams of traffic:

- Traffic from/to Anandapuram & beyond to/from Vizag City/Port - Northern Approach
- Traffic from/to Anakapalli & beyond to/from Vizag City/Port – Southern Approach

Net divertible traffic (Resultant gain) estimated for FY25 due to completion of Sabbavaram-Sheela Nagar port connectivity road is presented below:.

Table 0-3: Diversion analysis for Anandapuram/ Anakapalli & Beyond to Vizag Port Traffic – FY 25

Resultant Upside	2A	3A	MAV	PCU
North Traffic			199	896
South Traffic	39	83	1,257	6,023

The Sabbavaram-Sheela Nagar Road is expected to add 199 MAVs (896 PCUs) for Dukkavanipalem to Pinagdi ticket type and 6,023 PCUs for Marripalem to Pinagadi ticket type for Vizag Port bound traffic from Northern and Sothern Approaches respectively. This traffic has been grown and considered appropriately in the respective years of impact.

In context of the timelines, the 100 percent of the considered diverted traffic is assumed to shift by FY30, following the implementation of close tolling and the completion of construction on port connectivity road.

3. *Impact of Kharagpur – Vizag Expressway*

The assessment for the route between Kharagpur and Vizag city/Port has been done for the two traffic streams:

- Traffic from/to Bhubaneswar & beyond to/from Vizag City/Port
- Traffic from/to Bhubaneswar & beyond to/from Anakapalli & beyond

The total diverted traffic estimated for FY25 after the operation of Kharagpur-Vizag Expressway at the two toll plazas is presented below:.

Table 0-1: Total Impact Due to Kharagpur-Vizag Expressway – FY25

Diverted Traffic As % AADT	Car	LCV	2A	3A	MAV	PCUs
Diverted Traffic % Based on Diversion Analysis						
Madapam (TP01)	4.3	23.3	36.0	38.7	41.1	31.4
Nathavalasa (TP02)	3.5	18.1	32.2	34.9	32.6	25.9
Adopted @ 50%						
Madapam (TP01)	2.1	11.6	18.0	19.4	20.6	15.7

Diverted Traffic As % AADT	Car	LCV	2A	3A	MAV	PCUs
Nathavalasa (TP02)	1.8	9.1	16.1	17.4	16.3	12.9

This traffic has been grown and considered appropriately in the respective years of impact.

The project is a part of phase 2 of vision 2047, it is anticipated the whole process may take 10-15 years for completion. In view of this and pre-bid responses from NHAI, impact of this development has been considered from FY40 onwards. In addition, there would be some captive traffic of the PR due to distribution points along the route, familiarity of the existing route and roadside facilities. In view of this, 50 percent of this traffic is considered to shift to greenfield expressway. In terms of phasing for traffic shift, it is assumed that 50% of the diverted traffic will shift to the alternate route by FY40, 75% by FY41, and 100% by FY42.

Traffic Growth rates

The estimated traffic growth rates for the project road based on the elasticity approach applicable across all the three toll plazas have been presented till FY55 in line with the maximum extendable concession period of 30 years in below:
Table 0-2: Projected Traffic Growth Rates for Project Road (%)

FY/Modes	TP01 & TP02					TP03 & TP04				
	Car	LCV	2A	3A	MAV/ OSV	Car	LCV	2A	3A	MAV/ OSV
FY26	8.0	3.3	5.3	2.6	6.6	8.1	3.3	5.3	2.6	6.6
FY27	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY28	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY29	7.6	3.1	5.0	2.5	6.2	7.6	3.1	5.0	2.5	6.2
FY30	6.8	2.8	4.5	2.2	5.6	6.9	2.8	4.5	2.2	5.6
FY31	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY32	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY33	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY34	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY35	6.2	2.8	3.9	2.2	5.0	6.2	2.8	3.9	2.2	5.0
FY36	5.5	2.7	3.3	1.6	4.3	5.5	2.7	3.3	1.6	4.4
FY37	5.4	2.7	3.2	1.6	4.3	5.4	2.7	3.2	1.6	4.3
FY38	5.3	2.6	3.1	1.6	4.2	5.3	2.6	3.2	1.6	4.2
FY39	5.2	2.6	3.1	1.5	4.1	5.2	2.6	3.1	1.5	4.1
FY40	5.1	2.5	3.0	1.5	4.0	5.1	2.5	3.0	1.5	4.0
FY41	5.0	2.5	3.0	1.5	3.5	5.0	2.5	3.0	1.5	3.5
FY42	4.9	2.4	2.9	1.4	3.4	4.9	2.4	2.9	1.4	3.4
FY43	4.8	2.4	2.9	1.4	3.3	4.8	2.4	2.9	1.4	3.3
FY44	4.7	2.3	2.8	1.4	3.2	4.7	2.3	2.8	1.4	3.3
FY45 and beyond	4.6	2.3	2.7	1.4	3.2	4.6	2.3	2.7	1.3	3.2

Implied Traffic Growth Rates

The implied traffic growth rates for the project road after considering the impact of diversions at all the toll plazas have been presented below:.

Table 0-3: Implied Traffic Growth Rates for PR After Diversion for TP01 and TP02 (%)

FY/Modes	TP01					TP02				
	Car	LCV	2A	3A	MAV/ OSV	Car	LCV	2A	3A	MAV/ OSV
FY26	8.0	3.3	5.3	2.6	6.6	8.0	3.3	5.3	2.6	6.6
FY27	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY28	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY29	7.6	3.1	5.0	2.5	6.2	7.6	3.1	5.0	2.5	6.2
FY30	6.8	2.8	4.5	2.2	5.6	6.8	2.8	4.5	2.2	5.6
FY31	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY32	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY33	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY34	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY35	6.2	2.8	3.9	2.2	5.0	6.2	2.8	3.9	2.2	5.0
FY36	5.5	2.7	3.3	1.6	4.3	5.5	2.7	3.3	1.6	4.3
FY37	5.4	2.7	3.2	1.6	4.3	5.4	2.7	3.2	1.6	4.3

FY/Modes	TP01					TP02				
	Car	LCV	2A	3A	MAV/ OSV	Car	LCV	2A	3A	MAV/ OSV
FY38	5.3	2.6	3.1	1.6	4.2	5.3	2.6	3.1	1.6	4.2
FY39	5.2	2.6	3.1	1.5	4.1	5.2	2.6	3.1	1.5	4.1
FY40	4.0	-3.4	-6.2	-8.3	-6.7	4.2	-2.1	-5.3	-7.4	-4.4
FY41	4.5	-0.1	-1.1	-2.9	-1.3	4.6	0.5	-0.6	-2.4	-0.2
FY42	4.2	-1.5	-3.4	-5.4	-4.1	4.3	-0.5	-2.7	-4.6	-2.3
FY43	4.8	2.4	2.9	1.4	3.3	4.8	2.4	2.9	1.4	3.3
FY44	4.7	2.3	2.8	1.4	3.2	4.7	2.3	2.8	1.4	3.2
FY45 and beyond	4.6	2.3	2.7	1.4	3.2	4.6	2.3	2.7	1.4	3.2

Table 0-4: Implied Traffic Growth Rates for PR After Diversion for TP03 and TP04 (%)

FY/Modes	TP03					TP04				
	Car	LCV	2A	3A	MAV/ OSV	Car	LCV	2A	3A	MAV/ OSV
FY26	8.1	3.3	5.3	2.6	6.6	8.1	3.3	5.3	2.6	6.6
FY27	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY28	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY29	7.6	3.1	5.0	2.5	6.2	7.6	3.1	5.0	2.5	6.2
FY30	6.9	2.8	4.5	2.2	5.6	6.9	2.8	4.5	2.2	5.6
FY31	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY32	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY33	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY34	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY35	6.2	2.8	3.9	2.2	5.0	6.2	2.8	3.9	2.2	5.0
FY36	5.5	2.7	3.3	1.6	4.4	5.5	2.7	3.3	1.6	4.4
FY37	5.4	2.7	3.2	1.6	4.3	5.4	2.7	3.2	1.6	4.3
FY38	5.3	2.6	3.2	1.6	4.2	5.3	2.6	3.2	1.6	4.2
FY39	5.2	2.6	3.1	1.5	4.1	5.2	2.6	3.1	1.5	4.1
FY40	5.1	2.5	3.0	1.5	4.0	5.1	2.5	3.0	1.5	4.0
FY41	5.0	2.5	3.0	1.5	3.5	5.0	2.5	3.0	1.5	3.5
FY42	4.9	2.4	2.9	1.4	3.4	4.9	2.4	2.9	1.4	3.4
FY43	4.8	2.4	2.9	1.4	3.3	4.8	2.4	2.9	1.4	3.3
FY44	4.7	2.3	2.8	1.4	3.3	4.7	2.3	2.8	1.4	3.3
FY45 and Beyond	4.6	2.3	2.7	1.3	3.2	4.6	2.3	2.7	1.3	3.2

Traffic Projections

Mode-wise projected traffic for the toll plazas of the project road under the base case after considering diversion impacts till FY55 is presented below:

Table 0-5: Projected Mode-wise Traffic at TP01 and TP02

FY/ Modes	TP01						TP02					
	Car	LCV	2A	3A	MAV	OSV	Car	LCV	2A	3A	MAV	OSV
FY25	5,975	409	1,795	1,046	2,940	5	7,206	524	2,091	1,161	3,712	6
FY26	6,455	423	1,890	1,073	3,134	5	7,786	542	2,202	1,191	3,958	6
FY27	6,967	436	1,989	1,101	3,338	6	8,402	560	2,317	1,222	4,215	7
FY28	7,518	451	2,093	1,130	3,556	6	9,068	578	2,438	1,254	4,490	7
FY29	8,087	465	2,197	1,158	3,777	6	9,753	596	2,560	1,285	4,769	7
FY30	8,640	478	2,297	1,184	3,989	7	10,420	613	2,675	1,313	5,037	8
FY31	9,182	492	2,387	1,210	4,191	7	11,073	630	2,781	1,343	5,292	8
FY32	9,757	506	2,482	1,237	4,403	7	11,768	648	2,891	1,373	5,560	9
FY33	10,369	520	2,580	1,265	4,626	8	12,506	667	3,005	1,403	5,841	9
FY34	11,019	535	2,682	1,293	4,860	8	13,290	685	3,124	1,435	6,137	10
FY35	11,698	549	2,786	1,322	5,102	9	14,108	704	3,245	1,466	6,442	10
FY36	12,341	564	2,877	1,343	5,323	9	14,884	724	3,351	1,490	6,722	10
FY37	13,008	580	2,969	1,364	5,550	9	15,688	743	3,458	1,514	7,008	11
FY38	13,697	595	3,062	1,386	5,782	10	16,519	763	3,567	1,537	7,301	11
FY39	14,409	610	3,157	1,407	6,020	10	17,378	782	3,677	1,561	7,601	12
FY40	14,982	589	2,960	1,290	5,618	11	18,103	766	3,483	1,446	7,263	12

FY/ Modes	TP01						TP02					
	Car	LCV	2A	3A	MAV	OSV	Car	LCV	2A	3A	MAV	OSV
FY41	15,663	589	2,927	1,253	5,546	11	18,940	770	3,461	1,411	7,247	13
FY42	16,324	580	2,826	1,185	5,320	11	19,761	766	3,368	1,346	7,079	13
FY43	17,108	594	2,907	1,202	5,497	12	20,710	784	3,464	1,365	7,314	14
FY44	17,912	608	2,988	1,219	5,675	12	21,683	802	3,560	1,384	7,551	14
FY45	18,735	622	3,070	1,235	5,855	13	22,680	821	3,658	1,403	7,791	15
FY46	19,597	636	3,154	1,252	6,041	13	23,723	839	3,757	1,422	8,039	15
FY47	20,499	651	3,240	1,269	6,233	13	24,815	859	3,860	1,441	8,294	15
FY48	21,442	666	3,328	1,286	6,431	14	25,956	878	3,966	1,461	8,558	16
FY49	22,428	681	3,419	1,303	6,636	14	27,150	898	4,074	1,480	8,829	16
FY50	23,460	696	3,513	1,321	6,846	15	28,399	919	4,185	1,501	9,110	17
FY51	24,539	712	3,609	1,339	7,064	15	29,705	940	4,300	1,521	9,399	18
FY52	25,667	729	3,707	1,357	7,288	16	31,072	961	4,417	1,541	9,698	18
FY53	26,848	745	3,809	1,375	7,520	16	32,501	983	4,538	1,562	10,006	19
FY54	28,083	762	3,913	1,394	7,759	17	33,996	1,006	4,662	1,583	10,324	19
FY55	29,375	780	4,019	1,413	8,005	17	35,560	1,029	4,789	1,605	10,652	20

Table 0-6: Projected Mode-wise Traffic at TP03 and TP04

FY/ Modes	TP03						TP04					
	Car	LCV	2A	3A	MAV	OSV	Car	LCV	2A	3A	MAV	OSV
FY25	3,318	457	1,308	1,058	3,039	5	4,552	467	1,327	1,071	3,016	5
FY26	3,585	472	1,378	1,086	3,240	5	4,919	483	1,398	1,099	3,216	5
FY27	3,870	488	1,450	1,114	3,452	6	5,309	498	1,471	1,127	3,426	6
FY28	4,177	504	1,526	1,143	3,677	6	5,730	515	1,548	1,157	3,649	6
FY29	4,493	520	1,602	1,171	3,906	6	6,164	531	1,625	1,185	3,877	6
FY30	4,801	534	1,674	1,197	4,396	7	6,586	546	1,748	1,305	5,802	7
FY31	5,102	549	1,741	1,223	4,619	7	7,000	562	1,818	1,335	6,096	7
FY32	5,423	565	1,809	1,251	4,854	7	7,439	577	1,889	1,364	6,405	7
FY33	5,763	581	1,881	1,279	5,100	8	7,906	594	1,964	1,395	6,730	8
FY34	6,125	598	1,955	1,307	5,359	8	8,403	611	2,042	1,426	7,071	8
FY35	6,503	614	2,031	1,336	5,626	9	8,921	628	2,121	1,457	7,424	9
FY36	6,861	631	2,098	1,357	5,870	9	9,413	645	2,191	1,481	7,747	9
FY37	7,232	648	2,165	1,379	6,121	9	9,922	662	2,261	1,504	8,078	9
FY38	7,616	665	2,234	1,400	6,378	10	10,449	680	2,332	1,527	8,416	10
FY39	8,013	682	2,303	1,422	6,640	10	10,993	697	2,405	1,551	8,762	10
FY40	8,422	700	2,373	1,443	6,908	11	11,554	715	2,478	1,574	9,116	11
FY41	8,844	717	2,443	1,464	7,147	11	12,133	733	2,551	1,597	9,431	11
FY42	9,278	735	2,515	1,485	7,389	11	12,729	751	2,626	1,620	9,751	11
FY43	9,724	752	2,586	1,506	7,635	12	13,341	769	2,701	1,643	10,075	12
FY44	10,182	770	2,659	1,527	7,883	12	13,969	787	2,776	1,666	10,403	12
FY45	10,651	787	2,731	1,548	8,134	13	14,612	805	2,852	1,688	10,734	13
FY46	11,142	805	2,806	1,568	8,393	13	15,285	823	2,930	1,711	11,076	13
FY47	11,655	824	2,883	1,590	8,660	13	15,990	842	3,011	1,734	11,428	13
FY48	12,192	843	2,962	1,611	8,936	14	16,726	861	3,093	1,757	11,792	14
FY49	12,754	862	3,043	1,633	9,220	14	17,497	881	3,178	1,781	12,168	14
FY50	13,341	882	3,126	1,655	9,514	15	18,303	901	3,265	1,805	12,555	15
FY51	13,956	902	3,212	1,677	9,817	15	19,146	922	3,354	1,829	12,955	15
FY52	14,599	923	3,300	1,700	10,129	16	20,029	943	3,446	1,854	13,367	16
FY53	15,272	944	3,390	1,723	10,452	16	20,951	964	3,540	1,879	13,793	16
FY54	15,975	965	3,483	1,746	10,785	17	21,917	987	3,637	1,905	14,232	17
FY55	16,711	987	3,578	1,770	11,128	17	22,927	1,009	3,737	1,930	14,685	17

Projections of the total PCUs based on the most likely growth rates before and after considering diversion impacts is presented below: *Table 0-7: Projected Traffic (in PCUs)*

FY/ Modes	Before Diversion					After Diversion				
	TP01	TP02	TP03	TP04	Average	TP01	TP02	TP03	TP04	Average
FY25	28,364	34,479	24,800	26,041	28,421	28,364	34,479	24,800	26,041	28,421
FY26	30,109	36,615	26,289	27,627	30,160	30,109	36,615	26,289	27,627	30,160
FY27	31,941	38,857	27,850	29,292	31,985	31,941	38,857	27,850	29,292	31,985
FY28	33,891	41,246	29,510	31,064	33,928	33,891	41,246	29,510	31,064	33,928
FY29	35,874	43,674	31,196	32,864	35,902	35,874	43,674	31,196	32,864	35,902
FY30	37,780	46,008	32,814	34,593	37,799	37,780	46,008	32,814	34,593	37,799
FY31	39,603	48,241	34,360	36,249	39,613	39,603	48,241	34,360	36,249	39,613
FY32	41,520	50,589	35,984	37,989	41,520	41,520	50,589	35,984	37,989	41,520

FY/ Modes	Before Diversion					After Diversion				
	TP01	TP02	TP03	TP04	Average	TP01	TP02	TP03	TP04	Average
FY33	43,535	53,057	37,688	39,817	43,524	43,535	53,057	37,688	39,817	43,524
FY34	45,653	55,652	39,478	41,738	45,630	45,653	55,652	39,478	41,738	45,630
FY35	47,841	58,333	41,325	43,721	47,805	47,841	58,333	41,325	43,721	47,805
FY36	49,842	60,787	43,008	45,534	49,793	49,842	60,787	43,008	45,534	49,793
FY37	51,895	63,305	44,732	47,392	51,831	51,895	63,305	44,732	47,392	51,831
FY38	53,998	65,884	46,496	49,295	53,918	53,998	65,884	46,496	49,295	53,918
FY39	56,150	68,524	48,300	51,243	56,054	56,150	68,524	48,300	51,243	56,054
FY40	58,351	71,224	50,142	53,233	58,237	53,944	66,779	50,142	53,233	56,024
FY41	60,458	73,805	51,876	55,121	60,315	54,092	67,382	51,876	55,121	57,118
FY42	62,604	76,432	53,639	57,042	62,429	53,222	66,968	53,639	57,042	57,717
FY43	64,786	79,104	55,428	58,993	64,578	55,113	69,347	55,428	58,993	59,720
FY44	67,002	81,818	57,242	60,974	66,759	57,036	71,764	57,242	60,974	61,754
FY45	69,251	84,571	59,079	62,982	68,971	58,988	74,219	59,079	62,982	63,817
FY46	71,580	87,423	60,980	65,062	71,261	61,012	76,763	60,980	65,062	65,954
FY47	73,993	90,377	62,945	67,214	73,632	63,110	79,400	62,945	67,214	68,167
FY48	76,493	93,438	64,978	69,443	76,088	65,285	82,134	64,978	69,443	70,460

Toll Segmentation

Based on detailed review of historic trends of trip segmentation, according to the Consultant on the Asset, the tolling stream distribution for each toll plaza location has been derived using the respective electronic toll collection (ETC) data of FY25 from April to November. The cash and exemption traffic data for FY25 (April–November) has been added into the ETC traffic distribution for Nathavalasa TP, Dukkavanipalem TP, and Marripalem TP. However, for Madapam TP, cash and exemption traffic data from January 2023 to December 2023 has been considered due to data disruptions since January 2024. The resultant tolling segmentation is presented below: *Table 0-8: Tolling Distribution*

Ticket Type/Modes	Car	LCV	2A Truck	3A Truck	MAV	OSV
TP01 -Madapam						
Single	22.2	55.6	54.4	85.2	91.0	100.0
Return	58.4	34.3	21.7	9.1	7.4	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	9.1					
Local commercial	4.4	8.5	23.8	4.6	1.1	
Exempt	5.9	1.6	0.1	1.1	0.4	
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP02 - Nathavalasa						
Single	35.6	54.5	49.5	82.8	83.0	100.0
Return	62.1	40.4	43.5	16.7	16.3	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	2.0					
Local commercial	0.3	5.0	2.5	0.5	0.7	
Exempt	0.0	0.0	4.5	0.0	0.0	
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP03 - Dukkavanipalem						
Single	51.0	64.7	80.0	88.6	89.7	100.0
Return	38.3	34.9	19.9	11.2	10.1	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	0.5					
Local commercial	0.0	0.0	0.0	0.0	0.1	
Exempt	10.1	0.4	0.1	0.2	0.1	
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP04 - Marripalem						
Single	48.8	67.6	81.6	89.5	89.8	100.0
Return	36.4	31.6	18.2	10.0	10.1	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	0.2					
Local commercial	0.0	0.3	0.1	0.2	0.0	
Exempt	14.5	0.5	0.1	0.4	0.0	
Total	100.0	100.0	100.0	100.0	100.0	100.0

In order to arrive at the traffic at different points, the relevant streams have been worked out from OD survey conducted at the TP03 and TP04. The adopted closed tolling segmentation is presented below:

Table 0-9: Tolling Distribution for Closed Tolling

Ticket Type/Modes	Car	LCV	2A Truck	3A Truck	MAV	OSV
TP03 - Dukkavanipalem						
Single	51.0	64.7	80.0	88.6	89.7	100.0
Return	38.9	34.9	19.9	11.2	10.3	
Exempt	10.1	0.4	0.1	0.2	0.1	
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP04 - Marripalem						
Single	48.8	67.6	81.6	89.5	89.8	100.0
Return	36.7	31.9	18.3	10.1	10.1	
Exempt	14.5	0.5	0.1	0.4	0.0	
Total	100.0	100.0	100.0	100.0	100.0	100.0

Additionally, after completion of Raipur Vizag Expressway additional ticket will be introduced for Aduru to Pinagadi. The segmentation adopted for Aduru to Pinagadi is presented below: *Table 0-10: Tolling Distribution for Aduru to Pinagadi*

Ticket Type/Modes	Car	LCV	2A Truck	3A Truck	MAV	OSV
Single	95.0	95.0	95.0	95.0	95.0	95.0
Return	5.0	5.0	5.0	5.0	5.0	5.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Tollable Length and Toll Rates

The details of existing normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being charged at toll plaza locations are presented below:.

Table 0-11: Existing Tolling Lengths at PR

TP	TP01	TP02	TP03	TP04
Base Length				
Normal	48.105	65.707	16.776	19.169
Bypass	4.470	0.000	6.311	5.499
Eq structure	1.195	0.837	0.433	0.417
Total Length	53.770	66.544	23.520	25.085
Tolling Length				
Tolling Length	66.76	74.077	30.0325	31.5875

The Schedule M lengths have been considered from FY25 onwards. The details of normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being/ to be charged at the toll plazas from FY25 onwards as per the Schedule - M notification are presented below:.

Table 0-12: Schedule – M Tolling Lengths (Km)

SCH M Tolling Lengths (FY25 onwards)					
TP	TP01		TP02	TP03	TP04
	Before Construction (FY25 – till 30th Sept in FY28)	After Construction (from 1st October FY28)			
Base Length					
Normal	48.105	47.339	65.691	16.776	19.169
Bypass	4.47	4.470	0.000	6.311	5.499
Eq structure	1.195	1.990	0.853	0.433	0.417
Total Length	53.77	53.799	66.544	23.520	25.085
Tolling Length					
Tolling Length	66.76	73.944	74.2174	30.5725	31.5875

The net effective length for which fee shall be due and payable in closed tolling section from FY30 onwards is as presented in **below:**

Table 0-13: Distance Matrix for Total Tollable Road Length (Including equivalent length of structures >60 m length)

Distance matrix for total Tollable road length (Including equivalent length of structures >60 m length)						
From	**To**	**Km 686+540 Fee Plaza at Dukkavanipalem Village, Dist. Visakhapatnam**	**Km 703+921 Fee Plaza at Mudapaka Village, Dist. Visakhapatnam**	**Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam**	**Km 713+880 Fee Plaza at Pinagadi Village, Dist. Visakhapatnam**	**Km 722+170 Fee Plaza at Marripalem Village, Dist. Visakhapatnam**
	Km	682.980	703.921	711.050	713.880	731.585
Km 686+540 Fee Plaza at Dukkavanipalem Village, Dist. Visakhapatnam	682.980	0.000	22.840	32.588	36.777	56.255
Km 703+921 Fee Plaza at Mudapaka Village, Dist. Visakhapatnam	703.921	22.840	0.000	9.748	13.937	33.415
Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam	711.050	32.588	9.748	0.000	4.189	23.667
Km 713+880 Fee Plaza at Pinagadi Village, Dist. Visakhapatnam	713.880	36.777	13.937	4.189	0.000	19.478
Km 722+170 Fee Plaza at Marripalem Village, Dist. Visakhapatnam	731.585	56.255	33.415	23.667	19.478	0.000

The stream of existing toll rates being charged at the toll plaza of the project road in cardinal years till FY25 is presented below: The toll fee has been rounded to nearest 5 Rupees as per toll fee rules

Table 0-14: Existing Toll Rates

TP/Mode	Car	LCV	2A Truck	3A Truck	MAV	OSV
TP01- Madapam	100	160	330	360	520	635
TP02-Nathavalasa	110	175	370	400	575	700
TP03- Dukkavanipalem	45	70	150	165	235	285
TP04-Marripalem	45	75	155	170	245	300

The stream of toll rates likely to be charged basis schedule -M lengths and adopted WPI assumptions at the toll plazas of the project road in cardinal years till FY55 is presented below: *Table 0-15: Toll Rates at Project Road Toll Plazas (in Rs)*

FY End	Car/ MLCV	LCV/ M Bus	Bus / 2A Truck	3A Truck	MAV	OSV	Car Local
TP01-Madapam							
2025	100	160	330	360	520	635	340
2030	135	215	450	490	710	860	415
2035	165	265	550	600	865	1,050	510
2040	200	320	675	735	1,055	1,285	620
2045	245	390	820	895	1,290	1,570	760
2050	295	480	1,005	1,095	1,575	1,915	925
2055	365	585	1,225	1,340	1,925	2,345	1,130
TP02-Nathavalasa							
2025	110	175	370	400	580	705	340
2030	135	215	455	495	710	865	415
2035	165	265	555	605	870	1,055	510
2040	200	320	675	735	1,060	1,290	620
2045	245	395	825	900	1,295	1,575	760
2050	300	480	1,010	1,100	1,580	1,925	925
2055	365	590	1,230	1,345	1,930	2,350	1,130
TP03- Dukkavanipalem							
2025	45	70	150	165	240	290	340

FY End	Car/ MLCV	LCV/ M Bus	Bus / 2A Truck	3A Truck	MAV	OSV	Car Local
2030	55	90	185	205	295	355	415
2035	65	110	230	250	355	435	510
2040	80	135	280	305	435	530	620
2045	100	160	340	370	535	650	760
2050	125	200	415	455	650	790	925
2055	150	240	505	555	795	970	1,130
TP04-Marripalem							
2025	45	75	155	170	245	300	340
2030	55	90	195	210	300	370	415
2035	70	110	235	255	370	450	510
2040	85	135	285	315	450	550	620
2045	105	170	350	385	550	670	760
2050	125	205	430	470	675	820	925
2055	155	250	525	570	820	1,000	1,130

For further details in relation to Asset 18, please refer to **Annexure C** of this Preliminary Placement Document.

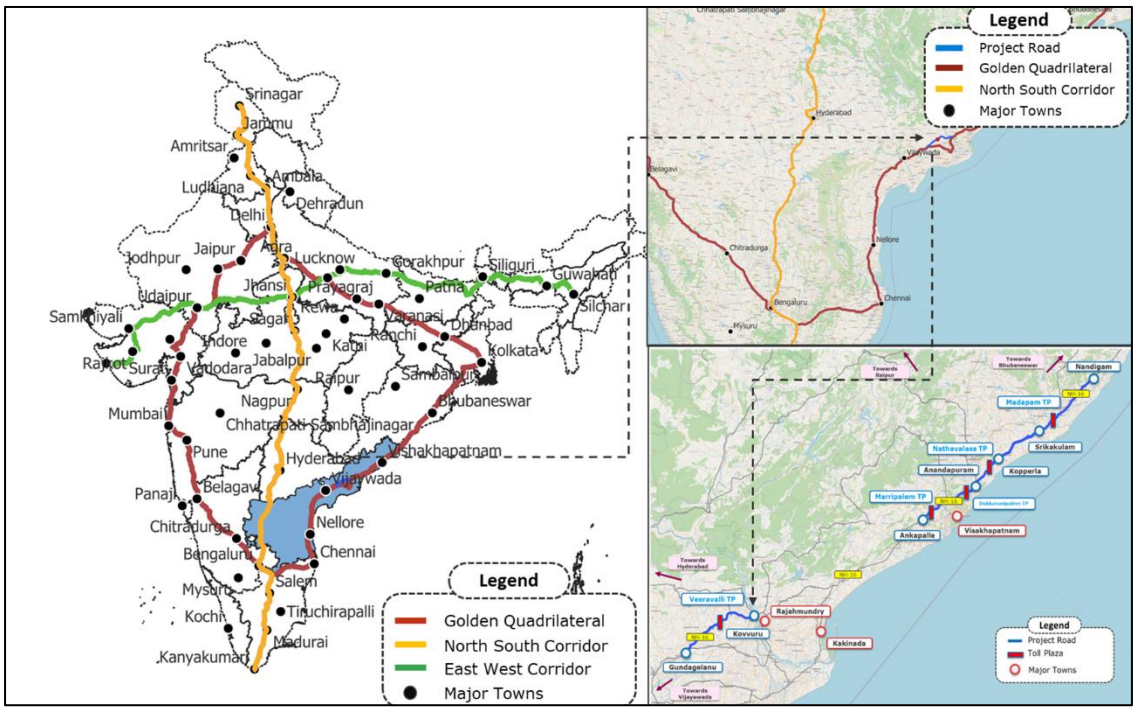
Gundugolanu-Devarapalli-Kovvuru ("Asset 19")

Project overview

According to the Traffic Consultant, the project highway, NH-16, is the major highway in India that runs along the eastern coast, connecting Dankuni, West Bengal with Chennai, Tamil Nadu and is a crucial part of the Golden Quadrilateral project aimed at enhancing connectivity between major cities in India. The NH 16 highway covers 1,764 kilometres and passes through the states of West Bengal, Odisha, Andhra Pradesh and Tamil Nadu.

The project road section, Gundugolanu-Devarapalli-Kovvuru starts at km 15.320 near Gundugolanu and ends at km 85.204 at Kovvuru with a length of about 70 km. The project road falls under the jurisdiction of Eluru and East Godavari districts passing through settlements of Kovvuru, Pangidi, Devarapalli, Veerampalem, Pullalapadu, Avapadu, Hanumanlagudem, and Gundugolanu. There is one operational toll plaza on the project road near Veeravalli (km 53.700) as part of the concession. This project has been offered by NHAI to National Highways Infra Investment Managers Private Limited (NHIIMPL) for transfer to InvIT in the fourth round for a concession period of 20 years with maximum extension till 30 years.

Figure 0 1 shows the context and alignment of project road with major places along the highway.



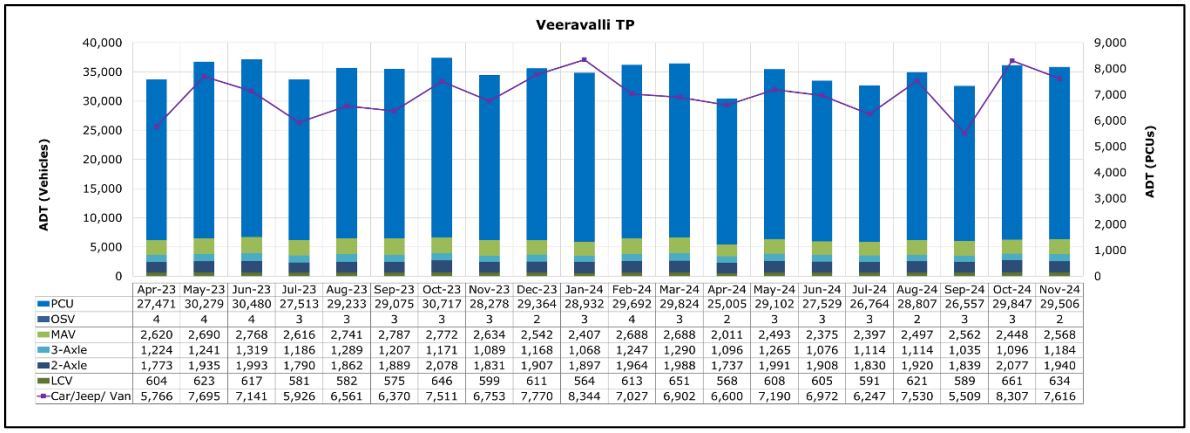
Source: Ramboll Traffic Report

Project Road Characteristics and Profile of Influencing Districts

The project road serves for long-distance traffic, which is primarily plying between Kolkata/Bhubaneswar/Visakhapatnam/northern region and Vijayawada/Bengaluru/Chennai/southern region. Apart from long-distance traffic, it also serves the short-distance traffic, which is mainly generated between Kovvuru/Rajahmundry/Tuni/Ankapalle/Visakhapatnam located on the north of the toll plaza and Gundugolanu/Eluru/Vijayawada located on the south of the toll plaza. The project road section falls under the jurisdiction of Eluru and East Godavari districts in the state of Andhra Pradesh.

Traffic Volume and Vehicle Composition - AADT for FY25

The past toll traffic data for the toll plaza was made available by the client from April 2023 to November 2024 is presented in Figure 0 2



	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24
PCU	27,471	30,279	30,480	27,513	29,233	29,075	30,717	28,278	29,364	28,932	29,692	29,824	25,005	29,102	27,529	26,764	28,807	26,557	29,847	29,506
OSV	4	4	4	3	3	3	3	3	2	3	4	3	2	3	3	3	2	3	3	2
MAV	2,620	2,690	2,768	2,616	2,741	2,787	2,772	2,634	2,542	2,407	2,688	2,688	2,011	2,493	2,375	2,397	2,497	2,562	2,448	2,568
3-Axle	1,224	1,241	1,319	1,186	1,289	1,207	1,171	1,089	1,168	1,068	1,247	1,290	1,096	1,265	1,076	1,114	1,114	1,035	1,096	1,184
2-Axle	1,773	1,935	1,993	1,790	1,862	1,889	2,078	1,831	1,907	1,897	1,964	1,988	1,737	1,991	1,908	1,830	1,920	1,839	2,077	1,940
LCV	604	623	617	581	582	575	646	599	611	564	613	651	568	608	605	591	621	589	661	634
Car/Jeep/ Van	5,766	7,695	7,141	5,926	6,561	6,370	7,511	6,753	7,770	8,344	7,027	6,902	6,600	7,190	6,972	6,247	7,530	5,509	8,307	7,616

Source: Ramboll Traffic Report

AADT for FY25

Due to the maintenance work on the Kovvur bridge, heavy trucks were not allowed to use the bridge from 30th March 2024 to 8th May 2024. Therefore, data from May 9, 2024, to November 2024 has been considered for freight modes. For cars, complete data from April to November (including data for the months of April and May) has been considered.

The AADT for FY25 is estimated by annualizing the ETC data from April/May 2024 to November 2024. A seasonal correction factor (SCF), based on an average of 7/8–12-month factors derived for FY23 from the toll data of the adjacent toll plazas of Krishnavaram and Vempadu under Safeway Concessions, has been adopted. Additionally, cash and exempt traffic for FY25 (Apr to Nov) have been added to the estimated ETC ADT of Veeravalli toll plaza.

FY25 AADT along with ADT, 7/8–12-month SCF, cash and exempt traffic is presented in in **Table 0-1**.

Particulars	CJV	LCV	2A	3A	MAV	OSV	PCUs
Veeravalli TP							
ETC (Apr-Nov)	6,996	615	1,929	1,126	2,477	3	28,244
SCF	1.02	1.00	1.00	1.00	1.02	1.02	
ETC AADT = A*B	7,164	614	1,925	1,126	2,526	3	28,619
Cash (Apr 24 - Nov 24)	70	2	3	2	2	2	106
Exempt (Apr 24 - Nov 24)	202	5		2	3	1	234
AADT FY25 (Estimated) = C+D+E	7,436	621	1,928	1,130	2,530	5	28,949

Source: Ramboll Traffic Report

Travel Pattern

<u>Passenger Traffic:</u>

- About 58.2 percent of cars and 46.9 percent of buses are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Devarapalli/Rajamahendravaram and surroundings. The traffic in this region reflects the heavy commuter movement within these prominent towns, likely driven by daily business and social interactions.

- In addition, around 11.7 percent of cars and 15.3 percent of buses are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Vishakapatnam and surroundings.

- Also, about 10.8 percent of cars and 27.0 percent of buses are found to be travelling from/to Suryapet/Hyderabad and beyond to/from Devarapalli and beyond.

Freight Traffic:

- About 59.3 percent of MLCVs and 28.1 percent of LCVs are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Devarapalli/Rajamahendravaram and surroundings.

- In case of heavy freight vehicles, about 23-27 percent of 2A & 3A trucks and around 13.4 percent of MAVs are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Devarapalli/Rajamahendravaram and surroundings.

- Additionally, around 16 percent of 2A & 3A trucks and around 12 percent of MAVs are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Vishakapatnam and surroundings.

Network Impacts

Impact of Khammam - Devarapalli Expressway

The total diverted traffic estimated for FY25 after the operation of Khammam - Devarapalli Expressway at Veeravalli TP is presented below:

Modes	Car	LCV	2A	3A	MAV
Veeravalli TP	0.0	0.7	2.2	3.8	4.1

Source: Ramboll Traffic Report

This traffic has been grown and considered appropriately in the respective years of impact. The proposed expressway will be a greenfield alignment and considering gradual build-up of traffic on the alternate routes, the diversion impact is considered from FY27 onwards under Base Case. Owing to the gradual shift of traffic away from the project road, the traffic impacts have been assumed to take place in phases with about 50 percent in FY27, 75 percent in FY28 and 100 percent from FY29 onwards.

Traffic Growth Rates

The estimated traffic growth rates for the project road based on the elasticity approach along with the implied growth rates after considering the impact of diversions have been presented till FY55 in line with the maximum extendable concession period of 30 years in Table 0 3.

FY/Modes	Cars	LCV	Bus/ 2A	3A	MAV/ OSV	Cars	LCV	Bus/ 2A	3A	MAV/ OSV
	Normal Growth Rates	Implied Growth Rates								
FY26	7.4	3.3	3.4	2.7	6.7	7.4	3.3	3.4	2.7	6.7
FY27	7.3	3.3	3.3	2.7	6.6	7.3	3.3	2.2	0.7	4.4
FY28	7.3	3.3	3.3	2.7	6.6	7.3	3.3	2.8	1.7	5.5
FY29	7.0	3.1	3.2	2.5	6.3	7.0	3.1	2.6	1.5	5.2
FY30	6.3	2.8	2.9	2.3	5.7	6.3	2.8	2.9	2.3	5.7
FY31	5.8	2.8	2.9	2.3	5.1	5.8	2.8	2.9	2.3	5.1
FY32	5.8	2.8	2.9	2.3	5.1	5.8	2.8	2.9	2.3	5.1
FY33	5.8	2.8	2.9	2.3	5.1	5.8	2.8	2.9	2.3	5.1
FY34	5.8	2.8	2.9	2.3	5.1	5.8	2.8	2.9	2.3	5.1
FY35	5.7	2.8	2.8	2.3	5.0	5.7	2.8	2.8	2.3	5.0
FY36	5.6	2.7	2.8	1.7	4.4	5.6	2.7	2.8	1.7	4.4
FY37	5.5	2.7	2.7	1.6	4.3	5.5	2.7	2.7	1.6	4.3
FY38	5.4	2.6	2.7	1.6	4.2	5.4	2.6	2.7	1.6	4.2
FY39	5.2	2.6	2.6	1.6	4.2	5.2	2.6	2.6	1.6	4.2
FY40	5.1	2.5	2.6	1.5	4.1	5.1	2.5	2.6	1.5	4.1
FY41	5.0	2.5	2.5	1.5	3.5	5.0	2.5	2.5	1.5	3.5
FY42	4.9	2.4	2.5	1.5	3.4	4.9	2.4	2.5	1.5	3.4
FY43	4.8	2.4	2.4	1.5	3.4	4.8	2.4	2.4	1.5	3.4
FY44	4.7	2.3	2.4	1.4	3.3	4.7	2.3	2.4	1.4	3.3
FY45 and beyond	4.6	2.3	2.3	1.4	3.2	4.6	2.3	2.3	1.4	3.2

Source: Ramboll Traffic Report

Projected Mode-wise Traffic

Mode-wise projected traffic for the toll plaza of the project under the base case after considering diversion impacts till FY55 is presented in Table 0 4.

FY/Modes	Car	LCV	Bus/2A	3A	MAV	OSV	PCU
2025	7,436	621	1,928	1,130	2,530	5	28,949
2026	7,989	642	1,993	1,161	2,699	5	30,585
2027	8,575	663	2,038	1,169	2,818	6	31,897
2028	9,203	685	2,094	1,188	2,973	6	33,483
2029	9,847	706	2,149	1,207	3,127	6	35,073
2030	10,470	726	2,211	1,234	3,305	7	36,799
2031	11,073	747	2,275	1,263	3,474	7	38,473
2032	11,710	768	2,341	1,292	3,653	8	40,230
2033	12,384	790	2,408	1,321	3,840	8	42,073
2034	13,096	813	2,478	1,352	4,037	8	44,007
2035	13,836	836	2,548	1,382	4,240	9	46,002
2036	14,605	859	2,619	1,405	4,427	9	47,927
2037	15,401	882	2,691	1,428	4,618	10	49,904
2038	16,225	905	2,763	1,451	4,814	10	51,931
2039	17,076	929	2,836	1,474	5,014	10	54,008
2040	17,955	952	2,909	1,497	5,219	11	56,133
2041	18,862	976	2,982	1,519	5,401	11	58,187
2042	19,795	1,000	3,056	1,542	5,586	12	60,281
2043	20,754	1,024	3,131	1,564	5,774	12	62,412
2044	21,739	1,048	3,205	1,587	5,964	12	64,579
2045	22,748	1,072	3,280	1,609	6,156	13	66,781
2046	23,804	1,097	3,356	1,631	6,354	13	69,064
2047	24,910	1,122	3,434	1,654	6,559	14	71,433
2048	26,066	1,148	3,514	1,677	6,770	14	73,889
2049	27,277	1,174	3,596	1,700	6,988	14	76,438
2050	28,543	1,201	3,680	1,724	7,213	15	79,081
2051	29,869	1,229	3,766	1,748	7,445	15	81,824
2052	31,256	1,257	3,853	1,772	7,685	16	84,671
2053	32,707	1,286	3,943	1,797	7,932	16	87,624
2054	34,226	1,315	4,035	1,822	8,188	17	90,690
2055	35,815	1,346	4,129	1,847	8,451	17	93,871

Source: Ramboll Traffic Report

Projected Traffic in PCUs

Total traffic in PCUs at the project road under the base case before and after considering diversion impacts is presented in **Table 0 5.**

FY End	Total Traffic Before Diversion	Total Traffic After Diversion
2025	28,949	28,949
2026	30,585	30,585
2027	32,298	31,897
2028	34,118	33,483
2029	35,962	35,073
2030	37,730	36,799
2031	39,445	38,473
2032	41,244	40,230
2033	43,131	42,073
2034	45,111	44,007
2035	47,153	46,002
2036	49,122	47,927
2037	51,143	49,904
2038	53,216	51,931
2039	55,338	54,008
2040	57,510	56,133
2041	59,607	58,187
2042	61,744	60,281
2043	63,919	62,412
2044	66,131	64,579
2045	68,377	66,781
2046	70,707	69,064
2047	73,122	71,433
2048	75,628	73,889

FY End	Total Traffic Before Diversion	Total Traffic After Diversion
2049	78,226	76,438
2050	80,922	79,081
2051	83,718	81,824
2052	86,620	84,671
2053	89,630	87,624
2054	92,753	90,690
2055	95,995	93,871
CAGR (%) (FY25 to FY45)	4.4	4.3

Source: Ramboll Traffic Report

As per the traffic projections estimated above, the six-laning of the PR section is anticipated to take place in FY35 and FY36.

It is to be noted, the majority of the distinct structures on the PR section are already six-laned, and the required land for the expansion to a six-lane carriageway is available. Thus, disruptions during the construction process are expected to be minimal. Cost ratio analysis suggests a minimal change in share of PR when compared in existing 4 lane configuration (during construction with a lower speed) with 6 lane configurations. Hence, no significant impact on traffic is expected during expansion of PR.

Tolling Segmentation

The tolling stream distribution for the project road has been derived from the average of ETC toll data of FY25 from April 2024 to November 2024. The cash and exemption traffic (April – November 2024) have been added to the ETC traffic distribution and the resultant tolling segmentation is presented in **Table 0 6**.

Type	Car	LCV	Bus/2A Trucks	3A Trucks	MAV	OSV
Single	48.2	67.4	54.4	61.8	91.2	100.0
Return	45.5	30.1	36.9	23.0	8.2	
Monthly	0.0	0.0	1.3	0.0	0.0	
Local personal	3.0					
Local commercial	0.5	1.8	7.4	15.0	0.4	
Exemptions and Violations	2.9	0.7	0.0	0.2	0.1	
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Ramboll Traffic Report

Tollable Length and Toll Rates

In case of the project road, the details of normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being charged at Veeravalli toll plaza are presented in **Table 0 7.**

Veeravalli TP at km 53.700	FY25 onwards
A. Normal	24.3590
B. Bypass	43.6930
C. Eq. structure	1.8320
Base Length	69.8840
Tolling Length = A+(B*1.5) + (C*10)	108.2185

Source: Ramboll Traffic Report

The stream of toll rates likely to be charged basis schedule -M lengths and adopted WPI assumptions at the toll plaza of the project road in cardinal years till FY55 is presented below:

FY	Car	LCV	Bus/ 2-axle Truck	3-axle Truck	MAV	O/size/ HME	Car Local
Veeravalli TP							
2025	160	255	535	585	840	1,025	340
2030	195	315	660	720	1,035	1,260	415
2035	240	385	805	880	1,265	1,540	510
2040	290	470	985	1,075	1,545	1,880	620
2045	355	575	1,205	1,310	1,885	2,295	760
2050	435	700	1,470	1,605	2,305	2,805	925
2055	530	855	1,795	1,960	2,815	3,430	1,130

Source: Ramboll Traffic Report

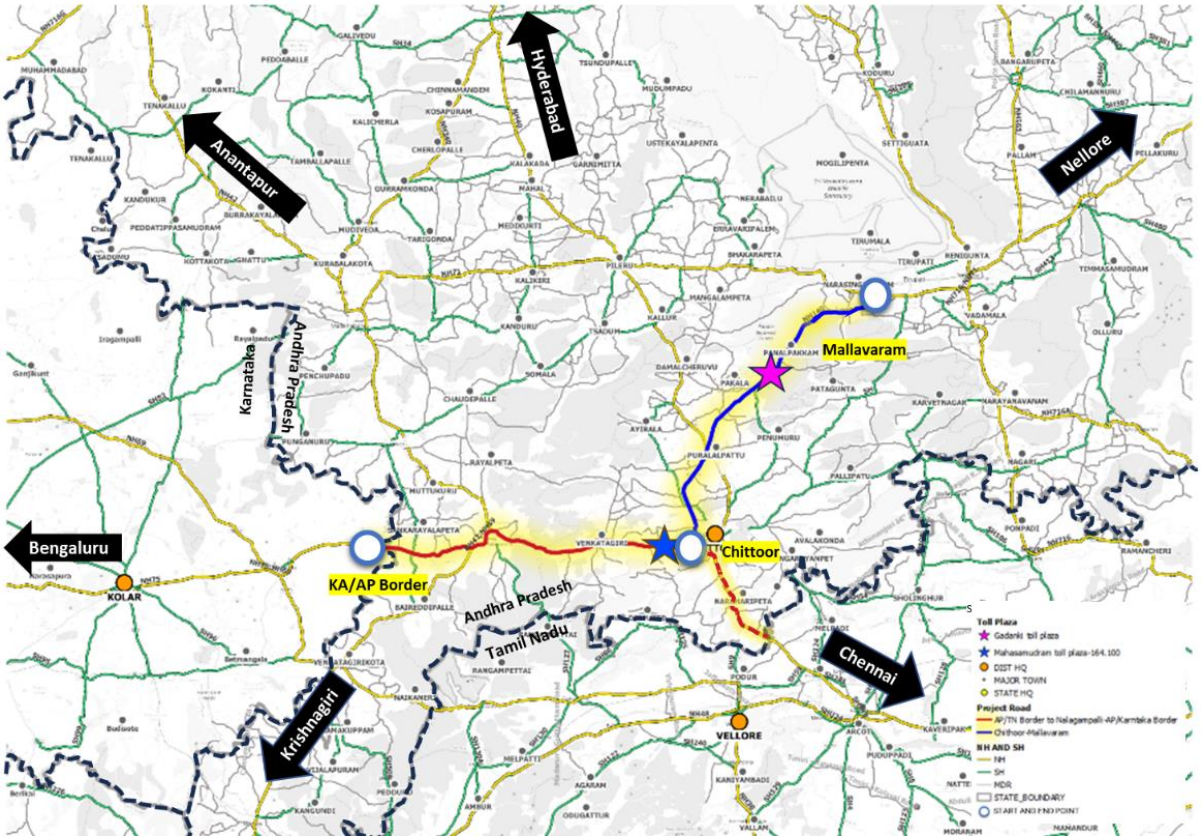
For further details in relation to Asset 19 please refer to **Annexure C** of this Preliminary Placement Document.

Chittoor to Mallavaram section of NH-140 ("Asset 20") and TN/AP – Border to Nalagampalli to AP/Karnataka Border section of NH 4 ("Asset 21")

Project Overview

According to the Traffic Consultant, the project road is part of the major National Highway 69/140 in which section1 is starting from AP/TN Border to Nalagampalli Village Section from Existing km 133.360 to km 171.590 (Design Chainage from km 134.890 to km 172.000) (Package-I) & from Nalagampalli Village to AP/Karnataka Border Section from km 172.000 (existing chainage km 171.590) to km 219.687(existing chainage km 216.912) (Package-II) & section 2 is starting from Chittoor (Design Chainage Km 0.00/Existing Chainage Km 158.00) to Mallavaram (Design Chainage Km 61.128/Existing Chainage Km 41.800), Providing connectivity between states like Andhra Pradesh, Karnataka, Tamil Nadu etc. The project road has two toll plazas (TPs), Gadanki Toll Plaza and Mahasamudram Toll Plaza.

Figure 1-1: Corridor with existing toll plaza location



Source: IBI Group India Private Limited

Salient growth features and traffic generators

The Chittoor-Mallavaram section is a vital economic corridor wherein Passenger traffic is mainly driven by tourism & Various temples and commercial traffic is influenced by multiple industries, playing a crucial role in regional and national logistics.

Tirumala is one of the most visited religious destinations in the world, attracting 60,000 to 80,000 pilgrims daily. In September 2023, the temple recorded an all-time high of 87,000 visitors in a single day, contributing to an annual footfall of approximately 30 to 40 million pilgrims. This massive influx of visitors plays a crucial role in driving regional economic activity, impacting tourism, transport, and local businesses.

Amara Raja Industries, a major player in the battery and power solutions sector, significantly contributes to regional industrial activity. Its large-scale manufacturing facility near Tirupati relies on an extensive logistics network for raw material procurement and finished product distribution. This industrial presence increases traffic at the Mahasamudram Toll Plaza, reinforcing its importance as a key growth driver in the region.

The Srikalahasti-Yerpedu node, located approximately 32 km from the project road, is part of the East Coast Industrial Corridor (ECIC), with Vizag-Chennai Industrial Corridor (VCIC) as its Phase 1. Key nodes along this corridor include

Kopparthy Node, Visakhapatnam (Nakkapalli Cluster), and Chittoor Node in Andhra Pradesh. This corridor is expected to drive future industrial growth, enhancing economic connectivity across the state.

The Chennai-Bengaluru Industrial Corridor (CBIC) is designed to accelerate regional industrial development across Tamil Nadu, Karnataka, and Andhra Pradesh. A key component of this corridor is the Krishnapatnam Industrial Area in Andhra Pradesh, which is poised to become a major future growth driver by fostering industrial agglomeration and economic expansion.

This combination of religious tourism, industrial growth, and strategic corridor development makes Andhra Pradesh a crucial economic hub, contributing significantly to regional and national economic progress.

Traffic volume and composite of vehicles

Past data pertaining to the project corridor was sourced from the client. This includes historic toll traffic and revenue data for the Gadanki, Mahasamudram toll plazas on the project road to study the past traffic and revenue trends, seasonal variations in traffic and other observations related to variations in the data. Past traffic trends in terms of year-on-year growth, month on month growth etc. were derived which will also help in understanding the travel pattern for both passenger and goods vehicles. The given traffic data includes the toll categories like single journey, local pass, and exempted traffic. Exempt category traffic falls under the list of vehicles where these types of vehicles are exempted from paying the user fee.

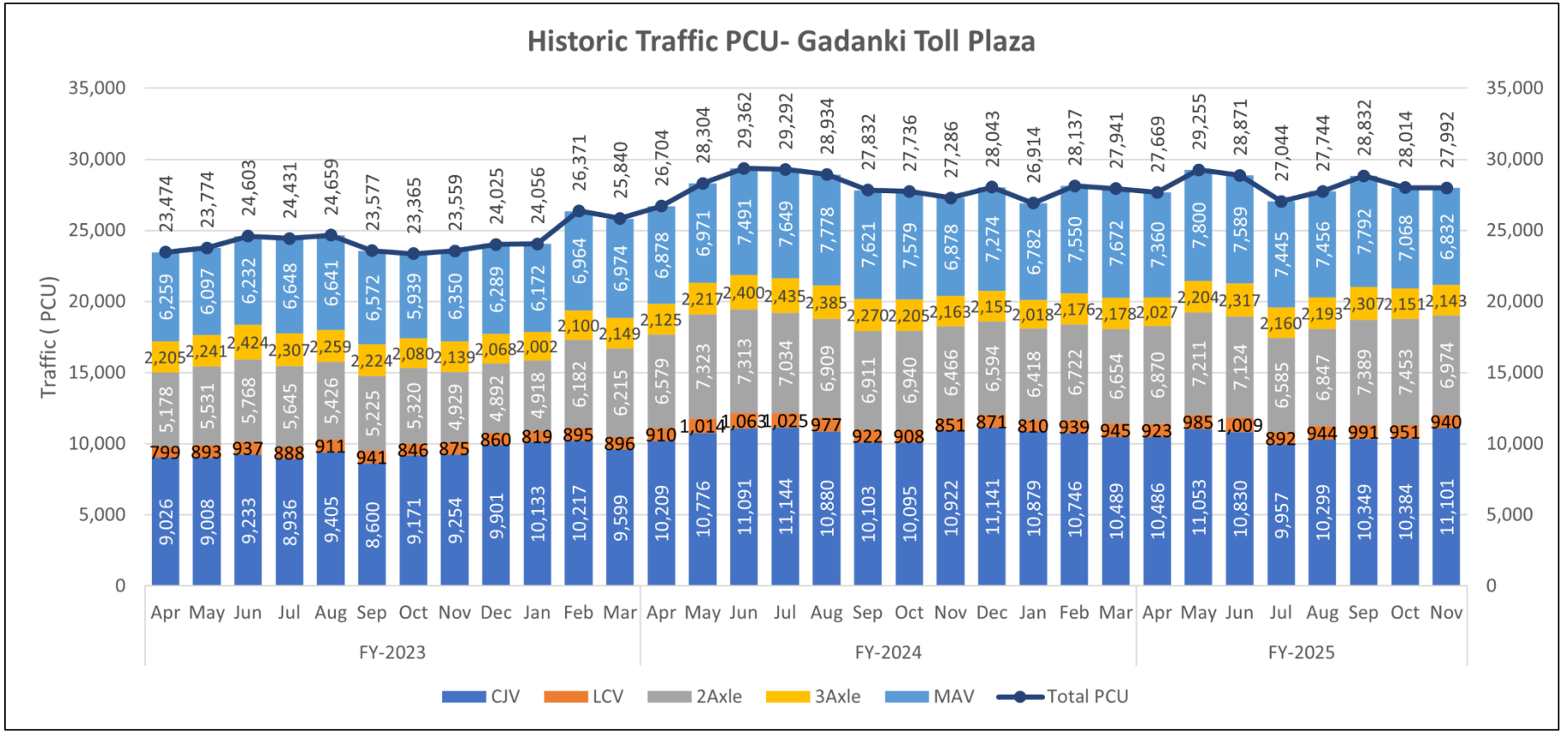
Historical traffic data

ETC daily-level data, segmented by ticket categories, was available for the following periods:

- Gadanki: Apr-2022 – Nov-2024
- Mahasamudram: Apr-2022 – Nov-2024

Gadanki Toll Plaza:

Figure 1-2: Historical Traffic PCU at Gadnaki TP

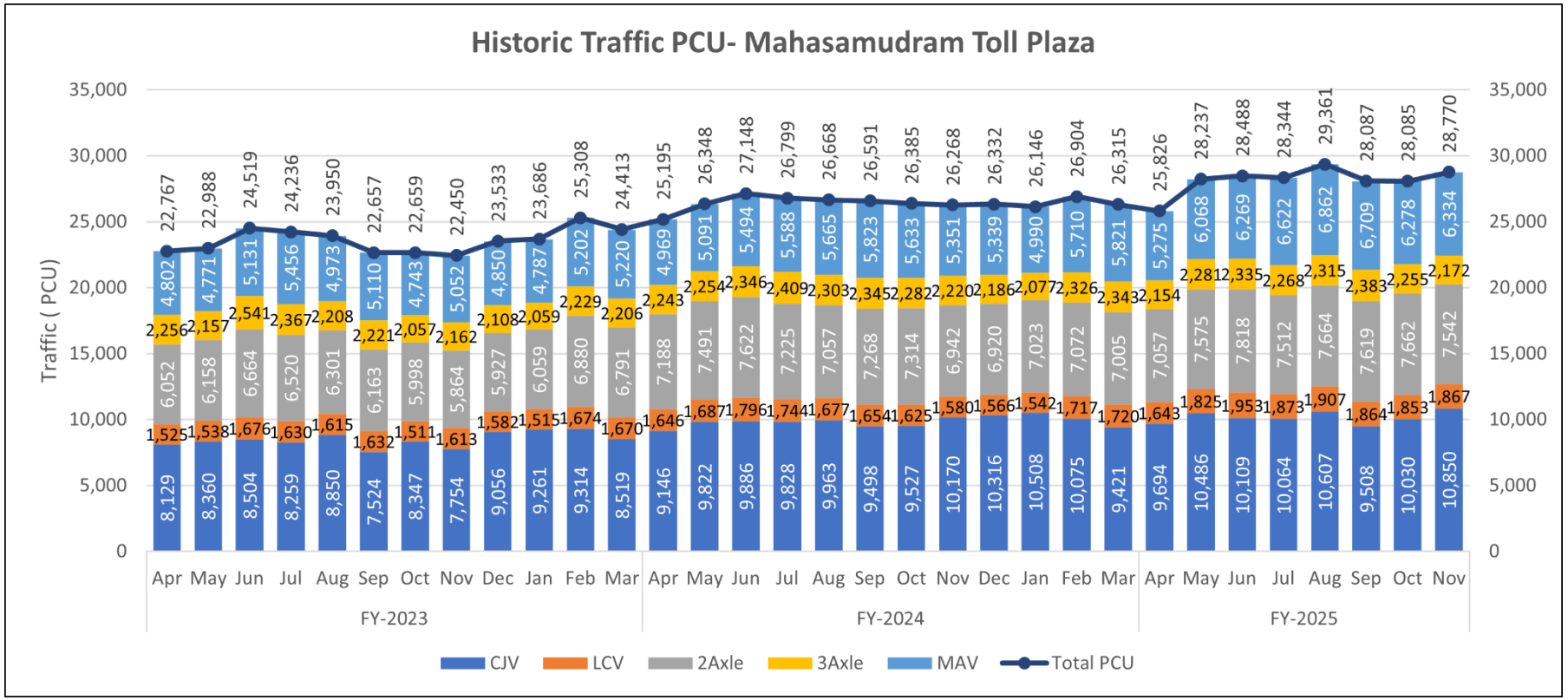


Source: IBI Group India Private Limited

The daily traffic volume remains fairly consistent throughout the year, with a range between 26,000 to 28,000 PCUs per day in FY24 and similarly 26,000 to 29000 PCUs in FY25, indicating steady traffic at the toll plaza.

Mahasamudram Toll Plaza:

Figure 1-3: Historical Traffic PCU at Mahasamudram TP



Source: IBI Group India Private Limited

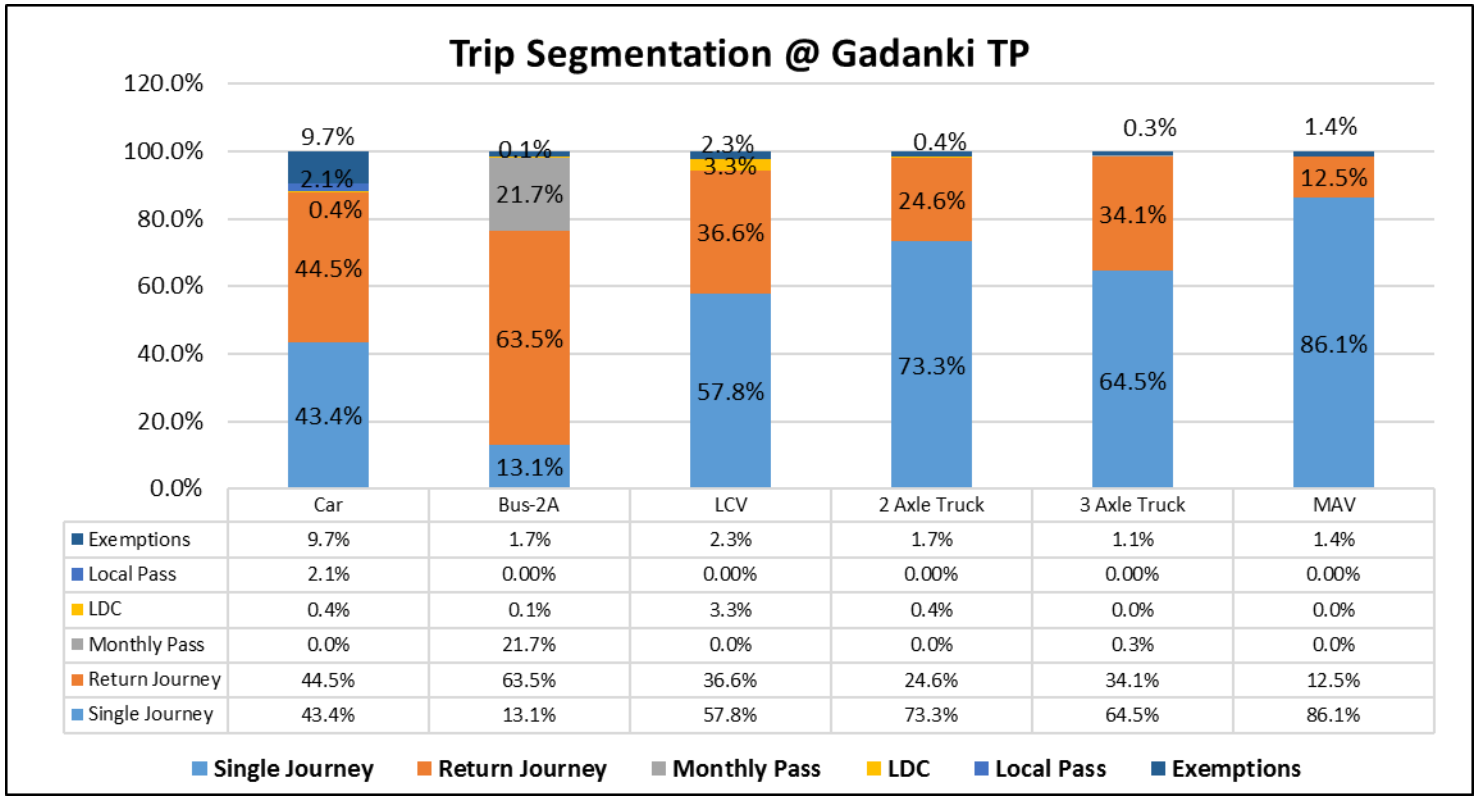
The daily traffic volume remains fairly consistent throughout the year, with a range between 23,000 to 26,000 PCUs per day, indicating steady traffic at the toll plaza in FY24 similarly 25,000 PCUs to 29,000 PCUs in FY25.

Toll Segmentation

FY 25 (Apr-Nov 24) Trip Segmentation for the base year and future traffic and revenue projections is considered.

Gadanki Toll Plaza:

Figure 1-4: Trip Segmentation at Gadanki TP

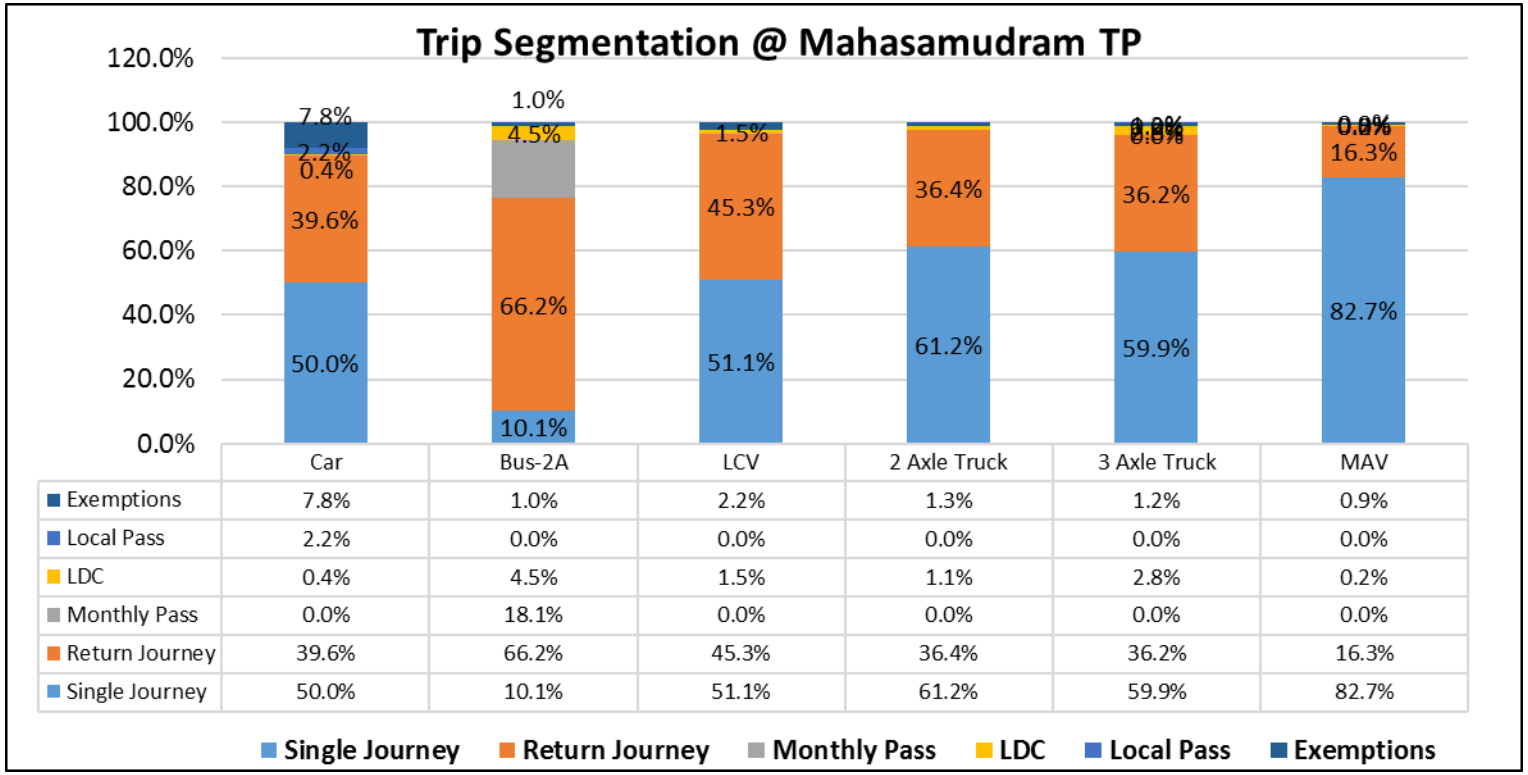


	Car	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
Exemptions	9.7%	1.7%	2.3%	1.7%	1.1%	1.4%
Local Pass	2.1%	0.00%	0.00%	0.00%	0.00%	0.00%
LDC	0.4%	0.1%	3.3%	0.4%	0.0%	0.0%
Monthly Pass	0.0%	21.7%	0.0%	0.0%	0.3%	0.0%
Return Journey	44.5%	63.5%	36.6%	24.6%	34.1%	12.5%
Single Journey	43.4%	13.1%	57.8%	73.3%	64.5%	86.1%

Source: IBI Group India Private Limited

Mahasamudram Toll Plaza:

Figure 1-5: Trip Segmentation at Mahasamudram TP



	Car	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
Exemptions	7.8%	1.0%	2.2%	1.3%	1.2%	0.9%
Local Pass	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%
LDC	0.4%	4.5%	1.5%	1.1%	2.8%	0.2%
Monthly Pass	0.0%	18.1%	0.0%	0.0%	0.0%	0.0%
Return Journey	39.6%	66.2%	45.3%	36.4%	36.2%	16.3%
Single Journey	50.0%	10.1%	51.1%	61.2%	59.9%	82.7%

Source: IBI Group India Private Limited

Base Year Traffic

- The consultant recommends FY 25 ETC Toll plaza data for Base Year AADT, as it is based on the most recent data.
- ETC data of FY23 & FY24 are considered for SCF calculation. As it is presumed to be more suitable for SCF calculation for both the Toll Plaza's.
- Final AADT has arrived by adding adjusted ADT (with selected SCF) arrived from ETC data (April to Nov 2024, which excludes cash & exemption/violation traffic), cash & exempt traffic from non-ETC data (April to Nov 2024) and forced exemption/violation data obtained from traffic survey conducted on 26th July (for 24 hrs).
- Adopted AADT for both the toll plazas has been mentioned below.

Table 1-1: Base year (FY 25) traffic at both the Toll Plazas

Mode	Gadanki Toll Plaza						Mahasamudram Toll Plaza					
	ADT(a)	SCF	AADT	Cash	Exempt	Final AADT	ADT(a)	SCF	AADT	Cash	Exempt	Final AADT
CJV	10,088	1.02	10,275	121	1,091	11,487	9,714	1.02	9,875	154	832	10,862
LCV	617	0.99	610	6	15	631	1,211	0.99	1,204	4	27	1,236
Bus	1,419	1.00	1,416	1	24	1,441	1,080	1.00	1,075	1	11	1,088
2Axle	891	1.00	889	1	15	905	1,410	1.00	1,403	1	15	1,420
3Axle	720	0.98	705	1	8	714	748	0.99	738	1	9	748
MAV	1,630	1.01	1,640	1	23	1,664	1,389	1.00	1,387	1	12	1,400
OSV	1	1.01	1	0	0	1	1	1.00	1	0	0	1
Total	**15,366**		**15,536**	**131**	**1,176**	**16,843**	**15,553**		**15,683**	**164**	**907**	**16,754**
PCU	**27,442**		**27,605**	**144**	**1,358**	**29,107**	**27,499**		**27,575**	**178**	**1,035**	**28,788**

Source: IBI Group India Private Limited

Traffic Forecast

Traffic forecasting for project road traffic was done considering past trend in growth and analysing prospects of project influence area. Elasticity approach of growth rate estimation was used for long term traffic forecasting.

The network developments near the Asset's alignment, which are expected to impact traffic during the concession period, include the 4/8-lane access-controlled Bangalore–Chennai Expressway, the 4–6 lane partially access-controlled Bangalore–Vijayawada Expressway, and the 6-lane access-controlled Chittoor–Thatchur Expressway.

The Bangalore–Chennai Expressway is expected to have a negative impact on Mahasamudram TP, with a 50% impact in FY-27 and full impact by FY-28.

The Bangalore–Vijayawada Expressway is projected to negatively impact both TPs, with a 50% impact in FY-28 and full impact by FY-29.

The Chittoor–Thatchur Expressway is also expected to negatively affect Mahasamudram TP, with a 50% impact in FY-27 and full impact by FY-28.

All these network impacts are considered in the Traffic Projections.

The methodology used for the study included following steps:

- The influencing factors obtained from OD surveys are utilized in deriving the key socio-economic parameters of the Project Influence Area (PIA) for the historic trend.
- Through regression analysis for various combinations of dependent and independent parameters is conducted to evaluate the significance of the relation.
- Potential growth of various vehicle categories was separately assessed based on its probable market share in expected multi-modal development.
- The elasticity values for the selected relation are taken & used for the traffic growth rates estimation. However, there are several steps performed before obtaining the traffic growth rates which are explained in the chapter 6.

Traffic and Revenue Assumptions

Traffic Assumptions: -

- Future traffic forecasting was done using elasticity approach which considers the elasticity of transport demand and probable pattern of future growth of the economy.
- Elasticity values for each mode is estimated using the past vehicle registration data, past traffic trend and AADT-tonnage with the growth of PCI, GSDP and Moderated elasticity values chosen for the analysis based on previous trends in socioeconomic variables.
- For Car, Bus and truck traffic, the adopted elasticity values are as follows –
    - Gadanki TP – 1.05, 0.60, 0.85
    - Mahasamudram TP – 1.05, 0.60, 0.80
- Based on the projected elasticity values for TP 1, TP2 the growth of PIA, the future average annual compound traffic growth rates by vehicle type have been estimated by using the following relationship:
    - For freight vehicle, the tonnages on the corridors are projected. The existing market share of different category of goods vehicles are then adjusted for the future years based on the past tonnage trend observed.
    - Normal traffic projections have arrived by applying the traffic growth on the base year traffic.
- The future traffic projections are presented for Effective case traffic projections & the Effective case has arrived by considering the future adjustments in the form of diversions and developments detailed in the chapter 5.

Table 1-2: Effective Future Traffic Projections at Gadanki TP

EFFECTIVE FUTURE TRAFFIC PROJECTIONS									
FINANCIAL YEAR	**CAR**	**MINIBUS**	**BUS**	**LCV**	**2AT**	**3AT**	**MAV**	**TOTAL VEH**	**PCU**
2025	11,487	168	1,441	462	905	714	1,665	16,843	29,107
2026	12,344	175	1,503	481	954	722	1,789	17,968	30,915
2027	13,264	183	1,566	500	1,006	729	1,918	19,167	32,824
2028	14,145	191	1,606	501	967	670	1,858	19,936	33,269
2029	15,034	198	1,643	499	918	608	1,773	20,672	33,563
2030	15,998	205	1,702	514	959	618	1,878	21,874	35,364
2035	21,521	242	2,010	594	1,185	700	2,483	28,735	45,632
2040	27,818	280	2,318	681	1,421	785	3,159	36,462	57,048
2045	34,962	316	2,621	758	1,654	855	3,890	45,056	69,468
2046	36,487	323	2,679	773	1,699	870	4,035	46,866	72,032
2056	54,025	393	3,260	912	2,155	988	5,600	67,333	1,00,390

Source: IBI Group India Private Limited

Table 1-3: Effective Future Growth Rates at Gadanki TP

EFFECTIVE TRAFFIC GROWTH							
Year	**CAR**	**MINIBUS**	**BUS**	**LCV**	**2AT**	**3AT**	**MAV**
2026-26	7.50%	4.30%	4.30%	4.00%	5.50%	1.10%	7.40%
2027-27	7.50%	4.20%	4.20%	4.00%	5.40%	1.10%	7.20%
2028-28	6.60%	4.20%	2.50%	0.10%	-3.90%	-8.10%	-3.10%
2029-29	6.30%	4.00%	2.30%	-0.30%	-5.10%	-9.30%	-4.60%
2030-30	6.40%	3.60%	3.60%	3.10%	4.50%	1.60%	5.90%
2031-35	6.10%	3.40%	3.40%	2.90%	4.30%	2.50%	5.70%
2036-40	5.30%	2.90%	2.90%	2.80%	3.70%	2.30%	4.90%
2041-45	4.70%	2.50%	2.50%	2.20%	3.10%	1.70%	4.20%
2046-50	4.20%	2.10%	2.10%	1.90%	2.60%	1.50%	3.60%
2051-55	3.90%	1.90%	1.90%	1.60%	2.30%	1.20%	3.20%

Source: IBI Group India Private Limited

Mahasamudram Toll Plaza:

Table 1-4: Effective Future Traffic Projections at Mahasamudram TP

EFFECTIVE FUTURE TRAFFIC PROJECTIONS									
FINANCIAL YEAR	**CAR**	**MINIBUS**	**BUS**	**LCV**	**2AT**	**3AT**	**MAV**	**TOTAL VEH**	**PCU**
2025	10,862	93	1,088	1,143	1,420	748	1,401	16,754	28,788
2026	11,680	97	1,135	1,183	1,487	753	1,515	17,849	30,541
2027	11,918	101	1,156	1,068	1,382	668	1,452	17,745	29,823
2028	12,026	104	1,141	902	1,131	498	1,244	17,046	27,443
2029	12,798	109	1,152	889	1,053	421	1,217	17,637	27,645
2030	13,630	113	1,194	912	1,093	426	1,293	18,661	29,124
2035	18,361	133	1,414	1,029	1,296	472	1,735	24,439	37,455
2040	23,630	154	1,625	1,152	1,503	519	2,225	30,808	46,542
2045	29,849	174	1,850	1,254	1,688	558	2,758	38,130	56,688
2046	31,150	178	1,892	1,273	1,726	564	2,863	39,646	58,755
2056	46,097	217	2,308	1,438	2,082	614	3,999	56,755	81,588

Source: IBI Group India Private Limited

Table 1-5: Effective Traffic growth rates at Mahasamudram TP

EFFECTIVE TRAFFIC GROWTH							
Year	**CAR**	**MINIBUS**	**BUS**	**LCV**	**2AT**	**3AT**	**MAV**
2026-26	7.50%	4.40%	4.40%	3.50%	4.70%	0.60%	8.10%
2027-27	2.00%	3.50%	1.90%	-9.70%	-7.10%	-11.30%	-4.10%
2028-28	0.90%	3.50%	-1.30%	-15.50%	-18.10%	-25.40%	-14.30%
2029-29	6.40%	4.10%	0.90%	-1.40%	-7.00%	-15.50%	-2.20%
2030-30	6.50%	3.70%	3.70%	2.50%	3.80%	1.20%	6.30%
2031-35	6.10%	3.40%	3.40%	2.40%	3.50%	2.10%	6.10%
2036-40	5.20%	2.90%	2.80%	2.30%	3.00%	2.00%	5.10%
2041-45	4.80%	2.50%	2.60%	1.70%	2.30%	1.40%	4.40%
2046-46	4.10%	2.10%	2.10%	1.40%	2.10%	1.00%	3.60%
2047-55	3.90%	1.90%	1.90%	1.10%	1.80%	0.80%	3.30%

Source: IBI Group India Private Limited

Toll Rates

Table 1-6: Toll Fees for the year FY-2025 from June'24 to March'25 for TP1 – Gadanki

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	125	185	4,085	60	340
Light Commercial Vehicle or Minibus	200	295	6,600	100	-
Bus - 2 Axle	415	620	13,830	205	-
Truck - 2 Axle	415	620	13,830	205	-
3Axle	455	680	15,085	225	-
MAV (4-6) Axle	650	975	21,685	325	-
OSV	790	1,190	26,400	395	-

Source: IBI Group India Private Limited

Table 1-7: Toll Fees for the year FY-2025 from June'24 to March'25 for TP2 – Mahasamudram

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	100	150	3,305	50	340
Light Commercial Vehicle or Minibus	160	240	5,335	80	-
Bus - 2 Axle	335	505	11,180	170	-
Truck - 2 Axle	335	505	11,180	170	-
3Axle	365	550	12,195	185	-
MAV (4-6) Axle	525	790	17,530	265	-
OSV	640	960	21,340	320	-

Source: IBI Group India Private Limited

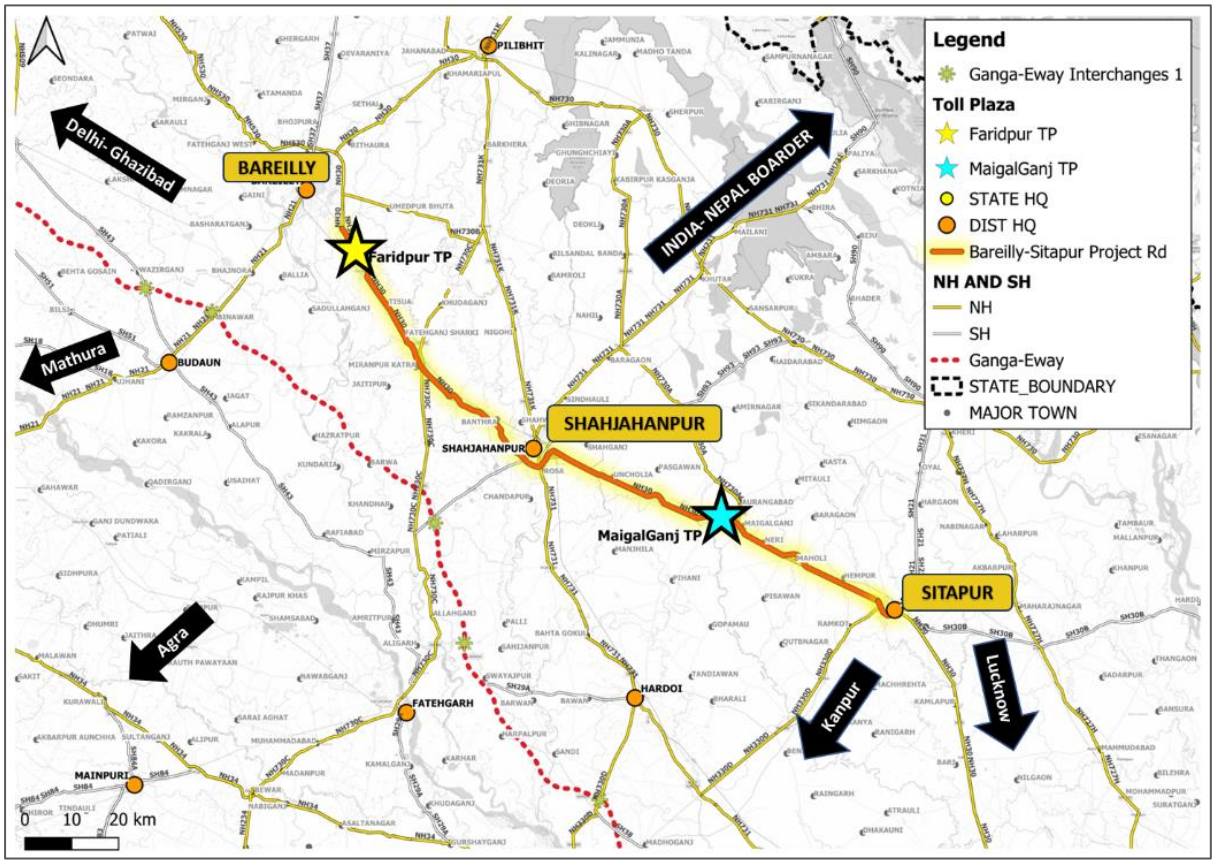
For further details in relation to Asset 20 and Asset 21 please refer to **Annexure C** of this Preliminary Placement Document.

Bareilly - Sitapur Section of NH-30 (Old NH-24) ("Asset 22")

Project Overview

According to the Traffic Consultant, the project road is part of the major NH-30 where the section starts at design kilometer 262.000 and ends at kilometer 419.590 (existing km 262.000 to km 413.200 of NH-24 in the State of Uttar Pradesh). Two toll plazas are existing on this section where Faridpur toll plaza is located at Km 266.900 and Maigalganj toll plaza at Km 372.168

Figure 1: Corridor with existing toll plaza location



Source: IBI Group India Private Limited

Salient growth features and traffic generators

Table 1: Growth Features and Traffic Generators

Sl. No	Developments	Description	Impact Type
1	Tourism – Agra, Vrindhavan, Ayodhya, Varanasi	The number of tourists visiting Uttar Pradesh has surged, growing from 16 crore in 2016 to over 48 crores currently, with more than 32 crore tourists recorded between January and June 2024 alone[2]. The state experiences an annual footfall of 540 million across its four major religious cities—Varanasi, Ayodhya, Prayagraj, and Mathura-Vrindavan. The upcoming inauguration of the Ram Mandir in Ayodhya is expected to draw an additional 50 to 100 million tourists each year. Moreover, Prayagraj experiences a significant surge in visitors during the Kumbh Mela, which occurs once every six years. In 2017, the city saw a staggering 250 million visitors in less than two months. The Maha-Kumbh in Prayagraj, set to begin on January 13, 2025, is expected to attract an even greater crowd, with projections of 500 million visitors.	Current Growth Driver
2	Industries	The Bareilly-Sitapur stretch serves as a key industrial corridor, with sugar factories being the dominant industry, accounting for 62% of the region's industrial activity. Other notable sectors include food products (10%), flour mills (8%), chemicals, fertilizers, plywood, and agro products, among others. Major companies like Bajaj Hindustan Ltd., WIMCO, IFFCO, Reliance, Bharat Petroleum, Dalmia Bharat Limited and Ramaa Shyama play a significant role in driving economic growth in the area. This corridor	Current Growth Driver

[2] https://timesofindia.indiatimes.com/city/kanpur/tourism-boom-in-uttar-pradesh-visitor-numbers-triple-in-eight-years/articleshow/113748352.cms

Sl. No	Developments	Description	Impact Type
		stands out as a critical hub for agro-processing, logistics, and diverse industries, supporting regional development.	
3	State upcoming developments	The UP Global Investor Summit 2023 marked a significant milestone with 18,643 MoU's signed, amounting to a total investment of Rs 33.50 lakh crore. Key sectors driving these investments include renewable energy (12.41%), higher education (9%), industrial parks (11.35%), manufacturing, logistics, and warehousing. The real estate industry and IT-enabled services also contributed significantly to this growth.	Future Growth Driver
4	Mega Food Park in Baheri	A major project, the Mega Food Park in Baheri, is under development, featuring a Dairy Craft Cheesemaking plant across 12 acres with an investment of Rs 250 crore, expected to create 600 direct jobs and benefit local farmers.	Future Growth Driver
5	Industrial township	• A new industrial township near **Jhumka** intersection is underway, further bolstering economic and employment opportunities in the region. • The **Moradabad Special Economic Zone** (SEZ) spans 464.28 acres, offering robust infrastructure and sector-specific facilities for handicraft trade, textile, IT/ITES, and hardware manufacturing, making it a multi-product hub. Out of 137 allotted plots, 45 industrial units are already operational, with 377 plots still available for new investments. • The **Greater Bareilly Township**, which focuses on planned urban growth and housing solutions. Additionally, 35 villages have been integrated into the Bareilly Development Authority (BDA) jurisdiction, facilitating easier land acquisition and MSME township development. These initiatives mark significant progress in infrastructure, industrial growth, and urban expansion in Bareilly, Moradabad, and surrounding regions, paving the way for economic advancement and employment opportunities. • The development of "**Medi city**", a designated area focusing on health businesses and activities. This project aims to create a hub for healthcare-related infrastructure and services, with the proposed Medi City land included in the Master Plan 2021.	Future Growth Driver

Source: IBI Group India Private Limited

Traffic Volume and Composite of Vehicles

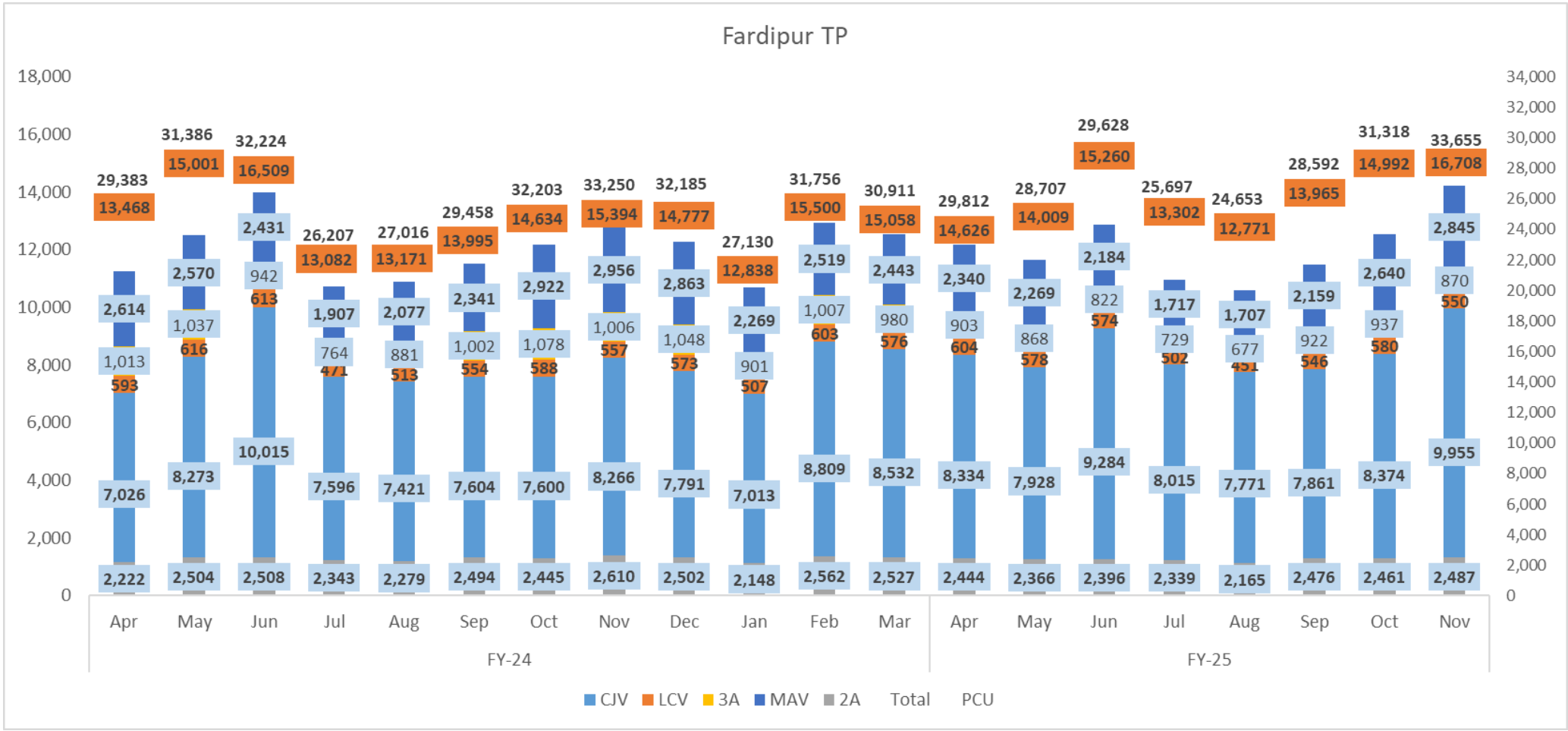
Historical traffic data

ETC daily-level data, segmented by ticket categories, was available for the following periods:

- Faridpur: Apr 2023– Nov-2024
- Maigalganj: Oct-2023 – Nov-2024

Faridpur Toll Plaza

Figure 2: Historical Traffic Trend Mode Wise



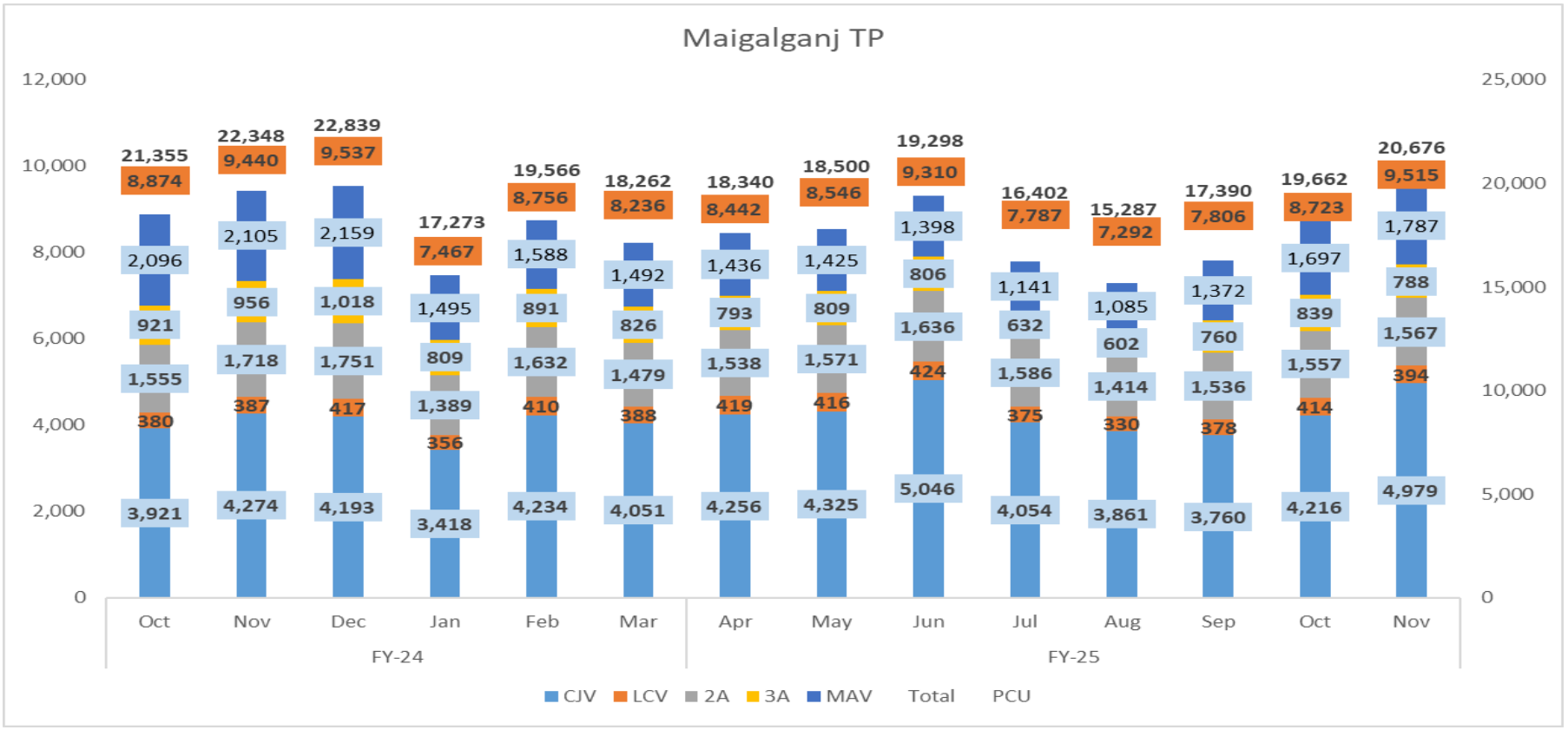
Source: IBI Group India Private Limited

It was observed from historic data that FY24 (Apr-Nov) vs FY25 (Apr-Nov) shows an 4.1% growth in CJV, but a 9.4% decline in MAV. Overall traffic experienced a 3.8% drop in terms of PCUs.

Lower traffic was observed in July and August due to the monsoon season and restrictions during the Kanwar Yatra

Maigalganj Toll Plaza

Figure 3: Historical Traffic Trend Mode Wise (Maigalganj TP)

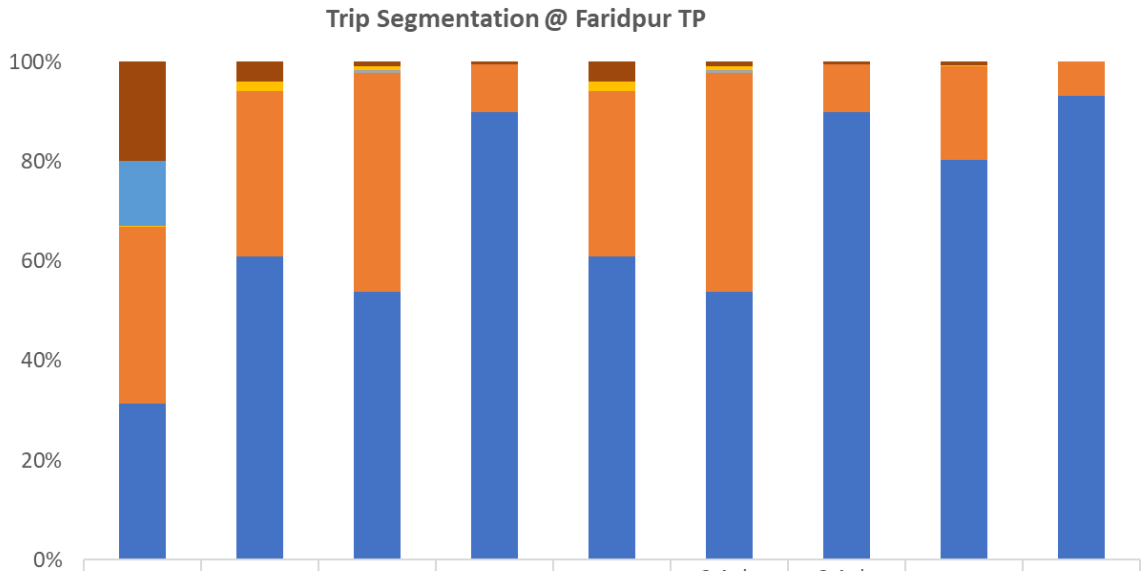


Lower traffic was observed in July and August due to the monsoon season and restrictions during the Kanwar Yatra. The overall traffic decline in traffic from Jan to Sep and slight growth observed in Nov and Oct months.

Toll Segmentation

Faridpur Toll Plaza:

Figure 4: Trip Segmentation Mode Vs Trip Wise (Fairdpur TP)



	Car	Mini Bus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	Over Size
Exemptions	19.9%	4.0%	0.9%	0.4%	4.0%	0.9%	0.4%	0.6%	0.0%
Local Pass	13.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Local Comm	0.1%	1.9%	0.7%	0.1%	1.9%	0.7%	0.1%	0.2%	0.0%
Monthly Pass	0.0%	0.0%	0.7%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%
Return Journey	35.5%	33.2%	43.8%	9.5%	33.2%	43.8%	9.5%	18.9%	6.8%
Single Journey	31.4%	60.9%	53.9%	90.0%	60.9%	53.9%	90.0%	80.3%	93.2%

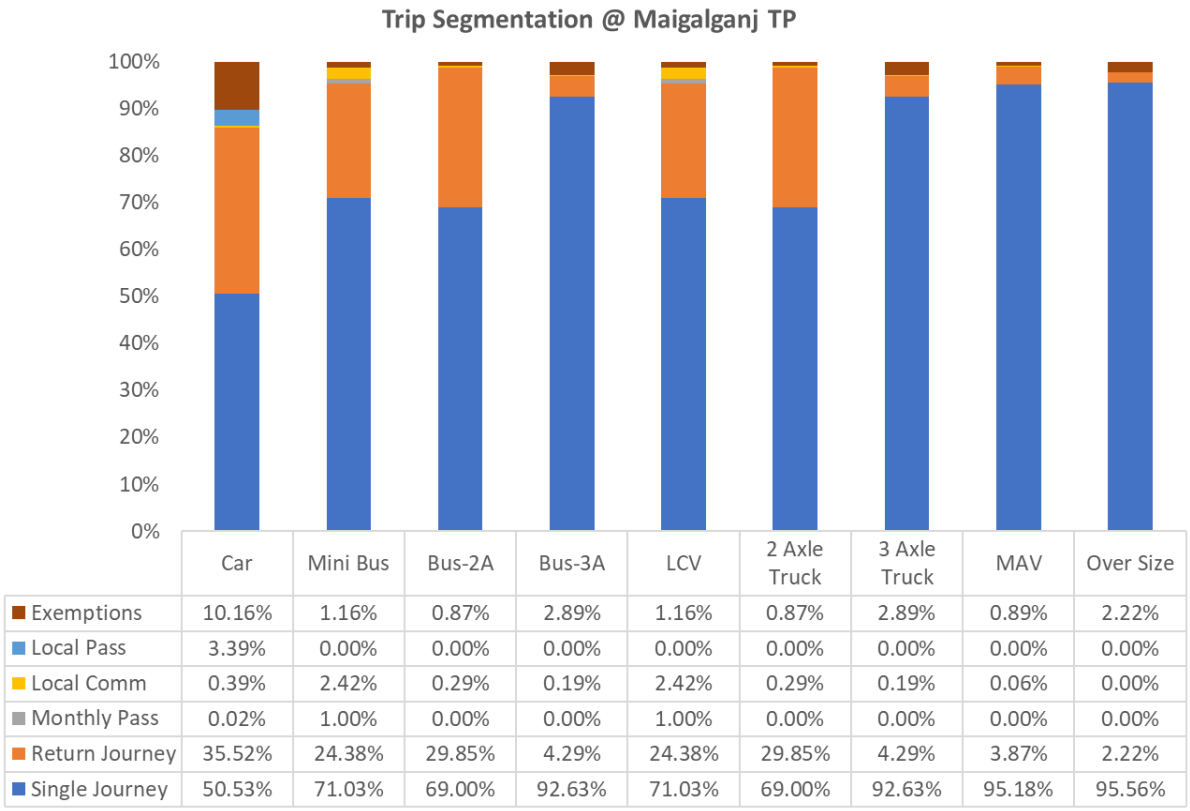
Source: IBI Group India Private Limited

Based on detailed review of historic trends of trip segmentation, the graph above is the FY 25(Apr-Nov) Trip Segmentation for the base year and future traffic and revenue projections.

Trip categories and trip rates arrived based on the historic data of project road.

Maigalganj Toll Plaza:

Figure 5: Trip Segmentation Mode Vs Trip Wise (Maigalganj TP)



	Car	Mini Bus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	Over Size
Exemptions	10.16%	1.16%	0.87%	2.89%	1.16%	0.87%	2.89%	0.89%	2.22%
Local Pass	3.39%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Local Comm	0.39%	2.42%	0.29%	0.19%	2.42%	0.29%	0.19%	0.06%	0.00%
Monthly Pass	0.02%	1.00%	0.00%	0.00%	1.00%	0.00%	0.00%	0.00%	0.00%
Return Journey	35.52%	24.38%	29.85%	4.29%	24.38%	29.85%	4.29%	3.87%	2.22%
Single Journey	50.53%	71.03%	69.00%	92.63%	71.03%	69.00%	92.63%	95.18%	95.56%

Source: IBI Group India Private Limited

Based on detailed review of historic trends of trip segmentation, the graph above is the FY 25(Apr- Nov) Trip Segmentation for this study for base year and future traffic and revenue forecasting.

Trip categories and trip rates arrived based on the historic data of project road.

Base Year Traffic

Table 2: Base Year AADT (Faridpur TP)

Mode	FasTAG	Cash	Exempt	Missing Trips	SCF	AADT
Car	7,580	13	841	1,038	1.00	**9,464**
LCV/Minibus	526	0	22	0	1.00	**545**
2Axle Truck	2,369	0	22	0	1.00	**2,380**
3 Axle	837	0	4	0	1.01	**850**
MAV	2,215	0	14	0	1.01	**2,251**
OSV	1	0	0	0	1.01	**1**
Total	**13,527**	**13**	**903**	**1,038**		**15,491**
PCU	**27,957**	**13**	**1,014**	**1,038**		**30,104**

Source: IBI Group India Private Limited

Table 3: Base Year AADT (Maigalganj TP)

Mode	FasTAG	Cash	Exempt	Missing Trips	SCF	AADT
Car	3,799	73	437	0	1.02	**4,369**
LCV/Minibus	387	2	5	0	1.01	**399**
2Axle Truck	1,536	1	13	0	1.00	**1,552**
3 Axle	731	1	22	0	1.01	**760**
MAV	1,402	1	13	0	1.03	**1,454**
OSV	0	0	0	0	1.02	**0**
Total	**7,856**	**77**	**489**	**0**		**8,534**
PCU	**17,492**	**85**	**606**	**0**		**18,446**

Source: IBI Group India Private Limited

AADT Based on FY 25 (Apr-Nov) Toll Operational data. Arrived AADT by adopting this formula (ETC X SCF + Cash + Exempt + Missing Trips).

Traffic Forecast

Traffic forecasting for project road traffic was done considering past trend in growth and analysing prospects of project influence area. Elasticity approach of growth rate estimation was used for long term traffic forecasting.

Table 16: Alternative Roads /Development Impacts on Project Road

S.NO	Alternative Road/ Network/ Land /Improvements	Impact Type	Year Of Impact
1	6 lane greenfield access-controlled highway with a route alignment connecting NH-334 Ganga Expressway	Negative impact on Both Faridpur & Maigalganj TP	FY27: 50% FY28:100%
2	Widening of Shahjahanpur-Hardoi-Lucknow to 4L	Negative Impact on Maigalganj TP	FY27: 50% FY28:100%
3	Ganga E-Way Phase-II (From Haridwar)	Negative Impact on Maigalganj TP	FY36: 50% FY37: 100%
4	4L E-Way from Ghaziabad-Hapur to Kanpur-Unnao Greenfield alignment via Farrukhabad (tentative length 380 Km)	The OD pairs impacted by this expressway are part of the Ganga Expressway diversion	

Source: IBI Group India Private Limited

All these network impacts are considered in the Traffic Projections.

The methodology used for the study included following steps:

- The influencing factors obtained from OD surveys are utilized in deriving the key socio-economic parameters of the Project Influence Area (PIA) for the historic trend.
- Through regression analysis for various combinations of dependent and independent parameters is conducted to evaluate the significance of the relation.
- Potential growth of various vehicle categories was separately assessed based on its probable market share in expected multi-modal development.
- The elasticity values for the selected relation are taken & used for the traffic growth rates estimation. However, there are several steps performed before obtaining the traffic growth rates which are explained in the chapter 6.

Traffic and Revenue Forecast

Traffic forecasting for project road traffic was done considering past trend in growth and analyzing prospects of project influence area. Elasticity approach of growth rate estimation was used for long term traffic forecasting.

The methodology used for the study included following steps:

- The influencing factors obtained from OD surveys are utilized in deriving the key socio-economic parameters of the Project Influence Area (PIA) for the historic trend.
- Through regression analysis for various combinations of dependent and independent parameters is conducted to evaluate the significance of the relation.
- Potential growth of various vehicle categories was separately assessed based on its probable market share in expected multi-modal development.
- The elasticity values for the selected relation are taken & used for the traffic growth rates estimation. However, there are several steps performed before obtaining the traffic growth rates which are explained in the chapter 6.

Traffic Assumptions

Traffic Assumptions: -

- Future traffic forecasting was done using elasticity approach which considers the elasticity of transport demand and probable pattern of future growth of the economy.
- Elasticity values for each mode is estimated using the past vehicle registration data, past traffic trend and AADT-tonnage with the growth of PCI, GSDP and Moderated elasticity values chosen for the analysis based on previous trends in socioeconomic variables.

- For Car, Bus and truck traffic, the adopted elasticity values are as follows –
    - Faridpur TP – 1.35, 0.50, 0.80
    - Maigalganj TP – 1.30, 0.50, 0.80
- Based on the projected elasticity values for TP 1 and TP2 the growth of PIA, the future average annual compound traffic growth rates by vehicle type have been estimated by using the following relationship:
    - For freight vehicle, the tonnages on the corridors are projected. The existing market share of different category of goods vehicles are then adjusted for the future years based on the past tonnage trend observed.
    - Normal traffic projections have arrived by applying the traffic growth on the base year traffic.
- The future traffic projections are presented for Effective case traffic projections & the Effective case has arrived by considering the future adjustments in the form of diversions and developments detailed in the chapter 5.

Traffic projections

Faridpur Toll Plaza:

Table 5: Effective Future Traffic (AADT): Faridpur (TP 1) – Most Likely

YEAR	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	TOTAL PCU
FY 2025	9,464	52	1,000	0	494	1,380	850	2,252	30,104
FY 2026	10,242	54	1,037	0	512	1,451	854	2,402	31,925
FY 2027	10,693	53	954	0	481	1,333	759	2,212	30,583
FY 2028	11,146	52	861	0	446	1,195	660	1,975	28,930
FY 2029	12,020	54	890	0	460	1,248	660	2,085	30,567
FY 2030	12,861	56	916	0	472	1,296	667	2,184	32,119
FY 2035	18,139	65	1,059	0	541	1,554	733	2,767	41,538
FY 2045	29,540	82	1,296	0	655	2,004	815	3,941	60,723
FY 2046	30,688	83	1,319	0	661	2,042	816	4,066	62,632
FY 2056	42,845	99	1,556	0	706	2,394	811	5,367	82,487

Source: IBI Group India Private Limited

Table 6: Effective traffic growth rates for toll plaze 01 – Faridpur (%) – Most Likely

Year	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	OSV
FY 2025	8.2%	3.7%	3.7%	0.0%	3.7%	5.1%	0.5%	6.7%	6.7%
FY 2026	4.4%	-1.2%	-8.0%	0.0%	-6.1%	-8.1%	-11.1%	-7.9%	-7.9%
FY 2027	4.2%	-1.5%	-9.7%	0.0%	-7.3%	-10.3%	-13.0%	-10.7%	-10.7%
FY 2028	7.8%	3.4%	3.3%	0.0%	3.1%	4.4%	0.1%	5.6%	5.6%
FY 2029	7.0%	3.1%	3.0%	0.0%	2.7%	3.9%	1.0%	4.7%	4.7%
FY 2030	7.0%	3.0%	2.9%	0.0%	2.8%	3.7%	1.9%	4.9%	4.9%
FY 2035	5.8%	2.7%	0.4%	0.0%	1.7%	1.1%	-0.1%	2.3%	2.3%
FY 2040	4.7%	2.2%	2.1%	0.0%	1.8%	2.6%	1.0%	3.6%	3.6%
FY 2045	3.9%	1.9%	1.8%	0.0%	1.0%	1.9%	0.2%	3.2%	3.2%
FY 2046	3.8%	1.8%	1.8%	0.0%	0.9%	1.8%	0.1%	3.1%	3.1%
FY 2055	3.1%	1.7%	1.6%	0.0%	0.6%	1.5%	-0.1%	2.6%	2.6%

Source: IBI Group India Private Limited

Maigalganj Toll Plaza:

Table 17: Effective Future Traffic (AADT): Maigalganj (TP 2) – Most Likely

YEAR	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	TOTAL PCU
FY 2025	4,369	24	493	0	374	1,059	760	1,454	18,446
FY 2026	4,713	25	511	0	390	1,114	763	1,562	19,529
FY 2027	4,525	24	445	0	354	990	668	1,430	17,833
FY 2028	4,275	22	372	0	314	849	571	1,265	15,849
FY 2029	4,594	23	384	0	326	888	573	1,345	16,709
FY 2030	4,900	24	396	0	337	924	581	1,418	17,524
FY 2040	8,843	31	516	0	448	1,323	716	2,234	27,279

YEAR	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	TOTAL PCU
FY 2041	9,240	32	527	0	457	1,359	726	2,318	28,239
FY 2042	9,642	33	538	0	466	1,396	735	2,403	29,210
FY 2043	10,050	33	549	0	475	1,432	745	2,490	30,193
FY 2044	10,464	34	560	0	483	1,469	754	2,578	31,188
FY 2045	10,884	35	571	0	492	1,505	763	2,667	32,191
FY 2046	11,288	35	581	0	499	1,536	771	2,754	33,146
FY 2056	15,549	42	685	0	558	1,832	835	3,664	42,994

Source: IBI Group India Private Limited

Table 8: Effective traffic growth rates for toll plaza 02 – Maigalganj (%) – Most Likely

Year	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	OSV
FY 2025	7.9%	3.6%	3.6%	0.0%	4.2%	5.2%	0.4%	7.4%	7.4%
FY 2026	-4.0%	-5.7%	-13.0%	0.0%	-9.3%	-11.1%	-12.5%	-8.5%	-8.5%
FY 2027	-5.5%	-6.7%	-16.3%	0.0%	-11.3%	-14.3%	-14.4%	-11.5%	-11.5%
FY 2028	7.5%	3.4%	3.3%	0.0%	3.8%	4.6%	0.4%	6.4%	6.4%
FY 2029	6.7%	3.1%	2.9%	0.0%	3.3%	4.1%	1.3%	5.4%	5.4%
FY 2030	6.7%	3.0%	2.9%	0.0%	3.2%	4.0%	2.2%	4.9%	4.9%
FY 2035	6.0%	2.7%	2.6%	0.0%	2.7%	3.4%	2.1%	4.5%	4.5%
FY 2040	4.5%	2.2%	2.1%	0.0%	2.0%	2.7%	1.4%	3.8%	3.8%
FY 2045	3.7%	1.9%	1.8%	0.0%	1.4%	2.1%	1.1%	3.2%	3.2%
FY 2046	3.6%	1.8%	1.8%	0.0%	1.4%	2.0%	1.0%	3.2%	3.2%
FY 2055	3.1%	1.7%	1.6%	0.0%	1.0%	1.7%	0.7%	2.6%	2.6%

Source: IBI Group India Private Limited

Toll rates

Table 0-18: Toll Fees for the year FY-2025 from Apr'24 to March'25 for TP1 – Faridpur

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
s	130	195	4,315	65	340
Light Commercial Vehicle or Minibus	210	315	6,970	105	-
Bus - 2 Axle	440	655	14,605	220	-
Truck - 2 Axle	440	655	14,605	220	-
3Axle	480	715	15,935	240	-
MAV (4-6) Axle	685	1,030	22,905	345	-
OSV	835	1,255	27,885	420	-

Source: IBI Group India Private Limited

Table 0-19: Toll Fees for the year FY-2025 from June'24 to March'25 for TP2 – Maigalganj

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	**130**	**195**	**4,385**	**65**	**340**
Light Commercial Vehicle or Minibus	**210**	**320**	**7,080**	**105**	**-**
Bus - 2 Axle	**445**	**670**	**14,835**	**225**	**-**
Truck - 2 Axle	**445**	**670**	**14,835**	**225**	**-**
3Axle	**485**	**730**	**16,185**	**245**	**-**
MAV (4-6) Axle	**700**	**1,045**	**23,265**	**350**	**-**
OSV	**850**	**1,275**	**28,325**	**425**	**-**

Source: IBI Group India Private Limited

For further details in relation to Asset 22, please refer to **Annexure C** of this Preliminary Placement Document.

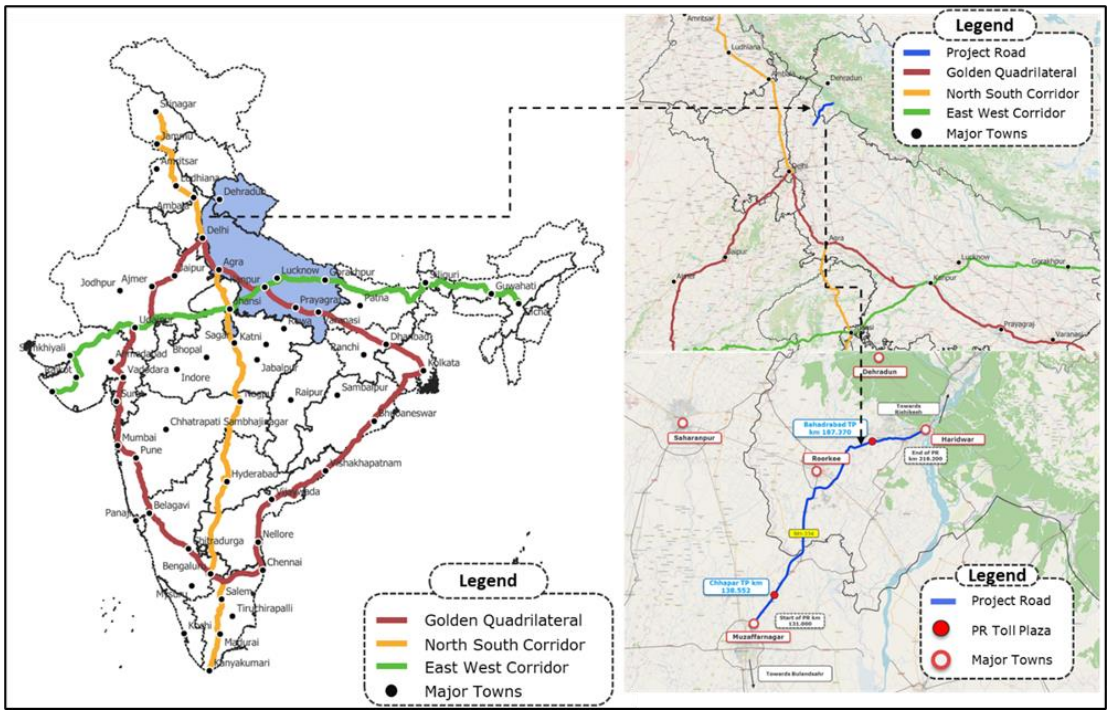
Project Muzaffarnagar – Haridwar ("**Asset 23**")

Project Overview

According to the Traffic Consultant, the Project Road, NH-334 (old NH-58), connects major industrial, agricultural, and cultural centres in India, serving as a primary conduit for freight and passenger traffic in the states of Uttarakhand and Uttar Pradesh and connects important cities and towns like Meerut, Muzaffarnagar, Roorkee and Haridwar etc.

The project road section, Muzaffarnagar-Haridwar, a part of NH-334 (old NH-58) in the state of Uttar Pradesh and Uttarakhand, starts at 131.00 km near Muzaffarnagar and ends at 218.00 near Haridwar with a length of 79 km. There are two operational toll plazas on the project road, Chhapar TP (km 138.552) and Bahadrabad TP (km 187.370). Both toll plazas have 14 tolling lanes (staggered 7 lanes in each direction). This project has been offered by NHAI to National Highways Infra Investment Managers Private Limited (NHIIMPL) for transfer to InvIT in the fourth round for a concession period of 20 years with maximum extension till 30 years.

Figure 0 1 shows the context and alignment of project road with major places along the highway.



Source: Ramboll Traffic Report

Salient Growth Feature and Traffic Generators

The project road serves the short distance traffic for both passenger and freight which is mainly generated from/to Delhi NCR to/from Roorkee/Haridwar/Dehradun/Rishikesh.

In wider context, PR also serves the traffic for the freight vehicles, which is plying from/to Haridwar/Roorkee and surroundings to/from Ahmedabad/Surat/Vadodara and surroundings.

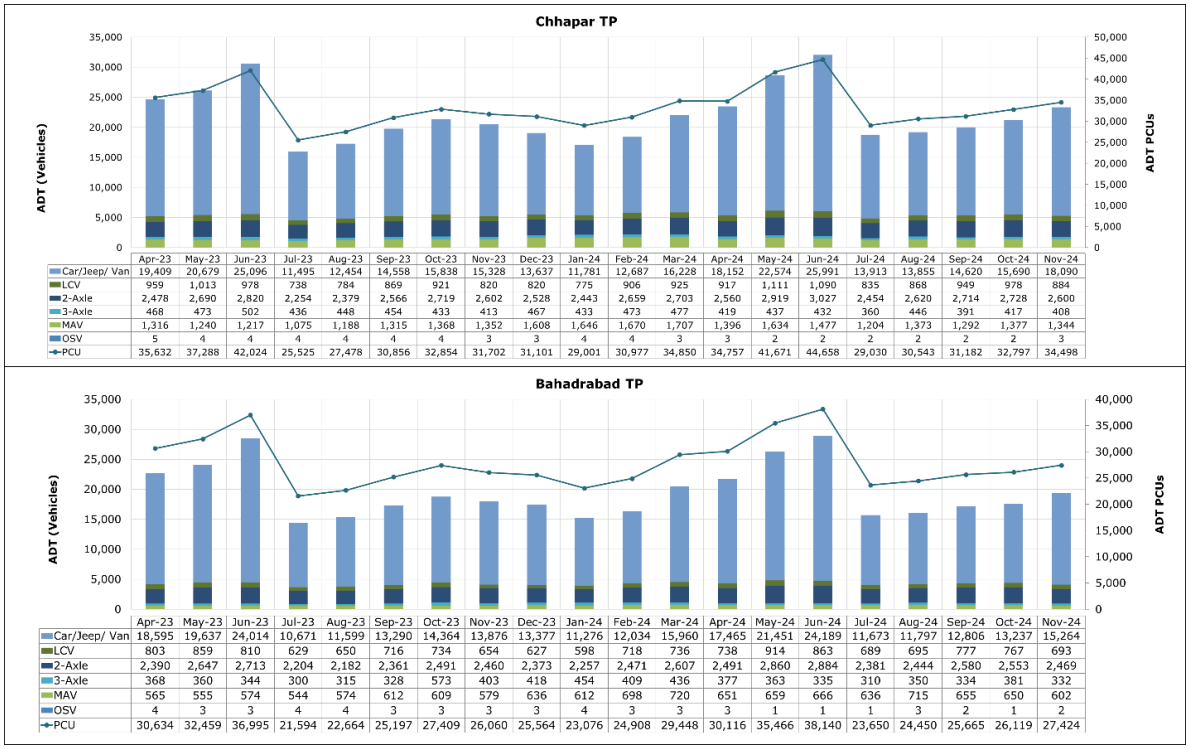
The project road section is located in the districts of Muzaffarnagar and Haridwar.

Muzaffarnagar district in Uttar Pradesh, is strategically located to connect economic hubs due to its extensive road network. The district's diverse agronomic activities, including sugarcane, wheat, mangoes, and rice, contribute to the country's sugar industry. The district has seen significant industrial growth, particularly in sugar and jaggery production units, steel, paper, and chemical industries.

Haridwar district located in western part of Uttarakhand and is renowned for its extensive Ayurvedic practice and production of herbal medicines. Sugarcane, rice, wheat, legumes, and oil seeds are among its principal crops. With the founding of two PSUs, Hindustan Antibiotics Ltd. and Bharat Heavy Electricals Ltd., industrialization began since 1960s. A new "Industrial Development Zone" is to be established close to Haridwar by the Uttarakhand State Industrial Development Corporation (SIDCUL). Haridwar also hosts the Ardh Kumbh every six years and the Kumbh Mela every twelve years adding a boom to its tourism.

Traffic Volume and Vehicle Composition - AADT for FY25

The toll data for both the toll plazas was made available by the client from August 2022 to November 2024. The month-on-month mode wise traffic for this period April 2023 to November 2024 for both the toll plazas is presented in Figure 0 2.



	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24
Car/Jeep/ Van	19,409	20,679	25,096	11,495	12,454	14,558	15,838	15,328	13,637	11,781	12,687	16,228	18,152	22,574	25,991	13,913	13,855	14,620	15,690	18,090
LCV	959	1,013	978	738	784	869	921	820	820	775	906	925	917	1,111	1,090	835	868	949	978	884
2-Axle	2,478	2,690	2,820	2,254	2,379	2,566	2,719	2,602	2,528	2,443	2,659	2,703	2,560	2,919	3,027	2,454	2,620	2,714	2,728	2,600
3-Axle	468	473	502	436	448	454	433	413	467	433	473	477	419	437	432	360	446	391	417	408
MAV	1,316	1,240	1,217	1,075	1,188	1,315	1,368	1,352	1,608	1,646	1,670	1,707	1,396	1,634	1,477	1,204	1,373	1,292	1,377	1,344
OSV	5	4	4	4	4	4	4	3	3	4	4	3	3	2	2	2	2	2	2	3
PCU	35,632	37,288	42,024	25,525	27,478	30,856	32,854	31,702	31,101	29,001	30,977	34,850	34,757	41,671	44,658	29,030	30,543	31,182	32,797	34,498

	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24
Car/Jeep/ Van	18,595	19,637	24,014	10,671	11,599	13,290	14,364	13,876	13,377	11,276	12,034	15,960	17,465	21,451	24,189	11,673	11,797	12,806	13,237	15,264
LCV	803	859	810	629	650	716	734	654	627	598	718	736	738	914	863	689	695	777	767	693
2-Axle	2,390	2,647	2,713	2,204	2,182	2,361	2,491	2,460	2,373	2,257	2,471	2,607	2,491	2,860	2,884	2,381	2,444	2,580	2,553	2,469
3-Axle	368	360	344	300	315	328	573	403	418	454	409	436	377	363	335	310	350	334	381	332
MAV	565	555	574	544	574	612	609	579	636	612	698	720	651	659	666	636	715	655	650	602
OSV	4	3	3	4	4	3	3	3	3	4	3	3	3	1	1	1	3	2	1	2
PCU	30,634	32,459	36,995	21,594	22,664	25,197	27,409	26,060	25,564	23,076	24,908	29,448	30,116	35,466	38,140	23,650	24,450	25,665	26,119	27,424

Source: Rambol traffic report; Figure 0 2: Month on Month Traffic Data for TP01 and TP02

The AADT for FY25 is estimated by annualizing the ETC data from April 2024 to November 2024. For

TP01-Chhapar, a SCF based on 8–12-month factor derived from the average of FY23 and FY24 ETC traffic data of Siwaya TP, has been adopted.

In case of TP02-Bahadrabad, an 8–12-month SCF has been derived based on the average of FY23 and FY24 ETC traffic data. Additionally, cash and exempted traffic for FY25 (Apr to Oct) have been added to the estimated ETC traffic of Chhapar and Bahadrabad toll plazas.

The AADT of FY25 along with the Seasonal Correction Factor (SCF), Average Daily Traffic (ADT), cash traffic and exempt traffic for respective months of FY25 is presented below:.

Particulars	CJV	LCV	2-Axle	3-Axle	MAV	OSV	PCUs	
TP01 – Chhapar								
A.	ADT FY25 (April - Nov)-ETC	17,861	954	2,703	414	1,387	2	34,894
B.	SCF (8-12 Month Factor)-Siwaya TP - Avg. of FY23 & FY24	0.97	0.98	1.00	1.05	1.05	1.05	
C.	ETC*SCF = A*B	17,333	931	2,706	433	1,452	2	34,690
D.	Cash (April 24 - Oct 24)	19	2	2	1	1	1	40
E.	Exempt (April 24 - Oct 24)	5,273	90	175	3	7	1	5,978
F.	AADT FY25 (Estimated) = C+D+E	22,624	1,023	2,883	437	1,460	5	40,711
TP02 - Bahadrabad								
A.	ADT FY25 (April - Nov)-ETC	15,985	767	2,583	348	654	2	28,881
B.	SCF (8-12 Month Factor)-Bahadrabad TP - Avg. of FY23 & FY24	0.94	0.96	1.00	1.03	1.05	1.05	
C.	ETC*SCF = A*B	15,020	735	2,580	356	685	2	28,022
D.	Cash (April 24 - Oct 24)	173	8	3	1	1	1	206
E.	Exempt (April 24 - Oct 24)	6,980	81	68	10	10	1	7,385
F.	AADT FY25 (Estimated) = C+D+E	22,173	823	2,651	368	697	4	35,619

Source: Rambol traffic report; Table 0 1: AADT for FY25

Travel Pattern

- The car traffic from/to Delhi/Ghaziabad/Noida and Surroundings to/from SIDCUL/Haridwar/Rishikesh and Surroundings is about 19-22 percent at TP01 & TP02.

- About 28-33 percent of Bus traffic at TP01 & TP02 was found to be travelling from/to Delhi/Ghaziabad/Noida and Surroundings to/from SIDCUL/Haridwar/Rishikesh and Surroundings.

- 3A trucks from/to Rajasthan/Central/South India to/from SIDCUL/Haridwar/Rishikesh and Surroundings is about 10-17 percent at TP01 & TP02.

- In case of MAVs, around 8 and 20 percent at TP01 & TP02 respectively, were found to be plying between Delhi/Ghaziabad/Noida and Surroundings to/from SIDCUL/Haridwar/Rishikesh and Surroundings.

- The MAV traffic is observed to be having Roorkee-Delhi and Roorkee-Haridwar as top OD pair at both toll plazas.

Network Impacts

In context of the project road, three road network developments which may impact the traffic on the project road are:

1. *Impact of Delhi-Dehradun Expressway (with spur to Haridwar)*

The assessment for the route between Delhi NCR & beyond and Dehradun/Haridwar & beyond has been done for the two traffic streams:

- Traffic plying between Delhi NCR & beyond and Dehradun & beyond
- Traffic from/to Delhi NCR & beyond to/from Haridwar/Rishikesh & beyond

The proposed expressway will be a mix of brownfield upgradation/greenfield alignment. The negative impact of traffic at the toll plazas has been considered as 40 percent in FY26 and 100 percent from FY27 onwards.

During the six laning of the project road section DDE may take away higher traffic due to construction activities on PR. For estimating this impact, six laning toll rates at 75 percent and reduced speeds on PR due to construction activity have been considered. It is to be noted that higher diversion percentages have been considered for diversion to DDE during construction period for six laning in FY35 and FY36 and lower percentage of diversion is applicable once the six laning is complete from FY37 onwards.

The total diverted traffic estimated for FY25 after the operation of Delhi-Dehradun Expressway at the two toll plazas is presented in **Table 0 2** before and after six laning of the project road section.

Potential Streams	Modes				
	Car	LCV	2A	3A	MAV
Diverted Traffic Before Six Laning of PR					
Chhapar TP	22.9	9.2	21.8	27.1	21.2
Bahadrabad TP	19.2	11.4	22.3	34.9	34.6
Diverted Traffic During Construction Period for Six Laning of PR					
Chhapar TP	28.8	10.2	24.5	30.7	24.4
Bahadrabad TP	24.3	12.6	25.8	39.7	39.8

Source: Rambol traffic report; Table 0 2: Diverted Traffic to Delhi-Dehradun Expressway - FY25

2. *Impact of Ganga Expressway Phase II*

The assessment for the route between East UP/Meerut & beyond and Haridwar & beyond has been done for the two traffic streams:

- Traffic plying between East UP & beyond and Haridwar & beyond
- Traffic from/to Meerut & beyond to/from Haridwar & beyond

The total diverted traffic after the operation of Ganga Expressway Phase II at the two toll plazas estimated for FY25 is presented below:.

Potential Streams	Modes				
	Car	LCV	2A	3A	MAV
Diverted Traffic (East UP & beyond)					
Chhapar TP	1.3	0.7	1.4	1.4	1.7
Bahadrabad TP	1.3	0.8	1.6	1.7	3.6
Diverted Traffic (Meerut & beyond)					
Chhapar TP	0.4	0.2	0.2	0.3	0.2
Bahadrabad TP	0.4	0.2	0.2	0.3	0.4

Source: Rambol traffic report; Table 0 3: Diverted Traffic to Ganga Expressway Phase II – FY25

In total Ganga Expressway Phase II may take away around 692 PCUs from both the toll plazas. The negative impact of traffic at all the toll plazas has been considered as 50 percent in FY35 and 100 percent from FY36 onwards.

3. *Impact of Upper Ganga Canal Road*

The assessment is done for the stream to/from Purquazi & beyond for Chhapar toll plaza. The total diverted traffic estimated for FY25after the operation Upper Ganga Canal Road at the Chhapar toll plazas is presented below:

Potential Streams	Modes		
	Car	**LCV**	**PCU**
Diverted Traffic			
Chhapar TP	15.4	11.6	9.0

Source: Rambol traffic report;

The proposed expressway may take away around 15 percent in cars and 12 percent in LCVs. Because of the two-way movement on this two-lane road abutting farmlands, presence of height restriction barriers and difficulty in manoeuvring higher axle vehicles, only car & LCV traffic have been considered for further analysis and freight traffic is not considered. The negative impact of traffic at all the toll plazas has been considered as 50 percent in FY28 and 100 percent from FY29 onwards.

Traffic Growth Rates

The estimated traffic growth rates for the project road based on the elasticity approach have been presented till FY55 in line with the maximum extendable concession period of 30 years in Table 0 5.

FY/Modes	Cars	LCV	2A	3A	MAV/ OSV
TP01-Chhapar					
FY26	6.3	1.3	5.7	1.3	6.3
FY27	6.2	1.3	5.6	1.2	6.2
FY28	6.2	1.3	5.6	1.2	6.2
FY29	5.9	1.2	5.3	1.2	5.9
FY30	5.3	1.1	4.8	1.1	5.3
FY31	5.3	1.1	4.3	1.1	4.8
FY32	5.3	1.1	4.3	1.1	4.8
FY33	5.3	1.1	4.3	1.1	4.8
FY34	5.3	1.1	4.3	1.1	4.8
FY35	5.2	1.1	4.2	1.1	4.7
FY36	5.1	1.0	3.6	1.0	4.1
FY37	5.1	1.0	3.5	1.0	4.1
FY38	5.0	1.0	3.5	1.0	4.0
FY39	4.9	1.0	3.4	1.0	3.9
FY40	4.8	1.0	3.3	1.0	3.8
FY41	4.7	0.9	3.3	0.9	3.8
FY42	4.6	0.9	3.2	0.9	3.7
FY43	4.5	0.9	3.2	0.9	3.6
FY44	4.4	0.9	3.1	0.9	3.5
FY45 and beyond	4.3	0.9	3.0	0.9	3.5
TP02-Bahadrabad					
FY26	6.5	1.3	5.8	1.3	6.4
FY27	6.4	1.3	5.7	1.3	6.3
FY28	6.4	1.3	5.7	1.3	6.3
FY29	6.1	1.2	5.4	1.2	6.1
FY30	5.5	1.1	4.9	1.1	5.5
FY31	5.5	1.1	4.4	1.1	4.9
FY32	5.5	1.1	4.4	1.1	4.9
FY33	5.5	1.1	4.4	1.1	4.9
FY34	5.5	1.1	4.4	1.1	4.9
FY35	5.4	1.1	4.3	1.1	4.8
FY36	5.3	1.1	3.7	1.1	4.2
FY37	5.2	1.0	3.6	1.0	4.2
FY38	5.1	1.0	3.6	1.0	4.1
FY39	5.0	1.0	3.5	1.0	4.0
FY40	4.9	1.0	3.4	1.0	3.9
FY41	4.8	1.0	3.4	1.0	3.8
FY42	4.7	0.9	3.3	0.9	3.8
FY43	4.6	0.9	3.2	0.9	3.7

FY/Modes	Cars	LCV	2A	3A	MAV/ OSV
FY44	4.5	0.9	3.2	0.9	3.6
FY45 and beyond	4.4	0.9	3.1	0.9	3.5

Source: Rambol traffic report

The implied traffic growth rates for the project road after considering the impact of diversion under the base case have been presented in Table 0-6.

FY/Modes	Cars	LCV	2A	3A	MAV/ OSV
TP01-Chhapar					
2026	-3.5	-2.4	-3.6	-9.7	-2.7
2027	-9.9	-4.5	-9.6	-17.3	-8.6
2028	-4.4	-5.2	5.6	1.2	6.2
2029	-5.8	-5.7	5.3	1.2	5.9
2030	5.3	1.1	4.8	1.1	5.3
2031	5.3	1.1	4.3	1.1	4.8
2032	5.3	1.1	4.3	1.1	4.8
2033	5.3	1.1	4.3	1.1	4.8
2034	5.3	1.1	4.3	1.1	4.8
2035	-6.3	-0.8	-0.5	-5.1	-0.9
2036	3.5	0.5	2.5	-0.2	2.8
2037	16.6	2.3	7.3	6.4	8.6
2038	5.0	1.0	3.5	1.0	4.0
2039	4.9	1.0	3.4	1.0	3.9
2040	4.8	1.0	3.3	1.0	3.8
2041	4.7	0.9	3.3	0.9	3.8
2042	4.6	0.9	3.2	0.9	3.7
2043	4.5	0.9	3.2	0.9	3.6
2044	4.4	0.9	3.1	0.9	3.5
2045 & beyond	4.3	0.9	3.0	0.9	3.5
TP02-Bahadrabad					
2026	-1.7	-3.3	-3.6	-12.9	-8.3
2027	-6.9	-6.0	-9.8	-23.4	-19.3
2028	6.4	1.3	5.7	1.3	6.3
2029	6.1	1.2	5.4	1.2	6.1
2030	5.5	1.1	4.9	1.1	5.5
2031	5.5	1.1	4.4	1.1	4.9
2032	5.5	1.1	4.4	1.1	4.9
2033	5.5	1.1	4.4	1.1	4.9
2034	5.5	1.1	4.4	1.1	4.9
2035	-2.5	-0.9	-1.6	-7.9	-6.6
2036	4.1	0.4	2.4	-0.7	0.7
2037	12.5	2.4	8.6	9.3	13.7
2038	5.1	1.0	3.6	1.0	4.1
2039	5.0	1.0	3.5	1.0	4.0
2040	4.9	1.0	3.4	1.0	3.9
2041	4.8	1.0	3.4	1.0	3.8
2042	4.7	0.9	3.3	0.9	3.8
2043	4.6	0.9	3.2	0.9	3.7
2044	4.5	0.9	3.2	0.9	3.6
2045 & beyond	4.4	0.9	3.1	0.9	3.5

Source: Rambol traffic report

Traffic Projections

Table 0-7 presents the projections of the mode-wise vehicles under Base Case after diversion till FY55.

TP01 - Chhapar							
FY End	**CJV**	**LCV**	**Bus/2A**	**3A**	**MAV**	**OSV**	**Total PCU**
2025	22,624	1,023	2,883	437	1,460	5	40,711
2026	21,842	998	2,781	394	1,420	5	39,279
2027	19,687	953	2,515	326	1,299	6	35,510
2028	18,818	903	2,655	330	1,379	6	35,361
2029	17,718	852	2,796	334	1,461	6	34,989
2030	18,663	861	2,931	338	1,539	7	36,715
2031	19,658	870	3,056	342	1,613	7	38,445
2032	20,706	880	3,187	345	1,690	7	40,261
2033	21,811	889	3,323	349	1,771	8	42,167

TP01 - Chhapar							
2034	22,973	899	3,465	353	1,857	8	44,167
2035	21,521	892	3,449	335	1,841	8	42,531
2036	22,273	896	3,535	334	1,892	9	43,777
2037	25,960	917	3,793	355	2,056	9	49,073
2038	27,247	927	3,925	359	2,137	10	51,150
2039	28,572	936	4,059	362	2,221	10	53,279
2040	29,935	945	4,195	366	2,306	10	55,458
2041	31,336	954	4,333	369	2,392	11	57,686
2042	32,772	963	4,473	372	2,480	11	59,962
2043	34,243	971	4,614	376	2,570	11	62,283
2044	35,749	980	4,756	379	2,660	12	64,648
2045	37,287	988	4,900	382	2,752	12	67,055
2046	38,892	997	5,048	386	2,847	13	69,556
2047	40,565	1,006	5,200	389	2,945	13	72,154
2048	42,311	1,015	5,357	392	3,047	14	74,853
2049	44,132	1,023	5,519	396	3,152	14	77,658
2050	46,031	1,032	5,686	399	3,261	15	80,572
2051	48,011	1,041	5,858	403	3,373	15	83,601
2052	50,077	1,050	6,035	406	3,490	16	86,748
2053	52,232	1,060	6,217	410	3,610	16	90,018
2054	54,480	1,069	6,405	413	3,735	17	93,417
2055	56,824	1,078	6,598	417	3,863	17	96,949
TP02 – Bahadrabad							
FY End	**CJV**	**LCV**	**Bus/2A**	**3A**	**MAV**	**OSV**	**Total PCU**
2025	22,173	823	2,651	368	697	4	35,619
2026	21,795	796	2,554	321	639	4	34,509
2027	20,293	748	2,303	246	516	5	31,404
2028	21,585	757	2,435	249	549	5	33,262
2029	22,896	766	2,567	252	582	5	35,145
2030	24,155	775	2,694	255	614	5	36,948
2031	25,483	783	2,812	257	644	6	38,788
2032	26,883	792	2,935	260	676	6	40,724
2033	28,361	801	3,063	263	709	6	42,760
2034	29,920	809	3,197	266	744	7	44,902
2035	29,184	802	3,146	245	695	7	43,718
2036	30,370	806	3,223	243	699	7	45,157
2037	34,177	825	3,501	266	795	7	50,330
2038	35,924	834	3,626	269	828	8	52,619
2039	37,726	842	3,753	271	861	8	54,971
2040	39,581	850	3,881	274	895	8	57,386
2041	41,490	859	4,012	277	929	9	59,863
2042	43,451	867	4,144	279	964	9	62,399
2043	45,462	875	4,277	282	1,000	9	64,992
2044	47,523	883	4,412	284	1,036	10	67,642
2045	49,631	890	4,549	287	1,073	10	70,345
2046	51,833	898	4,689	289	1,110	10	73,160
2047	54,132	906	4,834	292	1,150	11	76,093
2048	56,534	914	4,984	295	1,190	11	79,147
2049	59,042	922	5,138	297	1,233	12	82,329
2050	61,661	930	5,297	300	1,276	12	85,642
2051	64,397	939	5,460	302	1,321	12	89,094
2052	67,253	947	5,629	305	1,368	13	92,690
2053	70,237	955	5,803	308	1,417	13	96,436
2054	73,353	964	5,982	310	1,467	14	100,339
2055	76,607	972	6,167	313	1,519	14	104,405

Source: Rambol traffic report; Table 0 7: Mode-Wise Projected Traffic for PR

Total traffic in PCUs at the project road under the base case scenario before and after considering diversion impacts is presented in Table 0 8.

FY	Total Traffic Before Diversion	Total Traffic After Diversion				
	TP01	TP02	Average	TP01	TP02	Average
2025	40,711	35,619	38,165	40,711	35,619	38,165
2026	43,068	37,745	40,407	39,279	34,509	36,894
2027	45,532	39,971	42,751	35,510	31,404	33,457
2028	48,142	42,333	45,237	35,361	33,262	34,312

FY	Total Traffic Before Diversion	Total Traffic After Diversion				
2029	50,783	44,727	47,755	34,989	35,145	35,067
2030	53,309	47,020	50,164	36,715	36,948	36,831
2031	55,858	49,355	52,606	38,445	38,788	38,617
2032	58,535	51,810	55,173	40,261	40,724	40,492
2033	61,345	54,393	57,869	42,167	42,760	42,463
2034	64,296	57,110	60,703	44,167	44,902	44,534
2035	67,340	59,918	63,629	42,531	43,718	43,124
2036	70,348	62,719	66,534	43,777	45,157	44,467
2037	73,440	65,605	69,522	49,073	50,330	49,702
2038	76,614	68,574	72,594	51,150	52,619	51,885
2039	79,869	71,624	75,747	53,279	54,971	54,125
2040	83,204	74,755	78,979	55,458	57,386	56,422
2041	86,616	77,964	82,290	57,686	59,863	58,774
2042	90,103	81,251	85,677	59,962	62,399	61,180
2043	93,663	84,611	89,137	62,283	64,992	63,638
2044	97,292	88,043	92,668	64,648	67,642	66,145
2045	100,987	91,544	96,266	67,055	70,345	68,700
2046	104,828	95,190	100,009	69,556	73,160	71,358
2047	108,822	98,986	103,904	72,154	76,093	74,123
2048	112,973	102,940	107,957	74,853	79,147	77,000
2049	117,290	107,058	112,174	77,658	82,329	79,993
2050	121,777	111,346	116,562	80,572	85,642	83,107
2051	126,443	115,813	121,128	83,601	89,094	86,348
2052	131,294	120,464	125,879	86,748	92,690	89,719
2053	136,338	125,310	130,824	90,018	96,436	93,227
2054	141,583	130,356	135,970	93,417	100,339	96,878
2055	147,036	135,613	141,325	96,949	104,405	100,677
CAGR (FY25-FY45)	4.6%	4.8%	4.7%	2.5%	3.5%	3.0%

Source: Rambol traffic report

Tolling Segmentation

The tolling stream distribution under the present study has been derived from the toll data taking an average of FY25 and the same is presented in Table 0-9.

Type	Car	LCV	Bus/2A Trucks	3A Trucks	MAV	OSV
TP01 - Chhapar						
Single	42.2	42.8	31.7	67.3	56.0	100.0
Return	34.7	48.3	62.0	31.7	43.5	0.0
Monthly	0.0	0.0	0.0	0.0	0.0	0.0
Local personal	0.2	0.0	0.0	0.0	0.0	0.0
Local commercial	0.0	0.1	0.2	0.0	0.0	0.0
Exemptions	22.8	8.8	6.1	1.0	0.5	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
TP02 - Bahadrabad						
Single	38.6	40.7	27.4	48.5	62.8	100.0
Return	28.6	45.9	63.2	35.7	34.2	0.0
Monthly	0.0	0.0	0.0	0.0	0.0	0.0
Local personal	1.8	0.0	0.0	0.0	0.0	0.0
Local commercial	0.9	3.8	6.8	12.8	1.4	0.0
Exemptions	30.2	9.6	2.6	3.0	1.5	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Rambol traffic report

Tollable Length and Toll rates

The normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being charged at toll plazas along with the length which will be charged post augmentation to six lane configurations are presented in

Particulars	Gaz. Notification Length	Schedule M Length	
		Before Completion of Improvement (till 31st May FY28)	**After Completion of Improvement (From 1st June FY28)**
TP01- Chhapar at km 138.552			
A. Normal	27.595	27.595	26.545
B. Bypass	7.709	7.709	7.709
C. Equivalent structure	0.136	0.136	1.186
Base Length	35.440	35.440	35.440
Tolling Length = A+(B*1.5) + (C*10)	40.519	40.519	49.969
TP02- Bahadrabad at km 187.370			
A1. Normal - 2 lane (to be charged at 60%)		0.397	0.397
A2. Normal - 4/6 lane	24.471	22.621	22.531
B. Bypass	16.224	16.224	16.224
C1. Equivalent structure - 2 lane (to be charged at 60%)	0.525	0.653	0.653
C2. Equivalent structure - 4/6 lane	1.900	3.750	3.840
Base Length	43.120	43.645	43.645
Tolling Length = A+(B*1.5) + (C*10)	85.957	88.613	89.423

Source: Rambol traffic report

Particulars	Gaz. Notification Length	Schedule M Length	
		Before Completion of Improvement (till 31st May FY28)	**After Completion of Improvement (From 1st June FY28)**
TP01- Chhapar at km 138.552			
A. Normal	27.595	27.595	26.545
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Base Length	35.440	35.440	35.440
Tolling Length = A+(B*1.5) + (C*10)	40.519	40.519	49.969
TP02- Bahadrabad at km 187.370			
A1. Normal - 2 lane (to be charged at 60%)		0.397	0.397
A2. Normal - 4/6 lane	24.471	22.621	22.531
B. Bypass	16.224	16.224	16.224
C1. Equivalent structure - 2 lane (to be charged at 60%)	0.525	0.653	0.653

Particulars	Gaz. Notification Length	Schedule M Length	
C2. Equivalent structure - 4/6 lane	1.900	3.750	3.840
Base Length	43.120	43.645	43.645
Tolling Length = A+(B*1.5) + (C*10)	85.957	88.613	89.423

Source: Rambol traffic report

The stream of toll rates likely to be charged basis schedule -M lengths and adopted WPI assumptions at the toll plaza of the project road in cardinal years till FY55 is presentedbelow:. The toll fee has been rounded to nearest 5 Rupees as per toll fee rules.

FY End	Car	LCV/ M Bus	Bus/ 2A Truck	3-axle Truck	MAV	OSV	Car Local
TP01 - Chappar							
2025 (Existing)	60	95	200	220	315	385	340
With Schedule-M Lengths							
2025	60	95	200	220	315	385	340
2030	90	145	305	335	480	580	415
2035	110	180	370	405	585	710	510
2040	135	215	455	495	715	870	620
2045	165	265	555	605	870	1,060	760
2050	200	325	680	740	1,065	1,295	925
2055	245	395	830	905	1,300	1,585	1,130
TP02 - Bahadrabad							
2025 (Existing)	125	205	425	465	670	815	340
With Schedule-M Lengths							
2025	130	210	440	480	690	840	340
2030	160	260	545	595	855	1,040	415
2035	195	320	665	725	1,045	1,275	510
2040	240	390	815	890	1,275	1,555	620
2045	295	475	995	1,085	1,560	1,895	760
2050	360	580	1,215	1,325	1,905	2,320	925
2055	440	710	1,485	1,620	2,330	2,835	1,130

Source: Rambol traffic report

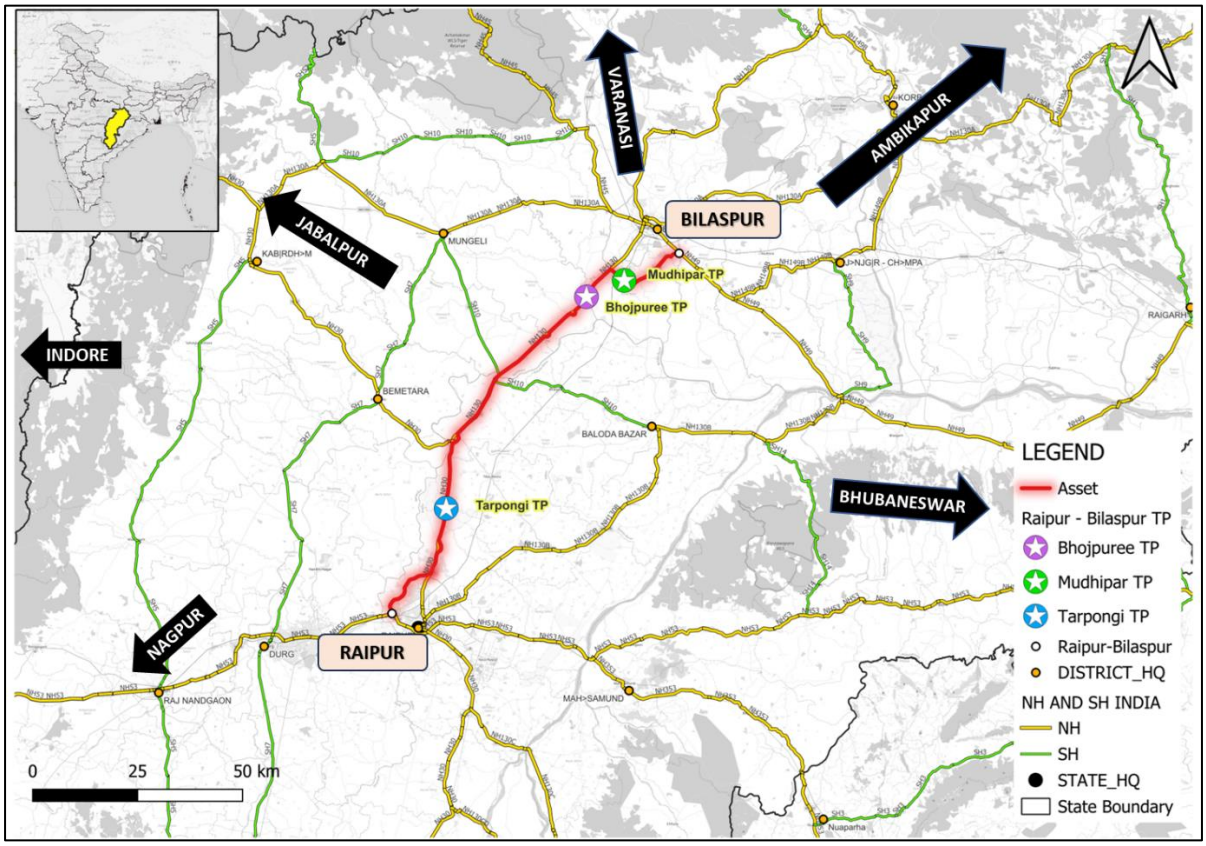
For further details in relation to Asset 23, please refer to **Annexure C** of this Preliminary Placement Document.

Raipur to Simga Section of NH-30 (Old NH-200) ("Asset 24") and Sigma to Bilaspur Section of NH-130 (Old NH-200) & NH-49 ("Asset 25")

Project Overview

According to the Traffic Consultant, the project road, a combination of NH-30 and NH-130, connects Raipur in the south to Bilaspur in the north, passing through Simga and Nandghat. After Simga, NH-30 bifurcates, linking Raipur to Jabalpur in the north while also passing through Jagdalpur, Sukma, Bhadrachalam, and Kothagudem before terminating in Vijayawada in the south. NH-130 extends further, connecting Raipur with Bilaspur, Katghora, and Ambikapur with Korba, a coal mining hub to the north, and Durg and Bhilai, major steel production centers to the south, the project road plays a vital role in transporting iron ore, coal, steel, and other goods. The project road has three toll plazas (TPs), Tarapongi Toll Plaza, Bhojpuree Toll Plaza and Mudhipar Toll Plaza.

Figure 1-1: Corridor with existing toll plaza location



Source: IBI Group India Private Limited

Salient growth features and traffic generators

The Raipur-Bilaspur section is a vital economic corridor influenced by multiple industries, playing a crucial role in regional and national logistics.

The coal mining industry significantly impacts this corridor, with major coalfields such as Gevra, Dipka, Kusmunda, and Mand-Raigarh collectively producing over 150 million tonnes of coal annually. These mines support power plants and industries across the country, generating substantial freight traffic through hundreds of daily truck and rail shipments. This industrial activity positions the road as a critical backbone for regional economic growth.

The cement industry also thrives along this corridor, with major plants operated by Ultratech Cement, Ambuja Cement, ACC Cement, and Shree Cement. These facilities contribute over 15 million tonnes of cement production annually, serving infrastructure and construction needs across central and eastern India. The high freight movement of raw materials and finished products further reinforces the road's importance in economic development.

Similarly, the steel industry plays a crucial role, with major steel plants such as Jindal Steel and Power (Raigarh), SAIL's Bhilai Steel Plant, and multiple sponge iron units in Raipur. These plants produce over 20 million tonnes of steel annually, catering to the construction, automotive, and industrial sectors. The constant movement of raw materials like iron ore and finished steel products highlights the corridor's significance in industrial transportation.

Additionally, the corridor facilitates the transportation of fly ash, a byproduct of several thermal power plants in the region, including Korba, Sipat, and Tamnar. These plants generate over 30 million tonnes of fly ash annually, which is extensively used in cement manufacturing, brick production, and infrastructure projects. The steady demand for fly ash ensures continuous freight movement, making the road an essential link for efficient resource utilization.

Looking ahead, the cement sector is witnessing significant investments, further reinforcing the region's industrial growth. Ambuja Cement is investing Rs. 1,600 crore in Nawada for a 6 MTPA unit, expected to create 250 direct and 1,000 indirect jobs by December 2025. Shree Cement has allocated Rs. 2,000 crore for capacity expansion, while Ramco Cements plans to invest Rs. 1,403 crore to double its Andhra Pradesh capacity and install a 10 MW waste heat recovery system by FY26. UltraTech Cement is committing Rs. 32,400 crore to expand its capacity to 200 MTPA. Additionally, ACC and the Adani Group have introduced "Bagcrete" and launched a Concrete R&D facility, while Dalmia Cement has launched Dalmia Supreme Cement in Eastern India. These investments position the corridor as a future growth driver in the cement industry.

With coal, steel, cement, and power industries fuelling freight traffic, the Raipur-Bilaspur corridor remains a key driver of industrial and economic growth in the region.

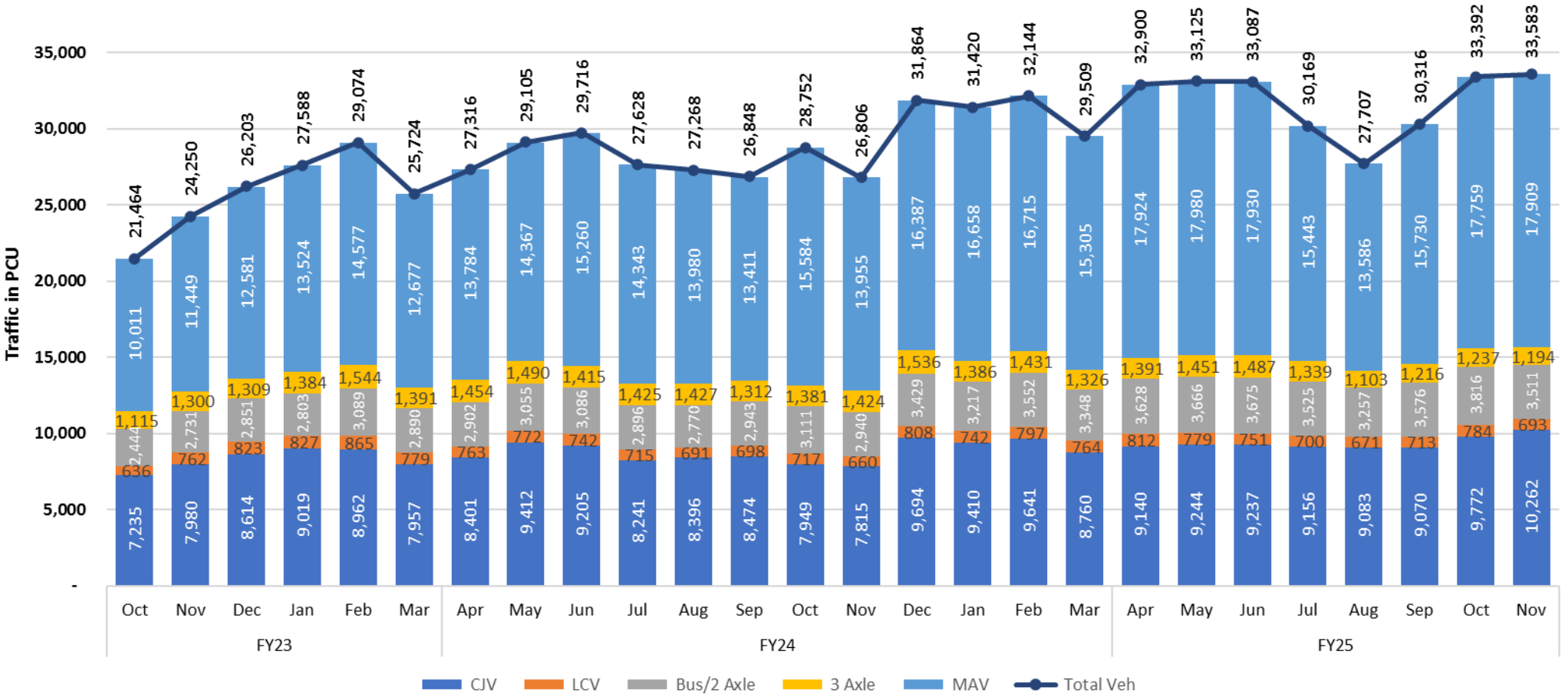
Traffic volume and composite of vehicles

Historical traffic data

Traffic and revenue data for Tarapongi, Bhojpuree (Oct 2022 – Nov 2024), and Mudhipar (Nov 2022 – Oct 2024) toll plazas were sourced from the Concessionaire. The data, includes toll categories like single journey, local pass, and exempted traffic, was analyzed for trends, & seasonal variations.

Monthly ADT in PCU for Tarapongi Toll Plaza:

Figure 1-2: Historic Traffic Trend of Tarapongi Toll Plaza

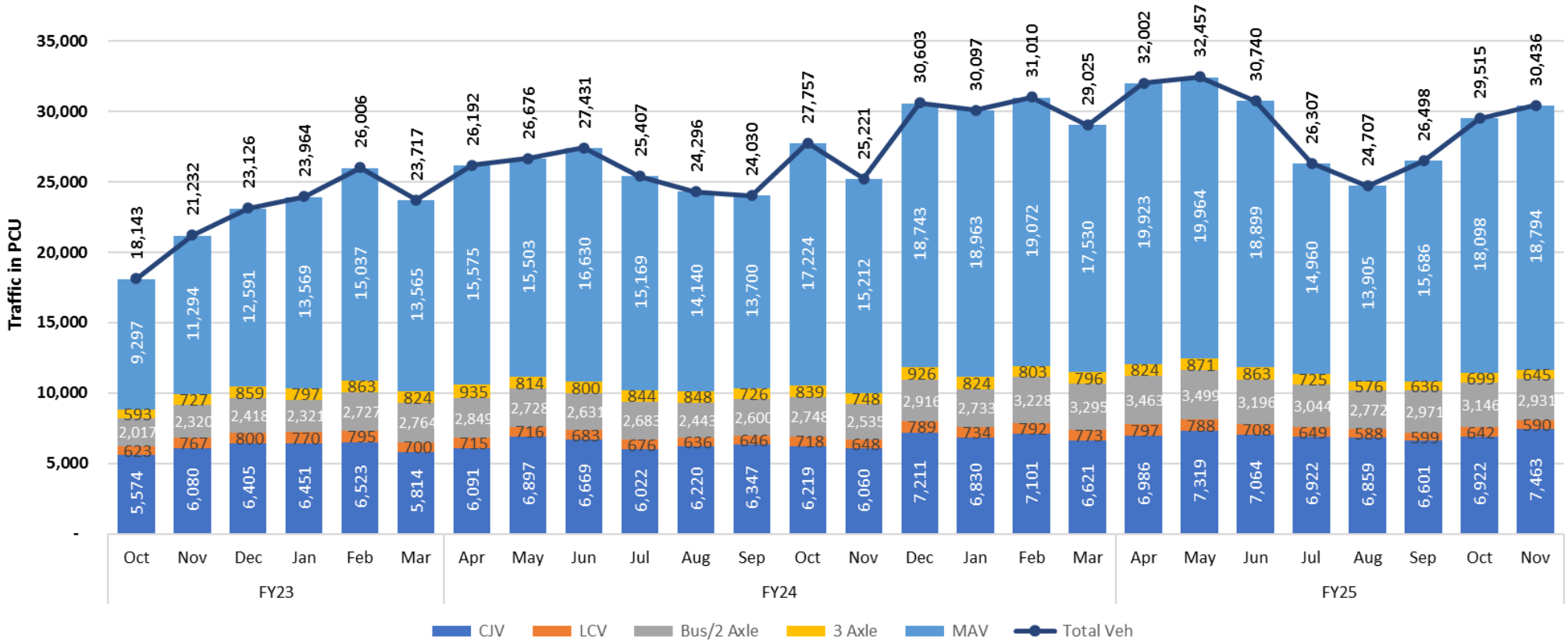


Source: IBI Group India Private Limited

The daily traffic, measured in Passenger Car Units (PCUs), has generally been in the range of 20,000 to 30,000 PCUs over the period from December FY23 to October FY25.The traffic has shown an upward trend, with a Compound Annual Growth Rate (CAGR) of 12.5% from FY23 to FY25.The daily revenue has also grown consistently, reaching ₹28.94 lakhs in October FY25.The revenue has shown a CAGR of 14.5% from FY23 to FY25.

Monthly ADT in PCU for Bhojpuri Toll Plaza:

Figure 1-3: Historic Traffic Trend of Bhojpuri Toll Plaza

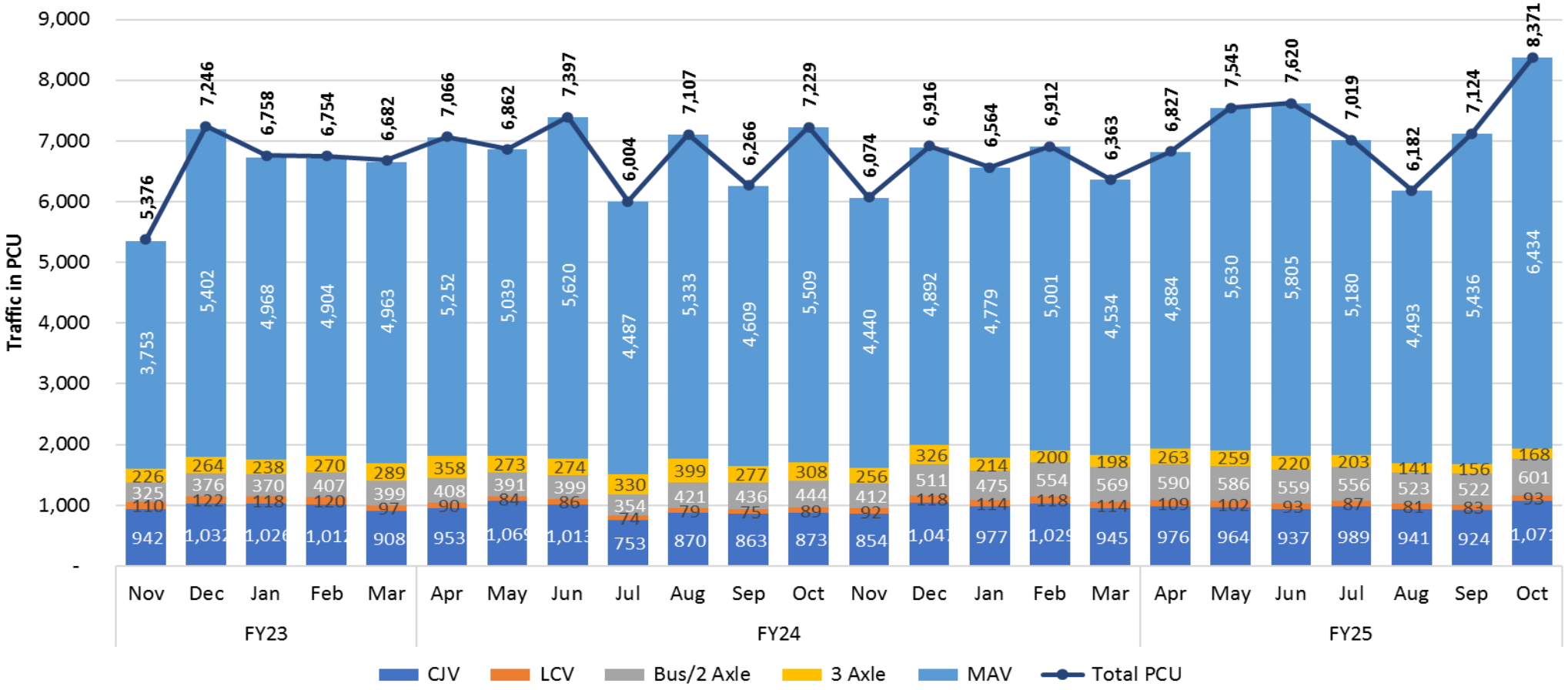


Source: IBI Group India Private Limited

The daily traffic, measured in Passenger Car Units (PCUs), has generally been in the range of 6,000 to 8,500 PCUs over the period from December FY24 to October FY25. The traffic has shown an upward trend, with a Compound Annual Growth Rate (CAGR) of 16.9% from FY23 to FY25.The daily revenue has grown consistently, reaching ₹28.26 lakhs in October FY25.The revenue has shown a CAGR of 15.6% from FY23 to FY25.

Monthly ADT in PCU for Bhojpuri Toll Plaza:

Figure 1-4: Monthly ADT in PCU for Mudhipar Toll Plaza



Source: IBI Group India Private Limited

Based on the available data from Dec-FY24 to Oct-FY25 it can be observed that the traffic has been varying around 6000 to 8500 PCUs daily and having revenue of around 3 lack to 4 lacks daily. Daily revenue grew consistently, reaching ₹4.04 lakh in October FY25, with a CAGR of 22.7% from FY23 to FY25.Daily traffic ranged from 6,378 to 8,499 PCU, showing an upward trend with a CAGR of 18.8% over the same period.

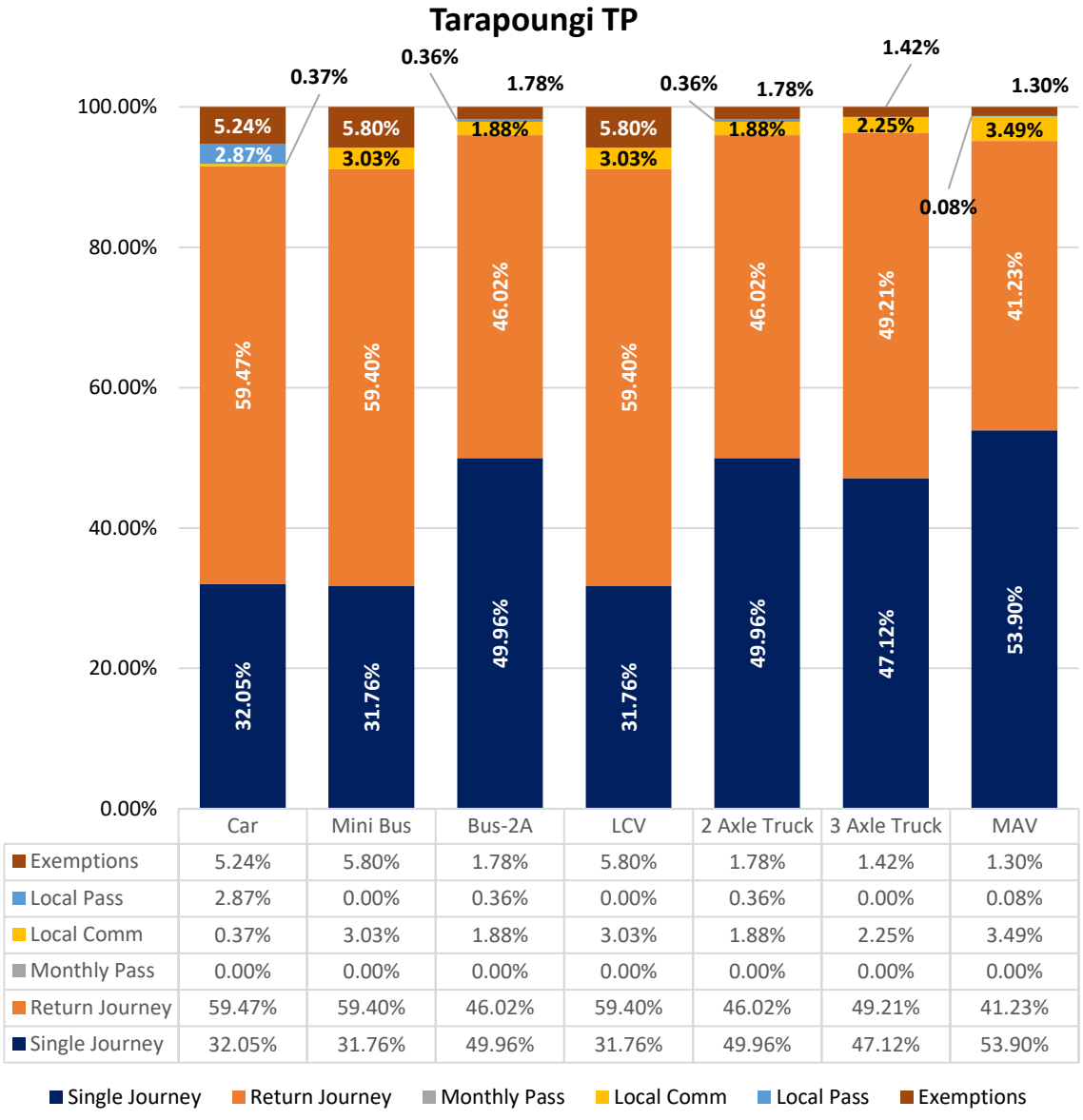
Toll Segmentation

Based on detailed review of historic trends of trip segmentation, Consultant has recommended that the combined data from Tarapongi, Bhojpuri, and Mudhipar Toll Plazas shows varied travel patterns across vehicle types. Tarapongi and Bhojpuri see more return journeys for cars and LCVs, while Mudhipar has a higher share of single journeys. Trucks and MAVs at Tarapongi and Bhojpuri have a balanced mix of single and return trips, whereas Mudhipar is dominated by single journeys. Local commercial traffic and exemptions are present at all three plazas in different proportions.

Local pass usage varies across locations and vehicle types. A potential increase in Local District Commercial (LDC) share, especially at Tarpongi, with a phased rise from FY-26 to FY-30 is considered. Each toll plaza reflects distinct travel characteristics in trip types, local pass reliance, and exemptions.

Tarapongi Toll Plaza:

Figure 0-2 Base Year (FY25) Trip Segmentation for Tarapongi Toll Plaza



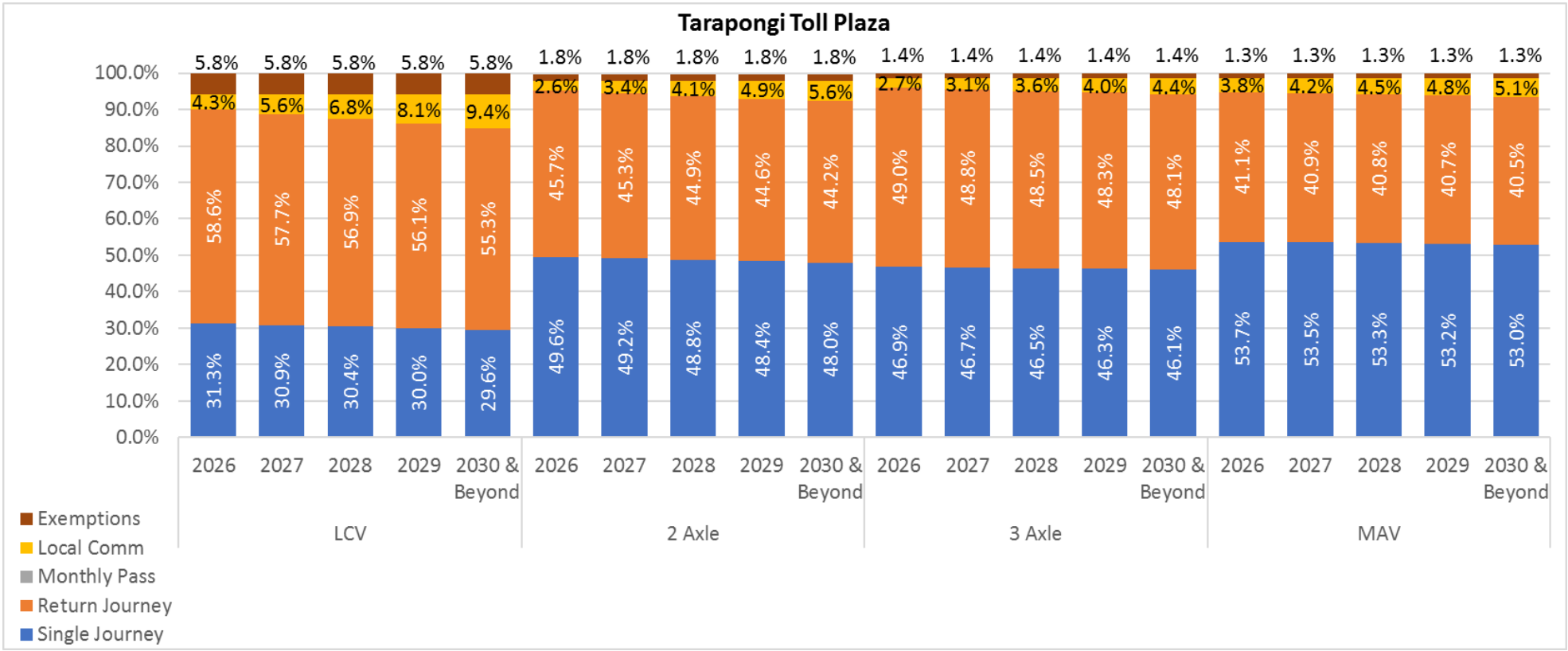
	Car	Mini Bus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
Exemptions	5.24%	5.80%	1.78%	5.80%	1.78%	1.42%	1.30%
Local Pass	2.87%	0.00%	0.36%	0.00%	0.36%	0.00%	0.08%
Local Comm	0.37%	3.03%	1.88%	3.03%	1.88%	2.25%	3.49%
Monthly Pass	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Return Journey	59.47%	59.40%	46.02%	59.40%	46.02%	49.21%	41.23%
Single Journey	32.05%	31.76%	49.96%	31.76%	49.96%	47.12%	53.90%

Source: IBI Group India Private Limited

Future trip Segmentation for Tarapongi Toll Plaza:

LDC shall increase and shall cap at 75% (25% of the users will not obtain the LDC due to insufficient LDC compliance) of the Actual Share estimated from Survey. For future projections, an expected increase in Local District Commercial (LDC) share at Tarapongi in a phased manner from FY-26 to FY-30 for LCV, 2A,3A and MAV is considered. Additionally, exemptions are factored in using available data, ensuring alignment with observed trends. The final adopted segmentation reflects these adjustments, and it is assumed that the forecast segmentation will remain consistent throughout the concession period.

Figure 0-3 Future trip Segmentation for Tarapongi Toll Plaza

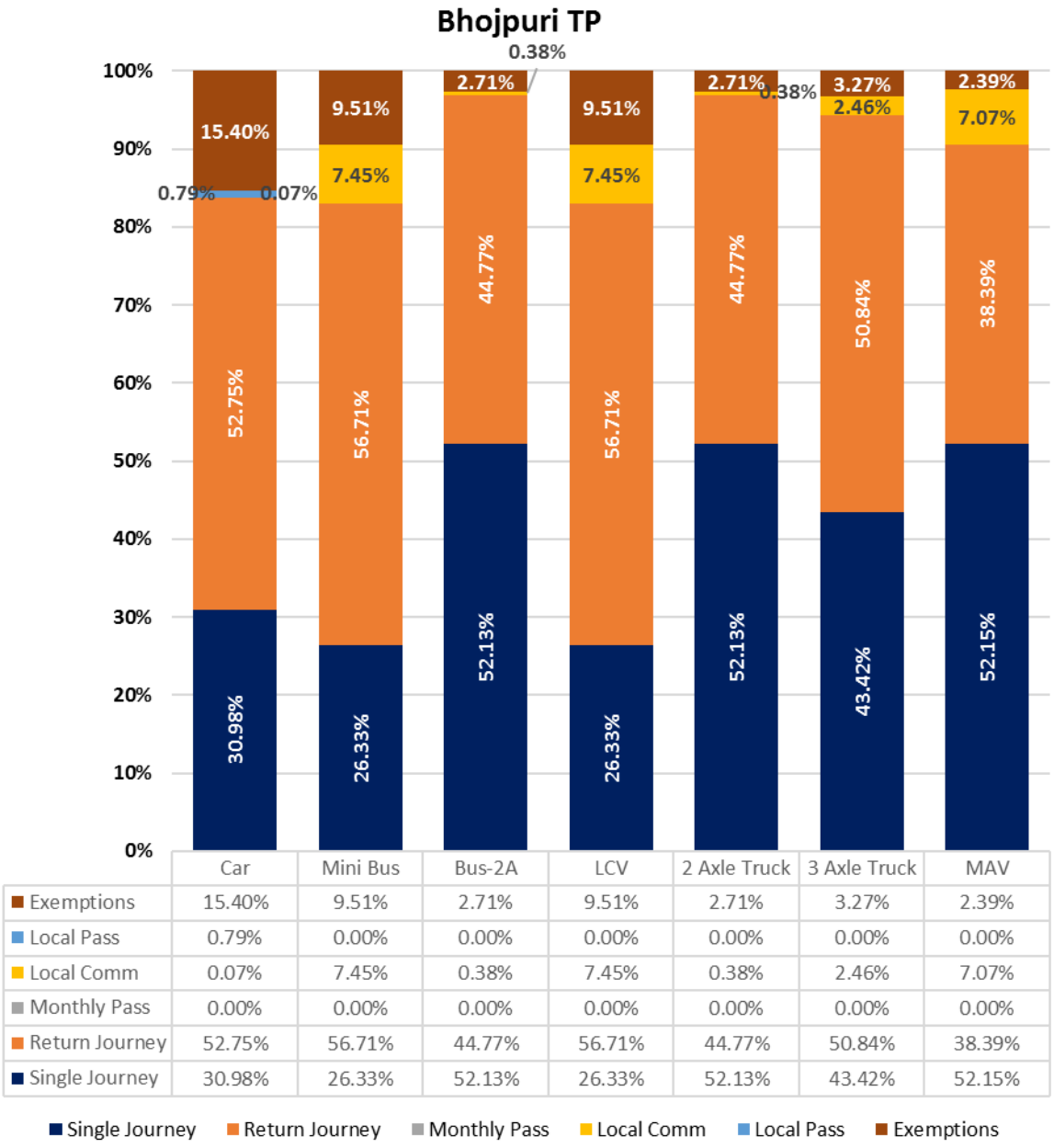


Source: IBI Group India Private Limited

Bhojpuri Toll Plaza:

Trip segmentation for FY25

Figure 1-7 Base Year (FY25) Trip Segmentation for Bhojpuri Toll Plaza:



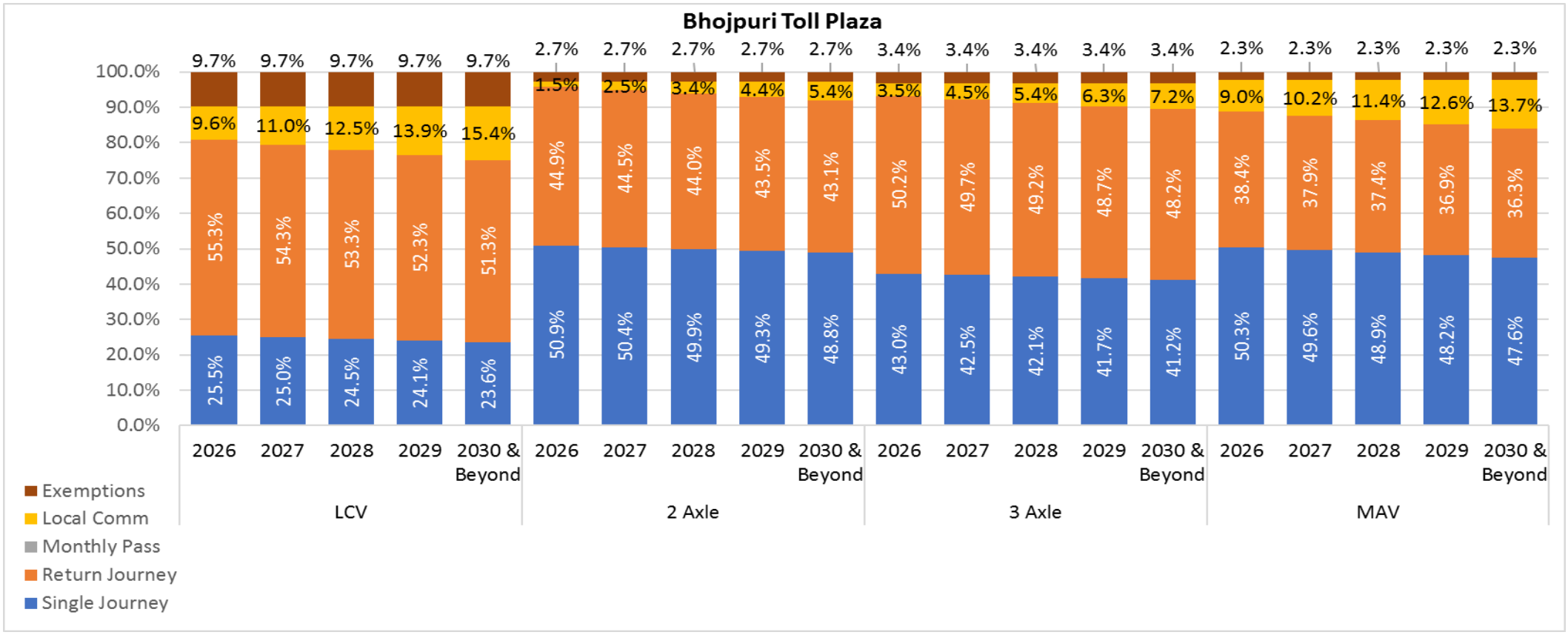
	Car	Mini Bus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
Exemptions	15.40%	9.51%	2.71%	9.51%	2.71%	3.27%	2.39%
Local Pass	0.79%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Local Comm	0.07%	7.45%	0.38%	7.45%	0.38%	2.46%	7.07%
Monthly Pass	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Return Journey	52.75%	56.71%	44.77%	56.71%	44.77%	50.84%	38.39%
Single Journey	30.98%	26.33%	52.13%	26.33%	52.13%	43.42%	52.15%

Source: IBI Group India Private Limited

Future trip Segmentation for Bhojpuri Toll Plaza

DC shall increase and shall cap at 75% (25% of the users will not obtain the LDC due to insufficient LDC compliance) of the Actual Share estimated from Survey. For future projections, the consultant has noted an expected increase in Local Daily Commuter (LDC) share at Bhojpuri in a phased manner from FY-26 to FY-30 for LCV, 2A,3A and MAV. Additionally, exemptions are factored in using available data, ensuring alignment with observed trends. The final adopted segmentation reflects these adjustments, and it is assumed that the forecast segmentation will remain consistent throughout the concession period.

Figure 0-4 Future trip Segmentation for Bhojpuri Toll Plaza

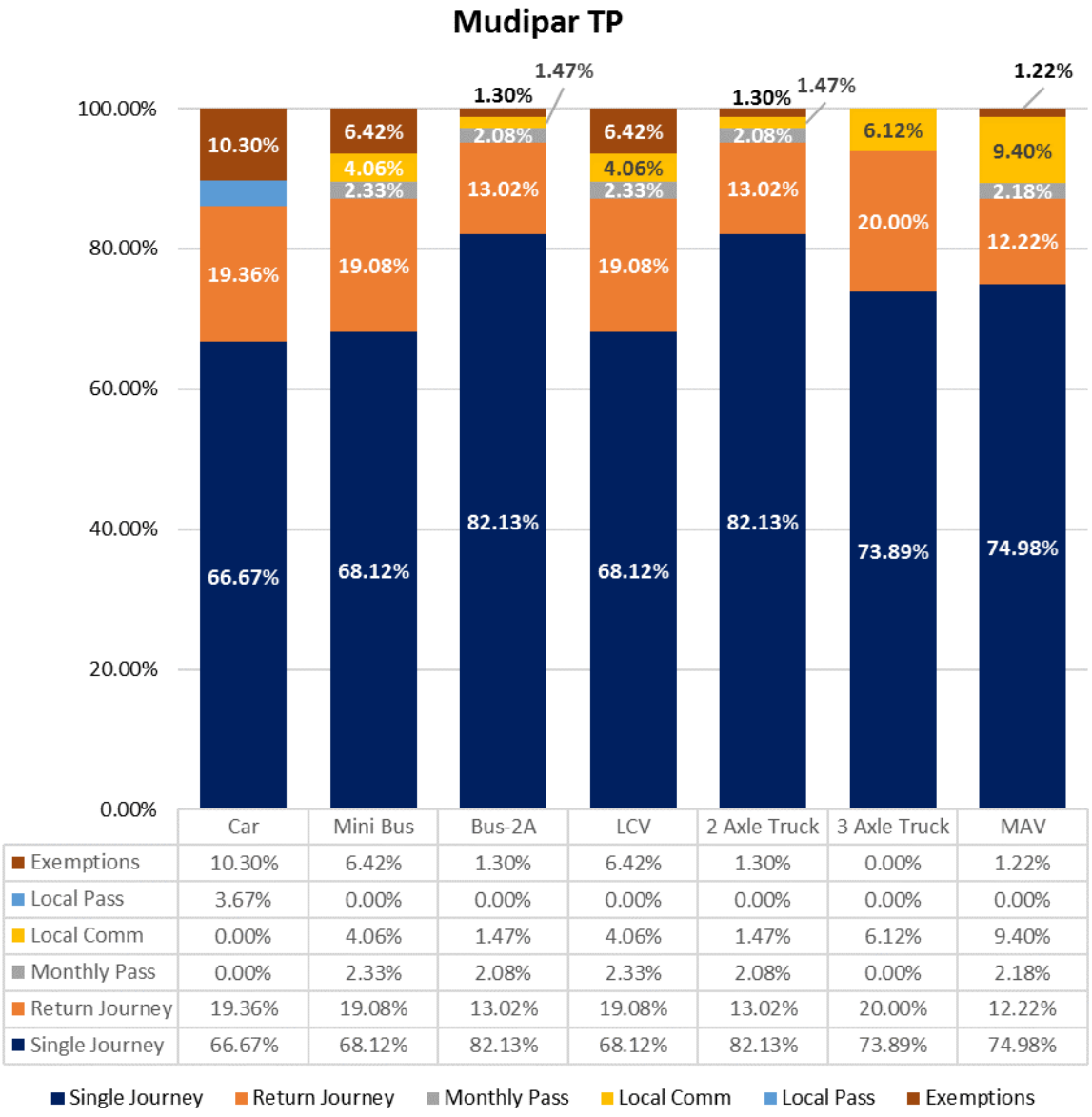


Source: IBI Group India Private Limited

Mudhipar Toll plaza:

Trip segmentation for FY25

Figure 0-5 Base Year (FY25) Trip Segmentation for Mudhipar Toll Plaza



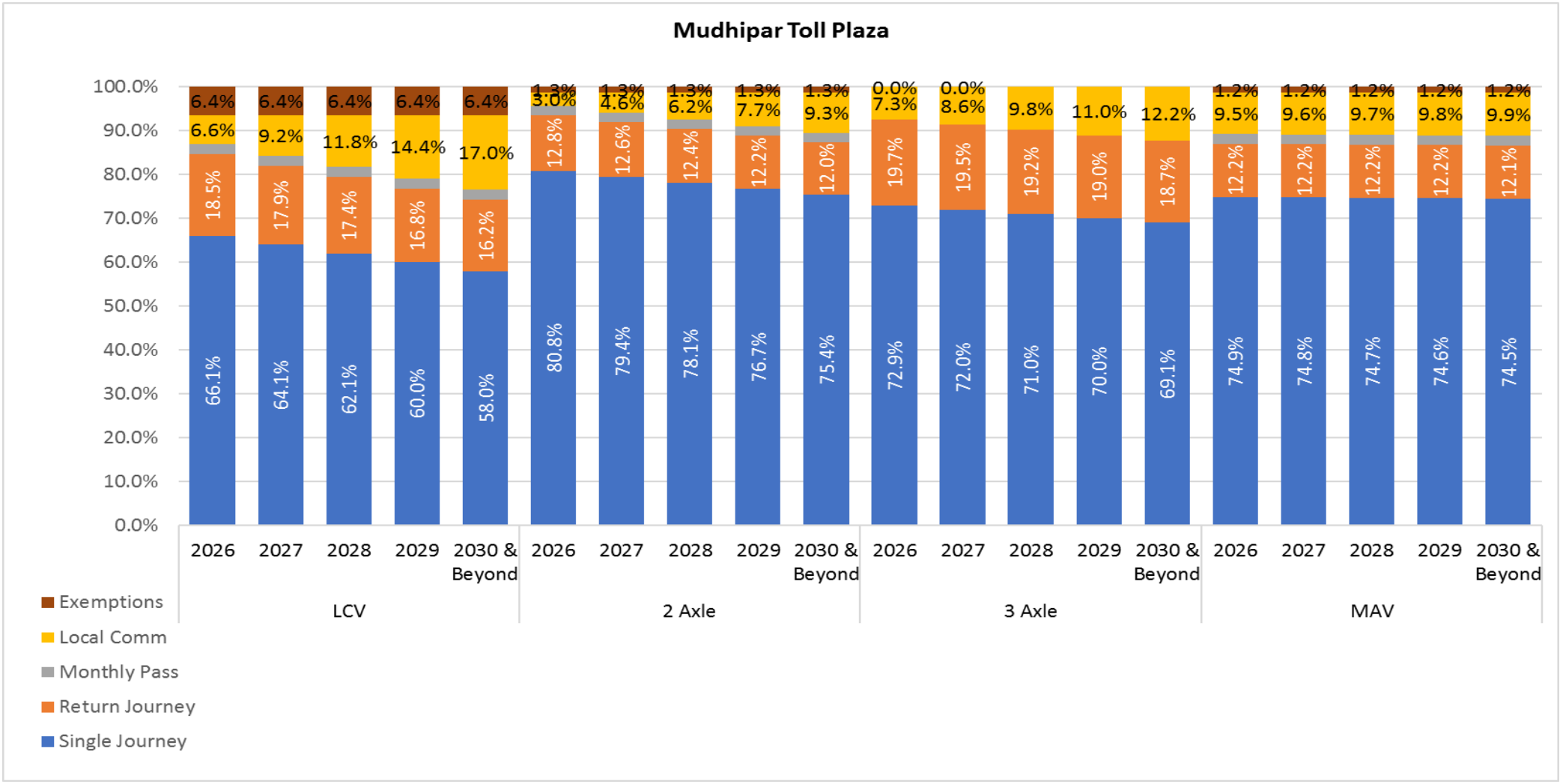
	Car	Mini Bus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
Exemptions	10.30%	6.42%	1.30%	6.42%	1.30%	0.00%	1.22%
Local Pass	3.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Local Comm	0.00%	4.06%	1.47%	4.06%	1.47%	6.12%	9.40%
Monthly Pass	0.00%	2.33%	2.08%	2.33%	2.08%	0.00%	2.18%
Return Journey	19.36%	19.08%	13.02%	19.08%	13.02%	20.00%	12.22%
Single Journey	66.67%	68.12%	82.13%	68.12%	82.13%	73.89%	74.98%

Source: IBI Group India Private Limited

Future trip Segmentation for Mudhipar Toll Plaza:

LDC shall increase and shall cap at 75% (25% of the users will not obtain the LDC due to insufficient LDC compliance) of the Actual Share estimated from Survey. For future projections, the consultant has noted an expected increase in Local Daily Commuter (LDC) share at Mudhipar in a phased manner from FY-26 to FY-30 for LCV, 2A,3A and MAV. Additionally, exemptions are factored in using available data, ensuring alignment with observed trends. The final adopted segmentation reflects these adjustments, and it is assumed that the forecast segmentation will remain consistent throughout the concession period.

Figure 1-10: Future trip Segmentation for Mudhipar Toll Plaza



Source: IBI Group India Private Limited

Base Year Traffic (AADT)

- FY 25 (Apr to Nov 2024) ETC Toll plaza data for Base Year AADT for Tarapongi & Bhojpuri and FY25(Apr-Oct) for Mudhipar Toll Plaza is considered.
- IHMCL data for FY23 and ETC data FY24 is considered most suitable for SCF calculation for all three toll plazas.
- Final AADT has arrived by adding adjusted ADT (with selected SCF) arrived from ETC data (April to Nov 2024/Oct 2024, which excludes cash & exemption/violation traffic), cash & exempt traffic from non-ETC data (April to Nov/Oct 2024) and forced exemption/violation data obtained from traffic survey.

Adopted AADT for all three toll plazas has been mentioned below.

Table 0-20 AADT FOR TARAPONGI TOLL PLAZA FY25

TARAPONGI TOLL PLAZA FY25 (Apr-Nov)						
Mode	**ADT(a)**	**SCF**	**AADT (ETC)**	**Cash**	**Exempt**	**Final AADT**
CJV	8,827	*1.03*	9,131	80	491	9,701
LCV	461	*1.01*	466	3	29	498
Bus/2 Axle	1,173	*1.05*	1,227	0	21	1,249
3 Axle	428	*1.02*	439	0	6	445
MAV	3,682	*1.05*	3,876	1	49	3,926
Total	**14,572**		**15,138**	**84**	**596**	**15,818**
PCU	**30,893**		**32,268**	**89**	**838**	**33,195**

Source: IBI Group India Private Limited

Table 0-21 AADT FOR BHOJPURI TOLL PLAZA FY25

BHOJPURI TOLL PLAZA FY25 (Apr-Nov)						
Mode	**ADT(a)**	**SCF**	**AADT (ETC)**	**Cash**	**Exempt**	**Final AADT**
CJV	6,641	1.03	6,863	17	1,195	8,075
LCV	405	1.02	413	1	43	457
Bus/2 Axle	1,015	1.05	1,067	0	28	1,096
3 Axle	235	1.03	242	0	8	250
MAV	3,807	1.08	4,097	0	91	4,186
Total	**12,104**		**12,681**	**18**	**1,366**	**14,065**
PCU	**28,134**		**29,843**	**19**	**1,781**	**31,644**

Source: IBI Group India Private Limited

Table 0-22 AADT FOR MUDHIPAR TOLL PLAZA FY25

MUDHIPAR TOLL PLAZA FY25 (Apr-Oct)						
Mode	**ADT(a)**	**SCF**	**AADT (ETC)**	**Cash**	**Exempt**	**Final AADT**
CJV	972	1.04	1,007	23	115	1,145
LCV	59	1.02	60	2	4	67
Bus/2 Axle	187	1.05	197	0	2	200
3 Axle	67	1.02	68	0	0	68
MAV	1,203	1.08	1,296	1	15	1,312
Total	**2,507**		**2,605**	**27**	**78**	**2,792**
PCU	**7,279**		**7,624**	**33**	**137**	**7,954**

Source: IBI Group India Private Limited

Traffic Forecast

Traffic forecasting for project road traffic was done considering past trend in growth and analysing prospects of project influence area. Elasticity approach of growth rate estimation was used for long term traffic forecasting.

The network developments near the Asset's alignment, which are expected to impact traffic on the Asset during the concession period, include the 4-laning of NH-130B (Raipur – Baloda Bazar – Sarangarh), the Raipur–Dhanbad Economic Corridor (EC-07), and associated upgrades in the region.

The 4-laning of NH-130B, covering approximately 169 km out of the total 216 km, is currently in the planning stage, with an estimated completion in FY-31. This development is expected to have a negative impact on the Asset's traffic from FY-32 onward.

The Raipur–Dhanbad Economic Corridor (EC-07), a 707 km-long access-controlled expressway, is under construction to enhance connectivity between Chhattisgarhh and Jharkhand. The corridor comprises both greenfield and brownfield sections, including the upgrade of the Raipur–Bilaspur Expressway to a six-lane highway. The ongoing construction between Bilaspur and Urga is expected to be completed by FY-27, positively impacting the Asset from the same year. A subsequent phase of the corridor is anticipated to be completed by FY-31, further influencing traffic patterns from FY-32.

All these network impacts are considered in the Traffic Projections.

The methodology used for the study included following steps:

- The influencing factors obtained from OD surveys are utilized in deriving the key socio-economic parameters of the Project Influence Area (PIA) for the historic trend.
- Through regression analysis for various combinations of dependent and independent parameters is conducted to evaluate the significance of the relation.
- Potential growth of various vehicle categories was separately assessed based on its probable market share in expected multi-modal development.
- The elasticity values for the selected relation are taken & used for the traffic growth rates estimation. However, there are several steps performed before obtaining the traffic growth rates which are explained in the chapter 6.

Traffic Assumptions

Traffic Assumptions: -

- Future traffic forecasting was done using elasticity approach which considers the elasticity of transport demand and probable pattern of future growth of the economy.
- Elasticity values for each mode is estimated using the past vehicle registration data, past traffic trend and AADT-tonnage with the growth of PCI, GSDP and Moderated elasticity values chosen for the analysis based on previous trends in socioeconomic variables.
- For Car, Bus and truck traffic, the adopted elasticity values are as follows –
    - Tarapongi TP – 1.20, 0.50, 0.90
    - Bhojpuree TP – 1.20, 0.50, 0.90
    - Mudhipar TP - 1.20, 0.50, 0.90
- Based on the projected elasticity values for TP 1, TP2 and TP 3 the growth of PIA, the future average annual compound traffic growth rates by vehicle type have been estimated by using the following relationship:
    - For freight vehicle, the tonnages on the corridors are projected. The existing market share of different category of goods vehicles are then adjusted for the future years based on the past tonnage trend observed.
    - Normal traffic projections have arrived by applying the traffic growth on the base year traffic.
- The future traffic projections are presented for Effective case traffic projections & the Effective case has arrived by considering the future adjustments in the form of diversions and developments detailed in the chapter 5.

Traffic projections

Tarapongi Toll Plaza:

Table 0-23 EFFECTIVE FUTURE TRAFFIC PROJECTIONS FOR TARAPONGI TOLL PLAZA

EFFECTIVE FUTURE TRAFFIC PROJECTIONS									
FINANCIAL YEAR	**CAR**	**MINI BUS**	**BUS**	**LCV**	**2AT**	**3AT**	**MAV**	**TOTAL VEH**	**PCU**
2025	9,701	11	488	486	760	445	3,926	15,818	33,195
2026	10,402	12	506	506	804	460	4,176	16,865	35,279

EFFECTIVE FUTURE TRAFFIC PROJECTIONS									
FINANCIAL YEAR	CAR	MINI BUS	BUS	LCV	2AT	3AT	MAV	TOTAL VEH	PCU
2027	11,152	12	523	526	849	476	4,438	17,976	37,475
2028	11,958	13	542	546	897	492	4,717	19,164	39,813
2029	12,779	13	560	566	945	508	4,999	20,369	42,181
2030	13,560	14	577	583	990	521	5,270	21,514	44,434
2035	17,862	15	659	661	1,185	578	6,529	27,488	55,518
2040	22,749	17	747	754	1,437	646	8,205	34,557	69,322
2045	27,820	19	832	836	1,692	702	9,997	41,897	83,763
2046	28,843	19	848	850	1,739	711	10,350	43,360	86,615
2056	39,981	23	1,011	973	2,206	781	14,139	59,116	1,17,100

Source: IBI Group India Private Limited

Table 0-24 EFFECTIVE TRAFFIC GROWTH RATES FOR TARAPONGI TOLL PLAZA

EFFECTIVE TRAFFIC GROWTH							
Year	CAR	MINIBUS	BUS	LCV	2AT	3AT	MAV
2026-26	7.2%	3.6%	3.6%	4.0%	5.7%	3.5%	6.4%
2027-27	7.2%	3.5%	3.5%	3.9%	5.6%	3.4%	6.3%
2028-28	7.2%	3.5%	3.5%	3.9%	5.6%	3.4%	6.3%
2029-29	6.9%	3.3%	3.3%	3.6%	5.3%	3.1%	6.0%
2030-30	6.1%	3.0%	3.0%	3.1%	4.8%	2.6%	5.4%
2031-35	5.9%	2.9%	2.9%	2.9%	4.1%	2.6%	5.2%
2036-40	5.0%	2.5%	2.5%	2.7%	3.9%	2.3%	4.7%
2041-45	4.1%	2.2%	2.2%	2.1%	3.3%	1.7%	4.0%
2046-56	3.4%	1.8%	1.8%	1.4%	2.4%	1.0%	3.2%

Source: IBI Group India Private Limited

Bhojpuri Toll Plaza:

Table 0-25 EFFECTIVE FUTURE TRAFFIC PROJECTIONS FOR BHOJPURI TOLL PLAZA

EFFECTIVE FUTURE TRAFFIC PROJECTIONS									
FINANCIAL YEAR	CAR	MINI BUS	BUS	LCV	2AT	3AT	MAV	TOTAL VEH	PCU
2025	8,075	15	404	442	691	250	4,188	14,065	31,644
2026	8,658	15	419	458	729	256	4,459	14,995	33,648
2027	9,284	16	433	474	769	263	4,744	15,981	35,759
2028	9,955	16	448	490	810	270	5,046	17,036	38,006
2029	10,639	17	463	506	852	276	5,353	18,106	40,285
2030	11,289	17	477	519	891	281	5,649	19,124	42,461
2035	14,836	19	543	573	1,046	294	6,932	24,245	52,571
2040	18,894	22	615	641	1,259	319	8,655	30,404	65,412
2045	23,101	24	685	695	1,469	336	10,482	36,793	78,822
2046	23,949	25	698	703	1,507	339	10,848	38,069	81,491
2056	33,175	30	833	769	1,882	354	14,734	51,776	1,09,881

Source: IBI Group India Private Limited

Table 0-26 EFFECTIVE TRAFFIC GROWTH RATES FOR BHOJPURI TOLL PLAZA

EFFECTIVE TRAFFIC GROWTH							
Year	CAR	MINIBUS	BUS	LCV	2AT	3AT	MAV
2026-26	7.2%	3.5%	3.5%	3.5%	5.5%	2.7%	6.5%
2027-27	7.2%	3.5%	3.5%	3.4%	5.4%	2.6%	6.4%
2028-28	7.2%	3.5%	3.5%	3.5%	5.4%	2.6%	6.4%
2029-29	6.9%	3.3%	3.3%	3.2%	5.1%	2.3%	6.1%
2030-30	6.1%	3.0%	3.0%	2.6%	4.6%	1.8%	5.5%
2031-35	5.9%	2.9%	2.9%	2.5%	3.9%	1.7%	5.0%
2036-40	5.0%	2.5%	2.5%	2.2%	3.8%	1.6%	4.5%
2041-45	4.1%	2.2%	2.2%	1.6%	3.1%	1.0%	3.9%
2046-56	3.3%	1.8%	1.8%	0.9%	2.3%	0.5%	3.1%

Source: IBI Group India Private Limited

Mudhipar Toll Plaza:

Table 0-27 EFFECTIVE FUTURE TRAFFIC PROJECTIONS FOR MUDHIPAR TOLL PLAZA

EFFECTIVE FUTURE TRAFFIC PROJECTIONS									
FINANCIAL YEAR	CAR	MINI BUS	BUS	LCV	2AT	3AT	MAV	TOTAL VEH	PCU
2025	1,145	1	4	66	196	68	1,312	2,792	7,954
2026	1,221	1	4	68	206	69	1,390	2,959	8,418
2027	1,537	1	6	80	219	74	1,550	3,466	9,528
2028	1,886	1	7	92	231	78	1,721	4,017	10,720
2029	2,011	1	8	95	242	79	1,820	4,256	11,332
2030	2,143	1	8	97	254	81	1,926	4,510	11,984
2035	2,823	1	6	131	289	74	2,450	5,775	15,156
2040	3,585	1	7	150	346	78	3,052	7,219	18,839
2045	4,389	2	7	166	402	79	3,692	8,737	22,719
2046	4,541	2	7	168	412	79	3,814	9,024	23,455
2056	6,364	2	9	195	512	82	5,217	12,380	31,941

Source: IBI Group India Private Limited

Table 0-28 EFFECTIVE TRAFFIC GROWTH RATES FOR MUDHIPAR TOLL PLAZA

EFFECTIVE TRAFFIC GROWTH							
Year	CAR	MINIBUS	BUS	LCV	2AT	3AT	MAV
2026-26	6.6%	3.3%	3.3%	3.0%	4.9%	1.7%	6.0%
2027-27	6.7%	3.3%	3.3%	3.0%	5.0%	1.7%	6.0%
2028-28	6.4%	3.2%	3.2%	2.7%	4.7%	1.5%	5.7%
2029-29	6.5%	3.2%	3.2%	2.7%	4.7%	1.5%	5.7%
2030-30	6.5%	3.2%	3.2%	2.8%	4.7%	1.5%	5.7%
2031-35	6.0%	2.9%	2.9%	2.7%	3.8%	1.2%	5.0%
2036-40	4.9%	2.5%	2.5%	2.6%	3.6%	0.9%	4.4%
2041-45	4.0%	2.2%	2.2%	2.0%	3.0%	0.3%	3.8%
2046-56	3.4%	1.8%	1.8%	1.4%	2.2%	0.2%	3.2%

Source: IBI Group India Private Limited

Toll rates

Table 0-29 Toll Fees for the year FY-2025 from June'24 to March'25 for TP1 – Tarapongi

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	95	140	3,140	45	340
Light Commercial Vehicle or Minibus	150	230	5,070	75	-
Bus - 2 Axle	320	480	10,620	160	-
Truck - 2 Axle	320	480	10,620	160	-
3Axle	350	520	11,585	175	-
MAV (4-6) Axle	500	750	16,655	250	-
OSV	610	910	20,275	305	-

Source: IBI Group India Private Limited

Table 0-30 Toll Fees for the year FY-2025 from June'24 to March'25 for TP2 – Bhojpuree

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	100	150	3,320	50	340
Light Commercial Vehicle or Minibus	160	240	5,360	80	-
Bus - 2 Axle	335	505	11,235	170	-
Truck - 2 Axle	335	505	11,235	170	-
3Axle	370	550	12,255	185	-
MAV (4-6) Axle	530	795	12,255	185	-
OSV	645	965	21,445	320	-

Source: IBI Group India Private Limited

Table 0-31 Toll Fees for the year FY-2025 from June'24 to March'25 for TP3 – Mudhipar

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	50	70	1,585	25	340
Light Commercial Vehicle or Minibus	75	115	2,565	40	-
Bus - 2 Axle	160	240	5,370	80	-
Truck - 2 Axle	160	240	5,370	80	-
3Axle	175	265	5,860	90	-
MAV (4-6) Axle	255	380	8,425	125	-

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
OSV	310	460	10,255	155	-

Source: IBI Group India Private Limited

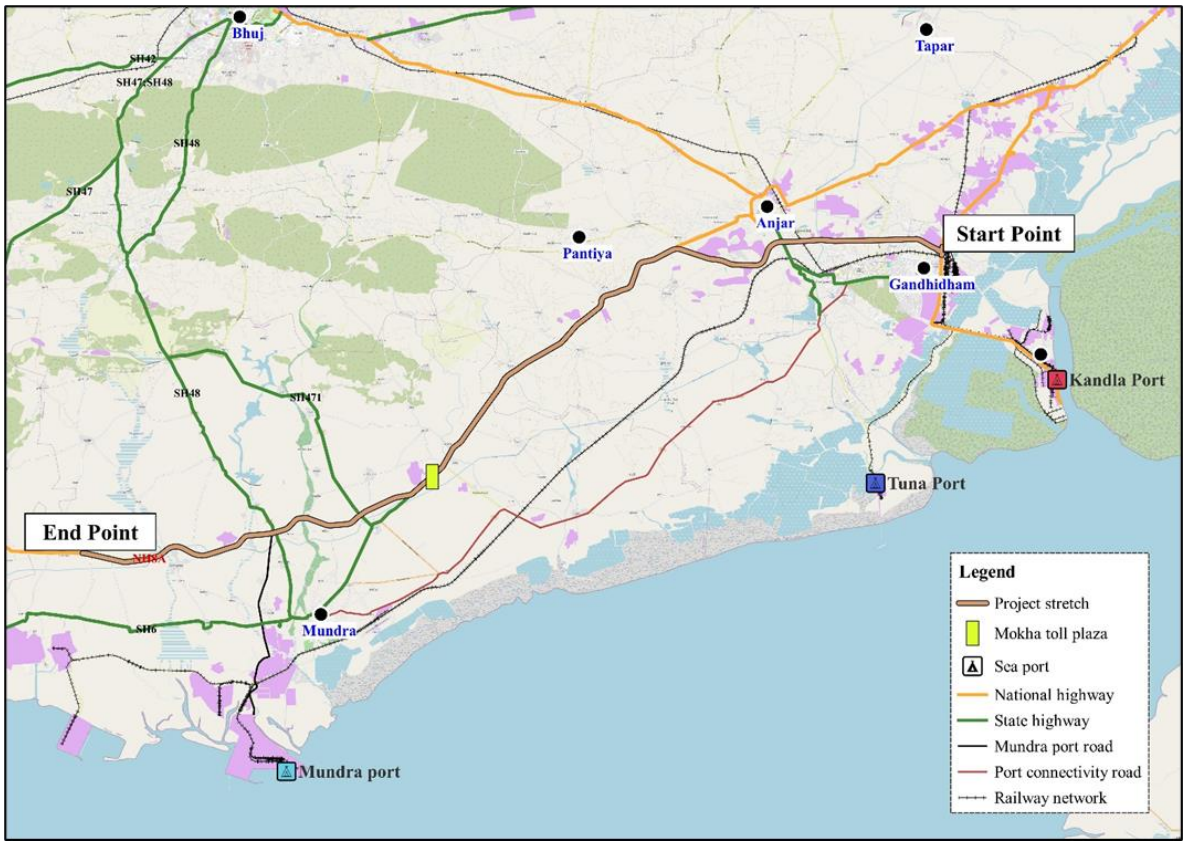
For further details in relation to Asset 24 and Asset 25, please refer to **Annexure C** of this Preliminary Placement Document.

Gandhidham (Kandla) to Mundra Port section of NH-41 ("Asset 26")

Project Overview

According to Traffic Consultant project road Gandhidham-Mundra is a 4-lane, 71.400 kms long stretch with 8.730 kms Anjar bypass, on national highways (NH) 8A/41 which connects Gandhidham and Mundra. Project road gives connectivity to Mundra port & Kandla Ports in the west region. The project stretch has one toll plaza by the name of Mokha which lies at the chainage of km 44+500 near Mokha Village. Most of the traffic is originating/destined to Mundra port. Around 61% of the truck is container trucks.

Figure 1-1: Project Road



Source: Open Street Map, CRISIL India

Salient growth features and traffic generators

Container traffic holds major share around 61% in the overall traffic. Project road gives connectivity to two important seaports in the region which are Mundra Port and Kandla Port. Mundra Port, located in Gujarat, India, is the largest commercial port in the country and a critical hub for container traffic. It handles a significant volume of cargo, including containers, dry bulk, liquid bulk, and automobiles. The port's strategic location on the western coast of India allows it to serve the vast hinterland regions, including the National Capital Region, Gujarat, Punjab, Rajasthan, and Madhya Pradesh. Mundra Port operates five container terminals across 12 berths, with a combined capacity of 9.5 million TEUs (twenty-foot equivalent units). India's container traffic decadal growth (FY14-FY24) is around 7.7% and Mundra port's container traffic decadal growth (FY14-FY24) is around 12.0%.

Second most carried commodity is tiles and ceramics, which is around 5.3%. The Morbi Ceramic Cluster, located in Gujarat, India, is one of the largest and most significant ceramic industry clusters in the world. It is situated about 250 km from Ahmedabad and is renowned for its extensive production of ceramic products. The cluster

comprises over 600 units, producing a wide range of items including wall tiles, floor tiles, vitrified tiles, polished glazed vitrified tiles, and sanitary ware.

Traffic volume and composite of vehicles

Traffic Survey Data

The following table shows the TVC seven-day traffic count of Gandhidham (Kandla)-Mundra Port section of NH-8A/41:

Table 1 1: Average Daily Traffic (ADT) from Traffic Volume Count Survey

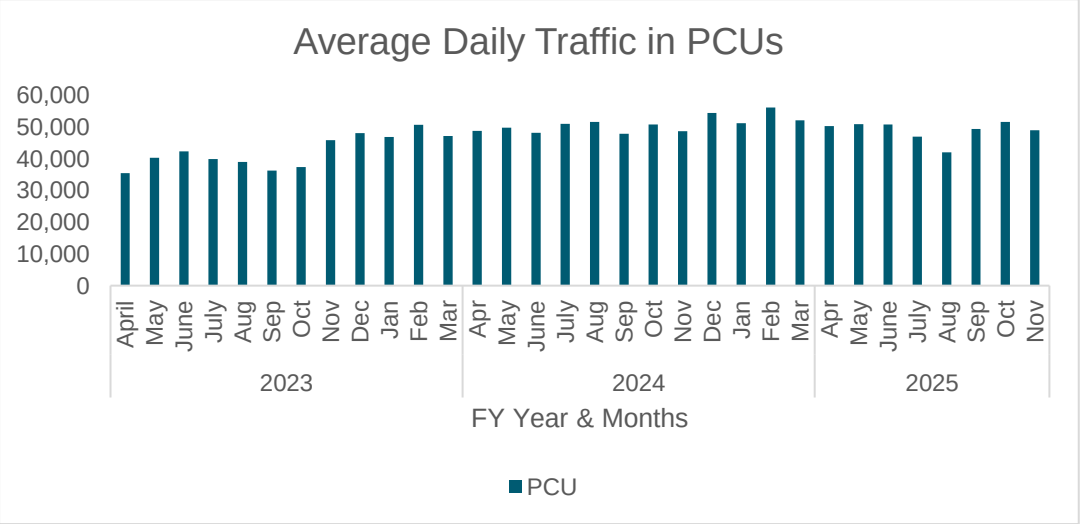
Date	Days	Car	LCV + 2 Axle	3-axle	MAV	Vehicles	PCUs
7/28/2024	Sunday	2,155	366	608	9,614	12,743	48,114
7/29/2024	Monday	2,167	518	534	8,430	11,649	42,963
7/30/2024	Tuesday	2,092	552	635	9,014	12,293	45,930
7/31/2024	Wednesday	2,056	646	703	9,740	13,145	49,564
8/1/2024	Thursday	2,252	592	671	9,880	13,395	50,110
8/2/2024	Friday	2,018	524	662	9,444	12,648	47,761
8/3/2024	Saturday	2,800	562	627	9,307	13,296	47,874
ADT		**2,220**	**537**	**634**	**9,347**	**12,738**	**47,473**

Source: Crisil India

Historical Traffic Data

The chart below shows the average daily traffic on Gandhidham-Mundra stretch from April 2022 to November 2024.

Figure 1-2: Historic Monthly Average Daily Traffic (MADT) in PCU



Source: Crisil India

Overloading scenario on the project stretch

To ascertain the quantum of overloading, a seven-day axle load survey was done by the technical consultants of the client. The results of axle load survey provided by the client, reveal that overloaded vehicles form a sizeable share of vehicles across categories. As per the survey, 41% of the MAVs, 40% of 3 axle and 3% of the 2 Axle vehicles are overloaded (considering more than 5% overload than permissible limits).

Tiles, Wood, Rice and Coal are key commodities which are overloaded.

As per discussions with the client, it is proposed that overloading will be levied on 25% of MAV and 3 Axle vehicles which are overloaded for more than 20% of the threshold and applied to the traffic which is travelling with trip length of less than 350kms and excluding commodities like fruits & vegetables, petroleum products and machinery. The quantum of vehicles for charging overloading penalty is decided after considering the practical numbers which can be charged per lane per hour. The revenue potential is arrived at, by considering an overloading levy equivalent to 1x of single journey toll rates.

Following table shows the overloading scenario for commercial vehicles on the stretch.

Table 1-2: Overloading survey Analysis

Direction	Vehicle Category	Sample	>5% overload	>20% overload	>5% overload	>20% overload
Overall	MAV	723	296	78	41%	11%
Overall	2A	107	3	0	3%	0%
Overall	3A	111	44	11	40%	10%
Gandhidham-Mundra	MAV	391	161	52	41%	13%
Gandhidham-Mundra	2A	36	2	0	7%	1%
Gandhidham-Mundra	3A	51	30	9	58%	17%
Mundra-Gandhidham	MAV	331	134	26	41%	8%
Mundra-Gandhidham	2A	71	1	-	1%	0%
Mundra-Gandhidham	3A	60	14	3	23%	4%

Source: Crisil India

Toll Segmentation

Based on detailed review of historic trends of trip segmentation, the below table presents a segmentation which is considered for the traffic based on the historic data.

Table 0-32: Trip segmentation

Vehicle category	Single journey	Return journey	Local Commercial Discount	Discount Monthly Local Pass	Exemptions
Car, jeep, van or LMV	26.5%	31.0%	0.0%	4.9%	37.6%
LCV, light goods vehicle, or minibus	25.8%	47.9%	2.0%	0.0%	24.3%
Bus or truck (2-axle)	36.4%	59.0%	3.5%	0.1%	1.0%
3-axle truck	17.6%	24.2%	38.0%	11.9%	8.3%
HCM, EME or MAV (4-6 axle)	26.1%	19.0%	42.0%	10.7%	2.2%

Source: Crisil India

The table below provides the traffic growth rates considering various diversion/impactsG:

Table 0-33: Projected Traffic Growth Rates

Vehicle Type	FY 25-26	FY 26-30	FY 30-35	FY 35-40	FY 40-45	FY 45-55
Car/Jeep/Van	7.0%	6.4%	5.5%	4.6%	3.8%	2.9%
Minibus	3.0%	2.9%	2.6%	2.4%	2.1%	1.8%
2 Axle Bus	3.0%	2.9%	2.6%	2.4%	2.1%	1.8%
LCV	5.0%	4.1%	4.0%	3.2%	1.7%	0.6%
Truck	2.5%	1.9%	3.3%	2.5%	1.1%	0.2%
3 Axle Truck	2.5%	1.8%	2.4%	1.6%	0.3%	0.0%
MAV	5.7%	5.2%	6.0%	5.2%	3.8%	1.8%
OSV	7.2%	6.2%	6.0%	5.2%	3.8%	1.8%
Total Vehicles	**5.7%**	**5.2%**	**5.7%**	**4.9%**	**3.6%**	**2.0%**
Total PCU	**5.6%**	**5.1%**	**5.8%**	**5.0%**	**3.7%**	**1.8%**
Revenue Growth	**9.4%**	**9.6%**	**10.2%**	**9.4%**	**7.8%**	**6.0%**

Source: Crisil India

Table 0-34: Projected Traffic

Vehicle Type	FY 25	FY 30	FY 35	FY 40	FY 45	FY 55
Car/Jeep/Van	2,385	3,271	4,268	5,337	6,438	8,601
Minibus	17	20	22	25	28	33
2 Axle Bus	181	208	237	266	296	354
LCV	142	175	213	248	271	286
Truck	216	239	281	317	336	343
3 Axle Truck	626	690	776	841	852	851
MAV	10,266	13,296	17,833	22,996	27,676	33,210
OSV	9	12	16	21	25	30
Total Vehicles	**13,841**	**17,911**	**23,645**	**30,051**	**35,921**	**43,709**
Total PCU	**51,928**	**66,861**	**88,821**	**113,595**	**135,990**	**163,306**

Source: Crisil India

Tollable Length and Toll Rates

In terms of tollable length of 78.500 Km, includes road length of 61.881 Kms (excluding 0.7889 km of structure) and Anjar bypass length of 8.730 kms. In India, toll rates are as per notification by the Ministry of Road Transport and Highways in the National Gazette. The present toll rates are determined with reference to the published base toll rates and are adjusted annually at the beginning of each fiscal year equal to 40% of the movement in the wholesale price index in December of the preceding year plus a fixed 3%.

As per Gazette notification dated 05.12.2008, under National Highways Fee (Determination of Rates and Collection) Rules 2008 [GSR 838 (E)] and as per new gazette [S.O. 3272(E)] notification for the Mokha Plaza in July 2023, the per km toll rates applicable from 2007/08 for normal tolling length and permanent structure, the revision basis and concessions are provided.

Toll rates at Mokha Toll Plaza, calculated as per schedule-M data, applicable until March 2025 (2024-25) are as provided below:

Table 1-6: Toll Rates

Type of vehicle	Single Journey	Return Journey	Monthly Pass	Commercial Vehicle Discount
Car/Jeep/Van	120	180	4,050	60
LCV	195	295	6,545	100
Bus/Truck	410	615	13,710	205
3 Axle Vehicle	450	675	14,960	225
MAV/4 to 6 Axle	645	970	21,500	325
HCM/EME	645	970	21,500	325
7 or more Axle	785	11,80	26,175	395

Source: Crisil India

For further information on Asset 26 please see Annexure C

Revalidation of Traffic and Revenue Estimates Based on Recent Data

IBI India, Ramboll India Private Ltd, and CRISIL Market Intelligence & Analytics were engaged to carry out a review of the earlier traffic and revenue forecasts pertaining to the Traffic Report submitted by the Traffic Consultants in relation to the Existing Toll Roads, based on the actual traffic/ revenue data up to the month of November 2024 ("Revalidation Note"). In the Revalidation Note, IBI India Private Limited, Ramboll India Private Ltd, and CRISIL Market Intelligence & Analytics has confirmed that the previous estimates of traffic and revenue for the Existing Toll Roads provided in the Traffic Reports for Fiscal Year 2024 and beyond has been updated with the revised GDP and WPI forecasts, as used in Target Toll Roads. Provided below is the asset wise summary of the traffic forecast as presented in the detailed Revalidation Note, is annexed as Annexure C.

For Round 1 ("R1") Assets;

FY	Chittorgarh Kota Project				Belgaum Kagal Project			Kothakota Kurnool Project	Aburoad Palanpur Project	Aburoad Swaroopganj Project
	Bassi TP	Aroli TP	Dhaneshwar TP	Average	Hattargi TP	Kognoli TP	Average			
2025	11,178	11,799	13,118	12,032	35,752	38,134	36,943	41,494	35,387	39,173
2026	12,075	12,821	14,316	13,071	38,109	40,547	39,328	43,730	38,570	40,405
2027	12,853	13,639	15,226	13,906	40,607	43,101	41,854	43,385	40,501	42,405
2028	13,637	14,464	16,149	14,750	42,581	45,133	43,857	44,304	42,806	44,781
2029	14,433	15,300	17,085	15,606	44,571	47,180	45,876	45,104	45,131	47,176
2030	15,195	16,102	17,982	16,426	46,469	49,130	47,799	47,236	47,347	49,458
2031	15,931	16,876	18,848	17,219	45,193	47,917	46,555	49,269	49,676	51,856
2032	16,703	17,688	19,757	18,050	45,412	48,194	46,803	51,404	52,123	53,634
2033	17,514	18,540	20,710	18,921	45,586	48,427	47,007	53,645	53,904	56,239
2034	18,364	19,434	21,710	19,836	47,504	50,396	48,950	55,998	56,563	60,247
2035	19,240	20,356	22,741	20,779	49,477	52,420	50,948	58,426	60,745	63,129
2036	20,143	21,304	23,802	21,750	51,325	54,321	52,823	60,929	63,642	66,098
2037	21,071	22,280	24,893	22,748	53,215	56,262	54,738	63,505	66,624	69,154
2038	22,025	23,282	26,014	23,774	55,144	58,242	56,693	66,155	69,690	72,294
2039	23,003	24,310	27,164	24,826	57,112	60,261	58,687	68,878	72,838	75,518
2040	24,007	25,363	28,343	25,904	59,118	62,316	60,717	71,673	76,068	78,823
2041	25,034	26,442	29,550	27,008	61,159	64,407	62,783	74,538	79,380	82,211
2042	26,084	27,544	30,783	28,137	63,235	66,532	64,883	77,472	82,771	85,678
2043	27,157	28,670	32,042	29,290	65,343	68,688	67,016	80,472	86,236	89,220
2044	28,251	29,818	33,327	30,465	67,483	70,876	69,179	83,538	89,773	92,835

2045	29,366	30,987	34,635	31,663	69,651	73,091	71,371	86,665	93,379	96,518
2046	30,500	32,177	35,965	32,881	71,846	75,332	73,589	89,853	97,050	100,266
2047	31,652	33,386	37,317	34,118	74,065	77,597	75,831	93,097	100,780	104,075
2048	32,821	34,612	38,689	35,374	76,306	79,883	78,095	96,394	104,567	107,940
2049	34,006	35,854	40,078	36,646	78,567	82,188	80,378	99,740	108,405	111,856
2050	35,205	37,111	41,484	37,933	80,844	84,509	82,677	103,132	112,288	115,819
2051	36,446	38,412	42,940	39,266	83,193	86,901	85,047	106,652	116,315	119,926
2052	37,732	39,760	44,447	40,647	85,615	89,367	87,491	110,304	120,491	124,184

For Round 2 (“R2”) Assets;

FY	Borkhedi – Kelapur Project			Agra Bypass Project	Jhansi – Shivpuri Project
	Dakoda TP	Kelapur TP	Average		
2025	22,446	23,420	22,933	31,510	16,738
2026	23,668	24,695	24,182	32,501	17,668
2027	23,711	24,769	24,240	34,301	18,627
2028	23,922	25,018	24,470	36,206	18,871
2029	24,836	25,982	25,409	38,128	18,971
2030	25,999	27,199	26,599	40,037	19,030
2031	27,221	28,477	27,849	42,045	20,011
2032	28,129	29,439	28,784	44,159	21,028
2033	29,064	30,430	29,747	46,383	22,082
2034	30,440	31,871	31,156	48,724	23,173
2035	31,860	33,357	32,609	51,144	24,279
2036	33,324	34,890	34,107	53,643	25,422
2037	34,831	36,467	35,649	56,221	26,600
2038	36,382	38,090	37,236	58,877	27,814
2039	37,974	39,757	38,866	61,612	29,065
2040	39,609	41,468	40,539	64,422	30,328
2041	41,285	43,222	42,254	67,307	31,629
2042	43,001	45,018	44,010	70,266	32,970
2043	44,755	46,854	45,805	73,297	34,351

For Round 3 (“R3”) Assets;

FY	Hubli Haveri Chitradurga project	Orai Bara	Lakhnadon Khawasa Project	Assam Roads Project

					h Project							
	Bankapur TP	Chalageri TP	Hebbalu TP	Average		Madai TP	Khawasa TP	Average	Patgaon TP	Dahalpara TP	Galia TP	Average
2025	30,040	28,913	29,767	29,573	33,461	27,432	25,613	26,523	18,345	21,225	22,128	20,566
2026	32,325	31,139	32,065	31,843	35,617	28,563	26,814	27,689	19,263	22,363	23,340	21,655
2027	34,768	33,518	34,523	34,270	37,886	28,801	27,326	28,064	20,216	21,256	22,293	21,255
2028	36,690	35,373	36,463	36,176	40,052	29,840	28,438	29,139	20,621	20,668	21,686	20,992
2029	38,641	37,256	38,433	38,110	41,091	31,018	29,561	30,290	20,901	22,460	23,515	22,292
2030	40,513	39,063	40,325	39,967	42,558	32,529	31,018	31,774	21,802	23,989	25,082	23,624
2031	38,511	36,989	38,341	37,947	44,021	34,116	32,551	33,334	22,746	25,018	26,156	24,640
2032	38,297	36,701	38,150	37,716	46,271	35,785	34,162	34,974	23,734	26,096	27,280	25,703
2033	37,996	36,322	37,875	37,398	48,642	37,538	35,856	36,697	24,768	27,224	28,458	26,817
2034	39,829	38,074	39,738	39,214	51,139	39,381	37,636	38,509	25,850	28,406	29,692	27,983
2035	41,727	39,888	41,671	41,095	53,724	41,285	39,476	40,381	26,964	29,622	30,963	29,183
2036	43,533	41,615	43,507	42,885	56,398	43,248	41,374	42,311	28,108	30,872	32,270	30,417
2037	45,391	43,390	45,398	44,726	59,159	45,271	43,330	44,301	29,283	32,156	33,613	31,684
2038	47,299	45,214	47,341	46,618	62,008	47,353	45,343	46,348	30,487	33,472	34,991	32,983
2039	49,259	47,086	49,338	48,561	64,943	49,492	47,412	48,452	31,721	34,822	36,404	34,316
2040	51,267	49,005	51,386	50,553	67,964	51,690	49,538	50,614	32,984	36,203	37,851	35,679
2041	53,325	50,971	53,485	52,593	70,728	53,946	51,721	52,834	34,274	37,616	39,331	37,074
2042	55,429	52,982	55,633	54,681	73,553	56,258	53,959	55,109	35,591	39,059	40,844	38,498
2043	57,580	55,036	57,830	56,815	76,436	58,625	56,251	57,438	36,935	40,531	42,387	39,951
2044	59,775	57,133	60,073	58,994	79,376	61,044	58,594	59,819	38,303	42,031	43,961	41,432

*For RKJL & CHK, no updates in traffic

Operations

Toll collection system

Toll is collected for each journey through each of the toll plazas. Signs setting out the toll rates for the Toll Road assets are displayed at the toll booths and tolls can be paid or tendered by the driver of any vehicle in the following manners:

Cash

Tolls paid by means of cash are collected by toll collectors at the manual toll booths.

Electronic toll collection

To ensure seamless traffic movement through toll plazas and increase transparency in collection of user fees using FASTag, the National Electronic Toll Collection (NETC) programme has been implemented on a pan-India basis. FASTags are simple to use reloadable tags to enable automatic deduction of toll charges from a pre-paid account without having to stop at toll plazas for cash transactions.

FASTag was started as a pilot project in 2014 on the stretch of Golden Quadrilateral between Mumbai and Ahmedabad. It was later extended to other toll plazas, with the FASTag use made mandatory across the country in February 2021. To ease

the process of getting a FASTag for citizens, the Ministry also mandated that all vehicles manufactured after December 2017 should be pre-fitted with a FASTag. This reform has been immensely beneficial for citizens and toll plaza operators.

Transition to 100% FASTag was implemented w.e.f 15th February, 2021 and thereafter, significant increase in toll collection through FASTag has been observed**.** (*Source: CRISIL Report*)

Monitoring

Toll collection

Payments at the toll plazas, both electronic as well as cash payments, are processed through a semi-automated or a fully automated toll collection system, depending on complexity of the project. Both these systems collect and store traffic and payment data, thereby reducing the need for manual operation. A semi-automated system consists of a revenue collection software desktop, a barrier gate, smart cards and monitoring cameras and a fully automated system includes equipment such as vehicle counting classifier, vehicle audit system, communication channels and traffic control equipment in addition to all the components of a semi-automated system.

For the purpose of identifying categories of vehicles and to charge an appropriate toll rate, the automatic vehicle identification based in-road/infrared sensors are also used. The Project SPVs would use weigh-in-motion technology for projects where weight-based toll collection is mandated. The weight based tolling systems are integrated with the fully automatic toll collection system for enhanced revenue controls.

There are cameras installed particularly for capturing and recording any toll evasion incidents by vehicles. There is also a back-up power supply system to ensure that there is no interruption to power supply at the toll plazas in order to maintain a stable power supply for the sub-systems and equipment. Servers used in the toll collection systems at the toll plazas are capable of real time uploading of transaction data from toll lane equipment and performing an automatic daily backup to prevent any toll data loss and to enable quick system recovery, which would allow the Project SPVs to collect variable amounts of tolls depending on the class of motor vehicles and serves as a traffic information system.

Only certain authorised persons have access to the toll collection systems and the activities are recorded for security purposes. The Project SPVs are responsible for operating the toll collection system at its toll plaza and taking regular preventive and corrective measures to maintain such systems at the highest levels of security and reliability.

Traffic control

There are helpline numbers displayed along the national highways for communication between the road users and the control room in case of any emergency. This provides a reliable communication channel for the road users in cases of an exigency where they need to communicate with staff at the Control Room. The Project SPVs would take regular preventive and corrective measures to maintain the emergency telephone system at the highest levels of reliability and safety. The Project SPVs are required to carry out regular patrolling and regulate and maintain traffic order within the projects. Emergency telephone systems and emergency helpline numbers are provided at all projects where such systems and numbers are required by the Concession Agreement. There are also patrol vehicles that continuously move on the section of the project that it is assigned to, which will intervene to regulate traffic and carry out surveillance activities.

Traffic and motorway assistance services

Traffic assistance

The Project SPVs would provide emergency assistance to motorists using the toll roads. They station patrol/light recovery vehicles on each toll road, which are deployed to patrol the toll roads on a continuous basis.

In the case of a vehicle breakdown or traffic accident, the Control Room will announce the occurrence via mobile phones or handsets to instruct a mobile supervisor and a recovery supervisor to proceed to the scene immediately, and file relevant reports with the police if personal injury is involved. At the scene of a traffic accident or vehicle breakdown, the mobile supervisor will report to the Control Room on the situation of the incident, ensure safety of the scene and apply first aid to injured persons, if any. The recovery supervisor will determine whether the vehicle can be recovered on site or deploy recovery vehicles for towing. The traffic officer will stop the traffic, close the affected lane where necessary and direct trapped vehicles away to other unaffected lanes.

Safety Measures

Under the Concession Agreement, the concessionaire is obligated to abide by certain safety requirements, which include measures such as road signs, pavement marking, traffic control devices, roadside furniture, highway design elements, enforcement and emergency response. The concessionaire must abide by among others, applicable laws and applicable permits, the Manual for Safety in Road Design as issued by the Ministry of Shipping, Road Transport and Highways, relevant standards and guidelines of the Indian Roads Congress and good industry practice. NHAI also carries out safety audits of the projects by appointing a safety consultant employing a team comprising of, among others, one road safety

expert and one traffic planner. These safety requirements apply to all phases of construction, operations and maintenance with emphasis on identification of factors associated with accidents and implementation of appropriate remedial measures.

Management

We are managed by qualified personnel of the Investment Manager and Investment Committee, with members who have management and operational experience in the roads and highways sector. For further details about the Investment Manager, please see the sections headed "*Parties to the Trust*" on page 75 of this Preliminary Placement Document.

The Investment Manager, in consultation with the Trustee, has appointed a majority of the directors on the board of the Project SPVs in accordance with the InvIT Regulations, and such directors form part of the quorum. The Project SPVs' board of directors have also formed committees, as applicable and required, under the Companies Act, 2013 and rules made thereunder.

Seasonality

Traffic volume tends to decrease during the monsoon season and conversely tends to increase during holiday seasons. While the northern parts of India experience monsoon rains during the period from June or July until September or October every year, the southern parts of India, especially coastal parts of Andhra Pradesh, experience monsoon rains even during the months of October to December. The monsoon season may also restrict the Trust's ability to carry on activities related to its operations and maintenance of toll roads. For further details on risk associated with seasonality, please see the section headed "*Risk Factors*" on page 43 of this Preliminary Placement Document. Conversely, traffic volume tends to increase during holiday seasons.

Property

The Investment Manager's corporate office is located in G - 5 & 6, Sector 10, Dwarka, New Delhi – 110075 from which all its administrative and reporting activities are conducted.

Insurance

The Trust's operations are subject to hazards inherent in providing operations and maintenance services, such as risk of equipment failure, work accidents, fire, earthquake, flood and other force majeure events. This includes hazards that may cause injury and loss of life, damage and destruction of property, equipment and environmental damage. NWPPL, in relation to itself and the Existing Toll Roads, has obtained insurance coverages, including, but not limited to, fire and special perils, loss of profit, fidelity guarantee and burglary. NSPPL shall obtain insurance with respect to the Target Toll Roads, in accordance with the relevant Concession Agreements.

Legal Proceedings

The Project SPVs, the Sponsor, the Investment Manager, the Project Manager and the Trustee may be involved in legal proceedings or claims from time to time. As on date of the Preliminary Placement Document, certain proceedings or claims involving the Sponsor and certain of its Associates and the Trustee, are currently pending at different levels of adjudication before various courts, tribunals and regulatory authorities. For a description of the material legal proceedings that are outstanding, please see the section entitled "*Legal and other Information*" on page 408 of this Preliminary Placement Document.

SUMMARY OF THE CONCESSION AGREEMENTS

Except as disclosed herein, for an overview of the summary of R1 and R2 Concession Agreements, please see the section entitled "Summary of the Concession Agreements" on page 152 of the R2 Placement Document available at https://www.bseindia.com/downloads1/NHIT_PD.pdf and for overview of the summary of R3 Concession Assets, please see the section entitled "Summary of the Concession Agreements" on page 232 of the R3 Placement Document available at https://nhit.co.in/pdf/communication-to-stock-exchange/NCDs/Project-Leap-Placement-Document_15.03.2024.pdf.

The following are summaries of the concession agreements entered into by the NHIT Southern Projects Private Limited in relation to Target Toll Roads. The descriptions and summaries of the agreements below are not, nor do they purport to be complete descriptions or summaries of all terms of such agreements. Certain terms used in this section have the meaning assigned to them in the respective concession agreements. Copies of these concession agreements are also available for inspection at the registered office of the Trust.

1. ***Concession Agreement between NSPPL ("Concessionaire") and NHAI in respect of the Narasannapeta to Ranasthalam Project dated*** **March 12, 2025**

The Concessionaire has entered into a concession agreement for tolling, operation, maintenance and transfer of Narasannapeta to Ranasthalam Project (as defined below) on toll, operate and transfer (TOT) basis (the "**Narasannapeta to Ranasthalam Concession Agreement**"), for a period of 20 years from the the Appointed Date (i.e., the date on which all Conditions Precedent have been satisfied) or such date on which the Narasannapeta to Ranasthalam Concession Agreement is terminated by a termination notice ("**Narasannapeta to Ranasthalam Concession Period**").

Certain Definitions

"**Narasannapeta to Ranasthalam Project**" means the operation and maintenance of the Narasannapeta to Ranasthalam Project Highway in accordance with the provisions of the Narasannapeta to Ranasthalam Concession Agreement and includes all works, services and equipment relating to or in respect of the scope of the Narasannapeta to Ranasthalam Project as set forth in the Narasannapeta to Ranasthalam Concession Agreement;

"**Narasannapeta to Ranasthalam Project Assets**" means all physical and other assets relating to and forming part of the Site including (a) rights over the Site in the form of licence, Right of Way or otherwise; (b) tangible assets such as civil works and equipment including foundations, embankments, pavements, road surface, interchanges, bridges, culverts, road overbridges, drainage works, traffic signals, sign boards, kilometre- stones, toll plazas, electrical systems, communication systems, rest areas, relief centers, maintenance depots and administrative offices; (d) all rights of the Concessionaire under the project agreements; security deposits; insurance proceeds; and (e) Applicable Permits and authorisations relating to or in respect of the Narasannapeta to Ranasthalam Project Highway, but does not include Additional Facilities; and

"**Narasannapeta to Ranasthalam Project Highway**" means the Site comprising the existing road comprising:

Stretch	State	Start (Km)	End (Km)	Length
Narasannapeta to Ranasthalam	Andhra Pradesh	580+671	634+470	53.799

and all Narasannapeta to Ranasthalam Project Assets."

Grant of Concession

Subject to and in accordance with the terms and conditions set forth in the Narasannapeta to Ranasthalam Concession Agreement, NHAI has granted to the Concessionaire, and the Concessionaire has accepted the concession for a period of 20 years, including the exclusive right, license and authority during the subsistence of the Narasannapeta to Ranasthalam Agreement to demand, collect and appropriate Fee, operate, manage and maintain the Narasannapeta to Ranasthalam Project Highway. Notwithstanding anything to the contrary in the Narasannapeta to Ranasthalam Concession Agreement, the parties have expressly agreed that the Concession Period shall not be reduced by more than 5 (five) years, or shall not be increased by more than 10 (ten) years on any account or for any reason whatsoever.

Subject to and in accordance with the terms and conditions set forth in the Narasannapeta to Ranasthalam Concession Agreement, the Concessionaire is entitled to undertake the following in accordance with the terms of the Narasannapeta to Ranasthalam Concession Agreement, applicable laws and applicable permits:

i. Right of Way, access and license to the Site for the purpose of and to the extent conferred by the provisions of the Narasannapeta to Ranasthalam Concession Agreement;

ii. manage, operate and maintain the Narasannapeta to Ranasthalam Project Highway and regulate the use thereof by third parties in accordance with the terms of Narasannapeta to Ranasthalam Concession Agreement;

iii. demand, collect and appropriate the fees from vehicles and persons liable for payment of fees for using the Narasannapeta to Ranasthalam Project Highway or any part thereof and refuse entry of any vehicle to the Narasannapeta to Ranasthalam Project Highway if the fee due is not paid;

iv. perform and fulfill all of the Concessionaire's obligations under and in accordance with the Narasannapeta to Ranasthalam Concession Agreement;

v. bear and pay all costs, expenses and charges in connection with or incidental to the performance of the obligations of the Concessionaire under the Narasannapeta to Ranasthalam Concession Agreement; and

vi. neither assign, transfer or sublet or create any lien or encumbrance on the Narasannapeta to Ranasthalam Concession Agreement, or the concession granted thereby, or on the whole or any part of the Narasannapeta to Ranasthalam Project Highway nor transfer, lease or part possession thereof, save and except as expressly permitted by the Narasannapeta to Ranasthalam Concession Agreement.

Fees

The Concessionaire is entitled to, during the Narasannapeta to Ranasthalam Concession Period, levy, collect and appropriate fees from users ("**User Fee**") of the Narasannapeta to Ranasthalam Project Highway pursuant to and in accordance with the provisions in the Narasannapeta to Ranasthalam Concession Agreement and the Fee Rules and to appropriate the same. In accordance with the terms of the Narasannapeta to Ranasthalam Concession Agreement, the Concessionaire shall not collect any fees in relation to exempted vehicles. The fees collected by Concessionaire shall be deposited in the escrow account and appropriated in accordance with the relevant provisions of the Narasannapeta to Ranasthalam Concession Agreement.

Sub Rule 6(6) of the above-mentioned Fee Rules states,

"(a) The fee shall be collected by the Central Government or the executing Authority as the case may be and for a specified period in accordance with the terms of agreement entered by the Concessionaire.
(b) The fee as notified as per Narasannapeta to Ranasthalam Concession Agreement shall be leviable till the end of the concession period and after the Concession Agreement is over, the fee shall be collected by the Central Government executing authority at a reduced rate of 40% of the fee on the date of transfer of such section of National Highways, bridge, tunnel or bypass, as the case may be, to be revised annually in accordance with these rules:

Provided that after the recovery of capital cost through user fee realised, in respect of a public funded project, the fee leviable would be reduced to 40% of the user fee for such section of National Highways, bridge, tunnel or bypass as the case may be, to be revised annually in accordance with these rules." In respect of the above, NHAI has clarified that Rule 6 of the Fee Rules provides that the user fee to be notified by Government as per the format of Schedule M of Concession Agreement shall be leviable till the end of the concession period. Hence, the rate of User Fee rate shall only be reduced after the concession period is over."

Concession Fees

As consideration for the grant of the Concession, the Concessionaire is required to pay a concession fee to NHAI equivalent to ₹ 13,883.00 million, within 120 days of the date of execution of the concession agreement or any extended date as agreed by NHAI prior to the Appointed Date as a Condition Precedent. The Concessionaire agrees that payment of the concession fee constitutes essential condition of the Concession Agreement. Further as communicated by the authority by way of a letter dated 13.02.25, any amount raised from the proceeds of the Issue in excess of the Base Concession Fee (being the aggregate of Concession Fees payable to NHAI in terms of the Additional Concession Agreements) shall be paid to the Authority. For further details, see the section titled "Use of Proceeds – Details of Utilisation of Issue Proceeds - Infusion of debt and/or equity into NSPPL" on page 355. For the purposes of stamp duty payment, concession agreements are generally considered to be agreements which are not lease deeds and stamp duty of ₹ 100.00 is typically paid for such concession agreements. However, stamp duty authorities of certain states in India have issued notices to some concessionaires alleging inadequate stamp duty on the concession agreements executed between the concessionaires and the NHAI. The stamp authorities allege that since concession agreements relate to the letting of tolls to the concessionaires in the form of leases, or as development agreements, such agreements were required to be stamped as lease agreements or development agreements, as applicable. The stamp duty for a lease agreement or a development agreement ranges between 1.0% and 11.0% of the annual rent or premium payable or the market value of the property. Furthermore, stamp duty authorities may impose penalties for payment of inadequate stamp duty, which could extend up to ten (10) times the amount of the stamp duty payable. Accordingly, concession agreements that have not been stamped as such could be considered to be inadequately stamped. The High Courts of Allahabad and Maharashtra have also held that a concession agreement ought to be stamped as a lease agreement and have upheld the imposition of a higher stamp duty on such agreements.

While we have paid stamp duty of ₹ 100.00 on each of our Concession Agreements in accordance with usual practice, if any demand for payment of a higher stamp duty or penalty is imposed, it would increase the costs of the Toll Roads.

In respect of above, NHAI has clarified that:

(i) As on the date of the Narasannapeta to Ranasthalam Concession Agreement, GST is not applicable on Concession Fee. However, if it becomes applicable at a later stage, this shall be considered as change in law.

(ii) There is no requirement of stamp duty in case of Concession Agreements since Fee Rules provided for levy and collection of user fee and not toll tax. In case, in future any such demand arises, it shall be treated as change in law.

Escrow Account

The provisions in relation to the escrow account in the Narasannapeta to Ranasthalam Concession Agreement are only applicable if the obligations of the Concessionaire under Narasannapeta to Ranasthalam Concession Agreement are financed by the Lenders.

The Concessionaire shall, prior to the Appointed Date, open and establish the escrow account with the escrow bank and all funds constituting the financing package related to the Narasannapeta to Ranasthalam Project shall be credited to such escrow account. During the Narasannapeta to Ranasthalam Concession Period all fees and any other revenues including the proceeds of any rentals, deposits, capital receipts or insurance claims from or in respect of the Narasannapeta to Ranasthalam Project Highway shall be deposited therein. In addition, all payments by NHAI pursuant to the Narasannapeta to Ranasthalam Concession Agreement, including, if any, in relation to the change of scope in the Narasannapeta to Ranasthalam Project shall be deposited by NHAI in the escrow account.

Withdrawals from Escrow Account

The Concessionaire shall, at the time of the opening of the escrow account, give irrevocable instructions by way of an escrow agreement substantially in form set forth in the Narasannapeta to Ranasthalam Concession Agreement to the escrow bank instructing, *inter alia*, that the deposits into the escrow account shall subject to the provisions of the Narasannapeta to Ranasthalam Concession Agreement, be appropriated in the following order every month and if not due in a month then appropriated proportionately in such month and retained in the escrow account and paid out therefrom in the month when due unless otherwise expressly provided in the instruction letter:

i. all taxes due and payable by the Concessionaire for and in respect of the Narasannapeta to Ranasthalam Project Highway;

ii. concession fee;

iii. all payments relating to construction of the Narasannapeta to Ranasthalam Project Highway, subject to and in accordance with the conditions, if any, set forth in the financing agreements;

iv. operation and maintenance expenses;

v. operation and maintenance expenses and other costs and expenses incurred by NHAI in accordance with the provisions of the Narasannapeta to Ranasthalam Concession Agreement, and certified by NHAI as due and payable to it;

vi. monthly proportionate provision of debt service payment due in an accounting year;

vii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Withdrawals upon Termination

Notwithstanding anything to the contrary contained in the escrow agreement and subject to the provisions of the Narasannapeta to Ranasthalam Concession Agreement, in the case of termination, the amounts standing to the credit of the escrow account shall be appropriated in the following order:

i. all taxes due and payable by the Concessionaire for and in respect of the Narasannapeta to Ranasthalam Project Highway;

ii. payment due to the lenders;

iii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire;

iv. retention and payments relating to the liability for defects and deficiencies;

v. incurred or accrued operation and maintenance expenses;

vi. any other payments required to be made under the Narasannapeta to Ranasthalam Concession Agreement; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Change of Scope

NHAI may, notwithstanding anything to the contrary contained in the Narasannapeta to Ranasthalam Concession Agreement, require the Concessionaire to make alterations/ modifications in the scope of the Narasannapeta to Ranasthalam Project as contemplated by the Narasannapeta to Ranasthalam Concession Agreement. If the cumulative costs relating to all the change of scope orders exceed 5% of the concession fee in any continuous period of 3 years immediately preceding the date of such change of scope order or if such cumulative costs exceed 25% of the concession fee at any time during the Narasannapeta to Ranasthalam Concession Period, NHAI may award any works or services, to any person on the basis of open competitive bidding and the Concessionaire shall be entitled to take part in such competitive bidding with a right to match the first-ranked bid in terms of the selection criteria, either by itself where such work requires tolling, operation and maintenance, or through another company where such work requires construction on any part of the Project Highway, subject to payment of 2% (two per cent) of the bid amount to the Authority, and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Concessionaire shall be entitled to exercise such option only if the Concessionaire has participated in the bidding process either individually or as a consortium or JV with another company and fulfils the eligibility criteria to undertake such work without compromising with its overall liability. All such changes shall be made by NHAI by an order issued in accordance with the procedure set forth in the Narasannapeta to Ranasthalam Concession Agreement.

Termination of the Narasannapeta to Ranasthalam Concession Agreement

Termination by either party

Either Party may in its discretion terminate the Narasannapeta to Ranasthalam Concession Agreement by giving a termination notice to the other party if a force majeure event subsists for a period of 120 days or more within a continuous period of 365 days. Before issuing such termination notice, the party intending to issue the termination notice shall inform the other party of such intention and grant 15 days' time to make a representation and may after the expiry of such 15 days period, whether or not it is in receipt of such representation, in its sole discretion issue the termination notice.

Termination by the NHAI

In the event of any of the defaults specified below have occurred, and if the Concessionaire has failed to cure default within the period provided for the same in the Narasannapeta to Ranasthalam Concession Agreement, then NHAI shall be entitled to issue a notice of its intention to terminate the Narasannapeta to Ranasthalam Concession Agreement, with a copy to the lenders. The following events shall constitute an event of default by the Concessionaire (a "**Concessionaire Default**") unless they have occurred as a result of any breach of the Narasannapeta to Ranasthalam Concession Agreement by NHAI or due to force majeure:

i. the performance security has been encashed and appropriated in accordance with the Narasannapeta to Ranasthalam Concession Agreement and the Concessionaire has failed to replenish or provide fresh performance security within a cure period of 15 days;

ii. subsequent to the replenishment or furnishing of fresh performance security in accordance with the Narasannapeta to Ranasthalam Concession Agreement, the Concessionaire fails to cure, within a cure period of 60 days, the Concessionaire Default for which whole or part of the performance security was appropriated;

iii. the Concessionaire abandons or manifests intention to abandon the operation and maintenance of the Narasannapeta to Ranasthalam Project Highway without the prior written consent of NHAI;

iv. the Concessionaire fails to roll over, renew and furnish new bank guarantee performance security subject to and in accordance with terms of the Narasannapeta to Ranasthalam Concession Agreement, at least three months prior to expiry of subsisting bank guarantee;

v. the Concessionaire is in breach of the Maintenance Requirements or the Safety Requirements, as the case may be;

vi the Concessionaire has failed to make any payment to NHAI within the period specified in the Narasannapeta to Ranasthalam Concession Agreement;

vii. upon occurrence of a financial default, the lenders' representative has by notice required NHAI to undertake

suspension or termination, as the case may be, in accordance with the substitution agreement and the Concessionaire fails to cure the default within the specified cure period;

viii. a breach of any of the project agreements by the Concessionaire causes a material adverse effect;

ix. the Concessionaire creates any encumbrance in breach of the Narasannapeta to Ranasthalam Concession Agreement;

x. the Concessionaire repudiates the Narasannapeta to Ranasthalam Concession Agreement or otherwise takes any action or evidences or conveys an intention not to be bound by the Narasannapeta to Ranasthalam Concession Agreement;

xi. a change in ownership occurs in breach of the provisions of the Narasannapeta to Ranasthalam Concession Agreement;

xii. there is a transfer, pursuant to law either of (i) the rights and/or obligations of the Concessionaire under any of the project agreements, or of (ii) all or part of the assets or undertaking of the Concessionaire, and such transfer causes a material adverse effect;

xiii. an execution levied on any of the assets of the Concessionaire has caused a material adverse effect;

xiv. the Concessionaire is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Concessionaire or for the whole or material part of its assets that has a material bearing on the Narasannapeta to Ranasthalam Project;

xv. the Concessionaire has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of NHAI, a material adverse effect;

xvi. a resolution for winding up of the Concessionaire is passed or any petition for winding up of the Concessionaire is admitted by a court of competent jurisdiction and a provisional liquidator or receiver is appointed and such order has not been set aside within 90 days of the date thereof or the Concessionaire is ordered to be wound up by Court except for the purpose of amalgamation or reconstruction; provided that, as part of such amalgamation or reconstruction, the entire property, assets and undertaking of the Concessionaire are transferred to the amalgamated or reconstructed entity and that the amalgamated or reconstructed entity has unconditionally assumed the obligations of the Concessionaire under the Narasannapeta to Ranasthalam Concession Agreement and the project agreements; and provided that:

    a. the amalgamated or reconstructed entity has the capability and operating experience necessary for the performance of its obligations under the Narasannapeta to Ranasthalam Concession Agreement and the project agreements;

    b. the amalgamated or reconstructed entity has the financial standing to perform its obligations under the Narasannapeta to Ranasthalam Concession Agreement and the project agreements and has a credit worthiness at least as good as that of the Concessionaire as at Appointed Date; and

    c. each of the project agreements remains in full force and effect;

xvii. any representation or warranty of the Concessionaire herein contained which is, as of the date of Narasannapeta to Ranasthalam Concession Agreement, found to be materially false, incorrect or misleading;

xviii. the Concessionaire submits to NHAI any statement, notice or other document, in written or electronic form, which has a material effect on NHAI's rights, obligations or interests and which is false in material particulars;

xix. the Concessionaire has failed to fulfil any obligation, for which failure termination has been specified in the Narasannapeta to Ranasthalam Concession Agreement;

xx. the Concessionaire commits a default in complying with any other provision of the Narasannapeta to Ranasthalam Concession Agreement if such default causes a material adverse effect on NHAI;

xxi. an escrow default occurs and the Concessionaire fails to cure the default within a cure period of 15 days;

Termination by Concessionaire

If any of the defaults specified below shall have occurred, and NHAI fails to cure such default within a cure period of 90 days or such longer period as has been expressly provided in the Narasannapeta to Ranasthalam Concession Agreement, NHAI shall be deemed to be in default of the Narasannapeta to Ranasthalam Concession Agreement, unless the default has

occurred as a result of any breach of the Narasannapeta to Ranasthalam Concession Agreement by the Concessionaire or due to force majeure:

i. NHAI commits a material default in complying with any of the provisions of the Narasannapeta to Ranasthalam Concession Agreement and such default has a material adverse effect on the Concessionaire; or

ii. NHAI repudiates the Narasannapeta to Ranasthalam Concession Agreement or otherwise takes any action that amounts to or manifests an irrevocable intention not to be bound by the Narasannapeta to Ranasthalam Concession Agreement; or

iii. the State commits a material default in complying with the provisions of the State Support Agreement if such default has a Material Adverse Effect on the Concessionaire and the breach continues for a period of 90 (ninety) days from the date of notice given in this behalf by the Concessionaire to the Authority.

Termination Payments

The termination payment pursuant to the Narasannapeta to Ranasthalam Concession Agreement becomes due and payable to the Concessionaire by NHAI within 15 days of the Concessionaire furnishing to NHAI an NOC issued by the lenders/ lenders' representative recording/ effecting release/ vacation/ discharge of the charge on Narasannapeta to Ranasthalam Project receivables (if any) created by Concessionaire for securing repayment of the debt. If NHAI fails to disburse the full termination payment within 15 days, NHAI shall pay interest at a rate equal to 3% above the bank rate on the amount of termination payment remaining unpaid.

Upon termination of the Narasannapeta to Ranasthalam Concession Agreement by the NHAI on account of occurrence of a Concessionaire Default, the NHAI shall pay the Concessionaire by way of termination payment 70% of the Unexpired Cash Flow.

Upon termination of the Narasannapeta to Ranasthalam Concession Agreement by the Concessionaire on account of occurrence of an NHAI Default, the Concessionaire shall be entitled to receive from NHAI by way of termination payment a sum equal to 105% of the Unexpired Cash Flow.

For details in relation to the technical clarifications received from NHAI in relation to the Concession Agreements, please refer to Annexure 1 of the Narasannapeta to Ranasthalam Concession Agreement.

2. ***Concession Agreement between NSPPL ("Concessionaire") and NHAI in respect of the Ranasthalam to Hanumanthavaka Project dated*** March 12, 2025

The Concessionaire has entered into a concession agreement for tolling, operation, maintenance and transfer of Ranasthalam to Hanumanthavaka Project (as defined below) on toll, operate and transfer (TOT) basis (the "**Ranasthalam to Hanumanthavaka Concession Agreement**"), for a period of 20 years from the the Appointed Date (i.e., the date on which all Conditions Precedent have been satisfied) or such date on which the Ranasthalam to Hanumanthavaka Concession Agreement is terminated by a termination notice ("**Ranasthalam to Hanumanthavaka Concession Period**").

Certain Definitions

"**Ranasthalam to Hanumanthavaka Project**" means the operation and maintenance of the Ranasthalam to Hanumanthavaka Project Highway in accordance with the provisions of the Ranasthalam to Hanumanthavaka Concession Agreement and includes all works, services and equipment relating to or in respect of the scope of the Ranasthalam to Hanumanthavaka Project as set forth in the Ranasthalam to Hanumanthavaka Concession Agreement;

"**Ranasthalam to Hanumanthavaka Project Assets**" means all physical and other assets relating to and forming part of the Site including (a) rights over the Site in the form of licence, Right of Way or otherwise; (b) tangible assets such as civil works and equipment including foundations, embankments, pavements, road surface, interchanges, bridges, culverts, road overbridges, drainage works, traffic signals, sign boards, kilometre- stones, toll plazas, electrical systems, communication systems, rest areas, relief centers, maintenance depots and administrative offices; (d) all rights of the Concessionaire under the project agreements; security deposits; insurance proceeds; and (e) Applicable Permits and authorisations relating to or in respect of the Ranasthalam to Hanumanthavaka Project Highway, but does not include Additional Facilities; and

"**Ranasthalam to Hanumanthavaka Project Highway**" means the Site comprising the existing road comprising:

Stretch	State	Start (Km)	End (Km)	Length
Ranasthalam to Hanumanthavaka	Andhra Pradesh	634+000	700+544	66.544

and all Ranasthalam to Hanumanthavaka Project Assets."

Grant of Concession

Subject to and in accordance with the terms and conditions set forth in the Ranasthalam to Hanumanthavaka Concession Agreement, NHAI has granted to the Concessionaire, and the Concessionaire has accepted the concession for a period of 20 years, including the exclusive right, license and authority during the subsistence of the Ranasthalam to Hanumanthavaka Agreement to demand, collect and appropriate Fee, operate, manage and maintain the Ranasthalam to Hanumanthavaka Project Highway. Notwithstanding anything to the contrary in the Ranasthalam to Hanumanthavaka Concession Agreement, the parties have expressly agreed that the Concession Period shall not be reduced by more than 5 (five) years, or shall not be increased by more than 10 (ten) years on any account or for any reason whatsoever.

Subject to and in accordance with the terms and conditions set forth in the Ranasthalam to Hanumanthavaka Concession Agreement, the Concessionaire is entitled to undertake the following in accordance with the terms of the Ranasthalam to Hanumanthavaka Concession Agreement, applicable laws and applicable permits:

i. Right of Way, access and license to the Site for the purpose of and to the extent conferred by the provisions of the Ranasthalam to Hanumanthavaka Concession Agreement;

ii. manage, operate and maintain the Ranasthalam to Hanumanthavaka Project Highway and regulate the use thereof by third parties in accordance with the terms of Ranasthalam to Hanumanthavaka Concession Agreement;

iii. demand, collect and appropriate the fees from vehicles and persons liable for payment of fees for using the Ranasthalam to Hanumanthavaka Project Highway or any part thereof and refuse entry of any vehicle to the Ranasthalam to Hanumanthavaka Project Highway if the fee due is not paid;

iv. perform and fulfill all of the Concessionaire's obligations under and in accordance with the Ranasthalam to Hanumanthavaka Concession Agreement;

v. bear and pay all costs, expenses and charges in connection with or incidental to the performance of the obligations of the Concessionaire under the Ranasthalam to Hanumanthavaka Concession Agreement; and

vi. neither assign, transfer or sublet or create any lien or encumbrance on the Ranasthalam to Hanumanthavaka Concession Agreement, or the concession granted thereby, or on the whole or any part of the Ranasthalam to Hanumanthavaka Project Highway nor transfer, lease or part possession thereof, save and except as expressly permitted by the Ranasthalam to Hanumanthavaka Concession Agreement.

Fees

The Concessionaire is entitled to, during the Ranasthalam to Hanumanthavaka Concession Period, levy, collect and appropriate fees from users ("**User Fee**") of the Ranasthalam to Hanumanthavaka Project Highway pursuant to and in accordance with the provisions in the Ranasthalam to Hanumanthavaka Concession Agreement and the Fee Rules and to appropriate the same. In accordance with the terms of the Ranasthalam to Hanumanthavaka Concession Agreement, the Concessionaire shall not collect any fees in relation to exempted vehicles. The fees collected by Concessionaire shall be deposited in the escrow account and appropriated in accordance with the relevant provisions of the Ranasthalam to Hanumanthavaka Concession Agreement.

Sub Rule 6(6) of the above-mentioned Fee Rules states,

"(a) The fee shall be collected by the Central Government or the executing Authority as the case may be and for a specified period in accordance with the terms of agreement entered by the Concessionaire.
(b) The fee as notified as per Narasannapeta to Ranasthalam Concession Agreement shall be leviable till the end of the concession period and after the Concession Agreement is over, the fee shall be collected by the Central Government executing authority at a reduced rate of 40% of the fee on the date of transfer of such section of National Highways, bridge, tunnel or bypass, as the case may be, to be revised annually in accordance with these rules:

Provided that after the recovery of capital cost through user fee realised, in respect of a public funded project, the fee leviable would be reduced to 40% of the user fee for such section of National Highways, bridge, tunnel or bypass as the case may be, to be revised annually in accordance with these rules." In respect of the above, NHAI has clarified that Rule 6 of the Fee Rules provides that the user fee to be notified by Government as per the format of Schedule M of Concession Agreement shall be leviable till the end of the concession period. Hence, the rate of User Fee rate shall only be reduced after the concession period is over."

Concession Fees

As consideration for the grant of the Concession, the Concessionaire is required to pay a concession fee to NHAI equivalent

to ₹ 17,953.00 million, within 120 days of the date of execution of the concession agreement or any extended date as agreed by NHAI prior to the Appointed Date as a Condition Precedent. The Concessionaire agrees that payment of the concession fee constitutes essential condition of the Concession Agreement. Further as communicated by the authority by way of a letter dated 13.02.25, any amount raised from the proceeds of the Issue in excess of the Base Concession Fee (being the aggregate of Concession Fees payable to NHAI in terms of the Additional Concession Agreements) shall be paid to the Authority. For further details, see the section titled "Use of Proceeds – Details of Utilisation of Issue Proceeds - Infusion of debt and/or equity into NSPPL" on page 355. For the purposes of stamp duty payment, concession agreements are generally considered to be agreements which are not lease deeds and stamp duty of ₹ 100.00 is typically paid for such concession agreements. However, stamp duty authorities of certain states in India have issued notices to some concessionaires alleging inadequate stamp duty on the concession agreements executed between the concessionaires and the NHAI. The stamp authorities allege that since concession agreements relate to the letting of tolls to the concessionaires in the form of leases, or as development agreements, such agreements were required to be stamped as lease agreements or development agreements, as applicable. The stamp duty for a lease agreement or a development agreement ranges between 1.0% and 11.0% of the annual rent or premium payable or the market value of the property. Furthermore, stamp duty authorities may impose penalties for payment of inadequate stamp duty, which could extend up to ten (10) times the amount of the stamp duty payable. Accordingly, concession agreements that have not been stamped as such could be considered to be inadequately stamped. The High Courts of Allahabad and Maharashtra have also held that a concession agreement ought to be stamped as a lease agreement and have upheld the imposition of a higher stamp duty on such agreements.

While we have paid stamp duty of ₹ 100.00 on each of our Concession Agreements in accordance with usual practice, if any demand for payment of a higher stamp duty or penalty is imposed, it would increase the costs of the Toll Roads.

In respect of above, NHAI has clarified that:

(i) As on the date of the Ranasthalam to Hanumanthavaka Concession Agreement, GST is not applicable on Concession Fee. However, if it becomes applicable at a later stage, this shall be considered as change in law.

(ii) There is no requirement of stamp duty in case of Concession Agreements since Fee Rules provided for levy and collection of user fee and not toll tax. In case, in future any such demand arises, it shall be treated as change in law.

Escrow Account

The provisions in relation to the escrow account in the Ranasthalam to Hanumanthavaka Concession Agreement are only applicable if the obligations of the Concessionaire under Ranasthalam to Hanumanthavaka Concession Agreement are financed by the Lenders.

The Concessionaire shall, prior to the Appointed Date, open and establish the escrow account with the escrow bank and all funds constituting the financing package related to the Ranasthalam to Hanumanthavaka Project shall be credited to such escrow account. During the Ranasthalam to Hanumanthavaka Concession Period all fees and any other revenues including the proceeds of any rentals, deposits, capital receipts or insurance claims from or in respect of the Ranasthalam to Hanumanthavaka Project Highway shall be deposited therein. In addition, all payments by NHAI pursuant to the Ranasthalam to Hanumanthavaka Concession Agreement, including, if any, in relation to the change of scope in the Ranasthalam to Hanumanthavaka Project shall be deposited by NHAI in the escrow account.

Withdrawals from Escrow Account

The Concessionaire shall, at the time of the opening of the escrow account, give irrevocable instructions by way of an escrow agreement substantially in form set forth in the Ranasthalam to Hanumanthavaka Concession Agreement to the escrow bank instructing, *inter alia*, that the deposits into the escrow account shall subject to the provisions of the Ranasthalam to Hanumanthavaka Concession Agreement, be appropriated in the following order every month and if not due in a month then appropriated proportionately in such month and retained in the escrow account and paid out therefrom in the month when due unless otherwise expressly provided in the instruction letter:

i. all taxes due and payable by the Concessionaire for and in respect of the Ranasthalam to Hanumanthavaka Project Highway;

ii. concession fee;

iii. all payments relating to construction of the Ranasthalam to Hanumanthavaka Project Highway, subject to and in accordance with the conditions, if any, set forth in the financing agreements;

iv. operation and maintenance expenses;

v. operation and maintenance expenses and other costs and expenses incurred by NHAI in accordance with the provisions of the Ranasthalam to Hanumanthavaka Concession Agreement, and certified by NHAI as due and

payable to it;

vi. monthly proportionate provision of debt service payment due in an accounting year;

vii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Withdrawals upon Termination

Notwithstanding anything to the contrary contained in the escrow agreement and subject to the provisions of the Ranasthalam to Hanumanthavaka Concession Agreement, in the case of termination, the amounts standing to the credit of the escrow account shall be appropriated in the following order:

i. all taxes due and payable by the Concessionaire for and in respect of the Ranasthalam to Hanumanthavaka Project Highway;

ii. payment due to the lenders;

iii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire;

iv. retention and payments relating to the liability for defects and deficiencies;

v. incurred or accrued operation and maintenance expenses;

vi. any other payments required to be made under the Ranasthalam to Hanumanthavaka Concession Agreement; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Change of Scope

NHAI may, notwithstanding anything to the contrary contained in the Ranasthalam to Hanumanthavaka Concession Agreement, require the Concessionaire to make alterations/ modifications in the scope of the Ranasthalam to Hanumanthavaka Project as contemplated by the Ranasthalam to Hanumanthavaka Concession Agreement. If the cumulative costs relating to all the change of scope orders exceed 5% of the concession fee in any continuous period of 3 years immediately preceding the date of such change of scope order or if such cumulative costs exceed 25% of the concession fee at any time during the Ranasthalam to Hanumanthavaka Concession Period, NHAI may award any works or services, to any person on the basis of open competitive bidding and the Concessionaire shall be entitled to take part in such competitive bidding with a right to match the first-ranked bid in terms of the selection criteria, either by itself where such work requires tolling, operation and maintenance, or through another company where such work requires construction on any part of the Project Highway, subject to payment of 2% (two per cent) of the bid amount to the Authority, and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Concessionaire shall be entitled to exercise such option only if the Concessionaire has participated in the bidding process either individually or as a consortium or JV with another company and fulfils the eligibility criteria to undertake such work without compromising with its overall liability. All such changes shall be made by NHAI by an order issued in accordance with the procedure set forth in the Ranasthalam to Hanumanthavaka Concession Agreement.

Termination of the Ranasthalam to Hanumanthavaka Concession Agreement

Termination by either party

Either Party may in its discretion terminate the Ranasthalam to Hanumanthavaka Concession Agreement by giving a termination notice to the other party if a force majeure event subsists for a period of 120 days or more within a continuous period of 365 days. Before issuing such termination notice, the party intending to issue the termination notice shall inform the other party of such intention and grant 15 days' time to make a representation and may after the expiry of such 15 days period, whether or not it is in receipt of such representation, in its sole discretion issue the termination notice.

Termination by the NHAI

In the event of any of the defaults specified below have occurred, and if the Concessionaire has failed to cure default within the period provided for the same in the Ranasthalam to Hanumanthavaka Concession Agreement, then NHAI shall be entitled to issue a notice of its intention to terminate the Ranasthalam to Hanumanthavaka Concession Agreement, with a copy to the lenders. The following events shall constitute an event of default by the Concessionaire (a "**Concessionaire Default**") unless they have occurred as a result of any breach of the Ranasthalam to Hanumanthavaka Concession Agreement by NHAI or due to force majeure:

i. the performance security has been encashed and appropriated in accordance with the Ranasthalam to Hanumanthavaka Concession Agreement and the Concessionaire has failed to replenish or provide fresh performance security within a cure period of 15 days;

ii. subsequent to the replenishment or furnishing of fresh performance security in accordance with the Ranasthalam to Hanumanthavaka Concession Agreement, the Concessionaire fails to cure, within a cure period of 60 days, the Concessionaire Default for which whole or part of the performance security was appropriated;

iii. the Concessionaire abandons or manifests intention to abandon the operation and maintenance of the Ranasthalam to Hanumanthavaka Project Highway without the prior written consent of NHAI;

iv. the Concessionaire fails to roll over, renew and furnish new bank guarantee performance security subject to and in accordance with terms of the Ranasthalam to Hanumanthavaka Concession Agreement, at least three months prior to expiry of subsisting bank guarantee;

v. the Concessionaire is in breach of the Maintenance Requirements or the Safety Requirements, as the case may be;

vi the Concessionaire has failed to make any payment to NHAI within the period specified in the Ranasthalam to Hanumanthavaka Concession Agreement;

vii. upon occurrence of a financial default, the lenders' representative has by notice required NHAI to undertake suspension or termination, as the case may be, in accordance with the substitution agreement and the Concessionaire fails to cure the default within the specified cure period;

viii. a breach of any of the project agreements by the Concessionaire causes a material adverse effect;

ix. the Concessionaire creates any encumbrance in breach of the Ranasthalam to Hanumanthavaka Concession Agreement;

x. the Concessionaire repudiates the Ranasthalam to Hanumanthavaka Concession Agreement or otherwise takes any action or evidences or conveys an intention not to be bound by the Ranasthalam to Hanumanthavaka Concession Agreement;

xi. a change in ownership occurs in breach of the provisions of the Ranasthalam to Hanumanthavaka Concession Agreement;

xii. there is a transfer, pursuant to law either of (i) the rights and/or obligations of the Concessionaire under any of the project agreements, or of (ii) all or part of the assets or undertaking of the Concessionaire, and such transfer causes a material adverse effect;

xiii. an execution levied on any of the assets of the Concessionaire has caused a material adverse effect;

xiv. the Concessionaire is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Concessionaire or for the whole or material part of its assets that has a material bearing on the Ranasthalam to Hanumanthavaka Project;

xv. the Concessionaire has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of NHAI, a material adverse effect;

xvi. a resolution for winding up of the Concessionaire is passed or any petition for winding up of the Concessionaire is admitted by a court of competent jurisdiction and a provisional liquidator or receiver is appointed and such order has not been set aside within 90 days of the date thereof or the Concessionaire is ordered to be wound up by Court except for the purpose of amalgamation or reconstruction; provided that, as part of such amalgamation or reconstruction, the entire property, assets and undertaking of the Concessionaire are transferred to the amalgamated or reconstructed entity and that the amalgamated or reconstructed entity has unconditionally assumed the obligations of the Concessionaire under the Ranasthalam to Hanumanthavaka Concession Agreement and the project agreements; and provided that:

a. the amalgamated or reconstructed entity has the capability and operating experience necessary for the performance of its obligations under the Ranasthalam to Hanumanthavaka Concession Agreement and the project agreements;

b. the amalgamated or reconstructed entity has the financial standing to perform its obligations under the Ranasthalam to Hanumanthavaka Concession Agreement and the project agreements and has a credit worthiness at least as good as that of the Concessionaire as at Appointed Date; and

c. each of the project agreements remains in full force and effect;

xvii. any representation or warranty of the Concessionaire herein contained which is, as of the date of Ranasthalam to Hanumanthavaka Concession Agreement, found to be materially false, incorrect or misleading;

xviii. the Concessionaire submits to NHAI any statement, notice or other document, in written or electronic form, which has a material effect on NHAI's rights, obligations or interests and which is false in material particulars;

xix. the Concessionaire has failed to fulfil any obligation, for which failure termination has been specified in the Ranasthalam to Hanumanthavaka Concession Agreement;

xx. the Concessionaire commits a default in complying with any other provision of the Ranasthalam to Hanumanthavaka Concession Agreement if such default causes a material adverse effect on NHAI;

xxi. an escrow default occurs and the Concessionaire fails to cure the default within a cure period of 15 days;

Termination by Concessionaire

If any of the defaults specified below shall have occurred, and NHAI fails to cure such default within a cure period of 90 days or such longer period as has been expressly provided in the Ranasthalam to Hanumanthavaka Concession Agreement, NHAI shall be deemed to be in default of the Ranasthalam to Hanumanthavaka Concession Agreement, unless the default has occurred as a result of any breach of the Ranasthalam to Hanumanthavaka Concession Agreement by the Concessionaire or due to force majeure:

i. NHAI commits a material default in complying with any of the provisions of the Ranasthalam to Hanumanthavaka Concession Agreement and such default has a material adverse effect on the Concessionaire; or

ii. NHAI repudiates the Ranasthalam to Hanumanthavaka Concession Agreement or otherwise takes any action that amounts to or manifests an irrevocable intention not to be bound by the Ranasthalam to Hanumanthavaka Concession Agreement; or

iii. the State commits a material default in complying with the provisions of the State Support Agreement if such default has a Material Adverse Effect on the Concessionaire and the breach continues for a period of 90 (ninety) days from the date of notice given in this behalf by the Concessionaire to the Authority.

Termination Payments

The termination payment pursuant to the Ranasthalam to Hanumanthavaka Concession Agreement becomes due and payable to the Concessionaire by NHAI within 15 days of the Concessionaire furnishing to NHAI an NOC issued by the lenders/ lenders' representative recording/ effecting release/ vacation/ discharge of the charge on Ranasthalam to Hanumanthavaka Project receivables (if any) created by Concessionaire for securing repayment of the debt. If NHAI fails to disburse the full termination payment within 15 days, NHAI shall pay interest at a rate equal to 3% above the bank rate on the amount of termination payment remaining unpaid.

Upon termination of the Ranasthalam to Hanumanthavaka Concession Agreement by the NHAI on account of occurrence of a Concessionaire Default, the NHAI shall pay the Concessionaire by way of termination payment 70% of the Unexpired Cash Flow.

Upon termination of the Ranasthalam to Hanumanthavaka Concession Agreement by the Concessionaire on account of occurrence of an NHAI Default, the Concessionaire shall be entitled to receive from NHAI by way of termination payment a sum equal to 105% of the Unexpired Cash Flow.

For details in relation to the technical clarifications received from NHAI in relation to the Concession Agreements, please refer to Annexure 1 of the Ranasthalam to Hanumanthavaka Concession Agreement.

3. ***Concession Agreement between NSPPL ("Concessionaire") and NHAI in respect of the Anandapuram – Pendurthi – Anakapalle Project dated*** March 12, 2025

The Concessionaire has entered into a concession agreement for tolling, operation, maintenance and transfer of Anandapuram – Pendurthi – Anakapalle Project (as defined below) on toll, operate and transfer (TOT) basis (the "**Anandapuram – Pendurthi – Anakapalle Concession Agreement**"), for a period of 20 years from the the Appointed Date (i.e., the date on which all Conditions Precedent have been satisfied) or such date on which the Anandapuram – Pendurthi – Anakapalle Concession Agreement is terminated by a termination notice ("**Anandapuram – Pendurthi – Anakapalle Concession Period**").

Certain Definitions

"**Anandapuram – Pendurthi – Anakapalle Project**" means the operation and maintenance of the Anandapuram – Pendurthi – Anakapalle Project Highway in accordance with the provisions of the Anandapuram – Pendurthi – Anakapalle Concession Agreement and includes all works, services and equipment relating to or in respect of the scope of the Anandapuram – Pendurthi – Anakapalle Project as set forth in the Anandapuram – Pendurthi – Anakapalle Concession Agreement;

"**Anandapuram – Pendurthi – Anakapalle Project Assets**" means all physical and other assets relating to and forming part of the Site including (a) rights over the Site in the form of licence, Right of Way or otherwise; (b) tangible assets such as civil works and equipment including foundations, embankments, pavements, road surface, interchanges, bridges, culverts, road overbridges, drainage works, traffic signals, sign boards, kilometre- stones, toll plazas, electrical systems, communication systems, rest areas, relief centers, maintenance depots and administrative offices; (d) all rights of the Concessionaire under the project agreements; security deposits; insurance proceeds; and (e) Applicable Permits and authorisations relating to or in respect to or in respect of the Anandapuram – Pendurthi – Anakapalle Project Highway, but does not include Additional Facilities; and

"**Anandapuram – Pendurthi – Anakapalle Project Highway**" means the Site comprising the existing road comprising:

Stretch	State	Start (Km)	End (Km)	Length
Anandapuram – Pendurthi – Anakapalle	Andhra Pradesh	682+980	731+585	48.605

and all Anandapuram – Pendurthi – Anakapalle Project Assets."

Grant of Concession

Subject to and in accordance with the terms and conditions set forth in the Anandapuram – Pendurthi – Anakapalle Concession Agreement, NHAI has granted to the Concessionaire, and the Concessionaire has accepted the concession for a period of 20 years, including the exclusive right, license and authority during the subsistence of the Anandapuram – Pendurthi – Anakapalle Agreement to demand, collect and appropriate Fee, operate, manage and maintain the Anandapuram – Pendurthi – Anakapalle Project Highway. Notwithstanding anything to the contrary in the Anandapuram – Pendurthi – Anakapalle Concession Agreement, the parties have expressly agreed that the Concession Period shall not be reduced by more than 5 (five) years, or shall not be increased by more than 10 (ten) years on any account or for any reason whatsoever.

Subject to and in accordance with the terms and conditions set forth in the Anandapuram – Pendurthi – Anakapalle Concession Agreement, the Concessionaire is entitled to undertake the following in accordance with the terms of the Anandapuram – Pendurthi – Anakapalle Concession Agreement, applicable laws and applicable permits:

i. Right of Way, access and license to the Site for the purpose of and to the extent conferred by the provisions of the Anandapuram – Pendurthi – Anakapalle Concession Agreement;

ii. manage, operate and maintain the Anandapuram – Pendurthi – Anakapalle Project Highway and regulate the use thereof by third parties in accordance with the terms of Anandapuram – Pendurthi – Anakapalle Concession Agreement;

iii. demand, collect and appropriate the fees from vehicles and persons liable for payment of fees for using the Anandapuram – Pendurthi – Anakapalle Project Highway or any part thereof and refuse entry of any vehicle to the Anandapuram – Pendurthi – Anakapalle Project Highway if the fee due is not paid;

iv. perform and fulfill all of the Concessionaire's obligations under and in accordance with the Anandapuram – Pendurthi – Anakapalle Concession Agreement;

v. bear and pay all costs, expenses and charges in connection with or incidental to the performance of the obligations of the Concessionaire under the Anandapuram – Pendurthi – Anakapalle Concession Agreement; and

vi. neither assign, transfer or sublet or create any lien or encumbrance on the Anandapuram – Pendurthi – Anakapalle Concession Agreement, or the concession granted thereby, or on the whole or any part of the Anandapuram – Pendurthi – Anakapalle Project Highway nor transfer, lease or part possession thereof, save and except as expressly permitted by the Anandapuram – Pendurthi – Anakapalle Concession Agreement.

Fees

The Concessionaire is entitled to, during the Anandapuram – Pendurthi – Anakapalle Concession Period, levy, collect and appropriate fees from users ("**User Fee**") of the Anandapuram – Pendurthi – Anakapalle Project Highway pursuant to and in accordance with the provisions in the Anandapuram – Pendurthi – Anakapalle Concession Agreement and the Fee Rules

and to appropriate the same. In accordance with the terms of the Anandapuram – Pendurthi – Anakapalle Concession Agreement, the Concessionaire shall not collect any fees in relation to exempted vehicles. The fees collected by Concessionaire shall be deposited in the escrow account and appropriated in accordance with the relevant provisions of the Anandapuram – Pendurthi – Anakapalle Concession Agreement.

Sub Rule 6(6) of the above-mentioned Fee Rules states,

"(a) The fee shall be collected by the Central Government or the executing Authority as the case may be and for a specified period in accordance with the terms of agreement entered by the Concessionaire.
(b) The fee as notified as per Narasannapeta to Ranasthalam Concession Agreement shall be leviable till the end of the concession period and after the Concession Agreement is over, the fee shall be collected by the Central Government executing authority at a reduced rate of 40% of the fee on the date of transfer of such section of National Highways, bridge, tunnel or bypass, as the case may be, to be revised annually in accordance with these rules:

Provided that after the recovery of capital cost through user fee realised, in respect of a public funded project, the fee leviable would be reduced to 40% of the user fee for such section of National Highways, bridge, tunnel or bypass as the case may be, to be revised annually in accordance with these rules." In respect of the above, NHAI has clarified that Rule 6 of the Fee Rules provides that the user fee to be notified by Government as per the format of Schedule M of Concession Agreement shall be leviable till the end of the concession period. Hence, the rate of User Fee rate shall only be reduced after the concession period is over."

Concession Fees

As consideration for the grant of the Concession, the Concessionaire is required to pay a concession fee to NHAI equivalent to ₹ 10,421.00 million, within 120 days of the date of execution of the concession agreement or any extended date as agreed by NHAI prior to the Appointed Date as a Condition Precedent. The Concessionaire agrees that payment of the concession fee constitutes essential condition of the Concession Agreement. Further as communicated by the authority by way of a letter dated 13.02.25, any amount raised from the proceeds of the Issue in excess of the Base Concession Fee (being the aggregate of Concession Fees payable to NHAI in terms of the Additional Concession Agreements) shall be paid to the Authority. For further details, see the section titled "Use of Proceeds – Details of Utilisation of Issue Proceeds - Infusion of debt and/or equity into NSPPL" on page 355. For the purposes of stamp duty payment, concession agreements are generally considered to be agreements which are not lease deeds and stamp duty of ₹ 100.00 is typically paid for such concession agreements. However, stamp duty authorities of certain states in India have issued notices to some concessionaires alleging inadequate stamp duty on the concession agreements executed between the concessionaires and the NHAI. The stamp authorities allege that since concession agreements relate to the letting of tolls to the concessionaires in the form of leases, or as development agreements, such agreements were required to be stamped as lease agreements or development agreements, as applicable. The stamp duty for a lease agreement or a development agreement ranges between 1.0% and 11.0% of the annual rent or premium payable or the market value of the property. Furthermore, stamp duty authorities may impose penalties for payment of inadequate stamp duty, which could extend up to ten (10) times the amount of the stamp duty payable. Accordingly, concession agreements that have not been stamped as such could be considered to be inadequately stamped. The High Courts of Allahabad and Maharashtra have also held that a concession agreement ought to be stamped as a lease agreement and have upheld the imposition of a higher stamp duty on such agreements.

While we have paid stamp duty of ₹ 100.00 on each of our Concession Agreements in accordance with usual practice, if any demand for payment of a higher stamp duty or penalty is imposed, it would increase the costs of the Toll Roads.

In respect of above, NHAI has clarified that:

(i) As on the date of the Anandapuram – Pendurthi – Anakapalle Concession Agreement, GST is not applicable on Concession Fee. However, if it becomes applicable at a later stage, this shall be considered as change in law.

(ii) There is no requirement of stamp duty in case of Concession Agreements since Fee Rules provided for levy and collection of user fee and not toll tax. In case, in future any such demand arises, it shall be treated as change in law.

Escrow Account

The provisions in relation to the escrow account in the Anandapuram – Pendurthi – Anakapalle Concession Agreement are only applicable if the obligations of the Concessionaire under Anandapuram – Pendurthi – Anakapalle Concession Agreement are financed by the Lenders.

The Concessionaire shall, prior to the Appointed Date, open and establish the escrow account with the escrow bank and all funds constituting the financing package related to the Anandapuram – Pendurthi – Anakapalle Project shall be credited to such escrow account. During the Anandapuram – Pendurthi – Anakapalle Concession Period all fees and any other revenues including the proceeds of any rentals, deposits, capital receipts or insurance claims from or in respect of the Anandapuram – Pendurthi – Anakapalle Project Highway shall be deposited therein. In addition, all payments by NHAI pursuant to the

Anandapuram – Pendurthi – Anakapalle Concession Agreement, including, if any, in relation to the change of scope in the Anandapuram – Pendurthi – Anakapalle Project shall be deposited by NHAI in the escrow account.

Withdrawals from Escrow Account

The Concessionaire shall, at the time of the opening of the escrow account, give irrevocable instructions by way of an escrow agreement substantially in form set forth in the Anandapuram – Pendurthi – Anakapalle Concession Agreement to the escrow bank instructing, *inter alia*, that the deposits into the escrow account shall subject to the provisions of the Anandapuram – Pendurthi – Anakapalle Concession Agreement, be appropriated in the following order every month and if not due in a month then appropriated proportionately in such month and retained in the escrow account and paid out therefrom in the month when due unless otherwise expressly provided in the instruction letter:

i. all taxes due and payable by the Concessionaire for and in respect of the Anandapuram – Pendurthi – Anakapalle Project Highway;

ii. concession fee;

iii. all payments relating to construction of the Anandapuram – Pendurthi – Anakapalle Project Highway, subject to and in accordance with the conditions, if any, set forth in the financing agreements;

iv. operation and maintenance expenses;

v. operation and maintenance expenses and other costs and expenses incurred by NHAI in accordance with the provisions of the Anandapuram – Pendurthi – Anakapalle Concession Agreement, and certified by NHAI as due and payable to it;

vi. monthly proportionate provision of debt service payment due in an accounting year;

vii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Withdrawals upon Termination

Notwithstanding anything to the contrary contained in the escrow agreement and subject to the provisions of the Anandapuram – Pendurthi – Anakapalle Concession Agreement, in the case of termination, the amounts standing to the credit of the escrow account shall be appropriated in the following order:

i. all taxes due and payable by the Concessionaire for and in respect of the Anandapuram – Pendurthi – Anakapalle Project Highway;

ii. payment due to the lenders;

iii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire;

iv. retention and payments relating to the liability for defects and deficiencies;

v. incurred or accrued operation and maintenance expenses;

vi. any other payments required to be made under the Anandapuram – Pendurthi – Anakapalle Concession Agreement; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Change of Scope

NHAI may, notwithstanding anything to the contrary contained in the Anandapuram – Pendurthi – Anakapalle Concession Agreement, require the Concessionaire to make alterations/ modifications in the scope of the Anandapuram – Pendurthi – Anakapalle Project as contemplated by the Anandapuram – Pendurthi – Anakapalle Concession Agreement. If the cumulative costs relating to all the change of scope orders exceed 5% of the concession fee in any continuous period of 3 years immediately preceding the date of such change of scope order or if such cumulative costs exceed 25% of the concession fee at any time during the Anandapuram – Pendurthi – Anakapalle Concession Period, NHAI may award any works or services, to any person on the basis of open competitive bidding and the Concessionaire shall be entitled to take part in such competitive bidding with a right to match the first-ranked bid in terms of the selection criteria, either by itself where such work requires tolling, operation and maintenance, or through another company where such work requires construction on any part of the Project Highway, subject to payment of 2% (two per cent) of the bid amount to the Authority,

and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Concessionaire shall be entitled to exercise such option only if the Concessionaire has participated in the bidding process either individually or as a consortium or JV with another company and fulfils the eligibility criteria to undertake such work without compromising with its overall liability. All such changes shall be made by NHAI by an order issued in accordance with the procedure set forth in the Anandapuram – Pendurthi – Anakapalle Concession Agreement.

Termination of the Anandapuram – Pendurthi – Anakapalle Concession Agreement

Termination by either party

Either Party may in its discretion terminate the Anandapuram – Pendurthi – Anakapalle Concession Agreement by giving a termination notice to the other party if a force majeure event subsists for a period of 120 days or more within a continuous period of 365 days. Before issuing such termination notice, the party intending to issue the termination notice shall inform the other party of such intention and grant 15 days' time to make a representation and may after the expiry of such 15 days period, whether or not it is in receipt of such representation, in its sole discretion issue the termination notice.

Termination by the NHAI

In the event of any of the defaults specified below have occurred, and if the Concessionaire has failed to cure default within the period provided for the same in the Anandapuram – Pendurthi – Anakapalle Concession Agreement, then NHAI shall be entitled to issue a notice of its intention to terminate the Anandapuram – Pendurthi – Anakapalle Concession Agreement, with a copy to the lenders. The following events shall constitute an event of default by the Concessionaire (a "**Concessionaire Default**") unless they have occurred as a result of any breach of the Anandapuram – Pendurthi – Anakapalle Concession Agreement by NHAI or due to force majeure:

i. the performance security has been encashed and appropriated in accordance with the Anandapuram – Pendurthi – Anakapalle Concession Agreement and the Concessionaire has failed to replenish or provide fresh performance security within a cure period of 15 days;

ii. subsequent to the replenishment or furnishing of fresh performance security in accordance with the Anandapuram – Pendurthi – Anakapalle Concession Agreement, the Concessionaire fails to cure, within a cure period of 60 days, the Concessionaire Default for which whole or part of the performance security was appropriated;

iii. the Concessionaire abandons or manifests intention to abandon the operation and maintenance of the Anandapuram – Pendurthi – Anakapalle Project Highway without the prior written consent of NHAI;

iv. the Concessionaire fails to roll over, renew and furnish new bank guarantee performance security subject to and in accordance with terms of the Anandapuram – Pendurthi – Anakapalle Concession Agreement, at least three months prior to expiry of subsisting bank guarantee;

v. the Concessionaire is in breach of the Maintenance Requirements or the Safety Requirements, as the case may be;

vi the Concessionaire has failed to make any payment to NHAI within the period specified in the Anandapuram – Pendurthi – Anakapalle Concession Agreement;

vii. upon occurrence of a financial default, the lenders' representative has by notice required NHAI to undertake suspension or termination, as the case may be, in accordance with the substitution agreement and the Concessionaire fails to cure the default within the specified cure period;

viii. a breach of any of the project agreements by the Concessionaire causes a material adverse effect;

ix. the Concessionaire creates any encumbrance in breach of the Anandapuram – Pendurthi – Anakapalle Concession Agreement;

x. the Concessionaire repudiates the Anandapuram – Pendurthi – Anakapalle Concession Agreement or otherwise takes any action or evidences or conveys an intention not to be bound by the Anandapuram – Pendurthi – Anakapalle Concession Agreement;

xi. a change in ownership occurs in breach of the provisions of the Anandapuram – Pendurthi – Anakapalle Concession Agreement;

xii. there is a transfer, pursuant to law either of (i) the rights and/or obligations of the Concessionaire under any of the project agreements, or of (ii) all or part of the assets or undertaking of the Concessionaire, and such transfer causes a material adverse effect;

xiii. an execution levied on any of the assets of the Concessionaire has caused a material adverse effect;

xiv. the Concessionaire is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Concessionaire or for the whole or material part of its assets that has a material bearing on the Anandapuram – Pendurthi – Anakapalle Project;

xv. the Concessionaire has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of NHAI, a material adverse effect;

xvi. a resolution for winding up of the Concessionaire is passed or any petition for winding up of the Concessionaire is admitted by a court of competent jurisdiction and a provisional liquidator or receiver is appointed and such order has not been set aside within 90 days of the date thereof or the Concessionaire is ordered to be wound up by Court except for the purpose of amalgamation or reconstruction; provided that, as part of such amalgamation or reconstruction, the entire property, assets and undertaking of the Concessionaire are transferred to the amalgamated or reconstructed entity and that the amalgamated or reconstructed entity has unconditionally assumed the obligations of the Concessionaire under the Anandapuram – Pendurthi – Anakapalle Concession Agreement and the project agreements; and provided that:

a. the amalgamated or reconstructed entity has the capability and operating experience necessary for the performance of its obligations under the Anandapuram – Pendurthi – Anakapalle Concession Agreement and the project agreements;

b. the amalgamated or reconstructed entity has the financial standing to perform its obligations under the Anandapuram – Pendurthi – Anakapalle Concession Agreement and the project agreements and has a credit worthiness at least as good as that of the Concessionaire as at Appointed Date; and

c. each of the project agreements remains in full force and effect;

xvii. any representation or warranty of the Concessionaire herein contained which is, as of the date of Anandapuram – Pendurthi – Anakapalle Concession Agreement, found to be materially false, incorrect or misleading;

xviii. the Concessionaire submits to NHAI any statement, notice or other document, in written or electronic form, which has a material effect on NHAI's rights, obligations or interests and which is false in material particulars;

xix. the Concessionaire has failed to fulfil any obligation, for which failure termination has been specified in the Anandapuram – Pendurthi – Anakapalle Concession Agreement;

xx. the Concessionaire commits a default in complying with any other provision of the Anandapuram – Pendurthi – Anakapalle Concession Agreement if such default causes a material adverse effect on NHAI;

xxi. an escrow default occurs and the Concessionaire fails to cure the default within a cure period of 15 days;

Termination by Concessionaire

If any of the defaults specified below shall have occurred, and NHAI fails to cure such default within a cure period of 90 days or such longer period as has been expressly provided in the Anandapuram – Pendurthi – Anakapalle Concession Agreement, NHAI shall be deemed to be in default of the Anandapuram – Pendurthi – Anakapalle Concession Agreement, unless the default has occurred as a result of any breach of the Anandapuram – Pendurthi – Anakapalle Concession Agreement by the Concessionaire or due to force majeure:

i. NHAI commits a material default in complying with any of the provisions of the Anandapuram – Pendurthi – Anakapalle Concession Agreement and such default has a material adverse effect on the Concessionaire; or

ii. NHAI repudiates the Anandapuram – Pendurthi – Anakapalle Concession Agreement or otherwise takes any action that amounts to or manifests an irrevocable intention not to be bound by the Anandapuram – Pendurthi – Anakapalle Concession Agreement; or

iii. the State commits a material default in complying with the provisions of the State Support Agreement if such default has a Material Adverse Effect on the Concessionaire and the breach continues for a period of 90 (ninety) days from the date of notice given in this behalf by the Concessionaire to the Authority.

Termination Payments

The termination payment pursuant to the Anandapuram – Pendurthi – Anakapalle Concession Agreement becomes due and payable to the Concessionaire by NHAI within 15 days of the Concessionaire furnishing to NHAI an NOC issued by the lenders/ lenders' representative recording/ effecting release/ vacation/ discharge of the charge on Anandapuram – Pendurthi – Anakapalle Project receivables (if any) created by Concessionaire for securing repayment of the debt. If NHAI

fails to disburse the full termination payment within 15 days, NHAI shall pay interest at a rate equal to 3% above the bank rate on the amount of termination payment remaining unpaid.

Upon termination of the Anandapuram – Pendurthi – Anakapalle Concession Agreement by the NHAI on account of occurrence of a Concessionaire Default, the NHAI shall pay the Concessionaire by way of termination payment 70% of the Unexpired Cash Flow.

Upon termination of the Anandapuram – Pendurthi – Anakapalle Concession Agreement by the Concessionaire on account of occurrence of an NHAI Default, the Concessionaire shall be entitled to receive from NHAI by way of termination payment a sum equal to 105% of the Unexpired Cash Flow.

For details in relation to the technical clarifications received from NHAI in relation to the Concession Agreements, please refer to Annexure 1 of the Anandapuram – Pendurthi – Anakapalle Concession Agreement.

4. ***Concession Agreement between NSPPL ("Concessionaire") and NHAI in respect of the Gundugolanu - Devarapalli - Kovvuru Project dated*** March 12, 2025

The Concessionaire has entered into a concession agreement for tolling, operation, maintenance and transfer of Gundugolanu - Devarapalli - Kovvuru Project (as defined below) on toll, operate and transfer (TOT) basis (the "**Gundugolanu - Devarapalli - Kovvuru Concession Agreement**"), for a period of 20 years from the the Appointed Date (i.e., the date on which all Conditions Precedent have been satisfied) or such date on which the Gundugolanu - Devarapalli - Kovvuru Concession Agreement is terminated by a termination notice ("**Gundugolanu - Devarapalli - Kovvuru Concession Period**").

Certain Definitions

"**Gundugolanu - Devarapalli - Kovvuru Project**" means the operation and maintenance of the Gundugolanu - Devarapalli - Kovvuru Project Highway in accordance with the provisions of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement and includes all works, services and equipment relating to or in respect of the scope of the Gundugolanu - Devarapalli - Kovvuru Project as set forth in the Gundugolanu - Devarapalli - Kovvuru Concession Agreement;

"**Gundugolanu - Devarapalli - Kovvuru Project Assets**" means all physical and other assets relating to and forming part of the Site including (a) rights over the Site in the form of licence, Right of Way or otherwise; (b) tangible assets such as civil works and equipment including foundations, embankments, pavements, road surface, interchanges, bridges, culverts, road overbridges, drainage works, traffic signals, sign boards, kilometre- stones, toll plazas, electrical systems, communication systems, rest areas, relief centers, maintenance depots and administrative offices; (d) all rights of the Concessionaire under the project agreements; security deposits; insurance proceeds; and (e) Applicable Permits and authorisations relating to or in respect of the Gundugolanu - Devarapalli - Kovvuru Project Highway, but does not include Additional Facilities; and

"**Gundugolanu - Devarapalli - Kovvuru Project Highway**" means the Site comprising the existing road comprising:

Stretch	State	Start (Km)	End (Km)	Length
Gundugolanu - Devarapalli - Kovvuru	Andhra Pradesh	15+320	85+204	69.884

and all Gundugolanu - Devarapalli – Kovvuru Project Assets."

Grant of Concession

Subject to and in accordance with the terms and conditions set forth in the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, NHAI has granted to the Concessionaire, and the Concessionaire has accepted the concession for a period of 20 years, including the exclusive right, license and authority during the subsistence of the Gundugolanu - Devarapalli - Kovvuru Agreement to demand, collect and appropriate Fee, operate, manage and maintain the Gundugolanu - Devarapalli - Kovvuru Project Highway. Notwithstanding anything to the contrary in the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, the parties have expressly agreed that the Concession Period shall not be reduced by more than 5 (five) years, or shall not be increased by more than 10 (ten) years on any account or for any reason whatsoever.

Subject to and in accordance with the terms and conditions set forth in the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, the Concessionaire is entitled to undertake the following in accordance with the terms of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, applicable laws and applicable permits:

i. Right of Way, access and license to the Site for the purpose of and to the extent conferred by the provisions of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement;

ii. manage, operate and maintain the Gundugolanu - Devarapalli - Kovvuru Project Highway and regulate the use thereof by third parties in accordance with the terms of Gundugolanu - Devarapalli - Kovvuru Concession Agreement;

iii. demand, collect and appropriate the fees from vehicles and persons liable for payment of fees for using the Gundugolanu - Devarapalli - Kovvuru Project Highway or any part thereof and refuse entry of any vehicle to the Gundugolanu - Devarapalli - Kovvuru Project Highway if the fee due is not paid;

iv. perform and fulfill all of the Concessionaire's obligations under and in accordance with the Gundugolanu - Devarapalli - Kovvuru Concession Agreement;

v. bear and pay all costs, expenses and charges in connection with or incidental to the performance of the obligations of the Concessionaire under the Gundugolanu - Devarapalli - Kovvuru Concession Agreement; and

vi. neither assign, transfer or sublet or create any lien or encumbrance on the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, or the concession granted thereby, or on the whole or any part of the Gundugolanu - Devarapalli - Kovvuru Project Highway nor transfer, lease or part possession thereof, save and except as expressly permitted by the Gundugolanu - Devarapalli - Kovvuru Concession Agreement.

Fees

The Concessionaire is entitled to, during the Gundugolanu - Devarapalli - Kovvuru Concession Period, levy, collect and appropriate fees from users ("**User Fee**") of the Gundugolanu - Devarapalli - Kovvuru Project Highway pursuant to and in accordance with the provisions in the Gundugolanu - Devarapalli - Kovvuru Concession Agreement and the Fee Rules and to appropriate the same. In accordance with the terms of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, the Concessionaire shall not collect any fees in relation to exempted vehicles. The fees collected by Concessionaire shall be deposited in the escrow account and appropriated in accordance with the relevant provisions of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement.

Sub Rule 6(6) of the above-mentioned Fee Rules states,

"(a) The fee shall be collected by the Central Government or the executing Authority as the case may be and for a specified period in accordance with the terms of agreement entered by the Concessionaire.
(b) The fee as notified as per Narasannapeta to Ranasthalam Concession Agreement shall be leviable till the end of the concession period and after the Concession Agreement is over, the fee shall be collected by the Central Government executing authority at a reduced rate of 40% of the fee on the date of transfer of such section of National Highways, bridge, tunnel or bypass, as the case may be, to be revised annually in accordance with these rules:

Provided that after the recovery of capital cost through user fee realised, in respect of a public funded project, the fee leviable would be reduced to 40% of the user fee for such section of National Highways, bridge, tunnel or bypass as the case may be, to be revised annually in accordance with these rules." In respect of the above, NHAI has clarified that Rule 6 of the Fee Rules provides that the user fee to be notified by Government as per the format of Schedule M of Concession Agreement shall be leviable till the end of the concession period. Hence, the rate of User Fee rate shall only be reduced after the concession period is over."

Concession Fees

As consideration for the grant of the Concession, the Concessionaire is required to pay a concession fee to NHAI equivalent to ₹ 21,829.00 million, within 120 days of the date of execution of the concession agreement or any extended date as agreed by NHAI prior to the Appointed Date as a Condition Precedent. The Concessionaire agrees that payment of the concession fee constitutes essential condition of the Concession Agreement. Further as communicated by the authority by way of a letter dated 13.02.25, any amount raised from the proceeds of the Issue in excess of the Base Concession Fee (being the aggregate of Concession Fees payable to NHAI in terms of the Additional Concession Agreements) shall be paid to the Authority. For further details, see the section titled "Use of Proceeds – Details of Utilisation of Issue Proceeds - Infusion of debt and/or equity into NSPPL" on page 355. For the purposes of stamp duty payment, concession agreements are generally considered to be agreements which are not lease deeds and stamp duty of ₹ 100.00 is typically paid for such concession agreements. However, stamp duty authorities of certain states in India have issued notices to some concessionaires alleging inadequate stamp duty on the concession agreements executed between the concessionaires and the NHAI. The stamp authorities allege that since concession agreements relate to the letting of tolls to the concessionaires in the form of leases, or as development agreements, such agreements were required to be stamped as lease agreements or development agreements, as applicable. The stamp duty for a lease agreement or a development agreement ranges between 1.0% and 11.0% of the annual rent or premium payable or the market value of the property. Furthermore, stamp duty authorities may impose penalties for payment of inadequate stamp duty, which could extend up to ten (10) times the amount of the stamp duty payable. Accordingly, concession agreements that have not been stamped as such could be considered to be inadequately stamped. The High Courts of Allahabad and Maharashtra have also held that a concession agreement ought to be stamped as a lease agreement and have upheld the imposition of a higher stamp duty on such agreements.

While we have paid stamp duty of ₹ 100.00 on each of our Concession Agreements in accordance with usual practice, if any demand for payment of a higher stamp duty or penalty is imposed, it would increase the costs of the Toll Roads.

In respect of above, NHAI has clarified that:

(i) As on the date of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, GST is not applicable on Concession Fee. However, if it becomes applicable at a later stage, this shall be considered as change in law.

(ii) There is no requirement of stamp duty in case of Concession Agreements since Fee Rules provided for levy and collection of user fee and not toll tax. In case, in future any such demand arises, it shall be treated as change in law.

Escrow Account

The provisions in relation to the escrow account in the Gundugolanu - Devarapalli - Kovvuru Concession Agreement are only applicable if the obligations of the Concessionaire under Gundugolanu - Devarapalli - Kovvuru Concession Agreement are financed by the Lenders.

The Concessionaire shall, prior to the Appointed Date, open and establish the escrow account with the escrow bank and all funds constituting the financing package related to the Gundugolanu - Devarapalli - Kovvuru Project shall be credited to such escrow account. During the Gundugolanu - Devarapalli - Kovvuru Concession Period all fees and any other revenues including the proceeds of any rentals, deposits, capital receipts or insurance claims from or in respect of the Gundugolanu - Devarapalli - Kovvuru Project Highway shall be deposited therein. In addition, all payments by NHAI pursuant to the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, including, if any, in relation to the change of scope in the Gundugolanu - Devarapalli - Kovvuru Project shall be deposited by NHAI in the escrow account.

Withdrawals from Escrow Account

The Concessionaire shall, at the time of the opening of the escrow account, give irrevocable instructions by way of an escrow agreement substantially in form set forth in the Gundugolanu - Devarapalli - Kovvuru Concession Agreement to the escrow bank instructing, *inter alia*, that the deposits into the escrow account shall subject to the provisions of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, be appropriated in the following order every month and if not due in a month then appropriated proportionately in such month and retained in the escrow account and paid out therefrom in the month when due unless otherwise expressly provided in the instruction letter:

i. all taxes due and payable by the Concessionaire for and in respect of the Gundugolanu - Devarapalli - Kovvuru Project Highway;

ii. concession fee;

iii. all payments relating to construction of the Gundugolanu - Devarapalli - Kovvuru Project Highway, subject to and in accordance with the conditions, if any, set forth in the financing agreements;

iv. operation and maintenance expenses;

v. operation and maintenance expenses and other costs and expenses incurred by NHAI in accordance with the provisions of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, and certified by NHAI as due and payable to it;

vi. monthly proportionate provision of debt service payment due in an accounting year;

vii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Withdrawals upon Termination

Notwithstanding anything to the contrary contained in the escrow agreement and subject to the provisions of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, in the case of termination, the amounts standing to the credit of the escrow account shall be appropriated in the following order:

i. all taxes due and payable by the Concessionaire for and in respect of the Gundugolanu - Devarapalli - Kovvuru Project Highway;

ii. payment due to the lenders;

iii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire;

iv. retention and payments relating to the liability for defects and deficiencies;

v. incurred or accrued operation and maintenance expenses;

vi. any other payments required to be made under the Gundugolanu - Devarapalli - Kovvuru Concession Agreement; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Change of Scope

NHAI may, notwithstanding anything to the contrary contained in the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, require the Concessionaire to make alterations/ modifications in the scope of the Gundugolanu - Devarapalli - Kovvuru Project as contemplated by the Gundugolanu - Devarapalli - Kovvuru Concession Agreement. If the cumulative costs relating to all the change of scope orders exceed 5% of the concession fee in any continuous period of 3 years immediately preceding the date of such change of scope order or if such cumulative costs exceed 25% of the concession fee at any time during the Gundugolanu - Devarapalli - Kovvuru Concession Period, NHAI may award any works or services, to any person on the basis of open competitive bidding and the Concessionaire shall be entitled to take part in such competitive bidding with a right to match the first-ranked bid in terms of the selection criteria, either by itself where such work requires tolling, operation and maintenance, or through another company where such work requires construction on any part of the Project Highway, subject to payment of 2% (two per cent) of the bid amount to the Authority, and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Concessionaire shall be entitled to exercise such option only if the Concessionaire has participated in the bidding process either individually or as a consortium or JV with another company and fulfils the eligibility criteria to undertake such work without compromising with its overall liability. All such changes shall be made by NHAI by an order issued in accordance with the procedure set forth in the Gundugolanu - Devarapalli - Kovvuru Concession Agreement.

Termination of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement

Termination by either party

Either Party may in its discretion terminate the Gundugolanu - Devarapalli - Kovvuru Concession Agreement by giving a termination notice to the other party if a force majeure event subsists for a period of 120 days or more within a continuous period of 365 days. Before issuing such termination notice, the party intending to issue the termination notice shall inform the other party of such intention and grant 15 days' time to make a representation and may after the expiry of such 15 days period, whether or not it is in receipt of such representation, in its sole discretion issue the termination notice.

Termination by the NHAI

In the event of any of the defaults specified below have occurred, and if the Concessionaire has failed to cure default within the period provided for the same in the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, then NHAI shall be entitled to issue a notice of its intention to terminate the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, with a copy to the lenders. The following events shall constitute an event of default by the Concessionaire (a "**Concessionaire Default**") unless they have occurred as a result of any breach of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement by NHAI or due to force majeure:

i. the performance security has been encashed and appropriated in accordance with the Gundugolanu - Devarapalli - Kovvuru Concession Agreement and the Concessionaire has failed to replenish or provide fresh performance security within a cure period of 15 days;

ii. subsequent to the replenishment or furnishing of fresh performance security in accordance with the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, the Concessionaire fails to cure, within a cure period of 60 days, the Concessionaire Default for which whole or part of the performance security was appropriated;

iii. the Concessionaire abandons or manifests intention to abandon the operation and maintenance of the Gundugolanu - Devarapalli - Kovvuru Project Highway without the prior written consent of NHAI;

iv. the Concessionaire fails to roll over, renew and furnish new bank guarantee performance security subject to and in accordance with terms of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, at least three months prior to expiry of subsisting bank guarantee;

v. the Concessionaire is in breach of the Maintenance Requirements or the Safety Requirements, as the case may be;

vi the Concessionaire has failed to make any payment to NHAI within the period specified in the Gundugolanu - Devarapalli - Kovvuru Concession Agreement;

vii. upon occurrence of a financial default, the lenders' representative has by notice required NHAI to undertake suspension or termination, as the case may be, in accordance with the substitution agreement and the Concessionaire fails to cure the default within the specified cure period;

viii. a breach of any of the project agreements by the Concessionaire causes a material adverse effect;

ix. the Concessionaire creates any encumbrance in breach of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement;

x. the Concessionaire repudiates the Gundugolanu - Devarapalli - Kovvuru Concession Agreement or otherwise takes any action or evidences or conveys an intention not to be bound by the Gundugolanu - Devarapalli - Kovvuru Concession Agreement;

xi. a change in ownership occurs in breach of the provisions of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement;

xii. there is a transfer, pursuant to law either of (i) the rights and/or obligations of the Concessionaire under any of the project agreements, or of (ii) all or part of the assets or undertaking of the Concessionaire, and such transfer causes a material adverse effect;

xiii. an execution levied on any of the assets of the Concessionaire has caused a material adverse effect;

xiv. the Concessionaire is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Concessionaire or for the whole or material part of its assets that has a material bearing on the Gundugolanu - Devarapalli - Kovvuru Project;

xv. the Concessionaire has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of NHAI, a material adverse effect;

xvi. a resolution for winding up of the Concessionaire is passed or any petition for winding up of the Concessionaire is admitted by a court of competent jurisdiction and a provisional liquidator or receiver is appointed and such order has not been set aside within 90 days of the date thereof or the Concessionaire is ordered to be wound up by Court except for the purpose of amalgamation or reconstruction; provided that, as part of such amalgamation or reconstruction, the entire property, assets and undertaking of the Concessionaire are transferred to the amalgamated or reconstructed entity and that the amalgamated or reconstructed entity has unconditionally assumed the obligations of the Concessionaire under the Gundugolanu - Devarapalli - Kovvuru Concession Agreement and the project agreements; and provided that:

    a. the amalgamated or reconstructed entity has the capability and operating experience necessary for the performance of its obligations under the Gundugolanu - Devarapalli - Kovvuru Concession Agreement and the project agreements;

    b. the amalgamated or reconstructed entity has the financial standing to perform its obligations under the Gundugolanu - Devarapalli - Kovvuru Concession Agreement and the project agreements and has a credit worthiness at least as good as that of the Concessionaire as at Appointed Date; and

    c. each of the project agreements remains in full force and effect;

xvii. any representation or warranty of the Concessionaire herein contained which is, as of the date of Gundugolanu - Devarapalli - Kovvuru Concession Agreement, found to be materially false, incorrect or misleading;

xviii. the Concessionaire submits to NHAI any statement, notice or other document, in written or electronic form, which has a material effect on NHAI's rights, obligations or interests and which is false in material particulars;

xix. the Concessionaire has failed to fulfil any obligation, for which failure termination has been specified in the Gundugolanu - Devarapalli - Kovvuru Concession Agreement;

xx. the Concessionaire commits a default in complying with any other provision of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement if such default causes a material adverse effect on NHAI;

xxi. an escrow default occurs and the Concessionaire fails to cure the default within a cure period of 15 days;

Termination by Concessionaire

If any of the defaults specified below shall have occurred, and NHAI fails to cure such default within a cure period of 90 days or such longer period as has been expressly provided in the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, NHAI shall be deemed to be in default of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement, unless the default has occurred as a result of any breach of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement by the Concessionaire or due to force majeure:

i. NHAI commits a material default in complying with any of the provisions of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement and such default has a material adverse effect on the Concessionaire; or

ii. NHAI repudiates the Gundugolanu - Devarapalli - Kovvuru Concession Agreement or otherwise takes any action that amounts to or manifests an irrevocable intention not to be bound by the Gundugolanu - Devarapalli - Kovvuru Concession Agreement; or

iii. the State commits a material default in complying with the provisions of the State Support Agreement if such default has a Material Adverse Effect on the Concessionaire and the breach continues for a period of 90 (ninety) days from the date of notice given in this behalf by the Concessionaire to the Authority.

Termination Payments

The termination payment pursuant to the Gundugolanu - Devarapalli - Kovvuru Concession Agreement becomes due and payable to the Concessionaire by NHAI within 15 days of the Concessionaire furnishing to NHAI an NOC issued by the lenders/ lenders' representative recording/ effecting release/ vacation/ discharge of the charge on Gundugolanu - Devarapalli - Kovvuru Project receivables (if any) created by Concessionaire for securing repayment of the debt. If NHAI fails to disburse the full termination payment within 15 days, NHAI shall pay interest at a rate equal to 3% above the bank rate on the amount of termination payment remaining unpaid.

Upon termination of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement by the NHAI on account of occurrence of a Concessionaire Default, the NHAI shall pay the Concessionaire by way of termination payment 70% of the Unexpired Cash Flow.

Upon termination of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement by the Concessionaire on account of occurrence of an NHAI Default, the Concessionaire shall be entitled to receive from NHAI by way of termination payment a sum equal to 105% of the Unexpired Cash Flow.

For details in relation to the technical clarifications received from NHAI in relation to the Concession Agreements, please refer to Annexure 1 of the Gundugolanu - Devarapalli - Kovvuru Concession Agreement.

5. ***Concession Agreement between NSPPL ("Concessionaire") and NHAI in respect of the Chittoor to Mallavaram Project dated*** March 12, 2025

The Concessionaire has entered into a concession agreement for tolling, operation, maintenance and transfer of Chittoor to Mallavaram Project (as defined below) on toll, operate and transfer (TOT) basis (the "**Chittoor to Mallavaram Concession Agreement**"), for a period of 20 years from the the Appointed Date (i.e., the date on which all Conditions Precedent have been satisfied) or such date on which the Chittoor to Mallavaram Concession Agreement is terminated by a termination notice ("**Chittoor to Mallavaram Concession Period**").

Certain Definitions

"**Chittoor to Mallavaram Project**" means the operation and maintenance of the Chittoor to Mallavaram Project Highway in accordance with the provisions of the Chittoor to Mallavaram Concession Agreement and includes all works, services and equipment relating to or in respect of the scope of the Chittoor to Mallavaram Project as set forth in the Chittoor to Mallavaram Concession Agreement;

"**Chittoor to Mallavaram Project Assets**" means all physical and other assets relating to and forming part of the Site including (a) rights over the Site in the form of licence, Right of Way or otherwise; (b) tangible assets such as civil works and equipment including foundations, embankments, pavements, road surface, interchanges, bridges, culverts, road overbridges, drainage works, traffic signals, sign boards, kilometre- stones, toll plazas, electrical systems, communication systems, rest areas, relief centers, maintenance depots and administrative offices; (d) all rights of the Concessionaire under the project agreements; security deposits; insurance proceeds; and (e) Applicable Permits and authorisations relating to or in respect of the Chittoor to Mallavaram Project Highway, but does not include Additional Facilities; and

"**Chittoor to Mallavaram Project Highway**" means the Site comprising the existing road comprising:

Stretch	State	Start (Km)	End (Km)	Length
Chittoor to Mallavaram	Andhra Pradesh	0+000	61+128	61.128

and all Chittoor to Mallavaram Project Assets."

Grant of Concession

Subject to and in accordance with the terms and conditions set forth in the Chittoor to Mallavaram Concession Agreement, NHAI has granted to the Concessionaire, and the Concessionaire has accepted the concession for a period of 20 years, including the exclusive right, license and authority during the subsistence of the Chittoor to Mallavaram Agreement to demand, collect and appropriate Fee, operate, manage and maintain the Chittoor to Mallavaram Project Highway. Notwithstanding anything to the contrary in the Chittoor to Mallavaram Concession Agreement, the parties have expressly agreed that the Concession Period shall not be reduced by more than 5 (five) years, or shall not be increased by more than 10 (ten) years on any account or for any reason whatsoever.

Subject to and in accordance with the terms and conditions set forth in the Chittoor to Mallavaram Concession Agreement, the Concessionaire is entitled to undertake the following in accordance with the terms of the Chittoor to Mallavaram Concession Agreement, applicable laws and applicable permits:

i. Right of Way, access and license to the Site for the purpose of and to the extent conferred by the provisions of the Chittoor to Mallavaram Concession Agreement;

ii. manage, operate and maintain the Chittoor to Mallavaram Project Highway and regulate the use thereof by third parties in accordance with the terms of Chittoor to Mallavaram Concession Agreement;

iii. demand, collect and appropriate the fees from vehicles and persons liable for payment of fees for using the Chittoor to Mallavaram Project Highway or any part thereof and refuse entry of any vehicle to the Chittoor to Mallavaram Project Highway if the fee due is not paid;

iv. perform and fulfill all of the Concessionaire's obligations under and in accordance with the Chittoor to Mallavaram Concession Agreement;

v. bear and pay all costs, expenses and charges in connection with or incidental to the performance of the obligations of the Concessionaire under the Chittoor to Mallavaram Concession Agreement; and

vi. neither assign, transfer or sublet or create any lien or encumbrance on the Chittoor to Mallavaram Concession Agreement, or the concession granted thereby, or on the whole or any part of the Chittoor to Mallavaram Project Highway nor transfer, lease or part possession thereof, save and except as expressly permitted by the Chittoor to Mallavaram Concession Agreement.

Fees

The Concessionaire is entitled to, during the Chittoor to Mallavaram Concession Period, levy, collect and appropriate fees from users ("**User Fee**") of the Chittoor to Mallavaram Project Highway pursuant to and in accordance with the provisions in the Chittoor to Mallavaram Concession Agreement and the Fee Rules and to appropriate the same. In accordance with the terms of the Chittoor to Mallavaram Concession Agreement, the Concessionaire shall not collect any fees in relation to exempted vehicles. The fees collected by Concessionaire shall be deposited in the escrow account and appropriated in accordance with the relevant provisions of the Chittoor to Mallavaram Concession Agreement.

Sub Rule 6(6) of the above-mentioned Fee Rules states,

"(a) The fee shall be collected by the Central Government or the executing Authority as the case may be and for a specified period in accordance with the terms of agreement entered by the Concessionaire.
(b) The fee as notified as per Narasannapeta to Ranasthalam Concession Agreement shall be leviable till the end of the concession period and after the Concession Agreement is over, the fee shall be collected by the Central Government executing authority at a reduced rate of 40% of the fee on the date of transfer of such section of National Highways, bridge, tunnel or bypass, as the case may be, to be revised annually in accordance with these rules:

Provided that after the recovery of capital cost through user fee realised, in respect of a public funded project, the fee leviable would be reduced to 40% of the user fee for such section of National Highways, bridge, tunnel or bypass as the case may be, to be revised annually in accordance with these rules." In respect of the above, NHAI has clarified that Rule 6 of the Fee Rules provides that the user fee to be notified by Government as per the format of Schedule M of Concession Agreement shall be leviable till the end of the concession period. Hence, the rate of User Fee rate shall only be reduced after the concession period is over."

Concession Fees

As consideration for the grant of the Concession, the Concessionaire is required to pay a concession fee to NHAI equivalent

to ₹ 15,302.00 million, within 120 days of the date of execution of the concession agreement or any extended date as agreed by NHAI prior to the Appointed Date as a Condition Precedent. The Concessionaire agrees that payment of the concession fee constitutes essential condition of the Concession Agreement. Further as communicated by the authority by way of a letter dated 13.02.25, any amount raised from the proceeds of the Issue in excess of the Base Concession Fee (being the aggregate of Concession Fees payable to NHAI in terms of the Additional Concession Agreements) shall be paid to the Authority. For further details, see the section titled "Use of Proceeds – Details of Utilisation of Issue Proceeds - Infusion of debt and/or equity into NSPPL" on page 355. For the purposes of stamp duty payment, concession agreements are generally considered to be agreements which are not lease deeds and stamp duty of ₹ 100.00 is typically paid for such concession agreements. However, stamp duty authorities of certain states in India have issued notices to some concessionaires alleging inadequate stamp duty on the concession agreements executed between the concessionaires and the NHAI. The stamp authorities allege that since concession agreements relate to the letting of tolls to the concessionaires in the form of leases, or as development agreements, such agreements were required to be stamped as lease agreements or development agreements, as applicable. The stamp duty for a lease agreement or a development agreement ranges between 1.0% and 11.0% of the annual rent or premium payable or the market value of the property. Furthermore, stamp duty authorities may impose penalties for payment of inadequate stamp duty, which could extend up to ten (10) times the amount of the stamp duty payable. Accordingly, concession agreements that have not been stamped as such could be considered to be inadequately stamped. The High Courts of Allahabad and Maharashtra have also held that a concession agreement ought to be stamped as a lease agreement and have upheld the imposition of a higher stamp duty on such agreements.

While we have paid stamp duty of ₹ 100.00 on each of our Concession Agreements in accordance with usual practice, if any demand for payment of a higher stamp duty or penalty is imposed, it would increase the costs of the Toll Roads.

In respect of above, NHAI has clarified that:

(i) As on the date of the Chittoor to Mallavaram Concession Agreement, GST is not applicable on Concession Fee. However, if it becomes applicable at a later stage, this shall be considered as change in law.

(ii) There is no requirement of stamp duty in case of Concession Agreements since Fee Rules provided for levy and collection of user fee and not toll tax. In case, in future any such demand arises, it shall be treated as change in law.

Escrow Account

The provisions in relation to the escrow account in the Chittoor to Mallavaram Concession Agreement are only applicable if the obligations of the Concessionaire under Chittoor to Mallavaram Concession Agreement are financed by the Lenders.

The Concessionaire shall, prior to the Appointed Date, open and establish the escrow account with the escrow bank and all funds constituting the financing package related to the Chittoor to Mallavaram Project shall be credited to such escrow account. During the Chittoor to Mallavaram Concession Period all fees and any other revenues including the proceeds of any rentals, deposits, capital receipts or insurance claims from or in respect of the Chittoor to Mallavaram Project Highway shall be deposited therein. In addition, all payments by NHAI pursuant to the Chittoor to Mallavaram Concession Agreement, including, if any, in relation to the change of scope in the Chittoor to Mallavaram Project shall be deposited by NHAI in the escrow account.

Withdrawals from Escrow Account

The Concessionaire shall, at the time of the opening of the escrow account, give irrevocable instructions by way of an escrow agreement substantially in form set forth in the Chittoor to Mallavaram Concession Agreement to the escrow bank instructing, *inter alia*, that the deposits into the escrow account shall subject to the provisions of the Chittoor to Mallavaram Concession Agreement, be appropriated in the following order every month and if not due in a month then appropriated proportionately in such month and retained in the escrow account and paid out therefrom in the month when due unless otherwise expressly provided in the instruction letter:

i. all taxes due and payable by the Concessionaire for and in respect of the Chittoor to Mallavaram Project Highway;

ii. concession fee;

iii. all payments relating to construction of the Chittoor to Mallavaram Project Highway, subject to and in accordance with the conditions, if any, set forth in the financing agreements;

iv. operation and maintenance expenses;

v. operation and maintenance expenses and other costs and expenses incurred by NHAI in accordance with the provisions of the Chittoor to Mallavaram Concession Agreement, and certified by NHAI as due and payable to it;

vi. monthly proportionate provision of debt service payment due in an accounting year;

vii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Withdrawals upon Termination

Notwithstanding anything to the contrary contained in the escrow agreement and subject to the provisions of the Chittoor to Mallavaram Concession Agreement, in the case of termination, the amounts standing to the credit of the escrow account shall be appropriated in the following order:

i. all taxes due and payable by the Concessionaire for and in respect of the Chittoor to Mallavaram Project Highway;

ii. payment due to the lenders;

iii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire;

iv. retention and payments relating to the liability for defects and deficiencies;

v. incurred or accrued operation and maintenance expenses;

vi. any other payments required to be made under the Chittoor to Mallavaram Concession Agreement; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Change of Scope

NHAI may, notwithstanding anything to the contrary contained in the Chittoor to Mallavaram Concession Agreement, require the Concessionaire to make alterations/ modifications in the scope of the Chittoor to Mallavaram Project as contemplated by the Chittoor to Mallavaram Concession Agreement. If the cumulative costs relating to all the change of scope orders exceed 5% of the concession fee in any continuous period of 3 years immediately preceding the date of such change of scope order or if such cumulative costs exceed 25% of the concession fee at any time during the Chittoor to Mallavaram Concession Period, NHAI may award any works or services, to any person on the basis of open competitive bidding and the Concessionaire shall be entitled to take part in such competitive bidding with a right to match the first-ranked bid in terms of the selection criteria, either by itself where such work requires tolling, operation and maintenance, or through another company where such work requires construction on any part of the Project Highway, subject to payment of 2% (two per cent) of the bid amount to the Authority, and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Concessionaire shall be entitled to exercise such option only if the Concessionaire has participated in the bidding process either individually or as a consortium or JV with another company and fulfils the eligibility criteria to undertake such work without compromising with its overall liability. All such changes shall be made by NHAI by an order issued in accordance with the procedure set forth in the Chittoor to Mallavaram Concession Agreement.

Termination of the Chittoor to Mallavaram Concession Agreement

Termination by either party

Either Party may in its discretion terminate the Chittoor to Mallavaram Concession Agreement by giving a termination notice to the other party if a force majeure event subsists for a period of 120 days or more within a continuous period of 365 days. Before issuing such termination notice, the party intending to issue the termination notice shall inform the other party of such intention and grant 15 days' time to make a representation and may after the expiry of such 15 days period, whether or not it is in receipt of such representation, in its sole discretion issue the termination notice.

Termination by the NHAI

In the event of any of the defaults specified below have occurred, and if the Concessionaire has failed to cure default within the period provided for the same in the Chittoor to Mallavaram Concession Agreement, then NHAI shall be entitled to issue a notice of its intention to terminate the Chittoor to Mallavaram Concession Agreement, with a copy to the lenders. The following events shall constitute an event of default by the Concessionaire (a "**Concessionaire Default**") unless they have occurred as a result of any breach of the Chittoor to Mallavaram Concession Agreement by NHAI or due to force majeure:

i. the performance security has been encashed and appropriated in accordance with the Chittoor to Mallavaram Concession Agreement and the Concessionaire has failed to replenish or provide fresh performance security within a cure period of 15 days;

ii. subsequent to the replenishment or furnishing of fresh performance security in accordance with the Chittoor to Mallavaram Concession Agreement, the Concessionaire fails to cure, within a cure period of 60 days, the Concessionaire Default for which whole or part of the performance security was appropriated;

iii. the Concessionaire abandons or manifests intention to abandon the operation and maintenance of the Chittoor to Mallavaram Project Highway without the prior written consent of NHAI;

iv. the Concessionaire fails to roll over, renew and furnish new bank guarantee performance security subject to and in accordance with terms of the Chittoor to Mallavaram Concession Agreement, at least three months prior to expiry of subsisting bank guarantee;

v. the Concessionaire is in breach of the Maintenance Requirements or the Safety Requirements, as the case may be;

vi the Concessionaire has failed to make any payment to NHAI within the period specified in the Chittoor to Mallavaram Concession Agreement;

vii. upon occurrence of a financial default, the lenders' representative has by notice required NHAI to undertake suspension or termination, as the case may be, in accordance with the substitution agreement and the Concessionaire fails to cure the default within the specified cure period;

viii. a breach of any of the project agreements by the Concessionaire causes a material adverse effect;

ix. the Concessionaire creates any encumbrance in breach of the Chittoor to Mallavaram Concession Agreement;

x. the Concessionaire repudiates the Chittoor to Mallavaram Concession Agreement or otherwise takes any action or evidences or conveys an intention not to be bound by the Chittoor to Mallavaram Concession Agreement;

xi. a change in ownership occurs in breach of the provisions of the Chittoor to Mallavaram Concession Agreement;

xii. there is a transfer, pursuant to law either of (i) the rights and/or obligations of the Concessionaire under any of the project agreements, or of (ii) all or part of the assets or undertaking of the Concessionaire, and such transfer causes a material adverse effect;

xiii. an execution levied on any of the assets of the Concessionaire has caused a material adverse effect;

xiv. the Concessionaire is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Concessionaire or for the whole or material part of its assets that has a material bearing on the Chittoor to Mallavaram Project;

xv. the Concessionaire has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of NHAI, a material adverse effect;

xvi. a resolution for winding up of the Concessionaire is passed or any petition for winding up of the Concessionaire is admitted by a court of competent jurisdiction and a provisional liquidator or receiver is appointed and such order has not been set aside within 90 days of the date thereof or the Concessionaire is ordered to be wound up by Court except for the purpose of amalgamation or reconstruction; provided that, as part of such amalgamation or reconstruction, the entire property, assets and undertaking of the Concessionaire are transferred to the amalgamated or reconstructed entity and that the amalgamated or reconstructed entity has unconditionally assumed the obligations of the Concessionaire under the Chittoor to Mallavaram Concession Agreement and the project agreements; and provided that:

a. the amalgamated or reconstructed entity has the capability and operating experience necessary for the performance of its obligations under the Chittoor to Mallavaram Concession Agreement and the project agreements;

b. the amalgamated or reconstructed entity has the financial standing to perform its obligations under the Chittoor to Mallavaram Concession Agreement and the project agreements and has a credit worthiness at least as good as that of the Concessionaire as at Appointed Date; and

c. each of the project agreements remains in full force and effect;

xvii. any representation or warranty of the Concessionaire herein contained which is, as of the date of Chittoor to Mallavaram Concession Agreement, found to be materially false, incorrect or misleading;

xviii. the Concessionaire submits to NHAI any statement, notice or other document, in written or electronic form, which has a material effect on NHAI's rights, obligations or interests and which is false in material particulars;

xix. the Concessionaire has failed to fulfil any obligation, for which failure termination has been specified in the Chittoor to Mallavaram Concession Agreement;

xx. the Concessionaire commits a default in complying with any other provision of the Chittoor to Mallavaram Concession Agreement if such default causes a material adverse effect on NHAI;

xxi. an escrow default occurs and the Concessionaire fails to cure the default within a cure period of 15 days;

Termination by Concessionaire

If any of the defaults specified below shall have occurred, and NHAI fails to cure such default within a cure period of 90 days or such longer period as has been expressly provided in the Chittoor to Mallavaram Concession Agreement, NHAI shall be deemed to be in default of the Chittoor to Mallavaram Concession Agreement, unless the default has occurred as a result of any breach of the Chittoor to Mallavaram Concession Agreement by the Concessionaire or due to force majeure:

i. NHAI commits a material default in complying with any of the provisions of the Chittoor to Mallavaram Concession Agreement and such default has a material adverse effect on the Concessionaire; or

ii. NHAI repudiates the Chittoor to Mallavaram Concession Agreement or otherwise takes any action that amounts to or manifests an irrevocable intention not to be bound by the Chittoor to Mallavaram Concession Agreement; or

iii. the State commits a material default in complying with the provisions of the State Support Agreement if such default has a Material Adverse Effect on the Concessionaire and the breach continues for a period of 90 (ninety) days from the date of notice given in this behalf by the Concessionaire to the Authority.

Termination Payments

The termination payment pursuant to the Chittoor to Mallavaram Concession Agreement becomes due and payable to the Concessionaire by NHAI within 15 days of the Concessionaire furnishing to NHAI an NOC issued by the lenders/ lenders' representative recording/ effecting release/ vacation/ discharge of the charge on Chittoor to Mallavaram Project receivables (if any) created by Concessionaire for securing repayment of the debt. If NHAI fails to disburse the full termination payment within 15 days, NHAI shall pay interest at a rate equal to 3% above the bank rate on the amount of termination payment remaining unpaid.

Upon termination of the Chittoor to Mallavaram Concession Agreement by the NHAI on account of occurrence of a Concessionaire Default, the NHAI shall pay the Concessionaire by way of termination payment 70% of the Unexpired Cash Flow.

Upon termination of the Chittoor to Mallavaram Concession Agreement by the Concessionaire on account of occurrence of an NHAI Default, the Concessionaire shall be entitled to receive from NHAI by way of termination payment a sum equal to 105% of the Unexpired Cash Flow.

For details in relation to the technical clarifications received from NHAI in relation to the Concession Agreements, please refer to Annexure 1 of the Chittoor to Mallavaram Concession Agreement.

6. ***Concession Agreement between NSPPL ("Concessionaire") and NHAI in respect of the TN/AP – Border to Nalagampalli to AP/Karnataka Borde*r *Project dated March 12, 2025***

The Concessionaire has entered into a concession agreement for tolling, operation, maintenance and transfer of TN/AP – Border to Nalagampalli to AP/Karnataka Border Project (as defined below) on toll, operate and transfer (TOT) basis (the "TN/AP – Border to Nalagampalli to AP/Karnataka Border **Concession Agreement**"), for a period of 20 years from the the Appointed Date (i.e., the date on which all Conditions Precedent have been satisfied) or such date on which the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement is terminated by a termination notice ("TN/AP – Border to Nalagampalli to AP/Karnataka Border **Concession Period**").

Certain Definitions

"TN/AP – Border to Nalagampalli to AP/Karnataka Border **Project**" means the operation and maintenance of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project Highway in accordance with the provisions of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement and includes all works, services and equipment relating to or in respect of the scope of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project as set forth in the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement;

"TN/AP – Border to Nalagampalli to AP/Karnataka Border **Project Assets**" means all physical and other assets relating to and forming part of the Site including (a) rights over the Site in the form of licence, Right of Way or otherwise; (b) tangible assets such as civil works and equipment including foundations, embankments, pavements, road surface,

interchanges, bridges, culverts, road overbridges, drainage works, traffic signals, sign boards, kilometre- stones, toll plazas, electrical systems, communication systems, rest areas, relief centers, maintenance depots and administrative offices; (d) all rights of the Concessionaire under the project agreements; security deposits; insurance proceeds; and (e) Applicable Permits and authorisations relating to or in respect of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project Highway, but does not include Additional Facilities; and

"TN/AP – Border to Nalagampalli to AP/Karnataka Border **Project Highway**" means the Site comprising the existing road comprising:

Stretch	**State**	**Start (Km)**	**End (Km)**	**Length**
TN/AP – Border to Nalagampalli to AP/Karnataka Border	Andhra Pradesh	134+890	219+687	84.797

and all TN/AP – Border to Nalagampalli to AP/Karnataka Border Project Assets."

Grant of Concession

Subject to and in accordance with the terms and conditions set forth in the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, NHAI has granted to the Concessionaire, and the Concessionaire has accepted the concession for a period of 20 years, including the exclusive right, license and authority during the subsistence of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Agreement to demand, collect and appropriate Fee, operate, manage and maintain the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project Highway. Notwithstanding anything to the contrary in the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, the parties have expressly agreed that the Concession Period shall not be reduced by more than 5 (five) years, or shall not be increased by more than 10 (ten) years on any account or for any reason whatsoever.

Subject to and in accordance with the terms and conditions set forth in the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, the Concessionaire is entitled to undertake the following in accordance with the terms of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, applicable laws and applicable permits:

i. Right of Way, access and license to the Site for the purpose of and to the extent conferred by the provisions of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement;

ii. manage, operate and maintain the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project Highway and regulate the use thereof by third parties in accordance with the terms of TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement;

iii. demand, collect and appropriate the fees from vehicles and persons liable for payment of fees for using the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project Highway or any part thereof and refuse entry of any vehicle to the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project Highway if the fee due is not paid;

iv. perform and fulfill all of the Concessionaire's obligations under and in accordance with the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement;

v. bear and pay all costs, expenses and charges in connection with or incidental to the performance of the obligations of the Concessionaire under the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement; and

vi. neither assign, transfer or sublet or create any lien or encumbrance on the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, or the concession granted thereby, or on the whole or any part of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project Highway nor transfer, lease or part possession thereof, save and except as expressly permitted by the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement.

Fees

The Concessionaire is entitled to, during the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Period, levy, collect and appropriate fees from users ("**User Fee**") of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project Highway pursuant to and in accordance with the provisions in the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement and the Fee Rules and to appropriate the same. In accordance with the terms of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, the Concessionaire shall not collect any fees in relation to exempted vehicles. The fees collected by Concessionaire shall be deposited in the escrow account and appropriated in accordance with the relevant provisions of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement.

Sub Rule 6(6) of the above-mentioned Fee Rules states,

"(a) The fee shall be collected by the Central Government or the executing Authority as the case may be and for a specified period in accordance with the terms of agreement entered by the Concessionaire.
(b) The fee as notified as per Narasannapeta to Ranasthalam Concession Agreement shall be leviable till the end of the concession period and after the Concession Agreement is over, the fee shall be collected by the Central Government executing authority at a reduced rate of 40% of the fee on the date of transfer of such section of National Highways, bridge, tunnel or bypass, as the case may be, to be revised annually in accordance with these rules:

Provided that after the recovery of capital cost through user fee realised, in respect of a public funded project, the fee leviable would be reduced to 40% of the user fee for such section of National Highways, bridge, tunnel or bypass as the case may be, to be revised annually in accordance with these rules." In respect of the above, NHAI has clarified that Rule 6 of the Fee Rules provides that the user fee to be notified by Government as per the format of Schedule M of Concession Agreement shall be leviable till the end of the concession period. Hence, the rate of User Fee rate shall only be reduced after the concession period is over."

Concession Fees

As consideration for the grant of the Concession, the Concessionaire is required to pay a concession fee to NHAI equivalent to ₹ 12,618.00 million, within 120 days of the date of execution of the concession agreement or any extended date as agreed by NHAI prior to the Appointed Date as a Condition Precedent. The Concessionaire agrees that payment of the concession fee constitutes essential condition of the Concession Agreement. Further as communicated by the authority by way of a letter dated 13.02.25, any amount raised from the proceeds of the Issue in excess of the Base Concession Fee (being the aggregate of Concession Fees payable to NHAI in terms of the Additional Concession Agreements) shall be paid to the Authority. For further details, see the section titled "Use of Proceeds – Details of Utilisation of Issue Proceeds - Infusion of debt and/or equity into NSPPL" on page 355. For the purposes of stamp duty payment, concession agreements are generally considered to be agreements which are not lease deeds and stamp duty of ₹ 100.00 is typically paid for such concession agreements. However, stamp duty authorities of certain states in India have issued notices to some concessionaires alleging inadequate stamp duty on the concession agreements executed between the concessionaires and the NHAI. The stamp authorities allege that since concession agreements relate to the letting of tolls to the concessionaires in the form of leases, or as development agreements, such agreements were required to be stamped as lease agreements or development agreements, as applicable. The stamp duty for a lease agreement or a development agreement ranges between 1.0% and 11.0% of the annual rent or premium payable or the market value of the property. Furthermore, stamp duty authorities may impose penalties for payment of inadequate stamp duty, which could extend up to ten (10) times the amount of the stamp duty payable. Accordingly, concession agreements that have not been stamped as such could be considered to be inadequately stamped. The High Courts of Allahabad and Maharashtra have also held that a concession agreement ought to be stamped as a lease agreement and have upheld the imposition of a higher stamp duty on such agreements.

While we have paid stamp duty of ₹ 100.00 on each of our Concession Agreements in accordance with usual practice, if any demand for payment of a higher stamp duty or penalty is imposed, it would increase the costs of the Toll Roads.

In respect of above, NHAI has clarified that:

(i) As on the date of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, GST is not applicable on Concession Fee. However, if it becomes applicable at a later stage, this shall be considered as change in law.

(ii) There is no requirement of stamp duty in case of Concession Agreements since Fee Rules provided for levy and collection of user fee and not toll tax. In case, in future any such demand arises, it shall be treated as change in law.

Escrow Account

The provisions in relation to the escrow account in the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement are only applicable if the obligations of the Concessionaire under the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement are financed by the Lenders.

The Concessionaire shall, prior to the Appointed Date, open and establish the escrow account with the escrow bank and all funds constituting the financing package related to the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project shall be credited to such escrow account. During the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Period all fees and any other revenues including the proceeds of any rentals, deposits, capital receipts or insurance claims from or in respect of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project Highway shall be deposited therein. In addition, all payments by NHAI pursuant to the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, including, if any, in relation to the change of scope in the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project shall be deposited by NHAI in the escrow account.

Withdrawals from Escrow Account

The Concessionaire shall, at the time of the opening of the escrow account, give irrevocable instructions by way of an escrow agreement substantially in form set forth in the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement to the escrow bank instructing, *inter alia*, that the deposits into the escrow account shall subject to the provisions of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, be appropriated in the following order every month and if not due in a month then appropriated proportionately in such month and retained in the escrow account and paid out therefrom in the month when due unless otherwise expressly provided in the instruction letter:

i. all taxes due and payable by the Concessionaire for and in respect of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project Highway;

ii. concession fee;

iii. all payments relating to construction of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project Highway, subject to and in accordance with the conditions, if any, set forth in the financing agreements;

iv. operation and maintenance expenses;

v. operation and maintenance expenses and other costs and expenses incurred by NHAI in accordance with the provisions of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, and certified by NHAI as due and payable to it;

vi. monthly proportionate provision of debt service payment due in an accounting year;

vii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Withdrawals upon Termination

Notwithstanding anything to the contrary contained in the escrow agreement and subject to the provisions of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, in the case of termination, the amounts standing to the credit of the escrow account shall be appropriated in the following order:

i. all taxes due and payable by the Concessionaire for and in respect of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project Highway;

ii. payment due to the lenders;

iii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire;

iv. retention and payments relating to the liability for defects and deficiencies;

v. incurred or accrued operation and maintenance expenses;

vi. any other payments required to be made under the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Change of Scope

NHAI may, notwithstanding anything to the contrary contained in the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, require the Concessionaire to make alterations/ modifications in the scope of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project as contemplated by the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement. If the cumulative costs relating to all the change of scope orders exceed 5% of the concession fee in any continuous period of 3 years immediately preceding the date of such change of scope order or if such cumulative costs exceed 25% of the concession fee at any time during the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Period, NHAI may award any works or services, to any person on the basis of open competitive bidding and the Concessionaire shall be entitled to take part in such competitive bidding with a right to match the first-ranked bid in terms of the selection criteria, either by itself where such work requires tolling, operation and maintenance, or through another company where such work requires construction on any part of the Project Highway, subject to payment of 2% (two per cent) of the bid amount to the Authority, and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Concessionaire shall be entitled to exercise such option

only if the Concessionaire has participated in the bidding process either individually or as a consortium or JV with another company and fulfils the eligibility criteria to undertake such work without compromising with its overall liability. All such changes shall be made by NHAI by an order issued in accordance with the procedure set forth in the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement.

Termination of the** TN/AP – Border to Nalagampalli to AP/Karnataka Border **Concession Agreement

Termination by either party

Either Party may in its discretion terminate the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement by giving a termination notice to the other party if a force majeure event subsists for a period of 120 days or more within a continuous period of 365 days. Before issuing such termination notice, the party intending to issue the termination notice shall inform the other party of such intention and grant 15 days' time to make a representation and may after the expiry of such 15 days period, whether or not it is in receipt of such representation, in its sole discretion issue the termination notice.

Termination by the NHAI

In the event of any of the defaults specified below have occurred, and if the Concessionaire has failed to cure default within the period provided for the same in the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, then NHAI shall be entitled to issue a notice of its intention to terminate the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, with a copy to the lenders. The following events shall constitute an event of default by the Concessionaire (a "**Concessionaire Default**") unless they have occurred as a result of any breach of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement by NHAI or due to force majeure:

i. the performance security has been encashed and appropriated in accordance with the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement and the Concessionaire has failed to replenish or provide fresh performance security within a cure period of 15 days;

ii. subsequent to the replenishment or furnishing of fresh performance security in accordance with the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, the Concessionaire fails to cure, within a cure period of 60 days, the Concessionaire Default for which whole or part of the performance security was appropriated;

iii. the Concessionaire abandons or manifests intention to abandon the operation and maintenance of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project Highway without the prior written consent of NHAI;

iv. the Concessionaire fails to roll over, renew and furnish new bank guarantee performance security subject to and in accordance with terms of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, at least three months prior to expiry of subsisting bank guarantee;

v. the Concessionaire is in breach of the Maintenance Requirements or the Safety Requirements, as the case may be;

vi the Concessionaire has failed to make any payment to NHAI within the period specified in the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement;

vii. upon occurrence of a financial default, the lenders' representative has by notice required NHAI to undertake suspension or termination, as the case may be, in accordance with the substitution agreement and the Concessionaire fails to cure the default within the specified cure period;

viii. a breach of any of the project agreements by the Concessionaire causes a material adverse effect;

ix. the Concessionaire creates any encumbrance in breach of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement;

x. the Concessionaire repudiates the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement or otherwise takes any action or evidences or conveys an intention not to be bound by the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement;

xi. a change in ownership occurs in breach of the provisions of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement;

xii. there is a transfer, pursuant to law either of (i) the rights and/or obligations of the Concessionaire under any of the project agreements, or of (ii) all or part of the assets or undertaking of the Concessionaire, and such transfer causes a material adverse effect;

xiii. an execution levied on any of the assets of the Concessionaire has caused a material adverse effect;

xiv. the Concessionaire is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Concessionaire or for the whole or material part of its assets that has a material bearing on the TN/AP – Border to Nalagampalli to AP/Karnataka Border Project;

xv. the Concessionaire has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of NHAI, a material adverse effect;

xvi. a resolution for winding up of the Concessionaire is passed or any petition for winding up of the Concessionaire is admitted by a court of competent jurisdiction and a provisional liquidator or receiver is appointed and such order has not been set aside within 90 days of the date thereof or the Concessionaire is ordered to be wound up by Court except for the purpose of amalgamation or reconstruction; provided that, as part of such amalgamation or reconstruction, the entire property, assets and undertaking of the Concessionaire are transferred to the amalgamated or reconstructed entity and that the amalgamated or reconstructed entity has unconditionally assumed the obligations of the Concessionaire under the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement and the project agreements; and provided that:

a. the amalgamated or reconstructed entity has the capability and operating experience necessary for the performance of its obligations under the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement and the project agreements;

b. the amalgamated or reconstructed entity has the financial standing to perform its obligations under the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement and the project agreements and has a credit worthiness at least as good as that of the Concessionaire as at Appointed Date; and

c. each of the project agreements remains in full force and effect;

xvii. any representation or warranty of the Concessionaire herein contained which is, as of the date of TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, found to be materially false, incorrect or misleading;

xviii. the Concessionaire submits to NHAI any statement, notice or other document, in written or electronic form, which has a material effect on NHAI's rights, obligations or interests and which is false in material particulars;

xix. the Concessionaire has failed to fulfil any obligation, for which failure termination has been specified in the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement;

xx. the Concessionaire commits a default in complying with any other provision of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement if such default causes a material adverse effect on NHAI;

xxi. an escrow default occurs and the Concessionaire fails to cure the default within a cure period of 15 days;

Termination by Concessionaire

If any of the defaults specified below shall have occurred, and NHAI fails to cure such default within a cure period of 90 days or such longer period as has been expressly provided in the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, NHAI shall be deemed to be in default of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement, unless the default has occurred as a result of any breach of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement by the Concessionaire or due to force majeure:

i. NHAI commits a material default in complying with any of the provisions of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement and such default has a material adverse effect on the Concessionaire; or

ii. NHAI repudiatkelaes the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement or otherwise takes any action that amounts to or manifests an irrevocable intention not to be bound by the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement; or

iii. the State commits a material default in complying with the provisions of the State Support Agreement if such default has a Material Adverse Effect on the Concessionaire and the breach continues for a period of 90 (ninety) days from the date of notice given in this behalf by the Concessionaire to the Authority.

Termination Payments

The termination payment pursuant to the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement becomes due and payable to the Concessionaire by NHAI within 15 days of the Concessionaire furnishing to NHAI an

NOC issued by the lenders/ lenders' representative recording/ effecting release/ vacation/ discharge of the charge on TN/AP – Border to Nalagampalli to AP/Karnataka Border Project receivables (if any) created by Concessionaire for securing repayment of the debt. If NHAI fails to disburse the full termination payment within 15 days, NHAI shall pay interest at a rate equal to 3% above the bank rate on the amount of termination payment remaining unpaid.

Upon termination of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement by the NHAI on account of occurrence of a Concessionaire Default, the NHAI shall pay the Concessionaire by way of termination payment 70% of the Unexpired Cash Flow.

Upon termination of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement by the Concessionaire on account of occurrence of an NHAI Default, the Concessionaire shall be entitled to receive from NHAI by way of termination payment a sum equal to 105% of the Unexpired Cash Flow.

For details in relation to the technical clarifications received from NHAI in relation to the Concession Agreements, please refer to Annexure 1 of the TN/AP – Border to Nalagampalli to AP/Karnataka Border Concession Agreement.

7. ***Concession Agreement between NSPPL ("Concessionaire") and NHAI in respect of the Bareilly – Sitapur Project dated*** March 12, 2025

The Concessionaire has entered into a concession agreement for tolling, operation, maintenance and transfer of Bareilly – Sitapur Project Highway (as defined below) on toll, operate and transfer (TOT) basis (the "**Bareilly – Sitapur Concession Agreement**"), for a period of 20 years from the the Appointed Date (i.e., the date on which all Conditions Precedent have been satisfied) or such date on which the Bareilly – Sitapur Concession Agreement is terminated by a termination notice ("**Bareilly – Sitapur Concession Period**").

Certain Definitions

"**Bareilly – Sitapur Project**" means the operation and maintenance of the Bareilly – Sitapur Project Highway in accordance with the provisions of the Bareilly – Sitapur Concession Agreement and includes all works, services and equipment relating to or in respect of the scope of the Bareilly – Sitapur Project as set forth in the Bareilly – Sitapur Concession Agreement;

"**Bareilly – Sitapur Project Assets**" means all physical and other assets relating to and forming part of the Site including (a) rights over the Site in the form of licence, Right of Way or otherwise; (b) tangible assets such as civil works and equipment including foundations, embankments, pavements, road surface, interchanges, bridges, culverts, road overbridges, drainage works, traffic signals, sign boards, kilometre- stones, toll plazas, electrical systems, communication systems, rest areas, relief centers, maintenance depots and administrative offices; (d) all rights of the Concessionaire under the project agreements; security deposits; insurance proceeds; and (e) Applicable Permits and authorisations relating to or in respect of the Bareilly – Sitapur Project Highway, but does not include Additional Facilities; and

"**Bareilly – Sitapur Project Highway**" means the Site comprising the existing road comprising:

Stretch	State	Start (Km)	End (Km)	Length
Bareilly – Sitapur	Uttar Pradesh	262+000	419+590	157.590

and all Bareilly – Sitapur Project Assets."

Grant of Concession

Subject to and in accordance with the terms and conditions set forth in the Bareilly – Sitapur Concession Agreement, NHAI has granted to the Concessionaire, and the Concessionaire has accepted the concession for a period of 20 years, including the exclusive right, license and authority during the subsistence of the Bareilly – Sitapur Agreement to demand, collect and appropriate Fee, operate, manage and maintain the Bareilly – Sitapur Project Highway. Notwithstanding anything to the contrary in the Bareilly – Sitapur Concession Agreement, the parties have expressly agreed that the Concession Period shall not be reduced by more than 5 (five) years, or shall not be increased by more than 10 (ten) years on any account or for any reason whatsoever.

Subject to and in accordance with the terms and conditions set forth in the Bareilly – Sitapur Concession Agreement, the Concessionaire is entitled to undertake the following in accordance with the terms of the Bareilly – Sitapur Concession Agreement, applicable laws and applicable permits:

i. Right of Way, access and license to the Site for the purpose of and to the extent conferred by the provisions of the Bareilly – Sitapur Concession Agreement;

ii. manage, operate and maintain the Bareilly – Sitapur Project Highway and regulate the use thereof by third parties in accordance with the terms of Bareilly – Sitapur Concession Agreement;

iii. demand, collect and appropriate the fees from vehicles and persons liable for payment of fees for using the Bareilly – Sitapur Project Highway or any part thereof and refuse entry of any vehicle to the Bareilly – Sitapur Project Highway if the fee due is not paid;

iv. perform and fulfill all of the Concessionaire's obligations under and in accordance with the Bareilly – Sitapur Concession Agreement;

v. bear and pay all costs, expenses and charges in connection with or incidental to the performance of the obligations of the Concessionaire under the Bareilly – Sitapur Concession Agreement; and

vi. neither assign, transfer or sublet or create any lien or encumbrance on the Bareilly – Sitapur Concession Agreement, or the concession granted thereby, or on the whole or any part of the Bareilly – Sitapur Project Highway nor transfer, lease or part possession thereof, save and except as expressly permitted by the Bareilly – Sitapur Concession Agreement.

Fees

The Concessionaire is entitled to, during the Bareilly – Sitapur Concession Period, levy, collect and appropriate fees from users ("**User Fee**") of the Bareilly – Sitapur Project Highway pursuant to and in accordance with the provisions in the Bareilly – Sitapur Concession Agreement and the Fee Rules and to appropriate the same. In accordance with the terms of the Bareilly – Sitapur Concession Agreement, the Concessionaire shall not collect any fees in relation to exempted vehicles. The fees collected by Concessionaire shall be deposited in the escrow account and appropriated in accordance with the relevant provisions of the Bareilly – Sitapur Concession Agreement.

Sub Rule 6(6) of the above-mentioned Fee Rules states,

"(a) The fee shall be collected by the Central Government or the executing Authority as the case may be and for a specified period in accordance with the terms of agreement entered by the Concessionaire.
(b) The fee as notified as per Bareilly – Sitapur Concession Agreement shall be leviable till the end of the concession period and after the Concession Agreement is over, the fee shall be collected by the Central Government executing authority at a reduced rate of 40% of the fee on the date of transfer of such section of National Highways, bridge, tunnel or bypass, as the case may be, to be revised annually in accordance with these rules:

Provided that after the recovery of capital cost through user fee realised, in respect of a public funded project, the fee leviable would be reduced to 40% of the user fee for such section of National Highways, bridge, tunnel or bypass as the case may be, to be revised annually in accordance with these rules." In respect of the above, NHAI has clarified that Rule 6 of the Fee Rules provides that the user fee to be notified by Government as per the format of Schedule M of Concession Agreement shall be leviable till the end of the concession period. Hence, the rate of User Fee rate shall only be reduced after the concession period is over."

Concession Fees

As consideration for the grant of the Concession, the Concessionaire is required to pay a concession fee to NHAI equivalent to ₹ 14,591.00 million, within 120 days of the date of execution of the concession agreement or any extended date as agreed by NHAI prior to the Appointed Date as a Condition Precedent. The Concessionaire agrees that payment of the concession fee constitutes essential condition of the Concession Agreement. Further as communicated by the authority by way of a letter dated 13.02.25, any amount raised from the proceeds of the Issue in excess of the Base Concession Fee (being the aggregate of Concession Fees payable to NHAI in terms of the Additional Concession Agreements) shall be paid to the Authority. For further details, see the section titled "Use of Proceeds – Details of Utilisation of Issue Proceeds - Infusion of debt and/or equity into NSPPL" on page 355. For the purposes of stamp duty payment, concession agreements are generally considered to be agreements which are not lease deeds and stamp duty of ₹ 100.00 is typically paid for such concession agreements. However, stamp duty authorities of certain states in India have issued notices to some concessionaires alleging inadequate stamp duty on the concession agreements executed between the concessionaires and the NHAI. The stamp authorities allege that since concession agreements relate to the letting of tolls to the concessionaires in the form of leases, or as development agreements, such agreements were required to be stamped as lease agreements or development agreements, as applicable. The stamp duty for a lease agreement or a development agreement ranges between 1.0% and 11.0% of the annual rent or premium payable or the market value of the property. Furthermore, stamp duty authorities may impose penalties for payment of inadequate stamp duty, which could extend up to ten (10) times the amount of the stamp duty payable. Accordingly, concession agreements that have not been stamped as such could be considered to be inadequately stamped. The High Courts of Allahabad and Maharashtra have also held that a concession agreement ought to be stamped as a lease agreement and have upheld the imposition of a higher stamp duty on such agreements.

While we have paid stamp duty of ₹ 100.00 on each of our Concession Agreements in accordance with usual practice, if any demand for payment of a higher stamp duty or penalty is imposed, it would increase the costs of the Toll Roads.

In respect of above, NHAI has clarified that:

(i) As on the date of the Bareilly – Sitapur Concession Agreement, GST is not applicable on Concession Fee. However, if it becomes applicable at a later stage, this shall be considered as change in law.

(ii) There is no requirement of stamp duty in case of Concession Agreements since Fee Rules provided for levy and collection of user fee and not toll tax. In case, in future any such demand arises, it shall be treated as change in law.

Escrow Account

The provisions in relation to the escrow account in the Bareilly – Sitapur Concession Agreement are only applicable if the obligations of the Concessionaire under the Bareilly – Sitapur Concession Agreement are financed by the Lenders.

The Concessionaire shall, prior to the Appointed Date, open and establish the escrow account with the escrow bank and all funds constituting the financing package related to the Bareilly – Sitapur Project shall be credited to such escrow account. During the Bareilly – Sitapur Concession Period all fees and any other revenues including the proceeds of any rentals, deposits, capital receipts or insurance claims from or in respect of the Bareilly – Sitapur Project Highway shall be deposited therein. In addition, all payments by NHAI pursuant to the Bareilly – Sitapur Concession Agreement, including, if any, in relation to the change of scope in the Bareilly – Sitapur Project shall be deposited by NHAI in the escrow account.

Withdrawals from Escrow Account

The Concessionaire shall, at the time of the opening of the escrow account, give irrevocable instructions by way of an escrow agreement substantially in form set forth in the Bareilly – Sitapur Concession Agreement to the escrow bank instructing, *inter alia*, that the deposits into the escrow account shall subject to the provisions of the Bareilly – Sitapur Concession Agreement, be appropriated in the following order every month and if not due in a month then appropriated proportionately in such month and retained in the escrow account and paid out therefrom in the month when due unless otherwise expressly provided in the instruction letter:

i. all taxes due and payable by the Concessionaire for and in respect of the Bareilly – Sitapur Project Highway;

ii. concession fee;

iii. all payments relating to construction of the Bareilly – Sitapur Project Highway, subject to and in accordance with the conditions, if any, set forth in the financing agreements;

iv. operation and maintenance expenses;

v. operation and maintenance expenses and other costs and expenses incurred by NHAI in accordance with the provisions of the Bareilly – Sitapur Concession Agreement, and certified by NHAI as due and payable to it;

vi. monthly proportionate provision of debt service payment due in an accounting year;

vii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Withdrawals upon Termination

Notwithstanding anything to the contrary contained in the escrow agreement and subject to the provisions of the Bareilly – Sitapur Concession Agreement, in the case of termination, the amounts standing to the credit of the escrow account shall be appropriated in the following order:

i. all taxes due and payable by the Concessionaire for and in respect of the Bareilly – Sitapur Project Highway;

ii. payment due to the lenders;

iii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire;

iv. retention and payments relating to the liability for defects and deficiencies;

v. incurred or accrued operation and maintenance expenses;

vi. any other payments required to be made under the Bareilly – Sitapur Concession Agreement; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Change of Scope

NHAI may, notwithstanding anything to the contrary contained in the Bareilly – Sitapur Concession Agreement, require the Concessionaire to make alterations/ modifications in the scope of the Bareilly – Sitapur Project as contemplated by the Bareilly – Sitapur Concession Agreement. If the cumulative costs relating to all the change of scope orders exceed 5% of the concession fee in any continuous period of 3 years immediately preceding the date of such change of scope order or if such cumulative costs exceed 25% of the concession fee at any time during the Bareilly – Sitapur Concession Period, NHAI may award any works or services, to any person on the basis of open competitive bidding and the Concessionaire shall be entitled to take part in such competitive bidding with a right to match the first-ranked bid in terms of the selection criteria, either by itself where such work requires tolling, operation and maintenance, or through another company where such work requires construction on any part of the Project Highway, subject to payment of 2% (two per cent) of the bid amount to the Authority, and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Concessionaire shall be entitled to exercise such option only if the Concessionaire has participated in the bidding process either individually or as a consortium or JV with another company and fulfils the eligibility criteria to undertake such work without compromising with its overall liability. All such changes shall be made by NHAI by an order issued in accordance with the procedure set forth in the Bareilly – Sitapur Concession Agreement.

Termination of the Bareilly – Sitapur Concession Agreement

Termination by either party

Either Party may in its discretion terminate the Bareilly – Sitapur Concession Agreement by giving a termination notice to the other party if a force majeure event subsists for a period of 120 days or more within a continuous period of 365 days. Before issuing such termination notice, the party intending to issue the termination notice shall inform the other party of such intention and grant 15 days' time to make a representation and may after the expiry of such 15 days period, whether or not it is in receipt of such representation, in its sole discretion issue the termination notice.

Termination by the NHAI

In the event of any of the defaults specified below have occurred, and if the Concessionaire has failed to cure default within the period provided for the same in the Bareilly – Sitapur Concession Agreement, then NHAI shall be entitled to issue a notice of its intention to terminate the Bareilly – Sitapur Concession Agreement, with a copy to the lenders. The following events shall constitute an event of default by the Concessionaire (a "**Concessionaire Default**") unless they have occurred as a result of any breach of the Bareilly – Sitapur Concession Agreement by NHAI or due to force majeure:

i. the performance security has been encashed and appropriated in accordance with the Bareilly – Sitapur Concession Agreement and the Concessionaire has failed to replenish or provide fresh performance security within a cure period of 15 days;

ii. subsequent to the replenishment or furnishing of fresh performance security in accordance with the Bareilly – Sitapur Concession Agreement, the Concessionaire fails to cure, within a cure period of 60 days, the Concessionaire Default for which whole or part of the performance security was appropriated;

iii. the Concessionaire abandons or manifests intention to abandon the operation and maintenance of the Bareilly – Sitapur Project Highway without the prior written consent of NHAI;

iv. the Concessionaire fails to roll over, renew and furnish new bank guarantee performance security subject to and in accordance with terms of the Bareilly – Sitapur Concession Agreement, at least three months prior to expiry of subsisting bank guarantee;

v. the Concessionaire is in breach of the Maintenance Requirements or the Safety Requirements, as the case may be;

vi the Concessionaire has failed to make any payment to NHAI within the period specified in the Bareilly – Sitapur Concession Agreement;

vii. upon occurrence of a financial default, the lenders' representative has by notice required NHAI to undertake suspension or termination, as the case may be, in accordance with the substitution agreement and the Concessionaire fails to cure the default within the specified cure period;

viii. a breach of any of the project agreements by the Concessionaire causes a material adverse effect;

ix. the Concessionaire creates any encumbrance in breach of the Bareilly – Sitapur Concession Agreement;

x. the Concessionaire repudiates the Bareilly – Sitapur Concession Agreement or otherwise takes any action or evidences or conveys an intention not to be bound by the Bareilly – Sitapur Concession Agreement;

xi. a change in ownership occurs in breach of the provisions of the Bareilly – Sitapur Concession Agreement;

xii. there is a transfer, pursuant to law either of (i) the rights and/or obligations of the Concessionaire under any of the project agreements, or of (ii) all or part of the assets or undertaking of the Concessionaire, and such transfer causes a material adverse effect;

xiii. an execution levied on any of the assets of the Concessionaire has caused a material adverse effect;

xiv. the Concessionaire is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Concessionaire or for the whole or material part of its assets that has a material bearing on the Bareilly – Sitapur Project;

xv. the Concessionaire has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of NHAI, a material adverse effect;

xvi. a resolution for winding up of the Concessionaire is passed or any petition for winding up of the Concessionaire is admitted by a court of competent jurisdiction and a provisional liquidator or receiver is appointed and such order has not been set aside within 90 days of the date thereof or the Concessionaire is ordered to be wound up by Court except for the purpose of amalgamation or reconstruction; provided that, as part of such amalgamation or reconstruction, the entire property, assets and undertaking of the Concessionaire are transferred to the amalgamated or reconstructed entity and that the amalgamated or reconstructed entity has unconditionally assumed the obligations of the Concessionaire under the Bareilly – Sitapur Concession Agreement and the project agreements; and provided that:

    a. the amalgamated or reconstructed entity has the capability and operating experience necessary for the performance of its obligations under the Bareilly – Sitapur Concession Agreement and the project agreements;

    b. the amalgamated or reconstructed entity has the financial standing to perform its obligations under the Bareilly – Sitapur Concession Agreement and the project agreements and has a credit worthiness at least as good as that of the Concessionaire as at Appointed Date; and

    c. each of the project agreements remains in full force and effect;

xvii. any representation or warranty of the Concessionaire herein contained which is, as of the date of Bareilly – Sitapur Concession Agreement, found to be materially false, incorrect or misleading;

xviii. the Concessionaire submits to NHAI any statement, notice or other document, in written or electronic form, which has a material effect on NHAI's rights, obligations or interests and which is false in material particulars;

xix. the Concessionaire has failed to fulfil any obligation, for which failure termination has been specified in the Bareilly – Sitapur Concession Agreement;

xx. the Concessionaire commits a default in complying with any other provision of the Bareilly – Sitapur Concession Agreement if such default causes a material adverse effect on NHAI;

xxi. an escrow default occurs and the Concessionaire fails to cure the default within a cure period of 15 days;

Termination by Concessionaire

If any of the defaults specified below shall have occurred, and NHAI fails to cure such default within a cure period of 90 days or such longer period as has been expressly provided in the Bareilly – Sitapur Concession Agreement, NHAI shall be deemed to be in default of the Bareilly – Sitapur Concession Agreement, unless the default has occurred as a result of any breach of the Bareilly – Sitapur Concession Agreement by the Concessionaire or due to force majeure:

i. NHAI commits a material default in complying with any of the provisions of the Bareilly – Sitapur Concession Agreement and such default has a material adverse effect on the Concessionaire; or

ii. NHAI repudiates the Bareilly – Sitapur Concession Agreement or otherwise takes any action that amounts to or manifests an irrevocable intention not to be bound by the Bareilly – Sitapur Concession Agreement; or

iii. the State commits a material default in complying with the provisions of the State Support Agreement if such default has a Material Adverse Effect on the Concessionaire and the breach continues for a period of 90 (ninety) days from the date of notice given in this behalf by the Concessionaire to the Authority.

Termination Payments

The termination payment pursuant to the Bareilly – Sitapur Concession Agreement becomes due and payable to the Concessionaire by NHAI within 15 days of the Concessionaire furnishing to NHAI an NOC issued by the lenders/ lenders' representative recording/ effecting release/ vacation/ discharge of the charge on Bareilly – Sitapur Project receivables (if any) created by Concessionaire for securing repayment of the debt. If NHAI fails to disburse the full termination payment within 15 days, NHAI shall pay interest at a rate equal to 3% above the bank rate on the amount of termination payment remaining unpaid.

Upon termination of the Bareilly – Sitapur Concession Agreement by the NHAI on account of occurrence of a Concessionaire Default, the NHAI shall pay the Concessionaire by way of termination payment 70% of the Unexpired Cash Flow.

Upon termination of the Bareilly – Sitapur Concession Agreement by the Concessionaire on account of occurrence of an NHAI Default, the Concessionaire shall be entitled to receive from NHAI by way of termination payment a sum equal to 105% of the Unexpired Cash Flow.

For details in relation to the technical clarifications received from NHAI in relation to the Concession Agreements, please refer to Annexure 1 of the Bareilly – Sitapur Concession Agreement.

8. ***Concession Agreement between NSPPL ("Concessionaire") and NHAI in respect of the Muzaffarnagar-Haridwar Project dated*** March 12, 2025

The Concessionaire has entered into a concession agreement for tolling, operation, maintenance and transfer of Muzaffarnagar-Haridwar Project Highway (as defined below) on toll, operate and transfer (TOT) basis (the "**Muzaffarnagar-Haridwar Concession Agreement**"), for a period of 20 years from the the Appointed Date (i.e., the date on which all Conditions Precedent have been satisfied) or such date on which the Muzaffarnagar-Haridwar Concession Agreement is terminated by a termination notice ("**Muzaffarnagar-Haridwar Concession Period**").

Certain Definitions

"**Muzaffarnagar-Haridwar Project**" means the operation and maintenance of the Muzaffarnagar-Haridwar Project Highway in accordance with the provisions of the Muzaffarnagar-Haridwar Concession Agreement and includes all works, services and equipment relating to or in respect of the scope of the Muzaffarnagar-Haridwar Project as set forth in the Muzaffarnagar-Haridwar Concession Agreement;

"**Muzaffarnagar-Haridwar Project Assets**" means all physical and other assets relating to and forming part of the Site including (a) rights over the Site in the form of licence, Right of Way or otherwise; (b) tangible assets such as civil works and equipment including foundations, embankments, pavements, road surface, interchanges, bridges, culverts, road overbridges, drainage works, traffic signals, sign boards, kilometre- stones, toll plazas, electrical systems, communication systems, rest areas, relief centers, maintenance depots and administrative offices; (d) all rights of the Concessionaire under the project agreements; security deposits; insurance proceeds; and (e) Applicable Permits and authorisations relating to or in respect of the Muzaffarnagar-Haridwar Project Highway, but does not include Additional Facilities; and

"**Muzaffarnagar-Haridwar Project Highway**" means the Site comprising the existing road comprising:

Stretch	State	Start (Km)	End (Km)	Length
Muzaffarnagar-Haridwar Section	Uttar Pradesh & Uttarakhand	130+560	209+120	78.56

and all Muzaffarnagar-Haridwar Project Assets."

Grant of Concession

Subject to and in accordance with the terms and conditions set forth in the Muzaffarnagar-Haridwar Concession Agreement, NHAI has granted to the Concessionaire, and the Concessionaire has accepted the concession for a period of 20 years, including the exclusive right, license and authority during the subsistence of the Muzaffarnagar-Haridwar Agreement to demand, collect and appropriate Fee, operate, manage and maintain the Muzaffarnagar-Haridwar Project Highway. Notwithstanding anything to the contrary in the Muzaffarnagar-Haridwar Concession Agreement, the parties have expressly agreed that the Concession Period shall not be reduced by more than 5 (five) years, or shall not be increased by more than 10 (ten) years on any account or for any reason whatsoever.

Subject to and in accordance with the terms and conditions set forth in the Muzaffarnagar-Haridwar Concession Agreement, the Concessionaire is entitled to undertake the following in accordance with the terms of the Muzaffarnagar-Haridwar Concession Agreement, applicable laws and applicable permits:

i. Right of Way, access and license to the Site for the purpose of and to the extent conferred by the provisions of the Muzaffarnagar-Haridwar Concession Agreement;

ii. manage, operate and maintain the Muzaffarnagar-Haridwar Project Highway and regulate the use thereof by third parties in accordance with the terms of Muzaffarnagar-Haridwar Concession Agreement;

iii. demand, collect and appropriate the fees from vehicles and persons liable for payment of fees for using the Muzaffarnagar-Haridwar Project Highway or any part thereof and refuse entry of any vehicle to the Muzaffarnagar-Haridwar Project Highway if the fee due is not paid;

iv. perform and fulfill all of the Concessionaire's obligations under and in accordance with the Muzaffarnagar-Haridwar Concession Agreement;

v. bear and pay all costs, expenses and charges in connection with or incidental to the performance of the obligations of the Concessionaire under the Muzaffarnagar-Haridwar Concession Agreement; and

vi. neither assign, transfer or sublet or create any lien or encumbrance on the Muzaffarnagar-Haridwar Concession Agreement, or the concession granted thereby, or on the whole or any part of the Muzaffarnagar-Haridwar Project Highway nor transfer, lease or part possession thereof, save and except as expressly permitted by the Muzaffarnagar-Haridwar Concession Agreement.

Fees

The Concessionaire is entitled to, during the Muzaffarnagar-Haridwar Concession Period, levy, collect and appropriate fees from users ("**User Fee**") of the Muzaffarnagar-Haridwar Project Highway pursuant to and in accordance with the provisions in the Muzaffarnagar-Haridwar Concession Agreement and the Fee Rules and to appropriate the same. In accordance with the terms of the Muzaffarnagar-Haridwar Concession Agreement, the Concessionaire shall not collect any fees in relation to exempted vehicles. The fees collected by Concessionaire shall be deposited in the escrow account and appropriated in accordance with the relevant provisions of the Muzaffarnagar-Haridwar Concession Agreement.

Sub Rule 6(6) of the above-mentioned Fee Rules states,

"(a) The fee shall be collected by the Central Government or the executing Authority as the case may be and for a specified period in accordance with the terms of agreement entered by the Concessionaire.
(b) The fee as notified as per Muzaffarnagar-Haridwar Concession Agreement shall be leviable till the end of the concession period and after the Concession Agreement is over, the fee shall be collected by the Central Government executing authority at a reduced rate of 40% of the fee on the date of transfer of such section of National Highways, bridge, tunnel or bypass, as the case may be, to be revised annually in accordance with these rules:

Provided that after the recovery of capital cost through user fee realised, in respect of a public funded project, the fee leviable would be reduced to 40% of the user fee for such section of National Highways, bridge, tunnel or bypass as the case may be, to be revised annually in accordance with these rules." In respect of the above, NHAI has clarified that Rule 6 of the Fee Rules provides that the user fee to be notified by Government as per the format of Schedule M of Concession Agreement shall be leviable till the end of the concession period. Hence, the rate of User Fee rate shall only be reduced after the concession period is over."

Concession Fees

As consideration for the grant of the Concession, the Concessionaire is required to pay a concession fee to NHAI equivalent to ₹ 16,522.00 million, within 120 days of the date of execution of the concession agreement or any extended date as agreed by NHAI prior to the Appointed Date as a Condition Precedent. The Concessionaire agrees that payment of the concession fee constitutes essential condition of the Concession Agreement. Further as communicated by the authority by way of a letter dated 13.02.25, any amount raised from the proceeds of the Issue in excess of the Base Concession Fee (being the aggregate of Concession Fees payable to NHAI in terms of the Additional Concession Agreements) shall be paid to the Authority. For further details, see the section titled "Use of Proceeds – Details of Utilisation of Issue Proceeds - Infusion of debt and/or equity into NSPPL" on page 355. For the purposes of stamp duty payment, concession agreements are generally considered to be agreements which are not lease deeds and stamp duty of ₹ 100.00 is typically paid for such concession agreements. However, stamp duty authorities of certain states in India have issued notices to some concessionaires alleging inadequate stamp duty on the concession agreements executed between the concessionaires and the NHAI. The stamp authorities allege that since concession agreements relate to the letting of tolls to the concessionaires in the form of leases, or as development agreements, such agreements were required to be stamped as lease agreements or development agreements, as applicable. The stamp duty for a lease agreement or a development agreement ranges between 1.0% and 11.0% of the annual rent or premium payable or the market value of the property. Furthermore, stamp duty authorities may impose penalties for payment of inadequate stamp duty, which could extend up to ten (10) times the amount of the stamp duty payable. Accordingly, concession agreements that have not been stamped as such could be considered to be inadequately stamped. The High Courts of Allahabad and Maharashtra have also held that a concession agreement

ought to be stamped as a lease agreement and have upheld the imposition of a higher stamp duty on such agreements.

While we have paid stamp duty of ₹ 100.00 on each of our Concession Agreements in accordance with usual practice, if any demand for payment of a higher stamp duty or penalty is imposed, it would increase the costs of the Toll Roads.

In respect of above, NHAI has clarified that:

(i) As on the date of the Muzaffarnagar-Haridwar Concession Agreement, GST is not applicable on Concession Fee. However, if it becomes applicable at a later stage, this shall be considered as change in law.

(ii) There is no requirement of stamp duty in case of Concession Agreements since Fee Rules provided for levy and collection of user fee and not toll tax. In case, in future any such demand arises, it shall be treated as change in law.

Escrow Account

The provisions in relation to the escrow account in the Muzaffarnagar-Haridwar Concession Agreement are only applicable if the obligations of the Concessionaire under the Muzaffarnagar-Haridwar Concession Agreement are financed by the Lenders.

The Concessionaire shall, prior to the Appointed Date, open and establish the escrow account with the escrow bank and all funds constituting the financing package related to the Muzaffarnagar-Haridwar Project shall be credited to such escrow account. During the Muzaffarnagar-Haridwar Concession Period all fees and any other revenues including the proceeds of any rentals, deposits, capital receipts or insurance claims from or in respect of the Muzaffarnagar-Haridwar Project Highway shall be deposited therein. In addition, all payments by NHAI pursuant to the Muzaffarnagar-Haridwar Concession Agreement, including, if any, in relation to the change of scope in the Muzaffarnagar-Haridwar Project shall be deposited by NHAI in the escrow account.

Withdrawals from Escrow Account

The Concessionaire shall, at the time of the opening of the escrow account, give irrevocable instructions by way of an escrow agreement substantially in form set forth in the Muzaffarnagar-Haridwar Concession Agreement to the escrow bank instructing, *inter alia*, that the deposits into the escrow account shall subject to the provisions of the Muzaffarnagar-Haridwar Concession Agreement, be appropriated in the following order every month and if not due in a month then appropriated proportionately in such month and retained in the escrow account and paid out therefrom in the month when due unless otherwise expressly provided in the instruction letter:

i. all taxes due and payable by the Concessionaire for and in respect of the Muzaffarnagar-Haridwar Project Highway;

ii. concession fee;

iii. all payments relating to construction of the Muzaffarnagar-Haridwar Project Highway, subject to and in accordance with the conditions, if any, set forth in the financing agreements;

iv. operation and maintenance expenses;

v. operation and maintenance expenses and other costs and expenses incurred by NHAI in accordance with the provisions of the Muzaffarnagar-Haridwar Concession Agreement, and certified by NHAI as due and payable to it;

vi. monthly proportionate provision of debt service payment due in an accounting year;

vii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Withdrawals upon Termination

Notwithstanding anything to the contrary contained in the escrow agreement and subject to the provisions of the Muzaffarnagar-Haridwar Concession Agreement, in the case of termination, the amounts standing to the credit of the escrow account shall be appropriated in the following order:

i. all taxes due and payable by the Concessionaire for and in respect of the Muzaffarnagar-Haridwar Project Highway;

ii. payment due to the lenders;

iii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire;

iv. retention and payments relating to the liability for defects and deficiencies;

v. incurred or accrued operation and maintenance expenses;

vi. any other payments required to be made under the Muzaffarnagar-Haridwar Concession Agreement; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Change of Scope

NHAI may, notwithstanding anything to the contrary contained in the Muzaffarnagar-Haridwar Concession Agreement, require the Concessionaire to make alterations/ modifications in the scope of the Muzaffarnagar-Haridwar Project as contemplated by the Muzaffarnagar-Haridwar Concession Agreement. If the cumulative costs relating to all the change of scope orders exceed 5% of the concession fee in any continuous period of 3 years immediately preceding the date of such change of scope order or if such cumulative costs exceed 25% of the concession fee at any time during the Muzaffarnagar-Haridwar Concession Period, NHAI may award any works or services, to any person on the basis of open competitive bidding and the Concessionaire shall be entitled to take part in such competitive bidding with a right to match the first-ranked bid in terms of the selection criteria, either by itself where such work requires tolling, operation and maintenance, or through another company where such work requires construction on any part of the Project Highway, subject to payment of 2% (two per cent) of the bid amount to the Authority, and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Concessionaire shall be entitled to exercise such option only if the Concessionaire has participated in the bidding process either individually or as a consortium or JV with another company and fulfils the eligibility criteria to undertake such work without compromising with its overall liability. All such changes shall be made by NHAI by an order issued in accordance with the procedure set forth in the Muzaffarnagar-Haridwar Concession Agreement.

Termination of the Muzaffarnagar-Haridwar Concession Agreement

Termination by either party

Either Party may in its discretion terminate the Muzaffarnagar-Haridwar Concession Agreement by giving a termination notice to the other party if a force majeure event subsists for a period of 120 days or more within a continuous period of 365 days. Before issuing such termination notice, the party intending to issue the termination notice shall inform the other party of such intention and grant 15 days' time to make a representation and may after the expiry of such 15 days period, whether or not it is in receipt of such representation, in its sole discretion issue the termination notice.

Termination by the NHAI

In the event of any of the defaults specified below have occurred, and if the Concessionaire has failed to cure default within the period provided for the same in the Muzaffarnagar-Haridwar Concession Agreement, then NHAI shall be entitled to issue a notice of its intention to terminate the Muzaffarnagar-Haridwar Concession Agreement, with a copy to the lenders. The following events shall constitute an event of default by the Concessionaire (a "**Concessionaire Default**") unless they have occurred as a result of any breach of the Muzaffarnagar-Haridwar Concession Agreement by NHAI or due to force majeure:

i. the performance security has been encashed and appropriated in accordance with the Muzaffarnagar-Haridwar Concession Agreement and the Concessionaire has failed to replenish or provide fresh performance security within a cure period of 15 days;

ii. subsequent to the replenishment or furnishing of fresh performance security in accordance with the Muzaffarnagar-Haridwar Concession Agreement, the Concessionaire fails to cure, within a cure period of 60 days, the Concessionaire Default for which whole or part of the performance security was appropriated;

iii. the Concessionaire abandons or manifests intention to abandon the operation and maintenance of the Muzaffarnagar-Haridwar Project Highway without the prior written consent of NHAI;

iv. the Concessionaire fails to roll over, renew and furnish new bank guarantee performance security subject to and in accordance with terms of the Muzaffarnagar-Haridwar Concession Agreement, at least three months prior to expiry of subsisting bank guarantee;

v. the Concessionaire is in breach of the Maintenance Requirements or the Safety Requirements, as the case may be;

vi the Concessionaire has failed to make any payment to NHAI within the period specified in the Muzaffarnagar-Haridwar Concession Agreement;

vii. upon occurrence of a financial default, the lenders' representative has by notice required NHAI to undertake suspension or termination, as the case may be, in accordance with the substitution agreement and the Concessionaire fails to cure the default within the specified cure period;

viii. a breach of any of the project agreements by the Concessionaire causes a material adverse effect;

ix. the Concessionaire creates any encumbrance in breach of the Muzaffarnagar-Haridwar Concession Agreement;

x. the Concessionaire repudiates the Muzaffarnagar-Haridwar Concession Agreement or otherwise takes any action or evidences or conveys an intention not to be bound by the Muzaffarnagar-Haridwar Concession Agreement;

xi. a change in ownership occurs in breach of the provisions of the Muzaffarnagar-Haridwar Concession Agreement;

xii. there is a transfer, pursuant to law either of (i) the rights and/or obligations of the Concessionaire under any of the project agreements, or of (ii) all or part of the assets or undertaking of the Concessionaire, and such transfer causes a material adverse effect;

xiii. an execution levied on any of the assets of the Concessionaire has caused a material adverse effect;

xiv. the Concessionaire is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Concessionaire or for the whole or material part of its assets that has a material bearing on the Muzaffarnagar-Haridwar Project;

xv. the Concessionaire has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of NHAI, a material adverse effect;

xvi. a resolution for winding up of the Concessionaire is passed or any petition for winding up of the Concessionaire is admitted by a court of competent jurisdiction and a provisional liquidator or receiver is appointed and such order has not been set aside within 90 days of the date thereof or the Concessionaire is ordered to be wound up by Court except for the purpose of amalgamation or reconstruction; provided that, as part of such amalgamation or reconstruction, the entire property, assets and undertaking of the Concessionaire are transferred to the amalgamated or reconstructed entity and that the amalgamated or reconstructed entity has unconditionally assumed the obligations of the Concessionaire under the Muzaffarnagar-Haridwar Concession Agreement and the project agreements; and provided that:

    a. the amalgamated or reconstructed entity has the capability and operating experience necessary for the performance of its obligations under the Muzaffarnagar-Haridwar Concession Agreement and the project agreements;

    b. the amalgamated or reconstructed entity has the financial standing to perform its obligations under the Muzaffarnagar-Haridwar Concession Agreement and the project agreements and has a credit worthiness at least as good as that of the Concessionaire as at Appointed Date; and

    c. each of the project agreements remains in full force and effect;

xvii. any representation or warranty of the Concessionaire herein contained which is, as of the date of Muzaffarnagar-Haridwar Concession Agreement, found to be materially false, incorrect or misleading;

xviii. the Concessionaire submits to NHAI any statement, notice or other document, in written or electronic form, which has a material effect on NHAI's rights, obligations or interests and which is false in material particulars;

xix. the Concessionaire has failed to fulfil any obligation, for which failure termination has been specified in the Muzaffarnagar-Haridwar Concession Agreement;

xx. the Concessionaire commits a default in complying with any other provision of the Muzaffarnagar-Haridwar Concession Agreement if such default causes a material adverse effect on NHAI;

xxi. an escrow default occurs and the Concessionaire fails to cure the default within a cure period of 15 days;

Termination by Concessionaire

If any of the defaults specified below shall have occurred, and NHAI fails to cure such default within a cure period of 90 days or such longer period as has been expressly provided in the Muzaffarnagar-Haridwar Concession Agreement, NHAI shall be deemed to be in default of the Muzaffarnagar-Haridwar Concession Agreement, unless the default has occurred as a result of any breach of the Muzaffarnagar-Haridwar Concession Agreement by the Concessionaire or due to force majeure:

i. NHAI commits a material default in complying with any of the provisions of the Muzaffarnagar-Haridwar Concession Agreement and such default has a material adverse effect on the Concessionaire; or

ii. NHAI repudiates the Muzaffarnagar-Haridwar Concession Agreement or otherwise takes any action that amounts to or manifests an irrevocable intention not to be bound by the Muzaffarnagar-Haridwar Concession Agreement; or

iii. the State commits a material default in complying with the provisions of the State Support Agreement if such default has a Material Adverse Effect on the Concessionaire and the breach continues for a period of 90 (ninety) days from the date of notice given in this behalf by the Concessionaire to the Authority.

Termination Payments

The termination payment pursuant to the Muzaffarnagar-Haridwar Concession Agreement becomes due and payable to the Concessionaire by NHAI within 15 days of the Concessionaire furnishing to NHAI an NOC issued by the lenders/ lenders' representative recording/ effecting release/ vacation/ discharge of the charge on Muzaffarnagar-Haridwar Project receivables (if any) created by Concessionaire for securing repayment of the debt. If NHAI fails to disburse the full termination payment within 15 days, NHAI shall pay interest at a rate equal to 3% above the bank rate on the amount of termination payment remaining unpaid.

Upon termination of the Muzaffarnagar-Haridwar Concession Agreement by the NHAI on account of occurrence of a Concessionaire Default, the NHAI shall pay the Concessionaire by way of termination payment 70% of the Unexpired Cash Flow.

Upon termination of the Muzaffarnagar-Haridwar Concession Agreement by the Concessionaire on account of occurrence of an NHAI Default, the Concessionaire shall be entitled to receive from NHAI by way of termination payment a sum equal to 105% of the Unexpired Cash Flow.

For details in relation to the technical clarifications received from NHAI in relation to the Concession Agreements, please refer to Annexure 1 of the Muzaffarnagar-Haridwar Concession Agreement.

9. ***Concession Agreement between NSPPL ("Concessionaire") and NHAI in respect of the Raipur to Simga Project dated*** March 12, 2025

The Concessionaire has entered into a concession agreement for tolling, operation, maintenance and transfer of Raipur to Simga Project Highway (as defined below) on toll, operate and transfer (TOT) basis (the "**Raipur to Simga Concession Agreement**"), for a period of 20 years from the the Appointed Date (i.e., the date on which all Conditions Precedent have been satisfied) or such date on which the Raipur to Simga Concession Agreement is terminated by a termination notice ("**Raipur to Simga Concession Period**").

Certain Definitions

"**Raipur to Simga Project**" means the operation and maintenance of the Raipur to Simga Project Highway in accordance with the provisions of the Raipur to Simga Concession Agreement and includes all works, services and equipment relating to or in respect of the scope of the Raipur to Simga Project as set forth in the Raipur to Simga Concession Agreement;

"**Raipur to Simga Project Assets**" means all physical and other assets relating to and forming part of the Site including (a) rights over the Site in the form of licence, Right of Way or otherwise; (b) tangible assets such as civil works and equipment including foundations, embankments, pavements, road surface, interchanges, bridges, culverts, road overbridges, drainage works, traffic signals, sign boards, kilometre- stones, toll plazas, electrical systems, communication systems, rest areas, relief centers, maintenance depots and administrative offices; (d) all rights of the Concessionaire under the project agreements; security deposits; insurance proceeds; and (e) Applicable Permits and authorisations relating to or in respect of the Raipur to Simga Project Highway, but does not include Additional Facilities; and

"**Raipur to Simga Project Highway**" means the Site comprising the existing road comprising:

Stretch	State	Start (Km)	End (Km)	Length
Raipur to Simga	Chhattisgarh	0+000	48+580	48+580

and all Raipur to Simga Project Assets."

Grant of Concession

Subject to and in accordance with the terms and conditions set forth in the Raipur to Simga Concession Agreement, NHAI has granted to the Concessionaire, and the Concessionaire has accepted the concession for a period of 20 years, including the exclusive right, license and authority during the subsistence of the Raipur to Simga Agreement to demand, collect and appropriate Fee, operate, manage and maintain the Raipur to Simga Project Highway. Notwithstanding anything to the

contrary in the Raipur to Simga Concession Agreement, the parties have expressly agreed that the Concession Period shall not be reduced by more than 5 (five) years, or shall not be increased by more than 10 (ten) years on any account or for any reason whatsoever.

Subject to and in accordance with the terms and conditions set forth in the Raipur to Simga Concession Agreement, the Concessionaire is entitled to undertake the following in accordance with the terms of the Raipur to Simga Concession Agreement, applicable laws and applicable permits:

i. Right of Way, access and license to the Site for the purpose of and to the extent conferred by the provisions of the Raipur to Simga Concession Agreement;

ii. manage, operate and maintain the Raipur to Simga Project Highway and regulate the use thereof by third parties in accordance with the terms of Raipur to Simga Concession Agreement;

iii. demand, collect and appropriate the fees from vehicles and persons liable for payment of fees for using the Raipur to Simga Project Highway or any part thereof and refuse entry of any vehicle to the Raipur to Simga Project Highway if the fee due is not paid;

iv. perform and fulfill all of the Concessionaire's obligations under and in accordance with the Raipur to Simga Concession Agreement;

v. bear and pay all costs, expenses and charges in connection with or incidental to the performance of the obligations of the Concessionaire under the Raipur to Simga Concession Agreement; and

vi. neither assign, transfer or sublet or create any lien or encumbrance on the Raipur to Simga Concession Agreement, or the concession granted thereby, or on the whole or any part of the Raipur to Simga Project Highway nor transfer, lease or part possession thereof, save and except as expressly permitted by the Raipur to Simga Concession Agreement.

Fees

The Concessionaire is entitled to, during the Raipur to Simga Concession Period, levy, collect and appropriate fees from users ("**User Fee**") of the Raipur to Simga Project Highway pursuant to and in accordance with the provisions in the Raipur to Simga Concession Agreement and the Fee Rules and to appropriate the same. In accordance with the terms of the Raipur to Simga Concession Agreement, the Concessionaire shall not collect any fees in relation to exempted vehicles. The fees collected by Concessionaire shall be deposited in the escrow account and appropriated in accordance with the relevant provisions of the Raipur to Simga Concession Agreement.

Sub Rule 6(6) of the above-mentioned Fee Rules states,

"(a) The fee shall be collected by the Central Government or the executing Authority as the case may be and for a specified period in accordance with the terms of agreement entered by the Concessionaire.
(b) The fee as notified as per Raipur to SimgaConcession Agreement shall be leviable till the end of the concession period and after the Concession Agreement is over, the fee shall be collected by the Central Government executing authority at a reduced rate of 40% of the fee on the date of transfer of such section of National Highways, bridge, tunnel or bypass, as the case may be, to be revised annually in accordance with these rules:

Provided that after the recovery of capital cost through user fee realised, in respect of a public funded project, the fee leviable would be reduced to 40% of the user fee for such section of National Highways, bridge, tunnel or bypass as the case may be, to be revised annually in accordance with these rules." In respect of the above, NHAI has clarified that Rule 6 of the Fee Rules provides that the user fee to be notified by Government as per the format of Schedule M of Concession Agreement shall be leviable till the end of the concession period. Hence, the rate of User Fee rate shall only be reduced after the concession period is over."

Concession Fees

As consideration for the grant of the Concession, the Concessionaire is required to pay a concession fee to NHAI equivalent to ₹ 13,040.00 million, within 120 days of the date of execution of the concession agreement or any extended date as agreed by NHAI prior to the Appointed Date as a Condition Precedent. The Concessionaire agrees that payment of the concession fee constitutes essential condition of the Concession Agreement. Further as communicated by the authority by way of a letter dated 13.02.25, any amount raised from the proceeds of the Issue in excess of the Base Concession Fee (being the aggregate of Concession Fees payable to NHAI in terms of the Additional Concession Agreements) shall be paid to the Authority. For further details, see the section titled "Use of Proceeds – Details of Utilisation of Issue Proceeds - Infusion of debt and/or equity into NSPPL" on page 355. For the purposes of stamp duty payment, concession agreements are generally considered to be agreements which are not lease deeds and stamp duty of ₹ 100.00 is typically paid for such concession agreements. However, stamp duty authorities of certain states in India have issued notices to some

concessionaires alleging inadequate stamp duty on the concession agreements executed between the concessionaires and the NHAI. The stamp authorities allege that since concession agreements relate to the letting of tolls to the concessionaires in the form of leases, or as development agreements, such agreements were required to be stamped as lease agreements or development agreements, as applicable. The stamp duty for a lease agreement or a development agreement ranges between 1.0% and 11.0% of the annual rent or premium payable or the market value of the property. Furthermore, stamp duty authorities may impose penalties for payment of inadequate stamp duty, which could extend up to ten (10) times the amount of the stamp duty payable. Accordingly, concession agreements that have not been stamped as such could be considered to be inadequately stamped. The High Courts of Allahabad and Maharashtra have also held that a concession agreement ought to be stamped as a lease agreement and have upheld the imposition of a higher stamp duty on such agreements.

While we have paid stamp duty of ₹ 100.00 on each of our Concession Agreements in accordance with usual practice, if any demand for payment of a higher stamp duty or penalty is imposed, it would increase the costs of the Toll Roads.

In respect of above, NHAI has clarified that:

(i) As on the date of the Raipur to Simga Concession Agreement, GST is not applicable on Concession Fee. However, if it becomes applicable at a later stage, this shall be considered as change in law.

(ii) There is no requirement of stamp duty in case of Concession Agreements since Fee Rules provided for levy and collection of user fee and not toll tax. In case, in future any such demand arises, it shall be treated as change in law.

Escrow Account

The provisions in relation to the escrow account in the Raipur to Simga Concession Agreement are only applicable if the obligations of the Concessionaire under the Raipur to Simga Concession Agreement are financed by the Lenders.

The Concessionaire shall, prior to the Appointed Date, open and establish the escrow account with the escrow bank and all funds constituting the financing package related to the Raipur to Simga Project shall be credited to such escrow account. During the Raipur to Simga Concession Period all fees and any other revenues including the proceeds of any rentals, deposits, capital receipts or insurance claims from or in respect of the Raipur to Simga Project Highway shall be deposited therein. In addition, all payments by NHAI pursuant to the Raipur to Simga Concession Agreement, including, if any, in relation to the change of scope in the Raipur to Simga Project shall be deposited by NHAI in the escrow account.

Withdrawals from Escrow Account

The Concessionaire shall, at the time of the opening of the escrow account, give irrevocable instructions by way of an escrow agreement substantially in form set forth in the Raipur to Simga Concession Agreement to the escrow bank instructing, *inter alia*, that the deposits into the escrow account shall subject to the provisions of the Raipur to Simga Concession Agreement, be appropriated in the following order every month and if not due in a month then appropriated proportionately in such month and retained in the escrow account and paid out therefrom in the month when due unless otherwise expressly provided in the instruction letter:

i. all taxes due and payable by the Concessionaire for and in respect of the Raipur to Simga Project Highway;

ii. concession fee;

iii. all payments relating to construction of the Raipur to Simga Project Highway, subject to and in accordance with the conditions, if any, set forth in the financing agreements;

iv. operation and maintenance expenses;

v. operation and maintenance expenses and other costs and expenses incurred by NHAI in accordance with the provisions of the Raipur to Simga Concession Agreement, and certified by NHAI as due and payable to it;

vi. monthly proportionate provision of debt service payment due in an accounting year;

vii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Withdrawals upon Termination

Notwithstanding anything to the contrary contained in the escrow agreement and subject to the provisions of the Raipur to Simga Concession Agreement, in the case of termination, the amounts standing to the credit of the escrow account shall be

appropriated in the following order:

i. all taxes due and payable by the Concessionaire for and in respect of the Raipur to Simga Project Highway;

ii. payment due to the lenders;

iii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire;

iv. retention and payments relating to the liability for defects and deficiencies;

v. incurred or accrued operation and maintenance expenses;

vi. any other payments required to be made under the Raipur to Simga Concession Agreement; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Change of Scope

NHAI may, notwithstanding anything to the contrary contained in the Raipur to Simga Concession Agreement, require the Concessionaire to make alterations/ modifications in the scope of the Raipur to Simga Project as contemplated by the Raipur to Simga Concession Agreement. If the cumulative costs relating to all the change of scope orders exceed 5% of the concession fee in any continuous period of 3 years immediately preceding the date of such change of scope order or if such cumulative costs exceed 25% of the concession fee at any time during the Raipur to Simga Concession Period, NHAI may award any works or services, to any person on the basis of open competitive bidding and the Concessionaire shall be entitled to take part in such competitive bidding with a right to match the first-ranked bid in terms of the selection criteria, either by itself where such work requires tolling, operation and maintenance, or through another company where such work requires construction on any part of the Project Highway, subject to payment of 2% (two per cent) of the bid amount to the Authority, and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Concessionaire shall be entitled to exercise such option only if the Concessionaire has participated in the bidding process either individually or as a consortium or JV with another company and fulfils the eligibility criteria to undertake such work without compromising with its overall liability. All such changes shall be made by NHAI by an order issued in accordance with the procedure set forth in the Raipur to Simga Concession Agreement.

Termination of the Raipur to Simga Concession Agreement

Termination by either party

Either Party may in its discretion terminate the Raipur to Simga Concession Agreement by giving a termination notice to the other party if a force majeure event subsists for a period of 120 days or more within a continuous period of 365 days. Before issuing such termination notice, the party intending to issue the termination notice shall inform the other party of such intention and grant 15 days' time to make a representation and may after the expiry of such 15 days period, whether or not it is in receipt of such representation, in its sole discretion issue the termination notice.

Termination by the NHAI

In the event of any of the defaults specified below have occurred, and if the Concessionaire has failed to cure default within the period provided for the same in the Raipur to Simga Concession Agreement, then NHAI shall be entitled to issue a notice of its intention to terminate the Raipur to Simga Concession Agreement, with a copy to the lenders. The following events shall constitute an event of default by the Concessionaire (a "**Concessionaire Default**") unless they have occurred as a result of any breach of the Raipur to Simga Concession Agreement by NHAI or due to force majeure:

i. the performance security has been encashed and appropriated in accordance with the Raipur to Simga Concession Agreement and the Concessionaire has failed to replenish or provide fresh performance security within a cure period of 15 days;

ii. subsequent to the replenishment or furnishing of fresh performance security in accordance with the Raipur to Simga Concession Agreement, the Concessionaire fails to cure, within a cure period of 60 days, the Concessionaire Default for which whole or part of the performance security was appropriated;

iii. the Concessionaire abandons or manifests intention to abandon the operation and maintenance of the Raipur to Simga Project Highway without the prior written consent of NHAI;

iv. the Concessionaire fails to roll over, renew and furnish new bank guarantee performance security subject to and in accordance with terms of the Raipur to Simga Concession Agreement, at least three months prior to expiry of subsisting bank guarantee;

v. the Concessionaire is in breach of the Maintenance Requirements or the Safety Requirements, as the case may be;

vi the Concessionaire has failed to make any payment to NHAI within the period specified in the Raipur to Simga Concession Agreement;

vii. upon occurrence of a financial default, the lenders' representative has by notice required NHAI to undertake suspension or termination, as the case may be, in accordance with the substitution agreement and the Concessionaire fails to cure the default within the specified cure period;

viii. a breach of any of the project agreements by the Concessionaire causes a material adverse effect;

ix. the Concessionaire creates any encumbrance in breach of the Raipur to Simga Concession Agreement;

x. the Concessionaire repudiates the Raipur to Simga Concession Agreement or otherwise takes any action or evidences or conveys an intention not to be bound by the Raipur to Simga Concession Agreement;

xi. a change in ownership occurs in breach of the provisions of the Raipur to Simga Concession Agreement;

xii. there is a transfer, pursuant to law either of (i) the rights and/or obligations of the Concessionaire under any of the project agreements, or of (ii) all or part of the assets or undertaking of the Concessionaire, and such transfer causes a material adverse effect;

xiii. an execution levied on any of the assets of the Concessionaire has caused a material adverse effect;

xiv. the Concessionaire is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Concessionaire or for the whole or material part of its assets that has a material bearing on the Raipur to Simga Project;

xv. the Concessionaire has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of NHAI, a material adverse effect;

xvi. a resolution for winding up of the Concessionaire is passed or any petition for winding up of the Concessionaire is admitted by a court of competent jurisdiction and a provisional liquidator or receiver is appointed and such order has not been set aside within 90 days of the date thereof or the Concessionaire is ordered to be wound up by Court except for the purpose of amalgamation or reconstruction; provided that, as part of such amalgamation or reconstruction, the entire property, assets and undertaking of the Concessionaire are transferred to the amalgamated or reconstructed entity and that the amalgamated or reconstructed entity has unconditionally assumed the obligations of the Concessionaire under the Raipur to Simga Concession Agreement and the project agreements; and provided that:

    a. the amalgamated or reconstructed entity has the capability and operating experience necessary for the performance of its obligations under the Raipur to Simga Concession Agreement and the project agreements;

    b. the amalgamated or reconstructed entity has the financial standing to perform its obligations under the Raipur to Simga Concession Agreement and the project agreements and has a credit worthiness at least as good as that of the Concessionaire as at Appointed Date; and

    c. each of the project agreements remains in full force and effect;

xvii. any representation or warranty of the Concessionaire herein contained which is, as of the date of Raipur to Simga Concession Agreement, found to be materially false, incorrect or misleading;

xviii. the Concessionaire submits to NHAI any statement, notice or other document, in written or electronic form, which has a material effect on NHAI's rights, obligations or interests and which is false in material particulars;

xix. the Concessionaire has failed to fulfil any obligation, for which failure termination has been specified in the Raipur to Simga Concession Agreement;

xx. the Concessionaire commits a default in complying with any other provision of the Raipur to Simga Concession Agreement if such default causes a material adverse effect on NHAI;

xxi. an escrow default occurs and the Concessionaire fails to cure the default within a cure period of 15 days;

Termination by Concessionaire

If any of the defaults specified below shall have occurred, and NHAI fails to cure such default within a cure period of 90 days or such longer period as has been expressly provided in the Raipur to Simga Concession Agreement, NHAI shall be

deemed to be in default of the Raipur to Simga Concession Agreement, unless the default has occurred as a result of any breach of the Raipur to Simga Concession Agreement by the Concessionaire or due to force majeure:

i. NHAI commits a material default in complying with any of the provisions of the Raipur to Simga Concession Agreement and such default has a material adverse effect on the Concessionaire; or

ii. NHAI repudiates the Raipur to Simga Concession Agreement or otherwise takes any action that amounts to or manifests an irrevocable intention not to be bound by the Raipur to Simga Concession Agreement; or

iii. the State commits a material default in complying with the provisions of the State Support Agreement if such default has a Material Adverse Effect on the Concessionaire and the breach continues for a period of 90 (ninety) days from the date of notice given in this behalf by the Concessionaire to the Authority.

Termination Payments

The termination payment pursuant to the Raipur to Simga Concession Agreement becomes due and payable to the Concessionaire by NHAI within 15 days of the Concessionaire furnishing to NHAI an NOC issued by the lenders/ lenders' representative recording/ effecting release/ vacation/ discharge of the charge on Raipur to Simga Project receivables (if any) created by Concessionaire for securing repayment of the debt. If NHAI fails to disburse the full termination payment within 15 days, NHAI shall pay interest at a rate equal to 3% above the bank rate on the amount of termination payment remaining unpaid.

Upon termination of the Raipur to Simga Concession Agreement by the NHAI on account of occurrence of a Concessionaire Default, the NHAI shall pay the Concessionaire by way of termination payment 70% of the Unexpired Cash Flow.

Upon termination of the Raipur to Simga Concession Agreement by the Concessionaire on account of occurrence of an NHAI Default, the Concessionaire shall be entitled to receive from NHAI by way of termination payment a sum equal to 105% of the Unexpired Cash Flow.

For details in relation to the technical clarifications received from NHAI in relation to the Concession Agreements, please refer to Annexure 1 of the Raipur to Simga Concession Agreement.

10. ***Concession Agreement between NSPPL ("Concessionaire") and NHAI in respect of the Simga to Bilaspur Project dated*** March 12, 2025

The Concessionaire has entered into a concession agreement for tolling, operation, maintenance and transfer of Simga to Bilaspur Project Highway (as defined below) on toll, operate and transfer (TOT) basis (the "**Simga to Bilaspur Concession Agreement**"), for a period of 20 years from the the Appointed Date (i.e., the date on which all Conditions Precedent have been satisfied) or such date on which the Simga to Bilaspur Concession Agreement is terminated by a termination notice ("**Simga to Bilaspur Concession Period**").

Certain Definitions

"**Simga to Bilaspur Project**" means the operation and maintenance of the Simga to Bilaspur Project Highway in accordance with the provisions of the Simga to Bilaspur Concession Agreement and includes all works, services and equipment relating to or in respect of the scope of the Simga to Bilaspur Project as set forth in the Simga to Bilaspur Concession Agreement;

"**Simga to Bilaspur Project Assets**" means all physical and other assets relating to and forming part of the Site including (a) rights over the Site in the form of licence, Right of Way or otherwise; (b) tangible assets such as civil works and equipment including foundations, embankments, pavements, road surface, interchanges, bridges, culverts, road overbridges, drainage works, traffic signals, sign boards, kilometre- stones, toll plazas, electrical systems, communication systems, rest areas, relief centers, maintenance depots and administrative offices; (d) all rights of the Concessionaire under the project agreements; security deposits; insurance proceeds; and (e) Applicable Permits and authorisations relating to or in respect of the Simga to Bilaspur Project Highway, but does not include Additional Facilities; and

"**Simga to Bilaspur Project Highway**" means the Site comprising the existing road comprising:

Stretch	State	Start (Km)	End (Km)	Length
Simga to Bilaspur	Chhattisgarh	48+580	126+525	77.945

and all Simga to Bilaspur Project Assets."

Grant of Concession

Subject to and in accordance with the terms and conditions set forth in the Simga to Bilaspur Concession Agreement, NHAI has granted to the Concessionaire, and the Concessionaire has accepted the concession for a period of 20 years, including the exclusive right, license and authority during the subsistence of the Simga to Bilaspur Agreement to demand, collect and appropriate Fee, operate, manage and maintain the Simga to Bilaspur Project Highway. Notwithstanding anything to the contrary in the Simga to Bilaspur Concession Agreement, the parties have expressly agreed that the Concession Period shall not be reduced by more than 5 (five) years, or shall not be increased by more than 10 (ten) years on any account or for any reason whatsoever.

Subject to and in accordance with the terms and conditions set forth in the Simga to Bilaspur Concession Agreement, the Concessionaire is entitled to undertake the following in accordance with the terms of the Simga to Bilaspur Concession Agreement, applicable laws and applicable permits:

i. Right of Way, access and license to the Site for the purpose of and to the extent conferred by the provisions of the Simga to Bilaspur Concession Agreement;

ii. manage, operate and maintain the Simga to Bilaspur Project Highway and regulate the use thereof by third parties in accordance with the terms of Simga to Bilaspur Concession Agreement;

iii. demand, collect and appropriate the fees from vehicles and persons liable for payment of fees for using the Simga to Bilaspur Project Highway or any part thereof and refuse entry of any vehicle to the Simga to Bilaspur Project Highway if the fee due is not paid;

iv. perform and fulfill all of the Concessionaire's obligations under and in accordance with the Simga to Bilaspur Concession Agreement;

v. bear and pay all costs, expenses and charges in connection with or incidental to the performance of the obligations of the Concessionaire under the Simga to Bilaspur Concession Agreement; and

vi. neither assign, transfer or sublet or create any lien or encumbrance on the Simga to Bilaspur Concession Agreement, or the concession granted thereby, or on the whole or any part of the Simga to Bilaspur Project Highway nor transfer, lease or part possession thereof, save and except as expressly permitted by the Simga to Bilaspur Concession Agreement.

Fees

The Concessionaire is entitled to, during the Simga to Bilaspur Concession Period, levy, collect and appropriate fees from users ("**User Fee**") of the Simga to Bilaspur Project Highway pursuant to and in accordance with the provisions in the Simga to Bilaspur Concession Agreement and the Fee Rules and to appropriate the same. In accordance with the terms of the Simga to Bilaspur Concession Agreement, the Concessionaire shall not collect any fees in relation to exempted vehicles. The fees collected by Concessionaire shall be deposited in the escrow account and appropriated in accordance with the relevant provisions of the Simga to Bilaspur Concession Agreement.

Sub Rule 6(6) of the above-mentioned Fee Rules states,

"(a) The fee shall be collected by the Central Government or the executing Authority as the case may be and for a specified period in accordance with the terms of agreement entered by the Concessionaire.
(b) The fee as notified as per Simga to Bilaspur Concession Agreement shall be leviable till the end of the concession period and after the Concession Agreement is over, the fee shall be collected by the Central Government executing authority at a reduced rate of 40% of the fee on the date of transfer of such section of National Highways, bridge, tunnel or bypass, as the case may be, to be revised annually in accordance with these rules:

Provided that after the recovery of capital cost through user fee realised, in respect of a public funded project, the fee leviable would be reduced to 40% of the user fee for such section of National Highways, bridge, tunnel or bypass as the case may be, to be revised annually in accordance with these rules." In respect of the above, NHAI has clarified that Rule 6 of the Fee Rules provides that the user fee to be notified by Government as per the format of Schedule M of Concession Agreement shall be leviable till the end of the concession period. Hence, the rate of User Fee rate shall only be reduced after the concession period is over."

Concession Fees

As consideration for the grant of the Concession, the Concessionaire is required to pay a concession fee to NHAI equivalent to ₹ 13,071.00 million, within 120 days of the date of execution of the concession agreement or any extended date as agreed by NHAI prior to the Appointed Date as a Condition Precedent. The Concessionaire agrees that payment of the concession fee constitutes essential condition of the Concession Agreement. Further as communicated by the authority by way of a letter dated 13.02.25, any amount raised from the proceeds of the Issue in excess of the Base Concession Fee (being the aggregate of Concession Fees payable to NHAI in terms of the Additional Concession Agreements) shall be paid to the

Authority. For further details, see the section titled "Use of Proceeds – Details of Utilisation of Issue Proceeds - Infusion of debt and/or equity into NSPPL" on page 355. For the purposes of stamp duty payment, concession agreements are generally considered to be agreements which are not lease deeds and stamp duty of ₹ 100.00 is typically paid for such concession agreements. However, stamp duty authorities of certain states in India have issued notices to some concessionaires alleging inadequate stamp duty on the concession agreements executed between the concessionaires and the NHAI. The stamp authorities allege that since concession agreements relate to the letting of tolls to the concessionaires in the form of leases, or as development agreements, such agreements were required to be stamped as lease agreements or development agreements, as applicable. The stamp duty for a lease agreement or a development agreement ranges between 1.0% and 11.0% of the annual rent or premium payable or the market value of the property. Furthermore, stamp duty authorities may impose penalties for payment of inadequate stamp duty, which could extend up to ten (10) times the amount of the stamp duty payable. Accordingly, concession agreements that have not been stamped as such could be considered to be inadequately stamped. The High Courts of Allahabad and Maharashtra have also held that a concession agreement ought to be stamped as a lease agreement and have upheld the imposition of a higher stamp duty on such agreements.

While we have paid stamp duty of ₹ 100.00 on each of our Concession Agreements in accordance with usual practice, if any demand for payment of a higher stamp duty or penalty is imposed, it would increase the costs of the Toll Roads.

In respect of above, NHAI has clarified that:

(i) As on the date of the Simga to Bilaspur Concession Agreement, GST is not applicable on Concession Fee. However, if it becomes applicable at a later stage, this shall be considered as change in law.

(ii) There is no requirement of stamp duty in case of Concession Agreements since Fee Rules provided for levy and collection of user fee and not toll tax. In case, in future any such demand arises, it shall be treated as change in law.

Escrow Account

The provisions in relation to the escrow account in the Simga to Bilaspur Concession Agreement are only applicable if the obligations of the Concessionaire under the Simga to Bilaspur Concession Agreement are financed by the Lenders.

The Concessionaire shall, prior to the Appointed Date, open and establish the escrow account with the escrow bank and all funds constituting the financing package related to the Simga to Bilaspur Project shall be credited to such escrow account. During the Simga to Bilaspur Concession Period all fees and any other revenues including the proceeds of any rentals, deposits, capital receipts or insurance claims from or in respect of the Simga to Bilaspur Project Highway shall be deposited therein. In addition, all payments by NHAI pursuant to the Simga to Bilaspur Concession Agreement, including, if any, in relation to the change of scope in the Simga to Bilaspur Project shall be deposited by NHAI in the escrow account.

Withdrawals from Escrow Account

The Concessionaire shall, at the time of the opening of the escrow account, give irrevocable instructions by way of an escrow agreement substantially in form set forth in the Simga to Bilaspur Concession Agreement to the escrow bank instructing, *inter alia*, that the deposits into the escrow account shall subject to the provisions of the Simga to Bilaspur Concession Agreement, be appropriated in the following order every month and if not due in a month then appropriated proportionately in such month and retained in the escrow account and paid out therefrom in the month when due unless otherwise expressly provided in the instruction letter:

i. all taxes due and payable by the Concessionaire for and in respect of the Simga to Bilaspur Project Highway;

ii. concession fee;

iii. all payments relating to construction of the Simga to Bilaspur Project Highway, subject to and in accordance with the conditions, if any, set forth in the financing agreements;

iv. operation and maintenance expenses;

v. operation and maintenance expenses and other costs and expenses incurred by NHAI in accordance with the provisions of the Simga to Bilaspur Concession Agreement, and certified by NHAI as due and payable to it;

vi. monthly proportionate provision of debt service payment due in an accounting year;

vii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Withdrawals upon Termination

Notwithstanding anything to the contrary contained in the escrow agreement and subject to the provisions of the Simga to Bilaspur Concession Agreement, in the case of termination, the amounts standing to the credit of the escrow account shall be appropriated in the following order:

i. all taxes due and payable by the Concessionaire for and in respect of the Simga to Bilaspur Project Highway;

ii. payment due to the lenders;

iii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire;

iv. retention and payments relating to the liability for defects and deficiencies;

v. incurred or accrued operation and maintenance expenses;

vi. any other payments required to be made under the Simga to Bilaspur Concession Agreement; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Change of Scope

NHAI may, notwithstanding anything to the contrary contained in the Simga to Bilaspur Concession Agreement, require the Concessionaire to make alterations/ modifications in the scope of the Simga to Bilaspur Project as contemplated by the Simga to Bilaspur Concession Agreement. If the cumulative costs relating to all the change of scope orders exceed 5% of the concession fee in any continuous period of 3 years immediately preceding the date of such change of scope order or if such cumulative costs exceed 25% of the concession fee at any time during the Simga to Bilaspur Concession Period, NHAI may award any works or services, to any person on the basis of open competitive bidding and the Concessionaire shall be entitled to take part in such competitive bidding with a right to match the first-ranked bid in terms of the selection criteria, either by itself where such work requires tolling, operation and maintenance, or through another company where such work requires construction on any part of the Project Highway, subject to payment of 2% (two per cent) of the bid amount to the Authority, and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Concessionaire shall be entitled to exercise such option only if the Concessionaire has participated in the bidding process either individually or as a consortium or JV with another company and fulfils the eligibility criteria to undertake such work without compromising with its overall liability. All such changes shall be made by NHAI by an order issued in accordance with the procedure set forth in the Simga to Bilaspur Concession Agreement.

Termination of the Simga to Bilaspur Concession Agreement

Termination by either party

Either Party may in its discretion terminate the Simga to Bilaspur Concession Agreement by giving a termination notice to the other party if a force majeure event subsists for a period of 120 days or more within a continuous period of 365 days. Before issuing such termination notice, the party intending to issue the termination notice shall inform the other party of such intention and grant 15 days' time to make a representation and may after the expiry of such 15 days period, whether or not it is in receipt of such representation, in its sole discretion issue the termination notice.

Termination by the NHAI

In the event of any of the defaults specified below have occurred, and if the Concessionaire has failed to cure default within the period provided for the same in the Simga to Bilaspur Concession Agreement, then NHAI shall be entitled to issue a notice of its intention to terminate the Simga to Bilaspur Concession Agreement, with a copy to the lenders. The following events shall constitute an event of default by the Concessionaire (a "**Concessionaire Default**") unless they have occurred as a result of any breach of the Simga to Bilaspur Concession Agreement by NHAI or due to force majeure:

i. the performance security has been encashed and appropriated in accordance with the Simga to Bilaspur Concession Agreement and the Concessionaire has failed to replenish or provide fresh performance security within a cure period of 15 days;

ii. subsequent to the replenishment or furnishing of fresh performance security in accordance with the Simga to Bilaspur Concession Agreement, the Concessionaire fails to cure, within a cure period of 60 days, the Concessionaire Default for which whole or part of the performance security was appropriated;

iii. the Concessionaire abandons or manifests intention to abandon the operation and maintenance of the Simga to Bilaspur Project Highway without the prior written consent of NHAI;

iv. the Concessionaire fails to roll over, renew and furnish new bank guarantee performance security subject to and in

accordance with terms of the Simga to Bilaspur Concession Agreement, at least three months prior to expiry of subsisting bank guarantee;

v. the Concessionaire is in breach of the Maintenance Requirements or the Safety Requirements, as the case may be;

vi the Concessionaire has failed to make any payment to NHAI within the period specified in the Simga to Bilaspur Concession Agreement;

vii. upon occurrence of a financial default, the lenders' representative has by notice required NHAI to undertake suspension or termination, as the case may be, in accordance with the substitution agreement and the Concessionaire fails to cure the default within the specified cure period;

viii. a breach of any of the project agreements by the Concessionaire causes a material adverse effect;

ix. the Concessionaire creates any encumbrance in breach of the Simga to Bilaspur Concession Agreement;

x. the Concessionaire repudiates the Simga to Bilaspur Concession Agreement or otherwise takes any action or evidences or conveys an intention not to be bound by the Simga to Bilaspur Concession Agreement;

xi. a change in ownership occurs in breach of the provisions of the Simga to Bilaspur Concession Agreement;

xii. there is a transfer, pursuant to law either of (i) the rights and/or obligations of the Concessionaire under any of the project agreements, or of (ii) all or part of the assets or undertaking of the Concessionaire, and such transfer causes a material adverse effect;

xiii. an execution levied on any of the assets of the Concessionaire has caused a material adverse effect;

xiv. the Concessionaire is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Concessionaire or for the whole or material part of its assets that has a material bearing on the Simga to Bilaspur Project;

xv. the Concessionaire has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of NHAI, a material adverse effect;

xvi. a resolution for winding up of the Concessionaire is passed or any petition for winding up of the Concessionaire is admitted by a court of competent jurisdiction and a provisional liquidator or receiver is appointed and such order has not been set aside within 90 days of the date thereof or the Concessionaire is ordered to be wound up by Court except for the purpose of amalgamation or reconstruction; provided that, as part of such amalgamation or reconstruction, the entire property, assets and undertaking of the Concessionaire are transferred to the amalgamated or reconstructed entity and that the amalgamated or reconstructed entity has unconditionally assumed the obligations of the Concessionaire under the Simga to Bilaspur Concession Agreement and the project agreements; and provided that:

a. the amalgamated or reconstructed entity has the capability and operating experience necessary for the performance of its obligations under the Simga to Bilaspur Concession Agreement and the project agreements;

b. the amalgamated or reconstructed entity has the financial standing to perform its obligations under the Simga to Bilaspur Concession Agreement and the project agreements and has a credit worthiness at least as good as that of the Concessionaire as at Appointed Date; and

c. each of the project agreements remains in full force and effect;

xvii. any representation or warranty of the Concessionaire herein contained which is, as of the date of Simga to Bilaspur Concession Agreement, found to be materially false, incorrect or misleading;

xviii. the Concessionaire submits to NHAI any statement, notice or other document, in written or electronic form, which has a material effect on NHAI's rights, obligations or interests and which is false in material particulars;

xix. the Concessionaire has failed to fulfil any obligation, for which failure termination has been specified in the Simga to Bilaspur Concession Agreement;

xx. the Concessionaire commits a default in complying with any other provision of the Simga to Bilaspur Concession Agreement if such default causes a material adverse effect on NHAI;

xxi. an escrow default occurs and the Concessionaire fails to cure the default within a cure period of 15 days;

Termination by Concessionaire

If any of the defaults specified below shall have occurred, and NHAI fails to cure such default within a cure period of 90 days or such longer period as has been expressly provided in the Simga to Bilaspur Concession Agreement, NHAI shall be deemed to be in default of the Simga to Bilaspur Concession Agreement, unless the default has occurred as a result of any breach of the Simga to Bilaspur Concession Agreement by the Concessionaire or due to force majeure:

i. NHAI commits a material default in complying with any of the provisions of the Simga to Bilaspur Concession Agreement and such default has a material adverse effect on the Concessionaire; or

ii. NHAI repudiates the Simga to Bilaspur Concession Agreement or otherwise takes any action that amounts to or manifests an irrevocable intention not to be bound by the Simga to Bilaspur Concession Agreement; or

iii. the State commits a material default in complying with the provisions of the State Support Agreement if such default has a Material Adverse Effect on the Concessionaire and the breach continues for a period of 90 (ninety) days from the date of notice given in this behalf by the Concessionaire to the Authority.

Termination Payments

The termination payment pursuant to the Simga to Bilaspur Concession Agreement becomes due and payable to the Concessionaire by NHAI within 15 days of the Concessionaire furnishing to NHAI an NOC issued by the lenders/ lenders' representative recording/ effecting release/ vacation/ discharge of the charge on Simga to Bilaspur Project receivables (if any) created by Concessionaire for securing repayment of the debt. If NHAI fails to disburse the full termination payment within 15 days, NHAI shall pay interest at a rate equal to 3% above the bank rate on the amount of termination payment remaining unpaid.

Upon termination of the Simga to Bilaspur Concession Agreement by the NHAI on account of occurrence of a Concessionaire Default, the NHAI shall pay the Concessionaire by way of termination payment 70% of the Unexpired Cash Flow.

Upon termination of the Simga to Bilaspur Concession Agreement by the Concessionaire on account of occurrence of an NHAI Default, the Concessionaire shall be entitled to receive from NHAI by way of termination payment a sum equal to 105% of the Unexpired Cash Flow.

For details in relation to the technical clarifications received from NHAI in relation to the Concession Agreements, please refer to Annexure 1 of the Raipur to Simga to Bilaspur Agreement.

11. ***Concession Agreement between NSPPL ("Concessionaire") and NHAI in respect of the Gandhidham (Kandla) to Mundra Port Project dated*** March 12, 2025

The Concessionaire has entered into a concession agreement for tolling, operation, maintenance and transfer of Gandhidham (Kandla) to Mundra Port Project Highway (as defined below) on toll, operate and transfer (TOT) basis (the "**Gandhidham (Kandla) to Mundra Port Concession Agreement**"), for a period of 20 years from the the Appointed Date (i.e., the date on which all Conditions Precedent have been satisfied) or such date on which the Gandhidham (Kandla) to Mundra Port Concession Agreement is terminated by a termination notice ("**Gandhidham (Kandla) to Mundra Port Concession Period**").

Certain Definitions

"**Gandhidham (Kandla) to Mundra Port Project**" means the operation and maintenance of the Gandhidham (Kandla) to Mundra Port Project Highway in accordance with the provisions of the Gandhidham (Kandla) to Mundra Port Concession Agreement and includes all works, services and equipment relating to or in respect of the scope of the Gandhidham (Kandla) to Mundra Port Project as set forth in the Gandhidham (Kandla) to Mundra Port Concession Agreement;

"**Gandhidham (Kandla) to Mundra Port Project Assets**" means all physical and other assets relating to and forming part of the Site including (a) rights over the Site in the form of licence, Right of Way or otherwise; (b) tangible assets such as civil works and equipment including foundations, embankments, pavements, road surface, interchanges, bridges, culverts, road overbridges, drainage works, traffic signals, sign boards, kilometre- stones, toll plazas, electrical systems, communication systems, rest areas, relief centers, maintenance depots and administrative offices; (d) all rights of the Concessionaire under the project agreements; security deposits; insurance proceeds; and (e) Applicable Permits and authorisations relating to or in respect of the Gandhidham (Kandla) to Mundra Port Project Highway, but does not include Additional Facilities; and

"**Gandhidham (Kandla) to Mundra Port Project Highway**" means the Site comprising the existing road comprising:

Stretch	State	Start (Km)	End (Km)	Length
Gandhidham (Kandla) to Mundra Port section of NH-41	Gujarat	0+000	71+400	71+400

and all Gandhidham (Kandla) to Mundra Port Project Assets."

Grant of Concession

Subject to and in accordance with the terms and conditions set forth in the Gandhidham (Kandla) to Mundra Port Concession Agreement, NHAI has granted to the Concessionaire, and the Concessionaire has accepted the concession for a period of 20 years, including the exclusive right, license and authority during the subsistence of the Gandhidham (Kandla) to Mundra Port Agreement to demand, collect and appropriate Fee, operate, manage and maintain the Gandhidham (Kandla) to Mundra Port Project Highway. Notwithstanding anything to the contrary in the Gandhidham (Kandla) to Mundra Port Concession Agreement, the parties have expressly agreed that the Concession Period shall not be reduced by more than 5 (five) years, or shall not be increased by more than 10 (ten) years on any account or for any reason whatsoever.

Subject to and in accordance with the terms and conditions set forth in the Gandhidham (Kandla) to Mundra Port Concession Agreement, the Concessionaire is entitled to undertake the following in accordance with the terms of the Gandhidham (Kandla) to Mundra Port Concession Agreement, applicable laws and applicable permits:

i. Right of Way, access and license to the Site for the purpose of and to the extent conferred by the provisions of the Gandhidham (Kandla) to Mundra Port Concession Agreement;

ii. manage, operate and maintain the Gandhidham (Kandla) to Mundra Port Project Highway and regulate the use thereof by third parties in accordance with the terms of Gandhidham (Kandla) to Mundra Port Concession Agreement;

iii. demand, collect and appropriate the fees from vehicles and persons liable for payment of fees for using the Gandhidham (Kandla) to Mundra Port Project Highway or any part thereof and refuse entry of any vehicle to the Gandhidham (Kandla) to Mundra Port Project Highway if the fee due is not paid;

iv. perform and fulfill all of the Concessionaire's obligations under and in accordance with the Gandhidham (Kandla) to Mundra Port Concession Agreement;

v. bear and pay all costs, expenses and charges in connection with or incidental to the performance of the obligations of the Concessionaire under the Gandhidham (Kandla) to Mundra Port Concession Agreement; and

vi. neither assign, transfer or sublet or create any lien or encumbrance on the Gandhidham (Kandla) to Mundra Port Concession Agreement, or the concession granted thereby, or on the whole or any part of the Gandhidham (Kandla) to Mundra Port Project Highway nor transfer, lease or part possession thereof, save and except as expressly permitted by the Gandhidham (Kandla) to Mundra Port Concession Agreement.

Fees

The Concessionaire is entitled to, during the Gandhidham (Kandla) to Mundra Port Concession Period, levy, collect and appropriate fees from users ("**User Fee**") of the Gandhidham (Kandla) to Mundra Port Project Highway pursuant to and in accordance with the provisions in the Gandhidham (Kandla) to Mundra Port Concession Agreement and the Fee Rules and to appropriate the same. In accordance with the terms of the Gandhidham (Kandla) to Mundra Port Concession Agreement, the Concessionaire shall not collect any fees in relation to exempted vehicles. The fees collected by Concessionaire shall be deposited in the escrow account and appropriated in accordance with the relevant provisions of the Gandhidham (Kandla) to Mundra Port Concession Agreement.

Sub Rule 6(6) of the above-mentioned Fee Rules states,

"(a) The fee shall be collected by the Central Government or the executing Authority as the case may be and for a specified period in accordance with the terms of agreement entered by the Concessionaire.
(b) The fee as notified as per Gandhidham (Kandla) to Mundra Port Concession Agreement shall be leviable till the end of the concession period and after the Concession Agreement is over, the fee shall be collected by the Central Government executing authority at a reduced rate of 40% of the fee on the date of transfer of such section of National Highways, bridge, tunnel or bypass, as the case may be, to be revised annually in accordance with these rules:

Provided that after the recovery of capital cost through user fee realised, in respect of a public funded project, the fee leviable would be reduced to 40% of the user fee for such section of National Highways, bridge, tunnel or bypass as the case may be, to be revised annually in accordance with these rules." In respect of the above, NHAI has clarified that Rule 6 of the Fee Rules provides that the user fee to be notified by Government as per the format of Schedule M of Concession

Agreement shall be leviable till the end of the concession period. Hence, the rate of User Fee rate shall only be reduced after the concession period is over."

Concession Fees

As consideration for the grant of the Concession, the Concessionaire is required to pay a concession fee to NHAI equivalent to ₹ 27,176.00 million, within 120 days of the date of execution of the concession agreement or any extended date as agreed by NHAI prior to the Appointed Date as a Condition Precedent. The Concessionaire agrees that payment of the concession fee constitutes essential condition of the Concession Agreement. Further as communicated by the authority by way of a letter dated 13.02.25, any amount raised from the proceeds of the Issue in excess of the Base Concession Fee (being the aggregate of Concession Fees payable to NHAI in terms of the Additional Concession Agreements) shall be paid to the Authority. For further details, see the section titled "Use of Proceeds – Details of Utilisation of Issue Proceeds - Infusion of debt and/or equity into NSPPL" on page 355. For the purposes of stamp duty payment, concession agreements are generally considered to be agreements which are not lease deeds and stamp duty of ₹ 100.00 is typically paid for such concession agreements. However, stamp duty authorities of certain states in India have issued notices to some concessionaires alleging inadequate stamp duty on the concession agreements executed between the concessionaires and the NHAI. The stamp authorities allege that since concession agreements relate to the letting of tolls to the concessionaires in the form of leases, or as development agreements, such agreements were required to be stamped as lease agreements or development agreements, as applicable. The stamp duty for a lease agreement or a development agreement ranges between 1.0% and 11.0% of the annual rent or premium payable or the market value of the property. Furthermore, stamp duty authorities may impose penalties for payment of inadequate stamp duty, which could extend up to ten (10) times the amount of the stamp duty payable. Accordingly, concession agreements that have not been stamped as such could be considered to be inadequately stamped. The High Courts of Allahabad and Maharashtra have also held that a concession agreement ought to be stamped as a lease agreement and have upheld the imposition of a higher stamp duty on such agreements.

While we have paid stamp duty of ₹ 100.00 on each of our Concession Agreements in accordance with usual practice, if any demand for payment of a higher stamp duty or penalty is imposed, it would increase the costs of the Toll Roads.

In respect of above, NHAI has clarified that:

(i) As on the date of the Gandhidham (Kandla) to Mundra Port Concession Agreement, GST is not applicable on Concession Fee. However, if it becomes applicable at a later stage, this shall be considered as change in law.

(ii) There is no requirement of stamp duty in case of Concession Agreements since Fee Rules provided for levy and collection of user fee and not toll tax. In case, in future any such demand arises, it shall be treated as change in law.

Escrow Account

The provisions in relation to the escrow account in the Gandhidham (Kandla) to Mundra Port Concession Agreement are only applicable if the obligations of the Concessionaire under the Gandhidham (Kandla) to Mundra Port Concession Agreement are financed by the Lenders.

The Concessionaire shall, prior to the Appointed Date, open and establish the escrow account with the escrow bank and all funds constituting the financing package related to the Gandhidham (Kandla) to Mundra Port Project shall be credited to such escrow account. During the Gandhidham (Kandla) to Mundra Port Concession Period all fees and any other revenues including the proceeds of any rentals, deposits, capital receipts or insurance claims from or in respect of the Gandhidham (Kandla) to Mundra Port Project Highway shall be deposited therein. In addition, all payments by NHAI pursuant to the Gandhidham (Kandla) to Mundra Port Concession Agreement, including, if any, in relation to the change of scope in the Gandhidham (Kandla) to Mundra Port Project shall be deposited by NHAI in the escrow account.

Withdrawals from Escrow Account

The Concessionaire shall, at the time of the opening of the escrow account, give irrevocable instructions by way of an escrow agreement substantially in form set forth in the Gandhidham (Kandla) to Mundra Port Concession Agreement to the escrow bank instructing, *inter alia*, that the deposits into the escrow account shall subject to the provisions of the Gandhidham (Kandla) to Mundra Port Concession Agreement, be appropriated in the following order every month and if not due in a month then appropriated proportionately in such month and retained in the escrow account and paid out therefrom in the month when due unless otherwise expressly provided in the instruction letter:

i. all taxes due and payable by the Concessionaire for and in respect of the Gandhidham (Kandla) to Mundra Port Project Highway;

ii. concession fee;

iii. all payments relating to construction of the Gandhidham (Kandla) to Mundra Port Project Highway, subject to and

in accordance with the conditions, if any, set forth in the financing agreements;

iv. operation and maintenance expenses;

v. operation and maintenance expenses and other costs and expenses incurred by NHAI in accordance with the provisions of the Gandhidham (Kandla) to Mundra Port Concession Agreement, and certified by NHAI as due and payable to it;

vi. monthly proportionate provision of debt service payment due in an accounting year;

vii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Withdrawals upon Termination

Notwithstanding anything to the contrary contained in the escrow agreement and subject to the provisions of the Gandhidham (Kandla) to Mundra Port Concession Agreement, in the case of termination, the amounts standing to the credit of the escrow account shall be appropriated in the following order:

i. all taxes due and payable by the Concessionaire for and in respect of the Gandhidham (Kandla) to Mundra Port Project Highway;

ii. payment due to the lenders;

iii. all payments and damages certified by NHAI as due and payable to it by the Concessionaire;

iv. retention and payments relating to the liability for defects and deficiencies;

v. incurred or accrued operation and maintenance expenses;

vi. any other payments required to be made under the Gandhidham (Kandla) to Mundra Port Concession Agreement; and

vii. balance, if any, in accordance with the instructions of the Concessionaire.

Change of Scope

NHAI may, notwithstanding anything to the contrary contained in the Gandhidham (Kandla) to Mundra Port Concession Agreement, require the Concessionaire to make alterations/ modifications in the scope of the Gandhidham (Kandla) to Mundra Port Project as contemplated by the Gandhidham (Kandla) to Mundra Port Concession Agreement. If the cumulative costs relating to all the change of scope orders exceed 5% of the concession fee in any continuous period of 3 years immediately preceding the date of such change of scope order or if such cumulative costs exceed 25% of the concession fee at any time during the Gandhidham (Kandla) to Mundra Port Concession Period, NHAI may award any works or services, to any person on the basis of open competitive bidding and the Concessionaire shall be entitled to take part in such competitive bidding with a right to match the first-ranked bid in terms of the selection criteria, either by itself where such work requires tolling, operation and maintenance, or through another company where such work requires construction on any part of the Project Highway, subject to payment of 2% (two per cent) of the bid amount to the Authority, and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Concessionaire shall be entitled to exercise such option only if the Concessionaire has participated in the bidding process either individually or as a consortium or JV with another company and fulfils the eligibility criteria to undertake such work without compromising with its overall liability. All such changes shall be made by NHAI by an order issued in accordance with the procedure set forth in the Gandhidham (Kandla) to Mundra Port Concession Agreement.

Termination of the Gandhidham (Kandla) to Mundra Port Concession Agreement

Termination by either party

Either Party may in its discretion terminate the Gandhidham (Kandla) to Mundra Port Concession Agreement by giving a termination notice to the other party if a force majeure event subsists for a period of 120 days or more within a continuous period of 365 days. Before issuing such termination notice, the party intending to issue the termination notice shall inform the other party of such intention and grant 15 days' time to make a representation and may after the expiry of such 15 days period, whether or not it is in receipt of such representation, in its sole discretion issue the termination notice.

Termination by the NHAI

In the event of any of the defaults specified below have occurred, and if the Concessionaire has failed to cure default within the period provided for the same in the Gandhidham (Kandla) to Mundra Port Concession Agreement, then NHAI shall be entitled to issue a notice of its intention to terminate the Gandhidham (Kandla) to Mundra Port Concession Agreement, with a copy to the lenders. The following events shall constitute an event of default by the Concessionaire (a "**Concessionaire Default**") unless they have occurred as a result of any breach of the Gandhidham (Kandla) to Mundra Port Concession Agreement by NHAI or due to force majeure:

i. the performance security has been encashed and appropriated in accordance with the Gandhidham (Kandla) to Mundra Port Concession Agreement and the Concessionaire has failed to replenish or provide fresh performance security within a cure period of 15 days;

ii. subsequent to the replenishment or furnishing of fresh performance security in accordance with the Gandhidham (Kandla) to Mundra Port Concession Agreement, the Concessionaire fails to cure, within a cure period of 60 days, the Concessionaire Default for which whole or part of the performance security was appropriated;

iii. the Concessionaire abandons or manifests intention to abandon the operation and maintenance of the Gandhidham (Kandla) to Mundra Port Project Highway without the prior written consent of NHAI;

iv. the Concessionaire fails to roll over, renew and furnish new bank guarantee performance security subject to and in accordance with terms of the Gandhidham (Kandla) to Mundra Port Concession Agreement, at least three months prior to expiry of subsisting bank guarantee;

v. the Concessionaire is in breach of the Maintenance Requirements or the Safety Requirements, as the case may be;

vi the Concessionaire has failed to make any payment to NHAI within the period specified in the Gandhidham (Kandla) to Mundra Port Concession Agreement;

vii. upon occurrence of a financial default, the lenders' representative has by notice required NHAI to undertake suspension or termination, as the case may be, in accordance with the substitution agreement and the Concessionaire fails to cure the default within the specified cure period;

viii. a breach of any of the project agreements by the Concessionaire causes a material adverse effect;

ix. the Concessionaire creates any encumbrance in breach of the Gandhidham (Kandla) to Mundra Port Concession Agreement;

x. the Concessionaire repudiates the Gandhidham (Kandla) to Mundra Port Concession Agreement or otherwise takes any action or evidences or conveys an intention not to be bound by the Gandhidham (Kandla) to Mundra Port Concession Agreement;

xi. a change in ownership occurs in breach of the provisions of the Gandhidham (Kandla) to Mundra Port Concession Agreement;

xii. there is a transfer, pursuant to law either of (i) the rights and/or obligations of the Concessionaire under any of the project agreements, or of (ii) all or part of the assets or undertaking of the Concessionaire, and such transfer causes a material adverse effect;

xiii. an execution levied on any of the assets of the Concessionaire has caused a material adverse effect;

xiv. the Concessionaire is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Concessionaire or for the whole or material part of its assets that has a material bearing on the Gandhidham (Kandla) to Mundra Port Project;

xv. the Concessionaire has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of NHAI, a material adverse effect;

xvi. a resolution for winding up of the Concessionaire is passed or any petition for winding up of the Concessionaire is admitted by a court of competent jurisdiction and a provisional liquidator or receiver is appointed and such order has not been set aside within 90 days of the date thereof or the Concessionaire is ordered to be wound up by Court except for the purpose of amalgamation or reconstruction; provided that, as part of such amalgamation or reconstruction, the entire property, assets and undertaking of the Concessionaire are transferred to the amalgamated or reconstructed entity and that the amalgamated or reconstructed entity has unconditionally assumed the obligations of the Concessionaire under the Gandhidham (Kandla) to Mundra Port Concession Agreement and the project agreements; and provided that:

    a. the amalgamated or reconstructed entity has the capability and operating experience necessary for the

performance of its obligations under the Gandhidham (Kandla) to Mundra Port Concession Agreement and the project agreements;

b. the amalgamated or reconstructed entity has the financial standing to perform its obligations under the Gandhidham (Kandla) to Mundra Port Concession Agreement and the project agreements and has a credit worthiness at least as good as that of the Concessionaire as at Appointed Date; and

c. each of the project agreements remains in full force and effect;

xvii. any representation or warranty of the Concessionaire herein contained which is, as of the date of Gandhidham (Kandla) to Mundra Port Concession Agreement, found to be materially false, incorrect or misleading;

xviii. the Concessionaire submits to NHAI any statement, notice or other document, in written or electronic form, which has a material effect on NHAI's rights, obligations or interests and which is false in material particulars;

xix. the Concessionaire has failed to fulfil any obligation, for which failure termination has been specified in the Gandhidham (Kandla) to Mundra Port Concession Agreement;

xx. the Concessionaire commits a default in complying with any other provision of the Gandhidham (Kandla) to Mundra Port Concession Agreement if such default causes a material adverse effect on NHAI;

xxi. an escrow default occurs and the Concessionaire fails to cure the default within a cure period of 15 days;

Termination by Concessionaire

If any of the defaults specified below shall have occurred, and NHAI fails to cure such default within a cure period of 90 days or such longer period as has been expressly provided in the Gandhidham (Kandla) to Mundra Port Concession Agreement, NHAI shall be deemed to be in default of the Gandhidham (Kandla) to Mundra Port Concession Agreement, unless the default has occurred as a result of any breach of the Gandhidham (Kandla) to Mundra Port Concession Agreement by the Concessionaire or due to force majeure:

iv. NHAI commits a material default in complying with any of the provisions of the Gandhidham (Kandla) to Mundra Port Concession Agreement and such default has a material adverse effect on the Concessionaire; or

v. NHAI repudiates the Gandhidham (Kandla) to Mundra Port Concession Agreement or otherwise takes any action that amounts to or manifests an irrevocable intention not to be bound by the Gandhidham (Kandla) to Mundra Port Concession Agreement; or

vi. the State commits a material default in complying with the provisions of the State Support Agreement if such default has a Material Adverse Effect on the Concessionaire and the breach continues for a period of 90 (ninety) days from the date of notice given in this behalf by the Concessionaire to the Authority.

Termination Payments

The termination payment pursuant to the Gandhidham (Kandla) to Mundra Port Concession Agreement becomes due and payable to the Concessionaire by NHAI within 15 days of the Concessionaire furnishing to NHAI an NOC issued by the lenders/ lenders' representative recording/ effecting release/ vacation/ discharge of the charge on Gandhidham (Kandla) to Mundra Port Project receivables (if any) created by Concessionaire for securing repayment of the debt. If NHAI fails to disburse the full termination payment within 15 days, NHAI shall pay interest at a rate equal to 3% above the bank rate on the amount of termination payment remaining unpaid.

Upon termination of the Gandhidham (Kandla) to Mundra Port Concession Agreement by the NHAI on account of occurrence of a Concessionaire Default, the NHAI shall pay the Concessionaire by way of termination payment 70% of the Unexpired Cash Flow.

Upon termination of the Gandhidham (Kandla) to Mundra Port Concession Agreement by the Concessionaire on account of occurrence of an NHAI Default, the Concessionaire shall be entitled to receive from NHAI by way of termination payment a sum equal to 105% of the Unexpired Cash Flow.

For details in relation to the technical clarifications received from NHAI in relation to the Concession Agreements, please refer to Annexure 1 of the Gandhidham (Kandla) to Mundra Port Agreement.

Differences between the R1 Concession Agreements, R2 Concession Agreements, R3 Concession Agreements and R4 Concession Agreement

The significant differences amongst the R1 Concession Agreements, R2 Concession Agreements, R3 Concession

Agreements and R4 Concession Agreements are provided below:

Category	R1 Concession Agreements	R2 Concession Agreements	R3 Concession Agreements	R4 Concession Agreements
Concession Period	30 years	20 years	20 years	20 years
Capacity Augmentation	The Sponsor shall not compensate the relevant Concessionaire for any reduction in toll rates due to capacity augmentation.	The Sponsor shall compensate the relevant Concessionaire on a quarterly basis for any reduction in toll rates due to capacity augmentation.	The Sponsor shall compensate the relevant Concessionaire on a quarterly basis for any reduction in toll rates due to capacity augmentation.	The Sponsor shall compensate the relevant Concessionaire on a quarterly basis for any reduction in toll rates due to capacity augmentation.
	The EPC contractor, undertaking capacity augmentation, shall be liable for all the defects and deficiencies for the Defect Liability Period (*as defined in the relevant Concession Agreements*).	The EPC contractor, undertaking capacity augmentation, shall additionally be liable for all the defects and deficiencies, maintenance and other operational responsibilities such as incident management, traffic management, routine maintenance etc. for the Defect Liability Period.	The EPC contractor, undertaking capacity augmentation, shall additionally be liable for all the defects and deficiencies, maintenance and other operational responsibilities such as incident management, traffic management, routine maintenance etc. for the Defect Liability Period.	The EPC contractor, undertaking capacity augmentation, shall additionally be liable for all the defects and deficiencies, maintenance and other operational responsibilities such as incident management, traffic management, routine maintenance etc. for the Defect Liability Period.
	The Detailed Project Report (*as defined in the relevant Concession Agreements*) may be commenced once the average daily traffic exceeds the target traffic and continues to exceed the designed capacity for three consecutive accounting years following thereafter.	The Detailed Project Report (*as defined in the relevant Concession Agreements*) may be commenced immediately once the average daily traffic has met the target traffic.	The Detailed Project Report (*as defined in the relevant Concession Agreements*) may be commenced immediately once the average daily traffic has met the target traffic.	The Detailed Project Report (*as defined in the relevant Concession Agreements*) may be commenced immediately once the average daily traffic has met the target traffic.
Effects of variation in toll collection	The actual fee shall be evaluated against the target revenue at the end of every 10th year.	The actual fee shall be evaluated against the target revenue at the end of every 7th year.	The actual fee shall be evaluated against the target revenue at the end of every 7th year.	The actual fee shall be evaluated against the target revenue at the end of every 5th year.
	If the actual fee deviates from Target fee 1 by more than the 20% threshold or from Target fee 2 by more than 30% threshold, whether exceeds or falling short, the remaining concession period shall be deemed modified accordingly.	If the actual fee deviates from Target fee 1 by more than the 20% threshold or from Target fee 2 by more than 30% threshold, whether exceeds or falling short, the remaining concession period shall be deemed modified accordingly.	If the actual fee deviates from Target fee 1 by more than the 20% threshold or from Target fee 2 by more than 30% threshold, whether exceeds or falling short, the remaining concession period shall be deemed modified accordingly.	If the actual fee deviates from Target fee by more than the 5% threshold, whether exceeds or falling short, the remaining concession period shall be deemed modified accordingly.

	The target revenue remains constant throughout the concession period.	The target revenue remains constant throughout the concession period.	The target revenue remains constant throughout the concession period.	The target revenue may be adjusted in accordance with changes in the concession period at each target point.

INFORMATION CONCERNING THE UNITS

Details of Unitholding of the Trust as on December 31, 2024

All units are held in dematerialised form.

Category	Category of Unit holder	No. of Units held	As a % of total outstanding Units	No. of Units mandatorily held		Number of Units pledged or otherwise encumbered	
				No. of Units	As a % of total Units held	No. of Units	As a % of total Units held
(A)	**Sponsor(s) / Investment Manager / Project Manager(s) and their Associates / related parties, and the Sponsor Group**						
(1)	**Indian**						
(a)	Individuals / HUF	-	0.00	-	0.00	-	0.00
(b)	Central/State Govt.	203,072,000	15.48	107,472,000	52.92	-	0.00
(c)	Financial Institutions/Banks	-	0.00	-	0.00	-	0.00
(d)	Any other	-	0.00	-	0.00	-	0.00
	Bodies Corporates	-	0.00	-	0.00	-	0.00
	Sub-Total (A) (1)	**203,072,000**	**15.48**	**107,472,000**	**52.92**	**-**	**0.00**
(2)	**Foreign**						
(a)	Individuals (Non Resident Indians / Foreign Individuals)		0.00	-	0.00	-	0.00
(b)	Foreign government	-	0.00	-	0.00	-	0.00
(c)	Institutions	-	0.00	-	0.00	-	0.00
(d)	Foreign Portfolio Investors	-	0.00	-	0.00	-	0.00
(e)	Any Other (Bodies Corporates)	-	0.00	-	0.00	-	0.00
	Sub-Total (A) (2)	**-**	**0.00**	**-**	**0.00**	**-**	**0.00**
	Total Unitholding of Sponsor and Sponsor Group (A) = (A)(1)+(A)(2)	**203,072,000**	**15.48**	**107,472,000**	**52.92**	**-**	**-**
(B)	**Public Holding**						
(1)	**Institutions**						
(a)	Mutual Funds	129,622,550	9.88				
(b)	Financial Institutions/Banks	20,094,100	1.53				
(c)	Central/State Govt.	-	0.00				
(d)	Venture Capital Funds	-	0.00				
(e)	Insurance Companies	53,787,750	4.10				
(f)	Provident/pension funds	122,227,103	9.31				
(g)	Foreign Portfolio Investors	-	0.00				
(h)	Foreign Venture Capital investors	-	0.00				
(i)	Any Other (specify)		0.00				
	Bodies Corporates	656,100,300	50.00				
	Alternative Investment Fund	21,365,940	1.63				
	Sub-Total (B) (1)	**1,003,197,743**	**76.45**				
(2)	**Non-Institutions**						
(a)	Central Government / State Governments(s) / President of India	-	0.00	-			
(b)	Individuals	28,896,126	2.20				
(c)	NBFCs registered with RBI	-	0.00				
(d)	Any Other (Specify)	-	0.00				
	TRUSTS	14,300,000	1.09				
	Non-Resident Indians	1,076,883	0.08				
	Clearing Members	-	0.00				
	Bodies Corporates	61,657,848	4.70				
			0.00				
	Sub-Total (B) (2)	**105,930,857**	**8.07**				

Category	Category of Unit holder	No. of Units held	As a % of total outstanding Units	No. of Units mandatorily held		Number of Units pledged or otherwise encumbered	
				No. of Units	As a % of total Units held	No. of Units	As a % of total Units held
	Total Public Unit holding (B) = (B)(1)+(B)(2)	**1,109,128,600**	**84.52**				
	Total Units Outstanding (C) = (A) + (B)	**1,312,200,600**	**100.00**				

Details of Unitholding pre and post- Issue

Particulars	Number of Units
Units issued and outstanding prior to this Issue	1,312,200,600
Units issued and outstanding after this Issue	[●]

Unitholders holding more than 5% of the Units as on December 31, 2024

Sr. No.	Name of Unit Holders	Pre- Issue		Post- Issue	
		Number of Units	Percentage of holding (%)	Number of Units	Percentage of holding (%)
1.	2452991 Ontario Limited	32,80,50,150	25.00	[●]	[●]
2.	CPP Investment Board Private Holdings 4 Inc	32,80,50,150	25.00	[●]	[●]
3.	National Highways Authority of India	20,30,72,000	15.48	[●]	[●]
4.	SBI AMC (SBI Mutual Fund)	12,25,43,650	9.33	[●]	[●]

Unitholding of the Sponsor, Sponsor Group, Investment Manager, Project Manager and Trustee

The Sponsor and the Sponsor Group hold 203,072,000 units (15.48 %) Units as on December 31, 2024, as disclosed above. The Trustee, Project Manager and the Investment Manager do not hold any Units and shall not acquire any Units in this Issue.

Unitholding of the directors of the Investment Manager

As on the date of this Preliminary Placement Document, none of the directors of the Investment Manager hold any Units or propose to hold any Units.

Sponsor and Sponsor Group

In accordance with Regulation 12(3), read with Regulation 12(3A) of the InvIT Regulations, the Sponsor and Sponsor Group, shall, at all times hold not less than 15% of total outstanding Units for a period of three years from the date of listing pursuant to the initial offering of the Units.

Further, in accordance with the InvIT Regulations, the Sponsor and the Sponsor Group are required to hold certain number of Units, from the beginning of 4th year after the date of listing pursuant to the initial offer as follows:

From the beginning of 4th year after the date of listing pursuant to the initial offer and till the end of 5th year from the date of listing pursuant to the initial offer	5% of total Units or ₹ 500 crores, whichever is lower*
From the beginning of 6th year after the date of listing pursuant to the initial offer and till the end of 10th year from the date of listing pursuant to the initial offer	3% of total Units or ₹ 500 crores, whichever is lower*
From the beginning of 11th year after the date of listing pursuant to the initial offer and till the end of 20th year from the date of listing pursuant to the initial offer	2% of total Units or ₹ 500 crores, whichever is lower*
After completion of the 20th year from the date of listing pursuant to the initial offer	1% of total Units or ₹ 500 crores, whichever is lower*

* *Provided that the maximum value of Units to be held by the Sponsor and Sponsor Group for compliance with the above shall not exceed ₹500 crores or such other value as may be decided by SEBI from time to time wherein such valuation shall be based on the latest available net asset value of the Trust*

USE OF PROCEEDS

The gross proceeds from the Issue will be up to ₹ [●] million ("**Gross Proceeds**") and the proceeds of this Issue net of Issue related and other expenses to be borne by the Trust ("**Net Proceeds**") are proposed to be ₹ [●] million.

The Proceeds of the Issue are set forth in the following table:

(In ₹ million)

Particulars	Amount
Gross Proceeds*	Up to [●]
Less*: Estimated Issue related and other expenses to be borne by the Trust	[●]
Net Proceeds	[●]

** Assuming full subscription and Allotment of Units. The size of the Issue shall be subject to finalisation of Allotment in the Issue*

Purpose of the Issue

1.1. Subject to compliance with applicable laws and regulations, the Net Proceeds are proposed to be:

(a). utilised (to the extent required) by the Trust for:

(i). creation and maintenance of major maintenance reserve for the Target Toll Assets, if required;

(ii). creation and maintenance of debt service reserve account at Trust level, if required; and

(iii). fees payable to lenders, if any.

(b). Infused as debt or equity, or both into NSPPL by the Trust. NSPPL proposes to utilize the said infusion of Net Proceeds for, amongst others:

(i). part or full payment of Base Concession Fee;

(ii). part or full payment of Additional Concession Fee;

(iii). initial improvement cost of the Target Toll Assets;

(iv). major maintenance cost of the Target Toll Assets, if any;

(v). creation and maintenance of major maintenance reserve for the Target Toll Assets, if any; and

(vi). part payment for creation and maintenance of debt service reserve account, if any.

(c). General corporate purposes.

(Collectively, referred to hereinafter as "**Objects**").

2. Requirements of Funds

2.1. The Net Proceeds are proposed to be used in accordance with the details provided below.

2.1.1. ***Utilisation of the Net Proceeds by the Trust***

The Trust may utilize a portion of Net Proceeds for the purposes set out below:

(In ₹ million)

Sr. No.	Particulars	Amount (up to)
(a).	Creation and maintenance of major maintenance reserve for the Target Toll Assets, if required	[●]
(b).	Infusion of debt or equity or both into NSPPL	[●]
(c).	Creation and maintenance of debt service reserve account at Trust level, if required	[●]

Sr. No.	Particulars	Amount (up to)
(d).	Fees payable to lenders, if any	[●]

2.1.2. ***Utilisation of the Net Proceeds by NSPPL infused as debt or equity, or both into NSPPL by the Trust***

(In ₹ million)

Sr. No.	Particulars	Amount (up to)
(a).	Part or full payment of Base Concession Fee	[●]
(b).	Part or full payment of Additional Concession Fee	[●]
(c).	Initial improvement cost of the Target Toll Assets	[●]
(d).	Major maintenance cost of the Target Toll Assets, if any	[●]
(e).	Creation and maintenance of major maintenance reserve for the Target Toll Assets, if any	[●]
(f).	Part payment for creation and maintenance of debt service reserve account, if any	[●]
	Total	[●]

We believe that the infusion of the funds into NSPPL by the Trust, in order to meet its obligations under the NSPPL Concession Agreements, will enable NSPPL to acquire the necessary rights under the NSPPL Concession Agreements. Accordingly, we believe that the proposed infusion of funds will be beneficial to the Trust and to Unitholders.

2.1.3. ***Utilisation of the Net Proceeds for General Corporate Purposes***

(In ₹ million)

Allocation Sr. No.	Particulars	Amount (up to)
	General Corporate Purpose	[●]

2.2. ***Miscellaneous***

(a). The fund requirements mentioned above, and the proposed deployment are based on the estimates of the Investment Manager and have not been appraised by any bank, financial institution or any other external agency. The fund requirements may vary due to factors beyond the Investment Manager's control, such as market conditions and competitive environment. Consequently, the fund requirements are subject to revisions in the future at the discretion of the Investment Manager. In the event of any shortfall of funds for the activities proposed to be financed out of the Issue Proceeds as stated above, the Investment Manager may re-allocate the Issue Proceeds to the activities where such shortfall has arisen, subject to compliance with applicable law.

3. Further Details Regarding Objects

3.1. ***Summary Details Regarding Concession Fee and Additional Concession Fee***

(a). The Target Toll Roads have been valued at a base value of ₹ 176,405 million by Ernst & Young Merchant Banking Service LLP, the independent valuer appointed by the Investment Manager on behalf of the Trust. The Unitholders have approved the Base Concession Fee for the Target Toll Roads by way of a resolution passed at the meeting held on March 10, 2025. It may be noted that the base valuation for the Target Toll Roads is for the purpose of establishing a price discovery mechanism for the Target Toll Roads and that the final amounts paid as concession fees to the Sponsor under the NSPPL Concession Agreements for the Target Toll Roads may be higher than the base valuation.

(b). The Base Concession Fee and the Additional Concession Fee for the Target Toll Roads shall be paid through a combination of the proceeds of the Issue and debt financing to be obtained by the Trust / NSPPL. The base valuation range for the Target Toll Roads, has been accepted by NHAI, subject to payment of additional amounts to be raised pursuant to the Issue. The actual amount to be invested into NSPPL by way of equity or equity like infusion or debt, if any, may be decided by the IM Board, in their discretion.

(c). ***Additional Concession Fee***

In terms of the R4 Concession Agreements read with the letter dated February 13, 2025, from the Authority, any Net Proceeds that are in excess of the Base Concession Fee shall be paid to the Authority. The Base Concession Fee has been calculated on the Base Price of ₹ 131.94. If the Issue Price is higher than the Base Price, then the entire differential amount is required to be paid to the Authority, as Additional Concession Fee. The Trust shall utilize up to ₹ [●] million for infusion of debt and/ or equity into NSPPL or both, to facilitate payment of an Additional Concession Fee to the Authority.

3.2 Fees payable to lenders, if any

The concession fee for the Target Toll Roads shall be paid through a combination of the proceeds of the Issue and debt financing to be obtained by the Trust and/or the NSPPL. The Trust proposes to avail debt financing with certain lenders for availing loans amounting to approximately ₹ 1,05,000 million ("**Trust Loan 4**") and has obtained letters from certain lenders in relation to the same. The Net Proceeds may be utilised by the Trust for payment of fees to the lenders in relation to the proposed financing.

3.3 Creation and maintenance of major maintenance reserve for the Target Toll Assets, if any and for creation and maintenance of debt service reserve account, if any

The Trust, either directly or through NSPPL may utilise a portion of the Net Proceeds for creation and maintenance of major maintenance reserve for the Target Toll Assets, if any and for creation and maintenance of debt service reserve account, if any. Further, NSPPL may also utilise the proceeds for initial improvement cost of the Target Toll Assets and major maintenance cost of the Target Toll Assets, if any.

3.2. *General Corporate Purposes*

3.2.1. In terms of the InvIT Regulations, the Investment Manager shall, at its discretion, deploy the balance Net Proceeds aggregating to ₹ [●] million towards general expenses for the operation of the Trust, subject to such utilization not exceeding 10% of the Gross Proceeds, in compliance with the InvIT Regulations. The general corporate purposes for which the Trust proposes to utilize Net Proceeds include meeting exigencies, creation and maintenance of debt service reserve and expenses incurred by the Trust in the ordinary course of business. In addition, the Trust may utilize the Net Proceeds towards other expenditure (in the ordinary course of business) considered expedient and as approved by the Investment Manager or the Trustee, as the case may be, subject to compliance with applicable law.

3.3. Issue Expenses

The total expenses of this Issue are estimated to be approximately ₹ [●] million. The Issue expenses consist of fee and commissions payable to the Lead Managers, fee payable to legal counsels, fee payable to Escrow Bank and Registrar to the Issue, printing and stationery expenses, and all other incidental and miscellaneous expenses for listing the Units on the Stock Exchanges. In accordance with the InvIT Regulations, the Investment Manager, at its discretion, may deploy any unutilized proceeds from the Issue expenses, if any, towards the objects as stated hereinabove. In case of any shortfall in meeting Issue Expenses, the same shall be met from distributions received by the Trust and/ or other sources available to the Trust. Further, in case of any surplus left over after usage towards these objectives, surplus would be utilized for General Corporate Purposes.

3.4. Miscellaneous

In case of a shortfall in Net Proceeds, the Investment Manager may, in compliance with the InvIT Regulations, have the flexibility to meet such shortfall including, by utilising the Trust's internal accruals or availing facilities from lenders. The Investment Manager will have flexibility in utilizing the proceeds earmarked for general purposes. The Investment Manager, in accordance with the investment objectives of the Trust, policies of its board of directors and the InvIT Regulations, will have flexibility in utilising any surplus amounts.

FINANCIAL INDEBTEDNESS AND DEFERRED PAYMENTS

As of December 31, 2024, except as stated below, the Trust or the Project SPVs does not have any outstanding or sanctioned fund-based facilities.

The details of indebtedness of Trust (on consolidated basis) as at December 31, 2024 and the post- Issue principal amount outstanding, are provided below:

Category of borrowing	Principal Amount outstanding as on December 31, 2024 (in Rs million)	Post- Issue Principal Amount outstanding (in Rs million)[#]
Trust		
Particulars		
Non-convertible debentures[*]	14,868.02	[●]
Indian rupee loan from banks[**]	106,256.31	[●]
Total Borrowings	121,124.33	[●]

**While the non-convertible debentures was issued for Rs. 15,000.00 million, the amount has been adjusted as per Ind AS. Further, on January 30, 2025, the Trust has raised ₹ 9,999.93 million through zero coupon bond and utilised the same for partial repayment of Trust loan 1.*

***The concession fee for the Target Toll Roads shall be paid through a combination of the proceeds of the Issue and debt financing to be obtained by the Trust and/or the NSPPL. The Trust proposes to avail debt financing with certain lenders for availing loans amounting to approximately of upto ₹ 1,05,000 million ("**Trust Loan 4**") and has obtained letters from certain lenders in relation to the same. The terms and conditions of such debt financing remain subject to the finalisation of definitive documents.*

[#]The post Issue details are not available as of date of this Preliminary Placement Document.

Additionally, the concession fee for the Target Toll Roads shall be paid through a combination of the proceeds of the Issue and debt financing to be obtained by the Trust and/or the NSPPL. The Trust proposes to avail debt financing with certain lenders for availing loans amounting to approximately ₹ 1,05,000 million ("**Trust Loan 4**") and has obtained letters from certain lenders in relation to the same. The terms and conditions of such debt financing remain subject to the finalisation of definitive documents.

Status of lender consents

The Trust has availed debt from certain third-party lenders and consents from the respective lenders are required in connection with the Issue. As on the date of this Preliminary Placement Document, the Project SPVs have obtained the required consents from such lenders for the purposes of this Issue. For further details, please see the section titled *"Risk Factors"* on page 43.

Borrowings of the Trust

The Trust has entered into a loan agreement dated September 29, 2021, with certain lenders for availing loans amounting to approximately ₹ 20,000.00 million ("**Trust Loan 1**"). The principal terms of the Trust Loans availed by the Trust are as follows:

Parameter	Description
Borrower	National Highways Infra Trust (Trust)
Sponsor	National Highways Authority of India
Project Manager	National Highways Invit Project Managers Private Limited
Investment Manager	National Highways Infra Investment Managers Private Limited
Project SPV	NWPPL
Lenders	State Bank of India, Axis Bank Limited and Bank of Maharashtra
Facility Agent	State Bank of India
Security Trustee	SBICAP Trustee Company Limited
Obligors	(a) the Trust; (b) the Project SPV; and (c) any other person who provides any Security or guarantee or any other contractual comfort in terms of the Finance Documents.
Facilities	Collectively, Facility A, Facility B and the Working Capital Facilities, for an aggregate principal amount not exceeding INR 200,00,000,000 (Two hundred million only)

Parameter	Description
Facility A	Rupee facility for an aggregate principal amount not exceeding INR 1480,00,00,000 (Indian Rupees One Thousand Four Hundred and Eighty Crores only) to be availed by the Trust from the Lenders.
Facility B	Rupee facility for an aggregate principal amount not exceeding INR 520,00,00,000 (Indian Rupees Five Hundred and Twenty Crores only) to be availed by the Trust from Axis Bank Limited and Bank of Maharashtra with the Working Capital Facilities, as its sub-limits.
Working Capital Facilities	Collectively, the BG Facility and the LC Facility.
LC/BG Facility	the letter of credit/ bank guarantee facility aggregating up to INR 20,00,00,000 (Indian Rupees Twenty Crores only) being extended as a sub-limit of Facility B.
Facility Agreement	The facility agreement dated September 29, 2021 executed between the Trust, the Facility Agent and the Lenders with respect to the Facilities.
Facility Agreement Date	29.09.2021 and 29.10.2021
Maturity Date	Earlier of (i) the date falling 19 years 6 months from the first drawdown date; and (ii) March 31, 2041.
Repayment	In 78 (seventy eight) structured quarterly installments
Project(s)	Following projects housed by the Project SPV: (a) Maharashtra – Karnataka Border to Belgaum section of the National Highway no. 48 (old National Highway no. 4) from 515.00 kms to 592.705 kms (total 77.705 kms) in the state of Karnataka; (b) Palanpur – Abu Road section of the National Highway no. 27 from 601.000 kms to 646.000 kms (total 45.000 kms) in the states of Gujarat/Rajasthan; (c) Abu Road – Swaroopganj section of the National Highway no. 27 from 646.000 kms to 676.000 (total 31.000 kms) in the state of Rajasthan; (d) Chittorgarh – Kota and Chittorgarh Bypass section of the National Highway no. 27 from 891.929 kms to 1052.429 kms (total 160.500 kms) in the state of Rajasthan; and (e) Kothakota Bypass – Kurnool section of the National Highway no. 44 from 135.469 kms to 211.000 kms (total 74.622 kms) in the state of Telangana.
Lenders' Consultants	The Lenders shall have the right to appoint lender traffic Consultants (if any), Lender independent engineer, the lender insurance advisors, lender environment consultants and lender legal counsel, and any other consultants as may be required by the Lenders during the currency of the Facilities. Any costs and expenses, fees and other moneys that are payable in relation to such appointment will be required to be borne by the Trust
Escrow Bank for the Project SPV	State Bank of India
Escrow Bank for the Trust	State Bank of India
Trust Escrow Account	Account(s) maintained with the Trust Escrow Bank where all amounts received from the Project SPV shall be deposited.
Purpose	The Facilities shall be utilized by the Trust in the following manner: (a) Facility A shall be utilised by the Trust for on lending to the Project SPV. (b) Facility B shall be utilised by the Trust for the following purposes: (i) towards initial capital expenditure incurred by the Trust; (ii) towards providing loans and advances to the Project SPV; (iii) towards funding the major maintenance reserve and for on lending to the Project SPV which the Project SPV shall utilise towards any expenses that it may incur other expenses that may be incurred by the Project SPV; (iv) towards funding the DSRA required to be maintained by the Trust in terms of the Facility Agreement; and

Parameter	Description
	(v) towards meeting the transaction-related expenses. (c) BG Facility being provided by the Working Capital Facility Lender shall be utilised by the Trust towards any performance bank guarantee. (d) LC Facility being provided by the Working Capital Facility Lender shall be utilised by the Trust towards any letter of credit requirements for purchase of equipment (such as toll equipment) for the purpose of the Projects and any other requirements as per the Concession Agreements.
Interest	Effective rate of interest of of 7.90% - 8.65%p.a. linked to the MCLR/External Benchmarks of respective Lenders plus spread, with monthly rests
Security	The obligations of the Trust under the Facilities, all interest and other monies in respect thereof shall be secured on a pari-passu basis, amongst the Lenders participating in the Facilities, by a first ranking security interest including, but not limited to following: a) a first ranking pari passu charges over the Trust's immovable assets (if any), both present and future; b) a first ranking pari passu charge over: (i) all tangible movable assets of the Trust, including moveable plant and machinery, machinery spares, tools and accessories, furniture, fixtures, vehicles, all other movable assets, inventories, securities, equipment, book debts, operating cash flows, scheduled and unscheduled receivables and revenues, commissions, revenues of whatsoever nature and wherever arising both present and future; (ii) all receivables of the Trust, both present and future; (iii) the intellectual property rights of the Trust, both present and future; (iv) all rights, titles, interests, benefits, claims and demands, whatsoever of the Trust in any real estate and leasehold rights held by the Trust, both present and future; (v) all rights, title, interest, benefits, claims and demands whatsoever of the Trust under all insurance contracts and insurance proceeds, both present and future; (vi) all rights, titles, interests, benefits, claims and demands, whatsoever of the Trust in respect of the escrow account and all subaccounts thereunder, and all other assets, and securities which represent amounts lying in or to be credited in such accounts / sub-accounts and any amounts lying therein; (vii) all rights, titles, interest, benefits, claims and demands, whatsoever of the Trust against the Project SPV and/or the Projects including in all facilities to be granted by the Trust to the Project SPV (including the interest and principal repayments) and the rights of substitution and termination available to the Trust in relation to the Projects; and c) a first ranking pari passu charge over the equity shares held by the Trust in the Project SPV, subject to compliance of Sections 19(2) and (3) of the Banking Regulations Act, 1949.
Undertakings from the Trust	The Trust is required to undertake, inter alia, the following: a) save and except for any sale or disposal of any assets of the Project SPV as permitted under the Finance Documents, the Trust shall neither sell, assign, mortgage or otherwise dispose of any of the assets of the Trust without the prior approval from the Lenders; b) the Trust shall create and perfect (if required) the Security Interest over the Security in accordance with the timelines stipulated under the Facility Agreement; c) the Trust shall not effect any change in the shareholding and exercise direct control over the Project SPV; d) the Trust shall not create any Security Interest (save and except for any permitted security interest) over its assets nor provide any guarantee without the prior written approval of the Lenders. Provided that the Trust may provide guarantees for securing any financial indebtedness availed by any new project SPV that it may acquire in compliance with the terms of the Finance Documents, without any recourse to the cash flows of the Trust and/or the Project SPV, the secured assets, the Project SPV secured assets and the Projects; e) the Trust shall ensure that its cash flows (including all receivables) shall be exclusively deposited in the Trust escrow account in accordance with the terms of the Trust escrow agreement and the Trust shall ensure that the cash flows of Project SPV shall be deposited in the Project SPV escrow account(s) in accordance with the terms of the escrow agreements; f) it shall ensure that the Project SPV shall not abandon the Projects during the subsistence of the Facilities; g) upon any default by the Project SPV leading to a termination or substitution in relation to any or all of the Projects as per the provisions of the relevant Concession Agreement(s), the Trust in its capacity as the representative (as defined in the respective Concession Agreement) shall act on the instructions of the Lenders or any trustee or agent acting for and on behalf of the

Parameter	Description
	Lenders) for exercising rights of termination or substitution as available to it as a lender of the Project SPV, in accordance with the Project SPV Financing Agreements, subject to the terms of the respective Concession Agreement; h) for undertaking any withdrawals from the Trust Escrow Account, the Trust shall comply with the waterfall mechanism as set out in the Trust escrow agreement; i) except as may be provided in the terms of the Finance Documents, no Person has any security interest over the assets and/or the cash flows of the Project SPV other than the Trust or its agent, trustee or nominee under the Project SPV Facility Agreements; j) unless otherwise expressly permitted by the Facility Agent in writing, the Trust shall not make any restricted payments at any time, unless each of the restricted payment conditions (as set out in the Finance Documents) are complied with to the satisfaction of the Facility Agent and in the manner set out in the Finance Documents; k) the debt cap shall not be more than 49% (forty nine percent); l) the Trust shall comply with the provisions of the InvIT Regulations in accordance with the timelines stipulated thereunder. m) the Trust shall not undertake a change of the Project Manager, the Investment Manager, the Trustee and/or the Sponsor without the prior written approval of the Lenders; n) the Trust per the scope of services approved by the Lenders. All costs and expenses will be borne by the Trust; o) the Trust shall and shall ensure that the Obligors comply with their obligations under the Finance Documents; p) the Trust shall not exercise any right to call an event of default in relation to the Project SPV Facilities extended by it; q) the Trust shall not file and/or initiate any recovery suit, insolvency proceeding, liquidation proceeding, resolution process or any other similar process under the IBC or any other Law, against itself, until the Final Settlement Date; r) the Trust shall immediately (unless otherwise provided under the Facility Agreement) provide the Lenders such information, certification and data as may be required by the Lenders or any agency appointed by the Lenders; s) the Trust shall not make any modifications/alterations to the Trust Documents which are inconsistent with the terms of the Finance Documents and may adversely affect the rights of the Lenders; t) save and except as set out in the Base Case Business Plan, the Trust shall not and shall ensure that the Project SPV does not undertake any expansion of any of the Projects without the prion approval of the Lenders; u) the Trust shall open and maintain the DSRA with the Trust Escrow Bank in accordance with the Finance Documents; v) the Trust shall not undertake any acquisition of any new project and/or new project SPV, if such proposed acquisition is not in compliance with the acquisition conditions set out in the Finance Documents. Further, any permitted indebtedness required to be incurred for undertaking any such acquisition shall be in compliance with the conditions set out in the Finance Documents; w) the Trust shall ensure that no person whose name appears in the list of wilful defaulters (in accordance with the extant guidelines issued by the RBI or any credit information companies) shall be inducted on the governing board of the Trust, and if such a person is found on the governing board, the Trust shall take expeditious and effective steps for removal of the person from its governing board. Notwithstanding anything contained herein, Clause 7.6(y) shall not apply to any nominee director appointed by the Lenders in accordance with the terms of the Finance Documents; x) upon the occurrence of default under the Project SPV Facility Agreements, such that the said default results in an event of default, the Trust agrees that the Lenders shall have the right to instruct the Trust to enforce the Security Interest (if any) created pursuant to such Project SPV Facility Agreements and the Trust agrees to act in accordance with the instructions given by the Lenders in this regard;

Parameter	Description
	y) the Trust shall ensure that any financial obligation of the Trust associated with the Project which is payable in foreign currency in any form at present or in future shall at all times be fully hedged; z) the Trust shall ensure that the Project SPV secured assets shall be held exclusively for the benefit of the Lenders and it shall not enforce the security interest created over the Project SPV secured assets, unless expressly requested by the Lenders and any enforcement proceeds received in relation thereto shall be held by the Trust in trust for the benefit of the Lenders; and aa) the Trust shall ensure, among other things that: (A) the Sponsor shall continue to act as the sponsor as per Regulation 2(zz) of the InvIT Regulations and that there shall be no change in the Sponsor, without the prior approval of the Lenders; (B) the Sponsor shall continue to hold at least 51% (fifty one percent) of the shareholding in the Investment Manager; (C) the Sponsor and the Project SPV do not abandon the Projects; (D) any liability (including in relation to any group contribution) of the Trust and/or the Project SPV towards the Sponsor or any other Unit Holders shall be subordinated to the Facilities; and (E) the Project SPV shall enter into requisite EPC Contracts, operations and maintenance agreements and major maintenance agreements as required pursuant to the Concession Agreements.
Undertakings from the Project SPV	The Project SPV is required to undertake, inter alia, the following: (a) To open the Escrow Account with the Project SPV account bank prior to the first Drawdown Date; (b) To not incur any financial indebtedness (without the prior approval of the Lenders) except the indebtedness permitted under the Finance Documents and any bank guarantee facilities to be issued in favour of a telecom authority or as performance security in favour of the Sponsor, and any letter(s) of credit to be issued for the purchase of any toll equipment; (c) To ensure that the Project SPV Escrow Bank transfers the amounts from the Project SPV escrow account(s) to the Trust on the terms set out in the Finance Documents. (d) To ensure that the prior approval of the Lenders is procured before undertaking any amendment to the Project Documents, which results in (A) a material amendment or material modification to the Project Documents; (B) non-compliance with the Base Case Business Plan; (C) affects the ability of the Obligors to perform their obligations and/or or enforce any right, benefit, privilege or remedy under the Finance Documents and / or Project Documents, to which they are a party; or (D) affects the ability of any Secured Party to exercise its rights or enforce any remedies available to it under any of the Finance Documents; (e) The Project SPV Facility Agreements entered into between the Trust and the Project SPVs shall have a definite repayment schedule. (f) Upon the occurrence of any default by the Project SPV leading to a termination or substitution in relation to any or all of the Projects as per the provisions of the relevant Concession Agreement(s), the Trust in its d in the respective Concession Agreement)) shall act on the instructions of the Lenders or any trustee or agent acting for and on behalf of the Lenders) for exercising rights of termination or substitution as available to it as a lender of the Project SPV, in accordance with the financing documents executed by, inter alios, the Project SPV; (g) The amount of Project SPV Facilities lent by the Trust to the Project Agreements) shall be higher than the Secured Obligations payable by the Trust in relation to the Facilities; and (h) The Project SPV escrow agreements to be executed by all parties (except NHAI) prior to the first Drawdown Date of Facility A. The Project SPV shall ensure that the Substitution Agreements are executed within 90 (ninety) days from the first Drawdown Date of Facility A. Further, the Project SPV shall ensure that NHAI shall execute the Escrow Agreements within 90 (ninety) days from the first drawdown date of Facility A.
Base Case Business Plan	The consolidated business plan of the Trust (including the cash flows from the Project SPV) setting out, inter alia the Project SPV, updated from time to time in accordance with the Facility Agreement,

Parameter	Description
	which shall be in line with the requirements under the Project Documents and mutually agreed between the Trust and the Facility Agent.
Project Documents	collectively, the following documents: (a) the concession agreements of the Project SPV; (b) the substitution agreements executed between the Project SPV, the Sponsor and the Trust; (c) the escrow agreements executed between the Project SPV, the Sponsor and the Project SPV Escrow Bank; (d) all the insurance contracts of the Project SPV in relation to the respective Projects; (e) documents of title in relation to the Projects, if any; (f) engineering, procurement and construction contracts in relation to the Projects; (g) all authorisations in relation to the Projects; (h) operation and maintenance agreements and major maintenance agreements for routine as well as periodic maintenance, if any; (i) any bonds, guarantees, letters of credit or any other security issued in relation to any of the Project Documents set out in points (a)-(h) above; (j) any other agreements, documents or instruments entered into by the Project SPV or by any person in its favour in respect of the Projects and Facility Agent and the Trust.
Trust Documents	collectively, the following: a) the trust deed dated October 19, 2020 executed between the Sponsor and IDBI Trusteeship Services Limited (**Trustee**) as amended and modified from time to time (**Trust Deed**) b) the investment management agreement dated October 21, 2020 executed between, inter alios, the Trustee and the Investment Manager, as amended and modified from time to time; c) the project implementation agreement dated March 30, 2021 entered into by the Trustee (on behalf of the Trust), the Investment Manager and the Project Manager, with the Project SPV, which sets out the obligations of the Project Manager with respect to operation, maintenance, implementation and management of the Project SPV, as may be amended, modified and/or supplemented from time to time; and d) such other documents as may be required to be executed by the Trust from time to time and mutually designated as such by the Lenders and the Trust.
Finance Documents	collectively, the following: (a) the Facility Agreement; (b) the Security trustee agreement for appointment of the Security Trustee; (c) the Security documents in relation to the Security mentioned in the Security clause of this term sheet; (d) agreement for assignment; (e) the escrow agreement to be executed by the Trust (f) the Trust confirmation to the inter-creditor agreement of the lenders if any. (g) the undertaking from Investment Manager; (h) the undertaking from the Project SPV; (i) the negative lien undertaking from the Project SPV; (j) any assignment/novation deed; (k) the WC Product Schedule; and

Parameter	Description
	(l) any other document Facility Agreement and/or mutually designated as such by the Facility Agent and the Trust.
Transaction Documents	collectively, the Project Documents, the Trust Documents and the Finance Documents
Voluntary Prepayment	a) The Trust shall be entitled to prepay the outstandings with respect to the Facilities, in full or in part, at any time during the term of the Facilities, subject to prior written notice of at least 30 (Thirty) days being provided to the Lenders. Prepayment premium at the rate of 0.5% (zero point five percent) shall be payable on such voluntary prepayment. b) If the increase in the spread in accordance with the terms of the Facility Agreement is not acceptable to the Trust, the Trust shall be entitled to prepay the outstanding Facilities without any prepayment premium provided the Trust has issued an irrevocable notice (within 30 (thirty days from the date on which the Spread was increased) to prepay the loan within 180 (One Hundred and Eighty) days commencing from the date on which the spread was increased. c) No prepayment premium will be payable if prepayment is made out of the cash accruals of the Project SPV, provided the Trust has issued an irrevocable notice (of at least 15 (fifteen) days prior to the date of such prepayment) to prepay the loans. d) The Trust may prepay the outstandings in full or in part, without being required to pay any prepayment premium, if the same is being made at the instance of the Lenders. e) The Trust may prepay the outstandings in full or in part, without being required to pay any prepayment premium, if the same is being made from any internal accruals of the Trust or from the funds of the Unit Holders, provided the Trust has issued an irrevocable notice (of at least 30 (thirty) days from the date of such prepayment) to prepay the loans. f) If any Lender does not consent to the sharing of the Security with the lenders of any Permitted Indebtedness (except for the Facilities) that may be availed by the Borrower in compliance with the terms of this Agreement and the Permitted Indebtedness Conditions, then the Borrower may prepay the Loans of such Lender in full, without being required to pay any Prepayment Premium provided the Borrower has issued an irrevocable notice (of at least 30 (thirty) days prior to the date of such prepayment) to prepay such Loans. Any amounts prepaid in the manner above (other than pursuant to (b) and (c) above shall be paid to all the Lenders on a pro rata basis, except that if any particular Lender entitled to a prepayment specifically notifies the Trust waiving such right of prepayment ("**Waiving Lender**"), then the Trust shall not be required to make any prepayment to such Lender and the Trust will be required to prepay only such amounts to the other Lenders, which would have been payable to them had the Waiving Lender not waived its right of prepayment otherwise provided under the terms of this Agreement. Any amounts pursuant to above shall be paid to the relevant Lenders shall be applied in inverse order of maturity.
Mandatory Prepayment	The Trust shall be required to mandatorily prepay the outstanding Facilities (in full or part, as the context may require), without being required to pay any prepayment premium , immediately upon receipt of the following amounts received by and on behalf of the Project SPV, and/or the Trust, and in any case no later than within 15 (fifteen) days from the occurrence of the events set out below, including in accordance with the Trust escrow agreement: (a) any insurance proceeds received by the Project SPV pursuant to the insurance contracts, and if such insurance proceeds are of an amount which is in excess of INR 1,00,00,000 (Indian Rupees One Crore only) (and as certified by an independent practicing chartered accountant) and which are not utilized towards the repair, renovation, restoration or reinstatement of the affected Project assets; (b) any proceeds from the disposal of any assets of the Project SPV (such disposal being subject to the terms of the Finance Documents or upon the Trust obtaining the prior written consent from the Lenders), if such proceeds, whether in aggregate in the Financial Year or individually, are in an amount which is in excess of INR 1,00,00,000 (Indian Rupees One Crore only) and which are not utilized for replacement of such assets of the Project SPV pursuant to which they were received; (c) amounts in the nature of liquidated damages or penalties received by the Project SPV under any Project Documents after adjusting for the additional interest payable to the Lenders, liquidated damages required to be paid under any Project Documents to the extent that such amounts are not applied for meeting any performance rectification arising on account of non-performance by various contractors under the Project Documents;

Parameter	Description
	(d) the proceeds resulting from an arbitral award or judicial order in connection with any of the Project Documents and the Trust Documents; (e) any proceeds in connection with a breach of warranty or guarantee under any Project Document to the extent not applied to repair or defect that is the subject of such warranty; (f) any proceeds resulting from the expiration, termination or revocation of any authorisation under the Project Documents or from any termination payments received from the Sponsor under the Project Documents; (g) any proceeds from nationalisation, compulsory acquisition, expropriation, seizure or other similar events with respect to any part of the Projects or the Project assets, unless the Lenders approve that such proceeds shall be utilised towards the reinstatement of such part of the Projects. Any amounts prepaid in the manner above (other than pursuant to (i) above shall be paid to all the Lenders on a pro rata basis, except that if any particular Lender entitled to a prepayment specifically notifies the Trust waiving such right of prepayment ("**Waiving Lender**"),then the Trust shall not be required to make any prepayment to such Lender and the Trust will be required to prepay only such amounts to the other Lenders, which would have been payable to them had the Waiving Lender not waived its right of prepayment otherwise provided under the terms of this Agreement. Any amounts pursuant to above shall be applied in the inverse order of maturity
Restricted Payment	The following have been identified as restricted payments in the Facility Agreement: (a) the authorisation, declaration or payment of any distributions including dividends, interest, pass through income to a Unit Holder or any other form of cash flows on share capital, shareholder units, inter-corporate deposits, quasi equity availed from the Sponsor, Unit Holders, associate companies and/or any strategic investors; and (b) capital reduction, all of which may, in any event, be made on a quarterly basis on an RPC Compliance Date, in accordance with and subject to the provisions of the Facility Agreement and the Trust escrow agreement, as the case may be. Provided however that any payment in relation to the Project SPV Facilities, or payment of any fees payable to the Investment Manager and/or the Security Trustee shall be permitted and not fall within the definition of Restricted Payments. The above-mentioned restricted payments shall be permitted on a quarterly basis subject to compliance with certain restricted payment conditions which include the following: (a) the Trust has paid the interest and/or repayment instalments and/or other charges due and payable under the Finance Documents; (b) the Trust has demonstrated the availability of liquidity equivalent for major maintenance funding requirements for all Projects being operated by the Project SPV, either in the form of earmarked cash or availability on credit facilities for the said amounts as mandated in cash flow waterfall mechanism set out in the Project SPV escrow agreement; (c) all reserves, including the DSRA Amount and the major maintenance reserve (in accordance with the Base Case Business Plan) as required on the immediately succeeding due date, are maintained and replenished in accordance with the Finance Documents and the Trust escrow agreement, to the satisfaction of the Lenders; (d) no Event of Default has occurred and is continuing or will be caused due to the making of the relevant Restricted Payment. (e) no Material Adverse Effect in respect of the Project SPV has occurred or continuing or will be cause due to making of the relevant Restricted Payment; (f) no breach of Financial Covenants has occurred or is continuing or will be caused due to making of the relevant Restricted Payment; (g) the relevant Restricted Payment is permitted by Law; and (h) the cash sweep pursuant to the occurrence of any Cash Sweep Trigger Event has been completed in accordance with the Finance Documents prior to the payment of the relevant Restricted Payment.

Parameter	Description
	Any payment in relation to the Project SPV Facilities, or payment of any fees payable to the Investment Manager and/or the Security Trustee shall be permitted and not fall within the definition of Restricted Payments
Events of Default	The occurrence of, inter alia, any one of the following events shall constitute an event of default: (a) Any default by the Trust in the payment of the principal amounts on any due date, subject to a cure period of 3 days in case such default is due to a technical issue (b) Breach or default by the Obligors in the performance or observance of material terms and covenants of the Finance Documents, subject to a cure period of 30 days. (c) Occurrence of any material event or circumstance that is prejudicial to or materially imperils or materially depreciates or jeopardizes the Security created or to be created in favour of the Lenders, subject to a cure period of 30 days. (d) Any breach or default in the performance and/or observation of a financial covenant for 2 consecutive years. (e) Upon downgrade of rating below AA-, by any credit rating agency, where such downgrade if capable of being cured is not cured within a period of 180 (one hundred and eighty) days. (f) The Trust fails to obtain the final initial credit rating in relation to the Facilities and the proposed exposure within 6 months from the first drawdown date. (g) Any material misrepresentation, warranty or statement made by any Obligor in connection with any Finance Document to which it is party or in any other document delivered by or on behalf or if under or in connection with any Finance Document, is or proves to have been substantially incorrect, untrue or misleading when made or deemed to be made, subject to a cure period of 30 days. (h) Any execution or distress being enforced or levied against whole or substantial part of the Trust's assets and any order obtained in relation thereto is not discharged, vacated or stayed within 30 days from the date of such enforcement or levy. (i) Abandonment of material activities being carried out by the Project SPV or abandonment of the Projects which materially impacts the obligation of the Trust under the Finance Documents. (j) Change in material activities being carried out by the Project SPV or a seizure of, or a change in, the Projects which materially impact the obligation of the Trust under the Finance Documents. (k) Occurrence of any event or circumstance which has or is likely to have a Material Adverse Effect, subject to a cure period of 30 days.
Consequences of Event of Default	On and at any time after the occurrence of an Event of Default, the Lenders will be entitled to one or all of, including but not limited to, the following rights: (a) declare all or any part of the outstandings to be immediately due and payable; (b) cancel the commitments (in part or in full) and accelerate all or a part of the payment obligations of the Trust under the Facility Agreement; (c) exercise their right to reset the spread, in addition to the right available to reset the spread on the relevant reset date under the terms of the Facility Agreement; (d) sue for creditor's process and/or exercise all or any rights (including the right to substitute/terminate assigned in their favour or the rights available to secured creditors or their agents and trustees under the Securitisation Act) in accordance with the Finance Documents, including any enforcement of any Security towards repayment of the outstanding; (e) exercise any or all of its rights, remedies, powers or discretions under the Finance Documents, the inter-creditor agreement, Law or equity (including pursuant to any guidelines which may be stipulated by the RBI from time to time); (f) subject to laws (including the InvIT Regulations), convert the outstanding outstandings into Units of the Trust. The Trust shall facilitate the Lenders (including by way of obtaining the requisite consent of the unit holders); (g) appoint 1 (one) Nominee Director on the board of directors of the Project SPV (subject to Laws and the terms of the Concession Agreements) or appoint a nominee on the board of

Parameter	Description
	directors of the Trust (subject to Laws) to protect the interests of the Lenders, till the event of default is cured, on the terms and conditions as more particularly set out under the Facility Agreement. (h) instruct the Trust to enforce the security interest created over the Project SPV secured assets in case of any default in the Project SPV Facilities.
Conditions Subsequent	The Trust shall fulfil certain conditions including but not limited to the following: a) Execution of the share pledge agreement and the power of attorney in relation thereto within 90 (ninety) days from the first drawdown date. b) Execution of the corporate guarantee and the substitution agreements, within 90 (ninety) days from the first drawdown date. c) Execution of the escrow agreement by NHAI within 90 (ninety) days from the first drawdown date. d) To obtain the final initial credit rating within 30 (ninety) days from the first drawdown date. e) Provide a certified true copy of the no-objection certificate/permission of the assessing officer granted to the Trust under Section 281(1) of the Income Tax Act, 1961, immediately upon receipt thereof. f) Evidence of the major maintenance reserve having been created as per the Base Case Business Plan and the Finance Documents.
End Use Certificate	The Trust shall furnish an end use certificate from the statutory auditor to the Facility Agent confirming that the proceeds have been utilised solely in accordance with the Purpose, no later than 30 (thirty) days from the respective drawdown.
Unconditional Cancellability Clause	The Lenders will have the absolute and the unconditional right to cancel the undrawn, unavailed and the unused commitments under the Facilities, in whole or in part, at any time during the Availability Period, without giving any prior notice to the Trust, for any reason whatsoever, including but not limited to, on the occurrence of: (a) in case of deterioration in the creditworthiness of the loan accounts of the Trust in any manner whatsoever; (b) in case the Facilities are not utilized by the Trust (in part or in full) within the Availability Period; and (c) in case of any non-compliance of any terms and conditions of the Finance Documents.
Governing Law and Jurisdiction	The Finance Documents shall be governed by the laws of India. Courts of Delhi shall have exclusive jurisdiction.

Note: On February 26, 2025 IDBI Bank Limited has taken over the loan of Bank of Maharashtra through assignment and Novation agreement.

Additionally, the Trust has issued secured, rated, listed, redeemable non-convertible debentures aggregating to an amount of upto Rs. 15,000 million ("**NCDs**"). The Debenture Trust Deed was signed on October 21, 2022 and amended on October 30, 2024.

The principal terms of the NCDs issued by the Trust are as follows:

Parameter	Description
Security Name	7.90% NHIT STRPP A, 7.90% NHIT STRPP B, 7.90% NHIT STRPP C
Issuer	National Highways Infra Trust
Debenture Trustee	SBICAP Trustee Company Limited
Registrar to the Issue	KFin Technologies Limited.
Type and nature of instrument	Secured, Rated, Listed, Redeemable, Non-Convertible Debentures
Mode of Issue	Public Issue

Parameter	Description
Issue	Public issue by the Issuer of secured, rated, listed, redeemable non-convertible debentures of face value of Rs. 1,000/- each, (comprising of 3 (three) separately transferrable and redeemable principal parts (**"STRPP"**) namely 1 STRPP A of face value of Rs.300/- , 1 STRPP B of face value of Rs. 300/- and 1 STRPP C of face value of Rs. 400/-, for an amount aggregating to Rs. 15,000 million **("Total Issue Size")**
Total Issue Size	Up to Rs. 15,000 million.
In multiples of	Rs. 1,000 (1 NCD comprising of 1 STRPP A, 1 STRPP B, 1 STRPP C) thereafter.
Stock Exchange/s proposed for listing of the NCDs	BSE Limited and National Stock Exchange of India Limited.
Security	The principal amount of the NCDs to be issued in terms of this Prospectus together with all interest/coupon due on the NCDs, subject to any obligations under applicable statutory and/or regulatory requirements shall be secured by: (a) a first ranking pari passu security interest over the issuer's immovable assets (if any), both present and future. The Issuer does not own any immoveable property at the present time. In the event, the Issuer acquires any immovable property in future, the Issuer shall mortgage said property within 180 (one hundred eighty) days from the date of acquisition of such immovable assets. The Debenture Trustee shall be authorised to do all acts, deeds, and enter into necessary documents, agreement, amendments and/or modifications, as may be required to give effect the same, including carrying out the due diligence as may be required by Debenture Trustee; (b) a first ranking pari passu Security Interest over the Hypothecated Assets (including Receivables), both present and future; and (c) Negative Lien Undertaking; (d) a first ranking pari passu Security Interest over the Pledged Securities, subject to compliance with the terms of the Share Pledge Agreement. The security interest/ security documents stipulated above shall be collectively referred to as the **"security"** **Security Creation Timelines** (a) The Security shall be created prior to making the listing application for the NCDs with the Stock Exchange(s). (b) Unless otherwise agreed to by the Debenture Trustee, in the event the above stipulated Security is not created and/or perfected within the timelines as mentioned above or any extended timeline as may be approved by the Debenture Trustee in writing, (i) the NCDs shall carry additional interest, over and above the Coupon Rate, at the rate of 2.0% (two percent) per annum, if any, on the NCDs, computed from the date falling after the expiry of the time period provided above, till creation and perfection of the relevant Security and/or till the execution of the relevant Security Documents. **Ranking** The Security created or to be created to secure the NCDs shall be first ranking pari passu security interest inter se the Existing Lenders, the Debenture Trustee (acting on behalf of the NCD Holders) and the Additional Lenders. The Issuer is permitted to provide and/or share any Security with the Additional Lenders for the purpose of securing the Additional Debt, provided that the availing of the Additional Debt is in the compliance with the Additional Debt Conditions and a 15 (fifteen) written intimation is provided to the Debenture Trustee. The Issuer shall maintain a minimum 100% security cover on the outstanding principal of the NCDs plus accrued interest/coupon thereon, at all the times.
Coupon, Interest rate, Interest payment date, Interest type and redemption premium/discount	STRPP A of an NCD 7.90% p.a. payable semi-annually STRPP B of an NCD 7.90% p.a. payable semi-annually STRPP C of an NCD 7.90% p.a. payable semi-annually
Tenor	STRPP A of an NCD 13 years

Parameter	Description
	STRPP B of an NCD 18 years STRPP C of an NCD 25 years
Default Coupon Rate	The Issuer shall pay interest, over and above the agreed coupon rate, in connection with any delay in allotment, refunds, dematerialized credit, payment of interest, redemption of principal amount beyond the time limits prescribed under applicable statutory and/or regulatory requirements, at such rates as stipulated/ prescribed under Applicable Law. The Issuer shall pay up to 2% per annum to the NCD holders, over and above the agreed coupon rate, till the execution of the debenture trust deed if the Issuer fails to execute the debenture trust deed within such period as prescribed under Applicable Law.
Maturity Date	(i) the 13th anniversary of the Deemed Date of Allotment for STRPP A, (ii) the 18th anniversary of the Deemed Date of Allotment for STRPP B and (iii) the 25th anniversary of the Deemed Date of Allotment for STRPP C.

Further, the Trust has entered into a loan agreement dated October 18, 2023 with Axis Bank for availing loans amounting to approximately Rs. 8,770.00 million ("**Trust Loan 2**").

The principal terms of the Trust Loan 2 availed by the Trust are as follows:

Parameter	Description
Borrower	National Highways Infra Trust (Trust)
Sponsor	National Highways Authority of India
Project Manager	National Highways Invit Project Managers Private Limited
Investment Manager	National Highways Infra Investment Managers Private Limited
Project SPV	NWPPL
Lender/Facility Lender	Axis Bank Limited
Security Trustee	SBICAP Trustee Company Limited
Obligors	Means each of the following, and the term "Obligors" shall be construed accordingly: - (a) the Borrower ; (b) the Project SPV; and (c) any other person who provides any Security or guarantee or any other contractual comfort in terms of the Finance Documents (other than the Secured Parties).
Facilities	Collectively, the Rupee Facility and the Working Capital facilities, for an aggregate principal amount not exceeding INR 877,00,00,000 (Indian Rupees Eight Hundred Seventy-Seven Crores only).
Working Capital Facilities	The non-fund based facilities aggregating up to Rs. 20,00,00, 000'- (Rupees Twenty Crores only) in the form of LC Facility or BG Facility
LC/BG Facility	the letter of credit/ bank guarantee facility aggregating up to INR 20,00,00,000 (Indian Rupees Twenty crores only) being extended as a sub-limit of Facility.
Facility Agreement	The facility agreement dated October 18, 2023, executed between the Trust and the Lender with respect to the Facilities.
Facility Agreement Date	October 18, 2023
Maturity Date	Earlier of (i) the date falling at the expiry of 20 years from the first drawdown date under the facilities; and (ii) March 31, 2042.
Amortization Schedule	The Structured Amortization Schedule is as below:- Repayment Start – Qtr 1 i.e. Dec 31, 2023 Repayment End – Qtr 74 i.e. March 31, 2042

Parameter	Description
	Amortization:- 18.5 years
Project(s)	Following projects housed by the Project SPV: (a) Borkhedi to Kelapur section of the National Highway no. 44 from 36.60 kms to 175 kms (total 139.40 kms) in the state of Maharashtra; (b) Entire Agra bypass, i.e., the National Highway no. 19 for a total stretch of 32.80 kms in the state of Uttar Pradesh; and (c) Shivpuri to Jhansi section of the National Highway no. 27 from 1.305.08 kms to 1380.38 kms (total 75.30 kms) in the state of Madhya Pradesh.
Purpose	The Facilities shall be utilised by the Borrower only for the following purposes: (a) for on lending to the Project SPV, who shall utilise the same towards the initial capital expenditure of the Projects: (b) funding MMRA, DSRA of the Borrower and other expenses of the Project SPV; (c) meeting transaction expenses, if any; (d) issuance of fresh/ replacement of existing performance bank guarantee as per regulatory requirements and issuance of LC/LC sublimit for equipment purchase like toll equipment, advance payments io contractors, etc of Project SPV and Borrower, (e) Initial capital expenditure for existing concession agreements and future concession agreements to be executed for future acquisitions; and (f) refinancing of high-cost debt availed by the Borrower.
Interest	Repo Rate + 1.50% (presently 8% per annum) payable at monthly intervals. The benchmark REPO would be as prevalent on the date of the 1st disbursement. The interest rate reset under REPO may be done once in three months or as decided by the bank, whichever is earlier, as per Bank's extant guidelines in force.
Security	In consideration of the Lenders making available the Facilities to the Borrower and to secure the due discharge by the Borrower of all the Secured Obligations in relation to the Facilities under the Finance Documents, the Borrower agrees that the following Security Interests shall be created and perfected (if required under Law) in favour the Security Trustee: a) a first ranking pari passu Security Interest over the Borrower's immovable assets (if any), both present and future; b) a first ranking pari passu Security Interest over the Hypothecated Properties, both present and future; and c) a first ranking pari passu Security Interest over the Pledged Securities, subject to compliance with the terms of the Share Pledge Agreement.
Project Documents	collectively, the following documents: (a) the concession agreements; (b) the substitution agreements; (c) the escrow agreements; (d) all the insurance contracts of the Project SPV in relation to the respective Projects; (e) documents of title in relation to the Projects, if any; (f) engineering, procurement and construction contracts in relation to the Projects; (g) all authorizations in relation to the Projects; (h) operation and maintenance agreements and major maintenance agreements for routine as well as periodic maintenance, if any;

Parameter	Description
	(i) any bonds, guarantees, letters of credit or any other security issued in relation to any of the Project Documents set out in points (a)-(h) above; (j) any other agreements, documents or instruments entered into by the Project SPV or by any person in its favour in respect of the Projects and mutually designated as Project Documents by the Lenders and the Borrower and each such Project Document as amended from time to time.
Trust Documents	collectively, the following: (a). the trust deed dated October 19, 2020 executed between the Sponsor and IDBI Trusteeship Services Limited (**Trustee**) as amended and modified from time to time (**Trust Deed**) (b). the investment management agreement dated October 21, 2020 executed between, inter alios, the Trustee and the Investment Manager, as amended and modified from time to time; (c). the project implementation and Management agreement; and (d). such other documents as may be required to be executed by the Trust from time to time and mutually designated as such by the Lenders and the Trust.
Finance Documents	Collectively, the following: (a). the Facility Agreement; (b). the Security trustee agreement; (c). the Security documents; (d). the InvIT Escrow Account Agreement (e). the Trust confirmation to the inter-creditor agreement of the lenders if any. (f). the Project SPV Undertaking; (g). each Assignment / Novation Deed; (h). the Negative Lien Undertaking; (i). the Agreement for Assignment; (j). the Deed of Assignment (k). the Product Schedule; (l). the Sanction Letter; and (m). any other document mutually designated as such by the Lenders and the Borrower.
Transaction Documents	Collectively, means the Finance Documents, the Trust Documents and the Project Documents.
Events of Default	The occurrence of, inter alia, any one of the following events shall constitute an event of default: (a) **Non-Payment** - Any default by the Trust in the payment of the principal amount of any Loan, Interest or the Additional Interest on any due date. Provided if the payment defaults mentioned above, by the Borrower are due to technical issues and the Borrower is able to cure the said payment defaults within a period 3 (three) days from the date of such payment default then it shall not amount to an Event of Default. (b) **No Breach of Finance Documents** - The Obligors are in breach or default in the performance or observance of material terms and covenants of the Finance Documents (other than those expressly specified as an event of default under this Clause 10 (Events of Default) or elsewhere in the Finance Documents), to which they are a party, and where such breach or default if capable of being remedied has not been remedied within a period of 30 (thirty) days from the occurrence of such default and/or breach. (c) **Security** - The occurrence of any material event or circumstance that is prejudicial to or materially imperils or materially depreciates or jeopardizes the Security created or to be created in favour of the Lenders and if such event if capable of being remedied is not remedied within 30 (thirty) days from lite occurrence of such event.

Parameter	Description
	(d) **Financial Covenants** - Any breach or default in the performance and/or observation of a Financial Covenant as specified in Clause 9.2 (Financial Covenants) for 2 (two) consecutive Financial Years. (e) **Credit Rating** – - Any downgrade in the Borrower's credit rating to below AA- by any Credit Rating Agency, where such downgrade if capable of being cured is not cured within a period of 240 (two hundred and forty) days. - The Borrower fails to obtain the Final Initial Credit Rating in relation to the Facilities and the proposed exposure within 6 (six) months from the first Drawdown Date. (f) **Misrepresentation** - Any material representation, warranty or statement made by any Obligor in connection with any Finance Document to which it is a party, or in any other document delivered by or on behalf of it under or in connection with any Finance Document, is or proves to have been substantially incorrect, untrue or misleading when made or deemed to be made, and where any non -deliberate misrepresentation or statement if capable of being remedied has not been remedied within 30 (thirty) days of such misrepresentation/statement being made. (g) **Judgment, creditor's process** - Any execution or distress being enforced or levied against whole or substantial part of the Borrower's assets and any order obtained in relation thereto is not discharged, vacated or stayed within 30 (thirty) days from the date of such enforcement or levy. (h) **Cessation of Business** – - Abandonment of any material activities being carried out by the Project SPV, or an Abandonment of the Projects which materially impact the obligation of the Borrower under the Finance Documents. - Change in the material activities being carried out by the Project SPV or a seizure of, or a change in, the Projects which materially impact the obligation of the Borrower under the Finance Documents. (i) **Material adverse Effect** - Notwithstanding any other event in Clause 10.1 (Event of Default), the Lenders determine the occurrence of any event or circumstance which has or is likely to have a Material Adverse Effect and if such Material Adverse Effect if capable of being remedied is not remedied within a period of 30 (thirty) days from the date of such determination. (j) **Cross Default** – - Any default by the Borrower, under any finance document (except for the Finance Documents) entered into by the Borrower in relation any Financial Indebtedness availed by the Borrower from Lender, and where such event if capable of being remedied is not remedied within a period of 30 (thirty) days from the date of occurrence of such event. - The occurrence of an event of default or otherwise described as an event of default of any associate, Subsidiary, and/or sister concern, of the Borrower (including a default in the payment cither of principal, or interest or any other money due or payable on any of its Financial Indebtedness (whether by scheduled maturity, required prepayment, acceleration, demand or otherwise}) under any loan agreement entered into by the associate. Subsidiary, and/or sister concern, of the Borrower with any of the Lenders in relation to any of their Financial Indebtedness, and where such event if capable of being remedied is not remedied within a period of 30 (thirty') days from the date of occurrence of such event. - The occurrence of an event of default or otherwise described as an event of default of any associate, Subsidiary, and/or sister concern, of the Borrower (including a default in die payment cither of principal, or interest or any other money due or payable on any of its Financial Indebtedness (whether by scheduled maturity, required prepayment, acceleration, demand or otherwise)) under any loan agreement entered into by the associate, Subsidiary, and/or sister concern, of the Borrower with any of the bank and/or financial institution (other than the Lenders) in relation to any of their Financial Indebtedness, and where such event if capable of being remedied is not remedied within a period of 30 (thirty) days from the date of occurrence of such event.
Consequences of Event of Default	On and at any time alter the occurrence of an Event of Default which has not been waived by the Secured Parties or is not cured within the cure period provided herein, the Lenders may severally exercise one or all of the following rights:

Parameter	Description
	(a) declare all or any part of the Secured Obligations to be immediately due and payable; (b) cancel the commitments (in part or in full) and accelerate all or a part of the payment obligations of the Trust under the Facility Agreement; (c) exercise their right to reset the spread, in addition to the right available to reset the spread on the relevant reset date under the terms of the Facility Agreement; (d) sue for creditor's process and/or exercise all or any rights (including the right to substitute/terminate assigned in their favour or the rights available to secured creditors or their agents and trustees under the Securitization Act) in accordance with the Finance Documents, including any enforcement of any Security towards repayment of the Secured Obligations; e) exercise any or all of its rights, remedies, powers or discretions under the Finance Documents, the inter-creditor agreement, Law or equity (including pursuant to any guidelines which may be stipulated by the RBI from time to time); (f) subject to laws (including the InvIT Regulations), convert the outstanding outstandings into Units of the Trust. The Trust shall facilitate the Lenders (including by way of obtaining the requisite consent of the unit holders) in the conversion of the outstanding secured obligation into its units; (g) after the provisioning for Taxes and other governmental levies, the Lenders shall have the first ranking pari passu right to appropriate the profits of the Borrower towards the repayment of the Secured Obligations; (h) take all such actions as may be provided in the Restructuring Circulars. The Borrower shall, if required and subject to mutual discussions between the Borrower and the Lenders, execute necessary agreement with the Lenders for giving effect to the terms and conditions subject to which the debt restructuring may be considered by the Lenders. A restructuring undertaken by the Lenders may include inter alia alteration of the terms of the Facilities, including modification in relation to the repayment period/repayable amount/the amount of instalments/rate of interest/rollover of credit facilities/sanction of additional credit facilities/enhancement of existing credit limits and compromise settlements where lime for payment of settlement amount exceed 3 (three) months; (i) instruct the Borrower to appoint 1 (one) Nominee Director on the board of directors of the Project SPV (subject to Laws and the terms of the Concession Agreements) or appoint a nominee on the board of directors of the Borrower (if any and subject to Laws) to protect the interests of the Lenders, till the Event of Default is cured; and; (j) instruct the Borrower to enforce the Security Interest created over the Project SPV Secured Assets; (k) instruct the Borrower to demand payment/repayment from the Project SPV of all outstanding amounts which are accrued or due by the Project SPV under the InvIT to SPV Loan Documents. Upon a failure by the Project SPV to make such payment/repayment under an InvIT to SPV Loan Agreement within 15 (fifteen) days from the occurrence of an Event of Default, the Lenders shall have the right to instruct the Borrower to immediately accelerate such InvIT to SPV Loan in respect of which the Project SPV has failed to make such payment/repayment (i.e. to declare that all outstanding amounts under the InvIT to SPV loan are immediately due and payable) and the Borrower shall immediately comply with such instructions. If the Project SPV fails to immediately make payments of all amounts demanded by the Borrower pursuant to such acceleration, then it shall result in an event of default (howsoever described) under the relevant InvIT to SPV Loan Document and the Borrower (acting on the instructions of the Lenders) shall immediately declare a financial Default (as defined under the Concession Agreement) in respect of the InvIT to SPV Loans and the Borrower (acting on the instructions of the Lenders) shall initiate necessary actions Lu terminate the relevant Concession Agreement(s), and immediately take all other relevant actions (and exercise all rights that it has as a lender under the InvIT to SPV loan Documents including the rights of substitution as per the terms of the Substitution Agreement) as instructed by the Lender in that regard thereafter;
End Use Certificate	(a) The Borrower unconditionally agrees, undertakes and acknowledges that the Borrower shall utilise the Facilities exclusively for the purpose mentioned in Clause 2.2 (Purpose) of this Agreement. Any deviation in the utilisation of the Facilities by the Borrower, in accordance with the relevant purpose for which a said Facility is lent, will be dealt with in accordance with the Master Circular- Loans and Advances Statutory and Other Restrictions issued by die RBI dated 1 July 2015, as may be amended, replaced or supplemented from time to time and the provisions of the Finance Documents. (b) The Borrower shall furnish an end use certificate from the statutory auditor, 10 the Lenders confirming that the proceeds of each Loan have been utilised solely in accordance with Clause

Parameter	Description
	2,2 (Purpose) of this Agreement, no later than 180 (one hundred eighty) days from the respective Drawdown.
Increased Costs	The Borrower will pay the Lenders, within 15 (fifteen) days of a demand made by the Lenders, unless required to be paid immediately by the Laws, any increased costs arising due to the implementation or imposition of any new reserve requirements or other measures by Government Agencies, including any change in capital adequacy norms, save and except for any change which is not otherwise factored in the revised Applicable Interest Rate, revised pursuant to agreement.
Governing Law and Jurisdiction	The Finance Documents shall be governed by the laws of India. Courts of Delhi shall have exclusive jurisdiction.

Further, the Trust has entered into a loan agreement dated March 22, 2024 with with State Bank of India, NabFID, Punjab National Bank, IDBI Bank Limited and Axis Bank Limited for availing loans amounting to approximately Rs. 90,000 million ("**Trust Loan 3**").

The principal terms of the Trust Loan 3 availed by the Trust are as follows:

Parameter	Description
Borrower	National Highways Infra Trust (Trust)
Sponsor	National Highways Authority of India
Project Manager	National Highways Invit Project Managers Private Limited
Investment Manager	National Highways Infra Investment Managers Private Limited
Project SPV	NEPPL
Lender/Facility Lender	State Bank of India, NabFID, Punjab National Bank, IDBI Bank Limited and Axis Bank Limited
Security Trustee	SBI Caps Security Trustee Limited
Obligors	Means each of the following, and the term "Obligors" shall be construed accordingly: - (a) the Borrower ; (b) the Project SPV; and (c) any other person who provides any Security or guarantee or any other contractual comfort in terms of the Finance Documents (other than the Secured Parties).
Facilities	Collectively, the Rupee Facility and the Working Capital facilities, for an aggregate principal amount not exceeding INR 9,000,000,0000 (Indian Rupees Nine Thousand Crores only).
Working Capital Facilities	The non-fund based facilities aggregating up to Rs. 30,00,00,000 - (Rupees Thirty Crores only) in the form of LC Facility or BG Facility as a sub-limit of the capex loan
LC/BG Facility	the letter of credit/ bank guarantee facility aggregating up to 90% of the capex loan (As a sub-limit) provided by the rupee lenders
Facility Agreement	The facility agreement dated March 22, 2024, executed between the Trust and the Lender with respect to the Facilities.
Facility Agreement Date	March 22, 2024
Maturity Date	March 31, 2042
Amortization Schedule	Quarterly Repayment starting from June 30, 2024 (FY 2025) Repayment Ends on March 31, 2042 (FY 2042)
Project(s)	Tolling, Operations and Maintenance of below National Highway stretches: Rewa-Katni-Jabalpur-Lakhnadon section in the state of Madhya Pradesh Mohgaon – Khawasa in the State of Madhya Pradesh

Parameter	Description
	Chichra-Kharagpur Stretch in the state of West Bengal Orai-Barah in the state of Uttar Pradesh Assam Package – 2 Toll Plazas in the state of Assam Galia in the State of Assam Haveri-Hebbalu-Chitradurga in the State of Karnataka
Purpose	The Facilities shall be utilised by the Borrower only for the following purposes: (a) for on lending to the Project SPV, who shall utilise the same towards the initial capital expenditure of the Projects: (b) funding MMRA, DSRA of the Borrower and other expenses of the Project SPV; (c) meeting transaction expenses, if any; (d) issuance of fresh/ replacement of existing performance bank guarantee as per regulatory requirements and issuance of LC/LC sublimit for equipment purchase like toll equipment, advance payments io contractors, etc of Project SPV and Borrower, (e) Initial capital expenditure for existing concession agreements and future concession agreements to be executed for future acquisitions; and (f) refinancing of high-cost debt availed by the Borrower.
Interest	Linked to Repo Rate + spread (Effective RoI of 8% per annum) payable at monthly intervals.
Security	In consideration of the Lenders making available the Facilities to the Borrower and to secure the due discharge by the Borrower of all the Secured Obligations in relation to the Facilities under the Finance Documents, the Borrower agrees that the following Security Interests shall be created and perfected (if required under Law) in favour the Security Trustee: d) a first ranking pari passu Security Interest over the Borrower's immovable assets (if any), both present and future; e) a first ranking pari passu Security Interest over the Hypothecated Properties, both present and future; and a first ranking pari passu Security Interest over the Pledged Securities, subject to compliance with the terms of the Share Pledge Agreement.
Project Documents	collectively, the following documents: (a) the concession agreements; (b) the substitution agreements; (c) the escrow agreements; (d) all the insurance contracts of the Project SPV in relation to the respective Projects; (e) documents of title in relation to the Projects, if any; (f) engineering, procurement and construction contracts in relation to the Projects; (g) all authorizations in relation to the Projects; (h) operation and maintenance agreements and major maintenance agreements for routine as well as periodic maintenance, if any; (i) any bonds, guarantees, letters of credit or any other security issued in relation to any of the Project Documents set out in points (a)-(h) above;

Parameter	Description
	(j) any other agreements, documents or instruments entered into by the Project SPV or by any person in its favour in respect of the Projects and mutually designated as Project Documents by the Lenders and the Borrower and each such Project Document as amended from time to time
Trust Documents	collectively, the following: (e). the trust deed dated October 19, 2020 executed between the Sponsor and IDBI Trusteeship Services Limited (**Trustee**) as amended and modified from time to time (**Trust Deed**) (f). the investment management agreement dated October 21, 2020 executed between, inter alios, the Trustee and the Investment Manager, as amended and modified from time to time; (g). the project implementation and Management agreement; and such other documents as may be required to be executed by the Trust from time to time and mutually designated as such by the Lenders and the Trust.
Finance Documents	Collectively, the following: (n). the Facility Agreement; (o). the Security trustee agreement; (p). the Security documents; (q). the InvIT Escrow Account Agreement (r). the Trust confirmation to the inter-creditor agreement of the lenders if any. (s). the Project SPV Undertaking; (t). each Assignment / Novation Deed; (u). the Negative Lien Undertaking; (v). the Agreement for Assignment; (w). the Deed of Assignment (x). the Product Schedule; (y). the Sanction Letter; and any other document mutually designated as such by the Lenders and the Borrower.
Transaction Documents	Collectively, means the Finance Documents, the Trust Documents and the Project Documents.
Events of Default	The occurrence of, inter alia, any one of the following events shall constitute an event of default: (k) **Non-Payment** - Any default by the Trust in the payment of the principal amount of any Loan, Interest or the Additional Interest on any due date. Provided if the payment defaults mentioned above, by the Borrower are due to technical issues and the Borrower is able to cure the said payment defaults within a period 3 (three) days from the date of such payment default then it shall not amount to an Event of Default. (l) **No Breach of Finance Documents** - The Obligors are in breach or default in the performance or observance of material terms and covenants of the Finance Documents (other than those expressly specified as an event of default under this Clause 10 (Events of Default) or elsewhere in the Finance Documents), to which they are a party, and where such breach or default if capable of being remedied has not been remedied within a period of 30 (thirty) days from the occurrence of such default and/or breach. (m) **Security** - The occurrence of any material event or circumstance that is prejudicial to or materially imperils or materially depreciates or jeopardizes the Security created or to be created in favour of the Lenders and if such event if capable of being remedied is not remedied within 30 (thirty) days from lite occurrence of such event. (n) **Financial Covenants** - Any breach or default in the performance and/or observation of a Financial Covenant as specified in Clause 9.2 (Financial Covenants) for 2 (two) consecutive Financial Years.

Parameter	Description
	(o) **Credit Rating** – - Any downgrade in the Borrower's credit rating to below AA- by any Credit Rating Agency, where such downgrade if capable of being cured is not cured within a period of 240 (two hundred and forty) days. - The Borrower fails to obtain the Final Initial Credit Rating in relation to the Facilities and the proposed exposure within 6 (six) months from the first Drawdown Date. (p) **Misrepresentation** - Any material representation, warranty or statement made by any Obligor in connection with any Finance Document to which it is a party, or in any other document delivered by or on behalf of it under or in connection with any Finance Document, is or proves to have been substantially incorrect, untrue or misleading when made or deemed to be made, and where any non -deliberate misrepresentation or statement if capable of being remedied has not been remedied within 30 (thirty) days of such misrepresentation/statement being made. (q) **Judgment, creditor's process** - Any execution or distress being enforced or levied against whole or substantial part of the Borrower's assets and any order obtained in relation thereto is not discharged, vacated or stayed within 30 (thirty) days from the date of such enforcement or levy. (r) **Cessation of Business** – - Abandonment of any material activities being carried out by the Project SPV, or an Abandonment of the Projects which materially impact the obligation of the Borrower under the Finance Documents. - Change in the material activities being carried out by the Project SPV or a seizure of, or a change in, the Projects which materially impact the obligation of the Borrower under the Finance Documents. (s) **Material adverse Effect** - Notwithstanding any other event in Clause 10.1 (Event of Default), the Lenders determine the occurrence of any event or circumstance which has or is likely to have a Material Adverse Effect and if such Material Adverse Effect if capable of being remedied is not remedied within a period of 30 (thirty) days from the date of such determination. (t) **Cross Default** – - Any default by the Borrower, under any finance document (except for the Finance Documents) entered into by the Borrower in relation any Financial Indebtedness availed by the Borrower from Lender, and where such event if capable of being remedied is not remedied within a period of 30 (thirty) days from the date of occurrence of such event. - The occurrence of an event of default or otherwise described as an event of default of any associate, Subsidiary, and/or sister concern, of the Borrower (including a default in the payment cither of principal, or interest or any other money due or payable on any of its Financial Indebtedness (whether by scheduled maturity, required prepayment, acceleration, demand or otherwise}) under any loan agreement entered into by the associate. Subsidiary, and/or sister concern, of the Borrower with any of the Lenders in relation to any of their Financial Indebtedness, and where such event if capable of being remedied is not remedied within a period of 30 (thirty') days from the date of occurrence of such event. The occurrence of an event of default or otherwise described as an event of default of any associate, Subsidiary, and/or sister concern, of the Borrower (including a default in die payment cither of principal, or interest or any other money due or payable on any of its Financial Indebtedness (whether by scheduled maturity, required prepayment, acceleration, demand or otherwise)) under any loan agreement entered into by the associate, Subsidiary, and/or sister concern, of the Borrower with any of the bank and/or financial institution (other than the Lenders) in relation to any of their Financial Indebtedness, and where such event if capable of being remedied is not remedied within a period of 30 (thirty) days from the date of occurrence of such event.
Consequences of Event of Default	On and at any time alter the occurrence of an Event of Default which has not been waived by the Secured Parties or is not cured within the cure period provided herein, the Lenders may severally exercise one or all of the following rights: (a) declare all or any part of the Secured Obligations to be immediately due and payable; (b) cancel the commitments (in part or in full) and accelerate all or a part of the payment obligations of the Trust under the Facility Agreement;

Parameter	Description
	(c) exercise their right to reset the spread, in addition to the right available to reset the spread on the relevant reset date under the terms of the Facility Agreement; (d) sue for creditor's process and/or exercise all or any rights (including the right to substitute/terminate assigned in their favour or the rights available to secured creditors or their agents and trustees under the Securitization Act) in accordance with the Finance Documents, including any enforcement of any Security towards repayment of the Secured Obligations; e) exercise any or all of its rights, remedies, powers or discretions under the Finance Documents, the inter-creditor agreement, Law or equity (including pursuant to any guidelines which may be stipulated by the RBI from time to time); (f) subject to laws (including the InvIT Regulations), convert the outstanding outstandings into Units of the Trust. The Trust shall facilitate the Lenders (including by way of obtaining the requisite consent of the unit holders) in the conversion of the outstanding secured obligation into its units; (g) after the provisioning for Taxes and other governmental levies, the Lenders shall have the first ranking pari passu right to appropriate the profits of the Borrower towards the repayment of the Secured Obligations; (h) take all such actions as may be provided in the Restructuring Circulars. The Borrower shall, if required and subject to mutual discussions between the Borrower and the Lenders, execute necessary agreement with the Lenders for giving effect to the terms and conditions subject to which the debt restructuring may be considered by the Lenders. A restructuring undertaken by the Lenders may include inter alia alteration of the terms of the Facilities, including modification in relation to the repayment period/repayable amount/the amount of instalments/rate of interest/rollover of credit facilities/sanction of additional credit facilities/enhancement of existing credit limits and compromise settlements where lime for payment of settlement amount exceed 3 (three) months; (i) instruct the Borrower to appoint 1 (one) Nominee Director on the board of directors of the Project SPV (subject to Laws and the terms of the Concession Agreements) or appoint a nominee on the board of directors of the Borrower (if any and subject to Laws) to protect the interests of the Lenders, till the Event of Default is cured; and; (j) instruct the Borrower to enforce the Security Interest created over the Project SPV Secured Assets; (k) instruct the Borrower to demand payment/repayment from the Project SPV of all outstanding amounts which are accrued or due by the Project SPV under the InvIT to SPV Loan Documents. Upon a failure by the Project SPV to make such payment/repayment under an InvIT to SPV Loan Agreement within 15 (fifteen) days from the occurrence of an Event of Default, the Lenders shall have the right to instruct the Borrower to immediately accelerate such InvIT to SPV Loan in respect of which the Project SPV has failed to make such payment/repayment (i.e. to declare that all outstanding amounts under the InvIT to SPV loan are immediately due and payable) and the Borrower shall immediately comply with such instructions. If the Project SPV fails to immediately make payments of all amounts demanded by the Borrower pursuant to such acceleration, then it shall result in an event of default (howsoever described) under the relevant InvIT to SPV Loan Document and the Borrower (acting on the instructions of the Lenders) shall immediately declare a financial Default (as defined under the Concession Agreement) in respect of the InvIT to SPV Loans and the Borrower (acting on the instructions of the Lenders) shall initiate necessary actions Lu terminate the relevant Concession Agreement(s), and immediately take all other relevant actions (and exercise all rights that it has as a lender under the InvIT to SPV loan Documents including the rights of substitution as per the terms of the Substitution Agreement) as instructed by the Lender in that regard thereafter;
End Use Certificate	(c) The Borrower unconditionally agrees, undertakes and acknowledges that the Borrower shall utilise the Facilities exclusively for the purpose mentioned in Clause 2.2 (Purpose) of this Agreement. Any deviation in the utilisation of the Facilities by the Borrower, in accordance with the relevant purpose for which a said Facility is lent, will be dealt with in accordance with the Master Circular- Loans and Advances Statutory and Other Restrictions issued by die RBI dated 1 July 2015, as may be amended, replaced or supplemented from time to time and the provisions of the Finance Documents. The Borrower shall furnish an end use certificate from the statutory auditor, the Lenders confirming that the proceeds of each Loan have been utilised solely in accordance with Clause 2,2 (Purpose) of this Agreement, no later than 180 (one hundred eighty) days from the respective Drawdown.
Increased Costs	The Borrower will pay the Lenders, within 15 (fifteen) days of a demand made by the Lenders, unless required to be paid immediately by the Laws, any increased costs arising due to the implementation or imposition of any new reserve requirements or other measures by Government

Parameter	Description
	Agencies, including any change in capital adequacy norms, save and except for any change which is not otherwise factored in the revised Applicable Interest Rate, revised pursuant to agreement.
Governing Law and Jurisdiction	The Finance Documents shall be governed by the laws of India. Courts of Delhi shall have exclusive jurisdiction.

Additionally, the Trust has issued secured, rated, listed, redeemable non-convertible debentures aggregating to an amount of upto Rs. 9,999.90 million ("**NCDs**"). The Debenture Trust Deed was signed on January 30, 2025. The funds raised through this NCD was utilized to reduce the first round of debt raised from State Bank of India, Axis Bank Limited and Bank of Maharashtra i.e. **"Trust Loan 1".**

The principal terms of the NCDs issued by the Trust are as follows:

Parameter	Description
Security Name	0% NHIT STRPP A 2034 0% NHIT STRPP B 2035
Issuer	National Highways Infra Trust
Debenture Trustee	SBICAP Trustee Company Limited
Registrar to the Issue	KFin Technologies Limited.
Type and nature of instrument	Secured, Rated, Listed, Redeemable, Non-cumulative, Taxable, Non-Convertible debentures
Mode of Issue	Private Issue
Issue	Private Placement of Secured, rated, listed, redeemable non-convertible debentures of face value of ₹ 200,000/- each, (comprising of 2 (two) separately transferable and redeemable principal parts ("STRPP") namely 1 STRPP A 2034 of face value of ₹ 100,000/- each, 1 STRPP B 2035 of face value of ₹ 100,000/- each), for an amount of up to ₹20,500,000,000 (face value) including green shoe option such that the total issue size comprising of Series1 Debentures and Series II Debentures does not exceed Rs. 25,000,000,000 (face value)
Total Issue Size	Aggregate Issue Size not exceeding Rs. 25,000,000,000 (face value) comprising of base issue size for Series 1 Debentures of Rs. 14,000,000,000 (face value) with a green shoe option of Rs. 6,500,000,000 (face value) and base issue size for Series 2 Debentures of Rs. 7,000,000,000 (face value) with a green shoe option of Rs. 3,700,000,000 (face value).
In multiples of	1 (one) NCD of face value of Rs. 2,00,000/- each comprising 1 STRPP A 2034 of face value Rs. 1,00,000/- each and 1 STRPP B 2035 of face value Rs. 1,00,000/- each and multiples of 1 NCD thereafter
Stock Exchange/s proposed for listing of the NCDs	BSE Limited and National Stock Exchange of India Limited.
Security	The Secured Obligations, subject to any obligations under applicable statutory and/or regulatory requirements shall be secured by: (a) a first ranking *pari* passu Security Interest over the Issuer's immovable assets (if any), both present and future. The Issuer does not own any immoveable property at the present time. In the event, the Issuer acquires any immovable property in future, the Issuer shall mortgage said property within 180 (one hundred eighty) days from the date of acquisition of such immovable assets. The Debenture Trustee shall be authorised to do all acts, deeds, and enter into necessary documents, agreement, amendments and/or modifications, as may be required to give effect the same, including carrying out the due diligence as may be required by Debenture Trustee; (b) a first ranking *pari passu* Security Interest over the Hypothecated Assets (including Receivables), both present and future, including DSRA; and (c) Negative Lien Undertaking to be executed as a Conditions Subsequent within 45 (forty-five) days from the Pay-In Date ("**Negative Lien Undertaking**"); (d) a first ranking *pari passu* Security Interest by way of pledge over the pledged securities[3] and shares of entities that may be acquired by the Issuer, in the future, which pledge shall be created within 45 days of such acquisition.

[3] "**Pledged Securities**" mean the 100% (one hundred percent) of the equity shares of the Project SPV as held by the Borrower and 100% (one hundred percent) of the bonds, non-convertible debentures issued by the Project SPV, from time to time, and held by the Borrower.

Parameter	Description
	The security interest/ security documents stipulated above shall be collectively referred to as the "**Security**". **Security Creation Timelines** (a) The Security shall be created prior to making the listing application for the NCDs with the Stock Exchange(s). (b) Unless otherwise agreed to by the Debenture Trustee, in the event the above stipulated Security is not created and/or perfected within the timelines as mentioned above or any extended timeline as may be approved by the Debenture Trustee in writing, the NCDs shall carry additional interest, at the rate of 2.0% (two percent) per annum, if any, on the NCDs, computed from the date falling after the expiry of the time period provided above, till creation and perfection of the relevant Security and/or till the execution of the relevant Security Documents. **Ranking** The Security created or to be created to secure the NCDs shall be first ranking *pari passu* security interest *inter se* the existing lenders, the Debenture Trustee (acting on behalf of the Debenture Holders) and the additional lenders by way of pledge over shares of Project SPV 1, Project SPV 2 and entities that may be acquired by the Issuer, in the future, which pledge shall be created within 45 days of such acquisition. The Issuer is permitted to provide and/or share any Security with the additional lenders for the purpose of securing the Additional Debt, provided that the availing of the Additional Debt is in compliance with the Additional Debt conditions and a 15 (fifteen) calendar days' prior written intimation is provided to the Debenture Trustee.
Coupon, Interest rate, Interest payment date, Interest type and redemption premium/discount	Zero Coupon The NCDs will be redeemed at par i.e. face value. The redemption amount is as follows: 1 STRPP A 2034 – Rs. 1,00,000/- 1 STRPP B 2035 – Rs. 1,00,000/-
Tenor	STRPP A 2034 - 9 years from the Deemed Date of Allotment STRPP B 2035 - 10 years from the Deemed Date of Allotment
Default Coupon Rate	Zero Coupon
Maturity Date	STRPP A 2034 – 30th January 2034 STRPP B 2035 – 30th January 2035

MANAGEMENT'S DISCUSSION AND ANALYSIS OF FACTORS BY THE DIRECTORS OF THE INVESTMENT MANAGER AFFECTING THE FINANCIAL CONDITION, RESULTS OF OPERATIONS AND CASH FLOWS

Due to the nature of the Project SPVs and the Target Toll Roads, there is limited financial information available in respect of us which can be presented in this Preliminary Placement Document. The following discussion of our financial condition and results of operations should be read in conjunction with our audited consolidated financial information as on March 31, 2022, audited consolidated financial information as on March 31, 2023, audited consolidated financial information as on March 31, 2024 and audited interim financial statements of the Trust for the six months period ended September 30, 2024, prepared in accordance with Ind AS, enclosed as Annexure A. No separate financial information, including actual revenue data for the Target Toll Roads, are currently available, which could be used to clearly assess financial information, including revenue and expenses, in respect of each of the Target Toll Roads. Accordingly, in lieu of financial statements of the Trust, the Target Toll Roads and/or Project SPVs, the revenue data that NHAI has historically collected through toll collection and maintenance contracts has been included in the section entitled "Asset Revenue Information" on page 469.

Furthermore, this limited historical revenue data available in respect of the Target Toll Roads may not reflect their operation in the future and are not indicative of our expected future financial condition, results of operations or cash flows. Investors are cautioned that the lack of financial information in this Preliminary Placement Document may make it difficult to assess our financial position or future prospects or results of operations.

The following discussion is intended to convey management's perspective on our expected financial condition and results of operations.

This discussion contains forward-looking statements and reflects our current views with respect to future events and financial performance that involve risks and uncertainties. Actual results may differ materially from those discussed in or implied by any of the forward-looking statements as a result of various factors, including those listed under "Risk Factors" and "Forward- Looking Statements".

Overview

We are a registered infrastructure investment trust under the InvIT Regulations. We currently have a right to toll, operate and maintain a portfolio of fifteen Existing Toll Roads (*defined below*) in the Indian states of Gujarat, Rajasthan, Telangana, Karnataka, Maharashtra, Uttar Pradesh, Madhya Pradesh, Assam, and West Bengal and intend to toll, operate and maintain a portfolio of eleven Target Toll Roads (*defined below*) in the Indian states of Andhra Pradesh, Gujarat, Uttar Pradesh, Uttarakhand and Chhattisgarh under the Toll Operate Transfer ("**TOT**") model conceived by NHAI. These Toll Roads (*defined below*) are operated and maintained pursuant to concessions granted by the NHAI. The Existing Toll Roads comprise fifteen stretches spanning a total length of approximately 1523.70 kms and the Target Toll Roads comprise eleven stretches spanning a total length of approximately 818.83 kms.

Our Sponsor is NHAI, an autonomous authority of the GoI under the MoRTH constituted on June 15, 1989 by NHAI Act. NHAI was operationalised in February 1995 with the appointment of a full-time Chairman and other members of the board. The functioning of NHAI is governed by the NHAI Act and the rules, and regulations framed thereunder.

The Project SPVs have entered into 26 independent Concession Agreements with the NHAI for concessions of each of the Toll Roads. We have satisfied all conditions precedent and commenced our concessions on December 16, 2021 for R1 Toll Roads, October 29, 2022 for R2 Toll Roads and on April 01, 2024 for R3 Toll Roads in accordance with the terms of the Initial Concession Agreements for the Existing Toll Roads and expect to satisfy all conditions precedent and commence our concessions for the Target Toll Roads in accordance with the terms of the R4 Concession Agreements for the Target Toll Roads. For further details, please see the section entitled "*Summary of the Concession Agreements*", "*Management's Discussion and Analysis of Factors by the Directors of the Investment Manager Affecting the Financial Condition, Results of Operations and Cash Flows*" and "*Use of Proceeds*" on pages 293, 380 and 354, respectively.

The Concession Agreements provide the Project SPVs the right to collect tolls for a period of 20 years or 30 years (as applicable under the relevant Concession Agreement) from users of each Toll Road, with certain overlay activities and the construction work which may include any other improvement work, such as construction, renovation, refurbishing, augmentation, upgradation, etc., of any road, structure, etc., in respect of certain of the Toll Roads (the "**Initial Improvement Works**") to be completed by the Project SPVs within 12 to 18 months from the Appointed Date (as defined in the section entitled "*Summary of the Concession Agreements*"). Responsibility for the supervision of the operations and maintenance of the Toll Roads also vests with us. In return, the Project SPVs is required to pay the concession fee to the NHAI prior to the commencement of the concession, as set out in the respective Concession Agreements. For further information on the provisions of the Concession Agreements, see "*Summary of the Concession Agreements" on page* 293.

NWPPL and NEPPL has a right to toll, operate and maintain the following toll road assets (the "**Existing Toll Roads**").

- Palanpur/Khemana Abu Road Project ("**Asset 1**"): Abu Road section of NH 27 with a total length of 45.00 kms, connecting the states of Gujarat and Rajasthan;

- Abu Road – Swaroopganj Project ("**Asset 2**"): Swaroopganj section of NH 27 with a total length of 31.00 kms, in

the state of Rajasthan;

- Maharashtra/ Karnataka Border (Kagal) – Belgaum Project ("**Asset 3**"): Belgaum – Kagal section of NH 48 with a total length of 77.7 kms, connecting the states of Karnataka and Maharashtra;

- Chittorgarh – Kota & Chittorgarh Bypass Project ("**Asset 4**"): Chittorgarh – Kota section of NH 27 with a total length of 160.5 kms, in the state of Rajasthan;

- Kothakota Bypass – Kurnool Project ("**Asset 5**"): Kothakota bypass – Kurnool section of NH 44 with a total length of 74.6 kms, connecting the states of Telangana to Andhra Pradesh;

- Agra Bypass Project ("**Asset 6**"): Agra Bypass section with a total length of 32.80 kms, connecting NH19 (old NH2) to NH44 (old NH7) in Uttar Pradesh;

- Borkhedi - Kelapur Project ("**Asset 7**"): Borkhedi-Kelapur-Maharashtra/Telangana border section of NH44 (old NH7) with a total length of 138.15 kms, in the state of Maharashtra;

- Shivpuri – Jhansi Project ("**Asset 8**"): Jhansi-Shivpuri section of NH 27 with a total length of 75.30 kms, connecting the districts of Jhansi in the state of Uttar Pradesh and Shivpuri in the state of Madhya Pradesh;

- Chichra - Kharagpur Project ("**Asset 9**"): Chichra - Kharagpur section of NH 49 with a total length of 56.12 kms, in the state of West Bengal;

- Rewa –Lakhnadon Project ("**Asset 10**"): Rewa – Katni – Jabalpur – Lakhnadon section of NH 30 and NH 34 with a total length of 306.34 kms, in the state of Madhya Pradesh;

- Kachugaon - Kaljhar Project ("**Asset 11**"): Kachugaon - Rakhaldubi Bus Junction – Kaljhar section of NH 27 with a total length of 114.17 kms, in the state of Assam;

- Kaljhar – Patacharkuchi Project ("**Asset 12**"): Kaljhar – Patacharkuchi section of NH 27 with a total length of 27.30 kms, in the state of Assam;

- Lakhnadon – Mahagaon (Mohgaon) – Khawasa ("**Asset 13**"): Lakhnadon – Mahagaon (Mohgaon) – Khawasa section of NH 44 with a total length of 107.35 kms, in the state of Madhya Pradesh;

- Orai – Barah Project ("**Asset 14**"): Orai – Barah section of NH 27 with a total length of 62.90 kms, in the state of Uttar Pradesh; and

- Chitradurga Bypass – Hubli Project/ Karnataka Project ("**Asset 15**"): Chitradurga Bypass - Chitradurga - Davanagere - Haveri – Hubli section of NH 48 with a total length of 214.47 kms, in the state of Karnataka.

From the Appointed Date, NSPPL will have the right to toll, operate and maintain the following toll road assets (the "**Target Toll Roads**"):

- Narasannapeta to Ranasthalam Project ("**Asset 16")** Narasannapeta to Ranasthalam section of NH-16 with a total length of Km 53.799 in the state of Andhra Pradesh;

- Ranasthalam to Hanumanthavaka Project ("**Asset 17**") Ranasthalam to Anandapuram section of NH 16 and Four lane with paved shoulders from Anandapuram to Hanumanthavaka (Visakhapatnam) Section of NH 16 with a total length of Km 66.544 in the State of Andhra Pradesh;

- Anandapuram – Pendurthi – Anakapalle Project ("**Asset 18**") Anandapuram-Pendurthi-Anakapalle of NH-16 with a total length of 48.605Km in the state of Andhra Pradesh;

- Gundugolanu-Devarapalli-Kovvuru Project ("**Asset 19**") Gundugolanu-Devarapalli-Kovvuru section of NH-16 with a total length of KM 69.884 in the state of Andhra Pradesh;

- Chittoor to Mallavaram Project ("**Asset 20**") six Lane with paved shoulder from Chittoor to Mallavaram section of NH-140 with a total length of 61.128Km in the state of Andhra Pradesh;

- TN/AP – Border to Nalagampalli to AP/Karnataka Border Project ("**Asset 21**") TN/AP – Border to Nalagampalli to AP/Karnataka Border Section of NH 4 with a total length of 84.797Km in the State of Andhra Pradesh;

- Bareilly – Sitapur Project ("**Asset 22**") Bareilly - Sitapur Section of NH-30 (Old NH-24) with a total length of 157.590 Km in the State of Uttar Pradesh;

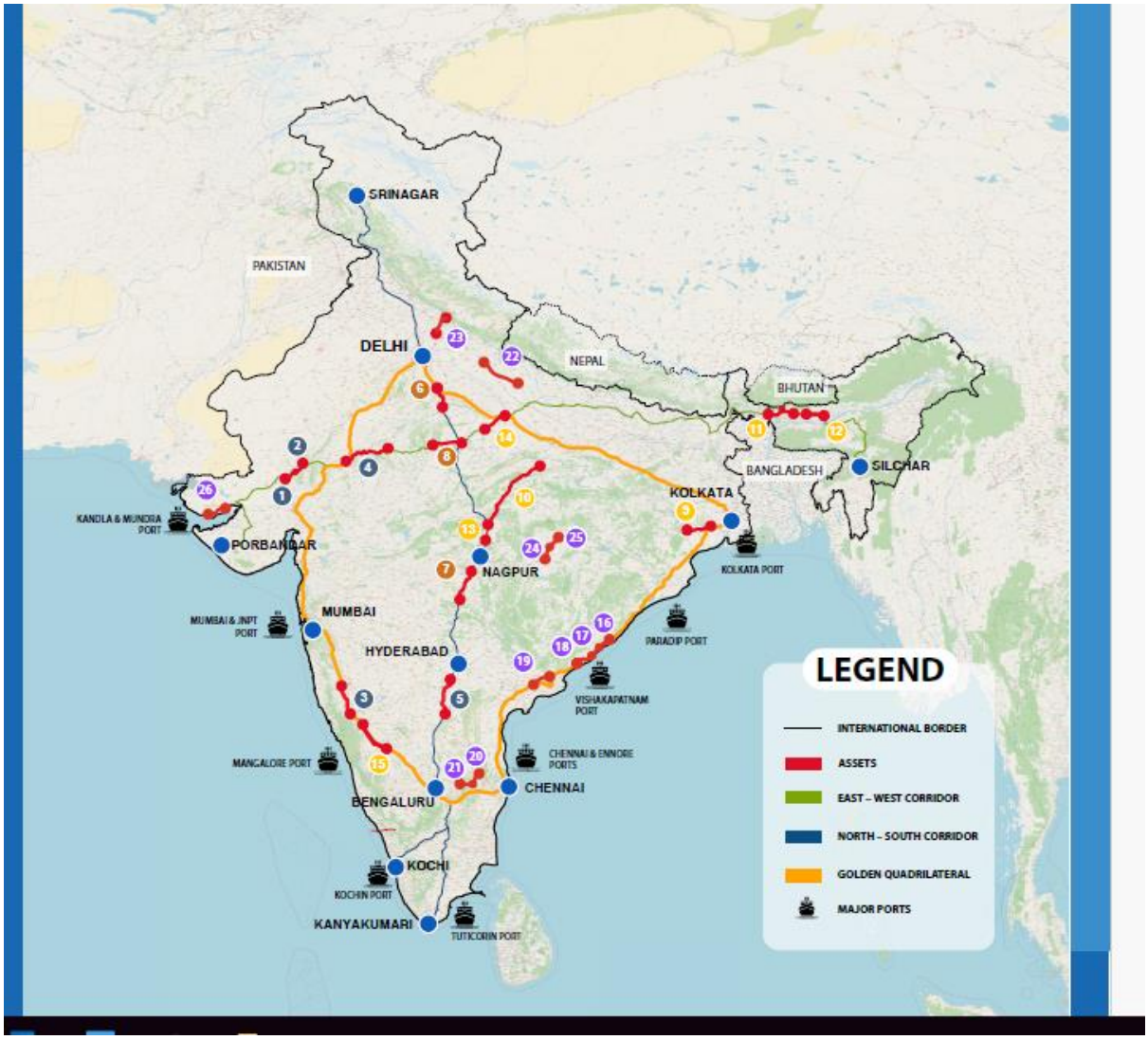
- Muzaffarnagar – Haridwar Project ("**Asset 23**") Muzaffarnagar to Haridwar section of Old NH 58 (New NH-334) with a total length of Km78.560 in the State of Uttar Pradesh & Uttarakhand;

- Raipur to Simga Project ("**Asset 24**") Raipur to Simga Section of NH-30 (Old NH 200) with a total length of Km 48.445580 in the State of Chhattisgarh;

- Simga to Bilaspur Project ("**Asset 25**") Simga to Bilaspur Section of NH-130 (Old NH-200) & NH-49 with a total length of Km 77.945 in the State of Chhattisgarh; and

- Gandhidham (Kandla) to Mundra Port Project ("**Asset 26**") Gandhidham (Kandla) to Mundra Port section of NH-41 with a total length of Km 71.400 in the State of Gujarat.

The following map depicts locations of the Toll Roads:



Note:

(1) This map is for illustrative purposes only, is not to scale and is subject to change at any time.

SEBI Exemptions

For the purposes of the Issue, the Investment Manager requested SEBI for certain exemptions by way of letter dated February 13, 2025 to allow for the relaxation of strict application of financial disclosure rules per the InvIT Regulations for the Sponsor and the NSPPL ("**SEBI Exemption Request**"). The SEBI Exemption Request was made on the basis that the Sponsor is incorporated under the NHAI Act and no historical consolidated financials are available for presentation in this Preliminary Placement Document. Further, considering that the project SPVs are typically held directly by the Authority and are not held as, or through, separate special purpose vehicles ("**SPVs**") or business units, NHAI typically operates these roads through third party contracts for collection of revenue and maintenance, and the profit and loss and the balance sheets are prepared only at the consolidated NHAI level. Upon transfer to the SPV(s) owned by the Trust, the respective concession agreements become applicable to them. SEBI accepted the request and granted an exemption through its letter dated March 7, 2025 read with email dated March 12, 2025.

Accordingly, only the following information is presented in this Preliminary Placement Document:

- Audited and published standalone financial statements of NHAI for each of the financial years ended March 31, 2021, March 31, 2022 and March 31, 2023.

- Unaudited financial results of NHAI for the financial year ended March 31, 2024 and for each of the quarters ended June 30, 2024 and September 30, 2024 (as disclosed to the Stock Exchanges in accordance with Regulations 52(8) and 54(2) of the Securities and Exchange Board of India (Listing Obligations and Disclosure Requirements) Regulations, 2015), prior to filing of the preliminary placement document, as applicable.

- Revenue details of R4 Assets for the previous three years and for the stub period i.e. for the preceding three complete financial years and until the completed month before the proposed Issue.

- Revenue data of the SPV as has been historically collected through toll collection and maintenance contracts and/or as included in the financial statements of the Trust, as may be available, for the financial years ended March 31, 2024, March 31, 2023 and March 31, 2022 and for the nine month period from April 1, 2024 to December 31, 2024 and for each of the month from January 1, 2025 until the last completed month before the Proposed Institutional Placement.

The absence of meaningful historical operating data or financial statements may make it difficult for investors to evaluate our ability to operate, manage and maintain the Toll Roads and assess our financial position or future prospects or results of operations.

Consolidated

1. **Basis of Preparation**

The Consolidated financial statements comprises of the Consolidated Balance Sheet, Consolidated Statement of Profit and Loss, Consolidated Cash Flow Statement, Consolidated Statement of Changes in Equity and Consolidated explanatory notes thereon of National Highways Infra Trust, for the six months ended 30 September 2024 ("**Interim Consolidated Financial Information**"). The Interim financial Information has been prepared in accordance with recognition and measurement principles laid down in Indian Accounting Standard 34 - Interim Financial Reporting (Ind AS 34), as prescribed in Rule 2(1)(a) of the Companies (Indian Accounting Standards) Rules, 2015 (as amended) and other accounting principles generally accepted in India, to the extent not inconsistent with the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014, as amended, the additional disclosures as required in Chapter 4 of SEBI Master Circular No. SEBI/HO/DDHS- PoD 2/P/C1R/2024/44 dated May 15, 2024 as amended including any guidelines and circulars issued thereunder ("**SEBI Circulars/InvIT Regulations**").

The Consolidated financial statements were authorised for issue in accordance with resolution passed by the board of directors of the Investment Manager on December 19, 2024.

The audit of these Interim Financials for the six months ended September 30, 2024 of NHIT has been carried out by the Statutory Auditors of NHIT.

The limited review consolidated financial information of the trust for the nine month period ended December 31, 2024, is included in this Preliminary Placement Document.

New amendments adopted during the period

The Ministry of Corporate Affairs has notified Companies (Indian Accounting Standards) Amendment Rules, 2023 dated 31 March 2023 to amend the following Ind AS:

Ind AS 8, Accounting Policies, Changes in Accounting Estimates and Errors

Ind AS 1, Presentation of Financial Statements

Ind AS 12, Income Taxes

The amendments are applicable for annual periods beginning on or after the April 1, 2023, however, these do not have material impact on the financial statements of the Group.

(a) **Material accounting policies and key sources of estimation uncertainties and critical judgements**

A Material accounting policies

The accounting policies adopted in preparation of these financial statements are consistent with those followed in preparation of the Group's latest Annual Consolidated Financial Statements.

B Key sources of estimation uncertainties and critical judgements

The preparation of the consolidated financial statements requires use of certain critical accounting estimates and judgements. It also requires the management to exercise judgement in the process of applying the Group's accounting policies. The areas where judgements and estimates are significant to the financial statements or areas involving a higher degree of judgement or complexity are the same as those applied to the Group's latest Annual Consolidated Financial

Statements.

Significant Factors Affecting Our Results of Operations

We expect our results of operations, financial condition and liquidity to be influenced by the following events, facts, developments and market characteristics.

The terms of the Concession Agreements and traffic volumes

Toll fees are typically pre-determined with the relevant government entity and cannot be modified to reflect prevailing circumstances, other than annual adjustments to account for inflation as specified in the Concession Agreements. Accordingly, our profitability is largely a function of how effectively we manage costs during the concession period. Significant costs during the concession period include operating and maintenance expenses such as periodic maintenance which is required to be performed as specified in the Concession Agreement. Periodic maintenance involves the repair of wear and tear of the roads and highways, including overlaying the surface of the roads and highways, if required. For further details on the maintenance requirements for each of our projects, see the section entitled "*Our Business"* in this Preliminary Placement Document. Our inability to effectively manage such operating and maintenance expenses during the concession period may have a material adverse effect on our profitability, financial condition and results of operations.

We are substantially dependent on the accuracy of the traffic volume forecasts for the respective Toll Road projects. Projects undertaken on a TOT basis involve Concession Agreements that are long-term in nature, usually between 20 to 30 years. The agreed consideration for the toll road projects is based on, amongst other factors, forecasts of traffic volumes and expected revenues over the concession period. Any material shortfall between the actual traffic volume and the forecast traffic volume for a project could have a material adverse effect on our cash flows, results of operations and financial condition.

Our projects involve agreements that are long-term in nature. All long-term projects have inherent risks associated with them and involve variables that may not necessarily be within our control. Accordingly, we may be exposed to a variety of operation and maintenance and other risks, including unanticipated cost increases and overruns, inability to negotiate satisfactory arrangements with third parties, and disagreements with third parties. In addition, the long-term nature of our contracts may expose us to increased risk of unforeseen business and industry changes and developments which could have a material adverse effect on their business, financial condition and results of operations.

Toll revenues

The operation of toll roads principally involves collection of tolls and maintenance. Revenues from the Toll Roads will substantially comprise receipts collected at toll plazas from vehicles passing through the Toll Roads. Toll revenues generated by each of the Toll Roads will be subject to a number of factors, including traffic volume by vehicle categories, weight of the vehicle, applicable toll rates and distance travelled. The volume can vary with the location of the asset and the period of operation, as well as seasonal effects. Meanwhile, toll rates are ultimately determined by the Indian government in accordance with certain national laws and regulations. We anticipate a continuing increase in toll rates for the Toll Roads given the annual inflation-linked adjustment.

Operation and maintenance costs

We will be responsible for the operation and maintenance of the Toll Roads upon commencement of the respective concession. Pursuant to each of the Concession Agreements, we will be required to ensure that the relevant Toll Road conforms to the maintenance requirements set forth in the Concession Agreements. For each Toll Road, we will be required to prepare an annual program of preventive, urgent and other scheduled maintenance to comply with the standards and requirements set out in the Concession Agreements.

Local state economies

We expect our financial results from the Toll Road to be dependent upon growth in the local state economies in which they are operated, namely Rajasthan, Gujarat, Telangana, Assam, Madhya Pradesh, Maharashtra, Uttar Pradesh, West Bengal and Karnataka. We expect trends in the economic development and population growth of each of these states to have a direct impact on the traffic utilizing the Toll Road.

Access to and cost of financing

Our ability to obtain financing, as well as the cost of such financing, affects our business. Our ability to access such additional financing is subject to a variety of factors, including interest rates and other funding costs and market conditions. Any lack of access or higher costs in relation to additional financing that may be required by us could negatively impact our results of operations.

Arrangement with respect to future assets

We plan to make significant investments in toll road assets so as to expand our portfolio over the next several years. The Sponsor may, from time to time, consider transferring additional road assets to the Trust.

The process of identification of Future Assets, offer of Future Assets to Trust and completion of transfer of Future Assets to the Trust including valuation mechanism may be refined and/or modified in line with the internal policies of NHAI. Furthermore, the success of our portfolio expansion is limited by the availability of, and competition for, suitable projects, by our financial resources, including our available cash and borrowing capacity, by our ability to integrate such acquired projects into our business and by other factors, some of which may be beyond our control. For more details, please see the section entitled "*Risk Factors—The Sponsor is under no obligation to provide the Trust with access to future assets, and the Trust may be unable to bid effectively for them"* in this Preliminary Placement Document.

Competition

We operate in a competitive environment. The competition for toll road and other infrastructure projects varies depending on the size, nature and complexity of the project and on the geographical region in which the project is to be executed. Some of our competitors have greater financial resources, economies of scale and operating efficiencies than we do. There can be no assurance that we can effectively compete with its competitors in the future, and this failure to compete effectively may have a material adverse effect on our financial condition and results of operations.

Exchange rate fluctuations

Financial information disclosed in this Preliminary Placement Document and the Asset Revenue Information will be presented in Rupees, and our functional currency is Rupees. However, while we generate revenue in Rupees, we may purchase our equipment in both Rupees and foreign currency, including U.S. dollars. Additionally, if we incur external borrowings in currencies other than Rupees, we will be exposed to foreign currency exchange risk and, depending on the cross-currency issues of these foreign currencies and the Rupee, our combined financial statements may include distorted figures of expenses and, consequentially, profits or loss. Accordingly, our results of operations will be impacted by the strength of the U.S. dollar and other currencies as measured against the Rupee due to translational effect. To the extent that the Rupee strengthens or weakens against the U.S. dollar, or other currencies in which we interact, our combined results of operations will be affected.

Results of Operations

The following table sets forth certain information with respect to our results of operations based on the Audited Financial Information:

National Highways Infra Trust

Unaudited Consolidated Interim Statement of Profit & Loss for the period ended December 31, 2024

Particulars	**For the period ended**
	December 31, 2024 *(₹ in lakh)*
Income	
Revenue from operations	1,71,683.43
Interest Income	1,707.91
Profit on sale of investments	1,615.50
Other income	105.06
Total income	**1,75,111.90**
Expenses	
Investment Manager fees	1,574.10
Trustee fees	7.20
Valuation Fee	46.59
Annual Listing fee	40.53
Rating Fee	8.90
Insurance Expenses	1,355.69
Custodian Fee	2.24
Project management fees	1,062.00
Operating expenses	26,179.31
Employee benefits expenses	1,803.89
Finance cost	78,593.62
Depreciation and amortization expense	57,810.97
Other expenses	2,951.98
Audit Expenses	12.71
Total expenses	**1,71,449.73**
Profit / (Loss) before exceptional items and tax	**3,662.17**
Tax expense	
Current tax	819.36
Current tax - earlier years	-

Deferred tax expense/(credit)	(15,607.10)
Total tax	**(14,787.74)**
Profit / (Loss) for the period	**18,449.91**
Other comprehensive income	
Items that will not be reclassified to Profit and Loss	(5.69)
Income tax related to items that will not be reclassified to Profit and Loss	1.14
Total comprehensive income for the period	**18,445.36**

Consolidated Results of Operations for the nine month period ended December 31, 2024

Income

The total income for the nine month period ended December 31, 2024 was ₹ 1,75,111.90 lakh, which primarily consisted of revenue from collection tolls from R1, R2 and R3 Toll Roads.

Revenue from operation

The revenue from operations for the nine month period ended December 31, 2024 was ₹ 171,683.43 lakh, which was on the account of revenue from collection tolls from R1, R2 and R3 Toll Roads.

Interest income

The revenue from other income for the nine month period ended December 31, 2024 was ₹ 1707.91 lakh, which comprised interest income on fixed deposit receipts.

Profit on Sale of Investments

The revenue from profit on sale of investment for the nine month period ended December 31, 2024 was ₹ 1615.5 lakh, which comprised gain on sale of mutual.

Other income

The revenue from other income for the nine month period ended December 31, 2024 was ₹ 105.06 lakh, which comprised Insurance claim and other miscellaneous income.

Expenses

The total expenses for the nine month period ended December 31, 2024 was ₹ 1,71,449.73 lakh, which primarily consisted of depreciation and amortization expense, finance charges and operating expenses.

Investment Manager fees

The total Investment Manager fees for the nine-month period ended December 31, 2024 was ₹ 1574.10 lakh, which was on the account of the fees paid to the Investment Manager pursuant to the Investment Management Agreement.

Trustee fees

The total Trustee fees for the nine month period ended December 31, 2024 was ₹ 7.20 lakh, which was on the account of fee paid to the Trustee pursuant to the Trust Deed.

Operating expenses

The total operating expenses for the nine month period ended December 31, 2024 was ₹ 26,179.31 lakh, which was on the account of provision for major maintenance obligation and operation and maintenance expenses.

Project management fees

The total project management fees for the nine month period ended December 31, 2024 was ₹ 1062.00 lakh, which was on the account of fee paid to the Project Manager pursuant to Project Implementation and Management Agreement.

Employee benefits expenses

The total employee benefit expenses for the nine month period ended December 31, 2024 was ₹ 1,803.89 lakh, which was on the account of salary and wage expenses.

Finance cost

The total finance cost for the nine month period ended December 31, 2024 was ₹ 78,593.62 lakh, which was on the account of interest paid to senior lenders.

Depreciation and amortization expense

The total depreciation and amortization expense for the nine month period ended December 31, 2024 was ₹ 57810.97 lakh, which was on the account of amortization of the intangible assets toll rights.

Other expenses

The total other expenses for the nine month period ended December 31, 2024 was ₹ 2951.98 lakh, which was on the account of legal and professional fees, repair & maintenance, vehicle hire charges, power & fuel expenses and tour & travel, etc.

Audited Consolidated Interim Statement of Profit & Loss for the period ended September 30, 2024

Particulars	**For the period ended**
	September 30, 2024 *(₹ in lakh)*
Income	
Revenue from operations	1,13,033.02
Interest Income	948.19
Profit on sale of investments	896.26
Other income	36.04
Total income	**1,14,913.51**
Expenses	
Investment Manager fees	990.00
Trustee fees	4.80
Valuation Fee	34.44
Annual Listing fee	26.97
Rating Fee	2.81
Insurance Expenses	935.90
Custodian Fee	2.82
Project management fees	708.00
Operating expenses	16,271.02
Employee benefits expenses	1,041.48
Finance cost	51,389.16
Depreciation and amortization expense	37,680.18
Other expenses	1607.23
Audit Expenses	8.73
Total expenses	**1,10,703.54**
Profit / (Loss) before exceptional items and tax	**4,209.97**
Tax expense	
Current tax	460.49
Current tax - earlier years	-
Deferred tax expense/(credit)	(10,103.32)
Total tax	**(9,642.83)**
Profit / (Loss) for the period	**13,852.80**
Other comprehensive income	
Items that will not be reclassified to Profit and Loss	(5.69)
Income tax related to items that will not be reclassified to Profit and Loss	1.15
Total comprehensive income for the period	**13,848.26**

Consolidated Results of Operations for the six month period ended September 30, 2024

Income

The total income for the six month period ended September 30, 2024 was ₹ 1,14,913.51 lakh, which primarily consisted of revenue from collection tolls from R1, R2 and R3 Toll Roads.

Revenue from operation

The revenue from operations for the six month period ended September 30, 2024 was ₹ 1,13,033.02 lakh, which was on the account of revenue from collection tolls from R1, R2 and R3 Toll Roads.

Interest income

The revenue from other income for the six month period ended September 30, 2024 was ₹ 948.19 lakh, which comprised interest income on fixed deposit receipts.

Profit on Sale of Investments

The revenue from profit on sale of investment for the six month period ended September 30, 2024 was ₹ 896.26 lakh, which comprised gain on sale of mutual.

Other income

The revenue from other income for the six month period ended September 30, 2024 was ₹ 36.04 lakh, which comprised Insurance claim and other miscellaneous income.

Expenses

The total expenses for the six month period ended September 30, 2024 was ₹ 1,10,703.54 lakh, which primarily consisted of depreciation and amortization expense, finance charges and operating expenses.

Investment Manager fees

The total Investment Manager fees for the six-month period ended September 30, 2024 was ₹ 990.00 lakh, which was on the account of the fees paid to the Investment Manager pursuant to the Investment Management Agreement.

Trustee fees

The total Trustee fees for the six month period ended September 30, 2024 was ₹ 4.80 lakh, which was on the account of fee paid to the Trustee pursuant to the Trust Deed.

Operating expenses

The total operating expenses for the six month period ended September 30, 2024 was ₹ 16,271.02 lakh, which was on the account of provision for major maintenance obligation and operation and maintenance expenses.

Project management fees

The total project management fees for the six month period ended September 30, 2024 was ₹ 708.00 lakh, which was on the account of fee paid to the Project Manager pursuant to Project Implementation and Management Agreement.

Employee benefits expenses

The total employee benefit expenses for the six month period ended September 30, 2024 was ₹ 1,041.48 lakh, which was on the account of salary and wage expenses.

Finance cost

The total finance cost for the six month period ended September 30, 2024 was ₹ 51,389.16 lakh, which was on the account of interest paid to senior lenders.

Depreciation and amortization expense

The total depreciation and amortization expense for the six month period ended September 30, 2024 was ₹ 37,680.18 lakh, which was on the account of amortization of the intangible assets toll rights.

Other expenses

The total other expenses for the six month period ended September 30, 2024 was ₹ 1607.23 lakh, which was on the account of legal and professional fees, repair & maintenance, vehicle hire charges, power & fuel expenses and tour & travel, etc.

Results of Operations for the Financial Year ended March 31, 2024, March 31, 2023 and March 31, 2022

Particulars	**For the Financial Year ended (in lakhs)**	**For the Financial Year ended (in lakhs)**	**For the Financial Year ended (in lakhs)**
	March 31, 2022	**March 31, 2023**	**March 31, 2024**
Income			
Revenue from operations	13,960.55	68,717.20	94,390.77
Interest Income	-	373.43	871.71
Profit on sale of investments	-	671.17	2,141.16
Other income	1,014.53	326.11	59.53
Total income	**14,975.08**	**70,087.91**	**97, 463.17**
Expenses			
Investment Manager Fee	1931.71	1,263.70	1,800.00
Trustee fee	3.73	9.60	9.60

Particulars	For the Financial Year ended (in lakhs)	For the Financial Year ended (in lakhs)	For the Financial Year ended (in lakhs)
	March 31, 2022	March 31, 2023	March 31, 2024
Valuation expenses	-	4.00	11.07
Annual Listing fees	-	20.00	53.80
Rating fees	0.57	0.20	7.73
Insurance expenses	166.04	628.74	737.91
Custodian Fees	-	0.84	3.15
Project Management Fees	290.43	991.20	1,168.20
Operating Expenses	849.77	9,025.05	13,665.60
Employee Benefits Expenses	2.12	289.01	1,156.60
Finance Cost	3154.43	16,621.32	28,023.17
Depreciation and Amortization Expense	1055.65	17,560.63	24,771.04
Other Expenses	504.87	1,924.27	2,569.62
Audit Fees	5.38	8.66	20.21
Total expenses	**7,964.71**	**48,347.23**	**73,997.70**
Profit / (Loss) before exceptional items and tax	**7010.37**	**21,740.68**	23,465.47
Tax expense			
Current tax	436.36	473.89	886.30
Current tax – earlier years	-	0.01	(2.52)
Deferred tax expense/(credit)	(262.32)	(4,422.79)	(6,837.88)
Total tax	**174.04**	**(3,948.89)**	**(5,954.10)**
Profit / (Loss) for the period	**6836.33**	**25,689.57**	29,419.57
Other comprehensive income			
Items that will not be reclassified to Profit and Loss	-	-	0.10
Income tax related to items that will not be reclassified to Profit and Loss	-	-	0.03
Total comprehensive income for the period	**6836.33**	**25,689.57**	**29,419.70**

Comparison Fiscal 2024 with Fiscal 2023

Income

The total income for the Financial Year ended March 31, 2024 was ₹ 97, 463.17 lakh, which primarily consisted of revenue from operations. Income increased by ₹ 27,375.26 lakh from March 31, 2023. The reason for change is the toll revenue income was from 8 operational projects however for Financial Year ended March 31. 2024, 7 additional toll roads were acquired and consequently toll revenue income was for 15 operational projects.

Revenue from operations

Revenue from operations for Financial Year 2024 was ₹ 94,390.77 lakh, which was on the account of revenue from toll collection. Revenue increased by ₹ 25,673.57 lakh from March 31, 2023. The reason for change is the toll revenue income was from 8 operational projects however for Financial Year ended March 31. 2024, 7 additional toll roads were acquired and consequently toll revenue income was from 15 operational projects.

Interest income & Profit on Sale of Investments

Revenue from *Interest income & Profit on Sale of Investments* for the Financial Year ended March 31, 2024 was ₹ 3,012.87 lakh, the reason for change is, there is excess surplus due to increase in revenue, and same is further invested in FDR and Mutual funds.

Other income

Revenue from other income for the Financial Year ended March 31, 2024 was ₹ 59.53 lakh, which was on the account insurance claim and other miscellaneous income.

Expenses

The total expenses for the Financial Year ended March 31, 2024 was ₹ 73,997.70 lakh, which primarily consisted of Investment Manager fees, Trustee fees, Valuation expenses, Annual Listing fees, Rating fees, Insurance expenses, Custodian fees, Operating expenses, Project Management fees, Employee Benefits expenses, Finance cost, Depreciation and Amortization expense, Other expenses and Audit fees. Total expense increases by ₹ 25,650.48lakh from March 31, 2023. The reason for change is increase in Investment Manager Fee, Annual Listing Fee, Insurance Expenses, Project

Manager Fee, Employee Benefit Expenses and Finance Cost etc.

Investment Manager fees

The total Investment Manager fees for the Financial Year ended March 31, 2024 was ₹ 1,800 lakh, which was on the account of fee to the Investment Manager pursuant to Investment Management Agreement. IM Fee increased by ₹ 536.3 lakh from March 31, 2023. The reason for change is escalation in fee as per the Investment Management Agreement.

Trustee fees

The total Trustee fees for the Financial Year ended March 31, 2024 was ₹ 9.60 lakh, which was on the account of fee paid to the Trustee pursuant to Trust Deed. No change in trustee fee as compared with previous year.

Operating expenses

The total operating expenses for the Financial Year ended March 31, 2024 was ₹ 13,665.60 lakh, which was on the account of which was on the account of provision for major maintenance obligation, operation and maintenance expenses]. Operating expense increased by to ₹ 4,640.55 lakh from March 31, 2023. The reason for change is in previous period operating expenses was from 8 operational projects, however for Financial Year ended March 31, 2024, 7 additional toll roads were acquired and consequently, operating expenses was for 15 operational projects.

Project management fees

The total project management fees for the Financial Year ended March 31, 2024 was ₹ 1,168.20 lakh, which was on the account of fee paid to the Project Manager pursuant to Project Implementation and Management Agreement. PM Fee increased by ₹ 177 lakh from March 31, 2023. The reason for change is in previous period there was 8 operational projects, however for Financial Year ended March 31, 2024 7 additional projects acquired and consequently, project manager fee was for 15 operational projects.

Employee benefits expenses

The total employee benefit expenses for the Financial Year ended March 31, 2024 was ₹ 1,156.60 lakh, which was on the account of salary and wage expenses. Employee benefits expenses increases by amounting to ₹ 867.59 lakh from March 31, 2023. The reason for the change is increment in salary & headcount as there are more operational projects in Financial Year ended March 31, 2024 as compared to previous period.

Finance cost

The total finance cost for the Financial Year ended March 31, 2024 was ₹ 28,023.17 lakh, which was on the account of interest paid to senior lenders. Finance charges increases by amounting to ₹ 11,401.85 lakh from March 31, 2023. The reason for the change is increase in additional borrowing and interest cost during the current period.

Depreciation and amortization expense

The total depreciation and amortization expense for the Financial Year ended March 31, 2024 was ₹ 24,771.04 lakh, which was on the account of amortization of the intangible assets toll rights. Depreciation and amortization expense increased by ₹ 7210.41 lakh from March 31, 2023. The reason for change is in previous period there was 8 operational projects, however for Financial Year ended March 31, 2024, 7 additional projects acquired and consequently, depreciation and amortization was for 15 operational projects.

Other expenses

The total other expenses for the Financial Year ended March 31, 2024 was ₹ 2,569.62 lakh, which was on the account of increase in Investment Manager Fee, Annual Listing Fee, Insurance Expenses, Project Manager Fee, Employee Benefit Expenses and Finance Cost etc. Other expenses increased by ₹ 645.35 lakh from March 31, 2023. The reason for the change is in previous period there was 8 operational projects, however for Financial Year ended March 31, 2024, 7 additional projects acquired and consequently, other expenses was for 15 operational projects.

Comparison Fiscal 2023 with Fiscal 2022

Income

The total income for the Financial Year ended March 31, 2023 was ₹ 70,087.91 lakh, which primarily consisted of revenue from operations. Income increased by ₹ 55,112.83 lakh from March 31, 2022. The reason for change is, in previous period toll revenue income was from 5 operational projects, however for Financial Year ended March 31, 2023 three additional toll roads were acquired and consequently, toll revenue income was from 8 operational projects.

Revenue from operations

Revenue from operations for the Financial Year ended March 31, 2023 was ₹ 68,717.20 lakh, which was on the account of revenue from toll collection. Revenue increased by ₹ 54,756.65 lakh from March 31, 2022. The reason for change is, in previous period toll revenue income was from 5 operational projects, however for Financial Year ended March 31, 2023 three additional toll roads were acquired and consequently, toll revenue income was from 8 operational projects.

Other income

Revenue from other income for the Financial Year ended March 31, 2023 was ₹ 1,370.71 lakh, which was on the account of interest income on fixed deposit receipts, gain on sale of mutual funds and other miscellaneous income. Other Income increased by ₹ 356.18 lakh from March 31, 2022. The reason for change is, there is excess surplus with the Trust due to increase in revenue, and same is further invested in FDR and Mutual funds.

Expenses

The total expenses for the Financial Year ended March 31, 2023 was ₹ 48,347.23 lakh, which primarily consisted of depreciation and amortization expense, finance charges and Investment Manager fees. Total expense increases by ₹ 40,382.52 lakh from March 31, 2022. The reason for change is, in previous period expenses was from 5 operational projects, however for Financial Year ended March 31, 2023 three additional toll roads were acquired and consequently, expenses was from 8 operational projects.

Investment Manager fees

The total Investment Manager fees for the Financial Year ended March 31, 2023 was ₹ 1,263.70 lakh, which was on the account of fee paid to the Investment Manager pursuant to Investment Management Agreement. IM Fee decreased by ₹ 668.01 lakh from March 31, 2022. The reason for change is, in FY 21-22 IM Fees for two Financial year, i.e. FY 20-21 and FY21-22 was accounted.

Trustee fees

The total Trustee fees for the Financial Year ended March 31, 2023 was ₹ 9.60 lakh, which was on the account of fee paid to the Trustee pursuant to Trust Deed. No major change in trustee fee as compared with previous year.

Operating expenses

The total operating expenses for the Financial Year ended March 31, 2023 was ₹ 9,025.05 lakh, which was on the account of provision for major maintenance obligation, operation and maintenance expenses. Operating expense increased by to ₹ 8,175.28 lakh from March 31, 2022. The reason for change is, in previous period there was 5 operational projects, however for Financial Year ended March 31, 2023 three additional toll roads were acquired and consequently, operating was for 8 operational projects.

Project management fees

The total project management fees for the Financial Year ended March 31, 2023 was ₹ 991.20 lakh, which was on the account of fee paid to the Project Manager pursuant to Project Implementation and Management Agreement. PM Fee increased by ₹ 700.77 lakh from March 31, 2022. The reason for change is, in previous period there was 5 operational projects, however for Financial Year ended March 31, 2023 three additional toll roads were acquired and consequently, project manager fee was for 8 operational projects.

Employee benefits expenses

The total employee benefit expenses for the Financial Year ended March 31, 2023 was ₹ 296.22 lakh, which was on the account of salary and wage expenses. Employee benefits expenses increases by amounting to ₹ 294.10 lakh from March 31, 2022. The reason for the change is, increment in salary & headcount as there are more operational projects in Financial Year ended March 31, 2023 as compared to previous period.

Finance charges

The total finance charges for the Financial Year ended March 31, 2023 was ₹ 16,621.32 lakh, which was on the account of interest paid to senior lenders. Finance charges increases by amounting to ₹ 13,466.89 lakh from March 31, 2022. The reason for the change is, increase in additional borrowing and interest cost during the current period.

Depreciation and amortization expense

The total depreciation and amortization expense for the Financial Year ended March 31, 2023 was ₹ 17,560.63 lakh, which was on the account of amortization of the intangible assets toll rights. Depreciation and amortization expense increased by ₹ 16,504.98 lakh from March 31, 2022. The reason for change is, in previous period there was 5 operational projects, however for Financial Year ended March 31, 2023 three additional toll roads were acquired and consequently, depreciation and amortization expenses was for 8 operational projects.

Other expenses

The total other expenses for the Financial Year ended March 31, 2023 was ₹ 1,924.27 lakh, which was on the account of legal and professional fees, vehicle hire charges, power & fuel expenses and tour & travel etc. Other expenses increased by ₹ 1,419.40 lakh from March 31, 2022. The reason for the change is increase in Legal and Professional fee, Power & Fuel, Environment Health and Safety expenses, vehicle hire charges, repair and maintenance etc. In previous period there was 5 operational projects, however for Financial Year ended March 31, 2023 three additional toll roads were acquired and consequently, other expenses was for 8 operational projects.

Liquidity and Capital Resources

Pursuant to the Concession Agreements, we are required to pay certain concession fees and make certain improvement works to each of the Toll Road relating to overlay activities and construction of additional toll lanes, among other things. We expect to finance our operations for the next 12 months primarily from cash flow from the operation of the Toll Roads and debt financing. We may also from time to time seek additional sources of funding, which may include debt or equity financings, depending on our financing needs and market conditions.

Qualitative Disclosures About Market Risk

Market risk is the risk of loss arising from adverse changes in market rates and prices, such as foreign currency exchange rates and commodity prices. We do not hold or issue financial instruments for trading purposes and does not enter into derivative transactions that would be considered speculative positions. We intend to minimize our exposure to currency risk by minimizing our non-Rupee borrowings.

Interest Rate Risk

As the infrastructure development and construction business is capital intensive, we are exposed to interest rate risk. Our borrowings are exposed to market risk relating to changes in interest rates upon any refinancing or additional financing. The debt financing provided by the Trust to the NWPPL and NEPPL are classified as senior debt under the Concession Agreements. This exposure to debt by NWPPL and NEPPL could further lead to an increase in interest expense and could have an adverse effect on the results of operations and financial condition. Although from time to time, we may exercise any rights available to us under these financing arrangements to terminate the existing debt financing arrangement on the respective reset dates and enter into new financing arrangements, there can be no assurance that we will be able to do so on commercially reasonable terms, that our counterparties will perform their obligations, or that these agreements, if entered into, will protect us adequately against interest rate risks.

Foreign currency exchange rate risk

Our foreign exchange risk primarily arises from movements of the Rupee against the U.S. dollar. Approximately 100% of our capital expenditures are denominated in Rupees. In addition, 100% of our borrowings are denominated in Rupees. Accordingly, our operating and financial results would be negatively affected when the Rupee depreciates against the U.S. dollar and interest rates in U.S. dollar increase. In addition, we may in the future enter into financing arrangements for foreign currency borrowings. We cannot assure you that we will be able to effectively mitigate the adverse impact of currency fluctuations and increases in international interest rates on our results of operation.

Liquidity Risk

We may not have sufficient cash flows to meet our operation and maintenance expense requirements and our financing obligations when they come due. We manage liquidity risks by forecasting projected cash flows. Management closely monitors our future and contingent obligations and set up required cash reserves as necessary in accordance with internal requirement.

Significant developments since December 31, 2024

Except as disclosed above and elsewhere in this Preliminary Placement Document, to our knowledge no material developments other than the following have taken place since December 31, 2024 being the last date of financial statements as disclosed in this Preliminary Placement Document which adversely affect or are likely to affect the revenue or profitability of the Trust, or the value of its assets, or its ability to pay its liabilities within next 12 months.

The Trust has obtained approval to avail credit facilities by various banks, financial institutions and / or other lenders, amounting to up to Rs. 105,000.00 million. These facilities include rupee term loan facilities, and working capital facilities. The approval for these facilities was granted in the board meeting held on February 12, 2025.

DISTRIBUTION

Statements contained in this section entitled "Distribution" that are not historical facts are forward-looking statements. Such statements are subject to certain risks and uncertainties that could cause actual results to differ materially from those that may be projected. Under no circumstances should the inclusion of such information herein be regarded as a representation, warranty or prediction with respect to the accuracy of the underlying assumptions by the Trust, the Trustee, the Sponsor, the Investment Manager, the Lead Managers or any other person. Bidders are cautioned not to place undue reliance on these forward-looking statements that are stated only as at the date of this Final Placement Memorandum. For details, please see the section entitled "Forward-Looking Statements" on page 25. For details on the risks relating to distribution, please see the section entitled "Risk Factors" on page 43 .

A. **Preamble**

The Distribution Policy (the "**Policy**") aims to outline the process and procedure for distribution in relation to the Trust.

B. The net distributable cash flows of the Trust (the "**Distributable Income**") shall be based on the cash flows generated from the underlying operations undertaken by the Project SPVs (being NHIT Western Projects Private Limited and NHIT Eastern Projects Private Limited and NHIT Southern Projects Private Limited and other SPVs incorporated/ acquired from time to time by the Trust) held by the Trust.

C. Distributions may be made from the monies received by the Trust, in accordance with the provisions of the InvIT documents and applicable law.

D. In terms of the InvIT Regulations, the Project SPVs shall distribute not less than 90% of the net distributable cash flows to the Trust in the proportion of its holding in the Project SPV, subject to applicable provisions of the Companies Act, 2013 or Limited Liability Partnership Act, 2008, each as amended.

E. In the event any infrastructure assets are sold by the Trust or any Project SPVs or if the equity shares or interest in any Project SPVs is sold by the Trust, then in accordance with the InvIT Regulations:

- if the Trust proposes to re-invest the sales proceeds into any other infrastructure asset, it shall not be required to distribute any sales proceeds to the Unitholders or the Trust; and
- if the Trust proposes not to invest the sales proceeds into any other infrastructure asset within a period of one year, it shall be required to distribute the same in accordance with the InvIT Regulations.

F. The Trust shall distribute at least 90% of the Distributable Income to its unitholders ("**Unitholders**"). Such distribution shall be declared and made such that the time period between any two declarations of distribution shall not exceed one year. In accordance with the InvIT Regulations, distributions by the Trust shall be made within 5 working days from the record date. The distribution, when made, shall be made in Indian Rupees.

G. All distributions to the Unitholders shall be made in compliance with the InvIT Regulations, Income-tax Act, 1961 ("**IT Act**") and other applicable laws.

H. The Distributable Income and the net distributable cash flows of any Project SPVs shall be calculated in accordance with the InvIT Regulations and circulars issued thereunder, as amended from time to time. The indicative method of calculating net distributable cash flows for the Project SPVs and the Trust is provided below:

I. ***Computation of net distributable cash flows at any HoldCo and/or SPV level: -***

Particulars
Cash flow from operating activities as per Cash Flow Statement of HoldCo/ SPV
(+) Cash Flows received from SPV's which represent distributions of NDCF computed as per relevant framework
(+) Treasury income/ income from investing activities (interest income received from FD, tax refund, any other income in the nature of interest, profit on sale of Mutual funds, investments, assets etc., dividend income etc., excluding any Ind AS adjustments. Further clarified that these amounts will be considered on a cash receipt basis)
(+) Proceeds from sale of infrastructure investments, infrastructure assets or shares of SPVs or Investment Entity adjusted for the following • Applicable capital gains and other taxes • Related debts settled or due to be settled from sale proceeds

• Directly attributable transaction costs • Proceeds reinvested or planned to be reinvested as per Regulation 18(7) of InvIT Regulations or any other relevant provisions of the InvIT Regulations
(+) Proceeds from sale of infrastructure investments, infrastructure assets or sale of shares of SPVs or Investment Entity not distributed pursuant to an earlier plan to re-invest as per Regulation 18(7) of InvIT Regulations or any other relevant provisions of the InvIT Regulations, if such proceeds are not intended to be invested subsequently
(-) Finance cost on Borrowings, excluding amortisation of any transaction costs as per Profit and Loss Account and any shareholder debt/ loan from Trust
(-) Debt repayment (to include principal repayments as per scheduled EMI's except if refinanced through new debt including overdraft facilities and to exclude any debt repayments/ debt refinanced through new debt, in any form or equity raise as well as repayment of any shareholder debt/ loan from Trust)
(-) any reserve required to be created under the terms of, or pursuant to the obligations arising in accordance with, any: (i). loan agreement entered with banks / financial institution from whom the Trust or any of its SPVs/ HoldCos have availed debt, or (ii). Terms and conditions, covenants or any other stipulations applicable to debt securities issued by the Trust or any of its SPVs/ HoldCos, or (iii). Terms and conditions, covenants or any other stipulations applicable to external commercial borrowings availed by the Trust or any of its SPVs/ HoldCos, (iv). Agreement pursuant to which the SPV/ HoldCo operates or owns the infrastructure asset, or generates revenue or cashflows from such asset (such as, concession agreement, transmission services agreement, power purchase agreement, lease agreement, and any other agreement of a like nature, by whatever name called); or (v). statutory, judicial, regulatory, or governmental stipulations; or –
(-) any capital expenditure on existing assets owned / leased by the SPV or Holdco, to the extent not funded by debt / equity or from reserves created in the earlier years
NDCF for HoldCo/SPV's

II. ***Computation of net distributable cash flows at the consolidated Trust level***

Particulars
Cashflows from operating activities of the Trust
(+) Cash flows received from SPV's/ Investment entities which represent distributions of NDCF computed as per relevant framework
(+) Treasury income/ income from investing activities of the Trust (interest income received from FD, any investment entities as defined in Regulation 18(5), tax refund, any other income in the nature of interest, profit on sale of Mutual funds, investments, assets etc., dividend income etc., excluding any Ind AS adjustments. Further clarified that these amounts will be considered on a cash receipt basis)
(+) Proceeds from sale of infrastructure investments, infrastructure assets or shares of SPVs/ Holdcos or Investment Entity adjusted for the following • Applicable capital gains and other taxes • Related debts settled or due to be settled from sale proceeds • Directly attributable transaction costs
Proceeds reinvested or planned to be reinvested as per Regulation 18(7) of InvIT Regulations or any other relevant provisions of the InvIT Regulations
(+) Proceeds from sale of infrastructure investments, infrastructure assets or sale of shares of SPVs/ Hold cos or Investment Entity not distributed pursuant to an earlier plan to re-invest as per Regulation 18(7) of InvIT Regulations or any other relevant provisions of the InvIT Regulations, if such proceeds are not intended to be invested subsequently
(-) Finance cost on Borrowings, excluding amortisation of any transaction costs as per Profit and Loss account of the Trust
(-) Debt repayment at Trust level (to include principal repayments as per scheduled EMI's except if refinanced through new debt including overdraft facilities and to exclude any debt repayments/ debt refinanced through new debt in any form or funds raised through issuance of units)
(-) any reserve required to be created under the terms of, or pursuant to the obligations arising in accordance with, any: (i). loan agreement entered with financial institution, or (ii). Terms and conditions, covenants or any other stipulations applicable to debt securities issued by the Trust or any of its SPVs/ HoldCos, or (iii). Terms and

conditions, covenants or any other stipulations applicable to external commercial borrowings availed by the Trust or any of its SPVs/ HoldCos, or (iv). Agreement pursuant to which the Trust operates or owns the infrastructure asset, or generates revenue or cashflows from such asset (such as, concession agreement, transmission services agreement, power purchase agreement, lease agreement, and any other agreement of a like nature, by whatever name called); or (v). statutory, judicial, regulatory, or governmental stipulations; or
(-) any capital expenditure on existing assets owned/ leased by the InvIT, to the extent not funded by debt/ equity or from contractual reserves created in the earlier years
NDCF at Trust level

III. While computation of the NDCF, the Trust shall additionally comply with the notes and the rules as specified by the SEBI in accordance with the InvIT Regulations and circulars issued thereunder, as amended from time to time.

In terms of the InvIT Regulations, if the distribution is not made within timelines as specified in the InvIT Regulations, then the Investment Manager shall be liable to pay interest to the Unitholders at the rate of 15% per annum or such other rate as may be specified under applicable law, whichever is lower, until the distribution is made. Such interest shall not be recovered in the form of fees or any other form payable to the Investment Manager by the Trust. For risks in relation to distribution, please see the section entitled "*Risk Factors*" on page 43.

I. For the purposes of the IT Act, any income distributed by the Trust to the Unitholders shall be deemed to be of the same nature and in the same proportion in the hands of the Unitholder as it had been received by, or accrued to, the Trust. Accordingly, the Trust may follow either the receipt approach or the accrual approach subject to the provisions of the IT Act and applicable accounting standard, however the same shall be followed since the beginning and on a consistent basis.

J. In terms of the InvIT Regulations, if the distribution is made within 5 working days from the record date, the Investment Manager shall be liable to pay interest to the Unitholders at the rate of 15% per annum or such other rate as may be specified under applicable law, until the distribution is made. Such interest shall not be recovered in the form of fees or any other form payable to the Investment Manager by the Trust.

K. Notwithstanding the above, this Policy will stand amended to the extent of any change in applicable law, including any amendment to the InvIT Regulations, without any action from the Investment Manager or approval of the Unitholders of the Trust.

L. ***In-specie Distribution***: Subject to the approval of the Unitholders, in accordance with the Trust Deed and provisions of applicable law, the Trustee, in consultation with the Investment Manager, may at any time during the life of the InvIT make in-specie distributions of the assets of the Trust on such terms and conditions and in such manner that is in accordance with the Trust Deed, the Investment Management Agreement, the Project Implementation and Management Agreement and other documents for the purpose of the Trust (including the offer documents) and applicable law.

Distributions made by the Trust

The table below provides the Distributions made by the Trust, in accordance with the Distribution Policy in the last three financial years and for the period from April 1, 2024 to the date of this Preliminary Placement Document.

S. No.	Financial Year/Period ended	Distribution made per Unit	Nature of Distribution
1.	Fiscal 2022*	Rs 0.79**	Refer** note below
2.	Fiscal 2023	Rs 6.3714***	Refer*** note below
3.	Fiscal 2024	Rs 6.603****	Refer**** note below
4.	For the period from April 1, 2024 to December 31, 2024	Rs 5.624*****	Refer***** note below
5.	For the period from January 1, 2025 to February 28, 2025	1.652******	Refer****** note below

* *from the date of listing of the Trust on the Stock Exchanges, i.e. November 10, 2021.*

** *The distribution of Rs. 0.79 per unit comprises of Rs. 0.71 per unit as interest pass through, Rs. 0.08 per unit as other income on surplus funds at Trust.*

*** *The distribution of Rs. 6.3714 per unit comprises of Rs. 6.3108 per unit as interest pass through, Rs. 0.0606 per unit as other income on surplus funds at Trust.*

**** *The distribution of Rs. 6.603 per unit comprises of Rs. 6.502 per unit as interest pass through, Rs. 0.101 per unit as other income on surplus funds at Trust.*

***** *The distribution of Rs. 5.624 per unit comprises of Rs. 5.588 per unit as interest pass through, Rs. 0.036 per unit as other income on surplus funds at Trust.*

****** *The distribution of Rs. 1.652 per unit comprises of Rs. 1.644 per unit as interest pass through, Rs. 0.008 per unit as other income on surplus funds at Trust, which has been announced but pending for distribution till the date of this preliminary placement document.*

RELATED PARTY TRANSACTIONS

In terms of Regulation 2(1)(zv) of the SEBI InvIT Regulations, related party shall be as defined as under the Companies Act, 2013 or under the applicable accounting standards and shall also include: (i) Parties to the InvIT; and (ii) promoters, directors, members and partners of the Parties to the InvIT. Further, related parties also include such persons and entities as defined in terms of the applicable accounting standards, being Ind AS 24 on "Related Party Disclosures" in relation to related party transactions (collectively, "**Related Parties**").

For further details in relation to the related party transactions for the six month period ended September 30, 2024 and Financial Years ended March 31, 2024, 2023 and 2022 as per Ind AS 24 read with the SEBI InvIT Regulations, see 'Audited Financial Information' enclosed as Annexure A. The Parties to the InvIT, may, from time to time, enter into related party transactions, in accordance with applicable law.

Present and On-going Related Party Transactions

A number of present and on-going transactions with certain related parties have been, or will be, entered into in relation to the Trust. The Trustee and the Investment Manager confirm that the following related party transactions have been, or shall be, entered into, on an arm's length basis in accordance with the relevant accounting standards, in the best interest of the Unitholders, consistent with:

A. Concession Agreement

Please see the section entitled "*Summary of the Concession Agreements*" on page 293 for a description of the terms of the Concession Agreements.

B. Amended and Restated Project Implementation and Management Agreement

Please see the section entitled "*Parties to the Trust –Key Terms of the Amended and Restated Project Implementation and Management Agreement*" on page 96 for a description of the terms of the Amended and Restated Project Implementation and Management Agreement

C. Transitional Support Agreement

The Sponsor, Project Manager and the Project SPV have entered into a transitional support agreement dated March 13, 2025, for the purpose of the Sponsor providing the transitional support to (i) the Project Manager in respect of its obligations under the Project Implementation and Management Agreement, and (ii) the Target Toll Roads in respect of its O&M obligations and tolling obligations (as provided under the R4 Concession Agreements). The terms and conditions of the transitional support agreement shall, in respect of each R4 Concession Agreement and the Project Implementation and Management Agreement, be effective and binding on the Parties (i) for a period of 6 (six) months for all Target Toll Roads except Gandhidham (Kandla) to Mundra Port Project, for which the period will be of 12 months, commencing from the appointed date of the respective Concession Agreements, unless terminated earlier by mutual consent. As per the transitional support agreement, the Sponsor's fee for the services provided under the transitional support agreement shall be such amount as may be mutually agreed amongst Sponsor, Project Manager and the Project SPV.

D. Trust Deed

Please see the section entitled "*Parties to the Trust – Key terms of the Trust Deed*" on page 76 for a description of the terms of the Trust Deed

E. Investment Management Agreement

Please see the section entitled "*Parties to the Trust – Key terms of the Investment Management Agreement*" on page 87 for a description of the terms of the Investment Management Agreement

Details of Related Party Transactions

(*₹ in lakhs*)

S. No.	Name of Entity	Particulars	For the period ended March 31, 2024	For the period ended March 31, 2023	For the period ended March 31, 2022
1.	National Highways Infra Investment Managers Private Limited (NHIIMPL)	Payment of Investment Manager Fee	1,800.00	1,491.17	1,931.71
		Advance Investment Manger Fee	4.93	86.06	-
		Expenses incurred by NHIIMPL on behalf of NHIT	15.35	39.79	214.80

S. No.	Name of Entity	Particulars	For the period ended March 31, 2024	For the period ended March 31, 2023	For the period ended March 31, 2022
		Expenses incurred on behalf of NEPPL by NHIIMPL	25.00	-	
		Other Support Services to NWPPL	22.96	3.12	-
		Reimbursement of expenses	-	0.07	-
		Expenses incurred by NWPPL for NHIIMPL	0.65		
2.	National Highways Authority of India (NHAI)	Reimbursement of Pre-Issue expenses of NHIT by NHAI	-	-	578.02
		Purchase of equity shares of Project SPV (NWPPL) by the Trust from NHAI	-	-	10,153.52
		Issue of units of Trust to NHAI	109,081.07	21,366.83	96,556.00
		Interest and Other Income Distribution	8,641.92	5,589.34	-
		O & M Expenses	96.03	1,152.32	-
		Payment for acquiring intangible assets	-	2,84,966.66	7,35,040.00
		Double Toll Fee	528.00	679.17	-
		Reimbursement for Initial Improvement Works	3,146.59		
		Independent engineers fee	228.56	345.38	-
3.	National Highways InvIT Project Managers Private Limited (NHIPMPL)	Project Managers Fees	1,168.20	991.20	290.43
	IDBI Bank Limited	Secured Loan given to NHIT	10,000.00	-	-
		Interest Expense incurred on Loan given to NHIT	4.38	-	-
		Repayment of Principal Amount	0.00	-	-
		Loan Processing Fees Paid to them	41.30	-	-
4.	IDBI Trusteeship Services Limited	Payment of Trustee Fee	9.60	12.73	12.15
		Other fees related to Round 1 & 2 assets	1.50	3.54	-
		Other Fees related to Round 3 Assets.	17.58	-	-
	Mr. Suresh Krishan Goyal	Reimbursement of expenses	0.79	0.39	-
	Mr. MP Sharma	Director's Sitting Fees	8.00	6.40	-
	Mr. Shailendra Narain Roy	Director's Sitting Fees	8.00	6.40	-
	Mr. Ajanta Sen	Short Term Employment Benefit	-	1.84	1.76
	Mr. Arun Kumar Jha	Short Term Employment Benefit	69.35	-	-
	Mr. Arun Kumar Jha	Reimbursement of expenses	3.31	-	-
	Mr. Bhanu Sharma (CS)	Short Term Employment Benefit	7.49	3.91	-
	Mr. Bhanu Sharma (CS)	Reimbursement of expenses	0.47	-	-
	Ms. Aashima Agarwal (CS)	Short Term Employment Benefit	6.28	-	-
	Ms. Aashima Agarwal (CS)	Reimbursement of expenses	0.58	-	-

***Note**: For further details in relation to the Related Party Transactions of the Trust, please refer to the "Audited Financial Information" enclosed as Annexure A.*

For details about RPT for half yearly ended as of September 30, 2024, please the below table:

S no.	Name of entity	Particulars	Half Year ended Sep 30, 2024
1.	National Highways Infra Investment Managers Private Limited (NHIIMPL)	Investment Manager Fee	990.00
		Expense incurred by NHIIMPL on behalf of NHIT	0.37
		Interest cost Reimbursement	0.03

		Expenses incurred on behalf of NEPPL by NHIIMPL	9.97
		Other Support Services to NWPPL	47.62
2.	National Highways Authority of India (NHAI)		
		Interest and other income distribution	5,097.11
		O & M Expenses	48.98
		Double toll fees	306.72
		Reimbursement for Initial Improvement Works	19,020.34
		Independent engineers fees	175.86
3.	IDBI Trusteeship Services Limited (ITSL)	Trustee Fee	4.80
		Other Fees related to Proposed Bonds Issuance	1.77
4.	IDBI Bank Limited	Secured Loan given to NHIT	1,078.00
		Interest Expense incurred on Loan given to NHIT	412.55
		Repayment of Principal Amount	122.78
5.	National Highways InVIT Project Managers Private Limited (NHIPMPL)	Project Manager Fees for NWPPL	318.60
		Project Manager Fees for NEPPL	389.40
6.	Mr. MP Sharma	Director's Sitting Fees	6.61
	Mr. Shailendra Narain Roy	Director's Sitting Fees	6.61
	Mr. Arun Kumar Jha	Short Term Employment Benefit	50.88
	Mr. Arun Kumar Jha	Reimbursement of expenses	0.25
	Mr. Bhanu Sharma (CS)	Short Term Employment Benefit	0.89
	Mr. Bhanu Sharma (CS)	Long Term Employment Benefit	0.43
	Ms. Aashima Agarwal (CS)	Short Term Employment Benefit	4.50
	Ms. Aashima Agarwal (CS)	Reimbursement of expenses	0.05

REGULATIONS AND POLICIES

The following description is a summary of certain sector specific laws currently in force in India, which are applicable to the operations of the Trust and the Project SPVs. The information detailed in this section has been obtained from statutes, regulations, sector-specific policies and publications available in the public domain. The description below may not be exhaustive, and is only intended to provide general information and is neither designed as, nor intended to substitute, professional legal advice. The information in this section is based on the current provisions of applicable law that are subject to change or modification by subsequent legislative, regulatory, administrative or judicial decisions in India. For information regarding regulatory approvals obtained by the Project SPVs, please see the section titled "Regulatory Approvals" on page 407.

Laws Relating to the Business and Operations of the Trust and the Project SPVs

The regulatory framework in India in the highways sector, implemented on a public-private partnership ("**PPP**") basis, mainly derives its source from the primary legislations of National Highways Authority of India Act, 1988 (the "**NHAI Act**") and the National Highways Act, 1956 (the "**NH Act**") enacted by the Indian parliament, each as amended or supplemented.

The National Highways Act, 1956

The policy of the MoRTH, in implementing the NH Act, is to vest the MoRTH with the power to declare a national highway and for acquisition of land for this purpose. The GoI, by notification, can declare the intention to acquire any land for a 'public purpose' as envisaged by the law and such land can be used for the purposes of building, maintenance and operation of the declared national highways throughout the country. The NH Act prescribes the procedure for such land acquisition. The procedure includes, *inter alia*, a declaration of an intention to acquire, entering and inspecting such land, hearing of objections, a declaration of the acquisition and the power to take possession. The NH Act also provides for payment of compensation to owners and any other person whose right of enjoyment or ownership in the land has been affected. The NH Act vests MoRTH with the power to appoint a competent authority for the effective implementation of the NH Act and its policies. The said appointed authority retains the right and power to (a) survey, make any inspection, valuation or enquiry; (b) take levels; (c) dig or bore into sub-soil; (d) set out boundaries and intended lines of work; € mark such levels, boundaries and lines placing marks and cutting trenches; or (f) do such other acts or things as may be laid down by rules made in this behalf by that government. All the notified national highways shall vest in the name of the Union and for the purposes, shall include all lands appurtenant thereto and all the bridges, culverts, tunnels and other enlisted constructions under the said NH Act. The Central Government shall assume the responsibility of maintaining and construction of national highways in proper condition in accordance to the law. The Central Government also retains the right to levy fee over the services and benefits rendered in relation to the use of such national highways.

The GoI is responsible for the development and maintenance of national highways. However, it may direct that such functions may also be exercised by the government of a state in which the highway is located or by any officer or authority subordinate to the GoI or to the state government. Further, the GoI has the power to enter into an agreement with any person for the development and maintenance of a part or whole of the highway. Such person would have the right to collect and retain fees at such rates as may be notified by the GoI and will also have the powers to regulate and control the traffic, for proper management of the highway, in accordance with the provisions of the Motor Vehicles Act, 1988, as amended. The GoI also has the power to make rules for carrying out the purposes of the NH Act.

The National Highways (Amendment) Act, 2017, entails the competent authority to issue reports to the Central Government in respect of any land (either acquired or proposed to be acquired) which is, either under incorrect revenue record or which is not required due to change in geometry or alignment of the construction, to issue order for the de-notification of such land from the acquisition for development and maintenance of the national highway. In pursuance of the foregoing amendment to the statute, the National Highways Rules, 1957, have been amended to ensure the exercise of the power under the NH Act. These rules provide for periodic regulatory compliance and reporting standards to be followed by the competent authority in reporting to the Central Government.

The National Highways Authority of India Act, 1988

The NHAI Act was enacted in pursuance of the powers of the Central Government for appointing a competent authority under the NH Act and provides for the constitution of an authority for the development, maintenance and management of national highways and for matters connected therewith or incidental thereto. In accordance with the NHAI Act, the GoI carries out development and maintenance of the national highways through NHAI. Subject to the provisions of the NHAI Act, the NHAI has the power to enter into and perform any contract necessary for the discharge of its functions. The NHAI has the power to acquire any land to discharge its functions, and such acquired land will be deemed to be land needed for a 'public purpose'. The NHAI Act prescribes a limit in relation to the value of the contracts that may be entered into by NHAI. However, the NHAI may enter into contracts exceeding the specified value, on obtaining prior approval of the GoI. The NHAI Act provides that the contracts for acquisition, sale, or lease of immovable property on behalf of the NHAI cannot exceed a term of 30 years unless previously approved by the GoI. NHAI's objective is to ensure that all contract awards and procurements conform to the best industry practices with regard to transparency of process, adoption of bid

criteria to ensure healthy competition in award of contracts. In accordance with the NHAI Act, the NHAI shall consist of a full time chairman, not more than six full time members and not more than six part time members who are being appointed by the Central Government. Additionally, various project implementation units headed by project director have been set at various sites to oversee timely completion of the projects.

In view of the challenging task of construction, development, and management of national highways being undertaken by NHAI, the Committee on Public Undertakings selected the subject "National Highways Authority of India (NHAI)" for comprehensive examination and report. The National Highways Authority of India (Amendment) Act, 2013, received the assent of the President of India on September 10, 2013, and aimed at increasing the institutional capacity of NHAI to help execute the powers delegated to it. National Highways Development Project ("**NHDP**") was launched in 1998 with the objective of developing roads of international standards which facilitate smooth flow of traffic. The NHDP envisages creation of roads with enhanced safety features, better riding surface, grade separator and other salient features.

As per the NHAI Works Manual, 2006, NHAI's mandate is the time and cost bound implementation of the NHDP. The sources of finance available to the NHAI include fund assistance from external funding agencies like the International Bank of Reconstruction and Development and the Asian Development Bank. NHAI's role encompasses involving the private sector in provision, maintenance, and operation of the national highways.

Financing of the NHDP

The GoI, under the Central Road and Infrastructure Fund Act, 2000 created a fund which is required to be utilized for the development and maintenance of national highways (the "**Central Road Fund**"). Section 18 of the NHAI Act also provides for the creation of a separate NHAI Fund. Any capital grant or aid received, loan taken, borrowing made, or any other sum received by the NHAI is credited to the NHAI Fund. Certain sources for financing of the NHDP are through dedicated accruals under the Central Road Fund by levy of cess on fuel as well as involving the private sector and encouraging public private partnerships. The NHDP is also financed through long-term external loans from the International Bank of Reconstruction and Development, the Asian Development Bank and the Japan Bank for International Cooperation as well as through tolling of roads for different projects undertaken by the NHAI.

Private Participation in NHDP

In an effort to attract private sector participation in the NHDP, the NHAI has issued model concession agreements ("**MCAs**") which have been formulated by Planning Commission of India or NITI Aayog and other departments of Central Government where a private entity, being the concessionaire, is, through an international competitive bidding process, awarded a concession (in form of a license) to build, own, operate and collect toll on a highway for a specified period of time. The concession to develop highway projects is given by the NHAI or other governmental authorities under various models of PPP like:

(i) Build, Operate, Transfer (BOT)/ Design, Build, Finance, Operate and Transfer (DBFOT) – In this model, the entire designing, financing and construction is undertaken by the concessionaire at its own cost. The concessionaire is entitled to collect toll or receive annuity payments from the NHAI, as the case may be, during the concession period after the construction of the highway project. The bid for the project may either be selected basis the lowest grant wanted by the private developer from the NHAI or the highest premium the private developer is willing to pay to NHAI, in the form of additional concession fee. The concessionaire at the end of the concession period transfers the highway project to the NHAI (free of charge and clear of all encumbrances). The concessionaire's investment in the highway project is recovered directly through user fees collected by way of tolls. Under the BOT model, the projects which are generally not viable based on toll revenue alone, the NHAI or the relevant governmental authority provides concessionaire with a capital grant upto certain percentage of the project cost to increase the viability of projects and the quantum of such grant is determined on a case to case basis. For certain projects with high traffic volumes, concessionaire also offers a negative grant (i.e., premium) to the NHAI.

(ii) Hybrid Annuity Model (HAM) – In this model, the NHAI or the relevant governmental authority invests 40% (forty percent) of the construction cost of the project in (five) equal instalments and the balance amount is infused by the private developer. The private developer recovers his investment in the form of annuity payments received by it over a period of 15 (fifteen) years. Additionally, there is no revenue risk for the private developer under HAM model because the toll is collected by the NHAI or relevant governmental authorities unlike the BOT model where the private developer collects it.

(iii) Toll, Operate and Transfer (TOT) – In this model, the road projects which are in operational phase are awarded by the NHAI or relevant governmental authorities to the concessionaire. The NHAI passes on the toll collection rights and operation and maintenance obligations to the concessionaire against payment of upfront concession fees quoted by the concessionaire as a part of the bidding process.

The bidding for the projects takes place in two stages as per the process provided below:

1. in the qualification (RFQ) stage, the NHAI selects certain applicants on the basis of technical and financial expertise, prior experience in implementing similar projects and previous track record; and

2. in the proposal (RFP) stage, the NHAI invites financial bids from the applicants qualified at the RFQ stage on the basis of which the concession is awarded to the successful bidder by the NHAI for implementation of the project.

Exit Policy

The CCEA in May 2015 approved a comprehensive exit policy framework with the objective to mobilize funds in the market. In pursuance thereto, NHAI, vide Circular No. NHAI/1103/CGM(FA)/4/2015 dated June 9, 2015 permitted divestment of 100% equity by concessionaires/developers after two years of completion of construction to facilitate unlocking of funds for new infrastructure projects. The equity divested is required to be invested by promoters in their new projects. This comprehensive exit policy framework is expected to harmonize certain conditions across all concessions signed prior to 2009 with the policy framework for post 2009 contracts which permit divestment of equity up to 100%, two years after completion of construction. In line with the spirit of quoted circular, the NHAI issued another circular dated September 9, 2015 followed by the circular dated November 19, 2015, on the same subject, allowing the promoter to use the proceeds from the sale of divested equity of the concessionaire in one or more of the following:

(i) to reinvest in incomplete NHAI projects;

(ii) To reinvest any other highway projects;

(iii) any other power sector projects; or

(iv) to retire their debt to financial institutions in any other infrastructure projects.

Relaxation in the 'change in ownership' clause in Hybrid Annuity Model (HAM) projects

The MoRTH, *vide* circular dated November 10, 2020 and November 27, 2020, read along with the NHAI circular dated December 31, 2020, amended the MCAs in respect of project implemented under the HAM model, and permitted the selected bidder/consortium members, for the new as well as subsisting national highways project under the HAM-model, to dilute their equity six months after COD is achieved for the respective project.

Rationalized Compensation

The CCEA in November 2015 approved a policy for rationalized compensation to concessionaires for languishing national highway projects in BOT mode for delays that are not attributable to the concessionaires. Under the policy, the NHAI is authorized to allow an extension of the concession period for BOT (Toll) projects while the tenure for the operations period as envisaged originally in the concession agreement may remain unchanged which would result in a corresponding increase in concession period. The NHAI has also been authorised to pay compensatory annuities to the concessionaire corresponding to the actual period of delay that is not attributable to the concessionaire upon successful completion of the project.

One Time Fund Infusion Scheme

The CCEA in October 2015 gave its approval to the NHAI for a one-time infusion of funds with the purpose of reviving and physically completing stalled projects in the advanced stages of completion. As per the policy, the amount of funds required in each case shall be approved by NHAI on a case to case basis.

Bidder Information

MoRTH has developed the Bidder Information Management System ("**BIMS**") to streamline the process of pre-qualification of bidders for EPC mode of contracts for all national highway works, with enhanced transparency and objectivity. BIMS works as a data base of bidder information that covers basic details, civil works experience, cash accruals and network, and annual turnover so that bidders' pre-qualification can be assessed based on evaluation parameters like threshold capacity and bid capacity from already stored data and the technical evaluation can be carried out in a faster manner.

Land Acquisition

While land is acquired for national highway projects under the NH Act, the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (the "**Land Acquisition Act**") must also be complied with. MoRTH has issued comprehensive guidelines on land acquisition for national highways taking into account the applicability of the Land Acquisition Act.

Arbitral Awards

CCEA on August 31, 2016 approved various measures to revive the construction sector. An office memorandum dated September 5, 2016 was issued by the National Institute for Transforming India with certain proposals. On November 20, 2019, the CCEA approved certain proposals in relation to the arbitrations by or against government entities, for the effective implementation of the CCEA's decision on August 31, 2016 on its initiatives to revive the construction sector. Initially, the CCEA had approved the proposal that government agencies will be required to pay 75% of the arbitral award to the

concessionaire against a bank guarantee, in cases where the award already announced is challenged. However, pursuant to a press release dated November 20, 2019, the CCEA approved, inter-alia, that where a government entity has challenged an arbitral award, resultant of which the amount of the arbitral award has not been paid, 75% of such award will be paid by the government entity to the contractor or the concessionaire against a bank guarantee only for the said 75% and not for its interest component. In relation to interest payable to the government entity, if a subsequent court order required the refund of 75% of the amount, the payment of such amounts will be required to be made as per the court orders.

Applicable Rules

As per the NH Act and the NHAI Act, the Central Government is empowered to make rules in order to further the objects of NH Act and NHAI Act. In exercise of such power, the Central Government has framed certain rules which are as follows:

- The National Highways Rules, 1957, as amended;
- National Highways Authority of India (Budget, Accounts Audit, Investment of Funds and Powers to enter Premises) Rules, 1990, as amended;
- The National Highways (Manner of Depositing the Amount by the Central Government with Competent Authority for Acquisition of Land) Rules, 1998;
- The National Highways Tribunal (Procedure for Appointment as Presiding Officer of the Tribunal) Rules, 2003, as amended;
- The Central Road Fund (State Roads) Rules, 2007;
- The National Highways Tribunal (Procedure) Rules 2003;
- National Highways Authority of India (The Term of Office and Other Conditions of Service of Members) Rules, 2003, as amended;
- The National Highways Tribunal (Financial and Administrative Powers) Rules, 2004;
- The National Highways Tribunal (Procedure for Investigation of Misbehaviour or Incapacity of Presiding Officer) Rules, 2003;
- The National Highways Fee (Determination of Rates and Collection) Rules, 2008, as amended;
- The Highway Administration Rules, 2004;
- The National Highways (Collection of Fees by any person for the use of Section of National Highways/Permanent Bridges/Temporary bridge on National Highways) Rules, 1997;
- The National Highways (Fee for the use of National Highways and Permanent Bridge public Funded Project) Rules, 1997; and
- The National Highways (Rate of Fee) Rules, 1997.
- Construction Workers (Regulation of Employment and Conditions of Services) Act, 1996 and Central Rule, 1998
- C.E.A. (Measures Relating to Safety and Electric Supply) Regulations, 2010
- Central Electronical Authority (Measures Relating to Safety and Electric Supply) Regulations, 2020
- Indian Electricity Rules, 1956

Other legislations relevant to the road sector

In addition to the above, there are also certain other legislations that are relevant to the road sector which include the Road Transport Corporation Act, 1950, Central Road and Infrastructure Act, 2000, etc.

Environmental Compliances and Regulations

Infrastructure projects must also ensure compliance with environmental legislations such as the Water (Prevention and Control of Pollution) Act, 1974 ("**Water Pollution Act**"), the Air (Prevention and Control of Pollution) Act, 1981 ("**Air Pollution Act**") and the Environment Protection Act, 1986 ("**Environment Act**", together with the Water Pollution Act and the Air Pollution Act, the "**Environment Protection Acts**"). The Water Pollution Act aims to prevent and control water pollution. This legislation provides for the constitution of a central pollution control board ("**Central Pollution Control Board**" or "**CPCB**") at the Central level and state pollution control boards ("**State Pollution Control Boards**"

or "**SPCBs**", together with the Central Pollution Control Board, the "**PCBs**") at the State levels. The functions of the CPCB includes, among other things, coordination of activities of the SPCBs, collecting data relating to water pollution and the measures devised for the prevention and control of water pollution and prescription of standards for streams or wells. The SPCBs are responsible for, among other things, the planning for programmes for prevention and control of pollution of streams and wells, collecting and disseminating information relating to water pollution and its prevention and control, inspection of sewage or trade effluents, works and plants for their treatment and to review the specifications and data relating to plants set up for treatment and purification of water, laying down or annulling the effluent standards for trade effluents and for the quality of the receiving waters, and laying down standards for treatment of trade effluents to be discharged. These authorities issue consent to establish and consent to operate which are to be required to be renewed periodically. These authorities also have the power of search, seizure and investigation if the authorities are aware of or suspect violation of such regulations. This legislation prohibits any person from establishing any industry, operation or process or any treatment and disposal system, which is likely to discharge trade effluent into a stream, well or sewer, or bring into use any new or altered outlet for discharge of sewage, or begin to make any new discharge of sewage without taking prior consent of the SPCBs.

In context of the environmental compliances and regulations, the National Green Tribunal Act, 2010 (the "**NGT Act**") is an important legislation which provides for the establishment of a National Green Tribunal ("**NGT**") for the effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto. In accordance with the Forest (Conservation) Act, 1980, state governments are not permitted to make any order directing the use of forest land for a non-forest purpose, or assignment of any forest land through lease or otherwise to any private person or corporation without the approval of the GoI. The Ministry of Environment, Forest and Climate Change ("**MoEF**") mandates the Environment Impact Assessment ("**EIA**") must be conducted for specified projects. In the process, the MoEF receives proposals or the setting up of projects and assesses their impact on the environment before granting clearances to the projects. The EIA Notification S.O. 1533, issued on September 14, 2006 (the "**EIA Notification**") and amended from time to time, under the provisions of the Environment Protection Act, prescribes that new construction of specified projects require prior environmental clearance from the MoEF. The environment clearance must be obtained from MoEF according to the procedure specified in the EIA Notification. No construction work or preparation of land by the project management except for securing the land, relating to the setting up of a specified project can be undertaken until such clearance is obtained. Under the EIA Notification, the environmental clearance process for new projects consists of four stages – screening, scoping, public consultation and appraisal. After completion of public consultation, the applicant is required to make appropriate changes in the draft 'EIA Report' and the 'Environment Management Plan.' The final EIA Report has to be submitted to the concerned regulatory authority for appraisal. The regulatory authority is required to give its decision within 105 days of the receipt of the final EIA Report. The EIA Guidance Manual for Highways, 2010 explains the four stages of the environmental clearance process and the contents of the EIA Report required to be submitted by highway projects.

Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016

The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, impose an obligation and duty on the owners and operators of any facility or industry with a capability to create hazardous materials to safely dispose of such material in transport and other means of collecting and storing. Each occupier and operator of any facility generating hazardous waste is required to obtain an approval from the relevant state pollution control board for collecting, storing and treating the hazardous waste.

Green Highways (Plantation, Transplantation, Beautification and Maintenance) Policy, 2015

In September 2015, MoRTH has launched Green Highways (Plantation, Transplantation, Beautification and Maintenance) Policy, 2015, which will require road developers to earmark 1% of a project's total cost for planting of trees and shrubs along the national highways. Under this policy, the maintenance of such plantations will be outsourced through a bidding process to plantation agencies. MoRTH/NHAI will appoint the authorized agency for empanelment of such plantation agencies.

Public Liability Insurance Act, 1991

The Public Liability Insurance Act, 1991 (the "**Public Liability Act**"), imposes liability on the owner or controller of hazardous substances for any damage arising out of an accident involving such hazardous substances. A list of 'hazardous substances' covered by the legislation has been enumerated by the GoI by way of a notification. The owner or handler is also required to take out an insurance policy insuring against liability under the legislation. The rules made under the Public Liability Act mandate that the employer has to contribute towards the Environment Relief Fund, a sum equal to the premium paid on the insurance policies. This amount is payable to the insurer.

Other applicable law

The Motor Vehicles Act, 1988

The development, maintenance and management as well as control of the National Highways are regulated by the NH Act and the NHAI Act. Under the Motor Vehicles Act, 1988, some powers have been delegated to the Transport Department

of the State Governments. Section 138 of the Motor Vehicles Act, 1988 further empowers the State Governments to make rules for the control of traffic, including for the purpose of the removal and the safe custody of vehicles including their loads which have broken down or which have been left standing or have been abandoned on roads; the installation and use of weighing devices; the maintenance and management of wayside amenities complexes; the exemption from all or any of the provisions of relating to fire brigade vehicles, ambulances and other special classes or descriptions of vehicle, subject to such conditions as may be prescribed; the maintenance and management of parking places and stands and the fee, if any, which may be charged for their use; prohibiting the taking hold of or mounting of a motor vehicle in motion; prohibiting the use of foot-paths or pavements by motor vehicles, generally, the prevention of danger, injury or annoyance to the public or any person, or of danger or injury to property or of obstruction to traffic. The Motor Vehicles (Amendment) Act, 2019 is targeted towards bringing changes in the transport sector to encourage safer driving practices among Indian motor vehicle drivers. The draft for the amendment was put forward in the lower house of the Parliament, with a proposal to impose strict fines on the violators of traffic rules. The Act proposes to create a National Road Safety Board to be created by the Central Government through a notification. The Board will advise the Central and State governments on all aspects of road safety and traffic management.

Indian Trusts Act, 1882

The Indian Trusts Act, 1882 ("**Trusts Act**") governs all private trusts in India. The Trusts Act sets out the purpose for which private trusts can be established, the manner in which they may be created, executed and extinguished. The person creating a trust under the Trusts Act is the author of such trust, the person to whom the author grants the power and authority to regulate the trust is the trustee and the persons for whose benefit such trust has been created are the beneficiaries of such trust. The Trust Act sets out the rights, duties, liabilities and powers of the trustees and the beneficiaries *vis-a-vis* the trust. The Trust has been settled in accordance with the provisions of the Trusts Act.

Control of National Highways (Land and Traffic) Act, 2002

The Control of National Highways (Land and Traffic) Act, 2002 (the "**Control of NH Act**") provides for control of land within national highways, right of way and traffic moving on national highways and also for removal of unauthorised occupation thereon.

In accordance with the provisions of the Control of NH Act, the Central Government has established Highway Administrations. Under the Control of NH Act, all land that forms part of a highway which vests in the Central Government, or that which does not already vest in the Central Government but has been acquired for the purpose of highways shall be deemed to be the property of the Central Government. The Control of NH Act prohibits any person from occupying any highway land or discharging any material through on such land without the permission of the Highway Administration or any officer authorised by such administration. The Control of NH Act permits the grant of lease and license for use of highway land for temporary use.

Indian Tolls Act, 1851

In accordance with the Indian Tolls Act, 1851 (the "**Tolls Act**"), the state governments have been vested with the power to levy tolls at such rates as they deem fit, to be levied upon any road or bridge, made or repaired at the expense of the Central or any state government. The tolls levied under the Tolls Act, are deemed to be 'public revenue' and the collection of tolls can be placed under any person the State governments' deem fit. Such persons are enjoined with the same responsibilities as if they were employed in the collection of land revenue. Further, all police officers are bound to assist the toll collectors when required in the implementation of the Tolls Act. The Tolls Act further gives power for recovery of toll and exempts certain category of people from payment of toll.

National Highways Fee (Determination of Rates and Collection) Rules, 2008

The National Highways Fee (Determination of Rates and Collection) Rules, 2008 (the "**NH Fee Rules**"), regulates the collection of fee for the use of national highways. In accordance with the NH Fee Rules, the GoI may, by a notification, levy fee for use of any section of a national highway, permanent bridge, bypass or tunnel forming part of a national highway, as the case may be. However, the GoI may, by notification, exempt any section of a national highway, permanent bridge, bypass or tunnel constructed through a public funded project from levy of such fee. The NH Fee Rules supersede the National Highways (Temporary Bridges) Rules, 1964, the National Highways (Collection of Fees by any Person for the Use of Section of National Highways/ Permanent Bridge/ Temporary Bridge on National Highways) Rules, 1997, the National Highways (Fees for the use of National Highways Section and Permanent Bridges Public Funded Project) Rules, 1997 and the National Highways (Rate of Fees) Rules, 1997 other than in respect of things done or omitted to be done under such rules prior to supersession. The NH Fee Rules do not apply to agreements and contracts executed or bids invited prior to the publication of such rules i.e. prior to December 5, 2008. The collection of fee in case of a public funded project shall commence within 45 days from the date of completion of the project. The NH Fee Rules further provide for the base rate of fee applicable for the use of a section of the national highway for different categories of vehicles and the fees collected by the executing authority shall be remitted to the GoI. However, the GoI may, by notification, allow any or all of the executing authorities to appropriate the whole, or part of such fees for purposes as may be specified.

FASTag lanes on fee plazas is an initiative of the GoI in which there is an exclusive lane in the fee plaza for movement of vehicles fitted with FASTag. The FASTag is a device which is fitted on the front windscreen of vehicles to indicate online

toll payment. The amended NH Fee Rules impose a penalty equivalent to two times the fee applicable if a vehicle not fitted with FASTag enters the exclusive FASTag lane. However, in case a user is unable to pay, due to malfunctioning electronic toll collection infrastructure, the user will be permitted to pass the fee plaza without payment. The NH Fee rules were also amended to provide that the driver or owner of a mechanical vehicle which is loaded in excess of permissible load specified for its category, (i) shall be liable to pay fee at such rate which is applicable for the next higher category of mechanical vehicles, and (ii) Payment of such fee shall not entitle the driver or owner, to use the national highway until the excess load has been remove from such mechanical vehicle. However, in case no weighbridge has been installed at the toll plaza, no fee for overloading shall be levied.

The National Highways Rules, 1957 (the "NH Rules")

The NH Rules provide that in situations where the estimate cost of the execution of any original work on a national highway exceeds ₹ 1,000,000, a detailed estimated of the cost is to be forwarded to the GoI. An application for allotment of funds for meeting expenditure on an original work on a national highway must also be made to the GoI. The executing agency of the highway is required to furnish monthly progress reports and a completion report on the conclusion of the work. The NH Rules also give the consulting engineer of the GoI the right to inspect the work while it is in progress or after completion. Provisions under the Constitution of India and other legislations in relation to collection of toll Entry 59, List II of Schedule VII read with Article 246 of the Constitution of India vests state governments with the power to levy tolls. Further, in accordance with the Tolls Act, state governments have been vested with the power to levy tolls at such rates as they deem fit.

National Monetisation Pipeline (NMP)

NITI Aayog has developed the pipeline, in consultation with infrastructure line ministries, based on the mandate for 'Asset Monetisation' for roads and highways, amongst others, under Union Budget 2021-22. The framework for monetisation of core asset monetisation has three key imperatives: (i) monetization of 'rights' not 'ownership' i.e. assets will be handed back to the government at the end of transaction life; (ii) brownfield de-risked assets and stable revenue streams; and (iii) structured partnerships under defined contractual frameworks with strict performance standards. This shall include selection of de-risked and brownfield assets with stable revenue generation profile with the overall transaction structured around revenue rights. The primary ownership of the assets under these structures shall be with the government.

Foreign Investment Regulations

Foreign investment in Indian securities is governed by the provisions of the FEMA, read with the applicable FEMA Rules, the FEMA (Mode of payment and Reporting of Non-Debt Instruments) Regulations, 2019 and the consolidated FDI Policy issued by the Department for Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, Government. Foreign investment is permitted (except in the prohibited sectors) either through the automatic route or the approval route, depending upon the sector in which foreign investment is sought to be made. Under the FEMA Rules and the current consolidated FDI Policy, effective from October 15, 2020, an infrastructure investment trust registered and regulated by the SEBI under the InvIT Regulations, being an 'investment vehicle', is permitted to receive foreign investment from a person resident outside India (subject to Press Note 3 (2020 series)), including an FPI or an NRI subject to the terms and conditions specified in the FEMA Rules.

Downstream investment by an infrastructure investment trust shall be regarded as indirect foreign investment if neither the sponsor nor the investment manager of such an infrastructure investment trust is Indian 'owned and controlled' as defined in FEMA Rules.

Downstream investment by an 'investment vehicle' shall have to conform to the sectoral caps and conditions/restrictions, if any, as applicable to the company in which the downstream investment is made as per the FDI Policy. Foreign investment of up to 100% through the automatic route is permitted in the infrastructure sector in India. An infrastructure investment trust that receives foreign investment shall be required to make such report and in such format to the RBI or to the SEBI as may be prescribed by them from time to time.

The payment for the units of an infrastructure investment trust acquired by a person resident or registered/ incorporated outside India shall be made by an inward remittance from abroad through banking channels or by way of swap of shares of an SPV, or out of funds held in a Non-resident External ("**NRE**") or Foreign Currency Non-resident Bank ("**FCNR(B)"**) account maintained in accordance with the Foreign Exchange Management (Deposit) Regulations, 2016.

Further, any person who is a non-resident and holds units of an infrastructure investment trust in accordance with the FEMA Rules may pledge such units (i) in favour of a bank in India to secure the credit facilities being extended to the Indian company for bona fide purposes; (ii) in favour of an overseas bank to secure the credit facilities being extended to the person, or a person resident outside India who is the promoter of the Indian company or the overseas group company of the Indian company; (iii) in favour of a Non-Banking Financial Company registered with the RBI to secure credit facilities being extended to the Indian company for bona fide purposes; and (iv) subject to the authorized dealer bank satisfying itself of the compliance of the conditions stipulated by the RBI in this regard.

Other Laws and Regulations

In addition to the aforementioned, the other laws and regulations that may be applicable to the Trust and the Project SPVs include the following:

- *Factories Act, 1948*[*]
- *The Contract Labour (Regulation and Abolition) Act, 1970*[*]
- *The Child Labour (Prohibition and Regulation) Act, 1986*
- *The Employees' Compensation Act, 1923*[**]
- *The Employees' State Insurance Act, 1948*[**]
- *The Employee's Provident Fund and Miscellaneous Provisions Act, 1952*[**]
- *The Equal Remuneration Act, 1976*[***]
- *The Maternity Benefit Act, 1961*[**]
- *The Minimum Wages Act, 1948*[***]
- *The Payment of Gratuity Act, 1972*[**]
- *The Payment of Bonus Act, 1965*[***]
- *The Payment of Wages Act, 1936*[***]
- *The Sexual Harassment of Women at Workplace (Prevention, Prohibition, and Redressal) Act, 2013*
- *Industrial Disputes Act, 1917*
- *Shops and Commercial Establishments Acts, where applicable*

[*] *The Occupational Safety, Health and Working Conditions Code, 2020 (enacted by the Parliament of India and assented to by the President of India on September 28, 2020) will come into force on such date as may be notified in the official gazette by the Central Government and different dates may be appointed for different provisions of the Occupational Safety, Health and Working Conditions Code, 2020. Once effective, it will subsume, inter alia, the Factories Act, 1948 and the Contract Labour (Regulation and Abolition) Act, 1970.*

[**] *The Code on Social Security, 2020 (enacted by the Parliament of India and assented to by the President of India on September 28, 2020) has been notified to the extent of Section 142 of the Code and will come into force in its entirety on such date as may be notified in the official gazette by the Central Government and different date may be appointed for different provisions of the Code on Social Security, 2020. Once effective, it will subsume, inter alia, the Employees' Compensation Act, 1923, the Employees' State Insurance Act, 1948, the Employee's Provident Fund and Miscellaneous Provisions Act, 1952, the Maternity Benefit Act, 1961 and the Payment of Gratuity Act, 1972.*

[***] *The Code on Wages, 2019 (enacted by the parliament of India and assented to by the President of India on August 8, 2019) was notified in the official gazette by the Central Government on September 28, 2020 to the extent of the rules governing the constitution and functions of the central advisory board under the Code on Wages once notified and effective in its entirety, it will subsume the Equal Remuneration Act, 1976, the Minimum Wages Act, 1948, the Payment of Bonus Act, 1965 and the Payment of Wages Act, 1936.*

In addition to the above, compliance with the provisions of various tax-related legislations, intellectual-property related legislations and other applicable law for our day-to-day operations is also required.

REGULATORY APPROVALS

Other than as stated in this section, the Trust have obtained necessary consents, licenses, permissions, registrations and approvals from various governmental, statutory and regulatory authorities, required for the registration as an infrastructure investment trust and for carrying out its present business, as applicable.

In view of the approvals listed below, the Trust can undertake the Issue as well as its current business, as applicable, and no further major approvals from any governmental or regulatory authority are required to undertake the Issue or to continue its business, as applicable. Unless otherwise stated, these approvals are all valid as on date of this Preliminary Placement Document.

For details of approvals relating to existing assets of the Trust (other than Target Toll Roads), please see the section entitled "*Regulatory Approvals*" on page 317 of the R3 Placement Document available at Project-Leap-Placement-Document_15.03.2024.pdf (nhit.co.in).

I. Approvals in relation to the Issue

1. In-principle approval from the NSE dated March 17, 2025; and

2. In-principle approval from the BSE dated March 17, 2025.

II. Approvals in respect of the Target Toll Roads

The Sponsor, by way of its letter dated March 12, 2025 has confirmed that it had obtained all the necessary approvals and clearances required for the Target Toll Roads as on the date of the letter.

III. Material Approvals applied for but not yet received

As on the date of the Preliminary Placement Document, there are no material approvals required to be obtained by National Highways Infra Trust, for which applications have been made, but approvals have not been received.

IV. Material Approvals for which applications are yet to be made

As on the date of the Preliminary Placement Document, there are no material approvals required to be obtained by National Highways Infra Trust, for which applications are yet to be made.

V. Material Approvals which have expired and renewal yet to be applied for

Except as stated in this section, there are no material litigations and actions by regulatory authorities, in each case against the Trust, the Project SPVs, the Sponsor, the Sponsor Group, the Investment Manager, the Project Manager and the Trustee as on the date of this Preliminary Placement Document. Further, since (i) the Sponsor is a body corporate whose capital is funded by the Central Government and members are appointed and executive decisions taken by the President of India (acting through the Department of Personnel and Training and MoRTH), and (ii) the President of India is the Promoter of the Investment Manager, persons or entities that may be classified as "associates" of the Sponsor and Investment Manager in terms of Regulation 2(1)(b)(ii) and Regulation 2(1)(b)(iii) of the InvIT Regulations, it has not been identified as 'associates' of the Sponsor and the Investment Manager. Additionally, since the Project Manager is a is a wholly-owned subsidiary of the Sponsor, it has not been identified as 'associates' of the Sponsor and the Investment Manager.

For the purpose of this section, details of all regulatory actions and criminal matters involving the Trust, the Project SPVs, the Sponsor, the Investment Manager, the Project Manager, and the Trustee, that are currently pending, have been disclosed. Further, any matter involving an amount equivalent to, or more than, the amount as disclosed below, in respect of the Trust, the Sponsor, the Investment Manager, the Project Manager and each of their Associates, and the Trustee has been disclosed.

In respect of the Sponsor, the Sponsor Group, all outstanding civil matters which involve an amount exceeding ₹ 5,000 million, have been considered material. All cases where the amount is not ascertainable, but considered material, have been disclosed.

For the Investment Manager, all outstanding civil matters which involve an amount exceeding ₹ 10 million, have been considered material. However, the Investment Manager does not have any outstanding litigation.

For the Project Manager, all outstanding civil matters which involve an amount exceeding ₹ 1 million, have been considered material. However, the Project Manager does not have any outstanding litigation.

For NEPPL, all outstanding civil matters which involve an amount exceeding ₹ 500 million or 5 per cent of the total revenue of NEPPL, as per the latest audited financial statements, whichever is higher have been considered material. However, NEPPL does not have any outstanding litigation.

For NWPPL, all outstanding civil matters which involve an amount exceeding ₹ 500 million or 5 per cent of the total revenue of NWPPL as per its latest annual audited financial statements of the Company, whichever is higher, have been considered material. However, NWPPL does not have any outstanding litigation.

For NSPPL, all outstanding civil matters which involve an amount which is or exceeds 1% of the net-worth of the Trust, as per the latest audited financial statements, have been considered material. However, NSPPL does not have any outstanding litigation.

For the Trustee, all outstanding cases involving the Trustee have been disclosed.

Further, all pending cases, where the amount is not ascertainable but considered material by the Trust, the Sponsor, the Investment Manager, the Project Manager or any of their Associates and the Trustee as on the date of the Preliminary Placement Memorandum have been disclosed. Also, in cases where outcome of one litigation impacts one or more other litigations, which individually are below materiality threshold, but collective above, such cases have also been disclosed.

I. Litigation involving the Trust

There are no pending criminal, regulatory or other material litigations involving the Trust as on the date of the Preliminary Placement Memorandum.

II. Litigation involving Associates of the Trust

As on the date of the Preliminary Placement Memorandum, the Trust does not have any Associate.

III. Litigations involving the Project SPVs

Other than what is disclosed below, there are no pending criminal, regulatory or other material litigations involving the Project SPVs as on the date of the Preliminary Placement Memorandum

Regulatory matters

1. NWPPL received a notice dated June 12, 2023 from the Deputy Registrar of Stamps, Government of Karnataka ("**GOK**") under article 32(A)(i) of the Karnataka Stamp Act, 1957, informing NHIPPL to pay the deficit stamp duty amounting to Rs. 699.00 million on the license agreement entered into between NHIPL with NHAI ("**Concession Agreement**"). Pursuant to receipt of such notice NHIPPL vide letter dated July 4, 2023, sought additional information to ascertain the basis of seeking additional stamp duty on the Concession Agreement. Subsequently, NHIPPL vide letter date July 4, 2023, informed NHAI of receipt of such letter from GOK. NHAI with several letters informed GOK

that the Concession Agreement was adequately stamped and requested them to withdraw all claims. Pursuant to these clarifications GOK reiterated that the NHIPPL was liable to pay the deficit stamp duty amount of Rs. 699.00 million. Further, NHIPPL has with letter dated March 5, 2024 clarified that they are not liable to pay the deficit stamp duty as GOK's reasoning is contrary to the law. The matter is currently pending.

2. A demand notice for alleged deficit stamp duty has been issued by the Department of Stamps and Registration, Office of Deputy Commissioner of Stamps & District Registrar Belagavi, State of Karnataka dated 28.11.2024 to NEPPL. The notice alleges that the stamp duty paid by NEPPL on the Concession Agreement dated 07.03.2024 executed with National Highways Authority of India (**NHAI**) for toll collection, operation, management, and maintenance of the project highway Chitradurga Bypass stretching from Km 0+000 to Km 20+700 km, (ii) Chitradurga-Davanagere from Km 208+000 to Km 260+000, (iii) Davanagere- Haveri from Km 260+000 to 338+923, and (iv) Haveri-Hubli from Km 340+000 to Km 403+000 of NH 48 in the State of Karnataka is insufficient. The department has demanded an additional stamp duty amounting to ₹99,35,32,740. The demand is primarily based on the ground as per article 30(A)(iv) of Karnataka Stamp Act, 1957 which states that if the period of license is more than 10 years and not exceeding 20 years the stamp duty has to be paid at the rate of 2% for every one hundred rupees or part thereof on the total amount or value of the average annual rent, premium, fine and money advance. NEPPL recently submitted a response to the department, asserting, among other points, that the concerned authority must provide a reasonable opportunity to be heard to the affected party before taking any action. A response thereof is currently awaited.

IV. Litigations involving the Associates of the Project SPVs

Please see the section entitled " – *Litigations involving the Associates of the Sponsor*" below.

V. Litigations involving the Sponsor and the Sponsor Group

Criminal matters

There are no pending criminal litigations involving the Sponsor or the Sponsor Group as on the date of the Preliminary Placement Memorandum.

Regulatory matters

1. An application was filed by Amresh Singh against Union of India and others including NHAI before the National Green Tribunal **("Tribunal")** alleging the rampant dumping of soil by NHAI contractors directly in the river Chenab and Tawi without prior environmental clearance. After considering all the documents placed on record, while referring the report of Monitoring Committee, the Tribunal was not satisfied with the actions taken by NHAI, and accepted the recommendations of the Monitoring Committee and directed the J&K Pollution Control Board to take appropriate actions in consultation with CPCB against the names mentioned in the report of the Monitoring Committee. The Bench also directed NHAI to take strict actions against the non-compliant contractors and sub-contractors at the HQ level. The matter is currently pending.

2. An application was filed before the National Green Tribunal Principal Bench, New Delhi regarding the Ghazipur Dump Site and the environmental problems that are caused due to the unsegregated, un-recycled large mountain of dump. The Sponsor was not a party to these proceedings till 2017 and East Delhi Municipal Corporation **("EDMC")** had been exploring the implementation of a project to undertake the removal and processing of the municipal solid waste dumped at the site. In view of the same, the EDMC held discussions with the Sponsor for use of solid waste for construction of embankments in the expansion of NH-24 or other National Highway projects undertaken by the Sponsor. In view of our role, we were impleaded in the case in 2017. The matter is currently pending.

Material civil matters

The following material civil cases are initiated by Contractors/Concessionaires (hereinafter mentioned as the **"Claimant")** against the Sponsor in relation to various projects across India:

Arbitrations

1. Abhijeet Angul Sambalpur Toll Road Limited has initiated arbitration proceedings against the Sponsor in relation to the rehabilitation and up-gradation of four laning of the Angul-Sambalpur section of NH-42 in the State of Odisha. The claims raised relate to the compensation for losses suffered by the Claimant on account of delay in procurement of site and necessary approvals, wrongful termination of the concession agreement and debarment from participation in bidding for future projects of the Sponsor. The claims raised by the Claimant amount to ₹ 21,070 million. The Sponsor has also filed counter claim for ₹1,282,7.20 million. The matter is currently pending.

2. Madhucon Projects Ltd.- (Barasat Krishnagar Expressway Limited) has initiated arbitration proceedings against the Sponsor in relation to Barasat-Krishnagar Section BOT (Annuity) in the State of West Bengal. The claims filed by the Claimant for loss due to interest on debt, loss due to interest on equity infused into the project, losses due to idling/underutilisation of machinery and equipment, losses due to idling/underutilisation of manpower,

losses due to miscellaneous expenditure incurred at site, compensation due to delay in handing over of site, losses due to price escalation on the works already executed, losses due to expenses incurred on the works executed, loss of overheads and profit and total termination payment. The Claimant has raised a claim for ₹2.1398.90 million. The Sponsor has also filed counter claims against the Claimant for ₹ 10,606.80 Million. The matter is currently pending.

3. M/s Raipur Expressway Limited has initiated arbitration proceedings against the Sponsor in relation to improvement, operation, maintenance and strengthening of existing 2-lane road and widening to 4-lane divided highway from Km 239.000 to Km 281.000 of NH-6 (Raipur- Aurung Section) in the state of Chhattisgarh on BOT basis. The claims were filed by the Claimant for compensation due to delay in declaration of appointed date, compensation due to. extension of time for project completion, damages for delay in providing right to way (ROW), claim on account of change of scope, claim for interest on delayed payments by the respondent, claim for loss of bonus due to arbitrary withdrawal of provisional completion certificate, claim on account of delay in releasing bank guarantees for retention money and claim for expenses and loss of profit due to delay in release of performance security. The Claimant has raised a claim for ₹ 10,121.00 million. The Sponsor has also filed counter claims against the Claimant for ₹ 4,231.70 million. The matter is currently pending.

4. M/s Indore Dewas Tollways Limited, has initiated arbitration proceedings against the Sponsor in relation to 6-laning of Indore-Dewas Section ofNh-3 from Km 577.550 to Km 610.000 and Km 0.000 to Km 12.600 (approx. length 45.05Km)- in the State of Madhya Pradesh under NHDP Phase-V to be executed as BOT(Toll) project on DBFOT pattern. The claims filed by .the Claimant for claim for utilization of resources beyond the scheduled 6-laning date, as envisaged in the respective concession agreement, compensation for Claimant's loss towards additional interest during construction, compensation towards Claimants loss of toll revenue attributable to respondents misrepresentation and subsequent default in maintaining feeder roads, refund of additional concession fee/premium paid by the Claimant, compensation/indemnification towards loss of profit claimants EPC contractor. The Claimant has raised a claim for ₹ 10709.60 million. The Sponsor has also filed counter claims against the Claimant for ₹ 5353.40 million. The matter is currently pending.

5. M/s GVK Deoli Kota Expressway Private Limited has initiated arbitration proceedings against the Sponsor in relation to design, construction, development, finance, operation and maintenance of four laning of Deoli- Kota Section of NH-12 from Km 165.000 to Junction of NH-76 on Kota Bypass (approx, length - 83.04 Kms) in the State of Rajasthan on BOT(Toll) project on DBFOT pattern under NHDP phase—II. The claims filed by the Claimant for claim on account of prolongation costs and extended stay at the site, loss suffered on account of additional overhead and loss of profit, loss of toll revenue, claim on account of increase in cost of the project due additional works done by the Claimant owing to the change of scope, claim on account of additional expenses incurred by'the Claimant towards tunnel work, claim on account of excessive repair and prolonged maintenance duration of existing road, claim on account of the Respondent in making the termination payment and claim on account of future loss to Claimant. The Claimant has raised a claim for ₹ 60130.00 Million . The Sponsor has also filed counter claims against the Claimant for ₹ 5,657.60 million. The matter is currently pending.

6. Panipat Jalandhar NH One Tollway Private Limited has initiated arbitration proceedings against the Sponsor in relation to six laning of Panipat-Jalandhar section of NH-1 (km 96.00 to km 387.100) in the state of Haryana and Punjab. The claims filed by the Claimant were in relation to delay in finalization of toll plaza and commencement of toll operations at approved locations, loss of fee revenue on account of defaults, extension of project completion schedule and change in scope and other claims. The Claimant has raised a claim for ₹ 70,359.00 million. The Sponsor has also filed counter claims against Claimant for ₹ 32,847.00 million. The matter is currently, pending.

7. M/s Bareilly Highways Project Limited has initiated arbitration proceedings against the Sponsor in relation to four laning of Bareilly-Sitapur section of NH-24 from Km 262.000 to Km 413.200 (approx. 151.200km) in the State of Uttar Pradesh under NHDP Phase-III of DBFOT basis. The claims filed by the Claimant were in relation to claim for additional interest on debt beyond SPCD (i.e. between August 23, 2013 to January 31,2019), interest for additional interest on debt beyond SPCD, claim for interest due on additional promoters contribution infused in the project, claim for interest due on delay release of grant, claim for expenses incurred by SPV company beyond SPCD, claim for interest for cost of land compensation, claim for net revenue loss from SPCD till January 31,2019, interest for net revenue loss from SPCD till January 31, 2019, claim for interest on excess 50% independent engineering cost debit by the Sponsor, claim for reimbursement of GST on regular EPC invoices-change of law, claim for interest on claim of GST on change of scope & utility shifting; claim for direct expenses incurred by EPC contractor beyond SPCD, ' claim for plant and machinery rental/rehandling for extended period, claim for interest for plant and machinery/rental/rehandling for extended period, claim for price escalation during the extended period, claim for interest for price escalation during the extended period, claim for expenses incurred on change of scope/variation .items, claim for interest for change of scope/variation items, claim, for additional transportation cost due to ban in local mining at sites, claim for interest for additional transportation cost due to ban in local mining at sites. The Claimant has raised a claim for ₹ 37,211.40 million. The Sponsor has also filed counter claims against the Claimant for ₹ 35,359.80 million. The matter is currently pending.

8. . M/s Lucknow-Sitapur Expressways Limited has initiated arbitration proceedings against the Sponsor in relation

to improvement, operation and maintenance including strengthening and widening of existing two lane road to four lane dual carriageway from km 488.270- Km. 413.200 of NH -24 (Lucknow Sitapur Section) in the State of Uttar Pradesh on BOT basis. The claims filed by the Claimant for revenue loss, revenue loss due to delay in COD, revenue loss from start of toll collection, EPC escalation, EPC additional overhead, EPC overstay of plant and equipment, additional maintenance cost of EPC, loss of profit earning capacity, extra cost IDC, revenue loss due to overloading and claims for underpasses. The Claimant has raised a claim for ₹ 7,470 million. The Sponsor has also filed counter claims against the Claimant for ₹ 3270.00 million. The matter is currently pending.

9. M/s Tantia Raxaul Private Limited has initiated arbitration proceedings against the Sponsor in relation to two laning with paved shoulder of Pioprakothi to Raxaul Section ofNH-28A from Km 0.600 to Km 62.064 in the state of Bihar. The claims filed by the Claimant were in relation to claim for termination payment for default of respondent, claim for non-finalisation of location and correct notification for toll plaza (along with interest at the rate of 18%), claim for delay in handover for land/ right of way/ site (along with interest at the rate of 18%) , claim for additional interest during construction on account of extended construction period, claim for increased distance/lead for stone aggregate, claim for inflation/ price escalation (along with interest at the rate of 18%), claim for additional cost of maintenance, claim for increased overheads of concessionaire (along with interest at the rate of 18%), claim for increased overheads of EPC contractor (along with interest at the rate of 18%), claim for idling/ underutilisation of plant, machinery & equipment, and claim for loss of profits of EPC-contractor. The Claimant has raised a claim for ₹ 9,861.70 million. The Sponsor has also filed counter claims against the Claimant for ₹ 2,873.60 million. The matter is currently pending.

10. M/s Haridwar Highways Project Limited has initiated arbitration proceedings against the Sponsor in relation to the four laning of Muzaffarnagar-Haridwar Section from Km 131.00 to Km 211.000 of NH-28 in the state of UP and Uttarakhand under NHDP Phase-II as BOT (Toll) on DBFOT pattern. The claims filed by the Claimant were in relation to financial expenses incurred by the Claimant beyond the scheduled commercial operation date till February 2019, interest payable on compensation for delay in handing over of the land form from appointed date-till February, 2019, interest due on delay towards release of grant from February 7, 2013, up to February, 2019, claim for reimbursement of GST on regular bills/invoices of the Claimant from July, 2016, claims for expenses incurred by the Claimant on rentals of plants and machinery beyond SCOD, claims for expenses incurred by the Claimant on rentals of plants and machinery beyond SCOD till February 2019, claim for expenses incurred by the Claimant due to price escalation beyond the SCOD up to February 2019, additional transportation cost due to ban on mining at sites, claim, for direct expenses incurred beyond SCOD up to February 2019,. expenses incurred on existing road maintenance beyond SCOD and claim on account of amount recovered for Dehradun Highway Project Limited. The Claimant has raised a claim for ₹ 22,060.00 million. The Sponsor has also filed counterclaims against the Claimant for ₹ 22,260.00 million. The matter is currently pending.

11. Madhucon (Madurai-Tuticorin Expressways Limited) has initiated arbitration proceedings against the Sponsor in relation to the ''Design. Engineering, Finance. Construction, Operation and Maintenance of Madurai-Tuticorn Section from km 138.800 to km 264.50 of NH-45B in the State of Tamil Nadu under NHDP Phase IIIA". The claims relate to compensation payable due to prolongation of the project, refund of liquidated damages, change of scope of work, loss of business opportunity, loss on account of shortfall in revenue from the project and amount payable on account of price escalation during the extended period of construction. The claim raised by Claimant amounts to ₹ 81,993.10 million. The Sponsor has also filed counter claims against the Claimant for ₹ 2,902.60 million. The said matter-is currently pending.

12. M/s Ranchi Expressway Limited has initiated arbitration proceedings against the Sponsor in relation to the four laning of Ranchi- Rargaon-Jamshedpur Section from Km 114.00 to Km 277.500 of NH-33 in the State of Jharkhand on BOT(Annuity) basis under NHDP Phasc-H. The claims filed by the Claimant were in relation to payment towards value of work done, amount payable towards maintenance of existing road, refund of amount expended on interest during construction, compensation payable due to delay in handling over of land, extra expenditure due to escalation of cost of work done, loss incurred due to idling of machinery due to prolongation of project, loss of overheads due to prolongation of project, loss of overheads and profits on value of work done due to illegal termination and claim for amount of revenue loss (loss of annuity). The Claimant has raised a claim for ₹ 89402.50 million. The Sponsor has also filed counter claims against the Claimant for ₹ 2,6281.80 million. The matter is currently pending.

13. M/s Millennium City Expressways Pvt. Ltd. has initiated arbitration proceedings against the Sponsor in relation to the 8/6 lane highway from Km. 14.300 to km. 42.000 at Delhi-Gurgaon section ofNH-8 on BOT basis. The claims filed by the Claimant were in relation to the Loss of profit on account of closure of the Km. 24 Toll Plaza (such amount calculated until 24.06.2021), Loss of profit on account of commissioning of the competing/alternate road facilities alternatively, extend Concession Period by a period of ninety four (94) months, Loss of profit suffered due to failure to provide requisite security at the Main Toll Plaza, thereby resulted in loss of toll revenue from the residents of nearby 31 villages, Various works carried out by the Claimant as change of scope, which were over and above the Project Agreements, payment for which remains pending despite the Claimant having already completed such additional .works, Compensation/extension due to Demonetization, Compensation/extension due to Pandemic/Covid, On account of additional compliance with the Joint Action Plan

that was over and above the Project Agreements. The Claimant has raised a claim for ₹ 24160.00 million. The Sponsor has also filed counter claims against the Claimant for ₹ 10440.00 million. The matter is currently pending.

14. M/s AE Tollway Ltd. has initiate arbitration proceedings against the Sponsor in relation to the 6-laning of Agra-Etawah Bypass Section ofNH-2 from km. 199.660 to km, 323.525 under NHDP Phase-V in the State of UP on BOT (Toll) basis. The claims filed by the Claimant were in relation to the Additional cost incurred towards Interest during Construction (IDC) for the delayed.Period, Additional direct cost incurred during the delayed period, Fixed Overhead (FOH) payable to EPC Contractor, Escalation cost. The Claimant has raised a claim for ₹ 13179.80 million. The Sponsor has filed a counter-claims of ₹ 11875.10 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

15. Pink City Expressway Pvt. Ltd. has initiate arbitration proceedings against the Sponsor in relation to the 6 laning of Gurgaon-Kotputli-Jaipur Section ofNH-8 from Km 42.700 to Km 273.00 (Length 225.60 Km.) in the State of Haryana & Rajasthan to be executed as BOT (Toll) on DBFOT pattern under NHDP PH-V. (Ref-Ill). The claims filed by the Claimant were in relation to the delay in handing over of ROW, idle of resources deployed in the way of man power, towards machineries, plant and equipment beyond the date. of completion. The Claimant has raised a claim for ₹ 42870 million. The Sponsor has filed the Counterclaims of₹ 149524.50 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

16. KM Toll Road Private Limited has initiated arbitration proceedings against the Sponsor in relation to the Construction, operation and maintenance of National Highway No. 8A extension including section from km 0.00 to km 71.40 (approximately 71.40 km) on the Gandhidham (Kandla) - Mundra Port section of National Highway No. 8A Extension in the state of Gujarat by four-laning and subsequent Six-Laning thereof on design, build, finance, operate and transfer ("DBFOT") basis. The claims filed by the Claimant for declaration for valid termination of the Concession Agreement by the Claimant, Termination Payment, refund to the Claimant of sum wrongfully deducted purportedly towards non-compliance of Punch List items, pay towards Change in Law etc. The Claimant has raised a claim for ₹ 18730.00 million. The Sponsor has filed the Counter-claims of₹ 1572.40 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

17. Supreme Panvel Indapur Tollway Pvt Ltd has initiated arbitration proceedings against the Sponsor in relation to Four laning of Panvel-Indapur Section ofNH-17 from km 0.00 to km 84.00 under NHDP Phase III on BOT Basis on design, build, finance, operate and transfer (DBFOT) pattern in the State of Maharashtra. The Claimant has raised a claim for ₹16,189.70 million. The Sponsor is yet to file the Counterclaim against the Claimant. The matter is currently pending before the Arbitral Tribunal.

18. Gorakhpur Infrastructure Co. Pvt. Ltd has initiated arbitration proceedings against the Sponsor in relation to Design construction Finance Operation and Maintenance of Km.0.000 to Km. 32.270 of Gorakhpur Bypass on NH-28 (existing Km. 255.700 to Km. 279.800) in the State of Uttar Pradesh on BOT (Annuity). basis. The Claimant has raised a claim for ₹ 7101.30 million. The Sponsor is yet to file the Counter-claim against the Claimant. The matter is currently pending before the Arbitral Tribunal.

19. M/s Raebareilly Allahabad Highway Private Limited.has initiated arbitration, proceedings against the Sponsor in relation to Two Laning with Paved shoulder of Raebareli to Alahabad section ofNH-24B from kn. 82.000 to km. 188.600 in the state of Uttar Pradesh through Public Private Partnership on Design, Build, Finance, Operate and Transfer on the Toll Basis under NHDP-IVA. The Claimant has raised a claim for ₹ 6842.40 million. The Sponsor has filed the Counter-claim of₹ 782.30 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

20. Solapur Tollways Pvt. Ltd. has initiated arbitration proceedings against the four laning of Solapur- Mah/Knl border Section ofNH-9 from Km. 249+000 to Km.348.800 in the State of Maharashtra is being executed on DBFOT basis. The Claimant has raised a claim for ₹ 8265.80 million. The Sponsor has filed the Counter-claim of₹ 8100.00 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

21. M/s Solapur Yedeshi Tollway Ltd has initiated arbitration proceedings against the four laning of Solapur- Yedeshi section of NH-2I from km.0.000 to km 100.000 (Design Length -98.717 km) in the state of Maharashtra to be executed for BOT (Toll) on DBFOT pattern under NHDP Phase IV. The Claimant has raised a claim for ₹ 7900.00 million. The Sponsor has filed the Counter-claim of₹ 1400.00 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

22. Kishangarh Gulabpura Tollway Ltd has initiated arbitration proceedings against the Six Lanning of Kishangarh to Gulabpura Section of NH 79A and NH 79 in the State of Rajasthan (Length 90.000 KM) on DBFOT (Toll) IRB-ARB1TRATION Ref NO.3. The Claimant has raised a claim for ₹ 8689.60 million. The Sponsor has filed the Counter-claim of₹ 3560.00 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

23. Transstroy Dindigul-Theni-Kumli Tollways Pvt Ltd has initiated arbitration proceedings against Two laning with

paved shoulder of Dindigul-Theni Section from Km 2.750 to Km 73.400 of NH-45 (Extn.) and Theni-Kumli section of NH-220 from Km 215.500 to Km 273.600 in the State of Tamil Nadu under DBFOT Annuity basis. The Claimant has raised a claim for ₹ 5,258.40 million. The Sponsor is yet to file the Counter-claim against the Claimant. The matter is currently pending before the Arbitral Tribunal.

24. JR Toll Road Pvt. Ltd. has initiated arbitration proceedings against the Sponsor in relation to the Design, Engeneering, Construction, Development, Finance, Operation and Maintainance of Jaipur to Reengus Section of NH-T1 (KM 246.300 to Km 298.075) in the state of Rajasthan under NHDP Phase-111 on Design, Build, Finance, Operate and Transfer (DBFOT) Basis. The claims raised by the Claimant amount to ₹ 8440 million. The Sponsor has also filed counter claim for ₹ 8200 million. The matter is currently pending.

25. M/s Dilip Buildcon Ltd. has initiated arbitration proceedings against the Sponsor in relation to the Six Laning of Gorhar to Khairtunda Section of NH-2 from km. 320.810 to km. 360.300 section on HAM in the' State of Jharkhand under NHDP phase V. The claims raised by the Claimant amount to ₹ 360.31 million. The Sponsor is yet to file the Counter-Claim against the Claimant. The matter is currently pending before the Arbitral Tribunal.

26. M/S VRC-SPIDPL has initiated arbitration proceedings against the Sponsor in relation to the 4-Laning of Rohtak-Jind section from km.307+000 to km 347+800 of NH-71 and connecting link from Km. 347.800 of NH-71 to km.9+400 of NH-71 A (Balance work) on EPC mode under Bharatmala (Left out in NHDP) in the State of Haryana. The claims raised by the Claimant amount to ₹4600.02 million. The Sponsor is yet to file the Counter-claim against the Claimant. The matter is currently pending before the Arbitral Tribunal.

27. Sadbhav Engineering Limited initiated arbitration proceedings against the Sponsor in relation to the 4 Laning of Rohtak-Panipat Section of NH-71 A from Km 0.00 (Km 63.300) of NH-10 to Km 80.58 (Km 83.500 of NH-1) in the State of Haryana of DBFOT basis under NHDP Phase-III.(BOT) (Ref 11). The claims raised by the Claimant amount to ₹19370.92 million. The Sponsor has-also filed counter claim for ₹6220.70 million. The matter is currently pending before the Arbitral Tribunal.

28. M/s PRS Tolls Private Limited initiated arbitration proceedings against the Sponsor in relation to the Tolling, Operation, Maintenance & Transfer of Palanpur- Radhanpur- Samkhiyali section of NH-27 from km 536+000 to kin 589+600 in the State of Gujarat (TOT Bundle 5 (A-l). The claims raised by the Claimant amount to ₹3140 million. The Sponsor is yet to file counter claim. The matter is currently pending before the Arbitral Tribunal.

29. M/s Simplex Infrastructures Ltd initiated arbitration proceedings against the Sponsor in relation to the Rehabilitation and up-gradation to 4-laning of,NH-31D from Km 113+200 to Km 154+854 (Pkg-2A) •Falakata-Salsalabari Section in the State of West Bengal on EPC Basis. The claims raised by the Claimant amount to ₹9000 million. The Sponsor is yet to file counter claim. The matter is currently pending before the Arbitral Tribunal.

30. M/S IL&FS Engineering & Construction Company Ltd. initiated arbitration proceedings against the Sponsor in relation to the Balance work of Patna-Gaya-Dobhi Section of NH-83 from Km.83.000 to Km.127.217 (Pkg-III) on EPC (Item Rate) in the State of Bihar executed under J1CA ODA Loan Assistance. The claims raised by the Claimant amount to ₹600 million. The Sponsor has also filed counter claim for ^22780 million. The matter is currently pending before the Arbitral Tribunal.

31. M/s Gayatri Projects limited initiated arbitration proceedings against the sponsor in relation to • Rehabilitation and up-gradation ofCuttack-Angul section of NH-42 (New NH-55), Package II to 4-lane (Km 60.200 to Km 112.00) on EPC Basis. The claims raised by the claimant 250 million. The sponsor is yet to file counter claim. The matter is currently pending before the Arbitral Tribunal.

32. M/S'Mangloor Highways Pvt. Ltd. Initiated the arbitration proceedings against the sponsor in relation to the Four laning of Sangareddy- Nanded- Akola Section of 161 from Mangloor (Design Km 86.788/ Existing Km 91.350) to Telangana/ Maharashtra Border (Design Km 135.751/ Existing Km 140.873) (Design Length 48.963 Km) in the State of Telangana under Bharatmala Pariyojna on Hybrid Annuity Mode Package- III. The SOC is yet to be filed. The matter is currently pending before the Arbitral Tribunal. PNC Infratech Ltd initiated arbitration proceedings against NHAI in relation Rehabilitation and upgradation of Barabanki - Jarwal road junction in the State of Uttar. The S.O.C is yet to be filed by the contractor. NHAI is yet to file counter claim. The matter is currently pending before the Arbitral Tribunal comprising of sole Arbitrator Justice Indira Banerjee (Former Judge, Supreme Court).

33. M/S JSR Constructions Private Limited initiated arbitration proceedings against the Sponsor in relation to the Construction of ROB Butibori and its approaches from km 22.865 to km 24.650 of Nagpur-Hyderabad section of NH-7 (New NH-44). Package NS-29 at Railway Level crossing No. 113. The claims raised by the Claimant amount to ₹ **406.4** million. The Sponsor is yet to file counter claim. The matter is currently pending before the Arbitral Tribunal.

34. M/s Dilip Buildcon Ltd- Wardha Butibori Highways Pvt Ltd initiated arbitration proceedings against the Sponsor

in relation to the Four laning of Wardha to Butbori section of NH- 361 from Km 465.500 to Km 524.690 (Design, length 59.190 km) in the state of Maharashtra under the NHDP Phase IV on Hvbrid Annuity Mode. The claims raised by the Claimant amount to ₹ 664.3 million. The Sponsor is yet to file counter claim. The matter is currently pending before the Arbitral Tribunal.

35. M/s Dilip Buildcon Ltd- Yavatmal Wardha Highways Pvt Ltd. initiated arbitration proceedings against the Sponsor in relation to the Four laning of Yavatmal to Wardha (Package III) section of NH- 361 from Km400,575 to Km 465.500 (Design length 64.925 km) in the state of Maharashtra.under the NHDP Phase IV on Hvbrid Annuity Mode. The claims raised by the Claimant amount to ₹ 779.3 million. The Sponsor is yet to file counter claim. The matter is currently pending before the Arbitral Tribunal.

36. M/s Dilip Buildcon Ltd- Mahagaon Yavatmal Highways Pvt Ltd initiated arbitration proceedings against the Sponsor in relation to the Four laning of Mahagaon to Yavatmal section of NH- 361 from Km320.580 to Km 400.575 in the state of Maharashtra under the NHDP Phase IV on Hvbrid Annuity Mode. The claims raised by the Claimant amount to ₹ **1433.8** million. The Sponsor is yet to file counter claim. The matter is currently pending before the Arbitral Tribunal.

37. M/s Atlanta Infra Assets Ltd. initiated arbitration proceedings against the Sponsor in relation to the Improvement, operation and maintenance including strengthening and widening of existing 2-lane road to 4-lane dual camageway from Km.9.200 to Km.50.000 of NH-6 (Nagpur-Kandhali section) in the State of Maharashtra on Build. Operate and Transfer (BOT) basis. (RefIII). The claims raised by the Claimant amount to ₹ **1680** million. The Sponsor-is yet to file counter claim. The matter is currently pending before the Arbitral Tribunal.

38. M/s Raipur Expressways Ltd. initiated arbitration proceedings against the Sponsor in relation to the Improvement, Operation & Maintenance, Rehabilitation and Strengthening of existing 2-lane road and widening to 4-lane divided carriageway from Km. 239.000 Km. to 281.000 of NH-6 (Raipur-Aurang Section) on Build, Operate and Transfer (BOT) basis (Ref-2). The claims raised by the Claimant amount to ₹ **9090** million. The Sponsor is yet to file counter claim. The matter is currently pending before the Arbitral Tribunal.

39. M/S Shamlaji EXpressway Private Limited initiated arbitration proceedings against the Sponsor in relation to the Six Laning of Shamlaji to Motachiloda from Km. 401.200 to 494.410 section ofNH-8 in Gujarat under NHDP Phase-V (Package -VI) on HAM. The claims raised by the Claimant amount to ₹ 11863.4 million. The Sponsor is yet to tile counter claim. The matter is currently pending before the Arbitral Tribunal.

40. M/s Srinagar Banihal Expressway Ltd initiated arbitration proceedings against the Sponsor in relation to the Rehabilitation, Strengthening and Four laning of Srinagar to Banihal Section from Km220.700 to Km286.110 of NH-44 (old NH 1A) in the UT of Jammu and Kashmir on BOT (Annuity) Basis. The claims raised by the Claimant amount to ₹ 29000 million. The Sponsor is yet to file counter claim. The matter is currently pending before the Arbitral Tribunal.

41. NK Toll Road Ltd. initiated arbitration proceedings against the Sponsor in relation to the Design, Construction, Development, Finance, Operation and maintenance of Km. 258.645 (end of Namakkal Bypass) to Km. 292.6 (Start of Karur Bypass) and Improvement, of Operation, Maintenance of Km. 248.625 (Start of proposed flyover on Namakkal Baypass) to Km. 258.645 (end of Namakkal Baypass) on NH- 7 in the State of Tamil Nadu on BOT basis. The claims raised by the Claimant, amount to ₹ **5521.4** million. The Sponsor is yet to file counter claim. The matter is currently pending before the Arbitral Tribunal.

Material civil matters filed by the Sponsor

42. The Sponsor has filed a petition before the High Court of Delhi (challenging the award of the arbitral tribunal) against Oriental Nagpur Betul Highways Limited. The claims challenged are for date of PCOD to be declared as January 7, 2014, and grant bonus of additional 91 day including 9th instalment of annuity payment. The amount challenged before the High Court of Delhi is ₹ 8220.70 million. The matter is currently pending.

43. The Sponsor has filed a petition, before the High Court of Delhi (challenging the award of the arbitral . tribunal) against West Haryana Highway Private Limited. The claims challenged are interest due on additional promoter contribution infused in the project., price escalation during the extended period, plant and machinery idling/rental/rehandling for extended period and interest on plant and machinery idling/rental. The amount challenged before the High Court of Delhi is ₹ 5,478.90 million. The matter is currently pending.

44. The Sponsor has filed a petition before the High Court of Delhi (challenging the award of the arbitral tribunal) against Gwalior Bypass Project Limited. The claims challenged are claim for interest on delayed release of annuity amount along with interest due to delayed payment of regular annuity, claim for interest on debt after COD till December 31,2016 and interest incurred on price escalation form PCOD till October 31, 2016. The amount challenged before the High Court of Delhi is ₹ 5,328.10 million. The matter is currently pending.

45. The Sponsor has filed a petition before the High Court of Delhi (challenging the award of the arbitral tribunal) against Pune Solapur Expressways Pvt. Ltd. The Sponsor has challenged the entire award w.r.t to extension of Concession Period by 928 days vide the petition marked as Diary No. 990741/2022. The amount challenged before the High Court of Delhi, is ₹ 224.60 million. The matter is currently pending.

46. The Sponsor has filed a petition before the High Court of Delhi (challenging the award of the arbitral tribunal) against M/s GMR. The Sponsor has challenged the Final Report released by Sole Arbitrator on 28.02.2022 which has determined the loss in terms of Article 41 amounting to ₹ 16722.00 million in favour of the Concessionaire. The petition is marked as FAO (OS) 108/2020 109/2020 110/2020. The matter is currently pending.

47. The Sponsor has filed a petition before the High Court of Delhi (challenging the award of the arbitral tribunal) against the M/s BSCPL Aurang Tollway Ltd. The Sponsor has challenged the entire award of the Arbitral Tribunal. The challenge include the claims with respect to the Right of Way, Payment for ideating of plant and machinery vide petition marked as OMP (Comm) 341/2022. The amount challenged before the High Court of Delhi is ₹ 2819.4 million. The matter is currently pending.

48. The Sponsor has filed a petition before the High Court of Delhi (challenging the award of the arbitral tribunal) against the M/s L&T Ltd. The sponsor has challenged the entire award awarded by the Arbitral Tribunal vide petition marked as OMP (Comm) 363/2022 before the High Court of Delhi. The amount challenged before the High Court of Delhi is ₹ 294.6 million. The matter is currently pending.

49. The sponsor has filed a petition before the High Court of Delhi challenging the award of the Arbitral Tribunal, against TK Tol) Pvt. Ltd. The Sponsor .has challenged the entire award passed by the Arbitral Tribunal vide petition numbered OMP Comn; 24/2023 before the Hon'ble High Court of Delhi. The amount challenged before the Hon'ble High Court of Delhi is ₹ 5870 million. The matter is currently pending.

50. The sponsor has filed a petition before the Hon'ble High Court of Delhi challenging the award of the Arbitral Tribunal against the GMR-HVEPL. The Sponsor has challenged the entire award passed by the Arbitral Tribunal vide petition numbered as O.M.P. (Comm) 319/2022 before the Hon'ble High Court of Delhi. The amount challenged before the-Hon'ble High Court of Delhi is ₹ 16720 million. The matter is currently pending.

51. The sponsor has filed a petition before the Hon'ble High Court of Delhi challenging the award of the Arbitral Tribunal against the Jetpur Somnath Tollways Pvt. Ltd. The Sponsor has challenged the entire award passed by the Arbitral Tribunal vide petition numbered as OMP (Comm) 5/2022 before the Hon'ble High Court of Delhi. The amount challenged before the Hon'ble High Court of Delhi is ₹ 14817 million. The matter is currently pending.

52. The sponsor has filed a petition before the Hon'ble High Court of Delhi challenging the award of the Arbitral Tribunal against the M/s Surat Hazira NH-6 Tollway Pvt Ltd. The Sponsor has challenged the entire award passed by the Arbitral Tribunal vide petition numbered as OMP (Comm) 237/2021 before the Hon'ble High Court of Delhi. The amount challenged before the Hon'ble High Court of Delhi is ₹ 32327 million. The matter is currently pending.

53. The sponsor has filed a petition before the Hon'ble High Court of Delhi challenging the award of the Arbitral Tribunal against the M/s MS IRB AHMEDABAD VADODARA SUPER EXPRESS. The Sponsor has challenged the entire award passed by the Arbitral Tribunal vide petition numbered as O.M.P. (COMM) 311/2024 & O.M.P (ENF.) (COMM)-179/2024 before the Hon'ble High Court of Delhi. The amount challenged before the Hon'ble High Court of Delhi is ₹ 16809.4 million. The matter is currently pending.

54. The sponsor has filed a petition before the Hon'ble High Court of Delhi challenging the award of the Arbitral Tribunal against the M/s IRB Yedeshi Aurangabad Tollway Ltd. The Sponsor has challenged the entire award passed by the Arbitral Tribunal vide petition numbered as OMP (COMM) 277/2024 before the Hon'ble High Court of Delhi. The amount challenged before the Hon'ble High Court of Delhi is ₹ 17201.6 million. The matter is currently pending.

55. You One Engg has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Contract Package AP-1 (OW) - Widening to 4/6 Lanes and Strengthening of existing 2-Lane road including Minor Bridges (upto 30m), Service Roads and auxiliary works from Km 49/0 (Champavathi River) and Km 97/0 (Srikakulam) of Visakhapatnam (Km 0) to Ichapuram (Km 233) Section of NH-5 (New NH-16) (Item Rate). The claims raised by the claimant 2980.2 million. The Sponsor has filed the Counter-claim of₹ 872 million against the Claimant. The matter is currently pending before the Arbitral Tribunal and PIU Vishakhapatnamwas contacted on 27-02-2024, whereby it was informed that award is still awaited. Legal Counsel informed that due to ill health of Presiding Arbitrator, prouncement of award has got delayed and the Award is likely to be issued.

56. M/s DBL Anandapuram Anakapalli Highways Ltd has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Six laning of Anandapuram —Pendurthi -Anakapalli Section of NH- 5 (new

NH-16) from Km.681.000 (Existing Km.681.000) to Km.731.780 (Existing Km.742.400) (Design Length=50.78 Km) in the State of Andhra Pradesh under Bharatmala Pariyojana on Hybrid Annuity Mode. The claims raised by the claimant 2643.9 million. The Sponsor has filed the Counter-claim of ₹ 50.9 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

57. M/s Agrisense Landscape has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Densification of Median Plantation (Advance Field Preparation Planting and Maintenance of . existing median plantation) works along Hyderabad - Bangalore section from (A) Km. 211.00 to 294.00 (B) Km. 294.00 to Km. 377.00 (C) Km. 377.00 to-Km. 462.164 of NH-44 (Old NH- 7) Total 83 Km. The claims raised by the claimant _ million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

58. M/s JKM Infra Projects Ltd. /Technocrats Advisory Services Pvt. Ltd. (TASPL) has filed a petition before - the Hon'ble High Court of Delhi against the sponsor in relation to 4- Laning of Forbcsganj to Jogbani section from Km. 0.000 to Km. 9.260 (ICP at Jogbani) of NH-57 in the state of Bihar on EPC mode. The claims raised by the claimant 96.4 million. The Sponsor has not filed the Counter-claim yet. The matter is currently reserved for. Award.

59. M/s GR Infraprojects Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Two laning with paved shoulder of Biharsharif -Barbhiga-Mokama section of NH-82 FROM DESIGN Ch. Km. 94.478 to Km. 149.053 in the state of Bihar. The claims raised by the claimant 1042.5 million. The Sponsor has filed the Counter-claim of₹ 1814.2 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

60. M/S IL&LFS Engineering & Construction Company Ltd. has filed a petition before the I lon'ble High Court of Delhi against the sponsor in relation to Balance work of Patna-Gaya-Dobhi Section of NH-83 from Km.83.000 to Km. 127.217 (Pkg-III) on EPC (Item Rate) in the State of Bihar executed under JICA ODA Loan Assistance. The claims raised by the claimant 6000 million. The Sponsor has filed the Counter-claim of₹ 22780 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

61. Appollo Enterprises, JLI and D S Construction Ltd. (JV) has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Improvement, Operation, Maintenance and Strengthening of existing 2-lane road and widening to 4-lane divided highway from Km 239.000 to Km 281.000 of NH-6 (Raipur- Aurung Section) in the state of Chhattisgarh on BOT basis. (Ref-1) 1CA Case No.2145. The claims raised by the claimant 10121 million. The Sponsor has filed the Counter-claim of₹ 4232 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

62. M/S Bilaspur Pathrapali Road Private Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to 4-lane with paved shoulder configuration of Bilaspur-Pathrapali (Km. 0+000 to Km. 53+300) section of NH-111 (New NH-130) in the State of Chhattisgarh under BharatMala on Hybrid Annuity. The claims raised by the claimant 7432.1 million. The Sponsor has not filed the Counter-claim yet. The matter is now reserved for pronouncement of order on the Application for amendment. No next date has been notified.

63. HULE CONSTRUCTIONS PVT LTD has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Operating a Fee Plaza at design Km 90.300 for the use of 4 & more lane of Jagdishpur • Ayodhya Section from Design KM 47.800 to KM 108.020 of National Highway No.330-A in the State of Uttar Pradesh. The claims raised by the claimant 336 million. The Sponsor has not filed the Counter-claim yet. It sets out the fees to be paid to the Sole Arbitrator in compliance with the Fourth Schedule of A&C Act, 1996.

64. M/s. GPC Infra has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Vantada Fee Plaza located at Km 415 for the Section from Km 388.180 to Km 443 of Ratanpur- Himmatnagar on NH-8 in the state of Gujarat. The claims raised by the claimant 285 million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

65. Nirmal Buidinfra Pvt. Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to 6 -Lane access-controlled highway(NH-152D) starting from Junction with Jind Safidon road(SH-14) near Kheri village to junction with NH-352(J.ind-Gohana section) near Julana (Ch. 80+000 to 108+000; lenght 28 Rm) on EPC Mode under Bharatmala Pariyojana in the State of Haryanat fkg-4). The claims raised by the claimant 1124.9 million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

66. KCC Buildcon Pvt. Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Six laning of Motachileda to Nanachiloda stretch from existing Km 494.410 (Design Chaninage 540.595 to existing Km 509.550 (Design Chainage 555.905) of NH-8 in the State of Gujarat under NHDP Phase-V. (EPC). The claims raised by the claimant 820.2 million. The Sponsor has filed the Counter-claim of₹ 550.7 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

67. Unique Construction has filed a petition before the.Hon'ble High Court of Delhi against the sponsor in relation to Six laning of Kamrej Chalthan Section from km. 248.100 to 264.350 of NH-8 including long . term remedial measures for 4 black spots in Kamrej-Bharuch Section of NH-8 in die State of Gujarat on EPC mode. The claims raised by the claimant 1744.8 million. The Sponsor has.not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

68. M/s VK1 Expressway Pvt. Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Construction Of Eight Lane Vadodara Kim Expressway from 355+000 km to 378+740 km (Padra to Vadodara section of Vadodara Mumbai Expressway) in the State of Gujarat under NHDP Phase-VI on HAM mode (Phase - IA- Package-!). The claims raised by the claimant 7425.4 million. The Sponsor has filed the Counter-claim of ₹ 7911 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

69. Vadodra Mumbai Expressways 8 Pvt. Ltd has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Construction of Eight lane access-controlled Expressway from Km 154.600 to Km 190.00 (Jujuwa to Gandeva Section) of VME in the State of Gujarat on HAM Mode under Bharatmala Pariyojana (Phase IB - PKG - 8). The claims raised by the claimant 10488 million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

70. Vadodra Mumbai Expressways 8 Pvt. Ltd has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Construction of Eight lane access-controlled Expressway from Km 12 8.000 to Km 154.600 (Karvad to Jujuwa Section) of VME in the State of Gujarat on HAM Mode under Bharatmala Pariyojana (Phase IB - PKG - 9). The claims raised by the claimant 9996.3 million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

71. M/S West Gujarat Expressway Limited has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Widening of the Existing Jetpur-Gondal Section (Km 117.600 to Km 143.000) from two lane to four lane; making improvements in the existing four lane Gondal-Rajkot Section (km 143.000 to Km 175.000) and Widening of the existing Rajkot Bypass (Km 175.000 to Km 185.000) from two lane to-four-lane on NH-8B in Gujarat. The claim raised by the claimant is yet to be fixed and no counter claim yet. The matter is currently pending before the Arbitral Tribunal.

72. Panipat Jalandhar NH-1 Tollway Private Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Six laning of Panipat-Jalandhar Section of NH-1 from Km. 96.000 to Km. 387.100 in the State of Haryana and Punjab on BOT (Toll) basis on DBFOT pattern under NHDP Phase- V 9 (Ref-11). The claims raised by the claimant 54436.5 million. The Sponsor has filed the Counter-claim of₹ 13037.8 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

73. M/s Dilip Buildcon Ltd.-Varha Infra Limited (JV) has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Four Laning of Ambala-Kaithal from Km. 0.000 (Ambala) to Km. 50.860 (Pehowa) with Paved Shoulder in the state of Haryana under NHDP Phase-Ill on EPC Basis (Package-1). The claims raised by the claimant 1685.6 million. The Sponsor has filed the Counter-claim of ₹ 493.3 million against the Claimant. The majter is currently pending before the Arbitral Tribunal.

74. M/S VRC-SPIDPL (JV) has filed a petition before the Hon’ble High Court of Delhi against the sponsor in relation to 4-Laning of Rohtak-Jind section from km.307+000 to km 347+800 of NH-71 and connecting link from Km. 347.800 of NH-71 to km.9+400 ofNH-71 A (Balance work) on EPC mode under Bharatmala (Left out in NHDP) in the State of Haryana. The claims raised by the claimant 4600.2 million. The Sponsor has not filed the Counter-claim yet. The claimant has withdrawn its claims. Application for termination of the arbitral proceedings has been filed in view of the successful amicable settlement b/w the parties by the claimant. The decision is being awaited from the tribunal side until the payment is made by the parties.

75. M/s Satya Prakash & Bros. Pvt. Ltd. has tiled a petition before the Hon'ble High Court of Delhi against the sponsor in relation to 4/6 Lanning of Delhi/Haryana Border to Rohtak section of NH-10 from Km 29.700 to Km 93.140 including Bahadurgarh and Rohtak Bypass in the State of Haryana under NHDP.Phase-III (A) on BOT basis - Repair &,Maintenace work from Km. 65.000 to Km. 93.140 (Phase-Ill). The claims raised by the claimant 161.6 million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

76. M/s Valecha Engineering Ltd. has filed a petition before the Hon’ble High Court of Delhi against the sponsor in relation to Construction of 4 Major Bridge and 1 Flyover on NH-1A (Srinagar Bypass). The claims raised by the claimant 600.4 million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

77. West Haryana Highways Projects Private Limited (WHHPPL) has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to 4/6 Laning of Delhi/Haryana Border to Rohtak section of NH-10 from

Km. 29.700 to Km. 93.140 including Bahadurgarh and Rohtak bye-passes in the State of Haryana under.NHDP Phase 111A on Build, Operate and Transfer (BOT) basis(Ref-lII). The claim raised by the claimant is yet to be fixed and no counter claim yet. The matter is currently pending before the Arbitral Tribunal.

78. M/s Srinagar Banihal Expressway Ltd has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Rehabilitation, Strengthening and Four laning of Srinagar to Banihal Section from Km220.700 to Km286.110 of NH-44 (old NH 1A) in the UT of Jammu and Kashmir on BOT (Annuity) Basis. The claims raised by the claimant 29000 million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

79. M/s Roadway Solution India Pvt. Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Short Tenn Improvement and Routine Maintenance contract of Chitradurga Davanagere section from Km 189.00 to Km 260.00 of NH-48(Old NH-4) in the State of Karnataka (Package-2). The claims raised by the claimant 132.2 million. The Sponsor has filed the Counter-claim of ₹ 5.2 million against the Claimant. The matter.is currently reserved for award.

80. M/s Roadway Solution India Pvt. Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Short Term Improvement and Routine Maintenance contract of Chitradurga Davanagere section from Km 189.00 to Km 260.00 ofNH-48(Old NH-4) ’in the State of Karnataka (Package-1). The claims raised by the claimant 185.2 million. The Sponsor has filed the Counter-claim of ₹ 9.7 million against the Claimant. The matter is currently reserved for award.

81. IRB Tumkur - Chitradurga Tollways Pvt. Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to 6-laning of Tumkur-Chitradurga (excluding Tumkur & Chitradurga bypass) Section from km 75.00 to km 189.00 of NH-4 (Approx. 114.00 km) in the State of Karnataka to be executed as BOT (Toll) Project on DBFOT pattern under NHDP. The claims raised by the claimant 949.8 million. The Sponsor has filed the Counter-claim of₹ 7804 million against the Claimant. The matter . is currently reserved for award.

82. . Hampi Expressways Private Limited has filed a petition before the.Hon'ble High Court of Delhi against ' the sponsor in relation to Four Laning of Hospet - Chitradurga section of NH 13 (New NH-50) from km 299+000 to km 418 + 750 in the state of Karnataka under National Highways Development Project (NHDP) Phase 111-on DBFOT (Toll) basis. The claims raised by the claimant 8775.5 million*. The Sponsor has filed • the Counter-claim of₹ 2254.3 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

83. M/s NSC Projects Pvt. Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Two-lanes with/without paved shoulders from Km 0.000 to Km 69.480 (Design) of Sanquelim to Belagavi Section of NH-748 AA in the State of Goa and Karnataka. The claims raised by the claimant 370.85 million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

84. M/s DBL Nidagatta Mysore Highways Pvt. Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Six laning of Nidagatta-Mysore section, Km 74+200 to Km of NH-275 in the state of Karnataka to be executed on HAM. The claims raised by the claimant 3515.1 million. The Sponsor has not filed the Counter-claim yet. The matter is’currently pending before the Arbitral Tribunal.

85. M/S DBL Byrapura- Challakare Highways Pvt. Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Four Laning of Byrapura to Challakare section of NH-150A from Km. 308.550 to Km 358.500 in HAM mode under Bharatmala Pariyojna in the state of Karnataka. The claims raised by the claimant 769 million. The Sponsor has filed the Counter-claim of₹ 30.4 million against the Claimant. The matter is cun'ently pending before the Arbitral Tribunal.

86. M/s DBL Bellary Byrapura Highways Pvt Ltd. has filed a petition before the Hon'ble High Court ofDelhi against the sponsor in relation to 4-Ianing of Bellary to Byrapura Sect\on of NH-1 SOA from km. 266.82 to km. 308.5 5 (Packade I) in the state of Karnataka. The claim raised by the claimant is yet to be fixed and no counter claim yet. The matter is currently pending before the Arbitral Tribunal.

87. M/s IRB West Coast Tollway Pvt Ltd has filed a petition before the Hon’ble High Court of Delhi against the sponsor in relation to Four laning of Goa-Karnataka Border to Kundapur section of NH-66 (formerly NH-17) from Km. 93.700 to Km. 283.300 in the Slate of Karnataka to be executed as BOT Project on DBFOT Pattern under NHDP-IV. The claims raised by the claimant 31076.1 million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

88. M/s Guruvayorr Infrastructure Pvt Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Design, Construction, Development, Finance, Operation and Maintenance of (i) KM 270.000 (Trissur) to Km 316.700 (Angamali) and (ii) Improvement. Operation and Maintenance of Km 316.700 (Angamali) to Km 342.000(Edapally) of NH-47 in the State of Kerala on BOT basis. The claims raised by the

claimant 15260 million. The Sponsor has tiled the Counter-claim of₹ 3735 million against the Claimant. The matter is cun'ently pending before the Arbitral Tribunal.

89. Gwalior Jhansi Expressway Ltd. has filed a petition before the Hon'ble High Court ofDelhi against the sponsor in relation to Design, Construction, Development, Finance, Operation and maintenance of the work of rehabilitation and upgradation of four lane from Km. 16.00 to Km. 96.127 on NH-75 in the state of U.P and M.P under North-South Corridor (NHDP Phase-II) on BOT (Annuity). The claims raised by the - claimant 20915.2 million. The Sponsor has filed the Counter-claim of₹ 13980 million against the Claimant. The matter is cuircntly pending before the Arbitral Tribunal.

90. M/s Guna Infrastructure Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in. relation to Construction, Operation and Maintenance of a new 2 lane road from Km 319.700 to Km 332.100 of NH-3 (Guna Bypass Section) in the state of Madhya Pradesh under NHDP Phase-IIIA. The claims raised by the claimant 2189.9 million. The Sponsor has filed the Counter-claim of₹ 109 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

91. M/s Ssangyong Engineering & Construction Co. Ltd has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to 4-laning of Jhansi Lakhnadon Section NH- 26 (ADB-ll/C-8) Ref-2 in the Stale of Madhya Pradesh (Item Rate). The claims raised by the claimant 967.4 million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

92. M/s A.K. Shivhare Infrastructure Pvt Ltd has filed a petition before the Hon'ble High Court ofDelhi against . the sponsor in relation to Balance Construction work from design Km 1.00+370 to 100+757 and 107+350 to 125+300 on.fourlane of Gwalior Shivpuri Section of NH-3 in the state of MP. The claims raised by the claimant 3 million. The Sponsor has filed the Counter-claim of₹ 456.5 million against the Claimant. The matter is currently pending.before the Arbitral Tribunal.

93. M/s Dilip Buildcon Ltd has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Rehabilitation and Upgradation of Jabalpur-Mandla-Chilpi Section of NH-12 A road (Package- 1) in the state of Madhya Pradesh on Engineering, Procurement and Construction. The claims raised by the claimant 214 million. The Sponsor has filed the Counter-claim of₹ 1334 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

94. M/s DBL Riwa Sidhi Highways Pvt. Ltd lias filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to The work of construction of Churhat Bypass including Tunnel on Rewa Sidhi section of NH-75E from chainage 33.200 to chainge 55.400 [design length 15.350 Km} in the state of MP on Hybrid Annuity Mode. The claims raised by the claimant 381.7 million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

95. M/s Indore Dewas Tollways Ltd has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to 6-laning of Indore-Dewas Section ofNh-3 from Km 577.550 to Km 610.000 and Km 0.000 to Km 12.600 (approx length 45.05Km) in the State of Madhya Pradesh under NHDP Phase-V to be executed as BOT(Toll) project on DBFOT pattern. The claims raised by the claimant 10709.6 million. The Sponsor has filed the Counter-claim of ₹ 535.3 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

96. M/s Biaora-Dewas Highway Pvt. Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to 4-laning of Biaora - Dewas section from Km 426.100 to Km 566.450 of NH-3 (Package-Ill) in the State of Madhya Pradesh to be executed on BOT (Toll) on DBFOT pattern under NHDP Phasc-IV. The. claims raised by the claimant 7487.3 million. The Sponsor has filed the Counterclaim of₹ 23520 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

97. Supreme Panvel Indapur Tollway Pvt Ltd has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Four laning of'Panvel-Indapur Section of NH-17 from km 0.00 to km 84.00 under NHDP Phase III on BOT Basis on design, build, finance, operate and transfer (DBFOT) pattern in the State of Maharashtra. The claims raised by the claimant 75048.6 million. The Sponsor has filed the Counter-claim of₹ 17330 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

98. DBL Sangli Borgaon Highway Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Four Laning of Sangli-Solapur (Package-1; Sangli to Borgoan) Section of NH-165 from existing Ch. Km. 182.195 to Ch. 2L9.956 (Design Ch. Km. 182.556 to km 224.0001' of length 4t.444 Km in the State pf Maharashtra. The claims raised by the claimant 3288.7 million. The Sponsor has filed the Counter-claim of₹ 1578.3 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

99. JSR Constructions Private Limited has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Construction of 4 laning of km 3 6.000 to km 64.000 of Borkhedi to Jam Section of NH-7 in the

State of Maharashtra (Package NS-22). The claims raised by the claimant 724.8 million. The Sponsor has not filed the Counter-claim yet. The matter is currently reserved for award.

100. M/s ANJ-VC(JV) has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Construction of 2nd Office Building of NHAI at plot no. G-3, Sector 10, Dwarka. The claims raised by the claimant 37 million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

101. M/S RUDRANEE 1NFRA-MANISHA CONSTRUCTION (JV) has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Four Lane with Paved Shoulder configuration of the highway starting from existing km 88.400 (Savaii Vihir) to km 163.400 (start of Ahmcdnagar bypass) (Design Length - .75.000 km) section or NH-160 in the State of Maharashtra. The claims.raised by the claimant 1564.5 million. The Sponsor has filed the Counter-claim of₹ 4311.6 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

102. M/s Progressive Constructions Pvt Limited has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Widening to 4/6 lane and strengthening of Existing 2 lane carriageway of NH-5, Km. 284.000 and Km. 338.000 (Ganjam - Sunakhala) in the State of Odisha (Project Chainage Km.284.000 to Km.339.713) Contract Package OR-V1I. The claims raised by the claimant 5205.7 million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

103. M/s Gammon India Limited has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Widening to 4/6 lane and strengthening of Existing 2 lane carriageway (bridges ,flyover and ROB) of NH-5 in the state of Odisha from Km. 61.00 to Km. 199.141 (Chandikole to Baleswar) contract package no. OR-V (Agreement No. 005/NH-5/GQ/GM (E-II1) 2001. The claims raised by the claimant 878.5 million. The Sponsor has filed the Counter-claim of₹ 1052 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

104. Punj Lloyd VRC Construction has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Development of four lanes with paved side shoulder of Tallcwal- Barnala section of NH-71 (New NH No.703) from existing Km. 136.07 including construction of Barnala bypass from existing Km.136.07 of NH-71 to existing Km.149.00 of NH-64 in the state of Punjab under NHDP-1V. The claims raised by the claimant 1966.1 million. The Sponsor has not-filed the Counter-claim yet. The matter is currently reserved for award.

105. SP Singla has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Construction of 3-Lane new RUB at Ch. 9+513 of -NH-lA (Now Known a*s NH-44) with Box Push Technique and its Approaches & Allied works from Ch. 9+200 to 9+770 (LHS) near Sujanpur (Pathankot) in the State of Punjab on Engineering, procurement and construction (EPC) mode. The claims raised by the claimant 618.8 million. The Sponsor has not filed the Counter-claim yet. The matter is currently pending before the Arbitral Tribunal.

106. CEIGALL - IMC JV has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Rehabilitation and augmentation of new NH-354 (Old SH-25) of section Ramdas to Gurdaspur from design chainage KM 140.000 (Existing km 46.32 of SH) to design chainage KM187.492(Existing . 3.185 of SH) for length of 47.492 km into two Lane with paved shoulder/four lane under Bharatmala Scheme in the state of Punjab on EPC mode (Package V)]. The claims raised by the claimant 377.7 million. The Sponsor has filed the Counter-claim of₹ 1141 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

107. Ceigall India Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation - to Construction of four lane Greenfield Delhi-Amritsar-Katra Expressway (Pkg-07) from Junction with Patiala-Bathinda road (NH-7) near Bhawanigarh to Junction with Ludhiana-Malerkotla road (SH-11) near Bhogiwal village to (Km 188+830 to Km 255+770) on EPC mode under Bharatmala Pariyojna in the State of Punjab (Pkg-7). The claims raised by the claimant 951.8 million. The Sponsor has not filed the Counterclaim yet. The matter is currently pending before the Arbitral Tribunal.

108. Varaha Infra has filed a petition before the Honible High Court of Delhi against the sponsor in relation to Improvement of Amritsar Bypass by construction of additional structure and service road on NH-l(Newe NH-3) b/w Km. 448+510 to Km 473+068 in the state of Punjab on EPC Mode. The claim raised by the claimant is yet to be fixed and no counter claim yet. The matter is currently pending before the Arbitral Tribunal.

109. KBTPL has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Operation & Maintenance of Kota-Baran Section from Km 1080.263 to Km 1184.322 of NH-27 in the State of Rajasthan on OMT basis. The claims raised by the claimant 1545.2 million. The Sponsor has filed the Counter-claim of₹ 3887 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

110. IRCON PB Tollway Ltd. has filed a petition before the Hon'ble High Court ofDelhi against the sponsor in relation to Widening & Strengthening of existing Bikaner-Phalodi Section to Four Lane from km.4.200 to Km. 55.250

and two lanes with paved shoulder from Kra 55.250 to Km 163.500 ofNH-15 on BOT (Toll) basis in the State of Rajasthan, (Ref-1). The claims raised by the claimant 3707.6 million. The Sponsor has filed the Counter-claim of₹ 424.3 million against the Claimant. The matter is cun'ently reserved for award.

111. Udaipur Tollway Ltd. has filed a petition before the Hon'ble High Court ofDelhi against the sponsor in relation to Six Lanning of from KM. 287.400 to KM 401.200 Section of NH-8 in the States of Rajasthan and Gujarat on DBFOT (Toll)) IRB-ARBITRATION Ref NO.1. The claims raised by the claimant 9060 million. The Sponsor has filed the Counter-claim of₹ 2150 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

112. CG Tollways Limitted has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Six Lanning of Kishangarh Udaipur Ahmedabad Section from KM 90.000(near Gulabpura) to KM 21.4.870 (end of Chittorgarh Bypass) of NH 79 in the State of Rajasthan on BOT(Toll) mode) IRB- ARBITRATION Ref NO.2. The claims raised by the claimant 5021.2 million. The Sponsor has filed the Counter-claim of₹ 3040 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

113. Uchit Expressway Pvt Ltd has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Six laning of Chittorgarh-Udaipur Section of NH-76 from design chainage Km 214.870 to Km 308.370 in the State of Rajasthan (length 93.500 to Km) on DBFOT (Toll) Mode under NHDP Phase- V (Paekcage-IIl). The claims raised by the claimant 3097.6 million. The Sponsor has filed the Counterclaim of₹ 395.6 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

114. M/s Oriental Pathways(Agra) Pvt Ltd" has filed a petition before the Hon'ble High Court ofDelhi against the sponsor in relation to Improvement, Operation and Maintenance including Strengthening and Widening of existing₹ lane road to 4 lane road dual carnage way from Km. 17.756 to Km 62.295 of NH- 11, (Agra- . Bharatpur Section) in the States of Uttar Pradesh and Rajasthan on Built, Operate and Transfer (BOT) basis. The claims raised by the claimant 1086.6 million. The Sponsor has not filed the Counter-claim yet against the Claimant. The matter is currently pending before the Arbitral Tribunal.

115. Beawer Pali Pindara Tollway Pvt Ltd. has filed a petition before the Hon'ble High Court ofDelhi against the sponsor in relation to 4 laning of Beawar-Pali-Pindwara Section of Nh-14(km 0.000 to Km 244+120) in the State of Rajasthan under NHDP Phase-III on design, build, finance, operate and transfer(toll) basis(Ref-l). The claims raised by the claimant 472.5 million. The Sponsor has filed the Counter-claim of ₹ 3605.1 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

116. Beawer Pali Pindara Tollway Pvt Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to 4 laning of Beawar-Pali-Pindwara Section of Nh-14(km 0.000 to Km 244+120) in the State of Rajasthan under NHDP Phase-III on design, build, finance, operate and transfer(toll) basis (Ref-II.). The claims raised by the claimant 1141.7 million. The Sponsor has not filed the Counterclaim yet against the Claimant. The matter is currently pending before the Arbitral Tribunal.

117. M/S CDS Infra Projects Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Construction of Eight Lane Carriageway starting near Junction with SH-37A to Junction with NH-76.(Ch. 359 170-388. 420) section of Delhi-Vadodara Access Controlled Green Field Alignment (NH- 148N) on EPC Mode under Bharatmala Pariyojana in the State of Rajasthan (Package-13). The claims has not been raised by the claimant. The Sponsor has filed the Counter-claim of₹ 459.6 million against the Claimant. The matter is currently reserved for the award.

118. M/s Sona Builder- M/s Bharat Spun Pipe has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to construction of Balance Works as part-2 (two numbers of interchanges) of Jaipur Ring Road (NH-148 C) from Tonk Road (NH-52) to Ajmer Road Section (NH-48) in the State of Rajasthan. The claims raised by the claimant 1020 million. The Sponsor has filed the Counter-claim of₹ 1120 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

119. AS Patel has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Operation and Maintenace of Kota Bypass Section from Km. 1052.429 to Km. 1080.263 Total Length 26.343 Km excluing 1.4Km. lenght of CSB, of NH-27(76) in the state of Rajasthan. The claims has not been raised by the claimant and the Sponsor has not filed the Counter-claim yet against the Claimant. The matter is currently pending before the Arbitral Tribunal.

120. Vijay Engineering has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Construction of 4-laning of Namakkal Bypass on NH-7, Package No. NS-27/TN at Namakkal in the State of Tamil Nadu - North South and East-West Corridor Project under Phase-II. (Mode of executioner BOQ). The claims raised by the claimant 3789.2 million. The Sponsor has not filed the Counter-claim yet against the Claimant. The matter is currently stayed by the HC.

121. TD Toll Road Pvt Ltd has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Design, Engineering, Finance, Construction, operation and Maintenance of Trichy-Dindigul Section from Km 333.000 to Kin 421.600 of NH-45 in the state of TN under NHDP Phase-HIA on BOT basis (Ref.- III). The claims raised by the claimant 280 million. The Sponsor has filed the Counter-claim of₹ 1094 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

122. MVR Infrastructure & Tollways Ltd has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Design, Construction, Development, Finance, Operation and Maintenance of Km 207.050 to Km 248.625 (start of proposed flyover on Namakkal Bypass) (ii) Improvement, operation and Maintenance of Km 199.200(start of Salem Bypass on NH-7) to Km 207.050 (salem) of NH-7 in the state of Tamil Nadu under North-South Corridor (NHDP Phase-11) on BOT basis (Ref 2) NHA1 Vs. MVR. The claims raised by the claimant 203.9 million. The Sponsor Jias not filed the Counter-claim yet against the Claimant. The matter is currently pending before the Arbitral Tribunal.

123. M/s. Trichy Thanjavur Expressways Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Design, engineering, finance construction, operation and maintenance of 4 laning - of Thanjavur- Trichy section from Km 80.000 to Km. 135.750 of NH -6*7 in the State of Tamil Nadu under NHDP-1HA on BOT basis. The claims raised by the claimant 13494.2 million. The Sponsor has filed the Counter-claim of₹ 4918 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

124. Krishnagiri Walajahpet Tollway Pvt Ltd has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to 6-laning of Krishnagiri Walajahpet Section of NH-48 (Old NH-46) from Km 0.00 to Km. 148-30 in Tamil Nadu under NHDP Phase-V on BOT (Toll) under DBFOT pattern. (Ref-2). The claims has not been raised by the claimant and the Sponsor has not filed the Counter-claim yet against the Claimant. The matter is currently pending before the Arbitral Tribunal.

125. TN (DK) Expressways Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Design, Construction, Development, Finance, Operation and Maintenance of Km.305.600 (End of Karur Bypass) to Km 373.725 (Dindigul) and Improvement, Operation and Maintenance of Km 292.600 (Start of Karur Bypass) to Km 305.600 (End of Karur Bypass) on NH-7 in the State of Tamil Nadu under North-South Corridor (NHDP-Phase-II) on Build, Operate and Transfer (BOT) Basis (Contract Package No. NS 2/BOT/TN-4). The claims raised by the claimant 10589.5 million. The Sponsor has filed the Counter-claim of₹ 2741 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

126. HK Toll Road Private Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Six laning of Hosur to Krishnagiri section of NH-44(01d NH-7) from km. 33/130 to Km.93/000 in the state of Tamilnadu under NHDP Phase V on BOT(toll) basis under DBFOT pattern. The claims raised by the claimant .11980.9 million. The Sponsor has not filed the Counter-claim yet against the Claimant. The matter is currently pending before the Arbitral Tribunal.

127. M/s. DS Toll Road Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Design Construction, Development, Finance, Operation and Maintenance of Km 373+726 (Start of Proposed Fly Over al Dindigul Bypass) to Km 426+775 (Samayanallur) [Actual Chainage Km 368+147 to Km 421+196] of NH-7 (TN05) on BOT Mode in the state of TN. The claims raised by the claimant 6360.8 million. The Sponsor has filed the Counter-claim of₹ 6402 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.'

128. K-NR Construction Ltd. has filed a petition before'the Hon'ble High Court-of Delhi against the sponsor in relation to Four laning of Km 5.000 to Km 81.000 (Design Chainages) and 2 laning with paved shoulders from Km 81.000 to Km 120.000 (Design Chainages) of Madurai- Ramanathapuram section of NH-49 in Tamil Nadu of EPC mode. The claims has not been raised by the claimant and the Sponsor has not filed the Counter-claim yet against the Claimant. The matter is currently pending before the Arbitral Tribunal.

129. Krishnagiri Walajahpet Tollway Pvt Ltd has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to 6-laning of Krishnagiri Walajahpet Section of NH-48 (Old NH-46) from Kin 0.00 to Km. 148-30 in Tamil Nadu under NHDP Phase-V on BOT (Toll) under DBFOT pattern. The claims has not been raised by the claimant. The Sponsor has filed the Counter-claim of₹ 1040 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

130. SU Toll Road Pvt Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to, Design, Engineering, Finance, Construction Operation and Maintenance qfFour laning of Salem to Ulundurpet section from Km.0/313 to Km. 136.670 of NH-68-Package no. NHDP /BOT-1/TN/06 on BOT basis. Theclaims raised by the claimant 8412 million. The Sponsor has filed the Counter-claim of₹ 2004 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

131. M/S ADTPL (Athaang Dichpally Tollway Pvt Ltd) has filed a petition before the Hon'ble High Court of Delhi

against the sponsor in relation to Design, Engineering, Finance, Construction, Operation and Maintenance of Four laning of Armur— Adloor— Yellareddy section on Nagpur— Hyderabad of NH 7 from Km 308.000 to Km 367.000 in the State of Andhra Pradesh on DBFOT Basis (Package No. NS2/BOT/AP- 1). The claims raised by the claimant 1537.6 million. The Sponsor has not filed the Counter-claim yet against the Claimant. The matter is currently pending before the Arbitral Tribunal.

132. M/s. GMR PEL has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Design, Construction, Development, Finance, Operation and Maintenance of Km.367.000 (Adloor Yellareddy) to Km.447.000 and Improvement, Operation & Maintenance of Km.447.000 to Km.464.000 (Gundla Pochanpalli) on NH-44 in the State of Telangana (Package No.NS-2/BOT/AP-2) under BOT (Annuity) Basis. The claims raised by the claimant 239.5 million. The Sponsor has not filed the Counterclaim yet against the Claimant. The matter is currently pending before the Arbitral Tribunal.

133. M/s. Allahabad Bypass pathway Pvt. Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Operation and Maintenance of Allahabad Bypass(including Ganga bridge pkg-abp-1) from km 158.000 to km 242.708 of NH-2 on OMT basis in the State of UP(Package - 32). The claims raised by the claimant 4448 million, the Sponsor has not filed die Counter-claim yet against die Claimant. The matter is currently pending before the Arbitral Tribunal.

134. M/s Freyssinet Prestressed Concrete Co Ltd. has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Work of repair and rehabilitation of existing Ganga Bridge (old) at Km. 92.395 and balance work of its approaches on Hapur Bypass to Moradabad section of NH-24 in the State of Uttar Pradesh. The claims raised by the claimant 105.9 million. The Sponsor has filed the Counter-claim of₹ 22.9 million against the Claimant. The matter is currently pending before the Arbitral Tribunal.

135. ORIENTAL STRUCTURAL ENGINEERS PVT. LTD. KMC CONSTRUCTION LTD. (JV) OSE KMC- JV has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Rehabilitation and upgradation of Barabanki - Jarwal road Junction section (km 0.000 to km 43.000) of NH-28C (new NH no. 972) in the State of Uttar Pradesh. The claims has not been raised by the claimant and the Sponsor has not filed rhe Counter-claim yet against the Claimant. The matter is currently pending before the Arbitral Tribunal.

136. MAPEX Expressway Private Ltd has filed a petition before the Hon'ble High Court of Delhi against the Sponsor in .relation to Four laning including strengthening of existing two lane.pavcment from Panagarh (Km.517.00) to Palsit (Km. 581.457) section of NH-2 in the state of the West Bengal - Request for reference to arbitration in respect of disputes arising out of the Contract relating to Change in Law for the Financial Years 2017-18, 2018-19 & 2019-20. The claims raised by the claimant 121.1 million. The Sponsor has not filed the Counter-claim yet against the Claimant. The matter is currently reserved for the award.

137. EMAS Expressway Private Ltd has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Four - laning including strengthening of existing two lane pavement from Palsit (Km. 5 81.45 7) to Dhankuni (Km. 646.000) section of NH-2 in the state of the West Bengal - Request for reference to arbitration in respect of disputes arising out of the Contract relating to Change in Law for the Financial Years 2017-18, 2018-19 & 2019-20. The claims raised by the claimant 138.5 million. The Sponsor has not filed the Counter-claim yet against the Claimant. The matter is currently pending before the Arbitral Tribunal.

138. M/S Ashoka Buildcon has filed a petition before the Hon'ble High Court of Delhi against the sponsor in relation to Development of 4-lane Isiampur Bypass of 10.31 km length from 0.000(Ex. Ch. Km 498.500) to km 10.310 (Ex. Ch. Km 506.950) on NH-31 in the State of West Bengal under NHDP Phase-11 on EPC. Mode. The claims raised by the claimant 1554.2 million. The Sponsor has not filed the Counter-claim yet against the Claimant. The matter is cunentiy pending before the Arbitral Tribunal.

Other material litigation

Considering the business and purpose of the Sponsor, it is imperative for the Sponsor to have an effective mechanism for the acquisition of land for building roads. Taking this need of the Sponsor into account, the parliament has enacted the NH Act,.a special enactment which oven-ides the Land Acquisition Act. 1894 in cases where the land is acquired for the purposes of building National Highways. The Parliament has enacted the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, which is applicable to land acquisitions under NH Act with effect from January 1, 2015 (i.e. one year from the date of commencement of the Act, subject to notification by Central Government). The process of acquiring land is a very cumbersome process and it leads to a large number of disputes. At present there are approximately 72,000

VI. Litigations involving the Associates of the Sponsor

As on the date of the Preliminary Placement Memorandum, other than as disclosed below, there are no pending criminal or material litigations or regulatory actions involving the Associates of the Sponsor.

Sr. No	Name of Associate	Number of proceedings outstanding	Amount involved (₹ in million)
		Direct Tax	
1.	Paradip Port Road Company Limited	5	7.74
2.	Tuticorin Port Road Company Limited	3	1.97
3.	Vishakhapatnam Port Road Company Limited	3	1.73
4.	Calcatta I-Ialdia Port Road Company Limited	3	-
5.	Mumbai JNPT Port Road Company Limited	2	-
6.	New Mangalore Port Road Company Limited	2	-
7.	Chennai Ennore Port Road Company Limited	1	-
8.	Ahmedabad Vadodara Expressway Company Limited	7	112.14

VII. Litigations involving the Project Manager

There are no pending criminal, regulatory or other material litigations involving the Project Manager as on the date of the Preliminary Placement Memorandum.

VIII. Litigations involving the Associates of the Project Manager

Please see the section entitled " – *Litigations involving the Associates of the Sponsor*" above.

IX. Litigations involving the Investment Manager

There are no pending criminal, regulatory or other material litigations involving the Investment Manager as on the date of the Preliminary Placement Memorandum.

X. Litigations involving the Associates of the Investment Manager

As the President of India is the Promoter of the Investment Manager, persons or entities that may be classified as 'associates' of the Investment Manager in terms of Regulation 2(1)(b)(ii) and Regulation 2(1)(b)(iii) of the InvIT Regulations, have not been identified as 'associates' of the Investment Manager. Consequently, information or disclosures required to be included with respect to such persons or entities pursuant to the InvIT Regulations has not been included in the Preliminary Placement Memorandum.

XI. Litigations involving the Trustee

1. SBICAP Trustee Company Limited (the "**Plaintiff**") had filed a suit before the City Civil Court, Bangalore against the Trustee and others (the "**Defendants**") requiring sale of pledged shares for a particular price by SREI Fund/Investors, for whom the Trustee was acting as the share pledge trustee. The Plaintiff was acting for a consortium of lenders and has residual interest. The aggregate claim amount is ₹1,550.30 million. The Trustee had filed an application seeking its removal from the suit and deletion of its name from the array of parties. Further, the Plaintiff had filed an interlocutory application before the City Civil Court, Bangalore ("Interlocutory Application") seeking recovery of complete residual dues received by the Defendants 2& 3 while selling the pledged shares, and which was dismissed. The Plaintiff has filed a writ petition before High Court of Karnataka challenging the dismissal of the Interlocutory Application, and the Trustee has not been impleaded as a party to such writ petition. The matter is currently pending.

2. In the matter of FCRL ESOP Trust of Future Corporate Resources Limited ("**FCRL**"), SEBI Adjudicating Officer has passed an order dated the February 3, 2021, on the ground of insider trading against seven employees of FCRL and FCRL Employees Trust of which the Trustee is a trustee. FCRL along with FCRL Employee Welfare Trust has been jointly and severally directed to disgorge an amount of ₹27.56 million. The Trustee has submitted that the Trustee as a trustee has acted on the instructions of the committee and not liable for insider trading and has not gained or received any amount. The Trustee and FCRL Employee Welfare Trust are separate. All the said persons have filed an appeal before SAT against the said SEBI Order dated the February 3, 2021. On April 19, 2023, SAT has reserved its order and directed certain of the parties to submit their written submissions. Such written submissions have been filed. The matter is currently pending.

3. Pursuant to receipt of information against Trustees Association of India and three of its members, *i.e.*, the Trustee, Axis Trustee Services Limited, and SBI CAP Trustee Company Limited (collectively, the "**Respondents**") for alleged contravention of Sections 3(3) and 4 of the Competition Act, 2002, *i.e.*, for entering into anti-competitive agreements and formation of cartel, the Competition Commission of India (the "**CCI**") passed an order dated December 23, 2021 under Section 26(1) of the Competition Act, 2002 directing the Director General to investigate the conduct of the Respondents and its office bearers for *prima facie* violating Section 3(1) read with Section 3(3) of the Competition Act, 2002.

   In response to the above order, the Respondents filed writ petitions before the High Court of Bombay challenging the jurisdiction of the CCI to decide the matter as SEBI is the sectoral regulator regulating the Respondents. The High Court of Bombay has directed CCI to decide on the jurisdictional issue. The Trustee had filed an application before the CCI for the same, and has subsequently filed additional written submissions before the CCI. The matter is currently pending.

4. R. K. Mohata Family Trust has filed a commercial suit before the High Court of Bombay against the Trustee praying for a meeting of the debenture holders of Reliance Home Finance Limited ("**RHFL**") to be held and also for damages worth ₹10.55 million from the Trustee. Pursuant to an order dated March 31, 2022 read with the orders dated April 6, 2022 and May 10, 2022 from the High Court of Bombay, the Trustee has convened a meeting of the debenture holders of RHFL and the results of the voting on matters taken up at such meeting have been placed before the High Court of Bombay. The matter is currently pending.

   Further, pursuant to a special leave petition filed by Authum Investments & Infrastructure Limited **("AIIL")** before the Supreme Court of India, the Supreme Court of India had allowed the resolution plan submitted by AIIL and had directed AIIL to make the necessary payments within the prescribed period. AIIL has complied with such direction of the Supreme Court of India.

   Subsequent to the above, a petition of contempt has been filed by Praduman Tandon and others against the order of the Supreme Court of India alleging that that the resolution plan and the distribution mechanism was not known. The matter is currently pending.

5. A suit was instituted before the Supreme Court of Mauritius (the "**Court**") in 2014 against Dynamic India Fund III ("**DIF III**"), International Financial Services Limited ("**IFS**"), ICICI Venture Funds Management Company Limited ("**ICICI Venture**"), ICICI Bank Limited ("**ICICI Bank**") and the Trustee (collectively, the "**Defendants**"), by certain investors of DIF III claiming damages to the tune of $103.69 million for the loss of their investments in DIF III.

   The Defendants have raised various preliminary objections to the suit, including on the jurisdiction of the Court to decide on disputes involving non-residents of Mauritius. By way of an order dated June 9, 2020, the Court stayed the proceedings against ICICI Venture and ICICI Bank on the grounds that the allegations made against these entities did not take place in Mauritius and therefore, the Court lacked jurisdiction to adjudicate on such matters. Subsequently, the plaintiffs informed that the Court of their decision not to appeal against such order. Thereafter, by way of an order dated June 3, 2022, the Court deleted ICICI Venture and ICICI Bank from the array of parties involved in the suit, thereby allowing the suit to continue against DIF III, IFS and the Trustee. The plaintiffs have filed an appeal against the order dated June 3, 2022. ICICI Venture, the investment manager of DIF III, is handling and taking care of the matter on behalf of the Trustee, who was acting as a trustee to DIF III. The matter is currently pending.

6. In the matter involving Karvy Data Management Services Limited **("KDMSL")**, Pawan Kapoor and Amri Resorts Private Limited (in their capacities as debenture holders) filed a writ petition before the High Court of Delhi against the Trustee and others alleging certain non-compliances including inaction against KDMSL for defaults in payment of interest and principal. The High Court of Delhi has directed the Ministry of Corporate Affairs, Government of India to investigate the complaint and such investigation is ongoing. The matter is currently pending.

7. Kamalakar B. P has filed declaratory civil suit before the Court of Civil Judge (Senior Division), Thane, pursuant to which the Trustee has received a notice dated July 28, 2023. The Plaintiff has sought for (i) declaration of deed of mortgage by a defendant to another in favour of the Trustee as void, illegal, invalid, non-est, not binding on the Plaintiff; (ii) permanent injunction from entering into the suit property, sale in auction and/ or agreeing to sell the suit property in auction; and (iii) temporary injunction from the sale of the suit property. Written statements and affidavit in reply have been filed before the court. The matter is currently pending.

8. CBM Constructions LLP, a holder of debentures issued by Three C Green Developers Private Limited, has filed a suit dated August 23, 2023 before the Senior Civil Judge cum RC, South East, Saket, New Delhi, praying for, inter alia, the Trustee to transfer pledged shares of certain defendants. The Trustee has complied with such prayer and filed an application for the deletion of its name from the array of parties. The matter is currently pending.

9. DSP Asset Managers Private Limited has filed a company application dated January 16, 2024 before the Mumbai Bench of the National Company Law Tribunal praying for condonation of delay in filing claims against Infrastructure Leasing & Financial Services Limited. The Trustee is acting as the debenture trustee in relation to certain debentures

issued by IL&FS Transportations Networks Limited, a subsidiary of Infrastructure Leasing & Financial Services, and the Plaintiff has alleged that the Trustee has delayed in filing their claim with Grant Thornton (Bharat) LLP for admission. The Trustee is in the process of filing its written statement in response to the application. The matter is currently pending.

10. In the case of Spenta Suncity Private Limited, Monivedda Consultant LLP, one of the stakeholder has filed civil appeal and contempt petition against the Trustee and its Managing Director for alleged violations of order dated December 16, 2022 passed by the Supreme Court of India to make further allotment of debentures and create further liabilities on the assets. At the hearing held on March 11, 2024, the Trustee has filed counter replies in both civil appeal and contempt petition before Supreme Court of India. At the hearing held on May 13, 2024, the Trustee has been directed to file affidavit/undertaking confirming that it is not carrying out any constructions nor it has authorised anyone to carry out constructions including Spenta Suncity Private Limited. The required Affidavit/Undertaking was filed by the Trustee and the matter is currently pending.

11. A summary suit has been filed before City Civil Court at Dindoshi (Borivali Division), Goregaon, Mumbai by Francis Cassian Mendis against Heida Aloysious Gomes and nine others include the Trusteechallenging the conveyance deed dated May 18, 1981 all all other conveyances executed thereafter and mortgage dated September 9, 2021 created in favour of the Trustee by Spenta Suncity Private Limied and a permanent order and injunction restraining the defendants from carrying out any constructions/development activity on the disputed property. The matter is currently pending and has now been listed on April 22, 2025.

12. In the matter of Balaji Enterprises versus Essel Lucknow Raibareli Toll Road Limited and other, before the Court of District and Sessions Judge, Rohini Commercial Court, North West Delhi, the Trustee has received Summons from the Court of District & Sessions Judge, Rohini Commercial Court, North West Delhi on July 11, 2024 for the alleged unpaid amount of Rs. 80,35,732, towards construction contracts executed by it. The matter is currently pending and the next date of hearing is scheduled on August 21, 2025.

13. In the matter of Spanhaus Traders LLP versus JLS Realty, Spenta Suncity Private Limited, Trustee and Rajat Jhunjhunwala before Bombay High Court, the Trustee has been made a respondent. The matter pertains to a loan allegedly advanced by Spanhaus Traders LLP to JLS Realty Private Limited. Spanhaus Traders LLP is that the sale of the disputed land by JLS Realty Private Limited was carried out fraudulently, illegally, and with the intent to defeat and frustrate the claims of Spanhaus Traders LLP . Spanhaus Traders LLP has sought that the deed of conveyance dated September 8, 2021 executed by JLS in favour of Spenta and other documents executed in relation to the transaction by Spenta in favour of the Trustee be declared invalid, illegal, non-est, void and not binding on Spanhaus Traders LLP and ordered to be cancelled and the respondents be be directed to make payment of sum of Rs. 118,16,80,355 along with interest . The matter is currently pending.

14. In the matter of Pawan Kappor versus State of Delhi NCT and others, a criminal revision petition has been filed before Session & District Court Tis Hazari, New Delhi. The criminal revision petition filed by Pawan Kapoor and debenture holders of Karvy Data Management Services Limited for reinstating the investigation in the issuer company which was rejected by the CMM, Tis Hazari Court, New Delhi alleging that there has been breach of trust by Trustee as a Debenture Trustee, lleged collusion between the Trustee and the issuer company and that the Trustee has not taken any action against the issuer company after the default in payment of dues to debenture holders. The matter is currently pending.

15. In the matter of Narayanamma versus Thammaiah before City Civil and Sessions Judge, Bangalore, the Trustee has been impleaded as a respondent in summons. The matter is currently pending and the next date of hearing is April 16, 2025.

16. In the matter of Sulochana versus India Cement Limited and other before the Principal District Court, Ariyalur, Chennai, the Trustee has been impleaded as a respondent. The matter is currently pending and the next date of hearing is April 7, 2025.

17. In the matter of Madhu Prasad versus Punniyama and others before Principal Subordinate Court, Krishnagiri, Tamilnadu, the Trustee has been made a party to the suit which pertains to partition of properties and the Trustee has released the charge on the disputed properties and executed a release deed and accordingly filed its reply in the matter. The matter is currently pending and the next date of hearing is March 25, 2025.

Tax Proceedings

Details of all direct tax, indirect tax and property tax matters against (i) the Investment Manager and (ii) Project SPVs, as of the date of this Preliminary Placement Document is as follows:

Nature of case	Number of cases	Amount involved (*in ₹ million*)*
Investment Manager		

Nature of case	Number of cases	Amount involved (*in ₹ million*)*
Direct tax	-	-
Indirect tax	1	16.44
Property tax	-	-
Project SPVs		
NWPPL		
Direct tax	1	Refer* note below
Indirect tax	-	-
Property tax	-	-
Total	**-**	**16.44**

*The amount involved in this tax proceeding is non-quantifiable.

SECURITIES MARKET OF INDIA

The information in this section has been extracted from documents available on the website of SEBI and the Stock Exchange and has not been prepared or independently verified by the Parties to the InvIT or any of their respective affiliates or advisors.

The Indian Securities Market

India has a long history of organized securities trading. In 1875, the first stock exchange was established in Mumbai. BSE and NSE together hold a dominant position among the stock exchanges in terms of the number of listed companies, market capitalisation and trading activity.

Stock Exchange Regulation

Indian stock exchanges are regulated primarily by SEBI, as well as by the Government acting through the Ministry of Finance, Capital Markets Division, under the SCRA and the SCRR. SEBI, in exercise of its powers under the SCRA and the SEBI Act, notified Securities Contract (Regulation) (Stock Exchanges and clearing Corporations) Regulations, 2018 (the "**SCR (SECC) Regulations**"), which regulate *inter alia* the recognition, ownership and internal governance of stock exchanges and clearing corporations in India together with providing for minimum capitalisation requirements for stock exchanges. The SCRA, the SCRR and the SCR (SECC) Regulations along with various rules, bye-laws and regulations of the respective stock exchanges, regulate the recognition of stock exchanges, the qualifications for membership thereof and the manner, in which contracts are entered into, settled and enforced between members of the stock exchanges.

The SEBI Act empowers SEBI to regulate the Indian securities markets, including stock exchanges and intermediaries in the capital markets, promote and monitor self-regulatory organisations and prohibit fraudulent and unfair trade practices. Regulations concerning minimum disclosure requirements by public companies, rules and regulations concerning investor protection, insider trading, substantial acquisitions of shares and takeover of companies, buy-backs of securities, employee stock option schemes, stockbrokers, merchant bankers, underwriters, mutual funds, foreign institutional investors, credit rating agencies and other capital market participants have been notified by the relevant regulatory authority.

Listing and Delisting of Securities

The InvIT Regulations provide for listing and delisting of units of InvITs on and from the stock exchanges.

BSE

Established in 1875, it is the oldest stock exchange in India. In 1956, it became the first stock exchange in India to obtain permanent recognition from the Government under the SCRA. It has evolved over the years into its present status as one of the premier stock exchanges of India. Pursuant to the BSE (Corporatization and Demutualization) Scheme 2005 of SEBI, with effect from August 19, 2005, BSE was incorporated as a company under the Companies Act, 1956. The equity shares of BSE were listed on NSE on February 3, 2017.

NSE

NSE was established by financial institutions and banks to provide nationwide online, satellite-linked, screen-based trading facilities with market-makers and electronic clearing and settlement for securities including government securities, debentures, public sector bonds and units. It has evolved over the years into its present status as one of the premier stock exchanges of India. NSE was recognised as a stock exchange under the SCRA in April 1993 and commenced operations in the wholesale debt market segment in June 1994. The capital market (equities) segment commenced operations in November 1994 and operations in the derivatives segment commenced in June 2000.

Internet-based Securities Trading and Services

Internet trading takes place through order routing systems, which route client orders to exchange trading systems for execution. Stockbrokers interested in providing this service are required to apply for permission to the relevant stock exchange and also have to comply with certain minimum conditions stipulated by SEBI. NSE became the first exchange to grant approval to its members for providing internet-based trading services. Internet trading is possible on both the "equities" as well as the "derivatives" segments of NSE.

Trading Hours

Trading on both NSE and BSE occurs from Monday to Friday, between 9:15 a.m. and 3:30 p.m. 1ST (excluding the 15 minutes pre-open session from 9:00 a.m. to 9:15 a.m. that has been introduced recently). BSE and NSE are closed on public holidays. The recognised stock exchanges have been permitted to set their own trading hours (in the cash and derivatives segments) subject to the condition that (i) the trading hours are between 9.00 a.m. and 5.00 p.m and (ii) the stock exchange has in place a risk management system and infrastructure commensurate to the trading hours.

Trading Procedure

This totally automated screen based trading in securities was put into practice nationwide. This has enhanced transparency in dealings and has assisted considerably in smoothening settlement cycles and improving efficiency in back-office work. In the year 2004, BSE introduced its new generation trading platform, BOLT Plus.

NSE has introduced a fully automated trading system called National Exchange for Automated Trading ("**NEAT**"), which operates on strict time/price priority besides enabling efficient trade. NEAT has provided depth in the market by enabling large number of members all over India to trade simultaneously, narrowing the spreads.

Depositories

The Depositories Act provides a legal framework for the establishment of depositories to record ownership details and effect transfer in book-entry form. Further, SEBI framed regulations in relation to the registration of such depositories, the registration of participants as well as the rights and obligations of the depositories, participants, companies and beneficial owners. The depository system has significantly improved the operation of the Indian securities markets.

SELLING AND TRANSFER RESTRICTIONS

The distribution of this Preliminary Placement Document and the offer, sale or delivery of the Units is restricted by law in certain jurisdictions. Persons who may come into possession of this Preliminary Placement Document are advised to consult with their own legal advisors as to what restrictions may be applicable to them and to observe such restrictions. This Preliminary Placement Document may not be used for the purpose of an offer or invitation in any circumstances. Due to the following restrictions, investors are advised to consult legal counsel prior to purchasing or subscribing to the Units or making any resale, pledge or transfer of the Units.

Republic of India

The Preliminary Placement Document may not be distributed directly or indirectly in India or to residents of India and any Units may not be offered or sold directly or indirectly in India to, or for the account or benefit of, any resident of India except as permitted by applicable Indian laws and regulations.

The Units may not be offered or sold, directly or indirectly, and the Preliminary Placement Document, any offering materials and any advertisements in connection with the offering of the Units may be distributed or published in or from any country or jurisdiction except under circumstances that will result in compliance with any applicable rules and regulations of any such country or jurisdiction. The Issue will be made in compliance with the applicable SEBI InvIT Regulations.

Australia

The Preliminary Placement Document:

1. does not constitute a product disclosure document or prospectus under Chapter 6D.2 of the Corporations Act, 2001 (Cth) ("**Australian Corporations Act**");

2. has not been, and will not be, lodged with the Australian Securities and Investments Commission ("**ASIC**"), as a disclosure document for the purposes of the Corporations Act and does not purport to include the information required of a disclosure document under Chapter 6D of the Australian Corporations Act;

3. does not constitute or involve a recommendation to acquire, an offer or invitation for issue or sale, an offer or invitation to arrange the issue or sale, or an issue or sale, of interests to a "retail client" (as defined in section 761G of Australian Corporations Act and applicable regulations) in Australia; and

4. may only be provided in Australia to select investors who are able to demonstrate that they fall within one or more of the categories of investors, or Exempt Investors, available under section 708 of the Australian Corporations Act.

The Units may not be directly or indirectly offered for subscription or purchased or sold, and no invitations to subscribe for or buy the Units may be issued, and no draft or definitive Preliminary Placement Document, advertisement or other offering material relating to any Units may be distributed in Australia, except where disclosure to investors is not required under Chapter 6D of the Australian Corporations Act or is otherwise in compliance with all applicable Australian laws and regulations. By submitting an application for the Units, you represent and warrant to us that you are an Exempt Investor.

As any offer of Units under this Preliminary Placement Document will be made without disclosure in Australia under Chapter 6D.2 of the Australian Corporations Act, the offer of those securities for resale in Australia within 12 months may, under section 707 of the Australian Corporations Act, require disclosure to investors under Chapter 6D.2 if none of the exemptions in section 708 applies to that resale. By applying for the Units you undertake to the Trust, the Investment Manager and the Lead Managers that you will not, for a period of 12 months from the date of issue of the Units, offer, transfer, assign or otherwise alienate those securities to any person in Australia except in circumstances where disclosure to such person is not required under Chapter 6D.2 of the Australian Corporations Act or where a compliant disclosure document is prepared and lodged with ASIC.

British Virgin Islands

The Units are not being, and may not be offered to the public or to any person in the British Virgin Islands for purchase or subscription by or on the behalf. The Units may be offered to companies incorporated under the BVI Business Companies Act, 2004 (British Virgin Islands) (each a "**BVI Company**"), but only where the offer will be made to, and received by, the relevant BVI Company entirely outside of the British Virgin Islands.

The Preliminary Placement Document has not been, and will not be, registered with the Financial Services Commission of the British Virgin Islands. No registered prospectus has been or will be prepared in respect of the Units for the purposes of the Securities and Investment Business Act, 2010 or the Public Issuers Code of the British Virgin Islands.

Canada

Units may be sold in Canada only to purchasers purchasing, or deemed to be purchasing, as principal that are both accredited investors, as defined in National Instrument 45-106 *Prospectus Exemptions* or subsection 73.3(1) of the *Securities Act* (Ontario), and are permitted clients, as defined in National Instrument 31-103 *Registration Requirements, Exemptions and Ongoing Registrant Obligations*. Any resale of the Units must be made in accordance with an exemption from, or in a transaction not subject to, the prospectus requirements of applicable Canadian securities laws.

Securities legislation in certain provinces or territories of Canada may provide a purchaser with remedies for rescission or damages if this Preliminary Placement Document (including any amendment hereto) contains a misrepresentation, provided that the remedies for rescission or damages are exercised by the purchaser within the time limit prescribed by the securities legislation of the purchaser's province or territory. The purchaser should refer to any applicable provisions of the securities legislation of the purchaser's province or territory for particulars of these rights or consult with a legal advisor.

Under Canadian securities laws, National Instrument 33-105 *Underwriting Conflicts* ("**NI 33-105**") provides disclosure requirements with respect to potential conflicts of interest between an issuer and underwriters, dealers or placement agents, as the case may be. To the extent any conflict of interest between us and any of the underwriters (or any other placement agent acting in connection with this offering) may exist in respect of this offering, the applicable parties to this offering are relying on the exemption from these disclosure requirements provided to them by section 3A.3 of NI 33-105 (Exemption based on U.S. disclosure).

Upon receipt of this Preliminary Placement Document, each Canadian purchaser is hereby deemed to confirm that it has expressly requested that all documents evidencing or relating in any way to the sale of the Units described herein (including, for the avoidance of doubt, any purchase confirmation or any notice) be drawn up in the English language only.

Cayman Islands

No offer or invitation to subscribe for Units may be made to the public in the Cayman Islands to subscribe for any of the Units but an invitation or offer may be made to sophisticated persons (as defined in the Cayman Islands Securities Investment Business Law (the "**SIBL**"), high net worth persons (as defined in the SIBL) or otherwise in accordance with the SIBL.

Hong Kong

Each Lead Manager has represented, warranted and agreed that:

(i) it has not offered or sold and will not offer or sell in Hong Kong, by means of any document, any Units other than (a) to "professional investors" as defined in the Securities and Futures Ordinance (Cap. 571) of Hong Kong (the "**SFO**") and any rules made under the SFO; or (b) in other circumstances which do not result in the document being a "prospectus" as defined in the Companies (Winding Up and Miscellaneous Provisions) Ordinance (Cap. 32) of Hong Kong (the "**CWUMPO**") or which do not constitute an offer to the public within the meaning of the CWUMPO; and

(ii) it has not issued or had in its possession for the purposes of issue, and will not issue or have in its possession for the purposes of issue, whether in Hong Kong or elsewhere any advertisement, invitation or document relating to the Units, which is directed at, or the contents of which are likely to be accessed or read by, the public of Hong Kong (except if permitted to do so under the securities laws of Hong Kong), other than with respect to Units which are or are intended to be disposed of only to persons outside Hong Kong or only to "professional investors" as defined in the SFO and any rules made under the SFO.

Indonesia

The Units have not been, and will not be, registered with the Indonesia Financial Service Authority (Otoritas Jasa Keuangan or OJK) in Indonesia, and therefore, the Units may not be offered and/or sold within the territory of Indonesia or to Indonesian citizens or entities, wherever domiciled, or to Indonesian residents, in a manner which constitutes a public offering under Law No. 8 of 1995 on Capital Markets and the implementing regulations or private placement under OJK Regulation No. 30/POJK.04/2019 on the Privately Issued Debt-Linked Securities and/or Sukuk.

Japan

The Units offered hereby have not been and will not be registered under the Financial Instruments and Exchange Act of Japan (Law. No. 25 of 1948 as amended) (the "**FIEA**"). Accordingly, no Units have, directly or indirectly, been offered or sold, and may not, directly or indirectly, be offered or sold in Japan including for the benefit of any resident of Japan (which term as used herein means any person resident in Japan, including any corporation or other entity organised under the laws of Japan) or to others for re-offering or re-sale, directly or indirectly, in Japan or to, or for the benefit of, any resident of Japan, except pursuant to an exemption from the registration requirements of, and otherwise in compliance with, the FIEA and other relevant laws and regulations of Japan.

Kuwait

The Preliminary Placement Document is not for general circulation to the public in Kuwait. The Units have not been licensed for offering in Kuwait by the Kuwait Capital Markets Authority or any other relevant Kuwaiti government agency. The offering of the Units in Kuwait on the basis a private placement or public offering is, therefore, restricted in accordance with Law No. 7 of 2010 and the bylaws thereto (as amended). No private or public offering of the Units is being made in Kuwait, and no agreement relating to the sale of the Units will be concluded in Kuwait. No marketing or solicitation or inducement activities are being used to offer or market the Units in Kuwait.

Malaysia

No prospectus or other offering material or document in connection with the offer and sale of the Units has been or will be registered with the Securities Commission of Malaysia ("**Commission**") for the Commission's approval pursuant to the Capital Markets and Services Act 2007. Accordingly, the Preliminary Placement Document, and any other document or material in connection with the offer or sale, or invitation for subscription or purchase, of the Units may not be circulated or distributed, nor may the Units be offered or sold, or be made the subject of an invitation for subscription or purchase, whether directly or indirectly, to persons in Malaysia other than (i) a closed end fund approved by the Commission; (ii) a holder of a Capital Markets Services Licence; (iii) a person who acquires the Units, as principal, if the offer is on terms that the Units may only be acquired at a consideration of not less than RM250,000 (or its equivalent in foreign currencies) for each transaction; (iv) an individual whose total net personal assets or total net joint assets with his or her spouse exceeds RM3 million (or its equivalent in foreign currencies), excluding the value of the primary residence of the individual; (v) an individual who has a gross annual income exceeding RM300,000 (or its equivalent in foreign currencies) per annum in the preceding twelve months; (vi) an individual who, jointly with his or her spouse, has a gross annual income of RM400,000 (or its equivalent in foreign currencies), per annum in the preceding twelve months; (vii) a corporation with total net assets exceeding RM10 million (or its equivalent in a foreign currencies) based on the last audited accounts; (viii) a partnership with total net assets exceeding RM10 million (or its equivalent in foreign currencies); (ix) a bank licensee or insurance licensee as defined in the Labuan Financial Services and Securities Act 2010; (x) an Islamic bank licensee or takaful licensee as defined in the Labuan Financial Services and Securities Act 2010; and (xi) any other person as may be specified by the Commission; provided that, in the each of the preceding categories (i) to (xi), the distribution of the Units is made by a holder of a Capital Markets Services Licence who carries on the business of dealing in securities. The distribution in Malaysia of the Preliminary Placement Document is subject to Malaysian laws. The Preliminary Placement Document does not constitute and may not be used for the purpose of public offering or an issue, offer for subscription or purchase, invitation to subscribe for or purchase any securities requiring the registration of a prospectus with the Commission under the Capital Markets and Services Act 2007.

Mauritius

The Units may not be offered or sold, directly or indirectly, to the public in Mauritius. Neither the Preliminary Placement Document nor any offering material or information contained herein relating to the offer of the Units may be released or issued to the public in Mauritius or used in connection with any such offer. The Preliminary Placement Document does not constitute an offer to sell the Units to the public in Mauritius and is not a prospectus as defined under the Companies Act 2001.

New Zealand

The Preliminary Placement Document is not a prospectus. It has not been prepared or registered in accordance with the Securities Act 1978 of New Zealand (the "**New Zealand Securities Act**"). The Preliminary Placement Document is being distributed in New Zealand only to persons whose principal business is the investment of money or who, in the course of and for the purposes of their business, habitually invest money, within the meaning of section 3(2)(a)(ii) of the New Zealand Securities Act ("**Habitual Investors**"). By accepting the Preliminary Placement Document, each investor represents and warrants that if they receive the Preliminary Placement Document in New Zealand, they are a Habitual Investor and they will not disclose the Preliminary Placement Document to any person who is not also a Habitual Investor.

Singapore

The Preliminary Placement Document has not been registered as a prospectus with the Monetary Authority of Singapore. Accordingly, the Preliminary Placement Document and any other document or material in connection with the offer or sale, or invitation for subscription or purchase, of the Units may not be circulated or distributed, nor may the Units be offered or sold, or be made the subject of an invitation for subscription or purchase, whether directly or indirectly, to any person in Singapore other than (i) to an institutional investor (as defined in Section 4A of the Securities and Futures Act 2001 of Singapore as modified and amended from time to time (the "**SFA**")) pursuant to Section 274 of the SFA, (ii) to a relevant person (as defined in Section 275(2) of the SFA) pursuant to Section 275(1) of the SFA, or any person pursuant to Section 275(1A) of the SFA, and in accordance with the conditions specified in Section 275 of the SFA, or (iii) otherwise pursuant to, and in accordance with the conditions of, any other applicable provision of the SFA.

*Singapore SFA Product Classification: In connection with Section 309B of the SFA and the Securities and Futures (Capital Markets Products) Regulations 2018 of Singapore (the "**CMP Regulations 2018**"), the Trust has determined, and hereby notifies all relevant persons (as defined in Section 309A(1) of the SFA) that the Units are: 'prescribed capital markets products' (as defined in the CMP Regulations 2018) and Excluded Investment Products (as defined in MAS Notice SFA*

04-N12: Notice on the Sale of Investment Products and MAS Notice FAA-N16: Notice on Recommendations on Investment Products).

South Korea

We are not making any representation with respect to the eligibility of any recipients of this document to acquire the Units therein under the laws of Korea, including, but without limitation, the Foreign Exchange Transaction Law and Regulations thereunder. The Units have not been and will not be registered under the Financial Investment Services and Capital Markets Act of Korea (the "**FSCMA**"). Accordingly, the Units may not be offered, sold or delivered, or offered or sold to any person for re-offering or resale, directly or indirectly, in Korea or to, or for the account or benefit of, any resident of Korea (as such term is defined under the Foreign Exchange Transaction Law of Korea and its Enforcement Decree), for a period of one year from the date of issuance of the Units, except (i) where relevant requirements are satisfied, the Units may be offered, sold or delivered to or for the account or benefit of a Korean resident which falls within certain categories of qualified professional investors as specified in the FSCMA, its Enforcement Decree and the Regulation on Securities Issuance and Disclosure promulgated thereunder, or (ii) as otherwise permitted under applicable Korean laws and regulations.

Furthermore, the Units may not be re-sold to Korea residents unless the purchaser of the Units complies with all applicable regulatory requirements (including, but not limited to, governmental approval requirements under the Foreign Exchange Transaction Law and its subordinate decrees and regulations) in connection with purchase of the Units.

Taiwan

The Units have not and will not be registered with the Financial Supervisory Commission of Taiwan pursuant to relevant securities laws and regulations and may not be sold, issued or offered within Taiwan through a public offering or in circumstances which constitutes an offer within the meaning of the Securities and Exchange Act of Taiwan that requires a registration or approval of the Financial Supervisory Commission of Taiwan. No person or entity in Taiwan has been authorized to offer, sell, give advice regarding or otherwise intermediate the offering and sale of the Units in Taiwan.

United States of America

Each purchaser acknowledges and represents that:

i. it understands and agrees that the Units have not been and will not be registered under the Securities Act or with any securities regulatory authority of any state, territory or other jurisdiction of the United States and may not be offered, resold, pledged or otherwise transferred, except (1) in an offshore transaction complying with Rule 903 or Rule 904 of Regulation S, (2) pursuant to an exemption from the registration requirements of the Securities Act, or (3) pursuant to an effective registration statement under the Securities Act and (4) in accordance with all applicable securities laws of any state, territory or other jurisdiction of the United States;

ii. it understands that in the event Units are held in certificated form, such certificated Units will bear a legend substantially to the following effect:

"THE SECURITY EVIDENCED HEREBY HAS NOT BEEN AND WILL NOT BE REGISTERED UNDER THE UNITED STATES SECURITIES ACT OF 1933, AS AMENDED (THE "**SECURITIES ACT**"), ANY STATE SECURITIES LAWS IN THE UNITED STATES OR THE SECURITIES LAWS OF ANY OTHER JURISDICTION AND MAY NOT BE OFFERED, SOLD, PLEDGED OR OTHERWISE TRANSFERRED, EXCEPT: (A) IN AN OFFSHORE TRANSACTION IN ACCORDANCE WITH RULE 903 OR RULE 904 OF REGULATION S UNDER THE SECURITIES ACT; (B) PURSUANT TO AN EXEMPTION FROM THE REGISTRATION REQUIREMENTS OF THE SECURITIES ACT; OR (C) PURSUANT TO AN EFFECTIVE REGISTRATION STATEMENT UNDER THE SECURITIES ACT, IN EACH CASE IN ACCORDANCE WITH ANY APPLICABLE SECURITIES LAWS OF ANY STATE OF THE UNITED STATES. NO REPRESENTATION CAN BE MADE AS TO THE AVAILABILITY OF THE EXEMPTION PROVIDED UNDER THE SECURITIES ACT FOR RESALES OF THIS SECURITY."

iii. any resale made other than in compliance with the above stated restrictions shall not be recognised by the Trust;

iv. it agrees that it will give to each person to whom it transfers Units notice of any restrictions on transfer of such Units; and

v. it acknowledges that the Trust, the Investment Manager, the Sponsor and the Lead Managers and others will rely upon the truth and accuracy of the foregoing acknowledgements, representations and agreements and agrees that, if any of such acknowledgements, representations or agreements deemed to have been made by virtue of its purchase of Units are no longer accurate, it will promptly notify the Trust, the Investment Manager, the Sponsor and the Lead Managers, and if it is acquiring any Units as a fiduciary or agent for one or more accounts, it represents that it has sole investment discretion with respect to each such account and that it has full power to make the foregoing acknowledgements, representations and agreements on behalf of each such account.

Other Jurisdictions

The distribution of Preliminary Placement Document and the offer and sale of the Units may be restricted by law in certain jurisdictions. Persons into whose possession this Preliminary Placement Document comes are required to inform themselves about, and to observe, any such restrictions to the extent applicable.

RIGHTS OF UNITHOLDERS

The rights and interests of Unitholders are included in this Preliminary Placement Document and the InvIT Regulations. Under the Trust Deed and the Investment Management Agreement, these rights and interests are safeguarded by the Trustee and the Investment Manager, respectively. Any rights and interests of Unitholders as specified in this Preliminary Placement Document would be deemed to be amended to the extent of any amendment to the InvIT Regulations.

Beneficial Interest

Each Unit represents an undivided beneficial interest in the Trust. A Unitholder has no equitable or proprietary interest in the InvIT Assets and is not entitled to transfer of the InvIT Assets (or any part thereof) or any interest in the InvIT Assets (or any part thereof) of the Trust. A Unitholder's right is limited to the right to require due administration of the Trust in accordance with the provisions of the Trust Deed and the Investment Management Agreement.

Ranking

No Unitholder of the Trust shall enjoy superior voting or any other rights over another Unitholder. Further, the Units shall not have multiple classes, except for any subordinate Units that may be issued only to the Sponsor and its Associates, where such subordinate units carry only inferior voting or any other rights compared to other Units in the future in accordance with Regulation 4(2)(h) of the InvIT Regulations.

Redressal of grievances

The Investment Manager shall ensure adequate and timely redressal of all Unitholders' grievances pertaining to the activities of the Trust, and the Trustee shall periodically review the status of Unitholders' complaints and their redressal undertaken by the Investment Manager. The Stakeholders' Relationship Committee of the Investment Manager shall monitor the status of complaints and their redressal, and maintain records of grievances and actions taken for the same. For details, please see the section entitled "*Corporate Governance*" on page 101 .

Distribution

The Unitholders shall have the right to receive distribution in accordance with the InvIT Regulations, the Distribution Policy and in the manner provided in this Preliminary Placement Document. For details, please see the section entitled "*Distribution*" on page 393.

Nominee Directors

Unitholder(s), holding not less than 10% of the total outstanding Units, either individually or collectively, shall be entitled to nominate one director on the board of directors of the Investment Manager. In this regard, we shall undertake the relevant actions in due course in accordance with the SEBI Circular dated September 11, 2023 entitled "SEBI/HO/DDHS-PoD-2/P/CIR/2023/153" and the InvIT Regulations. We have also adopted the Policy on Unitholder Nominee Directors on December 14, 2023, and such policy has been uploaded on the website of the Trust.

Meeting of Unitholders

Meetings of Unitholders will be conducted in accordance with the InvIT Regulations.

Passing of resolutions

1. With respect to any matter requiring approval of the Unitholders:

   (i). a resolution shall be considered as passed when the votes cast by Unitholders, so entitled and voting, in favour of the resolution exceed a certain percentage as specified in the InvIT Regulations, of votes cast against;

   (ii). the voting may be done by postal ballot or electronic mode;

   (iii). a notice of not less than 21 (twenty one) days shall be provided to the Unitholders;

   (iv). voting by any person who is a related party in such transaction, as well as associates of such person(s) shall not be considered on the specific issue; and

   (v). the Investment Manager shall be responsible for all the activities pertaining to conducting of meeting of the Unitholder, subject to oversight by the Trustee.

   However, for issues pertaining to the Investment Manager, including a change in Investment Manager, removal of Investment Manager or change in control of Investment Manager; the Trustee shall convene and handle all activities pertaining to conduct of the meetings. Additionally, for issues pertaining to the Trustee, including change in Trustee, the Trustee shall not be involved in any manner in the conduct of the meeting.

2. For the Trust:

   (i). an annual meeting of all Unitholders shall be held not less than once a year within 120 days from the end of each financial year and the time between two meetings shall not exceed 15 months;

   (ii). with respect to the annual meeting of Unitholders,

      (a). any information that is required to be disclosed to the Unitholders and any issue that, in the ordinary course of business, may require approval of the Unitholders may be taken up in the meeting including:

         - latest annual accounts and performance of the Trust;
         - approval of auditors and fee of such auditors, as may be required;
         - latest valuation reports;
         - appointment of valuer, as may be required; and
         - any other issue;

      (b). for any issue taken up in such meetings which require approval from the Unitholders other than as specified in Regulation 22(6) of the InvIT Regulations and paragraph 4 below, votes cast in favour of the resolution shall be more than the votes cast against the resolution.

3. In case of the following, approval from the Unitholders shall be required where the votes cast in favour of the resolution more than fifty per cent of the total votes cast for the resolution:

   (i). any approval from the Unitholders required in terms of Regulation 18 (*Investment conditions and dividend policy)*, Regulation 19 (*Related Party Transactions*) and Regulation 21 *(Valuation of assets*) of the InvIT Regulations;

   (ii). any borrowings, in excess of the limits specified under Regulation 20(3)(a) of the InvIT Regulations;

   (iii). any transaction, other than any borrowing, the value of which is equal to or greater than 25% (twenty five per cent) of the InvIT Assets;

   (iv). increasing period for compliance with investment conditions to one year in accordance with Regulation 18(5)(c) of the InvIT Regulations;

   (v). any issue, in the ordinary course of business, which in the opinion of the Sponsors or the Trustee or the Investment Manager, is material and requires approval of the Unitholders, if any;

   (vi). any issue of units after initial public offer by an InvIT], in whatever form, other than any issue of units which may be considered by the Board under sub-regulation (5)

   (vii). increasing period for compliance with investment conditions to one year in accordance with clause (c) of sub-regulation (5) of regulation 18.

   (viii). Any de-classification of the status of sponsor.

   (ix). any issue for which SEBI or the stock exchanges requires approval;

4. In case of the following, approval from the Unitholders shall be required where the votes cast in favour of the resolution shall be at least sixty per cent of total votes cast for the resolution:

   (i). any change in Investment Manager including removal of the Investment Manager or change in control of the Investment Manager;

   (ii). the Trustee and Investment Manager proposing to seek delisting of units of the Trust under clause (e) of sub-regulation (1) of regulation 17 of the InvIT Regulations;

   (iii). any issue, not in the ordinary course of business, which in the opinion of the Sponsors or Investment Manager or Trustee requires approval of the Unitholders;

   (iv). any material change in investment strategy or any change in the management fees of the Trust;

   (v). any issue for which SEBI or the designated stock exchanges require approval;

   (vi). any issue taken up on request of the Unitholders including:

(a). removal of the Investment Manager and appointment of another investment manager to the Trust;

(b). removal of the Auditors and appointment of another auditors to the Trust;

(c). removal of the Valuer and appointment of another valuer to the Trust;

(d). any issue which the Unitholders have sufficient reason to believe that is detrimental to the interest of the Unitholders;

(e). change in the Trustee, if Unitholders have sufficient reason to believe that acts of the Trustee are detrimental to the interest of Unitholders; and

(f). delisting of the Trust, if the Unitholders have sufficient reason to believe that such delisting would act in the interest of the Unitholders.

(vii). Any introduction of unit-based employee benefit scheme after an initial offer;

(viii). Any unit based employee benefit scheme proposed at the time of initial offer;

With respect to the rights of the Unitholders under clause 4(vi) above:

(i). not less than 25% of the Unitholders by value, other than any party related to the transactions and its associates, shall apply, in writing, to the Trustee for the purpose;

(ii). on receipt of such application, the Trustee shall require, with the Investment Manager to place the issue for voting in the manner as specified in the InvIT Regulations;

(iii). with respect to clause 4(iv)(e) above, not less than 60% of the Unitholders by value shall apply, in writing, to the Trustee for the purpose.

5. In case of the following, approval from 75% of Unitholders by value shall be required:

(i) In case of any borrowing by the Trust in terms of limit specified in clause (b) of sub-regulation 3 of Regulation 20 of the InvIT Regulations;

(ii) In case that any person other than the Sponsor, its related parties and its associates, acquires Units of the Trust, which taken together with Units held by such person and by persons acting in concert with such persons in the Trust, exceeds 25% of the value of the outstanding Units of the Trust (value of Units held by parties related to the transaction shall not be considered for this specific purpose);

Provided that if the required approval is not received, the person acquiring the Units shall provide an exit option to the dissenting Unitholders to the extent and in the manner as may be specified by SEBI;

(iii) Prior to any change in Sponsor or inducted sponsor or change in control of Sponsor or inducted sponsor or conversion to Self-Sponsored Investment Manager (value of Units held by parties related to the transaction shall not be considered for this specific purpose).

If the required approval is not received:

a. in case of change in Sponsor or inducted sponsor, the proposed inducted sponsor shall provide the dissenting Unitholders an option to exit by buying their units in the manner specified by SEBI;

b. in case of change in control of the Sponsor or inducted sponsor, the said Sponsor or inducted sponsor shall provide the dissenting Unitholders an option to exit by buying their Units in the manner specified by SEBI; and

c. in case of conversion to Self-Sponsored Investment Manager, the Investment Manager shall provide the dissenting unit holders an option to exit by buying their units in the manner specified by the Board

Information rights

The Investment Manager, on behalf of the Trust, shall also submit such information to the Stock Exchange and Unitholders, on a periodical basis as may be required under the InvIT Regulations and the Listing Agreement entered into with the Stock Exchange. The Investment Manager (on behalf of the Trust) shall disclose to the Stock Exchange, Unitholders and SEBI, all such information and in such manner as specified under the InvIT Regulations and such other requirements as may be specified by SEBI. The Investment Manager, on behalf of the Trust, shall also provide disclosures or reports specific to the sector or sub-sector in which the Trust has invested or proposes to invest, in the manner as may be specified by SEBI.

Dispute Resolution

All claims, differences or disputes between the Unitholders and the Investment Manager arising out of or in relation to the activities of the Investment Manager in the securities market shall be submitted to a resolution mechanism that includes mediation and/or conciliation and/or arbitration, in accordance with the procedure specified by SEBI pursuant to the Master Circular for Online Resolution of Disputes in the Indian Securities Market dated December 28, 2023 issued by the SEBI and bearing reference number SEBI/HO/OIAE/OIAE_IAD-3/P/CIR/2023/195, as amended.

No loss or damage or expenses incurred by the investment manager or officers of investment manager, including those in relation to resolution of claims or disputes of investors, shall be met out of the trust property.

The Investment Manager shall redress investor grievances within the timelines specified under the InvIT Regulations in the manner as specified by SEBI.

Buy-back, Listing and Delisting of Units

Any buy-back, listing or delisting of Units, shall be in accordance with the Trust Deed and the InvIT Regulations.

ISSUE STRUCTURE

An issue through a private placement of [●] Units by way of an institutional placement, for cash at price at a Floor Price of ₹ [●] per Unit aggregating up to ₹ [●] million by the Trust. This Issue constitutes at least [●] % of the total outstanding Units on a post-Issue basis.

Particulars	Details
Number of Units available for Allotment/allocation	[●] Units
Floor Price	₹ 133 *
Maximum Bid	Such number of Units not exceeding the size of this Issue, subject to applicable limits(1)
Mode of Allotment	Compulsorily in dematerialised form
Bid Lot/ Minimum Bid Size	A minimum of 1,900,000 Units and in multiples of 10 Units thereafter
Allotment Lot	A minimum of [●] Units, and in multiples of [●] Unit thereafter
Trading Lot(2)	25,000
Who can apply	Institutional Investors
Terms of Payment	Entire Bid Amount shall be payable at the time of submission of the Application Form(1)

* *Bids are required to be made for Units at a price that is at or above the floor price. Please note that Bids below the Floor Price are liable to be rejected.*

(1) In case of joint Bids, the Application Form is required to contain only the name of the First Bidder whose name should also appear as the first holder of the beneficiary account held in joint names. The signature of only the First Bidder would be required in the Application Form and such First Bidder would be deemed to have signed on behalf of the joint holders. Bidders are advised to consult their own advisors with respect to any restrictions or limitations that may be applicable to them, including any restrictions or limitations in relation to their ability to invest in the Units. By making a Bid (including any revision thereof), the Bidder will be deemed to have represented to the Investment Manager, the Trustee, the Lead Managers and the Lead Managers that it was eligible to participate in the Issue and be Allotted Units under applicable law.

(2) The trading lot post-listing of the Units may be modified in accordance with the SEBI Institutional Placement Guidelines and the InvIT Regulations and other applicable law.

Indicative Issue Timeline

Event	Indicative Date
Bid/ Issue Opening Date	Tuesday, March 18, 2025
Bidders to submit completed Application Forms	Bid/ Issue Period
Bid/ Issue Closing Date	Wednesday, March 19, 2025
Dispatch of CANs to successful Bidders	On or about Monday, March 24, 2025
Closing Date	On or about Monday, March 24, 2025
Designated Date	On or about Monday, March 24, 2025
Initiation of refunds, if any, in excess of the amount which was required to be paid by such Bidder pursuant to the Units Allocated to such Bidder	On or about Monday, March 24, 2025
Listing Date	On or about Wednesday, March 26, 2025

The above timetable is indicative and does not constitute any obligation or liability on the Trust, the Investment Manager, the Trustee or the Lead Managers.

While the Investment Manager shall ensure that all steps for the completion of the necessary formalities for the listing and the commencement of trading of the Units on the Stock Exchanges are completed within 2 Working Days from the date of Allotment, the timetable may change due to various factors, such as, any extension of the Bid/ Issue Period by the Investment Manager or any delay in receiving the final listing and trading approvals from the Stock

Exchanges. The commencement of trading of the Units will be entirely at the discretion of the Stock Exchanges and in accordance with applicable law.

ISSUE PROCEDURE

The following is a summary intended to present a general outline of the procedure relating to the application, payment of Application Amount, Allocation and Allotment of the Units. The procedure followed in the Issue may differ from the one mentioned below and investors are assumed to have apprised themselves of the same from the Investment Manager or the Lead Managers. Investors are advised to inform themselves of any restrictions or limitations that may be applicable to them and are required to consult their respective advisors in this regard. Investors that apply in the Issue will be required to confirm, and will be deemed to have represented to us, the Trustee, the Investment Manager, the Lead Managers and their respective directors, officers, agents, advisors, affiliates and representatives, that they are eligible under all applicable law, rules, regulations and guidelines to bid for, acquire and hold the Units in the Issue. For further details please see the section entitled "Selling and Transfer Restrictions" on page 430 . The Trust, the Investment Manager, the Trustee, the Lead Managers and their respective directors, officers, agents, advisors, affiliates and representatives accept no responsibility or liability for advising any investor on whether such investor is eligible to bid for, acquire or hold the Units in the Issue. The Trustee or the Investment Manager are acting on behalf of the Trust.

The Trust, the Investment Manager, and their respective directors, officers, agents, advisors, affiliates and representatives are not liable for any amendment or modification or change to applicable laws or regulations, which may occur after the date of this Preliminary Placement Document. Investors are advised to make their independent investigations and satisfy themselves that they are Eligible Investors and are eligible to apply in the Issue. Eligible Investors are advised to ensure that any single Bid from them does not exceed the investment limits or maximum number of Units that can be held by them under applicable law or regulation or as specified in this Preliminary Placement Document. Further, Eligible Investors shall be solely responsible for compliance with applicable securities laws, including the SEBI (Prohibition of Insider Trading) Regulations, 2015 and the UPSI Policy, other applicable law and dealing in securities of the Trust.

Authority for the Issue

THIS PRELIMINARY PLACEMENT DOCUMENT AND THE PLACEMENT DOCUMENT RELATE TO AN ISSUE BEING MADE ONLY TO ELIGIBLE INVESTORS AND NO ISSUE IS BEING MADE TO THE PUBLIC OR TO ANY OTHER CLASS OF INVESTORS.

This Preliminary Placement Document has not been, and will not be, filed as a prospectus with SEBI and, no Units will be offered in India or overseas to the public or any members of the public or any other class of investors, other than Eligible Investors.

The Issue is being made to Eligible Investors in reliance upon the SEBI Institutional Placement Guidelines and the InvIT Regulations, through the mechanism of institutional placement. The Trust is eligible to undertake the Issue under the SEBI Institutional Placement Guidelines and the InvIT Regulations.

This Preliminary Placement Document and the Placement Document are private documents provided only to select Eligible Investors. Please note that if you do not receive a serially numbered copy of this Preliminary Placement Document addressed to you, you may not rely on this Preliminary Placement Document or the Placement Document uploaded or to be uploaded, as applicable, on the website of the Stock Exchanges or the Trust, with a disclaimer to the effect that it is in connection with an institutional placement and that no offer is being made to the public or to any other category of investors, for making an application to subscribe to Units pursuant to the Issue.

The Issue was authorized and approved by the Board of Directors of the Investment Manager on February 5, 2025 and approved by the Unitholders on March 10, 2025.

Units being Allotted pursuant to the Issue shall not be sold for a period of one year from the date of Allotment, except on a recognized stock exchange.

The Units offered in the Issue have not been, and will not be, registered under the U.S. Securities Act or any other applicable law of the United States and may not be offered or sold within the United States, except pursuant to an exemption from, or in a transaction not subject to, the registration requirements of the U.S. Securities Act and applicable state securities laws. Accordingly, the Units are only being offered and sold outside the United States in an "offshore transaction" as defined in and in compliance with Regulation S under the U.S. Securities Act and the applicable laws of the jurisdiction where those offers and sales occur. For further information, please see the section entitled "*Selling and Transfer Restrictions*" on page 430.

The Units have not been and will not be registered, listed or otherwise qualified in any other jurisdiction outside India and may not be offered or sold, and Bids may not be made by persons in any such jurisdiction, except in compliance with the applicable laws of such jurisdiction.

The Investment Manager has filed a copy of this Preliminary Placement Document with each of the Stock Exchanges. The Trust has received in-principle approval dated March 17, 2025 from each of the Stock Exchanges under the SEBI Institutional Placement Guidelines.

After the Allotment of Units pursuant to the Issue, the Investment Manager shall make applications to the Stock Exchanges for the listing approvals. Subsequently, after the credit of Units to the beneficiary accounts of the Allottees, the Investment Manager shall make applications to the Stock Exchanges for the final trading approvals.

Disclaimer of the Stock Exchanges

Stock Exchanges do not in any manner:

1. warrant, certify or endorse the correctness or completeness of the contents of this Preliminary Placement Document;

2. warrant that the Units issued pursuant to the Issue will be listed or will continue to be listed on the Stock Exchanges; or

3. take any responsibility for the financial or other soundness of National Highways Infra Trust, its management or any scheme or project of National Highways Infra Trust.

It should not for any reason be deemed or construed to mean that this Preliminary Placement Document has been cleared or approved by the Stock Exchanges. Every person who desires to apply for or otherwise acquire any Units may do so pursuant to an independent inquiry, investigation and analysis and shall not have any claim against the Stock Exchanges whatsoever by reason of any loss which may be suffered by such person consequent to or in connection with such subscription/acquisition whether by reason of anything stated or omitted to be stated herein or for any other reason whatsoever.

Issue Procedure

1. On the Issue Opening Date, the Lead Managers shall circulate serially numbered copies of this Preliminary Placement Document and the serially numbered Application Form, either in electronic or physical form, to Eligible Investors and the Application Form will be specifically addressed to each such Eligible Investor. The Lead Managers shall maintain a record of the Eligible Investors to whom a serially numbered Preliminary Placement Document and Application Form has been dispatched. The Lead Managers will make the requisite filings with SEBI within the stipulated time periods as required under the SEBI Institutional Placement Guidelines. The list of Eligible Investors to whom this Preliminary Placement Document and the Application Form is delivered will be determined by the Investment Manager in consultation with the Lead Managers.

2. **Unless a serially numbered Preliminary Placement Document along with the serially numbered Application Form, which includes the details of the bank account where the Application Amount is to be deposited, is addressed to a particular Eligible Investor, no invitation to make an offer to subscribe shall be deemed to have been made to such Eligible Investor.** Even if such documentation were to come into the possession of any person other than the intended recipient, no offer or invitation to offer shall be deemed to have been made to such person and any application that does not comply with this requirement shall be treated as invalid.

3. Eligible Investors may submit the Application Form, including any revisions thereof along with the Application Amount and a copy of the PAN card or PAN allotment letter, during the Issue Period to the Lead Managers.

4. Bidders will be required to indicate the following in the Application Form:

    - full official name of the Bidder to whom Units are to be Allotted, complete address, phone number, PAN, e-mail address and bank account details;

    - number of Units Bid for;

    - category to which they belong to, as indicated in the Application Form;

    - price at which they are agreeable to subscribe for the Units (which shall not be less than the Floor Price) and the aggregate Application Amount for the number of Units Bid for;

    - details of the depository account to which the Units should be credited;

    - it has agreed to certain other representations set forth in the Application Form and this Preliminary Placement Document;

    - Eligible FPIs are required to indicate their SEBI FPI registration number in the Application Form; and

- a representation that they are outside the United States and acquiring the Units in an "offshore transaction" as defined in and in compliance with Regulation S and the applicable laws of the jurisdiction where those offers and sales occur and they have agreed to certain other representations set forth in the section entitled "*Notice to Investors*" on page 1, and certain other representations made in the Application Form.

5. Each Bidder shall be required to make the entire payment of the Application Amount for the Units Bid for, along with the Application Form, only through electronic transfer to the Escrow Account within the Issue Period as specified in the Application Form sent to the respective Bidders. Please note that any payment of Application Amount for the Units shall be made from the bank accounts of the relevant Bidders and the Investment Manager shall keep a record of the bank account from where such payment has been received. Application Amount payable on Units to be held by joint holders shall be paid from the bank account of the person whose name appears first in the Application Form. Pending Allotment, the Trustee and the Investment Manager shall ensure that the Application Amount received for subscription of the Units is kept in a separate bank account in the name of Trust and shall only be utilized for adjustment against allotment of Units or refund of money to the Bidders till the time such Units are listed. Notwithstanding the above, in the event, among others, a Bidder is not Allocated Units in the Issue, or a Bidder withdraws the Bid prior to the Issue Closing Date or the number of Units Allocated to the Bidder is lower than the number of Units applied for through the Application Form and towards which Application Amount has been paid by such Bidder, or the Application Amount is in excess of the amount equivalent to the product of the Units that have been Allocated to the Bidder and the Issue Price, the excess Application Amount will be refunded to the same bank account from which it was remitted, in the form and manner set out in the section entitled "- *Refunds*" below.

6. Once a duly completed Application Form is submitted by a Bidder and the Application Amount is transferred to the Escrow Account, such Application Form constitutes an irrevocable offer and the Bid cannot be withdrawn or revised downwards after the Issue Closing Date. In case of an upward revision before the Issue Closing Date, an additional amount shall be required to be deposited towards the Application Amount in the Escrow Account along with the submission of such revised Bid. The Issue Closing Date shall be notified to the Stock Exchanges and the Eligible Investors shall be deemed to have been given notice of such date after receipt of the Application Form.

7. The Bids made by asset management companies or custodians of Mutual Funds shall specifically state the names of the concerned schemes for which the Bids are made. In case of a Mutual Fund, a separate Bid can be made in respect of each scheme of the Mutual Fund registered with SEBI.

8. Each FPI is required to submit a separate Application Form.

9. Upon receipt of the duly completed Application Form and the Application Amount in the Escrow Account, after the Issue Closing Date, the Investment Manager shall, in consultation with the Lead Managers, determine the final terms, including the Issue Price of the Units to be issued pursuant to the Issue and Allocation and the successful Bidders to whom such Units have been Allocated. Upon such determination, the Lead Managers, on behalf of the Trust, will send serially numbered CANs to the successful Bidders who have been Allocated Units in the Issue. The dispatch of a CAN, and the Placement Document (when dispatched) to a successful Bidder shall be deemed a valid, binding and irrevocable contract for successful Bidders to subscribe to the Units Allocated to such Bidders at an aggregate price equal to the product of the Issue Price and Units Allocated to such Bidders. The CAN shall contain details such as the number of Units Allocated to the successful Bidders, Issue Price and the aggregate amount received towards the Units Allocated. Please note that the Allocation will be at the absolute discretion of the Investment Manager in consultation with the Lead Managers.

10. Upon determination of the Issue Price and the issue of CAN and before Allotment of Units to successful Bidders, the Lead Managers, shall, on behalf of the Trust, send a serially numbered Placement Document to each successful Bidder that has been Allocated Units.

11. Upon dispatch of the serially numbered Placement Document, the Investment Manager shall Allot Units as per the details in the CANs sent to successful Bidders. The Investment Manager will inform the Stock Exchanges of the details of the Allotment.

12. After passing the resolution for Allotment and prior to the credit of Units into the beneficiary account of the successful Bidders maintained by the depository participant, the Investment Manager shall apply to the Stock Exchanges for listing approvals in respect of the Units Allotted pursuant to the Issue.

13. After receipt of the listing approvals from the Stock Exchanges, the Investment Manager shall ensure credit of the Units Allotted pursuant to the Issue into the beneficiary accounts of the respective Allottees.

14. The Investment Manager will then apply for the final trading approvals from the Stock Exchanges.

15. The Units that would have been credited to the beneficiary account with the Depository Participant of the successful Bidders shall be eligible for trading on the Stock Exchanges only upon the receipt of final trading and listing approvals from the Stock Exchanges.

16. As per applicable law, the Stock Exchanges will notify the final listing and trading approvals, which are ordinarily available on their websites, and the Investment Manager may communicate the receipt of the listing and trading approvals to the Allottees. The Investment Manager, the Trust, shall not be responsible for any delay or non-receipt of the communication of the final trading and listing permissions from the Stock Exchanges or any loss arising from such delay or non-receipt. Investors are advised to apprise themselves of the status of the receipt of the permissions from the Stock Exchanges.

Institutional Investors

Only Eligible Investors are eligible to invest in the Units pursuant to the Issue. Currently, Eligible Investors, being '*institutional investors*', are eligible to participate in the Issue. In terms of Regulation 2(1)(ya) of the InvIT Regulations and the SEBI Institutional Placement Guidelines define '*institutional investors*' to mean:

- a qualified institutional buyer; or
- family trust or systematically important NBFCs registered with Reserve Bank of India or intermediaries registered with the SEBI, all with net-worth of more than five hundred crore rupees, as per their last audited financial statements.

Further, Regulation 2(1)(ss) of the SEBI ICDR Regulations define '*qualified institutional buyer*' to mean

- a mutual fund, venture capital fund, alternative investment fund and foreign venture capital investor registered with the SEBI;
- a foreign portfolio investor other than individuals, corporate bodies and family offices;
- a public financial institution;
- a scheduled commercial bank;
- a multilateral and bilateral development financial institution;
- a state industrial development corporation;
- an insurance company registered with the Insurance Regulatory and Development Authority of India;
- a provident fund with minimum corpus of ₹25 crore;
- a pension fund with minimum corpus of ₹25 crore registered with the Pension Fund Regulatory and Development Authority established under sub-section (1) of section 3 of the Pension Fund Regulatory and Development Authority Act, 2013;
- National Investment Fund set up by resolution no. F. No. 2/3/2005-DDII dated November 23, 2005 of the Government of India published in the Gazette of India;
- insurance funds set up and managed by army, navy or air force of the Union of India;
- insurance funds set up and managed by the Department of Posts, India; and
- systemically important non-banking financial companies.

Eligible FPIs are permitted to participate in the Issue in accordance with the FEMA Rules read with applicable provisions of the Foreign Exchange Management (Mode of Payment and Reporting of Non-Debt Instruments) Regulations, 2019 and other applicable foreign exchange laws and such other terms and conditions as may be prescribed by the SEBI from time to time.

Restriction on Allotment

Pursuant to paragraph 7.11.2 of the SEBI Institutional Placement Guidelines, allotment in the Issue shall not be made, either directly or indirectly, to an institutional investor who is our Sponsor or Investment Manager, or is a person related to or a related party or associate (as defined under the InvIT Regulations) of any of the Sponsor or the Investment Manager, provided that allotment of units can be made to the Sponsor for un-subscribed portion in the Issue subject to following conditions:

a. at least ninety percent of the Issue Size has been subscribed;

b. objects of the Issue is acquisition of assets from the Sponsor;

c. units allotted to Sponsor shall be locked in as per paragraph 7.6 of Chapter 7 of the SEBI Institutional Placement Guidelines;

d. unitholders approval shall be taken for unsubscribed portion being allotted to Sponsor.

No Allotment shall be made pursuant to Bids submitted by Eligible Investors such that the Bid or subscription to the Units by the investor would result in acquisition of Units which, taken together with Units already held by such investor and any person acting in concert with such investor in the Trust, would exceed 25% of the value of the post Issue outstanding units of the Trust.

The Trustee, or the Valuer or an employee of the Valuer involved in the valuation of the Project SPVs or the assets proposed to be acquired out of the proceeds of the Issue are not permitted to invest in the Units.

Affiliates or associates of the Lead Managers, who are Eligible Investors, may participate in the Issue in compliance with applicable laws.

Bid Process

Application Form

Eligible Investors shall only use the serially numbered Application Forms (which are addressed to them) supplied by the Lead Managers in either electronic form or by physical delivery for the purpose of making a Bid (including revision of a Bid) in terms of this Preliminary Placement Document.

By making a Bid (including any revision thereof) for Units through Application Forms and pursuant to the terms of this Preliminary Placement Document, the Eligible Investors will be deemed to have made the following representations, warranties, acknowledgements, and undertakings given or made under the sections entitled "*Notice to Investors* and "*Selling and Transfer Restrictions*" on pages 1 and 430, respectively:

- The Eligible Investor confirms that it is an Institutional Investor and is not prohibited under paragraph 7.11.2 of the SEBI Institutional Placement Guidelines from participating in the Issue, has a valid and existing registration under the applicable law in India (to the extent applicable) and is eligible to participate in the Issue;

- The Eligible Investor acknowledges that it has no right to withdraw or revise its Bid after the Issue Closing Date;

- The Eligible Investor confirms that if Units are Allotted through the Issue, it shall not, for a period of one year from Allotment, sell such Units otherwise than on the Stock Exchanges;

- The Eligible Investor confirms that it is eligible to Bid and hold Units so Allotted together with any Units already held by it prior to the Issue. The Eligible Investor further confirms that its holding of the Units, does not and shall not, exceed the level permissible as per any applicable law applicable to the Eligible Investor;

- The Eligible Investor agrees that although the Application Amount is required to be paid by it along with the Application Form within the Issue Period, the Investment Manager (on behalf of the Trust) reserves the right to Allocate and Allot Units pursuant to the Issue on a discretionary basis in consultation with the Lead Managers. The Eligible Investor further acknowledges and agrees that the payment of Application Amount does not guarantee Allocation and/or Allotment of Units Bid for in full or in part;

- The Eligible Investor confirms that the Bid submitted by it or its subscription to the Units will not result in acquisition of Units which taken together with Units already held by it and any person acting in concert with it in the Trust exceeding 25% of the value of the outstanding units of the Trust;

- The Eligible Investor confirms that it is outside the United States, and is acquiring the Units in an "offshore transaction" as defined in and in compliance with Regulation S and the applicable laws of the jurisdiction where those offers and sales occur, and is not our affiliate or a person acting on behalf of such an affiliate;

- The Eligible Investor acknowledges that no Allocation shall be made to it if the price at which it has Bid for in the Issue is lower than the Floor Price; and

- The Eligible Investor confirms that it shall not undertake any trade in the Units credited to its beneficiary account maintained with the Depository Participant until such time that the final listing and trading approvals for the Units are issued by the Stock Exchanges.

Further, in accordance with Press Note No. 3 (2020 Series), dated April 17, 2020, issued by the Department for Promotion of Industry and Internal Trade, Government of India, investments where the beneficial owner of the Units is situated in or is a citizen of a country which shares land border with India, can only be made through the Government approval route, as prescribed in the FDI Policy.

ELIGIBLE INSTITUTIONAL INVESTORS MUST PROVIDE THEIR NAME, E-MAIL ID, BENEFICIARY ACCOUNT DETAILS, PAN, NATIONALITY, DEPOSITORY PARTICIPANT'S NAME, COMPLETE ADDRESS, DEPOSITORY PARTICIPANT IDENTIFICATION NUMBER AND BENEFICIARY ACCOUNT NUMBER IN THE APPLICATION FORM. ELIGIBLE INVESTORS MUST ENSURE THAT THE NAME GIVEN IN THE APPLICATION FORM IS EXACTLY THE SAME AS THE NAME IN WHICH THEIR BENEFICIARY ACCOUNT IS HELD.

THE ELIGIBLE INVESTORS SUBMITTING A BID, ALONG WITH THE APPLICATION FORM, MAY ALSO HAVE TO SUBMIT REQUISITE DOCUMENT(S) TO EVIDENCE THEIR STATUS AS AN "INSTITUTIONAL INVESTOR" AS SET OUT ABOVE.

THE ELIGIBLE INVESTORS SUBMITTING A BID AND/OR BEING ALLOTTED UNITS IN THE ISSUE, MAY ALSO HAVE TO SUBMIT REQUISITE DOCUMENT(S) TO FULFILL THE KNOW YOUR CUSTOMER (KYC) NORMS, INCLUDING AFTER ISSUE CLOSURE.

Demographic details such as address and bank account will be obtained from the Depositories as per the Depository Participant account details provided in the Application Form.

The submission of an Application Form and payment of the Application Amount pursuant to the Application Form by a Bidder shall be deemed a valid, binding and irrevocable offer for such Bidder to pay the entire Issue Price for the Units that may be Allotted to such Bidder and shall become a binding contract on a successful Bidder upon issuance of the CAN and the Placement Document (when dispatched) by the Investment Manager in favour of the successful Bidder.

Submission of Application Form

All Application Forms must be duly completed with information including the number of Units applied for along with payment and a copy of the PAN card or PAN allotment letter. Additionally, the Application Form will include details of the relevant Escrow Account into which the Application Amounts will have to be deposited. The Application Amount shall be deposited in the Escrow Account as is specified in the Application Form and the Application Form shall be submitted to the Lead Managers either through electronic form or through physical delivery at any of the following addresses:

SBI CAPITAL MARKETS LIMITED 1501, 15th Floor, A & B Wing, Parinee Crescenzo Building, G Block, Bandra Kurla Complex, Bandra (East), Mumbai – 400 051 **Tel:** +91 22 4196 8300 **E-mail:** project.ascent@sbicaps.com **Investor Grievance E-mail**: investor.relations@sbicaps.com **Contact Person:** Mandeep Singh **Website:** www.sbicaps.com **SEBI Registration Number:** INM000003531	**AXIS CAPITAL LIMITED** 1st Floor, Axis House Pandurang Budhkar Marg, Worli Mumbai 400 025 Maharashtra, India **Tel:** +91 22 4325 2183 **E-mail:** nhaiinvit@axiscap.in **Investor Grievance E-mail:** compliants@axiscap.com **Contact Person:** Harish Patel/ Akash Aggarwal **Website:** www.axiscapital.co.in **SEBI Registration Number:** INM000012029	**HDFC BANK LIMITED** Investment Banking Group, Unit no. 701, 702 and 702-A, 7th floor, Tower 2 and 3, One International Centre, Senapati Bapat Marg, Prabhadevi, Mumbai – 400013 **Tel**: +91 22 3395 8233 **E-mail**: nhitinvit@hdfcbank.com **Investor Grievance E-mail**: Investor.redressal@hdfcbank.com **Contact Person**: Bharti Ranga/ Souradeep Ghosh **Website**: www.hdfcbank.com **SEBI Registration Number**: INM000011252	**ICICI SECURITIES LIMITED** ICICI Venture House, Appasaheb Marathe Marg, Prabhadevi, Mumbai – 400 025, Maharashtra, India **Tel:** +91 22 6807 7100 **E-mail:** nhitinvit@icicisecurities.com **Investor Grievance E-mail:** customercare@icicisecurities.com **Contact Person:** Aboli Pitre/ Sumit Singh **Website:** www.icicisecurities.com **SEBI Registration Number:** INM000011179

The Lead Managers, the Trustee and the Investment Manager shall not be required to provide any written acknowledgement of the receipt of the Application Form and the Application Amount.

All Bidders submitting a Bid in the Issue shall pay the entire Application Amount during the Issue Period.

Payment of Application Amount

The Investment Manager has opened the Escrow Account with the Escrow Agent, in terms of the Escrow Agreement. Bidders will be required to deposit the entire Application Amount payable for the Units applied for through the Application Form submitted by it in accordance with the applicable laws.

Payments are to be made only through electronic fund transfer.

Payments through cheque, demand draft or cash shall be rejected.

If the payment is not made favouring the Escrow Account within the Issue Period stipulated in the Application Form, the Bid is liable to be rejected.

Permanent Account Number or PAN

Each Bidder should mention its PAN allotted under the Income Tax Act, 1961 in the Application Form. Applications without this information will be considered incomplete and are liable to be rejected, except from Bidders which are not required to hold a PAN under applicable law. Bidders should not submit the GIR number instead of the PAN as the Application Form is liable to be rejected.

Bank Account Details

Each Bidder shall mention the details of the bank account from which the payment of Application Amount has been made along with confirmation that such payment has been made from such account.

Pricing and Allocation

Build-up of the Book

The Eligible Investors shall submit their Bids (including any revision thereof) through the Application Forms within the Issue Period to the Lead Managers. Such Bids cannot be withdrawn or revised after the Issue Closing Date. The book shall be maintained by the Lead Managers.

Price Determination and Allocation

The Investment Manager, in consultation with the Lead Managers, shall determine the Issue Price, which shall be at or above the Floor Price.

After finalisation of the Issue Price, the Investment Manager shall update this Preliminary Placement Document with the Issue Price details and file the Placement Document with the Stock Exchanges.

Method of Allocation

The Investment Manager shall determine the Allocation in consultation with the Lead Managers on a discretionary basis in accordance with the allocation methodology approved by the board of Directors of the Investment Manager ("**Allocation Methodology**") and in compliance with InvIT Regulations and SEBI Institutional Placement Guidelines.

The Allocation Methodology proposed to be followed by the Investment Manager and the Lead Managers is provided below:

1. Allotment of the number of Units to the existing unitholders of the Trust who have bid in the Issue at or above the Issue Price (the "**Existing Unitholders**"), which is lower of:

    a. the respective number of bids made by each of the Existing Unitholders; and

    b. such number of Units that would result in the post- Issue unitholding (*including the change in unitholding pursuant to the proposed Preferential Issue*) of the Existing Unitholders not getting diluted below their respective unitholding as of March 17, 2025.

    If number of Units available for allocation is less than the number of Units proposed to be allocated to all Existing Unitholders as per this Paragraph 1, then discretion shall be used by the Investment Manager to allocate/ allot units to the Existing Unitholders.

2. If the number of Units offered in the Issue exceeds the number of Units allocated as per Paragraph 1 above, the Allotment of such remaining Units to the successful bidders would be undertaken in accordance with the parameters set out below:

    Step 1 – Tiering the Eligible Investors

    a. Tier 1 – Sovereign wealth funds, pension funds, provident funds and insurance companies/ funds;

b. Tier 2 – Infrastructure sector focussed Government institutions, infrastructure sector focused funds \ (including, their respective affiliates holding at least one investment in the infrastructure sector) or AIFs (including, their respective affiliates holding at least one investment in the infrastructure sector), mutual funds and scheduled commercial banks; and

c. Tier 3 – other Eligible Investors.

Step 2 – Allocation approach within each Tier as specified above:

a. Within each tier, allocation should be ascertained basis following:

- Bid quantum;
- openness to participate in future rounds; and
- Eligible Investor repute (AUM, long term capital commitment, early expression of interest etc.)

b. In case of a tie, discretion shall be used by the Investment Manager

c. The Investment Manager will give priority in Allocation of Units based on tiers i.e. Tier 1 will be given priority first among all three tiers while Tier 3 would have lower priority in determining the Allocation Methodology. Further, Allocation of Units shall be subject to compliance with InvIT Regulations and applicable laws.

Bids received from the Bidders at or above the Issue Price shall be grouped together to determine the total demand. The Allocation to all such Bidders will be made at the Issue Price.

THE DECISION OF THE INVESTMENT MANAGER IN CONSULTATION WITH THE LEAD MANAGERS IN RESPECT OF ALLOCATION SHALL BE FINAL AND BINDING ON ALL ELIGIBLE INVESTORS. ELIGIBLE INVESTORS MAY NOTE THAT ALLOCATION OF UNITS IS AT THE SOLE AND ABSOLUTE DISCRETION OF THE INVESTMENT MANAGER IN CONSULTATION WITH THE LEAD MANAGERS AND ELIGIBLE INVESTORS MAY NOT RECEIVE ANY ALLOCATION EVEN IF THEY HAVE SUBMITTED VALID APPLICATION FORMS AND PAID THE ENTIRE APPLICATION AMOUNT AT OR ABOVE THE ISSUE PRICE. NEITHER THE INVESTMENT MANAGER NOR THE LEAD MANAGERS ARE OBLIGED TO ASSIGN ANY REASON FOR ANY NON-ALLOCATION.

CAN

Based on receipt of the Application Forms and Application Amount, the Investment Manager, in consultation with the Lead Managers, in its sole and absolute discretion, shall decide the successful Bidders to whom the serially numbered CAN shall be dispatched, pursuant to which the details of the Units Allocated to them, the Issue Price and the total amount received towards Units Allocated to them shall be notified to such successful Bidders.

The successful Bidders would also be sent a serially numbered Placement Document either in electronic form or by physical delivery.

The dispatch of the serially numbered CAN and the Placement Document (when dispatched), to the Eligible Investors shall be deemed a valid, binding and irrevocable contract for the Eligible Investors to subscribe to the Units Allocated to such successful Bidders at an aggregate price equivalent to the product of the Issue Price and Units Allocated to such successful Bidders. Subsequently, Board of Directors or the Allotment Committee will approve the Allotment of the Units to the Allottees.

Eligible Investors are advised to instruct their Depository Participant to accept the Units that may be Allotted to them pursuant to the Issue.

By submitting the Application Form, the Eligible Investors would have deemed to have made the representations and warranties as specified in the section entitled "*Notice to Investors*" on page 1 and further that such Eligible Investors shall not undertake any trade on the Units credited to its Depository Participant account pursuant to the Issue until such time as the final listing and trading approval is issued by the Stock Exchanges.

Designated Date and Allotment of Units

The Investment Manager, at its sole discretion, reserves the right to cancel the Issue at any time up to Allotment without assigning any reason whatsoever.

Following the Allotment, the Investment Manager shall apply to the Stock Exchanges for listing approvals and post receipt of the listing approvals from the Stock Exchanges, the Investment Manager shall credit the Units into the beneficiary accounts of the successful Bidders. Following the credit of the Units into the successful Bidders'

beneficiary accounts, the Investment Manager will apply for final listing and trading approvals from the Stock Exchanges.

The pre and post- Issue Unitholding pattern of the Trust will be filed by the Investment Manager with the Stock Exchanges and the Investment Manager will also file an allotment report with the SEBI providing details of the Allottees and the Allotment made.

After finalization of the Issue Price, the Investment Manager shall update this Preliminary Placement Document with the Issue details and file the same with the Stock Exchanges as the Placement Document.

Refunds

In the event that the Units are not Allocated to a Bidder for any reason, or the number of Units Allocated to a successful Bidder is lower than the number of Units applied for through the Application Form and towards which Application Amount has been paid by such Bidder, or the Application Amount paid by a successful Bidder is in excess of the amount equivalent to the product of the Units that have been Allocated to such Bidder and the Issue Price, or a Bidder withdraws the Application Form prior to the Issue Closing Date, or the Issue is cancelled prior to Allocation, the excess Application Amount paid by such Bidder will be refunded to the same bank account from which the Application Amount was remitted, in the form and manner set out in the Refund Intimation Letter. The Refund Amount will be transferred to the relevant Bidders within two Working Days from the date of issuance of the CAN.

Post Allotment, the Investment Manager shall make an application for listing of the units to the stock exchange(s) and the Units shall be listed within two working days from the date of Allotment.

If the Units are failed to be listed within the specified time, the monies received shall be refunded through verifiable means within four working days from the date of the allotment, and if any such money is not repaid within such time after the issuer becomes liable to repay it, the Trust and the Investment Manager and its director or partner who is an officer in default shall, on and from the expiry of the fourth working day, be jointly and severally liable to repay that money with interest at the rate of 15% per annum.

Allotment pursuant to the Unitholders' resolution shall be completed within a period of 365 days from the date of passing of the unitholder resolution.

Other Instructions

Right to Reject Applications

The Investment Manager, in consultation with the Lead Managers, may reject Bids, in part or in full, without assigning any reason whatsoever. The decision of the Investment Manager in consultation with the Lead Managers in relation to the rejection of Bids shall be final and binding. In the event the Bid is rejected, the Application Amount paid by the Bidder shall be refunded to the same bank account from which the Application Amount was remitted by such Bidder. For details see – "*Bid Process*" and – "*Refund*" above.

Units in Dematerialized form with NSDL or CDSL

The Allotment of the Units in the Issue shall be only in dematerialized form (i.e., not in physical certificates but be fungible and be represented by the statement issued through the electronic mode).

An Eligible Investor applying for Units to be issued pursuant to the Issue must have at least one beneficiary account with a Depository Participant of either NSDL or CDSL prior to making the Bid. Units Allotted to an Eligible Investor will be credited in electronic form directly to the specified beneficiary account (with the Depository Participant) of the Eligible Investor.

Units in electronic form can be traded only on the stock exchanges having electronic connectivity with NSDL and CDSL. The Stock Exchanges have electronic connectivity with NSDL and CDSL.

The trading of the Units to be issued pursuant to the Issue would be in dematerialized form only for all Eligible Investors in the demat segment of the respective Stock Exchanges.

The Investment Manager and the Lead Managers will not be responsible or liable for the delay in the credit of Units to be issued pursuant to the Issue due to errors in the Application Form or otherwise on the part of the Eligible Investor.

Release of Funds to Trust

The Escrow Agent shall not release the monies lying to the credit of the Escrow Account to Trust until the receipt of final trading and listing approvals of the Stock Exchanges for Units offered in the Issue and the receipt of the relevant instructions.

TAXATION

STATEMENT OF POSSIBLE TAX BENEFITS AVAILABLE TO THE TRUST AND ITS UNITHOLDERS UNDER THE APPLICABLE LAWS IN INDIA

March 17, 2025

To

National Highways Infra Trust
G-5 & 6, Sector – 10,
Dwarka,
New Delhi 110 075

National Highways Infra Investment Managers Private Limited
G-5 & 6, Sector – 10
Dwarka
New Delhi 110 075

IDBI Trusteeship Services Limited
1009, 10th Floor,
Ansal Bhawan, KG Marg,
New Delhi – 110 001

Sub: Statement of possible tax benefits available to National Highways Infra Trust and its Unitholders

Dear Sirs,

We refer to the proposed institutional placement of the units of the National Highways Infra Trust ("the Trust"). With reference to the captioned subject, given below is a statement and the Annexure herewith, of the applicable sections of the Income-tax Act, 1961, as amended ("Income Tax Act") relating to possible tax benefits available to the Trust and its Unitholders. These benefits are typically dependent on Trust or its unitholders fulfilling the conditions prescribed under the relevant provisions of the Income Tax Act.

The benefits discussed in the enclosed Annexure are not exhaustive but illustrative. The information contained in the Annexure is only intended to provide general information to the investors and hence is neither designed nor intended to be a substitute for professional tax advice. In view of the individual tax consequences and the changing tax laws, it is advisable to consult a tax consultant with respect to the specific tax implications arising out of the participation in the issue.

Our confirmation is based on the information, explanations and representations obtained from the Investment Manager and on the basis of our understanding of the business activities and operations of the Trust.

We do not express an opinion or provide any assurance as to whether:
- Trust or its Unitholders will continue to obtain these benefits in future.
- The conditions prescribed for availing the benefits, where applicable have been/would be met with.
- The revenue authorities/courts will concur with the views expressed herein.

Limitations

Our views expressed in the statement and as enclosed in the Annexure are based on the facts and assumptions indicated above. No assurance is given that the revenue authorities/ courts will concur with the views expressed herein. Our views are based on the existing provisions of law and its interpretation, which are subject to change from time to time. We do not assume responsibility to update the views consequent to such changes.

We have not considered the impact of the Finance Bill 2025 and the New Direct Tax Code 2025, as the bills are still pending approval from the parliament to become law.

We hereby give our consent to include this statement and the Annexure attached herewith, regarding possible tax benefits available to the Trust and to its Unitholders in the preliminary placement document and placement document in connection with the further offering of the units of the Trust which is intended to be filed with Securities and Exchange Board of India, relevant stock exchanges and any regulatory authority, as may be required under applicable law.

The Annexure has been prepared solely in connection with the institutional placement of Units of the Trust under the prescribed regulations.

Reliance on the Annexure is on the express understanding that we do not assume responsibility towards the investors who may or may not invest in the private placement relying on the Annexure.

For A.R. & Co.,
Chartered Accountants
FRN – 002744C

CA. Mohd Azam Ansari
Partner
MRN – 511623
UDIN: 25511623BMGYLK8819
Date: March 17, 2025
Place: New Delhi

ANNEXURE TO STATEMENT OF POSSIBLE TAX BENEFITS AVAILABLE TO THE TRUST AND ITS UNITHOLDERS UNDER THE APPLICABLE LAWS IN INDIA

The information provided below sets out the possible tax benefits available to the Unitholders in a summary manner only and is not a complete analysis or listing of all potential tax consequences of purchase, ownership and disposal of equity shares or units, under the tax laws presently in force in India. It is not exhaustive or comprehensive analysis and is not intended to be a substitute for professional tax advice.

The Income-tax Act, 1961 as amended ("**Act**") has set-out a special regime for taxation of income arising to the Trust and its unitholders under Chapter XII FA of the Act.

We have summarised below relevant income-tax provisions as applicable to the Trust and its unitholders, under the Act. The income tax provisions listed below are available to the Trust and its unitholders subject to compliance with the applicable provisions and/or the conditions laid out in the Act and the regulations as prescribed under the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014, made under the Securities and Exchange Board of India Act, 1992 (15 of 1992) ('InvIT Regulations').

Tax provisions applicable to the Trust

1. Definition of business trust under the Act

A 'business trust' is defined under section 2(13A) of the Act to mean a trust registered as an infrastructure investment trust (InvIT) under the SEBI InvIT Regulations or a real estate investment trust (REIT) under the SEBI REIT Regulations.

2. Taxability of the Trust

2.1.1. Income received from the Special Purpose Vehicle(s) ('SPVs')

a. Interest

Interest received or receivable by the Trust from the Project SPVs (being domestic companies) shall be exempt from tax, subject to satisfaction of conditions given in section 10(23FC) of the Act.

In this regard, please note that as per the explanation to section 10(23FC) of the Act, the expression "special purpose vehicle" means an Indian company in which the business trust holds controlling interest and any specific percentage of shareholding or interest, as may be required by the regulations under which such trust is granted registration.

As per provisions of section 14A of the Act, any expenditure incurred in relation to earning the exempt income as provided above, whether accrued, arisen or received or not, should not be tax deductible. In case the tax authorities are not satisfied by the disallowance considered by the Trust, the quantum of disallowance shall be computed in accordance with the provisions of section 14A read with Rule 8D of the Rules.

As per section 193(ix) and section 194A(3)(xi) of the Act, any income by way of interest received/receivable by the Trust from SPV is not subject to withholding of taxes.

b. Dividend (other than dividend in the nature of the buy-back proceeds from Project SPVs)

Dividend received or receivable by the Trust from the Project SPVs (being domestic companies) shall be exempt from tax, subject to satisfaction of conditions given in section 10(23FC) of the Act.

In this regard, please note that as per the explanation to section 10(23FC) of the Act, the expression "special purpose vehicle" means an Indian company in which the business trust holds controlling interest and any specific percentage of shareholding or interest, as may be required by the regulations under which such trust is granted registration.

As per provisions of section 14A of the Act, any expenditure incurred in relation to earning the exempt income as provided above, whether accrued, arisen or received or not, should not be tax deductible. In case the tax authorities are not satisfied by the disallowance considered by the Trust, the quantum of disallowance shall be computed in accordance with the provisions of section 14A read with Rule 8D of the Rules.

Further, second proviso to section 194 of the Act provides that no TDS is required to be deducted by a SPV in respect of dividend paid to the Trust.

c. Dividend in the nature of the buy-back proceeds from Project SPVs

As per amendments made *vide* Finance (No. 2) Act, 2024, proceeds from buy-back of shares shall be taxable as deemed dividend in the hands of shareholders as per provisions of newly inserted clause (f) under section 2(22) of the Act.

Further, with respect to shares bought back which are deemed as dividend under section 2(22)(f) of the Act, no deduction should be allowed while computing the dividend income as per second proviso to section 57 of the Act.

Additionally, as per proviso to section 46A of the Act, sales consideration in respect of shares bought back shall be considered as Nil for the purposes of computation of capital gains. Accordingly, cost of acquisition of such shares should be regarded as capital loss in the hands of shareholders in the year of such buy back.

It must be noted that such loss shall be considered as short-term capital loss where shares are held for a period of 24 months or less, and where shares are held for a period of more than 24 months, such losses shall be classified as long-term capital loss.

Section 70 read with section 74 of the Act allows short-term capital loss arising during a financial year to be set off against income, if any, from capital gains (short-term or long-term), arising in the same financial year. However, long-term capital loss arising during a financial year is allowed to be set-off only against long-term capital gains. Balance loss, if any, is allowed to be carried forward and set-off against income from capital gains, arising during subsequent eight assessment years, as follows: (i) balance short-term capital loss can be carried forward and set-off against capital gains (short-term or long-term); and (ii) balance long-term capital loss can be carried forward and set-off only against long-term capital gains.

Further, as per Section 71 of the Act, short term/ long term capital loss for the year cannot be set-off against income under any other head other than capital gains for the same year.

In absence of any clarity by the CBDT with respect to treatment of such deemed dividend in case of Trust, taxability of such deemed dividend in the hands of Trust should be in a similar manner, as in the case of normal dividend as discussed in Point 'b' above. Trust will incur a capital loss (to the extent of cost of acquisition of shares) in the year of buy back which will be eligible for carry forward and set off against future capital gains in accordance with provisions of section 70 read with section 74 of the Act, as discussed above.

2.1.2. Income other than the income distributed by the SPVs

a. Income by way of dividend/ interest/ any other income (such as treasury income)

Dividend/interest income received by the Trust from listed securities, liquid funds, etc. or treasury income etc. shall be subject to tax at the maximum marginal rate in force ('MMR') as per section 115UA of the Act. MMR is defined under the provisions of the Act to mean the rate of income-tax (including surcharge on income-tax, if any) applicable in relation to the highest slab of income as per the relevant Finance Act as increased by cess.

As per first proviso to section 57 of the Act, no deduction shall be allowable against dividend income other than deduction on account of interest expense and such interest expense shall not exceed 20% of the gross dividend income included in the total income for that year, without deduction under section 57 of the Act.

b. Income by way of capital gains

In terms of section 115UA(2) of the Act, the total taxable income of the Trust shall be chargeable to tax at MMR except for income arising on transfer of short-term capital assets and long-term capital assets[4] under section 111A and section 112 of the Act.

As per the provisions of section 111A of the Act, any income arising from transfer of short-term capital asset being an equity share in a company or a unit of an equity-oriented fund or a unit of a business trust,

[4] As per section 2(42A), a short-term capital asset means: (i) for unlisted shares – period of holding is less than or equal to 24 months; (ii) for unlisted bonds/debentures - always deemed to be short-term capital asset; (iii) Immovable property being land and/or building - period of holding is less than or equal to 24 months; (iv) listed equity shares or debentures or units of an equity-oriented fund or units of business trust– period of holding less than or equal to 12 months. As per section 2(29A), a capital asset which is not a short-term capital asset is regarded as a long-term capital asset.

transacted through a recognized stock exchange and subject to STT, should be taxable at a rate of 20%[++5]. However, the condition of subject to STT is not applicable if the transaction is undertaken on a recognized stock exchange located in any International Financial Services Centre ('IFSC') and where the consideration for such transaction is received or receivable in foreign currency.

Short-term capital gains arising from transfer of short-term capital asset other than the shares and securities covered under section 111A of the Act, will be taxed at MMR.

As per the provisions of section 112 of the Act, gains arising on the transfer of long-term capital assets shall be chargeable to tax in the hands of the Trust at the rate of 12.5%[++].

Section 48 of the Act prescribes the mode of computation of capital gains and provides for deduction of cost of acquisition/ improvement and expenses incurred in connection with the transfer of a capital asset, from the sale consideration to arrive at the amount of capital gains. In respect of long-term capital gains taxable under section 112 of the Act, section 48 of the Act provided for substitution of cost of acquisition/improvement with indexed cost of acquisition/improvement, which adjusts the cost of acquisition/improvement by a cost inflation index as prescribed from time to time. However, such adjustment of cost of acquisition/improvement by a cost inflation index has been removed *vide* Finance (No. 2) Act, 2024.

Further, as per provisions of section 112A of the Act, capital gains exceeding one lakh and twenty five thousand rupees arising on the transfer of long term capital asset, being an equity share in a company or a unit of an equity oriented fund or a unit of a business trust, transacted through a recognized stock exchange and subject to STT, shall be chargeable to tax in the hands of the business trust at the rate of 12.50% (plus applicable surcharge and cess) without applying the benefit under the first proviso to section 48 of the Act. Since specific carve out has not been provided under the provisions of section 115UA of the Act for section 112A of the Act, long term capital gains on account of sale of aforesaid equity share in a company or a unit of an equity oriented fund or a unit of a business trust, which are taxable @ 12.50% under section 112A (subject to certain conditions) of the Act may be taxable at MMR in the hands of business trust.

As per section 50CA of the Act, where the consideration on transfer of unquoted shares of a company, is less than the fair market value of such share determined in such manner as may be prescribed, the value so determined shall for the purpose of section 48 of the Act, be deemed to the full value of consideration.

Section 70 read with section 74 of the Act allows short-term capital loss arising during a financial year to be set off against income, if any, from capital gains (short-term or long-term), arising in the same financial year. However, long-term capital loss arising during a financial year is allowed to be set-off only against long-term capital gains. Balance loss, if any, is allowed to be carried forward and set-off against income from capital gains, arising during subsequent eight assessment years, as follows: (i) balance short-term capital loss can be carried forward and set-off against capital gains (short-term or long-term); and (ii) balance long-term capital loss can be carried forward and set-off only against long-term capital gains.

Further, as per Section 71 of the Act, short term/ long term capital loss for the year cannot be set-off against income under any other head other than capital gains for the same year.

Taxability of unitholders

2.1. Income by way of interest and dividend (including upstreaming of dividend in the nature of the buy-back proceeds from Project SPVs)

a. As per the provisions of section 115UA(1) of the Act, the income distributed by the Trust is taxable in the hands of the unitholders in the same manner and in the same proportion as the underlying income received by or accrued to the Trust.

b. As per the provisions of section 10(23FD), any income referred to in section 115UA(1) of the Act and distributed by the Trust shall not be included in the total income of the unitholders, except for the following income:

- Interest income from SPV (referred to in section 10(23FC)(a));
- Dividend Income from SPV [referred to in section 10(23FC)(b)], i.e., if the SPV has opted for concessional tax regime under section 115BAA;

[5] *excluding applicable surcharge and cess*

The above income would be taxable in the hands of the unitholders under section 115UA(3) of the Act at the rates applicable to the respective unitholders.

c. As per section 115A(1)(iiac) of the Act read with section 194LBA of the Act, income in the nature of interest referred to in section 10(23FC)(a) shall be taxable at the rate of 5%++ in the hands of a non-resident unitholders. Such interest would be taxable in the hands of resident unitholders at the applicable tax rates.

d. Taxability of dividend income distributed by the Trust to unitholders is dependent on the taxation regime adopted by the SPV(s), which distributes the dividend to the Trust. If the SPV(s) has not opted for a concessional corporate tax rate under section 115BAA of the Act ('Qualifying SPV'), dividend distributed by such Qualifying SPV ('Qualified Dividend') and distributed by the Trust is exempt in the hands of the unitholders. Any dividend other than Qualified Dividend distributed by the Trust ('Unqualified Dividend') is taxable in the hands of the unitholders. Such Unqualified Dividend shall be taxable in the hands of non-resident unitholders at the rate of 20%++ as per section 115A of the Act and shall be taxable in the hands of resident unitholders at the applicable tax rates.

e. Further, where the dividend, interest, or any other income received by the Trust is chargeable to tax in the hands of the Trust, such income shall be exempt in the hands of the unitholders on distribution by the Trust under section 10(23FD) of the Act. Further, any expenditure incurred for earning such exempt income shall not be deductible in the hands of the unitholders under the provisions of section 14A of the Act.

f. Deductions from income in the hands of unitholders

A domestic company is allowed deduction of dividend income received by it from another domestic company or the Trust subject to certain conditions. Therefore, if the unitholder is a domestic company, it should be able to claim the deduction under section 80M where the prescribed conditions mentioned under section 80M have been complied with.

Further, as per proviso to section 57 of the Act, no deduction shall be allowable against the dividend income other than deduction on account of interest expense and such interest expense shall not exceed 20% of the gross dividend income for that year, without deduction under section 57 of the Act. Furthermore, where dividend income is in the nature of the shares bought back, no expense shall be allowed as deduction against such dividend income.

2.2. Distribution of specified sum

a. The Finance Act, 2023 has amended section 56(2) of the Act to add a new clause (xii) which provides the taxability of any specified sum received by unitholders from the Trust in respect of units held by him at any time during the year.

b. Computation of "specified sum" shall be the result of 'A-B-C' where:

'A' = Cumulative distribution made by trust till date excluding the amount distributed in the nature of dividend, interest or rental income or any amount taxed/taxable in the hands of InvIT
'B' = Issue price of such units
'C' = Amount charged to tax under this provision in earlier years

Specified sum shall be deemed to be zero if 'A-B-C' results in negative value.

2.3. Other income (income other than interest or dividend income or income chargeable to tax under section 56(2)(xii) of the Act) received from Trust

a. Other income (income other than interest or dividend income or income chargeable to tax under section 56(2)(xii) of the Act) such as treasury income earned by Trust and distributed to unitholder shall be exempt in hands of unitholders as the same shall be taxable in the hands of Trust. Further, there shall be no withholding on distribution of such other income by the Trust to the unitholders.

2.4. Income by way of capital gains

2.4.1. For resident unitholder

a. For the purpose of computation of capital gains on sale of units of Trust, consideration received on sale of units of Trust shall be reduced by cost of acquisition of such units and expenditure incurred wholly and exclusively in connection with such sale.

b. As per the amendments made by Finance Act, 2023, the amount of distribution to the extent not chargeable to tax u/s 56(2)(xii) of the Act and not covered u/s 10(23FC), 10(23FCA) or 115UA(2) of the Act, shall be reduced from the cost of units, for the purpose of computation of capital gains.

c. Investors are advised to consult their tax advisor for computation of capital gains including cost of acquisition of units as per Indian tax laws in each case.

d. Where the gains arising on the transfer of units of the Trust by the unitholder are included in the business income of an assessee assessable under the head 'Profits and Gains from Business or Profession' and on which STT has been charged, such STT shall be a deductible expense from business income as per the provisions of section 36(1)(xv) of the Act. The characterization of gains/ losses, arising from sale of units, as capital gains or business income would depend on the nature of holding in the hands of the unitholder and various other factors.

e. Where the gains on transfer of the units of the Trust are characterized as capital gains, and if such units are long-term capital assets and such transaction is chargeable to STT, income arising on transfer of units of the Trust (over and above INR 0.125 million) will be taxable at a tax rate of 12.50%$^{++}$ subject to conditions as per section 112A. However, the condition of transaction being chargeable to STT is not required if the transaction is undertaken on a recognised stock exchange located in IFSC and where the consideration for such transaction is received or receivable in foreign currency. Further, in case of long-term capital gain on transfer of units of the Trust, which are not subject to STT, shall be taxable in the hands of the unitholders at the tax rate of 12.50%$^{++}$ under section 112 of the Act.

f. Short-term capital gains arising on transfer of the units of the Trust will be chargeable to tax at the rate of 20%$^{++}$ as per the provisions of section 111A of the Act, provided such transaction is subject to STT. The condition of STT is not required to be followed if the transaction is undertaken on a recognised stock exchange located in IFSC and where the consideration for such transaction is received or receivable in foreign currency.

g. In case of a unitholder being an individual or HUF, where the total taxable income as reduced by short-term capital gains is below the basic exemption limit, the short-term capital gains will be reduced to the extent of the shortfall and only the balance short-term capital gains will be subjected to such tax in accordance with the proviso to sub-section (1) of section 111A of the Act. Short-term capital gains on transfer of units of the business trust, not transacted through a recognized stock exchange and not subject to STT shall be taxable at the applicable rate of tax for respective unitholders.

h. In case of a unitholder being a resident individual or HUF, where the total taxable income as reduced by long-term capital gains taxable is below the basic exemption limit, such long-term capital gains will be reduced to the extent of the shortfall and only the balance long-term capital gains will be subjected to such tax in accordance with the proviso to sub-section (1) of section 112 and proviso to sub-section (2) of section 112A of the Act.

i. In case of determining the period of holding for units allotted pursuant to exchange of shares of special purpose vehicle, as per clause (hc) of explanation 1 to section 2(42A), the period of holding for the units shall include the period for which the shares were held by the promoter in the SPV

j. In case of unitholder, being a domestic company that are liable to pay MAT under provisions of section 115JB of the Act, the gains arising, if any, on sale of units of the Trust are to be included as part of book profits for the purposes of computing MAT lability. MAT paid by such companies should be available as credit for set off against future tax liability, provided such companies do not opt to be governed by the concessional tax rate under section 115BAA of the Act.

k. In case of unitholders, other than companies, that are liable to Alternate Minimum Tax (AMT) under provisions of Section 115JC of the Act, the gains arising, if any, on sale of units of Trust are to be included as part of adjusted total income for the purpose of computing AMT liability. AMT paid by such unitholders should be available as credit for set-off against future tax liability, provided they do not opt to be governed by the concessional tax rates u/s 115BAC or 115BAD of the Act.

2.4.2. <u>For non-resident unitholder (other than Foreign Portfolio Investors ('FPIs'):</u>

a. For the purpose of computation of capital gains on sale of units of Trust, consideration received on sale of units of Trust shall be reduced by cost of acquisition of such units and expenditure incurred wholly and exclusively in connection with such sale.

b. As per the amendments made by Finance Act, 2023, the amount of distribution to the extent not chargeable to tax u/s 56(2)(xii) of the Act and not covered u/s 10(23FC), 10(23FCA) or 115UA(2) of the Act, shall be reduced from the cost of units, for the purpose of computation of capital gains.

c. Investors are advised to consult their tax advisor for computation of capital gains including cost of acquisition of units as per Indian tax laws in each case.

d. Where the gains arising on the transfer of shares of the unitholder are included in the business income of an assessee assessable under the head 'Profits and Gains from Business or Profession' and on which STT has been charged, such STT shall be a deductible expense from business income as per the provisions of section 36(1)(xv) of the Act. Such business income should not be taxable in India unless the non-resident has a taxable presence in India.

e. Where the gains on transfer of the units are characterized as capital gains, if such units are long-term capital assets and such transaction is chargeable to STT, income arising on transfer of units of the Trust (over and above INR 0.125 million) will be taxable at a tax rate of 12.50%++ subject to conditions as per Section 112A. However, the condition of STT is not required to be followed if the transaction is undertaken on a recognised stock exchange located in IFSC and where the consideration for such transaction is received or receivable in foreign currency. Further, in case of long-term capital gain on transfer of units of the Trust, which are not subject to STT, shall be taxable in the hands of the unitholders at the tax rate of 12.50%++ under section 112 of the Act.

f. Short-term capital gains arising on transfer of the units of the Trust will be chargeable to tax at the rate of 20%++ as per the provisions of section 111A of the Act if such transaction is chargeable to STT. However, the condition of STT is not required to be followed if the transaction is undertaken on a recognised stock exchange located in IFSC and where the consideration for such transaction is received or receivable in foreign currency.

g. Short-term capital gains on transfer of units of the business trust, not transacted through a recognized stock exchange and not subject to STT shall be taxable at the applicable rate of tax for respective unitholders.

h. As per section 47 of the Act read with Notification no. 16/2020, any capital gain arising on transfer of capital asset being unit of a business trust listed on a recognised stock exchange located in any IFSC where the consideration is received or receivable in foreign currency, would not be regarded as a transfer and therefore, would not be subject to any capital gain tax implications.

i. In case of unitholders, other than companies, that are liable to AMT under provisions of Section 115JC of the Act, the gains arising, if any, on sale of units of Trust are to be included as part of adjusted total income for the purpose of computing AMT liability. AMT paid by such unitholders should be available as credit for set-off against future tax liability, provided they do not opt to be governed by the concessional tax rates u/s 115BAC or 115BAD of the Act.

j. As per explanation 4 to section 115JB(2), the provisions of section 115JB shall not be applicable to a foreign company if the foreign company is a resident of a country having DTAA with India and such foreign company does not have a permanent establishment within the definition of the term in the relevant DTAA, or the foreign company is a resident of a country which does not have a DTAA with India and such foreign company is not required to seek registration under the legislation covering companies in India.

2.4.3. <u>For non-resident unitholders who are FPIs:</u>

a. As per section 2(14) of the Act, any securities held by an FPI, which were invested in accordance with the regulations made under the Securities and Exchange Board of India Act, 1992 shall be deemed to be capital assets. Hence the income from the transfer of such securities shall be deemed to be treated as capital gains.

b. If units of the Trust are long-term capital assets and such transaction is chargeable to STT, income arising on their transfer (over and above INR 0.125 million) will be taxable at a tax rate of 12.50%$^{++}$ subject to conditions as per section 112A read with section 115AD. Further, in case of long-term capital gain on transfer of units of the Trust, which are not subject to STT, shall be taxable in the hands of the unitholders at the tax rate of 10%$^{++}$, as per section 115AD.

c. Short-term capital gains arising on transfer of the units of the Trust will be chargeable to tax at the rate of 20%$^{++}$ as per the provisions of section 111A of the Act read with section 115AD, if such transaction is

chargeable to STT. Short-term capital gains on transfer of units of the Trust, not transacted through a recognized stock exchange and not subject to STT shall be taxable at 30%[++] under section 115AD of the Act. The condition of payment of STT is not required to be followed if the transaction is undertaken on a recognised stock exchange located in IFSC and where the consideration for such transaction is received or receivable in foreign currency.

d. Investors are advised to consult their tax advisor for computation of capital gains including cost of acquisition of units as per Indian tax laws in each case.

e. As per the Explanation 4 to section 115JB, provisions of Minimum Alternate Tax shall not be applicable to any foreign company if:

- Such foreign company is a resident of country with which India has a DTAA and such foreign company does not have a permanent establishment in India; or

- Such foreign company is a resident of country with which India does not have a DTAA and such foreign company is not required to seek registration under any law for the time being in force relating to companies.

Accordingly, provisions of MAT shall not apply to FPIs/ FIIs in case the above conditions hold true.

2.4.4. For unitholders who are notified Sovereign Wealth Fund and notified Pension Funds:

a. As per section 10(23FE) of the Act, any income by way of dividend, interest, any sum referred to in section 56(2)(xii), or long-term capital gain arising from investment made in units of the Trust on or after 1 April 2020 and before 31 March 2030 and held for at least three years shall be exempt for notified Sovereign Wealth Fund, wholly owned subsidiary of Abu Dhabi Investment Authority (ADIA) and notified Pension Funds, subject to satisfaction of stipulated conditions.

b. Investors are advised to consult their tax advisor for computation of capital gains including cost of acquisition of units as per Indian tax laws in each case.

c. In this regard, please note that there as per provisions of the Act, no exemption is being provided from withholding of taxes on above mentioned income accruing to the specified persons as defined under section 10(23FE) of the Act.

2.4.5. Special tax benefits/ provisions applicable to Alternative Investment Fund (Category I and II)

a. Under section 10(23FBA) of the Act, any income of an investment fund other than the income chargeable under the head "Profits and gains of business or profession" is exempt from income tax.

b. Further, income of the investment fund chargeable under the head 'Profits and gains of business or profession' is taxable as follows (section 115UB(4) of the Act)

- at the rate or rates as specified in the Finance Act of the relevant year, where such fund is a company or a firm; or
- at maximum marginal rate in any other case

c. The losses incurred by AIF shall be treated in accordance with the provisions of section 115UB(2) and 115UB(2A) of the Act.

2.4.6. For unitholders who are mutual funds:

a. Under section 10(23D) of the Act, any income earned by a Mutual Fund registered under the Securities and Exchange Board of India Act, 1992, or a Mutual Fund set up by a public sector bank or a public financial institution, or a Mutual Fund authorised by the Reserve Bank of India would be exempt from income-tax, subject to such conditions as the Central Government may by notification in the Official Gazette specify in this behalf.

b. In light with the provisions of section 196 of the Act, no deduction of tax shall be made on any sum payable to a Mutual Fund specified under clause (23D) of section 10. Accordingly, the Trust is not required to withhold tax on any sum payable to Mutual Fund set up under section 10(23D) of the Act.

2.4.7. For Venture Capital Companies/Funds:

For VCF/VCC registered prior to 21 May 2012:

a. Under Section 10(23FB) of the Act, any income of Venture Capital Company to whom the certificate of registration is granted before 21/05/2012 under SEBI (Venture Capital Funds) Regulations, 1996 or as a subcategory I Alternative Investment Fund as is regulated under SEBI (Alternative Investment Funds Regulations) under the SEBI Act, 1992, would be exempt from income tax, subject to conditions specified therein.

b. As per Section 115U of the Act, any income derived by a person from his investment in Venture Capital Company/Venture Capital Fund would be taxable in the hands of the person making an investment in the same manner as if it were the income accruing or arising to or received by such person had the investments been made directly in the venture capital undertaking.

For VCF/VCC registered post 21 May 2012:

c. VCF/VCC registered post 21 May 2012 shall be classified as a Category 1 Alternate Investment Fund which shall be governed by the SEBI (AIF) Regulations 2012 or as referred to in sub-regulation (2) of regulation 18of the International Financial Services Centres Authority (Fund Management) Regulations, 2022 made under the International Financial Services Centres Authority Act, 2019. For such funds benefit of section 10(23FB) and section 115U shall not be applicable and shall be governed by section 115UB read with section 10(23FBA) and 10(23FBB) which states that business income earned by such fund shall be taxable in the hands of the Fund and exempt in the hands of the unit holders, and other income earned viz. capital gains, income from other sources shall be exempt in the hands of the fund and taxable in the hands of unit holder.

2.4.8. Benefits under Double taxation avoidance agreement (DTAA)

a. As per section 2(30) of the Act, non-resident is defined to mean a person who is not a "resident". A non-resident unit holder should be subject to taxation in India only if:

- it is regarded a tax resident of India; or
- being a non-resident in India, it derives: (a) if any income is received / deemed to be received in India; or (b) if any income has accrued or arisen / deemed to have accrued or arisen in India in terms of the provisions of the Act.

b. Section 6 of the Act provides that a foreign company should be treated as a tax resident in India if its place of effective management (POEM) is in India in that year. POEM has been defined to mean a place where key managerial and commercial decisions that are necessary for the conduct of the business of an entity as a whole are, in substance made.

c. Under the provisions of section 90(2) of the Act, a non-resident will be governed by the provisions of the DTAA between India and the country of tax residence of the non-resident and the provisions of the Act apply to the extent they are more beneficial to the assessee.

d. However, the non-resident investor will have to furnish a certificate of his being a tax resident in a country outside India and a suitable declaration stating that such non-resident does not have a fixed base/ permanent establishment in India, to obtain the benefit of the applicable DTAA and such other document as may be prescribed as per the provision of section 90(4) of Act. Further, as per Notification No. 3/2022 dated 16th July 2022, Form 10F is required to be furnished electronically for submitting information as required under Rule 21AB, where tax residence certificate does not contain all the prescribed requisite information.

e. As per the provisions of section 90(2) of the Act, the provisions of the Act would prevail over the provisions of the DTAA to the extent they are more beneficial to the non-resident.

2.4.9. Treatment of loss:

a. Section 70 read with section 74 of the Act allows short-term capital loss arising during a financial year to be set off against income, if any, from capital gains (short-term or long-term), arising in the same financial year. However, long-term capital loss arising during a financial year is allowed to be set-off only against long-term capital gains. Balance loss, if any, is allowed to be carried forward and set-off against income from capital gains, arising during subsequent eight assessment years, as follows: (i) balance short-term capital loss can be carried forward and set-off against capital gains (short-term or long-term); and (ii) balance long-term capital loss can be carried forward and set-off only against long-term capital gains.

b. Further, as per Section 71 of the Act, short term/ long term capital loss for the year cannot be set-off against income under any other head other than capital gains for the same year.

2.5. Tax deduction at source by the Trust

a. Section 194LBA – Certain income from units of the Trust: As per section 194LBA of the Act, taxes shall be required to be deducted at source at the time of payment/ credit (whichever is earlier) from following income distributions by the Trust to its unitholders:

Class of unitholders	Nature of income	Applicable tax rates
• Resident unitholders*	Interest income - Section 194LBA(1)	10%
	Unqualified Dividend income - Section 194LBA(1)	10%
	Qualified Dividend income - Section 194LBA(2A)	Not subject to withholding tax
	Specified sum – Section 56(2)(xii)	Not subject to withholding tax
• Non-resident unitholders*#^	Interest income – Section 194LBA(2)	5%++
	Unqualified Dividend income^ - Section 194LBA(2)	10%++
	Qualified Dividend income – Section 194LBA(2A)	Not subject to withholding tax
	Specified sum – Section 56(2)(xii)	Tax rates as may be applicable++
• Category I & II Alternative Investment Funds • Mutual Funds	Any distribution	Not subject to withholding tax

**The unitholders may provide NIL/Lower withholding certificate issues under section 197 of the Act with respect to income as specified u/s 194LBA of the Act.*

^ If the Act provides withholding tax rate for any specific category of non-resident unitholders, then the same needs to be considered.

 # Non-resident unitholders may seek to avail any beneficial provisions under applicable DTAA that India may have entered into with its country of residence. Rate of TDS for FPI/FII may be governed in accordance with section 196D of the Act.

b. Applicability of other provisions:

No income tax is deductible at source from income in the nature of capital gains arising to a resident unitholder under the provisions of the Act.

However, as per the provisions of Section 195 read with section 90 of the Act, any income on transfer of units of the Trust by non-residents may be subject to withholding of tax at the rate under the domestic tax laws or under the DTAA, whichever is more beneficial to the Assessee (other than FPIs/ FIIs who are subject to provisions of section 196D(2) of the Act)

Further, section 196D of the Act provide that in case of a payee, being FPIs/ FIIs of country with which India has entered into DTAA, tax shall be deducted at the rate of 20% or the DTAA rates (for the incomes referred in section 115AD(1), other than capital gains and interest income subject to TDS u/s 194LD of the Act), whichever is lower, subject to the FPI/ FII furnishing a Tax Residency Certificate (referred to in Section 90(4) of the Act) and a suitable declaration for not having a fixed base/ permanent establishment in India, to the payer.

Further, as per sub-section (2) of section 196D of the Act, no tax is to be deducted from any income, in the nature of capital gains arising to a FPI or FII from the transfer of units, subject to the FPI/ FII furnishing a Tax Residency Certificate (referred to in Section 90(4) of the Act) and a suitable declaration for not having a fixed base/ permanent establishment in India, to the payer.

Buyer and seller of unlisted shares/securities also need to check the applicability of TDS u/s 194Q of the Act read with provision of Tax Collection at Source (TCS) u/s 206C(1H) of the Act. As per the clarification issued by CBDT, the transaction in shares not taken place through recognized stock exchange/ recognised clearing corporations may also fall under the ambit of section 194Q/206C(1H) of the Act since CBDT has clarified that the said provisions of section 194Q/206C(1H) of the Act are not applicable to transactions in

securities and commodities transacted through recognised stock exchanges/ recognised clearing corporations, including those located in International Financial Service Centre.

c. Provisions of section 206AA of the Act

As per section 206AA of the Act, where a tax payer does not possess a Permanent Account Number ('PAN'), taxes have to be withheld on payment of income to the tax payer (where chargeable to tax) at higher of the following:

- at the rate specified in the Act; or
- at the rate or rates in force; or
- at the rate of twenty per cent

The Finance Act, 2016 amended the aforementioned provision to provide an exemption to non-residents, subject to compliance of such conditions as may be prescribed by the CBDT. In furtherance of the amended provision, the CBDT issued a notification prescribing the rules (Rule 37BC of the Rules) for relaxation from withholding of tax at higher rates in the absence of PAN in the case of non-resident deductee and laid down the information and alternative documents required to claim such relaxation.

d. Provisions of section 206AB of the Act

Finance Act 2021 has inserted section 206AB which *inter alia* stipulates that where tax is required to be withheld by a person on payment or credit to a *specified person*[6], the tax shall be deducted at the higher of the following rates:

- at twice the rate specified in the relevant provision of the Act; or
- at twice the rate or rates in force; or
- at the rate of five per cent.

If the provisions of section 206AA is applicable to a specified person, in addition to the provision of section 206AB, the tax shall be deducted at higher of the two rates provided in section 206AB and in section 206AA.

e. Applicability of other provisions:

Section 94(7) of the Act (commonly known as dividend stripping)

Vide Finance Act, 2022, applicability of section 94(7) of the Act (commonly known as dividend stripping) has been extended to the units of Trust as well (that with effect from Financial Year 2022-23) which provides that where:

a) any person buys or acquires any securities or unit within a period of three months prior to the record date[7];
b) such person sells or transfers such securities within three months after such record date or such units within a period of nine months after such record date;
c) the dividend or income on such securities or unit received or receivable by such person is exempt

then, the loss, if any, arising from the sale and purchase of securities and units, to the extent of dividend or income received or receivable on such securities or unit, shall be ignored for computing income chargeable to tax.

Section 94(8) of the Act (commonly known as bonus stripping)

Vide Finance Act, 2022, applicability of section 94(8) of the Act (commonly known as bonus stripping) has been extended to the units of Trust as well (that with effect from Financial Year 2022-23) which provides that where:

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[6] *As per the provisions of section 206AB of the Act, 'Specified person' means a person who:*

(i) has not furnished the return of income for the previous year immediately preceding the previous year in which the tax is required to be deducted, for which time-limit of furnishing the return of income u/s 139(1) has expired; and

(ii) the aggregate of tax deducted at source and tax collected at source is INR 50,000 or more in the said previous year

[7] *Record date means a date fixed to entitles the holder of such securities or units to receive dividend, income, or additional securities or unit without consideration, as the case may be*

a) any person buys or acquires any units within a period of three months prior to the record date;
b) such person is allotted additional units without any payment on the basis of holding of such units on such record date;
c) such person sells or transfers all or any of the units within a period of nine months after the record date, while continuing to hold all or any of the additional units referred above

then, the loss, if any, arising from the sale and purchase of all or any of the units shall be ignored for computing income chargeable to tax and notwithstanding anything contained in any other provision of the Act, the amount of loss so ignored shall be deemed to be the cost of purchase or acquisition of such additional units referred above as are held on the date of such sale or transfer.

f. Transaction not regarded as transfer under section 47(xvii) of the Act:

According to section 47(xvii) of the Act, any transfer of a capital asset, being share of a special purpose vehicle to a business trust in exchange of units allotted by that trust to the transferor shall not be regarded as transfer and accordingly not be liable to capital gains tax.

Further, as per section 49(2AC) of the Act, the cost of units of Trust allotted to the transferor in exchange of shares in SPV shall be deemed to be the cost of acquisition of shares in SPV.

Furthermore, as per clause (hc) of Explanation 1 to section 2(42A) of the Act, for ascertaining the period of holding of such units, the period of holding of shares in SPV shall also be included.

Any notional gain or loss arising on transfer of shares of SPV to business trust in exchange of units allotted by the trust as referred under section 47(xvii) are to be excluded while calculating book profits for the purpose of MAT under section 115JB. Similarly, any notional gain or loss arising upon change in carrying amount of the units held by Unitholder are to be excluded in calculating book profits for the levy of MAT under section 115JB (clause (iie)/(fc) to explanation 1 to section 115JB).

Further, actual gain or loss on disposal of units held by the Unitholder as referred to in section 47 (xvii) are considered for the purpose of normal provisions of the Act and MAT under section 115JB by taking into account the cost of the shares exchanged with units referred to in the said clause or the carrying amount of the shares at the time of exchange where such shares are carried at a value other than the cost through statement of profit and loss, as the case may be (clause (iif)/(k) to explanation 1 to section 115JB).

However, if the Unitholder opts for concessional tax regime under section 115BAA / 115BAB then provisions of MAT under section 115JB shall not be applicable for the Unitholder and it shall forego its entire MAT credit available, if any, at the time of exercising concessional tax-regime.

3. General tax rates and provisions

3.1. The characterization of gains/ losses, arising from sale / transfer of units, as capital gains or business income would depend on the nature of holding in the hands of the unit holder and various other factors.

3.2. Where the gains arising on the transfer of the units of the Trust are included in the business income of an assessee assessable under the head "Profits and Gains from Business or Profession" and on which securities transaction tax has been charged, such securities transaction tax shall be a deductible expense from business income as per the provisions of section 36(1)(xv) of the Act. However, securities transaction tax is not eligible to be deducted as cost on transfer of the units of the Trust in case where the gains arising from such transfer is assessable under the head "Capital Gains".

3.3. The income-tax rates specified in this note are as applicable for the financial year 2024-25 (relevant to assessment year 2025-26), and are exclusive of surcharge and cess, if any. Rate of surcharge and cess are provided below:

Surcharge:

Domestic companies (other than companies who have opted for concessional tax regime under section 115BAA and 115BAB of the Act):

a) If the total income does not exceed INR 10 million – Nil
b) If the total income exceeds INR 10 million but does not exceed INR 100 million - 7 %
c) If the total income exceeds INR 100 million - 12 %

Domestic companies (for companies who have opted for concessional tax regime under section 115BAA and 115BAB of the Act):

a) At the rate of 10% on total income

Foreign companies:

a) If the total income does not exceed INR 10 million - Nil
b) If the total income exceeds INR 10 million but does not exceed INR 100 million – 2%
c) If the total income exceeds INR 100 million – 5%

Firms:

a) If the total income does not exceed INR 10 million - Nil
b) If the total income exceeds INR 10 million – 12%

For individuals, HUF, AOP and BOI (including non-resident) who have not opted for the New Regime:

a) If the total income does not exceed INR 5 million – Nil
b) If the total income exceeds INR 5 million but does not exceed INR 10 million – 10%
c) If the total income exceeds INR 10 million but does not exceed INR 20 million – 15%
d) If the total income (excluding dividend income or income under the provision of section 111A, section 112 and section 112A of the Act) exceeds INR 20 million but does not exceed INR 50 million – 25%
e) If the total income (excluding dividend income or income under the provision of section 111A, section 112 and section 112A of the Act) exceeds INR 50 million – 37%
f) If total income is above 20 million (including dividend income or income under the provision of section 111A, section 112 and section 112A of the Act) but is not covered under (d) and (e) above – 15%

However, the applicable surcharge does not exceed 15% in case of dividend income or income under the provision of section 111A and section 112A of the Act included in such total income.

Also, in case of an association of persons consisting of only companies as its members, the rate of surcharge on the amount of Income-tax shall not exceed 15%.

The above surcharge is subject to marginal tax benefit as per the Act.

As per the Finance (No. 2) Act, 2024, in case of the Individual/HUF/AOP (other than co-operative)/ BOI/ Artificial Juridical Person ('AJP') taxable under the New Regime prescribed under the Act, the surcharge on the amount of income-tax shall not exceed 25% where taxable income exceeds INR 20 million.

As per the Finance (No. 2) Act, 2024, in the case of an AOP being a non-resident, and consisting of only companies as its members, surcharge shall be calculated at the rate of 10%, where the aggregate income exceeds INR 5 million but does not exceed INR 10 million; at the rate of 15%, where the aggregate income exceeds INR 10 million.

Health and education cess:

In all cases, health and education cess will be levied at the rate of 4% of income-tax and surcharge.

4. Disclaimer

4.1. The stated benefits will be available only to the sole/ first named holder in case the units are held by joint holders.

4.2. Please note that the TDS rates mentioned in the given document may be subject to any concessions introduced/ allowed by the Government under any policy, press release, etc. Also, the same may also be subject to lower/ nil withholding tax certificates which may be furnished by the unit holders.

4.3. In respect of non-residents, the tax rates and the consequent taxation mentioned above shall be further subject to any benefits available under the applicable DTAA, if any, between India and the country in which the non-resident has fiscal domicile. Further, it is pertinent to meet the terms and condition viz. Principal purpose test, beneficial ownership test etc. as enacted in DTAAs entered into by India with various countries based on Multilateral Convention to implement tax treaty related measures to prevent Base Erosion and Profit Shifting ('MLI').

4.4. The tax implications/ benefits stated in this document are subject to General Anti Avoidance Rules (GAAR) provisions under the Act. GAAR may be invoked by the Indian income-tax authorities in case arrangements are found to be impermissible avoidance arrangements. Further, in case GAAR provisions are invoked, the onus to prove that the main purpose of an arrangement was not to obtain any tax benefit is on the taxpayer. Also, any resident or non-resident may approach the Authority for Advance Rulings to determine whether an arrangement can be regarded as an impermissible avoidance arrangement.

4.5. This statement is intended only to provide general information to the investors and is neither designed nor intended to be substituted for professional tax advice. In view of the individual nature of tax consequences, each investor is advised to consult his/her own tax advisor with respect to specific tax consequences of his/her participation in the scheme.

4.6. No assurance is given that the revenue authorities/courts will concur with the views expressed herein. Our views are based on the existing provisions of law and its interpretation, which are subject to changes from time to time. We do not assume responsibility to update the views consequent to such changes. We shall not be liable to any claims, liabilities or expenses relating to this assignment, except to the extent of fees relating to this assignment, as finally judicially determined to have resulted primarily from bad faith or intentional misconduct. We will not be liable to any other person in respect of this statement.

4.7. This statement of possible direct tax benefits enumerated above is as per the Act as amended by the Finance (No. 2) Act, 2024 applicable for financial year ending 31 March 2025 relevant to the assessment year 2025-26. The above statement of possible Direct-tax Benefits sets out the possible tax benefits available to the Trust and its unitholders under the current tax laws presently in force in India. Several of these benefits available are dependent on the Trust or its unitholders fulfilling the conditions prescribed under the relevant tax laws.

4.8. Please note that the tax rates provided in this statement are excluding applicable surcharge and cess. As per the Finance (No. 2) Act, 2024, rates given in sub-section (1A) of section 115BAC of the Act ('New Tax Regime') are the default rates applicable to all individual/ HUF/ AOP (other than co-operative)/ BOI/ AJP. Accordingly, tax rates and surcharge prevailing as per New Tax Regime will be considered for the purpose of withholding.

4.9. The information provided above sets out the possible tax benefits available to the unit holders in a summary manner only and is not a complete analysis or listing of all potential tax consequences of the purchase, ownership and disposal of equity shares and units, under the current tax laws presently in force in India. It is not exhaustive or comprehensive and is not intended to be a substitute for professional advice. Investors are advised to consult their own tax advisor with respect to the tax implications arising on account of any investment in equity shares or units (including tax implications on account of any distributions by/ receipts from the Trust), particularly in view of the fact that certain recently enacted legislation may not have a direct legal precedent or may have a different interpretation impacting the benefits, which an investor can avail.

4.10. This statement does not discuss any tax consequences in the country outside India of an investment in the units of trust. The unit holders / investors in the country outside India are advised to consult their own professional advisors regarding possible Income tax consequences that apply to them.

4.11. The statement is prepared on the basis of information available with the Trust and there is no assurance that:

- the Trust or its unitholders will continue to obtain these benefits in future;
- the conditions prescribed for availing the benefits have been/ would be met with; and
- the revenue authorities/courts will concur with the view expressed herein.

The above views are based on the provisions of law that exist on this day and its interpretation, which are subject to change from time to time.

LEGAL MATTERS

Each of Cyril Amarchand Mangaldas, J. Sagar Associates and Linklaters Singapore Pte. Ltd do not make, or purport to make, any statement in this Preliminary Placement Document and is not aware of any statement in this Preliminary Placement Document which purports to be based on a statement made by any of them, and it makes no representation, express or implied, regarding, and to the extent permitted by law takes no responsibility for, any statement in or omission from this Preliminary Placement Document.

INDEPENDENT ACCOUNTANTS

The Audited Financial Information have been prepared in accordance with the Ind AS and in accordance with the accounting principles generally accepted in India. The Audited Financial Information included in this Preliminary Placement Document have been audited by A.R. & Co., Chartered Accountants (Firm Registration No. 002744C), the statutory auditors of the Trust, as stated in their audit reports dated May 23, 2022, May 22, 2023, May 27, 2024 and December 19, 2024, included in this Preliminary Placement Document

Further, the limited review consolidated financial information of the trust for the nine month period ended December 31, 2024, prepared in accordance with Ind AS have been subject to limited review by A.R. & Co., Chartered Accountants (Firm Registration No. 002744C), the statutory auditors of the Trust, as stated in their limited review report dated February 12, 2025, included in this Preliminary Placement Document.

CAPITALIZATION STATEMENT

The following table sets forth the capitalization statement of the Trust as at December 31, 2024 and as adjusted for the Issue, on a consolidated basis:

Particulars	Pre-Issue as at December 31, 2024 (Rs. in million, except ratios)	Adjusted for the Issue (Rs. in million, except ratios)*
Unitholders' Funds		
Initial Contribution to the Trust	0.01	[●]
Unit Capital	1,46,613.35	[●]
Other Equity	(6,603.25)	[●]
Total Unitholders' Funds (A)	1,40,010.11	[●]
Long Term Borrowings	1,19,908.65	[●]
Short Term Borrowings	-	[●]
Other Borrowings (Current Maturity of Long Terms Borrowings)	1,215.68	[●]
Total Debt (B)	1,21,124.33	[●]
Reserves(C)	-	-
Total Capitalization (A+B+C)	2,61,134.45	[●]
Long Term Debt/Unitholders' Funds Ratio	0.86	[●]
Total Debt/ Unitholders' Funds Ratio	0.87	[●]

**The corresponding post Issue details are not available as of date of this Preliminary Placement Document, hence the required disclosures in respect of the same have not been provided in the above table.*

ASSET REVENUE INFORMATION

In accordance with the SEBI Exemption, the revenue data for each asset for the financial years ended March 31, 2024, March 31, 2023 and March 31, 2022 and for the months of April 1, 2024 to February 28, 2025 is disclosed below. For further details, please see "R*isk Factors - We have no operating history or financial information for the Target Toll Roads. Accordingly, the information disclosed in this Preliminary Placement Document in relation to the Target Toll Roads is limited." on page* 43.

R1 Toll Roads

A. The details in relation to the revenue of the R1 Toll Roads as provided by the Sponsor by way of its letter dated August 24, 2021 are disclosed below:

Assured remittance details as per Tolling Contracts				
S. No.	**Project Highway**	**Toll Plaza**	**Period**	**Equivalent Annualized Amount (in ₹ million)**
1.	**Abu Road - Swaroopganj**	**Undavariya**	08.05.2021-15.12.2021	601.5
			04.03.2021-04.06.2021 (terminated on 07.05.2021)	590.6
			19.01.2020-19.01.2021 (extended till 04.03.2021)	440.1
			12.12.2018-22.12.2019 (extended till 19.01.2020)	374.5
2.	**Palanpur/Khemana Abu Road**	**Khemana**	16.12.2020-15.12.2021	713.5
			05.09.2020-05.12.2020 (extended till 16.12.2020)	663.6
			16.06.2019-16.06.2020 (extended till 05.09.2020)	623.7
			13.04.2018-13.07.2019 (terminated on 16.06.2019)	555.5
3.	**Chittorgarh – Kota & Chittorgarh Bypass**	**Bassi, Aroli, Dhaneswar**	24.04.2021-15.12.2021	870.8
			23.01.2021-23.04.2021	886.5
			22.09.2020-22.12.2020	775.2
			11.08.2020-22.09.2020	705.0
			04.05.2019-04.08.2020	848.7
4.	**Maharashtra/Karnataka (Kagal) – Belgaum**	**Kognoli**	17.12.2020-15.12.2021	815.4
			22.09.2020-17.12.2020	116.7
			08.08.2020-22.09.2020	50.7
			22.02.2020-08.08.2020	297.4
			23.01.2020-22.02.2020	50.0
			23.10.2019 to 23.01.2020	150.2
			16.06.2019-23.10.2019	43.0
			16.06.2019-16.09.2019	129.1

Assured remittance details as per Tolling Contracts				
S. No.	**Project Highway**	**Toll Plaza**	**Period**	**Equivalent Annualized Amount (in ₹ million)**
		Hattargi	18.12.2020-15.12.2021	333.3
			22.09.2020-18.12.2020	65.4
			05.08.2020-22.09.2020	25.3
			05.03.2020-05.08.2020	114.3
			05.12.2019-05.03.2020	68.6
			05.11.2019-05.12.2019	25.6
			05.08.2019-05.11.2019	76.9
			05.05.2019-05.08.2019	79.2
5.	***Kothakota Bypass – Kurnool***	**Pullur**	08.03.2021-15.12.2021	1275.3
			07.12.2019-07.12.2020	1203.3
			07.09.2018-07.12.2019	1173.6

B. The details of the revenue of the R1 Toll Roads (i) from December 16, 2021 (i.e. the Appointed Date) up to the financial year ended March 31, 2022; (ii) financial year ended March 31, 2023; (iii) financial year ended March 31, 2024; (iv) nine months period ended December 31, 2024; and (iv) for the month January 2025 and February 2025 are as follows:

(in ₹ million)

Period	Aburoad Swaroopganj Project	Palanpur Aburoad Project	Kothakota Kurnool Project	Belgaum Kagal Project	Chittorgarh Kota Project	Total
December 16, 2021 – March 31, 2022	181.20	221.36	385.76	344.10	261.77	**1,394.19**
April 1, 2022 - March 31, 2023	655.60	923.17	1714.66	1286.82	933.46	**5513.72**
April 1, 2023 - March 31, 2024	690.11	975.47	1,928.48	1,101.24	973.61	**5668.90**
April 1, 2024 - December 31, 2024	534.73	765.02	1552.49	718.10	822.81	**4393.15**
January 1, 2025 - January 31, 2025	63.08	88.83	175.06	80.27	112.50	**519.73**
February 1, 2025 - February 28, 2025	60.00	82.90	169.20	73.42	122.00	**507.52**
Total	**2184.69**	**3056.76**	**5925.64**	**3603.94**	**3226.18**	**17997.21**

R2 Toll Roads

A. The details of the revenue of the R2 Toll Roads as provided by the Sponsor by way of its letter dated September 21, 2022 are disclosed below:

Assured remittance details as per Tolling Contracts				
S. No.	**Project Highway**	**Toll Plaza**	**Period**	**Equivalent Annualized Amount per annum (in ₹ million)***

1.	**Agra Bypass**	**Raibha**	16.10.2021-16.10.2022	770
			16.10.2020-16.10.2021	641
			11.07.2020-16.10.2020	463
			12.04.2019-11.07.2020	370
2.	**Shivpuri-Jhansi**	**Raksha**	18.03.2022-18.03.2023	608.9
			29.01.2021-18.03.2022	587.8
			15.01.2020-29.01.2021	463.5
			15.10.2018-15.01.2020	466.4
3.	**Borkhedi-Wadner**	**Daroda**	24.12.2021-24.12.2022	657.7
			21.12.2020-24.12.2021	605.1
			23.09.2020-23.12.2020	516.8
			17.09.2019-23.09.2020	383.6
			24.05.2019-17.09.2019	332.5
		Kelapur	20.11.2021-20-12-2022	732.5
			11.09.2021-20.11.2021	684.3
			05.08.2021-11.09.2021	648.9
			12.06.2021-05.08.2021	558.4
			09.02.2021-12.06.2021	634.0
			28.01.2020-09.02.2021	496.8
			31.10.2019-28.01.2020	210.9
			11.09.2018-31.10.2019	197.7

**Note: The above assured remittances are as per the contractually agreed terms with the tolling contractors. However, the remittance amount payable by the tolling contractor gets revised every year from April 1 based on the revision of the toll rate revision for the year. Accordingly, the current remittance amounts (with effect from April 1, 2022) payable by the tolling contractor are as under*:

B. The details of the revenue of the R2 Toll Roads (i) from October 29, 2022 (i.e. the Appointed Date) up to the financial year ended March 31, 2023; (ii) financial year ended March 31, 2024; (iii) nine months period ended December 31, 2024; and (iv) for the month January 2025 and February 2025 are as follows:

(in ₹ million)

Period	Agra Bypass Project	Shivpuri - Jhansi Project	Borkhedi WadnerProject	Total
October 29, 2022 – March 31, 2023	376.94	286.91	693.33	**1357.18**
April 1, 2023 - March 31, 2024	1,027.41	801.44	1,941.33	**3,770.17**
April 1, 2024 - December 31, 2024	799.86	629.13	1579.70	**3008.70**
January 1, 2025 - January 31, 2025	91.11	83.73	172.55	**347.39**
February 1, 2025 - February 28, 2025	87.4	110.5	197.8	**395.7**
Total	**2382.71**	**1911.69**	**4584.76**	**8879.16**

R3 Toll Roads

A. The details of the revenue of the R3 Toll Roads as provided by the Sponsor by way of its letter dated March 7, 2024 are disclosed below:

Details of Revenue (Contracted Revenue) from the assets which are transferred to NEPPL*

S.No.	Project Stretch	Toll Plaza	Period	Equivalent Annualized Amount (Rs cr/annum)
1	Kaljhar to Patacharkuchi	Galia	03.08.2023- 03.08.2024	36.6

		(Plaza commenced w.e.f. 16.11.2021)	03.08.2022 -03.08.2023	30.3
			23.03.2022-03.08.2022	29.26
			16.11.2021-23.03.2022	28.8
2	Hubli-Haveri-Devangere-Chitradurga	Bankapur	18.01.2024 - 18.01.2025	102.1
			12.01.2023- 18.01.2024	53.8
			08.01.2022 – 12.01.2023	47.8
			17.12.2020-08.01.2022	46.2
			24.09.2020- 17.12.2020	39.0
			14.08.2020-24.09.2020	32.23
			02.04.2019-14.08.2020	45.68
2	Hubli-Haveri-Devangere-Chitradurga	Hebbalu	29.03.2023-29.03.2024	125.7
			29.03.2022-29.03.2023	55.1
			02.03.2021-02.03.2022	53.4
			21.03.2020 to 02.03.2021	`52.54
2	Hubli-Haveri-Devangere-Chitradurga	Chalageri	17.02.2024 -17.05.2024	140.10
			05.05.2023-17.02.2024	146.5
			05.05.2022 - 05.05.2023	71.6
			22.03.2022 to 05.05.2022	71.08
			22.01.2022-22.03.2022	67.05
			08.01.2021 -22.01.2022	64.27
			15.10.2020 - 08.01.2021	55.99
			12.09.2020-15.10.2020	45.88
			08.08.2020-12.09.2020	40.65
			21.11.2019-08.08.2020	55.81
3	Lakhnadon- Mahagaon-Khawasa	Madai	26.08.2023-26.08.2024	109.6
			26.08.2022-26.08.2023	90.4
			26.04.2022 -26.08.2022	89.45
			03.03.2022-26.04.2022	77.06
			29.12.2021-03.03.2022	74.04
			25.12.2020-29.12.2021	64.08
			22.09.2020-25.12.2020	41.35
			06.08.2020-22.09.2020	30.55
			18.12.2019-06.08.2020	54.20
3	Lakhnadon- Mahagaon-Khawasa	Khawasa (Plaza started on 19.02.2021)	19.09.2023-19.09.2024	98.0
			19.09.2022 -19.09.2023	81.5
			19.09.2021-19.09.2022	55.6
			30.07.2021-19.09.2021	50.8
			29.05.2021-30.07.2021	42.99
			19.02.2021-29.05.2021	43.29
4	Kachugaon-Rakhaldubi Bus Junction & Rakhaldubi Bus Junction - Kaljhar	Patgaon	29.11.2023 - 29.11.2024	70.3
			18.11.2022- 29.11.2023	58.9
			18.06.2022 - 18.11.2022	58.0
			30.03.2022 - 18.06.2022	52.2
			11.12.2020- 30.03.2022	50.6

			10.09.2020- 11.12.2020	34.7
			08.02.2020 - 10.09.2020	27.1
4	Kachugaon-Rakhaldubi Bus Junction & Rakhaldubi Bus Junction - Kaljhar	Dahalapara	29.11.2023 - 29.11.2024	69.7
			18.11.2022- 29.11.2023	60.3
			29.06.2022 - 18.11.2022	61.5
			29.06.2021 - 29.06.2022	55.5
			06.06.2020 - 29.06.2021	36.9
			30.01.2020 - 06.06.2020	27.9
5	Rewa-Katni-Jabalpur-Lakhnadon	Odhaki	01.05.2023 - 01.05.2024	58.9
			01.05.2022-01.05.2023	50.6
			01.05.2021 - 01.05.2022	48.6
			06.02.2021 - 01.05.2021	47.6
			19.09.2020 - 06.02.2021	44.2
			01.08.2020 - 19.09.2020	41.6
			29.02.2020 - 01.08.2020	41.5
5	Rewa-Katni-Jabalpur-Lakhnadon	Kherwasani	01-01-2024- 01-01-2025	80.12
			05-01-2023- 01-01-2024	66.4
			01.01.2022 - 01.01.2023	55.2
			29.10.2021 - 01.01.2022	52.3
			16.08.2021 - 29.10.2021	56.1
			23.06.2020 - 16.08.2021	46.7
			22.12.2019 - 23.06.2020	42.5
5	Rewa-Katni-Jabalpur-Lakhnadon	Mohtara	25.03.2023 - 25.03.2024	81.7
			25.03.2022 - 25.03.2023	62.2
			01.01.2022 - 25.03.2022	61.6
			25.12.2022 - 01.01.2022	57.5
			17.09.2020 - 25.12.2020	48.6
			20.07.2020 - 17.09.2020	47.0
			05.02.2020 - 20.07.2020	48.9
5	Rewa-Katni-Jabalpur-Lakhnadon	Boharipar	15.03.2023 - 15.03.2024	63.5
			15.03.2022 - 15.03.2023	53.1
			09.03.2021 - 15.03.2022	50.4
			25.12.2020 - 09.03.2021	56.8
			09.10.2020 - 25.12.2020	43.1
			14.07.2020 - 09.10.2020	36.8
			13.02.2020 - 14.07.2020	48.6
6	Orai-Bara	Usaka	05.07.2023 -05.07.2024	123.8
			05.04.2022 -05.07.2023	112.12
			22.02.2022- 05.04.2022	102.6
			16.11.2020 - 22.02.2022	107.0
			24.09.2020 - 16.11.2020	90.4
			20.08.2020 - 24.09.2020	81.1
			10.03.2020 - 20.08.2020	101.4
6	Chichira-Kharagpur	Bhalibhasa	02.07.2023-02.07.2024	92.5

			22.03.2022 - 22.07.2023	82.12
			22.12.2021 - 22.03.2022	81.7
			17.10.2020 - 22.12.2021	69.5
			17.07.2020 - 17.10.2020	60.4

*** The details above are as per work order issued by CO Division and the annualized amount is subject to revision in between of the contract due to annual rate revision.**

B. The details of the revenue of the R3 Toll Roads (i) from April 1, 2024 (i.e. the Appointed Date) up to nine months period ended December 31, 2024; and (ii) for the month January 2025 and February 2025 are as follows:

(in ₹ million)

Period	Chichra-Kharagpur Project	Hubli-Haveri-Chitradurga Project	Kachugaon-Kalijhar Project	Kalijhar-Patacharkuchi Project	Lakhnadon-Khawasa Project	Orai-Bara Project	Rewa-Katni-Jabalpur-Lakhnadon Project	Total
April 1, 2024 – December 31, 2024	695.77	2694.07	1063.21	279.63	1657.12	915.02	2433.66	**9738.48**
January 1, 2025 - January 31, 2025	87.19	298.99	119.50	31.87	213.75	101.91	315.27	**1168.48**
February 1, 2025 - February 28, 2025	74.79	273.17	115.58	30.54	288.11	108.95	488.48	**1379.62**
Total	**857.75**	**3,266.23**	**1,298.29**	**342.04**	**2,158.98**	**1,125.88**	**3,237.41**	**12,286.58**

The Target Toll Roads

In terms of the SEBI Exemption, the details of the revenue of the Target Toll Roads as provided by the Sponsor by way of its letter dated March 12, 2025 are disclosed below:

A.

S. No	Project Stretch	Toll Plaza	Contract Period	Equivalent Annualized Amount (Rs cr/annum)
1	Gundugolanu Devarapalli Kovvuru	Veeravalli (COD: 08.09.2021)	12.03.2024 - 12.06.2024	170.72
			03.12.2022 – 12.03.2023	169.29
			03.12.2021 - 03.12.2022	127.18
			07.09.2021 - 03.12.2021	109.76
2	Narasannapeta to Ranasthalam	Madapam (COD: Jan' 06)	10.05.2023 - 10.05.2024	86.87
			10.05.2022 - 10.05.2023	42.13
			09.03.2022 - 10.05.2022	37.48
			30.10.2021 - 09.03.2022	28.54
			01.04.2021 – 30.10.2021	28.03
3	Anandapuram – Pendurthi – Anakapalle	Dukkavanipalem & Marripalem (COD: Dec' 21)	03.06.2023 - 03.06.2024	39.70
			03.06.2022 - 03.06.2023	33.78
			01.02.2022 - 03.06.2022	25.64
			01.12.2021 - 01.02.2022	45.05
4	Ranasthalam to Hanumanthvaka	Nathavalsa (COD: May' 05)	19.11.2023 - 19.11.2024	128.09
			19.11.2022 - 19.11.2023	72.50
			13.08.2021 - 19.11.2022	69.64
			19.06.2021 - 13.08.2021	53.75

			05.02.2021 - 19.06.2021	66.36
5	Chittoor to Mallavaram	Gadanki (COD: 26.06.2021)	12.10.2023 -12.10.2024	117.59
			12.10.2022 - 12.10.2023	80.38
			12.10.2021 - 12.10.2022	70.72
			13.08.2021 - 12.10.2021	64.51
			26.06.2021 - 13.08.2021	53.22
6	TN/AP – Border to Nalagampalli, AP/Karnataka Border	Mahasamudram (COD: 10.08-2020)	30.01.2024 - 30.01.2025	85.29
			26.01.2023 - 30.01.2024	74.55
			26.01.2022 - 26.01.2023	62.29
			23.01.2021 - 26.01.2022	57.20
7	Gandhidham (Kandla) to Mundra Port	Mokha (Nov' 15)	15.11.2023 - 15.11.2024	211.69
			12.11.2022 - 15.11.2023	160.01
			09.09.2022 - 12.11.2022	159.79
			05.04.2022 – 09.09.2022	128.00
			01.04.2021 – 05.04.2022	122.31
8	Muzaffarnagar - Haridwar	Bahadrabad (COD: Jun' 21)	17.08.2023 - 17.08.2024	90.72
			17.08.2022 - 17.08.2023	77.27
			10.06.2022 - 17.08.2022	70.77
			14.04.2022 - 10.06.2022	59.82
			04.12.2021 - 14.04.2022	60.92
			07.10.2021 - 04.12.2021	53.62
			04.08.2021 - 07.10.2021	50.30
			22.06.2021 - 04.08.2021	36.86
			01.04.2021 – 22.06.2021	68.95
9	Muzaffarnagar - Haridwar	Chapar (COD: Jun' 21)	22.03.2023 - 22.03.2024	58.69
			21.03.2022 - 22.03.2023	45.66
			09.03.2021 - 21.03.2022	44.77
10	Bareilly Sitapur	Faridpur (COD: 12-04-2023)	03.08.2023 - 03.08.2024	108.88
			03.05.2023 - 03.08.2023	99.97
			12.04.2023 - 03.05.2023	118.31
11	Bareilly - Sitapur	Maigalganj (COD: 18-10-2023)	14.09.2024 - 14.12.2024	88.54
			03.05.2024 - 14.09.2024	89.60
			20.01.2024 - 03.05.2025	118.36
			20.10.2023 - 20.01.2024	100.18
12	Raipur to Simga	Tarpongi (COD: 17-03-2021)	24.08.2023 -24.08.2024	90.57
			24.08.2022 - 24.08.2023	66.47
			29.04.2022 - 24.08.2022	64.89
			21.12.2021 - 29.04.2022	68.87
			01.04.2021 – 21.12.2021	*Plaza not operational*
13	Simga to Bilaspur	Mudipar (COD: Jan' 20)	09.06.2023 - 09.06.2024	9.89
			09.06.2022 - 09.06.2023	5.81
			26.02.2022 - 09.06.2022	4.92
			01.04.2021 – 26.02.2022	4.80
14	Simga to Bilaspur	Bhojpuri	25.03.2023 - 25.03.2024	75.45

		(COD: Feb' 20)	25.03.2022 - 25.03.2023	51.50
			03.02.2022 - 25.03.2022	49.86
			06.01.2022 - 03.02.2022	48.11
			06.03.2021 - 06.01.2022	55.52

Note: The above assured remittances are as per contract values.

B. The remittance amount payable by the tolling contractor gets revised every year from 1st April based on the toll rate revision for the year. Accordingly, the current remittance amounts (with effect from 1st April 2024) payable by the tolling contractor are as under:

S.No	Project Stretch	Toll Plaza	Current Equivalent Annualized Amount (Rs cr/annum)
1	Gundugolanu Devarapalli Kovvuru	Veeravalli	164.80
2	Narasannapeta to Ranasthalam	Madapam	97.78
3	Anandapuram – Pendurthi – Anakapalle	Dukkavanipalem & Marripalem	86.79
4	Ranasthalam to Hanumanthvaka	Nathavalsa	142.20
5	Chittoor to Mallavaram	Gadanki	121.29
6	TN/AP – Border to Nalagampalli, AP/Karnataka Border	Mahasamudram	98.11
7	Gandhidham to Mundra	Mokha	187.38
8	Muzaffarnagar - Haridwar	Bahadrabad	116.43
9	Muzaffarnagar - Haridwar	Chapar	66.25
10	Bareilly - Sitapur	Faridpur	120.50
11	Bareilly - Sitapur	Maigalganj	93.26
12	Raipur to Simga	Tarpongi	109.32
13	Simga to Bilaspur	Mudipar	11.73
14	Simga to Bilaspur	Bhojpuri	101.97

DECLARATION

The Investment Manager declares and certifies that all relevant provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be) have been complied with and no statement made in this Preliminary Placement Document is contrary to the provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, the SCRA, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be). The Investment Manager further certifies that all the statements and disclosures in this Preliminary Placement Document are material, true, correct, not misleading and adequate in order to enable the Bidders to make a well informed decision.

For National Highways Infra Investment Managers Private Limited

Shailendra Narain Roy
Independent Director

Place: New Delhi
Date: March 17, 2025

DECLARATION

The Investment Manager declares and certifies that all relevant provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be) have been complied with and no statement made in this Preliminary Placement Document is contrary to the provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, the SCRA, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be). The Investment Manager further certifies that all the statements and disclosures in this Preliminary Placement Document are material, true, correct, not misleading and adequate in order to enable the Bidders to make a well informed decision.

For National Highways Infra Investment Managers Private Limited

Sumit Bose
Independent Director

Place: Goa
Date: March 17, 2025

DECLARATION

The Investment Manager declares and certifies that all relevant provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be) have been complied with and no statement made in this Preliminary Placement Document is contrary to the provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, the SCRA, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be). The Investment Manager further certifies that all the statements and disclosures in this Preliminary Placement Document are material, true, correct, not misleading and adequate in order to enable the Bidders to make a well informed decision.

For National Highways Infra Investment Managers Private Limited

Suresh Goyal
Managing Director and Chief Executive Officer

Place: New Delhi
Date: March 17, 2025

DECLARATION

The Investment Manager declares and certifies that all relevant provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be) have been complied with and no statement made in this Preliminary Placement Document is contrary to the provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, the SCRA, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be). The Investment Manager further certifies that all the statements and disclosures in this Preliminary Placement Document are material, true, correct, not misleading and adequate in order to enable the Bidders to make a well informed decision.

For National Highways Infra Investment Managers Private Limited

Usha Rao Monari
Independent Director

Place: Lisbon
Date: March 17, 2025

DECLARATION

The Investment Manager declares and certifies that all relevant provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be) have been complied with and no statement made in this Preliminary Placement Document is contrary to the provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, the SCRA, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be). The Investment Manager further certifies that all the statements and disclosures in this Preliminary Placement Document are material, true, correct, not misleading and adequate in order to enable the Bidders to make a well informed decision.

For National Highways Infra Investment Managers Private Limited

Vinay Kumar
Nominee Director

Place: New Delhi
Date: March 17, 2025

DECLARATION

The Investment Manager declares and certifies that all relevant provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be) have been complied with and no statement made in this Preliminary Placement Document is contrary to the provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, the SCRA, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be). The Investment Manager further certifies that all the statements and disclosures in this Preliminary Placement Document are material, true, correct, not misleading and adequate in order to enable the Bidders to make a well informed decision.

For National Highways Infra Investment Managers Private Limited

Debapratim Hajara
Unitholder Nominee Director

Place: Singapore
Date: March 17, 2025

DECLARATION

The Investment Manager declares and certifies that all relevant provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be) have been complied with and no statement made in this Preliminary Placement Document is contrary to the provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, the SCRA, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be). The Investment Manager further certifies that all the statements and disclosures in this Preliminary Placement Document are material, true, correct, not misleading and adequate in order to enable the Bidders to make a well informed decision.

For National Highways Infra Investment Managers Private Limited

Mahavir Parsad Sharma
Independent Director

Place: New Delhi
Date: March 17, 2025

DECLARATION

The Investment Manager declares and certifies that all relevant provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be) have been complied with and no statement made in this Preliminary Placement Document is contrary to the provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, the SCRA, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be). The Investment Manager further certifies that all the statements and disclosures in this Preliminary Placement Document are material, true, correct, not misleading and adequate in order to enable the Bidders to make a well informed decision.

For National Highways Infra Investment Managers Private Limited

Pradeep Singh Kharola
Independent Director

Place: New Delhi
Date: March 17, 2025

DECLARATION

The Investment Manager declares and certifies that all relevant provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be) have been complied with and no statement made in this Preliminary Placement Document is contrary to the provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, the SCRA, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be). The Investment Manager further certifies that all the statements and disclosures in this Preliminary Placement Document are material, true, correct, not misleading and adequate in order to enable the Bidders to make a well informed decision.

For National Highways Infra Investment Managers Private Limited

Pushkar Kulkarni
Unitholder Nominee Director

Place: Berlin
Date: March 17, 2025

DECLARATION

The Investment Manager declares and certifies that all relevant provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be) have been complied with and no statement made in this Preliminary Placement Document is contrary to the provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, the SCRA, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be). The Investment Manager further certifies that all the statements and disclosures in this Preliminary Placement Document are material, true, correct, not misleading and adequate in order to enable the Bidders to make a well informed decision.

For National Highways Infra Investment Managers Private Limited

N.R.V.V.M.K. Rajendra Kumar
Nominee Director

Place: Mumbai
Date: March 17, 2025

DECLARATION

The Trustee declares and certifies that all relevant provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be) have been complied with and no statement made in this Preliminary Placement Document is contrary to the provisions of the InvIT Regulations, the SEBI Institutional Placement Guidelines, the SCRA, SEBI Act and all regulations and guidelines issued by the GoI or SEBI (as the case may be). The Trustee further certifies that all the statements and disclosures in this Preliminary Placement Document are material, true, correct, not misleading and adequate in order to enable the Bidders to make a well informed decision.

For and on behalf of IDBI Trusteeship Services Limited

Authorised Signatory

Place: New Delhi
Date: March 17, 2025

ANNEXURE A

AUDITED FINANCIAL INFORMATION

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A.R. & CO.
Chartered Accountants

Delhi Office:
A-403, Gayatri Apartment
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pawankgoel1@gmail.com

Corporate and Correspondence Office:C-1, II Floor, RDC, Raj Nagar
Ghaziabad- 201001 Delhi-NCR National
Capital region Of Delhi

INDEPENDENT AUDITOR'S REPORT

To the Unit Holders of National Highways Infra Trust

Report on the Audit of the Consolidated Financial Statements

OPINION

We have audited the accompanying consolidated financial statements of National Highways Infra Trust (hereinafter referred to as "the InvIT" or "the Trust") and its two subsidiary (hereinafter referred to as "National Highways Infra Projects Private Limited" or "NHIPPL" and NHIT Eastern Projects Private Limited or "NEPPL") (the Trust and its subsidiary together referred to as "the Group"), which comprising of the consolidated Balance Sheet as at 31 March 2024, the consolidated Statement of Profit and Loss (including Other Comprehensive Income), the consolidated Statement of Changes in Unitholder's Equity and the consolidated Statement of Cash Flows for the year then ended, the consolidated Statement of Net Assets at fair value as at 31 March 2024, the consolidated Statement of Total Returns at fair value, the Statement of Net Distributable Cash Flows of the Trust and its subsidiaries for the year then ended and notes to the consolidated financial statements including a summary of material accounting policy and other explanatory information (hereinafter referred to as "the consolidated financial statements").

In our opinion and to the best of our information and according to the explanations given to us and based on the consideration of our report on financial statements of subsidiary and on the other financial information of the subsidiary, the aforesaid consolidated financial statements give the information required by the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014 as amended from time to time including any guidelines and circulars issued thereunder (together referred to as the "SEBI InvIT Regulations") in the manner so required and give a true and fair view in conformity with the Indian Accounting Standards as defined in Rule 2(1)(a) of the Companies (Indian Accounting Standards) Rules, 2015, as amended ("Ind AS") and other accounting principles generally accepted in India, to the extent not inconsistent with SEBI InvIT Regulations, of the consolidated state of affairs of the Group as at 31 March 2024, its consolidated profit including other comprehensive income, its consolidated cash flows, its consolidated statement of changes in Unitholders' equity for the year ended 31 March 2024, its consolidated net assets at fair value

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as at 31 March 2024, its consolidated total returns at fair value of the Group and the net distributable cash flows of the Trust and its subsidiaries for the year ended 31 March 2024.

BASIS FOR OPINION

We conducted our audit of the consolidated financial statements in accordance with the Standards on Auditing ("SAs") issued by the Institute of Chartered Accountants of India. Our responsibilities under those Standards are further described in the auditor's responsibilities for the audit of the consolidated financial statements section of our report. We are independent of the Group in accordance with the Code of Ethics issued by the Institute of Chartered Accountants of India together with the ethical requirements that are relevant to our audit of the consolidated financial statements under the provisions of the SEBI InvIT Regulations, and we have fulfilled our other ethical responsibilities in accordance with these requirements and the Code of Ethics. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion on the consolidated financial statements.

EMPHASIS OF MATTER

a) We draw the attention to Note No. 54 to the financial statements regarding Initial Improvement Works. The group has recognized provision for initial improvement works on 1st December 2023 amounting to Rs. 1,11,993.43 lakhs with corresponding impact in Statement of Profit and Loss amounting to Rs. 1124.63 Lakhs and Rs. 2396.83 Lakhs on account of amortization of initial improvement work and unwinding of interest on provision of initial improvement respectively.

b) We draw attention to Note 20 of the financial statements which describes that Major Maintenance Provision (MMR) is made based on the first cycle of overlay expected to occur in five to seven years and not based on the total Major Maintenance Cost estimated to be incurred over entire concession period. The discounting rate used for arriving at the present value for MMR provisions is government bond rate of 30 years for projects acquired in first phase and 20 years for projects acquired in second phase.

c) We draw the attention to Note No. 10 to the financial statements regarding Capital Advance paid to National Highway Authority of India (NHAI). The appointed date for these acquisitions is with effect from 1st April 2024, therefore the amount paid to NHAI has been classified as capital advance.

Our opinion is not modified in respect of these matters.

KEY AUDIT MATTERS

Key audit matters are those matters that, in our professional judgment, were of most significance in our audit of the consolidated financial statements for the financial year ended 31 March 2024. These matters were addressed in the context of our audit of the consolidated financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on these matters. We have determined the matters described below to be the key audit matters to be communicated in our report.



Sr. No.	Key Audit Matter	Auditor's Response
1.	**Assessment of Impairment of Intangible Assets in form of Toll Collection Rights** The Group operates toll assets which is constructed on Toll, Operate and Transfer (TOT) basis. The carrying value of the toll collection rights as at March 31, 2024 is Rs. 1088670.84 Lakhs. In accordance with its accounting policy and requirements under Ind AS 36 "Impairment of Assets", the Management has performed an impairment assessment by comparing the carrying value of the toll collection rights to their recoverable amount. For impairment testing, value in use has been determined by forecasting and discounting future cash flows. Further, the value in use is highly sensitive to changes in critical variable used for forecasting the future cash flows including traffic projections and discounting rates. The determination of the recoverable amount of the toll collection right involves significant estimates and judgments and accordingly, the evaluation of impairment of toll collection rights has been determined as a key audit matter. (Refer Note No. 2.1 (d) & Note 2.1 (r) of accounting policy relating to Intangible Assets and Note No. 44 of Consolidated Financial Statements for the year ended 31.03.2024)	Our Audit Procedures included the following :- • Verified the appropriateness of the Group's accounting policy on impairment of Intangible Assets and Valuation Methodology applied in determining the recoverable amount. • Checked the Impairment Sheet provided by the Management. • Obtained the Management Representation on the assumptions around the key drivers of the revenue projections, future cash flow, discount rates / weighted average cost of capital that were used by them. • Tested the arithmetical accuracy of the Impairment sheet.
2.	**Assessment of Impairment of Goodwill on Consolidation** Goodwill on consolidation is tested for impairment as per Ind AS 36 on an annual basis by the Group using enterprise value of respective subsidiary company to which the goodwill relates to. Enterprise value calculation involves use of future cashflow projections, discounted to	Our Audit Procedures included the following :- • Verified the appropriateness of the Group's accounting policy on impairment of Goodwill and Valuation Methodology applied in determining the enterprise value.

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	present value, terminal value and other variables. These use of management projections and estimates results in inherent risk of error with respect to the valuation of Goodwill and accuracy of impairment loss, if any. Goodwill amounting to Rs. 10,144.46 Lakhs as on March 31, 2024 (March 31, 2023: 10,144.46 Lakhs) arising out of business combination as per Ind AS 103 has been tested for impairment by the management. (Refer Note No. 2(c) & Note No-2.1 (r) for accounting policy relating to Goodwill on Consolidation, Note No. 44 of Consolidated Financial Statements for the year ended 31.03.2024) Therefore, Impairment of Goodwill has been considered as a Key Audit Matter.	• Checked the Impairment Sheet provided by the Management. • Obtained the Management Representation on the assumptions around the key drivers of the revenue projections, future cash flow, discount rates / weighted average cost of capital that were used by them. • Tested the arithmetical accuracy of the Impairment sheet.
3.	**Provisioning of Major Maintenance/Periodic Maintenance/resurfacing expenses (Refer Note No. 20 and 53 of the Consolidated Financial Statements)** As per Concession Agreement, the Group is obligated to perform regular maintenance along with periodic maintenance of road assets during the entire concession period. The Periodic maintenance includes resurface of pavements, repairs of structures and other equipment and maintenance of service roads. The Group has estimated the provision required towards major maintenance in accordance with Ind AS 37 "Provisions, Contingent Liabilities and Contingent Assets". The Provision made by the Group over the Concession involves detailed Calculation and Judgement and accordingly, the major maintenance expense is considered to be the Key audit Matter.	Our Audit Procedures included the following :- • Understood the Group's Process associated with the estimation of resurfacing obligation. • Verified the requirement under Concession agreement and Group's accounting policy. • Tested the assumption used in determining the major maintenance provision. • Tested the arithmetical accuracy and also verified the disclosure in the Consolidated Financial Statements.
4.	**Computation and disclosures as prescribed in the SEBI InvIT regulations relating to Consolidated Statement of Net Assets at Fair Value and Consolidated Total Returns at Fair Value** As per SEBI InvIT regulations, the Trust is required to disclose statement of net assets	Our Audit Procedures included the following :- • Obtained the understanding of the requirements of SEBI InvIT regulations for disclosures relating to

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	at fair value and statement of total returns at fair value. The fair value is determined by forecasting and discounting future cash flows from the operations of the investee entities which involves management estimates and judgements. These estimates and judgements include discounting rates, Tax rates and inflation rates which are considered for computing the fair value. There is an inherent risk in the computation of fair value due to the use of estimates and judgements mentioned above. Therefore, computation and disclosures of Consolidated statement of net assets at fair value and Consolidated statement of total returns at fair value is considered as a Key Audit Matter. Refer Note-2.1(r) Significant Accounting Assumptions – Fair Value and Disclosures and Statement of net assets at fair value and Statement of total returns at fair value in the Consolidated financial statements.	Consolidated Statement of Net Assets at Fair Value and Consolidated Statement of Total Returns at Fair Value. • Assessed the Valuation Report issued by the Independent Valuer engaged by the management. Also assessed the appropriateness of the Trust's valuation methodology applied in determining the fair values. • Obtained Management representation in this respect. • Tested the arithmetical accuracy of computation in the statement of net assets and total returns at fair value. • Ensured that disclosures is in compliance with SEBI InvIT regulations relating to the statement of net assets at fair value and the statement of total returns at fair value.

INFORMATION OTHER THAN THE CONSOLIDATED FINANCIAL STATEMENTS AND AUDITOR'S REPORT THEREON

The Board of Directors of the Investment Manager is responsible for the other information. The other information comprises the information included in the Management Discussion and Analysis, Report of Investment Manager including annexures to Investment Manager's Report and other information as required to be given by SEBI InvIT Regulations, but does not include the consolidated financial statements and our report thereon.

Our opinion on the consolidated financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.
In connection with our audit of the consolidated financial statements, our responsibility is to read the other information and, in doing so, consider whether

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the other information is materially inconsistent with the consolidated financial statements or our knowledge obtained during the course of our audit or otherwise appears to be materially misstated.

If, based on the work we have performed on the other information that we obtained prior to the date of this auditor's report, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

RESPONSIBILITIES OF THE BOARD OF DIRECTORS OF INVESTMENT MANAGER FOR THE CONSOLIDATED FINANCIAL STATEMENTS

The Board of Directors of Investment Manager is responsible for the preparation of these consolidated financial statements that give a true and fair view of the consolidated Balance Sheet as at 31 March 2024, consolidated statement of Profit & Loss including other comprehensive income, consolidated cash flows and consolidated statement of changes in Unitholder's equity for the year ended 31 March 2024, the consolidated net assets at fair value as at 31 March 2024, the consolidated total returns at fair value of the Group and the net distributable cash flows of the Trust and its subsidiary for the year ended 31 March 2024 in accordance with the requirements of the SEBI InvIT Regulations, Indian Accounting Standards as defined in Rule 2(1) (a) of Companies (Indian Accounting Standards) Rules, 2015, as amended and other accounting principles generally accepted in India, to the extent not inconsistent with SEBI InvIT Regulations. The respective Board of Directors of the subsidiary company included in the Group are responsible for maintenance of adequate accounting records for safeguarding of the assets of the Group and for preventing and detecting frauds and other irregularities; selection and application of appropriate accounting policies; making judgements and estimates that are reasonable and prudent; and design, implementation and maintenance of adequate internal financial controls for ensuring the accuracy and completeness of accounting records, relevant to the preparation and presentation of the consolidated financial statements that give a true and fair view and are free from material misstatement, whether due to fraud and error, which have been used for the purpose of preparation of the consolidated financial statements by the Board of Directors of Investment Manager, as aforesaid.

In preparing the consolidated financial statements, the Board of Directors of Investment Manager and respective Board of Directors of the company included in the Group are responsible for assessing the ability of the Group to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the respective Board of Directors either intends to liquidate the Group or to cease operations, or has no realistic alternative but to do so.

The Board of Directors of the Investment Manager and the respective Board of Directors of the subsidiary company included in the Group are also responsible for overseeing the financial reporting process of the Group.

AUDITOR'S RESPONSIBILITY FOR THE AUDIT OF THE CONSOLIDATED FINANCIAL STATEMENTS

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Our objectives are to obtain reasonable assurance whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with SAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with SAs, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the consolidated financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Group's internal controls.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Board of Directors of the Investment Manager.
- Conclude on the appropriateness of the Board of Directors of Investment Manager use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the consolidated financial statements, including the disclosures, and whether the consolidated financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- Obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the Group of which we are the independent auditors, to express an opinion on the consolidated financial statements. We are responsible for the direction, supervision and performance of the audit of financial statements of such entities included in the consolidated financial statements of which we are the independent auditors. We remain solely responsible for our audit opinion.

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Materiality is the magnitude of misstatements in the consolidated financial statements that, individually or in aggregate, makes it probable that the economic decisions of a reasonably knowledgeable user of the financial statements may be influenced. We consider quantitative materiality and qualitative factors in (i) planning the scope of our audit work and in evaluating the results of our work; and (ii) to evaluate the effect of any identified misstatements in the financial statements.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

We also provide those charged with governance with a statement that we have complied with relevant ethical requirements regarding independence, and to communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, related safeguards.

From the matters communicated with those charged with governance, we determine those matters that were of most significance in the audit of the consolidated financial statements of the current period and are therefore the key audit matters. We describe these matters in our auditor's report unless law or regulation precludes public disclosure about the matter or when, in extremely rare circumstances, we determine that a matter should not be communicated in our report because the adverse consequences of doing so would reasonably be expected to outweigh the public interest benefits of such communication.

REPORT ON OTHER LEGAL AND REGULATORY REQUIREMENTS

Based on our audit and as required by SEBI InvIT Regulations, we report that:

a) We have sought and obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit of the aforesaid consolidated financial statements.

b) the consolidated Balance Sheet, the consolidated Statement of Profit and Loss, the consolidated Statement of Cash Flows, the consolidated Statement of Changes in Unitholders' Equity, the consolidated Statement of Net Assets at fair value, the consolidated Statement of Total Returns at fair value and the Statement of Net Distributable Cash Flows of the Trust and its subsidiary dealt with by this Report are in agreement with the books of account.

c) In our opinion, the aforesaid financial statements comply with the Indian Accounting Standards as defined in Rule 2(1)(a) of Companies (Indian Accounting Standards) Rules, 2015, as amended, to the extent not incon[illegible] with SEBI InvIT regulations.

A.R. & Co. Chartered Accountants

d) There were no amounts which were required to be transferred to the Investor Protection and Education Fund by the Trust.

For A. R. & Co.
Chartered Accoui
FRN. 002744C



CA Mohd Azam
Partner
Membership No: 511623
UDIN: 24511623BCSSH2115

Place: New Delhi
Date: 27.05.2024

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
CONSOLIDATED BALANCE SHEET AS AT MARCH 31, 2024

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Note No.	As at March 31, 2024	As at March 31, 2023
ASSETS			
1) Non - Current Assets			
(a) Property, Plant and Equipment	3	219.29	125.17
(b) Capital work in Progress (CWIP)	4	19.76	-
(c) Goodwill	5	10,144.46	10,144.46
(d) Other Intangible assets	6	10,88,670.84	10,01,400.09
(e) Financial Assets			
(i) Other Financial Assets	7	10,177.86	9,672.44
(f) Deferred Tax Assets (net)	8	11,523.20	4,685.32
(g) Non -Current Tax Assets (Net)	9	22.38	12.06
(h) Other Non Current Assets	10	15,70,649.18	-
Total non-current assets		**26,91,426.97**	**10,26,039.54**
2) Current Assets			
(a) Financial Assets			
(i) Trade receivables	11	385.20	350.87
(ii) Cash and Cash Equivalents	12	46,400.78	21,124.08
(iii) Bank Balances Other than Cash & Cash Equivalents	13	512.98	-
(iii) Other financial assets	14	4.54	6.65
(b) Other current assets	15	2,303.89	1,634.06
Total current assets		**49,607.39**	**23,115.66**
TOTAL ASSETS		**27,41,034.36**	**10,49,155.20**
EQUITY AND LIABILITIES			
EQUITY			
1) Unit Capital	16	14,67,093.47	7,41,604.32
2) Initial settlement amount		0.10	0.10
3) Other Equity	17	(27,541.44)	(2,469.86)
Total Equity		**14,39,552.13**	**7,39,134.56**
LIABILITIES			
1) Non-Current liabilities			
(a) Financial liabilities			
(i) Borrowings	18	11,63,394.94	2,92,158.33
(ii) Other Financial liabilities	19	80.90	-
(b) Provisions	20	35,923.32	6,318.81
Total non-current liabilities		**11,99,399.16**	**2,98,477.14**
2) Current liabilities			
(a) Financial liabilities			
(i) Borrowings	21	10,054.00	2,000.00
(ii) Trade Payables	22		
(a) Total Outstanding, dues of micro and small enterprises		275.99	137.23
(b) Total outstanding, dues of creditors other than micro and small enterprises		4,479.00	3,871.17
(iii) Other financial liabilities	23	7,224.53	5,284.95
(b) Provisions	24	79,404.66	0.56
(c) Current Tax Liabilities (Net)	25	181.66	8.98
(d) Other current liabilities	26	463.23	240.61
Total current liabilities		**1,02,083.07**	**11,543.50**
Total liabilities		**13,01,482.23**	**3,10,020.64**
TOTAL EQUITY & LIABILITIES		**27,41,034.36**	**10,49,155.20**

Material Accounting Policies 1 - 2

The accompanying notes form an integral part of these consolidated financial statements 3 - 66

This is the Consolidated Balance Sheet referred to in our report of even date

For A.R. & Co.
Chartered Accountant
Firm Registration

CA Mohd.
Partner
M.No.511623

Date : 27th May 2024
Place : New Delhi

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ent
Mar **Highways Infra Trust)**

Sharma
Dire
DIN:

Mathew George
Chief Financial Officer

Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
CONSOLIDATED STATEMENT OF PROFIT AND LOSS FOR THE YEAR ENDED MARCH 31, 2024

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Note No.	For the year ended March 31, 2024	For the year ended March 31, 2023
INCOME			
Revenue from Operations	27	94,390.77	68,717.20
Interest Income	28	871.71	373.43
Profit on sale of investments	29	2,141.16	671.17
Other Income	30	59.53	326.11
TOTAL INCOME		**97,463.17**	**70,087.91**
EXPENSES			
Investment Manger Fee		1,800.00	1,263.70
Trusteeship Fee		9.60	9.60
Valuation expenses		11.07	4.00
Annual listing fees		53.80	20.00
Rating fees		7.73	0.20
Insurance expenses		737.91	628.74
Custodian Fees		3.15	0.84
Project Management Fees		1,168.20	991.20
Operating Expenses	31	13,665.60	9,025.05
Employee Benefits Expenses	32	1,156.60	289.01
Finance Cost	33	28,023.17	16,621.32
Depreciation & Amortization Expense	34	24,771.04	17,560.63
Audit Fees	35		
- Statutory audit fees		18.49	7.73
- Other audit services (including certification)		1.72	0.93
Other Expenses	36	2,569.62	1,924.27
TOTAL EXPENSES		**73,997.70**	**48,347.23**
Profit / (Loss) before Tax		**23,465.47**	**21,740.68**
Tax Expenses	37		
Current Tax		886.30	473.89
Current tax - earlier years		(2.52)	0.01
Deferred Tax expense/(credit)		(6,837.88)	(4,422.79)
Total Tax		**(5,954.10)**	**(3,948.89)**
Profit/ (loss) for the year		**29,419.57**	**25,689.57**
Other Comprehensive Income			
Items that will not be reclassified to Profit or Loss		0.10	-
Income tax relating to items that will not be reclassified to profit or loss		0.03	-
		0.13	-
Total Comprehensive Income for the year	-	**29,419.70**	**25,689.57**
Earnings per Unit			
Basic	38	3.90	3.91
Diluted	38	3.90	3.91

Material Accounting Policies 1 - 2

The accompanying notes form an integral part of these consolidated financial statements. 3 - 66

This is the Statement of Profit and Loss referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002

A.R. & Co. New Delhi Chartered Accountants

CA Mohd.
Partner
M.No.511623

Date : 27th May 2024
Place : New Delhi

For and on behalf Board of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Inf

National Highways Infra

Goyal **d Sharma**
DIN:

Mathew George
Chief Financial Officer

Gunjan
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
CONSOLIDATED STATEMENT OF CASH FLOWS FOR THE YEAR ENDED MARCH 31, 2024

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
A. OPERATING ACTIVITIES		
Net Profit/(Loss) Before Tax	23,465.47	21,740.68
Adjustments for :		
Depreciation and Amortization	24,771.04	17,560.63
Profit on redemption of mutual funds	(2,141.16)	(671.17)
Interest income from FDR	(871.71)	(373.43)
Finance Cost (net)	25,015.90	16,590.17
Provision for major maintenance expenses	8,444.05	5,879.20
Unwinding interest on major maintenance provision	2,867.62	24.95
Provision for Leave encashment and Gratuity	52.43	11.93
Provision for expected credit loss	-	59.60
Bad debts written off	-	9.90
Operating Profit/(Loss) before Working Capital Changes	**81,603.64**	**60,832.46**
Working Capital Adjustments:		
Decrease / (Increase) in Trade & Other Receivables	(34.34)	180.10
Decrease / (Increase) in Other Non Current Financial Assets	(2.52)	(208.85)
Decrease / (Increase) in Other Non Current/Current Assets	(516.99)	(834.96)
Decrease / (Increase) in Other Current Financial Assets	(293.92)	(293.53)
Increase / (Decrease) in Trade & Other Payables	12.68	3,267.01
Increase / (Decrease) in Other Financial Liabilities	188.39	57.50
Increase / (Decrease) in Provisions	(3.57)	(0.11)
Increase / (Decrease) in Other Current Liabilities	229.27	(0.14)
	(421.00)	**2,167.02**
Income Tax paid	(721.42)	(626.67)
Net Cash Flows from/(used in) Operating Activities	**80,461.22**	**62,372.81**
B. INVESTING ACTIVITIES		
Purchase of Property, Plant & Equipment, including CWIP, capital creditors and capital advances	(15,82,977.68)	(2,85,101.04)
Investment in FDR	(951.26)	(6,299.19)
Interest received on maturity of FDR	810.99	189.55
Profit on redemption of mutual funds	2,141.16	671.17
Net cash flows from (used in) Investing activities	**(15,80,976.79)**	**(2,90,539.51)**
C. FINANCING ACTIVITIES		
Proceeds from Issue of Unit Capital	7,27,206.41	1,43,013.67
Expense incurred towards initial public debt offering	-	(1,689.00)
Expense incurred towards institutional unit allotment	(1,471.46)	(1,099.13)
Precessing Fee paid	(1,482.16)	(197.00)
Distribution to Unit Holders	(54,491.29)	(34,927.86)
Proceeds from Long Term Borrowings (net of processing fees)	8,84,700.00	1,50,000.00
Financing charges paid	(24,909.51)	(11,180.86)
Repayment of Long Term Borrowings	(3,759.73)	(1,010.98)
Net cash flows from (used in) Financing activities	**15,25,792.26**	**2,42,908.84**
Net Increase/Decrease in Cash and Cash equivalents (A+B+C)	**25,276.69**	**14,742.14**
Cash and cash equivalents at the beginning of the year	21,124.08	6,381.94
Cash and cash equivalents at the end of the year	**46,400.78**	**21,124.08**

National Highways Infra Trust New Delhi

A.R. & Co. Chartered Accountants New Delhi

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
CONSOLIDATED STATEMENT OF CASH FLOWS FOR THE YEAR ENDED MARCH 31, 2024

Reconciliation of liabilities arising from Financing Activities pursuant to Ind AS 7- Statement of Cash Flows.

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
a) Carrying amount of debt at the beginning of the year	2,94,158.33	1,46,537.80
b) Additional borrowings during the year	8,84,700.00	1,50,000.00
c) Repayments during the year	(3,759.73)	(1,010.98)
d) Other adjustments/settlements during the year	-	-
e) Transaction Cost adjustment	(1,649.66)	(1,368.49)
f) Unwinding of interest	-	-
g) Carrying amount of debt at the end of the year	**11,73,448.94**	**2,94,158.33**

This is the Consolidated Cash Flows Statement referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

CA Mohd. Azam Ansari
Partner
M.No.511623

Date : 27th May 2024
Place : New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :- IN/InvIT/20-21/0014

Disclosures pursuant to SEBI circulars (SEBI Master Circular No. CIRSEBI/HO/DDHS_Div3/P/CIR/2021/1673 dated 29 November 2021 issued under the InvIT regulations)

Consolidated Statement of Net Assets at Fair Value

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024		As at March 31, 2023	
	Book value	Fair value^	Book value	Fair value^
A. Assets	27,41,034.36	29,47,706.90	10,49,155.20	11,68,122.00
B. Liabilities (at book value)	13,01,482.24	13,01,482.24	3,10,020.64	3,10,020.64
C. Net assets (A-B)	**14,39,552.12**	**16,46,224.66**	**7,39,134.56**	**8,58,101.36**
D. No of units	1,31,22,00,600.00	1,31,22,00,600.00	72,64,05,200.00	72,64,05,200.00
E. NAV (C/D)	**109.71**	**125.46**	**101.75**	**118.13**

^Fair values of total assets relating to the Trust as at March 31, 2024 & March 31, 2023 as disclosed above are based on the independent valuer report.

Consolidated Statement of Total Return at Fair Value:

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Total comprehensive income for the year (As per the Consolidated Statement of Profit and Loss)	29,419.70	25,689.57
Add: Other changes in fair value for the year *	2,06,672.54	1,18,966.80
Total return	**2,36,092.24**	**1,44,656.37**

* In the above statement, other changes in fair value for the year ended March 31, 2024 & March 31, 2023 have been computed based on the independent valuer report.

The accompanying notes form an integral part of the Consolidated Financial Statements.

This is the Consolidated Statement of Net Assets at Fair Value and Consolidated Statement of Total Return at Fair Value referred to in our report of even date.

For A.R. & Co.
Chartered Accountants

Firm Registration no. 002744C

A.R. & Co. New Delhi Chartered Accountants

CA Mohd. Azam Ansari
Partner
M.No.511623

Date : 27th May 2024
Place : New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

National Highways Infra Trust New Delhi

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :- IN/InvIT/20-21/0014

CONSOLIDATED STATEMENT OF CHANGES IN UNIT HOLDER'S EQUITY FOR THE YEAR ENDED MARCH 31, 2024

A. Initial Settlement Amount

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Amount
Balance as at April 1, 2022	0.10
Changes in unit capital	-
Balance as at March 31 2023	0.10
Changes in unit capital	-
Balance as at March 31, 2024	0.10

B. Unit Capital *

Particulars	Number of unit	Amount
Balance as at April 1, 2022	**59,52,00,000**	**5,99,442.82**
Changes in unit capital	13,12,05,200	1,43,013.67
One time issue expenses		(852.17)
Balance as at March 31, 2023	**72,64,05,200.00**	**7,41,604.32**
Changes in unit capital	58,57,95,400.00	7,27,206.41
One time issue expenses		(1,717.26)
Balance as at March 31, 2024	**1,31,22,00,600**	**14,67,093.47**

Issue expenses of Rs. 1,717.26 lakhs (March 31, 2023: Rs 852.17 lakhs) incurred in connection with issue of units have been reduced from the Unitholders capital in accordance with Ind AS 32 Financial Instruments: Presentation

C. OTHER EQUITY **

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Reserves and Surplus	Items of Other Comprehensive Income	Total
		Items that will not be reclassified to profit or loss	
	Retained Earnings	Remeasurement of Defined Benefit Obligation/ Plan	
Balance as at April 1, 2022	6,768.43	-	**6,768.43**
Profit/ (Loss) for the year	25,689.57	-	**25,689.57**
Less:			
Distribution to unit holders			
Interest	34,183.66	-	**34,183.66**
Other Income	744.20	-	**744.20**
Balance as at March 31, 2023	**(2,469.86)**	-	**(2,469.86)**
Profit/ (Loss) for the year	29,419.57	0.13	29,419.70
Less:			
Distribution to unit holders^			
Interest	53,701.68	-	53,701.68
Other Income	789.60	-	789.60
Balance as at March 31, 2024	**(27,541.57)**	**0.13**	**(27,541.44)**

^The distribution relates to the distributions during the financial year along with the distribution related to the last quarter of FY 2022-23 and does not include the distribution relating to the period February 01, 2024 to March 31, 2024 which will be paid after March 31, 2024. The distributions by the Trust to its unit holders are based on the Net Distributable Cash Flows of the Trust under the SEBI InvIT Regulations.

* Refer Note No. 16
** Refer Note No. 17

For A.R. & Co.
Chartered Accountants
Firm Registr[illegible]027440

CA Mohd. Azam [illegible]ari
Partner
M.No.511623

Date : 27th May 2024
Place : New Delhi

For and on behalf of the [illegible]ays Infra Investment Managers Private [illegible]ager of National H[illegible])

[illegible]ir Parsad Sharma
Direc[illegible]or
DIN: [illegible] D[illegible]03158413

Mathew George
Chief Financial Officer

Gu[illegible]
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :- IN/InvIT/20-21/0014

Disclosures pursuant to SEBI circulars (SEBI Master Circular No. CIRSEBI/HO/DDHS_Div3/P/CIR/2021/1673 dated 29th November, 2021 issued under the InvIT regulations)

a. Statement of Net Distributable Cash Flows (NDCF) at Trust Level NHIT

(All amounts in ₹ lakh unless otherwise stated)

S. No.	Particulars	For the year ended 31st March 2024	For the year ended 31st March 2023
1	**Profit after tax as per Statement of profit and loss/income and expenditure (Standalone) (A)**	96,819.27	77,236.17
2	Add: Depreciation and amortization as per statement of profit and loss account. Incase of Impairment reversal, same needs to be deducted from profit and loss.	-	
3	Add/Less: Loss/gain on sale of infrastructure assets	-	
4	Add: Proceeds from sale of infrastructure assets adjusted for the following: related debts settled or due to be settled from sale proceeds; directly attributable transaction costs; proceeds reinvested or planned to be reinvested as per Regulation 18(7)(a) of the InvIT regulations	-	
5	Add: Proceeds from sale of infrastructure assets not distributed pursuant to an earlier plan to re-invest, if such proceeds are not intended to be invested subsequently, net of any profit/ (loss) recognised in profit and loss account	-	
6	Add/ Less: Any other item of non- cash expense/ non cash income (net of actual cash flows for these items), if deemed necessary by the Investment Manager. For example, any decrease/ increase in carrying amount of an asset or a liability recognised in profit and loss /income and expenditure on measurement of the asset or the liability at fair value; Interest cost as per effective interest rate method, deferred tax lease rents recognised on a straight line basis, etc.	(82,058.04)	(45,002.00)
7	Less: Repayment of external debt (principal) / redeemable preference shares / debentures, etc. (excluding refinancing) / net cash set aside to comply with DSRA requirement under loan agreements.	(4,206.73)	(1,010.98)
8	**Total Adjustment (B)**	**(86,264.77)**	**(46,012.98)**
9	**Net Surplus (C) = (A+B) (NDCF)**	**10,554.50**	**31,223.19**
10	Add: Income recognised in previous year and received in this year	46,688.43	10,651.13
11	Less :- Interest expenses recognised in previous year and paid in this year	(5,129.59)	-
12	**Distibutable Cash Flow**	**52,113.35**	**41,874.32**
13	Less: Amount already distributed to Unitholders (for the period from April 23 to Jan 24)(PY for the period from April 22 to December 22))	42,843.37	30,225.78
14	**Balance Net Distributable Cash Flows for the year ended March 31, 2024**	**9,269.97**	**11,648.54**

National Highways Infra Trust New Delhi

A.R. & Co. Chartered Accountants New Delhi

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :-IN/InvIT/20-21/0014

Disclosures pursuant to SEBI circulars (SEBI Master Circular No. CIRSEBI/HO/DDHS_Div3/P/CIR/2021/1673 dated 29th November, 2021 issued under the InvIT regulations)

b. Statement of Net Distributable Cash Flows (NDCF) at SPV Level (NHIPPL)

(All amounts in ₹ lakh unless otherwise stated)

S. No.	Particulars	For the year ended March 31, 2024	For the year ended March 31,2023
1	**Profit/ (Loss) after tax as per Statement of profit and loss/income and expenditure (standalone) (A)**	**(65,433.38)**	**(51,546.61)**
2	**Add:** Depreciation and amortization as per statement of profit and loss account. Incase of Impairment reversal, same needs to be deducted from profit and loss.	24,770.91	17,560.63
3	**Add/Less:** Loss/gain on sale of infrastructure assets	-	-
4	**Add:** Proceeds from sale of infrastructure assests adjusted for the following: related debts settled or due to be settled from sale proceeds; directly attributable transaction costs; proceeds reinvested or planned to be reinvested as per Regulation 18(7)(a) of the InvIT regulations	-	-
5	**Add:** Proceeds from sale of infrastructure assets not distributed pursuant to an earlier plan to re-invest, if such proceeds are not intended to be invested subsequently, net of any profit/ (loss) recognised in profit and loss account. *	(142.72)	(134.38)
6	**Add/ Less:** Any other item of non- cash expense/ non cash income (net of actual cash flows for these items), if deemed necessary by the Investment Manager. For example, any decrease/ increase in carrying amount of an asset or a liability recognised in profit and loss /income and expenditure on measurement of the asset or the liability at fair value; Interest cost as per effective interest rate method, deferred tax lease rents recognised on a straight line basis, etc.	1,25,403.04	99,236.45
7	**Less:** Repayment of external debt (principal) / redeemable preference shares / debentures, etc. (excluding refinancing) / net cash set aside to comply with DSRA requirement under loan agreements. **	(504.26)	(4,004.00)
8	**Total Adjustments (B)**	**1,49,526.96**	**1,12,658.71**
9	**Net Distributable Cash Flows (C) = (A+B)**	**84,093.58**	**61,112.10**

* This includes amount utilized for purchase of Property, Plant and Equipment's and Intangible Assets

** As at 31-03-2024 this includes Fixed Deposit of Rs. 504.26 Lakhs lien marked in favor of Bank of Maharashtra against Performance Bank Guarantee issued in favour of NHAI.

Adjustment to Net Distributable Cash Flows

S. No.	Particulars	For the year ended March 31, 2024	For the year ended March 31,2023
1	**Net Distributable Cash flow for the year (From (C) Above)**	**84,093.58**	**61,112.10**
2	Less: Actual Distribution during the year	(82,549.93)	(58,661.01)
	Balance	**1,543.65**	**2,451.09**
3	Add: Opening Surplus (Opening Cash adjusted with Net working Capital as on 31-03-2023)	3,896.22	-
4	Less: Cash Set Aside For movemnet in net working capital as on 31-03-2024	(254.95)	-
	Balance Distributable Cash Flow* **	**5,184.93**	**2,451.09**

*** Rs. 5,162.05 lakhs of Cash out of Balance Distributable cash as on 31st March 2024 has been distributed to Trust in April 2024.

National Highways Infra Trust New Delhi

A.R. & Co. Chartered Accountants New Delhi

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :-IN/InvIT/20-21/0014

Disclosures pursuant to SEBI circulars (SEBI Master Circular No. CIRSEBI/HO/DDHS_Div3/P/CIR/2021/1673 dated 29th November, 2021 issued under the InvIT regulations)

c. Statement of Net Distributable Cash Flows (NDCF) at SPV Level (NEPPL)

(All amounts in ₹ lakh unless otherwise stated)

S. No.	Particulars	For the year ended March 31, 2024
		(Audited)
1	**Profit/ (Loss) after tax as per Statement of profit and loss/income and expenditure (standalone) (A)**	**(1,693.38)**
2	**Add:** Depreciation and amortization as per statement of profit and loss account. Incase of Impairment reversal, same needs to be deducted from profit and loss.	0.13
3	**Add/Less:** Loss/gain on sale of infrastructure assets	-
4	**Add:** Proceeds from sale of infrastructure assests adjusted for the following: related debts settled or due to be settled from sale proceeds; directly attributable transaction costs; proceeds reinvested or planned to be reinvested as per Regulation 18(7)(a) of the InvIT regulations	-
5	**Add:** Proceeds from sale of infrastructure assets not distributed pursuant to an earlier plan to re-invest, if such proceeds are not intended to be invested subsequently, net of any profit/ (loss) recognised in profit and loss account. *	(0.50)
6	**Add/ Less:** Any other item of non- cash expense/ non cash income (net of actual cash flows for these items), if deemed necessary by the Investment Manager. For example, any decrease/ increase in carrying amount of an asset or a liability recognised in profit and loss /income and expenditure on measurement of the asset or the liability at fair value; Interest cost as per effective interest rate method, deferred tax lease rents recognised on a straight line basis, etc.**	2,217.93
7	**Less:** Repayment of external debt (principal) / redeemable preference shares / debentures, etc. (excluding refinancing) / net cash set aside to comply with DSRA requirement under loan agreements.	-
8	**Total Adjustments (B)**	**2,217.57**
9	**Net Distributable Cash Flows (C) = (A+B)****	**524.19**

* This includes amount utilized for purchase of Property, Plant and Equipment's and Intangible Assets

** The distributable cash flows are retained for working capital requirements of the Company.

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NATIONAL HIGHWAYS INFRA TRUST

Notes to Consolidated Financial Statements for the year ended March 31, 2024

1. GROUP INFORMATION AND NATURE OF OPERATIONS

The consolidated financial statements comprise financial statements of National Highways Infra Trust ("the Trust" or "InvIT") and its subsidiaries (Project SPV – National Highways Infra Projects Private Limited (NHIPPL) & NHIT Eastern Projects Private Limited (NEPPL)) (collectively, the Group).

The Trust is an irrevocable trust registered under the provisions of the Indian Trusts Act, 1882 on October 19, 2020. It is registered under the Securities and Exchange Board of India (Infrastructure Investment Trust) Regulations, 2014 on October 28, 2020 having registration number IN/InvIT/20-21/0014.

The Trust was setup by National Highways Authority of India ("NHAI" or the "Sponsor"), an Infrastructure Development Trust in India. The Trustee to the Trust is IDBI Trusteeship Services Limited (the "Trustee") and Investment Manager for the Trust is National Highways Infra Investment Managers Private Limited ("Investment Manager").

The Trust has been formed to invest in infrastructure assets primarily being in the road sector in India. The Trust's road projects are implemented and held through special purpose vehicles ("Project SPVs"/ "Subsidiaries"). The units of the Trust were listed in Bombay Stock Exchange and National Stock Exchange on November 10, 2021.

During FY 21-22, the Trust acquired 100% equity control in National Highway Infra Projects Private Limited (the "Project SPV") from the Sponsor with effect from November 03, 2021. The Project SPV (NHIPPL) has entered into five concession agreements with National Highway Authority of India ("NHAI") on March 30, 2021 for Tolling, Management, Maintenance and Transfer of five toll road projects for a period of 30 years from the Appointed Date. The Appointed Date has commenced on 16.12.2021.

In previous financial year, Project SPV (NHIPPL) entered into three new concession agreements with National Highway Authority of India ("NHAI") on September 26, 2022 for Tolling, Management, Maintenance and Transfer of three toll road projects for a period of 20 years from the Appointed Date. The Appointed Date has commenced on 29.10.2022.

During Current financial year, the Trust has invested in the equity share capital of the NHIT Eastern Projects Private Limited (Project SPV - NEPPL) & holding 100% equity share capital.

The Project SPV (NEPPL)has entered into seven concession agreements with National Highway Authority of India ("NHAI") for Tolling, Management, Maintenance and Transfer of seven toll road projects for a period of 20 years from the Appointed Date. The Appointed Date has commenced on 01.04.2024.

The registered office of the Trust is G-5 & 6, Sector-10, Dwarka, Delhi - 110075.

The consolidated financial statements were authorised for issue in accordance with resolution passed by board of directors of the Investment Manager 27th May,

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2. MATERIAL ACCOUNTING POLICIES

a) Basis of Preparation

The Consolidated Financial Statements of the Group comprising of the Consolidated Balance Sheet as at March 31, 2024, and the Consolidated Statement of Profit and Loss (including Other Comprehensive Income), the Consolidated Statement of Cash Flows, the Consolidated Statement of Changes in Unitholders' Equity for the year then ended, the Consolidated statement of Net Assets at fair value as at March 31, 2024, the Consolidated statement of Total return at fair value, and the Consolidated statement of Net Distributable Cash Flows (NDCFs) for the year then ended and a summary of material accounting policies and other explanatory notes have been prepared in accordance with the Indian Accounting Standard as defined in Rule 2(1)(a) of the Companies (Indian Accounting Standards) Rules, 2015, as amended ("Ind AS"), and other accounting principles generally accepted in India to the extent not inconsistent with the InvIT Regulations.

The Consolidated Financial Statements of the Group for the Year ended March 31, 2024 has been prepared in accordance with Indian Accounting Standard, as defined in Rule 2(1)(a) of the Companies (Indian Accounting Standards) Rules, 2015 (as amended) ("Ind AS") and other accounting principles generally accepted in India to the extent not inconsistent with the Securities Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014 ("InvIT regulations") (as amended) including SEBI Master Circular SEBI/HO/DDHS-PoD-2/P/CIR/2023/115 dated July 06, 2023 herein after referred to as "SEBI Master Circular". Refer note 16 on presentation of "Unit capital" as "Equity" instead of compound financial instruments under Indian Accounting Standard (Ind AS) 32- Financial Instruments: Presentation). The Group has applied the accounting policies during the periods presented.

The Consolidated Financial Statements are presented in India Rupees which is also the functional currency of the Group, and all values are rounded to the nearest lakhs, unless otherwise indicated.

Impact of the initial application of new and amended IND ASs that are effective for current year:

In the current year, the Group has applied the below amendments to Ind ASs that are effective for an annual period that begins on or after April 1, 2023.

(a) The Group has adopted the amendments to Ind AS 1 – "Presentation of Financial Statements" for the first time in the current year. The amendments change the requirements in Ind AS 1 with regard to disclosure of accounting policies. The amendments replace all instances of the term 'significant accounting policies' with 'material accounting policy information'. Accounting policy information is material if, when considered together with other information included in an entity's financial statements, it can reasonably be expected to influence decisions that the primary users of general-purpose financial statements make on the basis of those financial statements.

(b) The Group has adopted the amendments to Ind AS 8 – "Accounting Policies, Changes in Accounting Estimates and Errors" for the first time in the current year. The amendment replace the definition of a change in accounting estimates with a definition of accounting estimates. Under the new definition, accounting estimates are "monetary amounts in financial statements that are subject to measurement uncertainty". The definition of a change in accounting estimates was deleted.

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b) Basis of Consolidation

The consolidated financial statements incorporate the financial statements of the Trust and it's Project SPVs' (NHIPPL - from date of acquisition i.e. November 3, 2021 & Project SPV - NEPPL - from date of incorporation i.e. April 19, 2023).

Group consolidates entities which it owns or controls. Control exists when the Trust has power over the entity, is exposed, or has rights, to variable returns from its involvement with the entity and has the ability to affect those returns by using its power over the entity. Power is demonstrated through existing rights that give the ability to direct relevant activities, those which significantly affect the entity's returns. Subsidiaries are consolidated from the date on which control is transferred to the Group until the date control ceases.

Consolidated Financial Statements are prepared using uniform accounting policies for like transactions and other events in similar circumstances. The Group combines the financial statements of the Trust and its subsidiaries line by line adding together like items of assets, liabilities, equity, income and expenses. Intercompany transactions, balances and unrealized gains on transactions between group companies are eliminated.

c) Business Combination/ Goodwill on Acquisition

The Group acquires operational toll road SPV from the Sponsor. The key activity for these SPVs is toll collection and the maintenance of the toll roads.

Based on evaluation vis-a-vis the guidance on definition of business under Ind AS 103 and also keeping in view the relevant guidance on similar fact patterns available under accounting standards applicable in other jurisdictions, the management has classified the acquisition of toll road SPVs as business combinations.

Business combinations are accounted for using the acquisition method. For each business combination, the Group elects whether to measure the non-controlling interests in the acquiree at fair value or at the proportionate share of the acquiree's identifiable net assets. Acquisition related costs are recognised in the statement of profit and loss as incurred.

The acquiree's identifiable assets, liabilities and contingent liabilities that meet the condition for recognition are recognised at their fair values at the acquisition date.

Goodwill is initially measured at cost which is not amortised, however, it is tested for impairment annually. In the event of cessation of operations of a subsidiary, the unimpaired goodwill is written off fully.

Any impairment loss for goodwill is recognised in the consolidated statement of profit or loss. An impairment loss recognised for goodwill is not reversed in subsequent periods. Where goodwill has been allocated to a cash generating unit and part of the operation within that unit is disposed of, the goodwill associated with the disposed operation is included in th of the operation when determining the gain or loss on disposal.

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Goodwill disposed in these circumstances is measured based on the relative values of the disposed operation and the portion of the cash-generating unit retained.

2.1 Summary of Material Accounting Policies

a. Current versus non-current classification

Based on the time involved between the acquisition of assets for processing and their realisation in cash and cash equivalents, the Trust has identified twelve months as its operating cycle for determining current and non-current classification of assets and liabilities in the balance sheet.

b. Revenue Recognition

Revenue is recognised to the extent that it is probable that the economic benefits will flow to the Group and the revenue can be reliably measured, regardless of when the payment is being made. Revenue is measured at the fair value of the consideration received or receivable, taking into account contractually defined terms of payment and excluding taxes or duties collected on behalf of the government.

The specific recognition criteria described below must also be met before revenue is recognised:

Toll Revenue - Toll Revenue from users of toll roads held by subsidiary company is recognised in respect of toll revenue accrued for respective toll road projects. Revenue from electronic toll collection is recognised on accrual basis.

Interest income - Interest income is recognised using the effective interest method.

Dividends - Dividend income is recognised when the Group's right to receive the payment is established.

Claims with National Highways Authority of India ('NHAI') and other government authorities are accounted as and when the money is received from the respective authorities, in cases of monetary compensations.

Other items - Other items of income are recognised as and when the right to receive the income arises.

c. Property, plant and equipment

Property, plant and equipment are stated at historical cost, as applicable, less accumulated depreciation and cumulative impairment losses, if any.

Historical cost includes purchase price, borrowing costs and any cost directly attributable to bringing the assets to its working condition for its intended use.

Subsequent costs are included in the asset's carrying amount or recognised as a separate asset, as appropriate, only when it is probable that the future economic benefits associated with the item will flow to the entity and the cost of the item can be measured reliably. Cost includes expenditure that is directly attributable to qualifying assets and includes borrowing costs capitalised in

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accordance with the Group's accounting policy. Such properties are classified to the appropriate categories of property, plant, and equipment when completed and ready for intended use.

Depreciation on Plant and Equipment is provided using straight-line method based on estimated useful life. The estimated useful life of all the property, plant and equipment is ascertained by the management using the best estimate on the basis of technical evaluation, which is depreciated based on useful life as prescribed in Schedule II of the Companies Act, 2013. Depreciation on additions/ deductions is calculated pro-rata from/ to the month of additions/ deductions.

The residual values, useful lives and methods of depreciation of Property, plant and equipment are reviewed at each period end and adjusted prospectively, if appropriate.

The Group has estimated the following useful lives for its tangible fixed assets:

Category of Assets	Estimated useful life (in years)
Temporary Structure	3
Computer	3
Office Equipment's	5
Furniture & Fixtures	10
Plant and Machinery	5-20

The estimated residual value of the PPE has been taken as 5% as prescribed in Schedule II to the Companies Act, 2013. Fixed Assets amounting upto INR 5,000 are recognised in Statement of Profit and Loss in entirety in the year of purchase.

d. Intangible assets

Intangible assets are stated at original cost net of tax/duty credits availed, if any, less accumulated amortisation, and cumulative impairment, if any.

Intangible Assets are stated at historical cost, as applicable, less accumulated amortisation and cumulative impairment losses, if any.

The useful lives of intangible assets are assessed as either finite or indefinite.

Rights under Service Concession Arrangements – Toll Collection Rights

The Group has acquired rights for Tolling, Operation, Maintenance and Transfer of five toll road projects for a period of 30 years basis Toll Concession agreements with NHAI, group further acquired rights during the Previous F.Y. 2022-23 for Tolling, Operation, Maintenance and Transfer of three additional toll road projects for a period of 20 years w.e.f. 29.10.2022 basis Toll Concession agreements with NHAI, and the same have been recognised as Intangible Assets in the financial statements. Further, the group has acquired seven concession agreements with National Highway Authority of India ("NHAI") for Tolling, Management, Maintenance and Transfer of seven toll road projects for a period of 20 years from the Appointed Date. The Appointed Date has commenced on 01.04.2024 and therefore the revenue and expenses of these seven toll road projects shall be recognised from next financial year.

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Extension of concession period by the Authority in compensation for claims made by the Group are capitalised as part of Toll Collection Rights on acceptance of the claim. Where the Group has a contractual right to an extension in the concession period as per the concession agreement, the same is capitalized when the right to extension in the concession period is established at the estimated amount of eligible claims.

Amortisation of Intangible Assets

Toll Collection Rights are amortized basis a Consumption based model (using Passenger Car Unit (PCU) projections) over the tenure of the Concession Agreement. The projected traffic is based on independent traffic volume projections: amortisation is revised in case of any material change in expected pattern of economic benefits.

Other intangible assets - Software purchased is amortized over a period of three to six years on straight line basis from the month in which the addition is made. The estimated useful life is reviewed at the end of each reporting period, with the effect of any changes in estimate being accounted for on a prospective basis.

e. Employee benefits

Employee benefits include provident fund, gratuity, compensated absences, and medical benefits.

i. **Short term employee benefits**

Employee benefits such as salaries, short term compensated absences, expected cost of bonus, ex-gratia and performance linked rewards falling due wholly within twelve months of rendering the service are classified as short-term employee benefits and are expensed in the period in which the employee renders the related service.

ii. **Post-Employment Benefits**

Defined contribution plan: A defined contribution plan is a post-employment plan under which an entity pays fixed contributions and will have no legal or constructive obligations to pay further amounts. The Group contributes to provident fund and employees deposit linked insurance scheme, and have no further obligations beyond making its contributions. The Group's contribution to the above funds are charged to the Consolidated Statement of Profit and Loss.

Defined benefit plan: The Group has an un-funded benefit plan for post-employment benefits in the form of Gratuity. The value of obligation under the plan is determined by the group based on best estimate of the present value of the estimated future cash flows towards the gratuity obligation. Defined benefit costs comprising current service cost, past service cost and gains or losses on settlements are recognised in the Consolidated Statement of Profit and Loss as employee benefits expense. Gains or losses on the curtailment or settlement of any defined benefit plan are recognised when the curtailment or settlement occurs.

iii. **Termination benefits**

Termination benefits such as compensation under employee separation schemes (wherever applicable) are recognised as expense in the Consolidated Statement of Profit and Loss. Liability for the same is recognised at the earlier of when the group can nc the effect of ermination benefit.

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iv. **Other long-term employee benefits**

The present value of the obligation under long term employee benefit plans such as compensated absences is determined and is recognised in a similar manner as in the case of defined benefit plans.

Long term employee benefit costs comprising current service cost and gains or losses on curtailments and settlements, re-measurements are recognised in the Consolidated Statement of Profit and Loss as employee benefit expenses. Interest cost implicit in long term employee benefit cost is recognised in the Consolidated Statement of Profit and Loss under finance cost.

f. Leases

The Group assesses whether a contract contains a lease, at inception of a contract.

At the date of commencement of the lease, the Group recognizes a right-of-use asset ("ROU") and a corresponding lease liability for all lease arrangements in which it is a lessee, except for leases with a term of twelve months or less (short-term leases) and low value leases, which are accounted for as under.

Short-term leases and leases of low-value assets

Short term leases are leases with a term of twelve months or less. For short-term and low value leases, the Group recognises the lease payments as an operating expense on a straight-line basis over the term of the lease.

g. Borrowing costs

Borrowing costs include interest calculated using the effective interest method, amortization of ancillary costs and other costs the Trust incurs in connection with the borrowing of funds.

Borrowing costs are expensed in the period in which they are incurred.

h. Financial Instruments

Financial assets and financial liabilities are recognized when the Group becomes a party to the contractual provisions of the instruments.

Financial assets and financial liabilities are initially measured at fair value. Transaction costs that are directly attributable to the acquisition or issue of financial assets and financial liabilities are added to or deducted from the fair value of the financial assets or financial liabilities, as appropriate, on initial recognition. However, transaction costs directly attributable to the acquisition of financial assets or financial liabilities at fair value through profit or loss ("FVTPL") are recognized immediately in the Statement of Profit and Loss.

If the Group determines that the fair value at initial recognition differs from the transaction price, the Group accounts for that instrument at that date as follows:

- at the measurement basis mentioned above if that fair value is evidenced by a quoted price in an active market for an identical asset or liability (i.e. a Level 1 input) or based on a valuation technique that uses only data from observable markets. The Trust recognises the

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difference between the fair value at initial recognition and the transaction price as a gain or loss.

- in all other cases, at the measurement basis mentioned above, adjusted to defer the difference between the fair value at initial recognition and the transaction price. After initial recognition, the Group recognises that deferred difference as a gain or loss only to the extent that it arises from a change in a factor (including time) that market participants would take into account when pricing the asset or liability.

Subsequent measurement of financial assets and financial liabilities is described below.

Financial Assets

All recognized financial assets are subsequently measured in their entirety at either amortized cost or fair value, depending on the classification of the financial assets.

1. **Classification of Financial Assets**

Financial Assets that meet the following conditions are subsequently measured at amortised cost (unless the same are designated as fair value through profit or loss (FVTPL)):

- The asset is held within a business model whose objective is to hold assets in order to collect contractual cash flows; and
- The contractual terms of instrument give rise on specified dates to cash flows that are solely payments of principal and interest on the principal amount outstanding..

Financial Assets at FVTPL is a residual category for debt instruments and all changes are recognized in profit or loss.

2. **Amortized cost and effective interest method**

Income is recognized on an effective interest method as per Ind AS 109 for financial assets other than those financial assets classified as at FVTPL. Interest income is recognized in the Statement of Profit and Loss and is included in the "Other income" line item.

3. **Impairment of financial assets (Expected credit loss model)**

An impairment loss on financial asset is established when there is objective evidence that the Group will not be able to collect all amounts due according to the original terms of the receivables. Impairment loss, if any, are recognised in Statement of Profit or Loss for the period.

4. **De-recognition of financial assets**

The Group derecognize a financial asset when the contractual rights to the cash flows from the asset expire, or when it transfers the financial asset and substantially all the risks and rewards of [illegible] asset to another party.

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On de-recognition of a financial asset in its entirety, the difference between the asset's carrying amount and the sum of the consideration received and receivable and the cumulative gain or loss that had been recognized in other comprehensive income and accumulated in equity is recognized in profit or loss if such gain or loss would have otherwise been recognized in the Statement of Profit or Loss on disposal of that financial asset.

b) Financial Liabilities

All financial liabilities are recognized initially at fair value and, in the case of loans and borrowings and payables, net of directly attributable transaction costs.

Loans and borrowings are subsequently measured at amortized costs using Effective Interest Rate method.

Financial liabilities at fair value through profit or loss (FVTPL) are subsequently measured at fair value.

De-recognition of financial liabilities

Financial liability is derecognized when the obligation under the liability is discharged or cancelled or expires. When an existing financial liability is replaced by another from the same lender on substantially different terms, or the terms of an existing liability substantially modified, such an exchange or modification is treated as the de-recognition of the original liability and the recognition of the new liability. The difference in the respective carried amount is recognized in the Statement of Profit and Loss

Financial liability is derecognized when the obligation under the liability is discharged or cancelled or expires.

c) Classification as debt or equity

Debt and equity instruments issued by Group are classified as either financial liabilities or as equity in accordance with the substance of the contractual arrangements and the definitions of a financial liability and an equity instrument.

i. Fair Value measurement

Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date, regardless of whether that price is directly observable or estimated using another valuation technique. In estimating the fair value of an asset or a liability, the Group considers the characteristics of the asset or liability if market participants would take those characteristics into account when pricing the asset or liability at the measurement date. Fair value for measurement and/or disclosure purposes in these financial Statements is determined on such a basis and measurements that have some similarities to fair value but are not fair value, such as net realisable value in Ind AS 2 "Inventory" or value in S 36 "Impairment of Assets".

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In addition, for financial reporting purposes, fair value measurements are categorized into Level 1, 2 or 3 based on the degree to which the inputs to the fair value measurements are observable and the significance of the inputs to the fair value measurement in its entirety, which are described as follows:

- Level 1 inputs are quoted prices (unadjusted) in active markets for identical assets or liabilities that entity can access at measurement date

- Level 2 inputs other than quoted prices included in Level 1, that are observable for the asset or liability, either directly (as prices) or indirectly (derived from prices); and

- Level 3 inputs for the asset or liability that are not based on observable market data (unobservable inputs).

j. Cash and Cash Equivalents

Cash and cash equivalents in the Consolidated Balance Sheet comprise cash at banks and on hand, overnight mutual fund investments and short-term deposits with an original maturity of three months or less, which are subject to an insignificant risk of changes in value.

For the purpose of the Consolidated statement of cash flows, cash and cash equivalents consist of cash and short-term deposits, as defined above, net of outstanding bank overdrafts as they are considered an integral part of the Group's cash management.

k. Impairment of Non- Financial Assets

The carrying values of assets / cash generating units at each reporting date are reviewed for impairment if any indication of impairment exists. If any indication exists, the Group estimates the asset's recoverable amount. use.

If the carrying amount of the assets exceed the estimated recoverable amount, an impairment is recognized for such excess amount. The impairment loss is recognized as an expense in the Consolidated Statement of Profit and Loss.

The recoverable amount is the higher of the fair value less costs of disposal and its value in use. In assessing value in use, the estimated future cash flows are discounted to their present value using a pre-tax discount rate that reflects the current market assessments of the time value of money and the risks specific to the asset for which the estimated future cash flows have not been adjusted.

When there is indication that an impairment loss recognized for an asset (other than a revalued asset) in earlier accounting periods no longer exists or may have decreased, such reversal of impairment loss is recognized in the Consolidated Statement of Profit and Loss.

l. Taxes on income

Current income tax

The income tax expense or credit for the year is the tax payable on current year's taxable income based on the applicable income tax rate adjusted by changes in deferred tax assets and liabilities

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attributable to temporary differences and to unused tax losses. The current income tax charge is calculated based on tax laws enacted or substantively enacted at the end of the reporting period.

Deferred tax

Deferred income tax is provided in full, using the liability method on temporary differences arising between the tax bases of assets and liabilities and their carrying amounts in the financial statements. However deferred income tax is not accounted if it arises from the initial recognition of an asset or liability that at the time of the transaction affects neither the accounting profit nor taxable profit (tax loss). Deferred income tax is determined using tax rates and laws that have been enacted or substantively enacted by the end of the reporting period and are expected to apply when the related deferred income tax asset/liability is realized or settled.

Deferred tax assets are recognized for all deductible temporary differences and unused tax losses only if it is probable that future taxable amounts will be available to utilize those temporary differences and losses.

m. Provisions, Contingent Liabilities, Contingent Assets and Capital Commitments

Contingent Liabilities
Contingent liabilities are disclosed in notes in case of a present obligation arising from past events, when it is not probable that an outflow of resources will be required to settle the obligation or a present obligation arising from past events, when no reliable estimate is possible

Contingent Assets
Contingent assets usually arise from unplanned or other unexpected events that give rise to the possibility of an inflow of economic benefits to the entity.

Contingent assets are recognized when the realisation of income is virtually certain, in which case the related asset is not a contingent asset and its recognition is appropriate.

Contingent assets are reviewed at each reporting date. A contingent asset is disclosed where an inflow of economic benefits is probable.

Provisions
Provisions are recognised when the Trust has a present obligation (legal or constructive) as a result of a past event, it is probable that an outflow of resources embodying economic benefits will be required to settle the obligation and a reliable estimate can be made of the amount of the obligation.

n. Consolidated Statement of Cash Flows

Consolidated Statement of Cash Flows is prepared segregating the cash flows into operating, investing and financing activities.

Cash flow from operating activities is reported using indirect method adjusting the net profit for the effects of:

- changes during the period in operating receivables and payables, tra[illegible]non-cash nature;

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- non-cash items such as depreciation, provisions, deferred taxes, unrealised foreign currency gains and losses;
- all other items for which the cash effects are investing or financing cash flows.

Cash and cash equivalents (including bank balances) shown in the Consolidated Statement of Cash Flows exclude items which are not available for general use as at the date of Consolidated Balance Sheet.

o. Distribution to unit holders

The Group recognises a liability to make cash distributions to unit holders when the distribution is authorised and a legal obligation has been created. As per the SEBI InvIT Regulations, a distribution is authorised when it is approved by the Board of Directors of the Investment Manager. A corresponding amount is recognised directly in other equity.

p. Earnings per Unit (EPU)

Basic EPU are calculated by dividing the profit for the period attributable to unitholders by the weighted average number of units outstanding during the period.

Diluted EPU are calculated by dividing the profit/(loss) attributable to unitholders by the weighted average number of units outstanding during the period plus the weighted average number of units that would be issued on conversion of all the dilutive potential units into unit capital.

q. Recent Pronouncements

As on 31st March 2024, there are no new standards or amendment to the existing standards applicable to the Group which has been notified by Ministry of Corporate Affairs.

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r. Significant accounting judgements, estimates and assumptions

The preparation of the Group's financial statements requires management to make judgements, estimates and assumptions that affect the reported amounts of revenues, expenses, assets and liabilities, and the accompanying disclosures, and the disclosure of contingent liabilities. Uncertainty about these assumptions and estimates could result in outcomes that require a material adjustment to the carrying amount of assets or liabilities affected in future periods.

Judgements

In the process of applying the Group's accounting policies, management has made the following judgments, apart from those involving estimations, which have the most significant effect on the amounts recognised in the financial statements.

Applicability of service concession arrangement accounting to toll roads concessionaire arrangements

The Group has determined that Appendix D to Ind AS 115 "Revenue from Contracts with Customers" relating to 'Service Concession Arrangements' is applicable to the SPVs which provides an accounting by the operators of public to private service concession arrangements. The SPVs have entered into concession arrangement with National Highway Authority of India (NHAI) (the "Authority") as per which the individual SPVs would participate in Toll Operate Transfer (TOT) of the toll roads infrastructure. After the end of the Concession arrangement, the SPVs have to transfer the infrastructure i.e. toll roads constructed to the Authority.

Accordingly, the SPVs have recognized the intangible assets as per the accounting policy mentioned in Note (d) Intangible Assets.

Future revenue projections for the balance concession period

The future revenue projections are based on the assumptions made by the Group's management regarding future traffic growth and inflation factor for assessing user toll fee as supported by the studies from the third-party independent consultant for individual project done at reasonable intervals.

The Group uses the future revenue projections for the following purposes:

- **Amortisation of Rights under Service Concession Arrangements (SCA) i.e. Intangible Assets-Toll Road Carriageway**:

  Toll Collection Rights are amortized on the basis of Consumption based model (using Passenger Car Unit (PCU) projections) over the tenure of the Concession Agreement. The projected traffic is based on independent traffic volume projections : amortisation is revised in case of any material change in expected pattern of economic benefits.

Classification of unit holders Funds

The Unit Capital has been presented as "Equity" in accordance with the InvIT R
ound financial instrument. Refer note 16 on presentation of "Unit ca

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instead of compound financial instruments under Indian Accounting Standard (Ind AS) 32- Financial Instruments: Presentation).

Fair value measurements

Management applies valuation techniques to determine the fair value of financial instruments (where active market quotes are not available). This involves developing estimates and assumptions consistent with how market participants would price the instrument. The Trust engages third party valuers, where required, to perform the valuation. Information about the valuation techniques and inputs used in determining the fair value of investments are disclosed in the notes to Standalone Financial Statements.

Fair valuation and disclosures

SEBI Master Circular issued under the SEBI InvIT Regulations requires disclosures relating to net assets at fair value and total returns at fair value. In estimating the fair value of investments in subsidiaries (which constitute substantial portion of the net assets), the Group engages independent qualified external valuers to perform the valuation. The Investment Manager works closely with the valuers to establish the appropriate valuation techniques and inputs to the model. The valuation report and findings are discussed at the meeting of the Board of Directors on yearly basis to understand the changes in the fair value of the subsidiaries. The inputs to the valuation models are taken from observable markets, where possible, but where this is not feasible, a degree of judgement is required in establishing fair values. Judgements include considerations of inputs such as weighted average cost of capital, tax rates, inflation rates etc. Changes in assumptions about these factors could affect the fair value.

Useful lives of property, plant, and equipment

Management of the Group reviews the useful lives of property, plant and equipment at each reporting date to ensure that the useful lives represent the expected utility of the assets to the Group.

Obligations relating to employee benefits

The employee benefit obligation depends on several factors that are determined on an actuarial basis using several assumptions. The assumptions used in determining the net cost/ (income) [illegible] discount rate, inflation and mortality assumptions. Any changes in these assumptions [illegible] pon the carrying amount of employee benefit obligations.

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Impairment of intangible assets

Impairment exists when the carrying value of an asset or cash generating unit exceeds its recoverable amount, which is the higher of its fair value less costs of disposal and its value in use. The recoverable amounts for the intangible assets are based on value in use of the underlying projects. The value in use calculation is based on a DCF model. The cash flows are derived from forecasts over the remaining SCA period of the projects.

Major Maintenance Expenses / Resurfacing Expenses

As per industry practice, the Project SPV (NHIPPL) is required to carry out resurfacing of the roads under the Concession. For this purpose, a regular maintenance along with periodic maintenances is required to be performed. Normally, periodic maintenance includes resurface of pavements, repairs of structures and other equipment and maintenance of service roads. The maintenance cost / bituminous overlay may vary based on the actual usage during maintenance period. Accordingly, on the grounds of matching cost concept and based on technical estimates, a provision for major maintenance expenses is reviewed and is provided for in the accounts annually.

The provisions for MMR as per industry practice has been made based on the first cycle of of overlay expected to occur in five to seven years and not based on the total MMR cost over entire concession period. The discounting rate used for arriving at the present value for MMR provisions is government bond rate of 30 years for projects acquired in first phase and 20 years for projects acquired in second phase.

Expected Credit Loss on financial assets

As per Ind AS 109, Financial Assets that are measured at amortised cost are required to compute the Expected Credit Loss (ECL). As at the reporting period, Investment manager of the Group credit risk of the financial assets and concluded that no provision for ECL is required.

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3 Property, Plant and Equipment

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Temporary Structure	Plant & Machinary	Computer	Office Equipments	Furniture & Fixtures	Total
Gross Carrying Amount:						
Balance as at April 1, 2022	-		**0.50**	-	-	**0.50**
Additions	25.59		44.94	17.42	44.27	132.22
Less: Disposals	-		-	-	-	-
Balance as at March 31, 2023	**25.59**		**45.44**	**17.42**	**44.27**	**132.72**
Additions	10.99	13.58	43.60	48.32	26.75	143.23
Less: Disposals	-		1.09	-	-	1.09
Balance as at March 31, 2024	**36.58**	**13.58**	**87.95**	**65.74**	**71.02**	**274.86**
Accumulated Depreciation:						
Balance as at April 1, 2022	-		0.04	-	-	0.04
Additions	1.49		4.32	0.82	0.88	7.51
Less: Disposals	-		-	-	-	-
Balance as at March 31, 2023	**1.49**		**4.36**	**0.82**	**0.88**	**7.55**
Additions	10.71	0.08	22.29	9.97	5.27	48.31
Less: Disposals	-		0.29	-	-	0.29
Balance as at March 31, 2024	**12.20**	**0.08**	**26.36**	**10.79**	**6.15**	**55.57**
Net Carrying Amount:						
Balance as at March 31, 2023	**24.10**	-	**41.08**	**16.60**	**43.39**	**125.17**
Balance as at March 31, 2024	**24.38**	**13.50**	**61.59**	**54.95**	**64.87**	**219.29**

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4. Capital Work in Progress

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Plant and Machinery*	19.76	-
Total	**19.76**	**-**

* This is pertaining to Solar Power Plants which is under installation at toll plaza.

Capital Work in Progress (CWIP) ageing schedule

As at March 31, 2024	Less than 1 Year	1-2 Year	2-3 Year	More than 3 Year	Total
Project in Progress	19.76	-	-	-	19.76
Total	**19.76**	-	-	-	**19.76**

As at March 31, 2023	Less than 1 Year	1-2 Year	2-3 Year	More than 3 Year	Total
Project in Progress	-	-	-	-	-
Total	-	-	-	-	-

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5 Goodwill

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	As at March 31, 2024	As at March 31, 2023
Gross Carrying Amount		
Balance at the beginning of the year	10,144.46	10,144.46
Additions	-	-
Less: Disposals	-	-
Less: Impairment	-	-
Balance at the closing of the year	**10,144.46**	**10,144.46**

The carrying amount relates to goodwill arising on acquisition of Project SPV (NHIPPL) by the Trust and has been tested for impairment against the respective cash generating unit (CGU). The calculation uses cash flow forecast based on financial models which cover remaining future periods of respective concession periods of toll assets.

Based on a review of the future discounted cash flows of the intangible assets (Toll Collection Rights) held by the subsidiary (NHIPPL), the recoverable amount is higher than the carrying amount of the assets, and accordingly no impairment loss has been recognised in the statement of profit and loss for the year ended March 31, 2024.





6 Other Intangible Assets

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Software	Toll collection rights	Total
Gross Carrying Amount:			
Balance as at April 1, 2022	-	**7,35,040.00**	**7,35,040.00**
Additions	2.16	2,84,966.66	**2,84,968.82**
Less: Disposals		-	-
Balance as at March 31, 2023	**2.16**	**10,20,006.66**	**10,20,008.82**
Additions	0.06	1,11,993.43	1,11,993.49
Less: Disposals	-	-	-
Balance as at March 31, 2024	**2.22**	**11,32,000.09**	**11,32,002.31**
Accumulated Amortization:			
Balance as at April 1, 2022	-	1,055.61	**1,055.61**
Additions	0.25	17,552.87	**17,553.12**
Less: Disposals	-	-	-
Balance as at March 31, 2023	**0.25**	**18,608.48**	**18,608.73**
Additions	0.68	24,722.06	24,722.74
Less: Disposals	-	-	-
Balance as at March 31, 2024	**0.93**	**43,330.54**	**43,331.47**
Net Carrying Amount			
Balance as at March 31, 2023	**1.91**	**10,01,398.18**	**10,01,400.09**
Balance as at March 31, 2024	**1.29**	**10,88,669.55**	**10,88,670.84**

Note:-

1. In FY 2021-22, the Group has acquired rights for Tolling, Operation, Maintenance and Transfer of five toll road projects for a period of 30 years basis Toll Concession agreements with NHAI, for a consideration of INR 7,350.40 Crore and the same have been recognised as Intangible Assets in financial statements. The Group further acquired rights during the Previous FY 2022-23 for Tolling, Operation, Maintenance and Transfer of three additional toll road projects for a period of 20 years basis Toll Concession Agreements with NHAI, for a consideration of INR 2,849.66 Crore and the same have been addition in the Intangible Assets in financial statements.

2.Toll Collection Rights has been amortized on the basis of Consumption based model (using Passenger Car Unit (PCU) projections) over the tenure of the Concession Agreement i.e. 30 years and 20 years basis respective concession agreements for those toll road projects.

3. During the current year, the Group has capitalised Initial Improvement Works amounting to Rs. 1,119.93 Crores to Intangible Asset (For detailed note on initial improvement works refer note no. 54).





7 Other Financial Assets: Non Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Investment in Fixed Deposits		
Fixed Deposits with banks*	9,916.99	9,469.99
Security Deposits	3.38	1.60
Interest receivable on Debenture recovery expense fund	1.32	0.42
Interest receivable on fixed deposits	241.17	185.43
Deposit - Debenture Recovery Expense Fund for NCD's	15.00	15.00
	10,177.86	**9,672.44**

*The Fixed Deposits are kept in Debt Servicing Reserve Account (DSRA) as per borrowing agreements with lenders and as per terms of the debenture trust deed, to be utilized at the end of tenure of long term borrowings from Senior Lenders and to maintain DSRA balance for Debenture holders, hence classified as Other Financial Assets- Non Current irrespective of date of maturity.

8 Deferred Tax Assets (Net)

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Deferred Tax Assets arising on account of:		
- Expense disallowed as per Income Tax Act, 1961, allowable in future years	-	-
- Unabsorbed depreciation	1,19,086.98	72,562.41
-Provision on Initial improvement	25,179.31	-
Total (A)	**1,44,266.29**	**72,562.41**
Deferred Tax Liabilities arising on account of:		
- Difference between Book & Tax base related to Intangible assets & PPE	1,32,743.09	67,877.09
Total (B)	**1,32,743.09**	**67,877.09**
Net (A-B)	**11,523.20**	**4,685.32**

Reconciliation of Deferred Tax Asset/ (Liabilities)

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Opening Balance - Deferred Tax Asset	4,685.32	262.53
Deferred tax income/ (expense) during the period recognised in profit & loss	6,837.88	4,422.79
Closing Balance - Deferred Tax Asset	**11,523.20**	**4,685.32**

As at March 31, 2024, based on the expected future profitability of the NHIPPL & NEPPL (SPVs), the management has recognised deferred tax assets on the unabsorbed tax depreciation carried forward only and not recognised Deferred Tax Assets on major maintainance obligation and business losses for the period, as carried forward business losses will not be available for utilisation within the time limit allowable as per the Income Tax Act based on the future projections of the profitability of the entity in accordance with provision of Ind AS 12 "Income Taxes".

9 Non Current Tax Assets (Net)

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Income tax refundable (net of provision)	22.38	12.06
	22.38	**12.06**

10 Other non current assets

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As At March 31, 2023
Capital advances	565.57	-
Advance paid to NHAI for acquisition of R3 asset*	15,69,988.18	
Processing fees paid for undrawn loan	95.43	-
	15,70,649.18	-

*This includes amount of Rs. 15,69,988.18 Lakhs pertaining to concession fees paid to NHAI by NEPPL for the acquisition of seven projects. The appointed date for these acquisitions is with effect from 1st April 2024 , therefore the amount paid to NHAI has been classified as capital advance.

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11 Trade Receivables: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Considered good-unsecured	385.20	350.87
Trade Receivables - Credit Impaired (unsecured)	59.60	59.60
	444.80	**410.47**
Less:- Allowances for expected credit loss	(59.60)	(59.60)
	385.20	**350.87**

The receivables are hypothecated by way of first ranking exclusive charge to secure senior lenders and non convertible debenture holders in Trust.

Trade Receivables ageing schedule as on March 31, 2024

Particulars	Outstanding for following period from due date of payment.					
	0-6 Months	6 Months -1 Year	1-2 Years	2-3 Years	More than 3 years	Total
Undisputed trade receivables						
i) Considered good	385.20	-	-	-	-	**385.20**
ii) Which have significant increase in credit risk	-	-	-	-	-	-
iii) Credit impaired	-	-	59.60	-	-	**59.60**
Disputed trade receivables						
i) Considered good	-	-	-	-	-	-
ii) Which have significant increase in credit risk	-	-	-	-	-	-
iii) Credit impaired	-	-	-	-	-	-
Total	**385.20**	-	**59.60**	-	-	**444.80**

Trade Receivables ageing schedule as on March 31, 2023

Particulars	Outstanding for following period from due date of payment.					
	0-6 Months	6 Months -1 Year	1-2 Years	2-3 Years	More than 3 years	Total
Undisputed trade receivables						
i) Considered good	350.87	-	-	-	-	**350.87**
ii) Which have significant increase in credit risk	-	-	-	-	-	-
iii) Credit impaired	-	59.60	-	-	-	**59.60**
Disputed trade receivables						
i) Considered good	-	-	-	-	-	-
ii) Which have significant increase in credit risk	-	-	-	-	-	-
iii) Credit impaired	-	-	-	-	-	-
Total	**350.87**	**59.60**	-	-	-	**410.47**

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12 Cash and Cash Equivalents*

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Balances with Banks		
In Current Accounts	1,260.12	735.06
In Escrow Accounts	467.42	338.04
Draft in Hand	-	8.14
Cash in Hand	15.17	7.93
Fixed Deposits (having original maturity of less than 3 months)	6,163.15	10,000.00
Overnight mutual fund**	38,494.92	10,034.91
	46,400.78	**21,124.08**

*Cash and Cash Equivalents includes Rs. 6209.70 Lakhs (March 31, 2023: Rs. Nil) which are unutilised balance in Project SPV - NHIPPL for initial improvement works of R1 and R2 Projects.
The balances in escrow accounts are hypothecated by way of first ranking exclusive charge to secure senior lenders and non convertible debenture holders in Trust.

** Investment in Mutual Funds includes Rs. 15,000 Lakhs raised in current year from unit issue for leap projects, to be utilised for creation of DSRA against loans raised for leap projects. Further these investments also includes Rs. 4106.06 Lakhs pertaining to one time issue related expenses unutilized as on 31-03-2024.

13 Bank Balance Other than Cash and Cash Equivalent

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Bank Deposits with original maturity of more than 3 Months*	504.26	-
Interest Accrued on bank deposits	8.72	-
	-	
	512.98	**-**

* Fixed deposits amounting to Rs. 504.26 Lakhs (March 31, 2023: Rs. Nil) is lien marked in favour of Bank of Maharashtra and kept as Margin Money against the Bank Guarantee issued to NHAI for R-2 Projects by the group.

14 Other Financial Assets: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Security deposits	4.54	2.92
Interest receivable on Fixed Deposits	-	3.73
	4.54	**6.65**

15 Other Current Assets

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Prepaid expenses*	470.02	882.86
GST Input	523.36	642.12
Processing fees paid for undrawn loan	152.84	103.49
Advance to suppliers	1,157.23	5.59
Others	0.44	-
	2,303.89	**1,634.06**

* Prepaid includes Round 3 expenses of Rs. Nil during the current period and Rs. 290.72 Lakh in previous year.

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16 Unit Capital

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024		As at March 31, 2023	
	No of Units	Amount	No of Units	Amount
Unit Capital*				
Opening balance	72,64,05,200	7,41,604.32	59,52,00,000.00	5,99,442.82
Add: Units issued during the year	58,57,95,400	7,27,206.41	13,12,05,200	1,43,013.67
Less: Issue expenses (refer note below)	-	(1,717.26)	-	(852.17)
Balance at year end	**1,31,22,00,600**	**14,67,093.47**	**72,64,05,200**	**7,41,604.32**

* 58,57,95,400 units issued at Rs. 124.14 per unit during current financial year (13,12,05,200 unit issued at Rs 109 per unit in previous financial year).

In current year the Trust offered an issue of 58,57,95,400 units of National Highways Infra Trust ("NHIT"), for cash at a price of 124.14 per unit (the "issue price"), aggregating to ` Rs 7,27,206.41 lakhs through Institutional and preferential placement in accordance with the Securities and Exchange Board of India (Infrastructure Investment Trust) Regulations, 2014 including the rules, circulars and guidelines issued thereunder.

In previous year the Trust offered an issue of 13,12,05,200 units of National Highways Infra Trust ("NHIT"), for cash at a price of 109.00 per unit (the "issue price"), aggregating to ` Rs 1,43,013.67 lakhs through Institutional and preferential placement in accordance with the Securities and Exchange Board of India (Infrastructure Investment Trust) Regulations, 2014 including the rules, circulars and guidelines issued thereunder.

Issue expenses of Rs. 1,717.16 lakhs (March 31, 2023: Rs 852.17 lakhs) incurred in connection with issue of units have been reduced from the Unitholders capital in accordance with Ind AS 32 Financial Instruments: Presentation

Rights/ preferences and restrictions attached to Unit Capital

Subject to the provisions of the InvIT Regulations, the indenture of funds, and applicable rules, regulations and guidelines, the rights of the unit holders include:

a) The beneficial interest of each unitholder shall be equal and limited to the proportion of the number of the units held by that unitholder to the total number of units.

b) Right to receive income or distributions with respect to the units held.

c) Right to attend the annual general meeting and other meetings of unit holders of the Trust.

d) Right to vote upon any matters/resolutions proposed in relation to the Trust.

e) Right to receive periodic information having a bearing on the operation or performance of the Trust in accordance with the InvIT Regulations.

f) Right to apply to the Trust to take up certain issues at meetings for unit holders approval.

g) Right to receive additional information, if any, in accordance with InvIT documents filed with Placement Memorandum.

In accordance with the InvIT Regulations, no unit holders shall enjoy superior voting or any other rights over any other unit holders, and there shall not be multiple classes of units. There shall be only one denomination of units. Not withstanding the above, subordinate units may be issued only to the Sponsor and its Associates, where such subordinate units shall carry only inferior voting or any other rights compare to the other units.

Under the provisions of the InvIT Regulations, not less than 90% of the net distributable cash flows of the Trust is required to be distributed to the unitholders, and in accordance with such statutory obligation the Trust has formulated a distribution policy to declare and distribute the distributable cash flows to its unitholders atleast once every financial year as approved by the Board of Directors of the Investment Manager. The distributions made by Trust to its unitholders are based on the Net Distributable Cash Flows (NDCF) of the Trust under the InvIT Regulations. The distribution in proportion to the number of units held by the unitholders. The Trust declares and pays in distributions in indian rupees.

Limitation to the Liability of the unit holders

The liability of each unit holders towards the payment of any amount (that may arise in relation to the Trust including any taxes, duties, fines, levies, liabilities, costs or expenses) shall be limited only to the extent of the capital contribution of such unit holders and after such capital contribution shall have been paid in full by the unit holders, the unit holders shall not be obligated to make any further payments.

The unit holders shall not have any personal liability or obligation with respect to the Trust.

Classification of Unit Holders' Funds

Under the provisions of the InvIT Regulations, NHIT is required to distribute to Unitholders not less than ninety percent of the net distributable cash flows of NHITfor each financial year. Accordingly, a portion of the unitholders' funds contains a contractual obligation of the Trust to pay to its Unitholders cash distributions. The Unitholders' funds could therefore have been classified as compound financial instrument which contain both equity and liability components in accordance with Ind AS 32 - Financial Instruments: Presentation. However, in accordance with SEBI Circulars (No. CIR/IMD/DF/114/2016 dated 20-Oct-2016 and No. CIR/IMD/DF/127/2016 dated 29-Nov-2016) issued under the InvIT Regulations, the unitholders' funds have been classified as equity in order to comply with the mandatory requirements of Section H of Annexure A to the SEBI Circular dated 20-Oct-2016 dealing with the minimum disclosures for key financial statements. In line with the above, the distribution payable to unit holders is recognised as liability when the same is approved by the Investment Manager.

Details of Unitholders Holding More Than 5% Units In The Trust

Name of Unitholders	As at March 31, 2024		As at March 31, 2023	
	No of Units	%	No of Units	%
Ontario Limited	32,80,50,150	25.00%	18,16,01,300	25.00%
CPP Investment Board Private Holdings Inc.	32,80,50,150	25.00%	18,16,01,300	25.00%
SBI Balanced Advantage Trust	6,31,60,260	4.81%	6,31,60,260	8.69%
National Highways Authority of India (NHAI)	20,30,72,000	15.48%	11,52,02,600	15.86%

As per records of the Trust, including its register of unitholders and other declaration received from unitholders regarding beneficial interest, the above unitholding represent both legal and beneficial ownership of units.

The Trust has not allotted any fully paid-up units by way of bonus units nor has it bought back any class of units from the date of incorporation till the balance sheet date. Further the Trust has not issued any units for consideration other than cash during the year.

Reconciliation of number of units outstanding is set out below:

Particulars	As at March 31, 2024		As at March 31, 2023	
	No of Units	Amount (amounts in ₹ lakh)*	No of Units	Amount (amounts in ₹ lakh)*
Number of Units at the beginning of the year	72,64,05,200	7,44,165.67	59,52,00,000	6,01,152.00
Units issued during the year	58,57,95,400	7,27,206.41	13,12,05,200	1,43,013.67
Number of Units at the end of the year	1,31,22,00,600	14,71,372.08	72,64,05,200	7,44,165.67

* Amount related to issue expenses are not deducted in the reconciliation of number of unit capital outstanding.

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17 Other equity

(All amounts in ₹ lakh unless otherwise stated)

Reserves and Surplus	As At March 31, 2024	As At March 31, 2023
Retained Earnings		
Balance at the beginning of the year	**(2,469.86)**	**6,768.43**
Total comprehensive income for the year	29,419.57	25,689.57
Other Comprehensive Income for the year	0.13	-
Less:		
Distribution to unit holders^		
Interest	53,701.68	34,183.66
Other Income	789.60	744.20
Balance at the closing of the year	**(27,541.44)**	**(2,469.86)**

^The distribution relates to the distributions during the financial year along with the distribution related to the last quarter of FY 2022-23 and does not include the distribution relating to the period February 01, 2024 to March 31, 2024 which will be paid after March 31, 2024. The distributions by the Trust to its unit holders are based on the Net Distributable Cash Flows of the Trust under the SEBI InvIT Regulations.

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18 Borrowings: Non Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Secured		
Non-Convertible Debenture	1,50,000.00	1,50,000.00
Less: Unamortized Borrowing Cost	1,360.91	1,411.80
Total (A)	**1,48,639.09**	**1,48,588.20**

Note:- Other terms and conditions of NCD

i) Interest rate: 7.90% p.a payable semi annually.

ii) Terms of repayment: Redemption of respective STRPP shall be made in equal instalments
i) STRPP A - starting from eigth anniversary of deemed date of allotment till thirteenth anniversary.
ii) STRPP-B- starting from thirteenth anniversary of deemed date of allotment till eighteenth anniversary.
iii) STRPP-C- starting from eighteenth anniversary of deemed date of allotment till twenty fifth anniversary.

Term Loan:		
From Banks	7,21,927.70	1,45,987.43
From Financial Institution	3,05,000.00	-
	10,26,927.70	**1,45,987.43**
Less: Current Maturities of Long Term borrowings (Refer Note 21)	10,054.00	2,000.00
Less: Unamortised Borrowing Cost	2,117.85	417.30
Total (B)	**10,14,755.85**	**1,43,570.13**
Grand Total C = (A+B)	**11,63,394.94**	**2,92,158.33**

During the year ended 31st March 2024, the Trust has obtained the sanction of Rs. 877 Crores from the Axis bank for initial improvement works of Round 2 Assets. Further Trust has obtained sanction of Rs. 9,000 Crores from banks and financial institution for acquistion of Round 3 Assets and has taken a disbursement of Rs. 8,658 Crore during the year.

Loan from Banks include loan received from IDBI Bank which is Promoter of IDBI Trusteeship Services Limited (ITSL) - Trustee of the Trust, therefore the transactions with IDBI Bank are disclosed in Related Party Transaction.

Note:- Other terms and conditions of Term Loans

i) Interest rate: Benchmark Rate plus spread applicable on each reset date for facility agreement.

ii) Terms of repayment: Repayable in unstructured quarterly instalments with last repayment date upto March 31, 2041 & March 31, 2042 for facility agreement of R1 & R2 Assets respectively.
Repayable in unstructured quarterly instalments with last repayment date upto March 31, 2042 for facility agreement of R3 Asset.

Security for Term Loans :
The loan is secured by,
- first pari passu charge on all immovable assets (if any), movable assets and receivables of the Trust including but not limited to,
(i) the interest and principal repayments on the loans advanced by the Trust to Project SPVs
(ii) dividends to be paid by Project SPVs to the Trust
- first pari passu Security Interest on Trust Escrow account and all sub-accounts thereunder, including DSRA.
- pledge of 100% equity shares of Project SPVs' (NHIPPL & NEPPL) in dematerialized form held by the Trust
- assignment of loans advanced by the Trust to Project SPVs (NHIPPL & NEPPL) and securities created by the Trust including the assignment of rights of substitution, termination and invocation of provision of Escrow agreement in case of default.
- negative lien on immovable assets (including current assets and cash flows) of the Project SPVs (NHIPPL & NEPPL) subject to sale of obsolete items or cars/ ambulances, old toll equipment etc., under normal business practice, subject to maximum cumulative value of INR 5 Crore in any financial year for R1 projects / INR 2 Crore per project in any financial year for R2 & R3.

The senior lenders of the Trust have also been provided with a corporate guarantee from Project SPV (NHIPPL) to guarantee upto the secured obligations of the Trust. The funds have been raised at Trust level from unitholders and domestic lenders, and the same have been lent to Project SPV (NHIPPL) for payment of concession fee by NHIPPL to NHAI. The cashflows viz., toll collections are lying in NHIPPL. Accordingly, corporate guarantee amounting upto the secured obligations of the Trust via Corporate Guarantee Deed dated 14.03.2022 and 08.01.2024, valid across the tenure of the loan of the Trust i.e. up to 31.03.2041 and 31.03.2042 respectively, has been provided by the Project SPV (NHIPPL) to the senior lenders of the Trust.

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Nature of Security for Non Convertible debentures:
The debenture holders are secured by :

a) a first ranking pari passu Security Interest over the Trust's immovable assets (if any), both present and future. The Trust does not own any immovable property at the present time. In the event, the Trust acquires any immovable property in future, the Trust shall mortgage said property within 180 (one hundred eighty) days from the date of acquisition of such immovable assets. The Debenture Trustee shall be authorised to do all acts, deeds, and enter into necessary documents, agreement, amendments and/or modifications, as may be required to give effect the same, including carrying out the due diligence as may be required by Debenture Trustee;
b) a first ranking pari passu Security Interest over the Hypothecated Assets (including Receivables), both present and future; and
c) Negative Lien Undertaking
d) corporate guarantee executed by the Project SPV (NHIPPL) in favour of the Debenture Trustee for guaranteeing the due repayment of the secured obligations in accordance with the terms of the Debenture Trust Deed.

The non convertible debenture holders of the Trust acting through debenture trustee have also been provided with a corporate guarantee from Project SPV (NHIPPL) to guarantee the repayment of amount raised from non convertible debenture holders by the Trust. The funds have been raised at Trust level from debentureholders, have been lent to Project SPV (NHIPPL) for payment of concession fee by NHIPPL to NHAI. Accordingly, corporate guarantee amounting upto the secured obligations via Corporate Guarantee Deed dated 21.10.2022 is valid till all outstanding principal and accrued interest payable by the Trust are satisfied to the non convertible debenture holders of the Trust.

There have been no breaches in financial covenants with respect to the borrowings from either senior lenders or debenture holders.

19 Other Financial liabilities: Non Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Creditors for capital supplies and services	80.90	-
	80.90	**-**

20 Provisions: Non Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars		As at March 31, 2024	As at March 31, 2023
Provision for employees benefits			
Gratuity (unfunded)	(Refer Note 39)	25.31	4.41
Leave Encashment (unfunded)	(Refer Note 39)	33.39	6.96
Provision for major maintenance	(Refer Note 53)	15,222.28	6,307.44
Provision for Infrastructure Upgrade	(Refer Note 54)	20,642.34	-
Total		**35,923.32**	**6,318.81**

a) Nature of provisions for major maintenance

The company is required to operate and maintain the project tollway during the entire concession period and hand over the project back to NHAI as per the maintenance standards prescribed in concession agreements. For this purpose, a regular maintenance along with periodic maintenance is required to be performed. Normally, periodic maintenance includes resurface of pavements, repairs of structures and other equipment and maintenance of service roads. As per industry practice, the periodic maintenance is expected to occur once in five to seven years. The provisions for MMR as per industry practice has been made based on the first cycle of of overlay expected to occur in five to seven years and not based on the total MMR cost over entire concession period. The discounting rate used for arriving at the present value for MMR provisions is government bond rate of 30 years for projects acquired in first phase and 20 years for projects acquired in second phase. The maintenance cost / bituminous overlay may vary based on the actual usage during maintenance period. Accordingly, on the grounds of matching cost concept and based on technical estimates, a provision for major maintenance expense is reviewed and is provided for in the financial statements in each reporting period. Considering that the expense to be incurred is depended on various factors including the usage, wear and tear of the toll road, bituminous overlay, etc., it is not possible to estimate the exact timing and the quantum of the cashflow.

Details of movement in Provisions

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Opening Balance	6,307.44	403.29
Add: Accretion during the year	-	-
Provision for Major Maintenance Obligation	8,444.05	5,879.20
Unwinding finance cost on major maintenance provision	470.79	24.95
Less: Utilized during the year	-	-
Closing Balance	**15,222.28**	**6,307.44**

21 Borrowings: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Current Maturities of Long Term borrowings (Refer Note No.18)	10,054.00	2,000.00
Total	**10,054.00**	**2,000.00**

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22 Trade Payables: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Total outstanding, dues of micro and small enterprises	275.99	137.23
Total outstanding, dues of creditors other than micro and small enterprises (Outstanding for less than 12 months from the due date of payment)	4,479.00	3,871.17
Total	**4,754.99**	**4,008.40**

Note:-

Details of dues to micro and small enterprises as per MSMED Act, 2006.

The group has certain dues to suppliers registered under Micro, Small and Medium Enterprises Development Act, 2006 ('MSMED Act'). The disclosures pursuant to the said MSMED Act are as follows:

	As at March 31, 2024	As at March 31, 2023
a) The principal amount remaining unpaid to any supplier at the end of the year	275.99	137.23
b) Interest accrued and due thereon to suppliers under MSMED Act on the above amount remaining unpaid to any supplier at the end of year.	-	-
c) The amount of interest paid by the buyer in terms of section 16 of the MSMED Act, 2006, along with the amount of the payment made to the supplier beyond the appointed day during the year	-	-
d) The amount of interest due and payable for the period of delay in making payment (which have been paid but beyond the appointed day during the year) but without adding the interest specified under the MSMED Act, 2006	-	-
e) The amount of interest accrued and remaining unpaid at the end of each accounting year	-	-
f) The amount of further interest remaining due and payable even in the succeeding years, until such date when the interest dues above are actually paid to the small enterprises, for the purpose of disallowance of a deductible expenditure under section 23 of the MSMED Act, 2006	-	-
Disclosure of payable to vendors as defined under the "Micro, Small and Medium Enterprise Development Act, 2006" is based on the information available with the group regarding the status of registration of such vendors under the said Act, as per the intimation received from them on requests made by the group.	-	-

Trade Payable ageing schedule as at March 31, 2024

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Not due*	Outstanding for following period from due date of payment.				
		Less than 1 Year	1-2 Years	2-3 Years	More than 3 Years	Total
i) MSME	-	275.99	-	-	-	275.99
ii) Others	3,884.28	534.02	60.70	-	-	4,479.00
iii) Disputed dues - MSME	-	-	-	-	-	-
iv) Disputed dues - Others	-	-	-	-	-	-

* Trade Payables include unbilled payables amounting to Rs 3,884.28 Lakhs.

Trade Payable ageing schedule as at March 31, 2023

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Not due*	Outstanding for following period from due date of payment.				
		Less than 1 Year	1-2 Years	2-3 Years	More than 3 Years	Total
i) MSME	-	137.23	-	-	-	137.23
ii) Others	2,468.10	1,403.07	-	-	-	3,871.17
iii) Disputed dues - MSME	-	-	-	-	-	-
iv) Disputed dues - Others	-	-	-	-	-	-

* Trade Payables include unbilled payables amounting to Rs 2,468.10 Lakhs.

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23 Other Financial Liabilities: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Interest accrued but not due on NCD	5,162.05	5,129.59
Double toll Fee payable to NHAI	10.19	151.17
Security Deposit	4.19	4.19
Employees payable	2.18	-
Payable to NHIMPL	41.69	-
Creditors for capital supplies and services	2,004.23	-
Total	**7,224.53**	**5,284.95**

24 Provisions: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Provision for Employee Benefits		
Leave Encashment (unfunded)	2.01	0.55
Gratuity (unfunded)	0.07	0.01
Provision for Infrastructure Upgrade	79,402.58	-
Total	**79,404.66**	**0.56**

25 Current Tax Liabilities (Net)

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Provision for Income Tax	188.74	8.98
Less: Advance Tax & TDS Receivable	(7.08)	
Total	**181.66**	**8.98**

Reconciliation of Current Tax Liabilities

Particulars	As at March 31, 2024	As at March 31, 2023
Opening Balance	8.98	161.77
Add: Income Tax Payable for the year	886.30	473.89
Less: Income taxes paid during the year (including earlier year taxes)	(713.62)	(626.68)
Closing Balance	**181.66**	**8.98**

26 Other Current Liabilities

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Statutory dues payable	462.78	226.85
Unearned Revenue	-	2.12
Advance received	0.45	5.00
Employees payable	-	6.64
Total	**463.23**	**240.61**

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27 Revenue from operations

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
Sale of Services		
Revenue from Toll Collection	94,390.77	68,708.93
Other Operative Revenue		
Interest on delay in Toll Remittance	-	8.27
Total	**94,390.77**	**68,717.20**

28 Interest income

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
On fixed deposits with banks	871.71	373.43
Total	**871.71**	**373.43**

29 Profit on sale of investments

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
Profit on redemption of Mutual Funds	2,141.16	671.17
Total	**2,141.16**	**671.17**

30 Other Income

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
Other non operating income		
Liabilities no longer required written back	32.06	-
Other Income	27.47	326.11
Total	**59.53**	**326.11**

31 Operating Expenses

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
Operation and Maintenance Expenses	5,221.55	3,145.85
Major Maintenance Obligation	8,444.05	5,879.20
Total	**13,665.60**	**9,025.05**

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32 Employee Benefit Expenses

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
Salaries and wages	961.98	222.98
Contribution to provident and other funds (Refer note 39(i))	65.87	15.27
Gratuity Expenses (Refer note 39(ii)A)	21.09	4.42
Leave Encashment Expense (Refer note 39(ii)B)	31.34	7.51
Staff Welfare Expenses	43.06	38.84
Employee Insurance Policy	29.23	-
Relocation and Transfer Expenses	4.03	-
Total	**1,156.60**	**289.01**

33 Finance Cost

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
Interest on Long term borrowings	13,059.49	11,244.91
Interest on Debentures	11,882.48	5,129.59
Unwinding finance cost on major maintenance provision	470.79	24.95
Unwinding interest on infrastructure upgrade	2,396.83	-
Other Finance Charges	213.58	221.87
Total	**28,023.17**	**16,621.32**

34 Depreciation and Amortization Expenses

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
Depreciation on Property, Plant and Equipment	48.30	7.51
Amortization on Intangible Assets	24,722.74	17,553.12
Total	**24,771.04**	**17,560.63**

35 Audit Fees

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
Statutory audit fees	8.14	4.53
Limited review fees	8.82	2.26
Tax audit fees	1.53	0.94
Total	**18.49**	**7.73**
Certification and other charges	1.72	0.93
Total	**1.72**	**0.93**

Further an amount of Rs.3 lakhs (March 31, 2023: Rs 6 lakh) paid to auditor as certification charges has been booked as part of one time expenses in the Unit Capital. (Refer note no 16)

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36 Other Expenses

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
Advertisement expenses	19.81	35.75
Legal and Professional fees	1,262.92	1,542.22
Community Engagement Program	39.84	-
Director's sitting fees	18.88	15.10
Travelling and conveyance	81.43	19.80
Training and Seminar Expenses	41.42	7.21
Guest House Expenses	16.71	
Telephone and internet charges	41.29	6.58
Power and fuel	253.79	58.78
Environment, health and safety expenses	64.22	13.06
Fee, subscription & taxes	380.72	43.42
Recruitment expenses	2.25	
Bank charges	2.12	1.53
Data Management Expenses	1.50	3.00
Provision for expected credit loss	-	59.60
Vehicle hire charges	186.01	63.58
Repair and maintenance expenses	38.71	14.71
Preliminary Expenses written off	2.55	-
Bad Debts Written Off	-	9.90
Directors Strategy Meet Expenses	16.41	-
Miscellaneous expenses	99.04	30.03
Total	**2,569.62**	**1,924.27**

37 Tax Expense

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
Current Tax	886.30	473.89
Provision for Taxation–Earlier years	(2.52)	0.01
	883.78	**473.90**
Deferred tax expense/(credit)	(6,837.88)	(4,422.79)
	(5,954.10)	**(3,948.89)**

Effective tax Reconciliation:

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	For the year ended March 31, 2024	For the year ended March 31, 2023
Accounting Profit before Income Taxes	23,465.47	21,740.68
Tax at India's statutory income tax rate for SPVs (25.17%)	(18,569.40)	(14,086.70)
Tax at India's statutory income tax rate for Business Trusts - Maximum Marginal Rate (42.744%)	41,681.52	33,215.05
Increase/ (reduction) in taxes on account of:		
Impact of deferred tax on reversible allowance/ disallowance of business expense and income, as per Indian Income Tax Act, 1961	11,920.25	9,663.91
Impact of exemption u/s 10(23FC) of the Indian Income Tax Act, 1961 available to the Trust	(40,986.47)	(32,741.15)
Income tax expense reported in the statement of profit and loss	**(5,954.10)**	**(3,948.89)**

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38 Earning per Unit

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
Basic and diluted EPU		
Net Profit/ loss available for unitholders (in ₹ lakh)	29,419.70	25,689.57
Weighted average number of units for EPU computation	75,36,14,275.96	65,66,68,737.53
EPU- Basic and diluted	**3.90**	**3.91**

Basic EPU amounts are calculated by dividing the profit for the period/ year attributable to Unit holders by the weighted average number of units outstanding during the period/ year. Diluted EPU amounts are calculated by dividing the profit/(loss) attributable to unit holders by the weighted average number of units outstanding during the period/ year plus the weighted average number of units that would be issued on conversion of all the dilutive potential units into unit capital.

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39 Disclosure pursuant to Ind As 19 " Employee benefits'

i) Defined contribution plan

The group has provident fund which is the defined contribution plan. The group is required to contribute a specified percentage of payroll costs to the recognised provident fund to fund the benefits. The only obligation of the group with respect to these plans is to make the specified contributions.

An amount of Rs. 65.87 lakhs (March 31,2023 : Rs 15.27 lakhs being contribution made to recognised provident fund is is recognised as expense and included under Employee benefits expense (refer Note 32) in the Statement of Profit and Loss.

(ii) Defined benefit plans:

A Disclosure of gratuity

a) Features of its defined benefit plans:

The group has a unfunded defined benefit gratuity plan. The gratuity plan is governed by the Payment of Gratuity Act, 1972 (' the Gratuity Act'). Under the Act, employee who has completed five years of service is entitled to specific benefit.The level of benefits provided depends on the member's length of service and salary at retirement age. Every employee who has completed five years or more of service gets a gratuity on departure at 15 days salary (last drawn salary) for each completed year of service as per the provision of the Act.

The key features are as under:

Plan Features

i	Benefit offered	15/ 26 × salary × duration of service
ii	Salary Definition	Basic salary including dearness allowance (if any)
iii	Benefit ceiling	Benefit ceiling of Rs. 20,00,000 was applied
iv	Vesting conditions	5 years of continuous service (not applicable in case of death/disability)
v	Benefit eligibility	Upon death or resignation / withdrawal or retirement
vi	Retirement age	60 Years (or) end of concession period, whichever is earlier

The amounts recognised in Balance Sheet are as follows : (All amounts in ₹ lakh unless otherwise stated)

Particulars	As at 31 March 2024		As at 31 March 2023	
	Current	Non-current	Current	Non-current
Gratuity	0.07	25.31	0.01	4.41
Leave encashment	2.01	33.39	0.55	6.96
Total	**2.08**	**58.70**	**0.56**	**11.37**

(i) Amount recognised in the statement of profit and loss is as under:

(All amounts in ₹ lakh unless otherwise stated)

Description	As at 31 March 2024	As at 31 March 2023
Current service cost	20.77	4.42
Interest cost	0.33	-
Net impact on profit (before tax)	**21.10**	**4.42**
Actuarial loss/(gain) recognized during the year	(0.13)	-
Amount recognized in total comprehensive income	**20.97**	**4.42**

(ii) Change in the present value of obligation:

(All amounts in ₹ lakh unless otherwise stated)

Description	As at 31 March 2024	As at 31 March 2023
Present value of defined benefit obligation as at the beginning of the year	4.42	-
Current service cost	20.77	4.42
Interest cost	0.33	-
Benefits paid		
Actuarial loss/(gain)	(0.13)	-
Present value of defined benefit obligation as at the end of the year	**25.39**	**4.42**

(iii) Reconciliation of present value of defined benefit obligation and the fair value of assets:

(All amounts in ₹ lakh unless otherwise stated)

Description	As at 31 March 2024	As at 31 March 2023
Present value of unfunded obligation as at the end of the year	25.39	4.42
Fair value of plan assets as at the end of the period funded	-	-
Unfunded net liability recognized in balance sheet	**25.39**	**4.42**

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(iv) **Breakup of actuarial (gain)/loss:**

(All amounts in ₹ lakh unless otherwise stated)

Description	As at 31 March 2024	As at 31 March 2023
Actuarial (gain)/loss from change in demographic assumption	-	-
Actuarial (gain)/loss from change in financial assumption	-	-
Actuarial (gain)/loss from experience adjustment	(0.13)	
Total actuarial (gain)/loss	**(0.13)**	-

(v) **Actuarial assumptions**

Description	As at 31 March 2024	As at 31 March 2023
Discount rate	7.38%	7.38%
Rate of increase in compensation levels	7.00%	7.00%
Retirement age (years)	60	60

Notes:

1) The discount rate is based on the prevailing market yield of Indian Government bonds as at the balance sheet date for the estimated terms of obligations.

2) The estimates of future salary increases considered takes into account the inflation, seniority, promotion and other relevant factors.

(vi) **Expected expense for the next annual reporting period**

(All amounts in ₹ lakh unless otherwise stated)

Description	As at 31 March 2024	As at 31 March 2023
Service cost	32.14	12.16
Interest cost	1.83	0.33
Actuarial loss/(gain)	-	-
Expected Expense for the next annual reporting period	**33.97**	**12.49**

(vii) **Sensitivity analysis for gratuity liability**

(All amounts in ₹ lakh unless otherwise stated)

Description	As at 31 March 2024	As at 31 March 2023
Impact of change in discount rate		
Present value of obligation at the end of the year	25.39	4.42
- Impact due to increase of 0.5 %	(1.74)	(0.33)
- Impact due to decrease of 0.5 %	1.91	0.37
Impact of change in salary increase		
Present value of obligation at the end of the year	25.39	4.42
- Impact due to increase of 0.5 %	1.91	0.36
- Impact due to decrease of 0.5 %	(1.75)	(0.33)

The above sensitivity analysis is based on a change an assumption while holding all other assumptions constant. In practice, this is unlikely to occur and changes in some of the assumptions may be correlated. When calculating the sensitivity of the defined benefit obligation to significant actuarial assumptions the same method (present value of the defined benefit obligation calculated with the projected unit credit method at the end of the reporting period) has been applied which was applied while calculating the defined benefit obligation liability recognized in the balance sheet.

The methods and types of assumptions used in preparing the sensitivity analysis did not change compared to previous year.

(viii) **Maturity profile of defined benefit obligation**

(All amounts in ₹ lakh unless otherwise stated)

Description	As at 31 March 2024	As at 31 March 2023
Within next 12 months	0.07	0.01
Between 1-5 years	3.28	0.11
5 to 6 years	0.58	0.23
Beyond 6 years	21.44	4.07

B Leave encashment

Amount recognized in the statement of profit and loss is as under:

(All amounts in ₹ lakh unless otherwise stated)

Description	As at 31 March 2024	As at 31 March 2023
Current service cost	29.88	7.51
Interest cost	0.55	-
Actuarial loss/(gain) recognized during the year	0.91	-
Amount recognized in the statement of profit and loss	**31.34**	**7.51**

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40 Statement of Related Parties

A. List of Related Parties as per requirement of IND AS 24 – "Related Party Disclosures"

Enterprises where Control / significant influence exists	**National Highways Infra Projects Private Limited ('NHIPPL') (Subsidiary Company)**
	NHIT Eastern Projects Private Limited ('NEPPL') (Subsidiary Company)

B. List of additional related parties as per Regulation 2(1)(zv) of the SEBI InvIT Regulations

Parties to the Trust

National Highways Infra Investment Managers Private Limited (NHIIMPL) - Investment Manager (IM) of the Trust
IDBI Trusteeship Services Limited (ITSL) - Trustee of the Trust
National Highways Authority of India (NHAI)- Sponsor
National Highways InvIT Project Managers Private Limited (NHIPMPL)- Project Manager

Promoters of the Parties to the Trust specified above

Government of India (acting through Ministry of Road, Transport & Highways (MORTH)) - Promoter of NHIIMPL
IDBI Bank Limited (IDBI Bank) - Promoter of ITSL
Government of India (acting through Ministry of Road, Transport & Highways (MORTH)) - Promoter of NHAI
National Highways Authority of India (NHAI)- Promoter of NHIPMPL

Directors of the parties to the Trust specified above

Directors of NHIIMPL
Mr. Suresh Krishan Goyal
Mr. Shailendra Narain Roy
Mr. Mahavir Prasad Sharma
Mr. Pradeep Singh Kharola
Mr. N.R.V.V.M.K. Rajendra Kumar
Mr. Sumit Bose
Mr. Bruce Cane (Ceased to be Director w.e.f. 07.11.2023)
Mr. Amit Kumar Ghosh (Ceased to be Director w.e.f. 15.11.2023)
Ms. Kavita Saha (Ceased to be Director w.e.f. 08.11.2023)
Mr. Pushkar Vijay Kulkarni (Appointed as Director w.e.f. 08.11.2023)
Mr. Debapratim Hajara (Appointed as Director w.e.f. 08.11.2023)
Mr. Vinay Kumar (Appointed as Nominee Director w.e.f. 27.03.2024)
Ms. Usha Monari (Appointed as Woman Independent Director w.e.f. 16.04.2024)

Directors of NHIPPL
Mr. Suresh Krishan Goyal
Mr. Shailendra Narain Roy
Mr. Mahavir Prasad Sharma
Mr. Muralidhara Rao Bugatha
Mr. N.R.V.V.M.K. Rajendra Kumar

Directors of NEPPL
Mr. Suresh Krishan Goyal
Mr. Mathew George
Mr. Mahavir Prasad Sharma (Appointed as Director w.e.f. 15.04.2024)
Mr. Shailendra Narain Roy (Appointed as Director w.e.f. 15.04.2024)

Directors of ITSL
Mr. Pradeep Kumar Jain
Ms. Jayashree Vijay Ranade
Mr. Pradeep Kumar Malhotra
Ms. Baljinder Kaur Mandal
Ms. Jayakumar Subramoniapillai

Directors of NHIPMPL
Mr. Akhil Khare
Mr. Ashish Kumar Singh

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C. Transactions with Related Parties during the year

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Year ended 31st March 2024	Year ended 31st March 2023
National Highways Infra Investment Managers Private Limited (NHIIMPL)		
Investment Manager Fee	1,800.00	1,491.17
Advance Investment Manager Fee Paid	4.93	86.06
Expense incurred by NHIIMPL on behalf of NHIT	15.35	39.79
Expenses incurred on behalf of NEPPL by NHIIMPL	25.00	-
Other Support Services to NHIPPL	22.96	3.12
Expenses incurred by NHIPPL for NHIIMPL Behalf	0.65	-
Reimbursement of Expenses	-	0.07
National Highways Authority of India (NHAI)		
Issue of units of Trust to NHAI	1,09,081.07	21,366.83
Interest and other income distribution	8,641.92	5,589.34
Payment related to aquisition of intangible assets	-	2,84,966.66
O & M Expenses	96.03	1,152.32
Double toll fees	528.00	679.17
Reimbursement for Initial Improvement Works	3,146.59	-
Independent engineers fees	228.56	345.38
IDBI Trusteeship Services Limited (ITSL)		
Payment of Trustee Fee	9.60	12.73
Other fees related to Round 1 & 2 Assets	1.50	3.54
Other Fees related to Round 3 Assets ("Project Leap")	17.58	-
IDBI Bank Limited		
Secured Loan given to NHIT	10,000.00	-
Interest Expense incurred on Loan given to NHIT	4.38	-
Repayment of Principal Amount	0.00	-
Loan Processing Fees Paid to them	41.30	-
National Highways InVIT Project Managers Private Limited (NHIPMPL)		
Project Manager Fees	1,168.20	991.20

D. Summary of Transactions with Key Managerial Personnel (KMP)

(All amounts in ₹ lakh unless otherwise stated)

Name of KMP and Nature of Transaction	Year ended 31st March 2024	Year ended 31st March 2023
Mr. Suresh Krishan Goyal - Reimbursement of Expenses	0.79	0.39
Mr. M.P. Sharma - Director's Sitting Fees	8.00	6.40
Mr. Shailendra Narain Roy - Director's Sitting Fees	8.00	6.40
Mrs. Ajanta Sen - Short Term Employment Benefits	-	1.84
Mr. Arun Kumar Jha - Short Term Employment Benefits	69.35	-
Mr. Arun Kumar Jha - Reimbursement of Expenses	3.31	-
Mr. Bhanu Sharma (CS) - Short Term Employment Benefits	7.49	3.91
Mr. Bhanu Sharma (CS) - Reimbursement of Expenses	0.47	-
Ms. Aashima Agarwal (CS)- Short Term Employment Benefits	6.28	-
Ms. Aashima Agarwal (CS)- Reimbursement of Expenses	0.58	-

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E. Closing Balances with Related Parties

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
National Highways Authority of India (NHAI)		
Issue of units of Trust to NHAI	2,27,003.91	1,17,922.83
O & M Expenses payable	717.98	880.35
Double toll fees payable	10.19	151.17
Independent Engineers Fees payable	451.45	276.03
Amount Payable for Initial Improvement Works	829.65	-
National Highways Infra Investment Managers Private Limited (NHIIMPL)		
Advance IM Fee	4.93	-
IM Fee Payable	-	1.89
Payable by NHIPPL for Other Support Services	16.69	-
Expenses Payable	-	0.48
Amount Payable by NEPPL for expenses incurred on their behalf by NHIIMPL	25.00	-
IDBI Trusteeship Services Limited		
Trustee Fee Payable	1.73	1.73
Other Fees related to Round 3 Assets ("Project Leap")	2.68	-
IDBI Bank Limited		
Outstanding Secured Loan Amount	9,999.99	-
National Highways InVIT Project Managers Private Limited (NHIPMPL)		
Project Manager Fees Payable	540.00	762.50

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41 Disclosure as per Ind AS 115, "Revenue from contracts with customers"

A Disaggregation of revenue

Revenue recognised mainly comprises of revenue from toll collections, claims with NHAI, contract revenue. Set out below is the disaggregation of the Group's revenue from contracts with customers:

(All amounts in ₹ lakh unless otherwise stated)

Description	For the year ended March 31, 2024	For the year ended March 31, 2023
Operating revenue		
(a) Toll income (User Fee) from Highways	94,390.77	68,708.93
(b) Interest on delay in Toll Remittance	-	8.27
Total revenue	**94,390.77**	**68,717.20**

The table below presents disaggregated revenues from contracts with customers based on nature, amount and timing:

S.No.	Types of Products by Nature	Types of Services by Timing	For the year ended March 31, 2024	For the year ended March 31, 2023
1	Services	At the point in time	94,390.77	68,717.20

B Assets and liabilities related to contracts with customers

The following table provides information about receivables, contract assets and contract liabilities from contract with customers:

Description	As At March 31, 2024	As At March 31, 2023
	Current	Current
Contract assets		
Trade receivables:		
- Receivables under service concession arrangements	385.20	350.87
Total	**385.20**	350.87

C. Performance Obligation

Income from toll collection

The performance obligation in service of toll collection is recorded as per rates notified by NHAI and approved by management and payment is generally due at the time of providing service.

Contract revenue

The performance obligation under service concession agreements ('SCA') is due on completion of work as per terms of SCA.

D. Disclosure as per Appendix - C & D of Ind AS 115 - " Service Concession Arrangements"

All the below service concession arrangement have been accounted under intangible asset model

Till year ended March 31, 2024

Name of Concessionaire	Start of Concession period under concession agreement (Appointed Date)	End of Concession period under concession agreement	Period of Concession since the appointed date (in days)
National Highways Infra Projects Private Limited	16.12.2021	15.12.2051	837
National Highways Infra Projects Private Limited	29.10.2022	28.10.2042	520

The above TOT projects shall have following rights / obligations in accordance with the Concession Agreement entered into with the respective Government Authorities

a. Right to use the Specified Assets
b. Obligations to provide or rights to except provision of services
c. Obligations to deliver or rights to receive at the end of concession

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42 Capital Management

For the purpose of the Group's capital management, capital includes issued unit capital and all other reserves attributable to the unit holders of the Group.

The primary objective of the Group's capital management is to ensure that it maintains a strong credit rating and healthy capital ratios in order to support its business and maximise unit holder value.

The Group manages its capital structure and makes adjustments to it in light of changes in economic conditions and the requirements of the financial covenants. To maintain or adjust the capital structure, the Group may adjust the dividend payment / income distribution to unit holders (subject to the provisions of SEBI InvIT Regulations which require distribution of at least 90%of the net distributable cash flows of the Group to unit holders), return capital to unit holders or issue new units. The Group monitors capital using a gearing ratio, which is net debt divided by total capital plus net debt. The Group's policy is to keep the gearing ratio optimum.

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Net Debt Components:		
Long Term Borrowings (Non-Current portion)	11,63,394.94	2,92,158.33
Current Maturities of Long-Term Borrowings	10,054.00	2,000.00
Trade Payables	4,754.99	4,008.40
Other financial liabilities	7,305.43	5,284.95
Less: Cash and Cash Equivalents	(46,400.78)	(21,124.08)
Less: Other Financial Assets comprising DSRA FDs	(10,687.46)	(9,670.84)
Net Debt (i)	**11,28,421.12**	**2,72,656.76**
Capital Components:		
Unit Capital	14,67,093.47	7,41,604.32
Initial Settlement Amount	0.10	0.10
Other Equity	(27,541.44)	(2,469.86)
Total Capital (ii)	**14,39,552.13**	**7,39,134.56**
Capital and Debt [(iii) = (i) + (ii)]	**25,67,973.25**	**10,11,791.32**
Gearing Ratio (i)/(iii)	**43.94%**	**26.95%**

Financial Covenants:

In order to achieve this overall objective, the Board of Directors of Investment Manager, amongst other things, aims to ensure that it meets financial covenants attached to the interest-bearing loans and borrowings that define capital structure requirements. Breaches in meeting the financial covenants would permit the lenders to call loans and borrowings. There have been no breaches in the financial covenants of any interest-bearing loans and borrowing in the current year. No changes were made in the objectives, policies or processes for managing capital during the years ended March 31, 2024 and March 31, 2023.

43 Financial Risk Management Objectives and Policies

The Group is in the process of formulation of its risk management policies with an objective of identification and analysis of risks faced by the Group, to set appropriate risk limits and controls, and to monitor risks and adherence to limits. Risk management policies shall be reviewed regularly to reflect changes in market conditions and the Group's activities.

The Board of Directors of Investment Manager has overall responsibility for the establishment and oversight of the Group's risk management framework.

In performing its operating, investing and financing activities, the Group is exposed to the Credit risk, Liquidity risk and Market risk.

Market Risk

Market risk is the risk that the fair value of future cash flows of a financial instrument will fluctuate because of changes in market prices. Market risk comprises three types of risk: interest rate risk, currency risk and other price risk. Financial instruments affected by market risk include loans and borrowings, Receivable and Payables and Investments measured at FVTPL.

The sensitivity analyses in the following sections relate to the position as at March 31, 2024 and March 31, 2023.

The sensitivity analyses have been prepared on the basis that the amount of net debt, the ratio of fixed to floating interest rates of the debt are all constant.

The following assumptions have been made in calculating the sensitivity analyses:

The sensitivity of the relevant profit or loss item is the effect of the assumed changes in respective market risks. This is based on the financial assets and financial liabilities held at March 31, 2024 & March 31, 2023.

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Foreign Currency Risk

Foreign currency risk is the risk that the fair value or future cash flows of an exposure will fluctuate because of changes in foreign exchange rates. The Group transacts business primarily in Indian Rupees only, and hence, the sensitivity of profit and loss of the Group to a possible change in foreign exchange rates is non-existent as on 31st March, 2024 and 31st March, 2023.

Interest Rate Risk

Interest rate risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market interest rates. Exposure to risk of changes in market interest rates generally relates primarily to long-term debt obligations with floating interest rates.

The following table provides a break-up of the group fixed and floating rate borrowings:

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Floating Rate Borrowings	10,26,927.70	1,45,987.43

Sensitivity analysis based on average outstanding Debt:

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Increase or decrease in interest rate by 25 basis points	2,567.32	364.97

Price Risk

Price risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market prices (other than those arising from interest rate risk or currency risk).

Credit risk

Credit risk is the risk that counterparty will not meet its obligations under a financial instrument or customer contract, leading to a financial loss. With respect to credit risk arising from other financial assets of the Group, which comprise Balances with banks, Trade Receivables, Loans and Advances and Investments. The Group's exposure to credit risk arises from default of the counterparty, with maximum exposure equal to the carrying amount of these instrument.

The carrying value of financial assets represents the maximum credit risk. The maximum exposure to credit risk was Rs. 57,481.35 Lakh and Rs. 31,154.04 Lakh as at March 31, 2024 and March 31, 2023 respectively, being the total carrying value of Trade receivables, Investments, Balances with bank, bank deposits and other financial assets.

Liquidity Risk

Liquidity risk is the risk that an entity will encounter difficulty in meeting obligations associated with financial liabilities that are settled by delivering cash or another financial assets.

The Group is exposed to liquidity risk due to bank borrowings and trade and other payables.

The Group measures risk by forecasting cash flows.

The Group's approach to managing liquidity is to ensure, as far as possible, that it will always have sufficient liquidity to meet its liabilities when due without incurring unacceptable losses or risking damage to the Group's reputation. The Group ensures that it has sufficient funds to meet expected operational expenses, servicing of financial obligations.

In addition, processes and policies related to such risk are overseen by senior management. Management monitors the Group's net liquidity position through rolling forecast on the basis of expected cash flows.

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The table below summarises the maturity profile of the group's financial liabilities based on contractual undiscounted payments.

(All amounts in ₹ lakh unless otherwise stated)

As at 31-03-2024	Carrying Amount	<1 Yr.	1-3 Yrs.	>3 Yrs.
Term Loan	10,24,809.85	10,054.00	26,862.00	9,87,893.85
Non-Convertible Debentures	1,48,639.09	-	-	1,48,639.09
Trade Payables	4,754.99	4,754.99	-	-
Other Financial Liabilities	7,305.43	7,305.43	-	-
Total	**11,85,509.36**	**22,114.42**	**26,862.00**	**11,36,532.94**

As at 31-03-2023	Carrying Amount	<1 Yr.	1-3 Yrs.	>3 Yrs.
Term Loan	1,45,570.13	2,000.00	6,000.00	1,37,570.13
Non-Convertible Debentures	1,48,588.20	-	-	1,48,588.20
Trade Payables	4,008.40	4,008.40	-	-
Other Financial Liabilities	5,284.95	5,284.95	-	-
Total	**3,03,451.67**	**11,293.36**	**6,000.00**	**2,86,158.33**

44 Disclosure pursuant to IND AS 36 "Impairment of Assets"

Based on impairment testing done which involves review of the future discounted cash flows of the subsidiary, the recoverable amount is higher than the carrying amount of the investment made in the subsidiary and accordingly, no provision for impairment is required to be recognised in the books as on the reporting date. In case of goodwill based on impairment testing recoverable amount is higher then the carrying value as on the reporting date, hence no provision for impairment is required to be recognised in the books as on reporting date.

45 Financial Instrument by Category

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at 31st March, 2024			As at 31st March, 2023		
	Amortized Cost	At FTVPL	At FVOCI	Amortized Cost	At FTVPL	At FVOCI
Assets:						
Trade Receivables	385.20	-	-	350.87	-	-
Cash and Cash Equivalents	46,400.78	-	-	21,124.08	-	-
Bank Balances Other than Cash & Cash Equivalents	512.98	-	-	-	-	-
Other Financial Assets	10,182.40	-	-	9,679.09	-	-
Total	**57,481.35**	-	-	**31,154.04**	-	-
Liabilities:						
Borrowings	11,73,448.94	-	-	2,94,158.33	-	-
Trade Payables	4,754.99	-	-	4,008.40	-	-
Other Financial Liabilities	7,305.43	-	-	5,284.95	-	-
Total	**11,85,509.36**	-	-	**3,03,451.67**	-	-

Defaults and breaches

There are no defaults during the year with respect to repayment of principal and payment of interest and no breaches of the terms and conditions of the borrowings.

There are no breaches during the year which permitted lender to demand accelerated payment.

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46 Fair Values of Assets and Liabilities

The carrying amount of all financial assets and liabilities appearing in the financial statements is reasonable approximation of fair values. Fair value of the financial assets and liabilities is the amount at which the instrument could be exchanged in a current transaction between willing parties, other than in a forced or liquidation sale.

The Group is required to present the Statement of total assets at fair value and Statement of total returns at fair value as per SEBI Circular No. CIR/IMD/DF/114/2016 dated October 20, 2016 as a part of these financial statements - Refer Statement of Net assets at fair value and Statement of Total Returns at fair value

Fair Value Hierarchy

The Group uses the following hierarchy for fair value measurement of the Group's financial assets and liabilities:

Level 1 - Quoted prices (unadjusted) in active markets for identical assets or liabilities.

Level 2 – Inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly (i.e. as prices) or indirectly (i.e. derived from prices).

Level 3 - Inputs for the assets or liabilities that are not based on observable market data (unobservable inputs).

Fair value of financial assets and financial liabilities that are not measured at fair value (but fair value disclosures are required)

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Carrying Value		Fair Value	
	As at 31st March,	As at 31st March, 2023	As at 31st March, 2024	As at 31st March, 2023
Financial Assets at Amortized Cost:				
Trade Receivables	385.20	350.87	385.20	350.87
Cash and Cash Equivalents	46,400.78	21,124.08	46,400.78	21,124.08
Bank Balances Other than Cash & Cash Equivalents	512.98	-	512.98	-
Loans & Advances	-	-	-	-
Other Financial Assets	10,182.40	9,679.09	10,182.40	9,679.09
Total	**57,481.35**	**31,154.04**	**57,481.35**	**31,154.04**
Financial Liabilities at Amortized Cost:				
Borrowings*	11,73,448.94	2,94,158.33	11,73,448.94	2,94,158.33
Trade Payables	4,754.99	4,008.40	4,754.99	4,008.40
Other Financial Liabilities	7,305.43	5,284.95	7,305.43	5,284.95
Total	**11,85,509.36**	**3,03,451.67**	**11,85,509.36**	**3,03,451.67**

The carrying value of financial assets and other financial liabilities measured at amortised cost are considered to be same as their fair values largely due to their short term nature.

*The carrying valu[illegible] oximates the fair value as the instruments are at prevailing market rate

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47 Statement of Contingent Liabilities/Contingent Assets

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Contingent Liabilities		
Stamp Duty on Concession agreement on Belgaum Kagal Project (refer note (a) below)	6,990.00	-
Corporate Guarantee issued in favour of Senior Lenders & Debenture Trsutee of the Trust (refer note (c))	4,37,700.00	3,50,000.00
Contingent Assets		
Stamp Duty on Concession agreement on Belgaum Kagal Project (refer note (b) below)	6,990.00	-

a) Stamp Duty on Concession agreement on Belgaum Kagal Project - The group has received notice from Office of Deputy Registrar of Stamps, Government of Karnataka. As per this notice additional stamp duty of Rs 69.90 crore has been imposed on the group for the concession agreement entered into for Belgaum-Kagal road.

Stamp legislation in certain states (including Karnataka) also specifies that copy of the main document in respect of any property, or any business within the state also needs to be stamped with original amount of stamp duty, if the original document has not been stamped with full amount of the stamp duty applicable for place of business.

As regards to the applicability of stamp duty on Concession Agreement, it may please be noted that there is no specific entry in respect of the concession agreement. Such agreements are stamped under the residuary category of the agreements and a nominal amount was paid on such agreements. We are given to understand that the Karnataka State Govt. has given instructions to procure copies of licence /Agreement of toll collecting agencies in respect of roads passing through state of Karnataka. We have further been issued a notice for recovery of shortfall in stamp duty.

Various judicial pronouncements by various high courts have divergent views and the issue is debatable and there is no clarity on the same.

The group is contesting this imposition of deficit stamp duty on concession agreement notice with Government of Karnataka. We are also in receipt of copies of letters sent by NHAI to the Karnataka State Govt clarifying the issue. The group is in the process of filing injuction with the Dharwad bench of Karnataka High Court.

b) Contingent Assets

Stamp Duty on Concession agreement on Belgaum Kagal Project- In the event of the stamp duty becoming payable, it shall be reimbursed by NHAI as confirmed by them vide letter No. NHAI/F&A/InVIT/2021-22/CLFN_GST&SD(E-106870) dated 28.09.2021. Since no provision has been recognised in the books with respect to stamp duty, the reimbursement has not been recognised as an asset considering the guidance in Ind AS 37.

c) Corporate Guarantees

31st March 2024	Rs 4,37,700.00 Lakh
31st March 2023	Rs 3,50,000.00 Lakh

The Project SPV company (NHIPPL) has issued Corporate Guarantees amounting to Rs. 2,000 Crore or secured obligations on 14.03.2022 and Rs 877 Crore or secured obligations on 08.01.2024 in favour of Senior Lenders, Rs. 1,500 Crore or secured obligations on 21.10.2022 in favour of Debenture Trustee of the Trust for the benefit of NCD holder.

The group during previous year has carried out a fair valuation of Corporate Guarntees referred above from an independent external valuer. Basis such valuation report and management estimate, fair value of corporate gurantee is estimated to be Nil.

48 Financial Information of Investment Manager

The summary financials of Investment Manager are not disclosed alongwith these financials as its networth is not materially eroded.

49

The Code on Social Security, 2020 ('Code') relating to employee benefits during employment and post-employment benefits received Presidential assent in September 2020. The Code has been published in the Gazette of India. However, the date on which the Code will come into effect has not been notified The Group will assess the impact of the Code when it comes into effect and will record any related impact in the period the Code becomes effective.

50 Withholding Tax liability for interest accrued but not due on non convertible debentures

The Trust has issued publicly listed non convertible debentures ("NCDs") with interest payable on semi-annual basis. Interest on these NCDs was due for payment on 25 April 2024 and for the purpose of payment of interest, record date was 10 April 2024 and debenture-holders existing as on 10 April 2024 are entitled to the coupon interest. Trust has recorded liability of interest accrued till 31st March 2024 and there is no credit in favour of any payee at the time of creating such provision as entitled payee will be identifiable as on record date i.e., on 10 April 2024.

As on the year end March 2024, there is uncertainty with respect to the ultimate recipient of interest income, and such uncertainty would only become clear on the record date i.e., 10 April 2024 when the obligation of payment of interest by NHIT arises and therefore Trust has not withheld any taxes at the time of creating these provisions.

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51 Distribution made

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024^	For the year ended March 31, 2023
Interest	42,240.46	29,985.39
Return of capital	-	-
Dividend	-	-
Other income of the Trust	602.92	240.39
Total	**42,843.38**	**30,225.78**

^The distribution relates to the distributions during the financial year along with the distribution related to the last quarter of FY 2022-23 and does not include the distribution relating to the period February 01, 2024 to March 31, 2024 which will be paid after March 31, 2024. The distributions by the Trust to its unit holders are based on the Net Distributable Cash Flows of the Trust under the SEBI InvIT Regulations.

52 Details of Project Management Fees and Investment Management Fees

Details of fees paid to project manager and investment manager as required pursuant to SEBI Circular No. CIR/MD/DF/127/2016, dated 29th November 2016 are as under:

Project Management Fees:
The project manager National Highways InVIT Project Managers Private Limited ('NHIPMPL') for NHIPPL (R1 & R2 assets) and is entitled to fixed fees based on the Project Implementation and Management Agreement (PIMA) signed by both the parties dated 30th March 2021 as amended on 6th March 2024. NHIPMPL is also Project Manager for NEPPL (R3 Assets) w.e.f 1st April 2024 as per deed of adherence signed on 7th March 2024.

Investment Management Fees:

i) The Investment Manager's fee as per agreement dated 21st October 2020 will initially be Rs. 1,100 Lakh (Rupees Eleven Hundred Lakhs) per annum.
ii) The Investment Management Agreement is revised and the fee with effect from 1st April 2023 has been agreed at Rs 1,800 Lakhs (Rupees Eighteen hundred lakhs) for the Financial Year 2023-24.
iii) The management fee set out in paragraph (ii) above shall be subject to escalation on an annual basis at the rate of 10% of the management fee for the previous year.
iv) Any applicable taxes, cess or charges, as the case may be, shall be in addition to the management fee and shall be payable by National Highways Infra Trust (NHIT) to the Investment Manager (NHIIMPL).
Payment of frequency: Payment of management fee shall be made by National Highways Infra Trust (NHIT) to the Investment Manager (NHIIMPL) in advance on a quarterly basis at the beginning of each quarter of a financial year.

53 Provision for Major Maintenance

The group has a contractual obligation to maintain the performance standards of the Project Highways in respect of riding quality and allied measures as per the performance parameters stipulated under the respective Concession Agreements. Cost of such obligation is measured at the best estimate of the expenditure required to settle the obligation at the balance sheet date and recognised over the period at the end of which the overlay is estimated to be carried out using Discounted Cash Flows method with the discount rate taken as the risk-free interest rate i.e. the discounting rate used for arriving at the present value for MMR provisions is government bond rate of 30 years for projects acquired in first phase and 20 years for projects acquired in second phase. The group has recognised finance cost on major maintenance provision for the year ended March 31, 2024 amounting to Rs. 470.79 Lakhs (P.Y. Rs. 24.95 lakhs). The provision for Major Maintenance Obligation as at March 31, 2024 has been recognised in the financial statements at Rs 8,444.05 Lakhs (P.Y. Rs. 6,307.44 Lakhs).

54 Initial Improvement Works

As per the concession agreement between NHIPPL and NHAI, the concessionaire is obligated to undertake initial improvement works as specified in Schedule B including certain improvement works required initially and then to extend required repairs maintenance, regular upkeep of the Project Highway. These obligations will require outflow of economic resources and will be fulfilled over the period of time. Therefore, a provision shall be recognised and measured as per Ind AS 37 for contractual obligations toward the Fair Value of future upgrade services and correspondingly the group shall capitalize the present value of provision for upgrade services to the intangible asset at the time of acquisition.

At the time of acquisition of SPV there was uncertainty with respect to the cost estimates for the initial improvement work to be done and the group was in discussion with NHAI for de-scoping of certain work. Further, as per Ind as 38, an intangible asset can be recognised if, and only, if the cost of the asset can be measured reliably.

Since the cost for initial improvement work was not ascertainable until 1st Dec 2023 (under Ind AS 38) because of discussion around de-scoping of various works, no reliable estimates could be made for the Fair Value of the said scope. This was further substantiated with the technical note prepared by the technical department basis their discussion and meetings with NHAI and various vendors. Considering that the management has now ascertained the costs based on contracts awarded and the sign off received from the PMC, (estimated as required under Ind AS 38) has now , based on discussions with its technical consultants, capitalised the initial improvement works amounting to Rs. 1,21,227.32 Lakhs (Undiscounted Value) on 1st Dec 2023.

Further the group has also recognised provision for initial improvement works as per Ind AS 37 amounting to Rs. 1,11,993.43 Lakhs (Present Value) on 1st December 2023 with corresponding impact in Statement of Profit and Loss amounting to Rs. 1124.63 Lakhs and Rs. 2396.83 Lakhs on account of amortization of initial improvement work and unwinding of interest on provision of initial improvement respectively.

Actual initial improvement work done up to March 2024 is Rs. 14,346.87 Lakhs.

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55 Statement of Commitments

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2024	As at March 31, 2023
Estimated amount of contracts remaining to be executed on capital account and not provided for	49,698.13	-
Total	49,698.13	-

56 Segment Reporting

The activities of the Group mainly include investing in infrastructure assets primarily in the SPVs operating in the road sector to generate cash flows for distribution to unit holders. Based on the guiding principles given in Ind AS - 108 "Operating Segments", this activity falls within a single operating segment. Further, the entire operations of the Group are only in India and hence, disclosure of secondary/ geographical segment information does not arise. Accordingly, requirement of providing disclosures under Ind AS 108 does not arise.

57 Salient aspects of the Tolling Concession Arrangement

The Project SPV (NHIPPL) has entered into five concession agreements with National Highway Authority of India ("NHAI") on March 30, 2021 for Tolling, Management, Maintenance and Transfer of five toll road projects for a period of 30 years from the Appointed Date. The Appointed Date has commenced on 16.12.2021. The toll roads covered under the concession agreement as follows:

- Palanpur/ Khemana – Abu Road Project (from km 601+000 to km 646+000) of NH-27, connecting the states of Gujrat and Rajasthan
- Abu Road- Swaroopganj Project (from km 646+000 to km 677+000) of NH-27 , in the state of Rajasthan
- Maharashtra Karnataka Border (Kagal) – Belgaum Project (from km 646+000 to km 677+000) of NH-48, connecting the states of Karnataka and Maharashtra
- Chitorgarh- Kota & Chittorgarh Project (from km 891+929 to km 1052+429) of NH-27 , in the state of Rajasthan
- Kothakota Bypass- Kurnool Highway Project (from km 135+469 to km 211+000) of NH-44 , connecting the states of Telangana and Andhra Pradesh

In previous financial year, Project SPV (NHIPPL) entered into three new concession agreements with National Highway Authority of India ("NHAI") on September 26, 2022 for Tolling, Management, Maintenance and Transfer of three toll road projects for a period of 20 years from the Appointed Date. The Appointed Date has commenced on 29.10.2022. The toll roads covered under the concession agreement as follows:

- Agra bypass Section (from km 0.000 to km 32.800) of NH-19 in the state of Uttar Pradesh
- Borkhedi-Wadner-Deodhari-Kelapur Section (from km 36.600 to km 175.000) of NH-44 in the state of Maharashtra
- Shivpuri – Jhansi Section (from km 1305.087 to km 1380.387) of NH-27 in the states of Madhya Pradesh and Uttar Pradesh.

The project SPV (NHIPPL) is required to operate and maintain the Project/ Project Facilities in accordance with the provision of the Agreement, Applicable Laws and Applicable permits.

The Project SPV (NEPPL)has entered into seven concession agreements with National Highway Authority of India ("NHAI") for Tolling, Management, Maintenance and Transfer of seven toll road projects for a period of 20 years from the Appointed Date. The Appointed Date has commenced on 01.04.2024 and therefore the revenue and expenses of these seven road projects shall be recognised from next financial year. The toll roads covered under the concession agreement are as follows:

-Chichra – Kharagpur Project : Chichra – Kharagpur section of NH 49 with a total length of 56.12 kms, in the state of West Bengal;
-Rewa –Lakhnadon Project : Rewa – Katni – Jabalpur – Lakhnadon section of NH 30 and NH 34 with a total length of 306.34 kms, in the state of Madhya Pradesh;
-Kachugaon – Kaljhar Project : Kachugaon – Rakhaldubi Bus Junction – Kaljhar section of NH 27 with a total length of 114.17 kms, in the state of Assam

-Kaljhar – Patacharkuchi Project : Kaljhar – Patacharkuchi section of NH 27 with a total length of 27.30 kms, in the state of Assam;
-Lakhnadon – Mahagaon (Mohgaon) – Khawasa : Lakhnadon – Mahagaon (Mohgaon) – Khawasa section of NH 44 with a total length of 107.35 kms, in the state of Madhya Pradesh;
-Orai – Barah Project : Orai – Barah section of NH 27 with a total length of 62.90 kms, in the state of Uttar Pradesh; and
-Chitradurga Bypass – Hubli Project/ Karnataka Project : Chitradurga Bypass – Chitradurga – Davanagere – Haveri – Hubli section of NH 48 with a total length of 214.47 kms, in the state of Karnataka.

The Group acquired rights for Tolling, Management and Maintenance of the seven toll roads under the concession agreement signed with NHAI for consideration of INR 15,69,988.18 Lakhs , and the same have been recognized in current year financial statements as Capital Advance to NHAI as appointed date for the project is w.e.f 01.04.2024.

The Group is required to operate and maintain the Project/ Project Facilities in accordance with the provision of the Concession Agreement, Applicable Laws and Applicable permits.

National Highways Infra Trust New Delhi

A.R. & Co. New Delhi Chartered Accountants

58 Material Developments

The group is in the process of changing the name of one of it's SPV from National Highways Infra Projects Private Limited to NHIT Western Projects Private Limited and has obtained necessary shareholders approval for the same. The procedural formailities are under process with Ministry of Corporate Affairs.

The Trust has invested the amount of Rs. 240,610 Lakh in the equity share capital of the NHIT Eastern Projects Private Limited (Project SPV's - II) during the year. NEPPL acquired rights for Tolling, Management and Maintenance of the seven toll roads under the concession agreement signed with NHAI for consideration of INR 15,69,988.18 Lakhs , Appointed date for the project is w.e.f 01.04.2024.

59 The Board of Directors of the Investment Manager has declared distribution for January 2024 of Rs. 0.631 per unit which comprises of Rs. 0.606 per unit as interest and Rs. 0.025 per unit as other income on surplus funds at the Trust level in their meeting held on 4th March, 2024. Further, the Board of Directors of the Investment Manager has declared distribution for February 2024 & March 2024 of Rs. 0.705 per unit which comprises of Rs. 0.687 per unit as interest and Rs. 0.018 per unit as other income on surplus funds at the Trust level in their meeting held on 27th May, 2024.
The Board of Directors of the Investment Manager has declared distribution for Quarter 3 of FY 2023-24 of Rs. 1.697 per unit which comprises of Rs. 1.693 per unit as interest and Rs. 0.004 per unit as other income on surplus funds at the Trust level in their meeting held on 2nd February, 2024.
The Board of Directors of the Investment Manager had declared distribution for Quarter 2 of FY 2023-24 of Rs. 1.816 per unit which comprises of Rs. 1.774 per unit as interest and Rs. 0.042 per unit as other income on surplus funds at the Trust level in their meeting held on 8th November, 2023 and the Board of Directors of the Investment Manager had declared distribution for Quarter 1 of FY 2023-24 of Rs. 1.754 per unit which comprises of Rs. 1.742 per unit as interest and Rs. 0.012 per unit as other income on surplus funds at the Trust level in their meeting held on 11th August, 2023.

60 Financial Ratios as on March 31, 2024 and March 31, 2023

S. No.	Particulars	As at March 31, 2024	As at March 31, 2023
1	Current Asset ratio (Current Assets /Current Liability)	0.49	2.00
2	Debt- Equity ratio (Debt/ Equity)	0.82	0.40
3	Debt service coverage ratio (Net Operating Cash flow/ Debt Service Obligation)	3.54	5.19
4	Interest service coverage ratio (EBIT/Finance Cost)	1.84	2.31
5	Networth (Unit Capital + Other Equity)	14,39,552.13	7,39,134.56
6	Asset Cover Ratio	2.01	3.21
7	Return on Equity (ROE ratio) (Net Profit/ Equity)	2.70%	3.82%
8	Total Debt to total assets	0.43	0.28
9	Net profit after tax	29,419.70	25,689.57
10	Outstanding redeemable preference shares (quantity and value) :	-	-
11	Capital redemption reserve/debenture redemption reserve :	-	-
12	Long term debt to working capital	(27.66)	21.67
13	Earning per unit	3.90	3.91
14	Inventory turnover ratio	NA	NA
15	Trade receivable turnover ratio	245.04	195.85
16	Trade payable turnover ratio	4.46	3.53
17	Current liability ratio	0.08	0.04
18	Bed debt to account receivable ratio	-	-
19	Net Capital turnover ratio (Total Income / Net Working Capital)	(2.30)	5.16
20	Operating margin %	77.54%	79.39%
21	Net profit after tax ratio (Net profit / Total Income)	30.19%	36.65%
22	Return on capital employed ratio ((Net Profit before Tax plus Finance Cost)/ (Equity + Debt))	1.97%	3.71%
23	Return on investment (Income on Investment / Average Cost of Investment)	8.82%	12.17%

National Highways Infra Trust New Delhi

A.R. & Co. New Delhi Chartered Accountants

61 Assets pledged as security

Under security provisions for external lenders, the shares of SPVs' i.e. NHIPPL & NEPPL held by NHIT (Trust) are pledged to external lenders to Trust. Whereas the loans provided by Trust to NHIPPL & NEPPL are assigned to the external lenders. Also it may be noted that the shares are not pledged to debenture holders. The carrying amounts of assets pledged as security for current and non current borrowings are :

Particulars	As at 31st March 2024	As at 31st March 2023
Current		
Financial assets		
First Charge		
Trade receivables	385.20	350.87
Cash and cash equivalents	46,400.78	21,124.08
Other financial assets	517.52	6.65
Non Financial assets		
First Charge		
Other current assets	2,303.89	1,634.06
Total current assets pledged as security	**49,607.39**	**23,115.65**
Non Current		
Other financial assets	10,177.86	9,672.44
Non -current tax assets (Net)	22.38	12.06
Total non current assets pledged as security	**10,200.24**	**9,684.50**
Total assets pledged as security	**59,807.63**	**32,800.16**

62 Key sources of estimation

The preparation of Consolidated financial statements in conformity with Ind AS requires the Group to makes estimates and assumptions that affect the reported amounts of income and expenses of the period, the reported balances of assets and liabilities and the disclosures relating to contingent liabilities as of the date of the financial statements. The estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates include allowance for doubtful loans /other receivables, fair value measurement etc. Difference, if any, between the actual results and estimates is recognised in the period in which the results are known.

63 Disclosure pursuant to Ind AS 23 "Borrowing Costs"

Borrowing cost capitalised during the year Rs. Nil [March 31 , 2023 : Rs. Nil]

64 Default and breaches

There are no defaults during the year with respect to repayment of principal and payment of interest and no breaches of the terms and conditions of the borrowings. There are no breaches during the year which permitted lender to demand accelerated payment.

National Highways Infra Trust New Delhi

A.R. & Co. New Delhi Chartered Accountants

NATIONAL HIGWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
Notes to the Consolidated Financial Statements for the year ended March 31, 2024

65 Additional regulatory information required by Schedule III

(i) Details of benami property held

No proceedings have been initiated on or are pending against the group for holding benami property under the Benami Transactions (Prohibition) Act, 1988 (45 of 1988) and Rules made thereunder.

(ii) Wilful defaulter

The group is not declared wilful defaulter by any bank or financial institution or government or any government authority.

(iii) Compliance with number of layers of companies

The group has complied with the number of layers prescribed under the Companies Act, 2013.

(iv) Undisclosed income

There is no income surrendered or disclosed as income during the current or previous year in the tax assessments under the Income Tax Act, 1961, that has not been recorded in the books of account.

(v) The group have not received any fund from any person(s) or entity(ies), including foreign entities (Funding Party) with the understanding (whether recorded in writing or otherwise) that the Trust shall

(a) directly or indirectly lend or invest in other persons or entities identified in any manner whatsoever by or on behalf of the Funding Party (Ultimate Beneficiaries) or

(b) provide any guarantee, security or the like on behalf of the Ultimate Beneficiaries

(vi) The group have not advance or loaned or invested (either from borrowed fund or share premium or any other source or kind of fund) by the company to or in any person(s) or entity(ies), including foreign entities (Funding Party) with the understanding (whether recorded in writing or otherwise) that the Trust shall:

(a) directly or indirectly lend or invest in other persons or entities identified in any manner whatsoever by or on behalf of the company (Ultimate Beneficiaries) or

(b) provide any guarantee, security or the like on behalf of the Ultimate Beneficiaries

(vii) Details of crypto currency or virtual currency

The group has not traded or invested in crypto currency or virtual currency during the current or previous year.

(viii) Valuation of Property, plant and equipment and intangible asset

The group has not revalued its property, plant and equipment or intangible assets or both during the current or previous year.

(ix) The Group did not have any long-term contracts including derivative contract for which there were any material foreseeable losses.

(x) Relationship with struck off companies.

The group does not have any transactions with the companies struck off under Section 248 of companies Act 2013 and therefore no further disclosure required thereunder.

66 Comparatives figures have been reclassified/regrouped wherever necessary to confirm to the current period classification.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

A.R. & Co. Chartered Accountants New Delhi

CA Mohd. Azam Ansari
Partner
M.No.511623

Date : 27-5-2024
Place : New Delhi

For and on behalf Board of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

National Highways Infra Trust New Delhi

A. R. & Co.
Chartered Accountant

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pawankgoel1@gmail.com

INDEPENDENT AUDITORS' REPORT

To,
The Unit Holders of National Highways Infra Trust

Opinion

We have audited the condensed consolidated interim financial statements of National Highways Infra Trust ("the 'Trust') "), which comprise the condensed consolidated interim balance sheet as at 30th September 2024, the condensed consolidated interim statement of profit and loss (including other comprehensive income) for year to-date period then ended, and the condensed consolidated interim statement of cash flows for the year-to-date period then ended, the condensed Statement of Net Assets at fair value for the year-to-date period then ended, the condensed Statement of Total Returns at fair value and the condensed Statement of Net Distributable Cash Flows ("NDCFs") for the year-to-date period then ended and notes to the condensed consolidated interim financial statements, including a summary of the significant accounting policies ("the condensed consolidated interim financial statements") and other explanatory information, as required by Indian Accounting Standard 34, "Interim Financial Reporting" ("Ind AS 34") and other accounting principles generally accepted in India.

In our opinion and to the best of our information and according to the explanations given to us, the aforesaid condensed consolidated interim financial statements give the information required by the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014 as amended from time to time including any guidelines and circulars issued thereunder (together referred to as the "SEBI InvIT Regulations") in the manner so required and give a true and fair view in conformity with Ind AS 34 and other accounting principles generally accepted in India, to the extent not inconsistent with SEBI InvIT Regulations, of the state of affairs of the Trust, as at 30th September 2024, Profit and other comprehensive income for the year-to-date period then ended , its cash flows for the year-to-date-period ended on that date, its statement of changes in Unitholder's equity for the year-to-date period then ended, its net assets at fair value as at 30th September, 2024, its total returns at fair value and the net distributable cash flows of the Trust for the year-to-date period then ended..

Basis for Opinion

We conducted our audit in accordance with the Standards on Auditing ("SAs") issued by the Institute of Chartered Accountants of India. Our responsibilities under those SAs are further described in the Auditor's Responsibilities for the Audit of the Condensed Consolidated Interim Financial Statements section of our report. We are independent of the Trust in accordance with the Code of Ethics issued by the Institute of Chartered Accountants of India together with the ethical requirements that are relevant to our audit of the condensed consolidated interim financial statements under the provisions of the of the SEBI InvIT Regulations, and we have fulfilled our other ethical responsibilities in accordance with these requirements and the Code of Ethics. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

A. R. & Co.
Chartered Accountant

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pawankgoel1@gmail.com

RESPONSIBILITIES OF THE BOARD OF DIRECTORS OF INVESTMENT MANAGER FOR THE CONDENSED CONSOLIDATED INTERIM FINANCIAL STATEMENTS

The Board of Directors of National Highways Infra Investment Managers Private Limited (Investment Manager) is are responsible for the preparation of these condensed consolidated interim financial statements that give a true and fair view of the state of affairs, profit and other comprehensive income , cash flows and the movement of the Unitholder's equity for the year-to-date period then ended, the net assets at fair value as at 30 September 2024, the total returns at fair value and the net distributable cash flows of the Trust in accordance with the requirements of the SEBI InvIT Regulations, Indian Accounting Standards as defined in Rule 2(1)(a) of Companies (Indian Accounting Standards) Rules, 2015, as amended and other accounting principles generally accepted in India, to the extent not inconsistent with SEBI InvIT Regulations.

This responsibility also includes maintenance of adequate accounting records in accordance with the provisions of the SEBI Invit Regulations for safeguarding of the assets of the Trust and for preventing and detecting frauds and other irregularities; selection and application of appropriate accounting policies; making judgments and estimates that are reasonable and prudent; and design, implementation and maintenance of adequate internal financial controls that were operating effectively for ensuring accuracy and completeness of the accounting records, relevant to the preparation and presentation of the condensed consolidated interim financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

In preparing the condensed consolidated interim financial statements, the Board of Directors of Investment Manager are responsible for assessing the Trust's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the management either intends to liquidate the Trust or to cease operations, or has no realistic alternative but to do so.

The Board of Directors of Investment Manager are also responsible for overseeing the Trust's financial reporting process.

Auditor's Responsibilities for the Audit of the Condensed Consolidated Interim Financial Statements

Our objectives are to obtain reasonable assurance about whether the condensed consolidated interim financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditors' report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with SAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these condensed consolidated interim financial statements.

A. R. & Co.
Chartered Accountant

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As part of an audit in accordance with SAs, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the condensed consolidated interim financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Trust's internal control.

- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.

- Conclude on the appropriateness of management's use of the going concern basis of accounting and based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Trust's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditors' report to the related disclosures in the condensed consolidated interim financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditors' report. However, future events or conditions may cause the Trust to cease to continue as a going concern.

- Evaluate the overall presentation, structure and content of the condensed consolidated interim financial statements, including the disclosures, and whether the condensed consolidated interim financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

We also provide those charged with governance with a statement that we have complied with relevant ethical requirements regarding independence, and communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, related safeguards.

Other Matter

A. R. & Co.
Chartered Accountant

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Attention is drawn to the fact that the figures for the year-to-date-period ended on 30 September 2023 as reported in these condensed interim consolidated financial statements, were subject to a limited review by us.

Our opinion is not modified in respect of this matter.

For A. R. & Co.
Chartered Accountants
FRN. 002744C

MOHD AZAM ANSARI
Digitally signed by MOHD AZAM ANSARI
Date: 2024.12.19 16:57:25 +05'30'

CA Mohd Azam Ansari
Partner
Membership No: 0511623
UDIN: 24511623BKCSYS8783
Place: New Delhi
Date: 19-12-2024

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
INTERIM CONSOLIDATED BALANCE SHEET AS AT SEPTEMBER 30, 2024

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	Note No.	As at September 30, 2024	As at March 31, 2024
ASSETS			
1) Non - Current Assets			
(a) Property, Plant and Equipment	3	382.15	219.29
(b) Capital work in Progress (CWIP)	4	24.32	19.76
(c) Goodwill	5	10,144.46	10,144.46
(d) Other Intangible assets	6	26,52,182.61	10,88,670.84
(e) Right of Use Assets	7	609.95	-
(f) Financial Assets			
(i) Other Financial Assets	8	30,666.24	10,177.86
(g) Deferred Tax Assets (net)	9	21,626.53	11,523.20
(h) Non -Current Tax Assets (Net)	10	48.64	22.38
(i) Other Non Current Assets	11	212.12	15,70,649.18
Total non-current assets		**27,15,897.02**	**26,91,426.97**
2) Current Assets			
(a) Financial Assets			
(i) Trade receivables	12	4,696.79	385.20
(ii) Cash and Cash Equivalents	13	48,657.44	46,400.78
(iii) Bank Balances Other than Cash & Cash Equivalents	14	535.78	512.98
(iv) Other financial assets	15	50.84	4.54
(b) Current Tax Assets (Net)	28	47.20	-
(c) Other current assets	16	1,721.06	2,303.89
Total current assets		**55,709.11**	**49,607.39**
TOTAL ASSETS		**27,71,606.13**	**27,41,034.36**
EQUITY AND LIABILITIES			
EQUITY			
1) Unit Capital	17	14,66,947.80	14,67,093.46
2) Initial settlement amount		0.10	0.10
3) Other Equity	18	(46,629.45)	(27,541.44)
Total Equity		**14,20,318.45**	**14,39,552.13**
LIABILITIES			
1) Non-Current liabilities			
(a) Financial liabilities			
(i) Borrowings	19	11,98,463.18	11,63,394.94
(ii) Lease Liabilities	20	538.32	-
(iii) Other Financial liabilities	21	161.25	80.90
(b) Provisions	22	55,941.53	35,923.32
Total non-current liabilities		**12,55,104.28**	**11,99,399.16**
2) Current liabilities			
(a) Financial liabilities			
(i) Borrowings	23	11,442.50	10,054.00
(ii) Lease Liabilities	24	66.72	-
(iii) Trade Payables	25		
(a) Total Outstanding, dues of micro and small enterprises		216.53	275.99
(b) Total outstanding, dues of creditors other than micro and small enterprises		6,111.76	4,479.00
(iv) Other financial liabilities	26	6,900.09	7,224.53
(b) Provisions	27	71,121.24	79,404.66
(c) Current Tax Liabilities (Net)	28	-	181.66
(d) Other current liabilities	29	324.56	463.23
Total current liabilities		**96,183.40**	**1,02,083.07**
Total liabilities		**13,51,287.68**	**13,01,482.23**
TOTAL EQUITY & LIABILITIES		**27,71,606.13**	**27,41,034.36**

The accompanying notes form an integral part of these consolidated financial statements. 1 - 62

This is the Consolidated Balance Sheet referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

MOHD AZAM ANSARI
Digitally signed by MOHD AZAM ANSARI
Date: 2024.12.19 16:31:35 +05'30'

CA Mohd. Azam Ansari
Partner
M.No.511623

Place : New Delhi
Date : 19th December 2024

For and on behalf of National Highways Infra Trust
(By National Highways Infra Investment Managers Private Limited)

SURESH GOYAL
Digitally signed by SURESH GOYAL
Date: 2024.12.19 16:08:03 +05'30'

Suresh Krishan Goyal
Director
DIN: 02721580

GUNJAN SINGH
Digitally signed by GUNJAN SINGH
Date: 2024.12.19 16:13:52 +05'30'

Gunjan Singh
Compliance Officer

MATHEW GEORGE
Digitally signed by MATHEW GEORGE
Date: 2024.12.19 16:19:13 +05'30'

Mathew George
Chief Financial Officer

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
INTERIM CONSOLIDATED STATEMENT OF PROFIT AND LOSS FOR THE HALF YEAR ENDED SEPTEMBER 30, 2024

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	Note No.	For the Half Year ended	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
INCOME				
Revenue from Operations	30	1,13,033.02	47,173.44	94,390.77
Interest Income	31	948.19	470.03	871.71
Profit on sale of investments	32	896.26	476.27	2,141.16
Other Income	33	36.04	14.27	59.53
TOTAL INCOME		**1,14,913.51**	**48,134.01**	**97,463.17**
EXPENSES				
Investment Manger Fee		990.00	902.47	1,800.00
Trustee Fee		4.80	4.81	9.60
Valuation expenses		34.44	3.24	11.07
Annual listing fees		26.97	26.97	53.80
Rating fees		2.81	0.10	7.73
Insurance expenses		935.90	393.08	737.91
Custodian Fees		2.82	1.58	3.15
Project Management Fees		708.00	495.60	1,168.20
Operating Expenses	34	16,271.02	7,808.38	13,665.60
Employee Benefits Expenses	35	1,041.48	463.91	1,156.60
Finance Cost	36	51,389.16	12,518.17	28,023.17
Depreciation & Amortization Expense	37	37,680.18	11,464.03	24,771.04
Audit Fees	38			
- Statutory audit fees		7.77	9.19	18.49
- Other audit services (including certification)		0.96	0.40	1.72
Other Expenses	39	1,607.23	1,022.03	2,569.62
TOTAL EXPENSES		**1,10,703.54**	**35,113.96**	**73,997.70**
Profit for the period/year before Income Tax		**4,209.97**	**13,020.05**	**23,465.47**
Tax Expenses	40			
Current Tax		460.49	252.51	886.30
Current tax - earlier years		-	0.32	(2.52)
Deferred Tax expense/(credit)		(10,103.32)	(2,885.33)	(6,837.88)
Total Tax		**(9,642.83)**	**(2,632.50)**	**(5,954.10)**
Profit for the period/year after Income Tax		**13,852.80**	**15,652.55**	**29,419.57**
Other Comprehensive Income				
Items that will not be reclassified to Profit or Loss		(5.69)	(1.79)	0.10
Income tax relating to items that will not be reclassified to profit or loss		1.15	-	0.03
		(4.54)	**(1.79)**	**0.13**
Total Comprehensive Income for the period/year		**13,848.26**	**15,650.76**	**29,419.70**
Earnings per Unit				
Basic	41	1.06	2.15	3.90
Diluted	41	1.06	2.15	3.90

The accompanying notes form an integral part of these consolidated financial statements. 1 - 62

This is the Statement of Profit and Loss referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

MOHD AZAM ANSARI
Digitally signed by MOHD AZAM ANSARI
Date: 2024.12.19 16:30:38 +05'30'

CA Mohd. Azam Ansari
Partner
M.No.511623

For and on behalf of National Highways Infra Trust
(By National Highways Infra Investment Managers Private Limited)

SURESH GOYAL
Digitally signed by SURESH GOYAL
Date: 2024.12.19 16:08:27 +05'30'

Suresh Krishan Goyal
Director
DIN: 02721580

MATHEW GEORGE
Digitally signed by MATHEW GEORGE
Date: 2024.12.19 16:18:52 +05'30'

Mathew George
Chief Financial Officer

GUNJAN SINGH
Digitally signed by GUNJAN SINGH
Date: 2024.12.19 16:14:14 +05'30'

Gunjan Singh
Compliance Officer

Place : New Delhi
Date : 19th December 2024

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
INTERIM CONSOLIDATED STATEMENT OF CASH FLOWS FOR THE HALF YEAR ENDED SEPTEMBER 30, 2024

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the year ended March 31, 2024
A. OPERATING ACTIVITIES		
Net Profit/(Loss) Before Tax	4,209.97	23,465.47
Adjustments for :		
Depreciation and Amortization	37,680.18	24,771.04
Profit on redemption of mutual funds	(896.26)	(2,141.16)
Interest income from FDR	(948.19)	(871.71)
Finance Cost (net)	48,133.54	25,015.90
Provision for major maintenance expenses	10,330.53	8,444.05
Unwinding interest on major maintenance provision	3,240.59	2,867.62
Unwinding interest on Lease Liability	7.46	-
Provision for Leave encashment and Gratuity	45.92	52.43
Operating Profit/(Loss) before Working Capital Changes	**1,01,803.74**	**81,603.64**
Working Capital Adjustments:		
Decrease / (Increase) in Trade & Other Receivables	(4,311.68)	(34.34)
Decrease / (Increase) in Other Non Current/Current Assets	(17.44)	(516.99)
Decrease / (Increase) in Other Financial Assets	189.74	(296.44)
Increase / (Decrease) in Trade & Other Payables	2,214.19	12.68
Increase / (Decrease) in Other Financial Liabilities	380.64	188.39
Increase / (Decrease) in Provisions	(1.01)	(3.57)
Increase / (Decrease) in Other Current Liabilities	(138.68)	229.27
	1,00,119.50	**81,182.64**
Income Tax paid	(715.61)	(721.42)
Net Cash Flows from/(used in) Operating Activities	**99,403.89**	**80,461.22**
B. INVESTING ACTIVITIES		
Purchase of Property, Plant & Equipment, including CWIP, capital creditors and capital advances	(33,094.06)	(15,82,977.68)
Investment in FDR	(20,247.10)	(951.26)
Interest received on maturity of FDR	716.35	810.99
Profit on redemption of mutual funds	896.26	2,141.16
Net cash flows from (used in) Investing activities	**(51,728.55)**	**(15,80,976.79)**
C. FINANCING ACTIVITIES		
Proceeds from Issue of Unit Capital	-	7,27,206.41
Expense incurred towards institutional unit allotment	(399.53)	(1,471.46)
Precessing Fee paid	(489.70)	(1,482.16)
Distribution to Unit Holders	(32,936.24)	(54,491.29)
Proceeds from Long Term Borrowings	41,466.00	8,84,700.00
Payment of Rent	(11.57)	-
Financing charges paid	(48,025.81)	(24,909.51)
Repayment of Long Term Borrowings	(5,021.83)	(3,759.73)
Net cash flows from (used in) Financing activities	**(45,418.68)**	**15,25,792.26**
Net Increase/Decrease in Cash and Cash equivalents (A+B+C)	**2,256.66**	**25,276.69**
Cash and cash equivalents at the beginning of the period/year	46,400.78	21,124.08
Cash and cash equivalents at the end of the period/ year	**48,657.44**	**46,400.78**

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
INTERIM CONSOLIDATED STATEMENT OF CASH FLOWS FOR THE HALF YEAR ENDED SEPTEMBER 30, 2024

Reconciliation of liabilities arising from Financing Activities pursuant to Ind AS 7- Statement of Cash Flows.

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the year ended March 31, 2024
a) Carrying amount of debt at the beginning of the period/year	11,73,448.94	2,94,158.33
b) Additional borrowings during the period/year	41,466.00	8,84,700.00
c) Repayments during the period/year	(5,021.83)	(3,759.73)
d) Other adjustments/settlements during the period/year	-	-
e) Transaction Cost/Unwinding interest adjustment	12.56	(1,649.66)
f) Carrying amount of debt at the end of the period/year	**12,09,905.68**	**11,73,448.94**

This is the Consolidated Cash Flows Statement referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

MOHD AZAM ANSARI
Digitally signed by MOHD AZAM ANSARI
Date: 2024.12.19 16:32:04 +05'30'

CA Mohd. Azam Ansari
Partner
M.No.511623

Date : 19th December 2024
Place : New Delhi

For and on behalf of National Highways Infra Trust (By National Highways Infra Investment Managers Private Limited)

SURESH GOYAL
Digitally signed by SURESH GOYAL
Date: 2024.12.19 16:08:46 +05'30'

Suresh Krishan Goyal
Director
DIN: 02721580

MATHEW GEORGE
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Mathew George
Chief Financial Officer

GUNJAN SINGH
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Date: 2024.12.19 16:14:32 +05'30'

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :-IN/InvIT/20-21/0014

Statement of Net Distributable Cash Flows for the Half Year ended September 30, 2024

Additional disclosures as required by SEBI Master Circular No.SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024

a) Statement of Net Distributable Cash Flows (NDCF) at Trust Level (NHIT)

(All amounts are in ₹ lakh unless otherwise stated)

S.No.	Particulars	Amount
1	**Cashflows from operating activities of the Trust**	(1,769.83)
2	(+) Cash flows received from SPV's / Investment entities which represent distributions of NDCF computed as per relevant framework (Refer Notes Below)	1,06,788.73
3	(+) Treasury income / income from investing activities of the Trust (interest income received from FD, any investment entities as defined in Regulation 18(5), tax refund, any other income in the nature of interest, profit on sale of Mutual funds, investments, assets etc., dividend income etc., excluding any Ind AS adjustments)	951.51
4	(+) Proceeds from sale of infrastructure / real estate investments, infrastructure / real estate assets or shares of SPVs/Holdcos or Investment Entity adjusted for the following	-
	• Applicable capital gains and other taxes	-
	• Related debts settled or due to be settled from sale proceeds	-
	• Directly attributable transaction costs	-
	• Proceeds reinvested or planned to be reinvested as per Regulation 18(16)(d) of REIT Regulations or Regulation 18(7) of InvIT Regulations or any other relevant provisions of the REIT/InvIT Regulations	-
5	(+) Proceeds from sale of infrastructure / real estate investments, infrastructure / real estate assets or sale of shares of SPVs/ Hold cos or Investment Entity not distributed pursuant to an earlier plan to re-invest as per Regulation 18(16)(d) of REIT Regulations or Regulation 18(7) of InvIT Regulations or any other relevant provisions of the REIT/InvIT Regulations, if such proceeds are not intended to be invested subsequently	-
6	(-) Finance cost on Borrowings, excluding amortisation of any transaction costs, recognized in Profit and Loss account of the Trust	(48,009.47)
7	(-) Debt repayment at Trust level (to include principal repayments as per scheduled EMI's except if refinanced through new debt including overdraft facilities and to exclude any debt repayments / debt refinanced through new debt in any form or equity raise)	(5,021.82)
8	(-) any reserve required to be created under the terms of, or pursuant to the obligations arising in accordance with, any: (i). loan agreement entered with lenders, or (ii). agreement pursuant to which the Trust operates or owns the infrastructure or real estate asset, or generates revenue or cashflows from such asset (such as, concession agreement, transmission services agreement, power purchase agreement, lease agreement, and any other agreement of a like nature, by whatever name called); or (iii). statutory, judicial, regulatory, or governmental stipulations; or (iv). such mandatory terms or conditions, which if breached (or not complied with) would result in the Trust losing the right to own or operate the relevant infrastructure asset or real estate asset	(5,233.03)
9	(-) any capital expenditure to the extent not funded by debt / equity or from reserves created in the earlier years	-
10	**NDCF at Trust level as on 30th September 2024**	**47,706.09**
	NDCF Distributed in June 2024 Quarter	**23,685.22**
	Balance NDCF for September 2024	**24,020.87**

Notes:

1 In accordance with the SEBI circular no. SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024, the framework for computation of Net Distributable cash flows ("NDCF") is revised with effect from April 01, 2024. Accordingly, NDCF for the period April 01, 2024, to September 30, 2024, has been calculated and presented in accordance with the revised framework. NDCF for the periods on or before March 31, 2024, has been calculated and presented as per the earlier framework and has been disclosed/reproduced in Annexure 1 to the consolidated financial information.

2 This NDCF includes cash flows received from SPV after 30th September 2024 but before the date of the Board Meeting of the InvIT i.e. 12th November 2024. Rs. 149.15 Crores received from NWPPL and Rs. 101.03 Crores received from NEPPL.

3 Under the provisions of the InvIT Regulations, the Trust is required to distribute to Unitholders not less than 90% of the Net Distributable Cash Flows of the Trust for each financial year. Accordingly, a portion of the Unit Capital contains a contractual obligation of the Trust to pay to its unitholders as cash distributions. Hence, the Unit Capital is a compound financial instrument which contains both equity and liability components in accordance with Ind AS 32 - Financial Instruments: Presentation. However, in accordance with SEBI Circulars issued under the InvIT Regulations, the Unit Capital has been presented as "Equity" in order to comply with the requirements of Section H of Chapter 3 to the SEBI Master Circular No. SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024 dealing with the minimum disclosures for key financial information/statements. Consistent with Unit Capital being classified as equity, the distributions to Unitholders is also presented in Statement of Changes in Unitholders' Equity when the distributions are approved by the Board of Directors of Investment Manager.

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :-IN/InvIT/20-21/0014

Disclosures as required by SEBI Master Circular No.SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024

b) Statement of Net Distributable Cash Flows (NDCF) at SPV Level (NWPPL) for the Half Year ended September 30, 2024.

(All amounts in ₹ lakh unless otherwise stated)

S. No.	Particulars	Amount
1	Cash flow from operating activities as per Cash Flow Statement.	41,821.02
2	(+) Treasury income / income from investing activities (interest income received from FD, tax refund, any other income in the nature of interest, profit on sale of Mutual funds, investments, assets etc., dividend income etc., excluding any Ind AS adjustments)	427.92
3	(+) Proceeds from sale of infrastructure / real estate investments, infrastructure / real estate assets or shares of SPVs or Investment Entity adjusted for the following	-
	• Applicable capital gains and other taxes	-
	• Related debts settled or due to be settled from sale proceeds	-
	• Directly attributable transaction costs	-
	• Proceeds reinvested or planned to be reinvested as per Regulation 18(16)(d) of REIT Regulations or Regulation 18(7) of InvIT Regulations or any other relevant provisions of the REIT/InvIT Regulations	-
4	(+) Proceeds from sale of infrastructure/ real estate investments, infrastructure/ real estate assets or sale of shares of SPVs or Investment Entity not distributed pursuant to an earlier plan to re-invest as per Regulation 18(16)(d) of REIT Regulations or Regulation 18(7) of InvIT Regulations or any other relevant provisions of the REIT/InvIT Regulations, if such proceeds are not intended to be invested subsequently	-
5	(-) Finance cost on Borrowings, excluding amortisation of any transaction costs as per Profit and Loss Account and any shareholder debt / loan from Trust	-
6	(-) Debt repayment (to include principal repayments as per scheduled EMI's and to exclude any debt refinanced through new debt or equity raise as well as repayment of any shareholder debt / loan from Trust)	-
7	(-) any reserve required to be created under the terms of, or pursuant to the obligations arising in accordance with, any: (i). loan agreement entered with banks / financial institution from whom the Trust or any of its SPVs/ HoldCos have availed debt, or (ii). terms and conditions, covenants or any other stipulations applicable to debt securities issued by the Trust or any of its SPVs/ HoldCos, or (iii). terms and conditions, covenants or any other stipulations applicable to external commercial borrowings availed by the Trust or any of its SPVs/ HoldCos, (iv). agreement pursuant to which the SPV/ HoldCo operates or owns the infrastructure asset, or generates revenue or cashflows from such asset (such as, concession agreement, transmission services agreement, power purchase agreement, lease agreement, and any other agreement of a like nature, by whatever name called); or (v). statutory, judicial, regulatory, or governmental stipulations; or	-
8	(-) any capital expenditure to the extent not funded by debt / equity or from reserves created in the earlier years	(126.90)
9	**Net Distributable Cash Flow for the period ended September 2024**	**42,122.04**

Adjustment to Net Distributable Cash Flows

S. No.	Particulars	Amount
1	**Net Distributable Cash flow for the year (From (9) Above)**	**42,122.04**
2	Less: NDCF Already Distributed during the period ended September 2024	(32,368.66)
3	Add: NDCF pertaining to March 2024 distributed during the period ended June 2024	5,162.05
4	**Balance Distributable Cash Flow for the period ended September 2024**	**14,915.43**

In accordance with the SEBI circular no. SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024, the framework for computation of Net Distributable cash flows ("NDCF") is revised with effect from April 01, 2024. Accordingly, NDCF for the period April 01, 2024, to September 30, 2024, has been calculated and presented in accordance with the revised framework. NDCF for the periods on or before March 31, 2024, has been calculated and presented as per the earlier framework and has been disclosed/reproduced in Annexure 2(i) to the consolidated financial information.

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :-IN/InvIT/20-21/0014

Disclosures as required by SEBI Master Circular No.SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024

c) Statement of Net Distributable Cash Flows (NDCF) at SPV Level (NEPPL) for the Half Year ended September 30, 2024

(All amounts in ₹ lakh unless otherwise stated)

S. No.	Particulars	Amount
1	Cash flow from operating activities as per Cash Flow Statement.	59,352.68
2	(+) Treasury income / income from investing activities (interest income received from FD, tax refund, any other income in the nature of interest, profit on sale of Mutual funds, investments, assets etc., dividend income etc., excluding any Ind AS adjustments)	233.18
3	(+) Proceeds from sale of infrastructure / real estate investments, infrastructure / real estate assets or shares of SPVs or Investment Entity adjusted for the following	-
	• Applicable capital gains and other taxes	-
	• Related debts settled or due to be settled from sale proceeds	-
	• Directly attributable transaction costs	-
	• Proceeds reinvested or planned to be reinvested as per Regulation 18(16)(d) of REIT Regulations or Regulation 18(7) of InvIT Regulations or any other relevant provisions of the REIT/InvIT Regulations	-
4	(+) Proceeds from sale of infrastructure/ real estate investments, infrastructure/ real estate assets or sale of shares of SPVs or Investment Entity not distributed pursuant to an earlier plan to re-invest as per Regulation 18(16)(d) of REIT Regulations or Regulation 18(7) of InvIT Regulations or any other relevant provisions of the REIT/InvIT Regulations, if such proceeds are not intended to be invested subsequently	-
5	(-) Finance cost on Borrowings, excluding amortisation of any transaction costs as per Profit and Loss Account and any shareholder debt / loan from Trust	-
6	(-) Debt repayment (to include principal repayments as per scheduled EMI's and to exclude any debt refinanced through new debt or equity raise as well as repayment of any shareholder debt / loan from Trust)	-
7	(-) any reserve required to be created under the terms of, or pursuant to the obligations arising in accordance with, any: (i). loan agreement entered with banks / financial institution from whom the Trust or any of its SPVs/ HoldCos have availed debt, or (ii). terms and conditions, covenants or any other stipulations applicable to debt securities issued by the Trust or any of its SPVs/ HoldCos, or (iii). terms and conditions, covenants or any other stipulations applicable to external commercial borrowings availed by the Trust or any of its SPVs/ HoldCos, (iv). agreement pursuant to which the SPV/ HoldCo operates or owns the infrastructure asset, or generates revenue or cashflows from such asset (such as, concession agreement, transmission services agreement, power purchase agreement, lease agreement, and any other agreement of a like nature, by whatever name called); or (v). statutory, judicial, regulatory, or governmental stipulations; or	-
8	(-) any capital expenditure to the extent not funded by debt / equity or from reserves created in the earlier years	(81.18)
9	**Net Distributable Cash Flow for the period ended September 2024**	**59,504.68**
10	**NDCF Already Distributed for the period ended September 2024**	**(49,401.85)**
11	**Balance Distributable Cash flow for the period ended September 2024**	**10,102.83**

In accordance with the SEBI circular no. SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024, the framework for computation of Net Distributable cash flows ("NDCF") is revised with effect from April 01, 2024. Accordingly, NDCF for the period April 01, 2024, to September 30, 2024, has been calculated and presented in accordance with the revised framework. NDCF for the periods on or before March 31, 2024, has been calculated and presented as per the earlier framework and has been disclosed/reproduced in Annexure 2(ii) to the consolidated financial information.

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :- IN/InvIT/20-21/0014

Disclosures pursuant to SEBI circulars (as required by paragraph 6 of chapter 4 to the SEBI Master Circular No.SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024)

Consolidated Statement of Net Assets at Fair Value (All amounts are in ₹ lakh unless otherwise stated)

Particulars	As at September 30, 2024		As at March 31, 2024	
	Book value	Fair value^	Book value	Fair value^
A. Assets	27,71,606.13	30,95,727.16	27,41,034.36	29,47,706.90
B. Liabilities (at book value)	13,51,287.68	13,51,287.68	13,01,482.24	13,01,482.24
C. Net assets (A-B)	**14,20,318.45**	**17,44,439.48**	**14,39,552.12**	**16,46,224.66**
D. No of units	1,31,22,00,600.00	1,31,22,00,600.00	1,31,22,00,600.00	1,31,22,00,600.00
E. NAV (C/D)	**108.24**	**132.94**	**109.71**	**125.46**

^Fair values of total assets relating to the Trust as at September 30, 2024 & March 31, 2024 as disclosed above are based on the independent valuer report.

Consolidated Statement of Total Return at Fair Value: (All amounts are in ₹ lakh unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Total comprehensive income for the year (As per the Consolidated Statement of Profit and Loss)	13,848.26	29,419.70
Add: Other changes in fair value for the period/year *	3,24,121.03	2,06,672.54
Total return	**3,37,969.29**	**2,36,092.24**

* In the above statement, other changes in fair value for the period/year ended September 30, 2024 & March 31, 2024 have been computed based on the independent valuer report.

The accompanying notes form an integral part of the Consolidated Financial Statements.

This is the Consolidated Statement of Net Assets at Fair Value and Consolidated Statement of Total Return at Fair Value referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

MOHD AZAM ANSARI
Digitally signed by MOHD AZAM ANSARI
Date: 2024.12.19 16:32:26 +05'30'

CA Mohd. Azam Ansari
Partner
M.No.511623

Place : New Delhi
Date : 19th December 2024

For and on behalf of National Highways Infra Trust
(By National Highways Infra Investment Managers Private Limited)

SURESH GOYAL
Digitally signed by SURESH GOYAL
Date: 2024.12.19 16:09:09 +05'30'

Suresh Krishan Goyal
Director
DIN: 02721580

MATHEW GEORGE
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Date: 2024.12.19 16:18:06 +05'30'

Mathew George
Chief Financial Officer

GUNJAN SINGH
Digitally signed by GUNJAN SINGH
Date: 2024.12.19 16:14:58 +05'30'

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014

Annexure 1: Statement of Net Distributable Cash Flows (NDFC) of the Trust as per the earlier framework paragraph 6 of chapter 4 to the Master circular No. SEBI/HO/DDHS-PoD-2/P/CIR/2023/115 dated July 06, 2023

(All amounts in ₹ lakh unless otherwise stated)

S. No.	Particulars	For the year ended 31st March 2024
1	**Profit after tax as per Statement of profit and loss/income and expenditure (Standalone) (A)**	96,819.27
2	Add: Depreciation and amortization as per statement of profit and loss account. Incase of Impairment reversal, same needs to be deducted from profit and loss.	-
3	Add/Less: Loss/gain on sale of infrastructure assets	-
4	Add: Proceeds from sale of infrastructure assets adjusted for the following: related debts settled or due to be settled from sale proceeds; directly attributable transaction costs; proceeds reinvested or planned to be reinvested as per Regulation 18(7)(a) of the InvIT regulations	-
5	Add: Proceeds from sale of infrastructure assets not distributed pursuant to an earlier plan to re-invest, if such proceeds are not intended to be invested subsequently, net of any profit/ (loss) recognised in profit and loss account	-
6	Add/ Less: Any other item of non- cash expense/ non cash income (net of actual cash flows for these items), if deemed necessary by the Investment Manager. For example, any decrease/ increase in carrying amount of an asset or a liability recognised in profit and loss /income and expenditure on measurement of the asset or the liability at fair value; Interest cost as per effective interest rate method, deferred tax lease rents recognised on a straight line basis, etc.	(82,058.04)
7	Less: Repayment of external debt (principal) / redeemable preference shares / debentures, etc. (excluding refinancing) / net cash set aside to comply with DSRA requirement under loan agreements.	(4,206.73)
8	**Total Adjustment (B)**	**(86,264.77)**
9	**Net Surplus (C) = (A+B) (NDCF)**	**10,554.51**
10	Add: Income recognised in previous year and received in this year	46,688.43
11	Less :- Interest expenses recognised in previous year and paid in this year	(5,129.59)
12	**Distibutable Cash Flow**	**52,113.35**
13	Less: Amount already distributed to Unitholders (for the period from April 23 to Jan 24(PY for the period from April 22 to December 22))	42,843.37
14	**Balance Net Distributable Cash Flows for the year ended March 31, 2024**	**9,269.98**

NHIT Western Projects Private Limited

CIN: U45201DL2020PTC366737

Annexure 2(i): Statement of Net Distributable Cash Flows (NDFC) of the SPV as per the earlier framework paragraph 6 of chapter 4 to the Master circular No. SEBI/HO/DDHS-PoD-2/P/CIR/2023/115 dated July 06, 2023

(All amounts in ₹ lakh unless otherwise stated)

S. No.	Particulars	For the year ended March 31, 2024
1	**Profit/ (Loss) after tax as per Statement of profit and loss/income and expenditure (standalone) (A)**	**(65,433.38)**
2	**Add:** Depreciation and amortization as per statement of profit and loss account. Incase of Impairment reversal, same needs to be deducted from profit and loss.	24,770.91
3	**Add/Less:** Loss/gain on sale of infrastructure assets	-
4	**Add:** Proceeds from sale of infrastructure assests adjusted for the following: related debts settled or due to be settled from sale proceeds; directly attributable transaction costs; proceeds reinvested or planned to be reinvested as per Regulation 18(7)(a) of the InvIT regulations	-
5	**Add:** Proceeds from sale of infrastructure assets not distributed pursuant to an earlier plan to re-invest, if such proceeds are not intended to be invested subsequently, net of any profit/ (loss) recognised in profit and loss account. *	(142.72)
6	**Add/ Less:** Any other item of non- cash expense/ non cash income (net of actual cash flows for these items), if deemed necessary by the Investment Manager. For example, any decrease/ increase in carrying amount of an asset or a liability recognised in profit and loss /income and expenditure on measurement of the asset or the liability at fair value; Interest cost as per effective interest rate method, deferred tax lease rents recognised on a straight line basis, etc.	1,25,403.04
7	**Less:** Repayment of external debt (principal) / redeemable preference shares / debentures, etc. (excluding refinancing) / net cash set aside to comply with DSRA requirement under loan agreements. **	(504.26)
8	**Total Adjustments (B)**	**1,49,526.96**
9	**Net Distributable Cash Flows (C) = (A+B)**	**84,093.58**

* This includes amount utilized for purchase of Property, Plant and Equipments and Intangible Assets

** As at 31-03-2024 this includes Fixed Deposit of Rs. 504.26 Lakhs lien marked in favor of Bank of Maharashtra against Performance Bank Guarantee issued in favour of NHAI.

Adjustment to Net Distributable Cash Flows

S. No.	Particulars	For the year ended March 31, 2024
1	**Net Distributable Cash flow for the year (From (C) Above)**	**84,093.58**
2	Less: Actual Distribution during the year	(82,549.93)
	Balance	**1,543.65**
3	Add: Opening Surplus (Opening Cash adjusted with Net working Capital as on 31-03-2023)	3,896.22
4	Less: Cash Set Aside For movemnet in net working capital as on 31-03-2024	(254.95)
	Balance Distributable Cash Flow* **	**5,184.93**

*** Rs. 5,162.05 lakhs of Cash out of Balance Distributable cash as on 31st March 2024 has been distributed to Trust in April 2024.

NHIT EASTERN PROJECTS PRIVATE LIMITED

CIN: U42101DL2023PTC412707

Annexure 2(ii): Statement of Net Distributable Cash Flows (NDFC) of the SPV as per the earlier framework paragraph 6 of chapter 4 to the Master circular No. SEBI/HO/DDHS-PoD-2/P/CIR/2023/115 dated July 06, 2023

(All amounts in ₹ lakh unless otherwise stated)

S. No.	Particulars	For the year ended March 31, 2024
1	**Profit/ (Loss) after tax as per Statement of profit and loss/income and expenditure (standalone) (A)**	**(1,693.38)**
2	**Add:** Depreciation and amortization as per statement of profit and loss account. Incase of Impairment reversal, same needs to be deducted from profit and loss.	0.13
3	**Add/Less:** Loss/gain on sale of infrastructure assets	-
4	**Add:** Proceeds from sale of infrastructure assests adjusted for the following: related debts settled or due to be settled from sale proceeds; directly attributable transaction costs; proceeds reinvested or planned to be reinvested as per Regulation 18(7)(a) of the InvIT regulations	-
5	**Add:** Proceeds from sale of infrastructure assets not distributed pursuant to an earlier plan to re-invest, if such proceeds are not intended to be invested subsequently, net of any profit/ (loss) recognised in profit and loss account. *	(0.50)
6	**Add/ Less:** Any other item of non- cash expense/ non cash income (net of actual cash flows for these items), if deemed necessary by the Investment Manager. For example, any decrease/ increase in carrying amount of an asset or a liability recognised in profit and loss /income and expenditure on measurement of the asset or the liability at fair value; Interest cost as per effective interest rate method, deferred tax lease rents recognised on a straight line basis, etc.**	2,217.93
7	**Less:** Repayment of external debt (principal) / redeemable preference shares / debentures, etc. (excluding refinancing) / net cash set aside to comply with DSRA requirement under loan agreements. ***	
8	**Total Adjustments (B)**	**2,217.57**
9	**Net Distributable Cash Flows (C) = (A+B)****	**524.19**

* This includes amount utilized for purchase of Property, Plant and Equipments and Intangible Assets

** The distributable cash flows are retained for working capital requirements of the Company.

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
INTERIM CONSOLIDATED STATEMENT OF CHANGES IN UNIT HOLDER'S EQUITY FOR THE HALF YEAR ENDED SEPTEMBER 30, 2024

A. Initial Settlement Amount

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	Amount
Balance as at April 1, 2023	0.10
Changes in unit capital	-
Balance as at March 31, 2024	0.10
Changes in unit capital	-
Balance as at September 30, 2024	0.10

B. Unit Capital *

Particulars	Number of unit	Amount
Balance as at April 1, 2023	**72,64,05,200.00**	**7,41,604.32**
Changes in unit capital	58,57,95,400.00	7,27,206.41
One time issue expenses	-	(1,717.27)
Balance as at March 31, 2024	**1,31,22,00,600**	**14,67,093.46**
Changes in unit capital	**-**	**-**
One time issue expenses	**-**	(145.66)
Balance as at September 30, 2024	**1,31,22,00,600**	**14,66,947.80**

Issue expenses of Rs. 145.66 lakhs (March 31, 2024: Rs 1,717.27 lakhs) incurred in connection with issue of units have been reduced from the Unitholders capital in accordance with Ind AS 32 Financial Instruments: Presentation

C. Other Equity **

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	Reserves and Surplus	Items of Other Comprehensive Income	Total
		Items that will not be reclassified to profit or loss	
	Retained Earnings	Remeasurement of Defined Benefit Obligation/ Plan	
Balance as at April 1, 2023	**(2,469.86)**	-	**(2,469.86)**
Profit/ (Loss) for the year	29,419.57	0.13	29,419.70
Less:			
Distribution to unit holders^			
Interest	53,701.68	-	53,701.68
Other Income	789.60	-	789.60
Balance as at March 31, 2024	**(27,541.57)**	**0.13**	**(27,541.44)**
Profit/ (Loss) for the year	13,852.80	**(4.54)**	13,848.26
Less:			
Distribution to unit holders^			
Interest	32,529.45	**-**	32,529.45
Other Income	406.78	**-**	406.78
Balance as at September 30, 2024	**(46,625.01)**	**(4.42)**	**(46,629.45)**

^This distribution for the Half Year ended 30th September 2024 includes for the period February 01, 2024 to June 30, 2024 and does not include the distribution relating the period 1st July 2024 to 30th September 2024. The distributions for the previous year includes for the period 1st January 2023 upto 31st January 2024. The distributions by the Trust to its unit holders are based on the Net Distributable Cash Flows of the Trust under the SEBI InvIT Regulations.

* Refer Note No. 17
** Refer Note No. 18

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

MOHD AZAM ANSARI
Digitally signed by MOHD AZAM ANSARI
Date: 2024.12.19 16:46:48 +05'30'

CA Mohd. Azam Ansari
Partner
M.No.511623

Place : New Delhi
Date : 19th December 2024

For and on behalf of National Highways Infra Trust
(By National Highways Infra Investment Managers Private Limited)

SURESH GOYAL
Digitally signed by SURESH GOYAL
Date: 2024.12.19 16:11:01 +05'30'

Suresh Krishan Goyal
Director
DIN: 02721580

GUNJAN SINGH
Digitally signed by GUNJAN SINGH
Date: 2024.12.19 16:15:27 +05'30'

Gunjan Singh
Compliance Officer

MATHEW GEORGE
Digitally signed by MATHEW GEORGE
Date: 2024.12.19 16:17:43 +05'30'

Mathew George
Chief Financial Officer

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
Notes to the Interim Consolidated Financial Statements for the Half Year ended September 30, 2024

1 TRUST INFORMATION AND NATURE OF OPERATIONS

National Highways Infra Trust ("Trust" or "InvIT") is an irrevocable trust registered under the provisions of the Indian Trusts Act, 1882 on 19th October 2020. It is registered under the Securities and Exchange Board of India (Infrastructure Investment Trust) Regulations, 2014 on 28th October 2020 having registration number IN/InvIT/20-21/0014.

The Trust was setup by National Highways Authority of India ("NHAI" or the "Sponsor"). The Trustee to the Trust is IDBI Trusteeship Services Limited (the "Trustee") and Investment Manager for the Trust is National Highways Infra Investment Managers Private Limited ("Investment Manager").

The Trust has been formed to invest in infrastructure assets primarily being in the road sector in India. The Trust's road projects are implemented and held through special purpose vehicles ("Project SPVs"/ "Subsidiaries"). The units of the Trust were listed in Bombay Stock Exchange and National Stock Exchange on 10th November 2021.

During the FY 2021-2022, the Trust acquired 100% equity control in NHIT Western Projects Private Limited (Formerly known as National Highway Infra Projects Private Limited) (the "Project SPV") from the Sponsor with effect from 3rd November 2021. During the FY 2020-2021, the project SPV entered into five Concession Agreements for 30 years with the Sponsor (National Highways Authority of India - NHAI) on Toll, Operate and Transfer ('TOT') basis and in FY 2022-2023, further signed 3 new Concession Agreements for 20 years with National Highways Authority of India for Toll, Operate and Transfer ('TOT') basis. Further, the trust incorporated the SPV - II NHIT Eastern Projects Private Limited (NEPPL) on 19-04-2023. NEPPL entered into seven concession agreements with National Highway Authority of India ("NHAI") for Tolling, Management, Maintenance and Transfer of seven toll road projects for a period of 20 years from the appointed date which is 01.04.2024.

The registered office of the Investment Manager is G-5 & 6, Sector-10, Dwarka, New Delhi - 110075.

2 Basis of Preparation

The Consolidated financial statements comprises of the Consolidated Balance Sheet, Consolidated Statement of Profit and Loss, Consolidated Cash Flow Statement, Consolidated Statement of Changes in Equity and Consolidated explanatory notes thereon of National Highways Infra Trust, for the Half Year ended 30 September 2024 ("Interim Financial Information"). The Interim financial Information has been prepared in accordance with recognition and measurement principles laid down in Indian Accounting Standard 34- Interim Financial Reporting (Ind AS 34), as presribed in Rule 2(1)(a) of the Companies (Indian Accounting Standards) Rules, 2015 (as amended) and other accounting principles generally accepted in India, to the extent not inconsistent with the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014, as amended, the additional disclosures as required in Chapter 4 of SEBI Master Circular No. SEBI/HO/DDHS-PoD 2/P/CIR/2024/44 dated 15 May 2024 as amended including any guidelines and circulars issued thereunder ("SEBI Circulars/InvIT Regulations")

The financial information do not contain any false or misleading statement or figures and do not omit any material fact which makes the statements or the figures contained therein misleading.

The Consolidated financial statements were authorised for issue in accordance with resolution passed by the board of directors of the Investment Manager on 19.12.2024.

The audit of the Consolidated Financial statements for the Half Year ended September 30, 2024 of NHIT has been carried out by the Statutory Auditors of NHIT.

2.1 Material accounting policies and key sources of estimation uncertainities and critical judgements

A Material accounting policies

The accounting policies adopted in preparation of these financial statements are consistent with those followed in preparation of the Group's latest Annual Consolidated Financial Statements.

B Key sources of estimation uncertainities and critical judgements

The preparation of the consolidated financial statements requires use of certain critical accounting estimates and judgements. It also requires the management to exercise judgement in the process of applying the Group's accounting policies. The areas where judgements and estimates are significant to the financial statements or areas involving a higher degree of judgement or complexity are the same as those applied to the Group's latest Annual Consolidated Financial Statements.

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
Notes to the Interim Consolidated Financial Statements for the Half Year ended September 30, 2024

3 Property, Plant and Equipment

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Temporary Structure	Plant & Machinary	Computer	Office Equipment	Furniture & Fixtures	Total
Gross Carrying Amount:						
Balance as at April 1, 2023	**25.59**	**-**	**45.44**	**17.42**	**44.27**	**132.72**
Additions	10.99	13.58	43.60	48.32	26.75	143.23
Less: Disposals	**-**	**-**	1.09	**-**	**-**	1.09
Balance as at March 31, 2024	**36.58**	**13.58**	**87.95**	**65.74**	**71.02**	**274.86**
Additions	27.00	3.12	93.87	50.87	28.67	203.53
Less: Disposals	**-**	**-**	-	**-**	**-**	-
Balance as at September 30, 2024	**63.57**	**16.70**	**181.83**	**116.61**	**99.69**	**478.39**
Accumulated Depreciation:						
Balance as at April 1, 2023	**1.49**	**-**	**4.36**	0.82	0.88	**7.55**
Additions	10.71	0.08	22.29	9.97	5.27	48.31
Less: Disposals	-	-	0.29	-	-	0.29
Balance as at March 31, 2024	**12.20**	**0.08**	**26.36**	10.79	6.15	**55.57**
Additions	7.28	0.50	18.95	9.94	4.01	40.67
Less: Disposals	**-**	**-**	**-**	-	-	-
Balance as at September 30, 2024	**19.47**	**0.57**	**45.30**	20.74	10.16	**96.24**
Net Carrying Amount:						
Balance as at April 1, 2023	**24.10**	**-**	**41.08**	**16.60**	**43.39**	**125.17**
Balance as at March 31, 2024	**24.38**	**13.50**	**61.59**	**54.95**	**64.87**	**219.29**
Balance as at September 30, 2024	**44.10**	**16.12**	**136.52**	**95.88**	**89.53**	**382.15**

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
Notes to the Interim Consolidated Financial Statements for the Half Year ended September 30, 2024

4. Capital Work in Progress

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Plant and Machinery*	24.32	19.76
Total	**24.32**	**19.76**

* This is pertaining to Solar Power Plants which is under installation at toll plaza.

Capital Work in Progress (CWIP) ageing schedule

As at September 30, 2024	Less than 1 Year	1-2 Year	2-3 Year	More than 3 Year	Total
Project in Progress	24.32	-	-	-	24.32
Total	**24.32**	**-**	**-**	**-**	**24.32**

As at March 31, 2024	Less than 1 Year	1-2 Year	2-3 Year	More than 3 Year	Total
Project in Progress	19.76	-	-	-	19.76
Total	**19.76**	**-**	**-**	**-**	**19.76**

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
Notes to the Interim Consolidated Financial Statements for the Half Year ended September 30, 2024

5 Goodwill

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	As at September 30, 2024	As at March 31, 2024
Gross Carrying Amount		
Balance at the beginning of the period/year	10,144.46	10,144.46
Additions	-	-
Less: Disposals	-	-
Less: Impairment	-	-
Balance at the closing of the period/year	**10,144.46**	**10,144.46**

The carrying amount relates to goodwill arising on acquisition of Project SPV (NWPPL) by the Trust. There has been no impairment loss recognised in the statement of profit and loss for the period ended September 30, 2024

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
Notes to the Interim Consolidated Financial Statements for the Half Year ended September 30, 2024

6 Other Intangible Assets

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Software	Toll collection rights	Total
Gross Carrying Amount:			
Balance as at April 1, 2023	**2.16**	**10,20,006.66**	**10,20,008.82**
Additions	0.06	1,11,993.43	1,11,993.49
Less: Disposals	-	-	-
Balance as at March 31, 2024	**2.22**	**11,32,000.09**	**11,32,002.31**
Additions	-	16,01,139.28	16,01,139.28
Less: Disposals	-	-	-
Balance as at September 30, 2024	**2.22**	**27,33,139.37**	**27,33,141.59**
Accumulated Amortization:			
Balance as at April 1, 2023	**0.25**	**18,608.48**	**18,608.73**
Additions	0.68	24,722.06	24,722.74
Less: Disposals	-	-	-
Balance as at March 31, 2024	**0.93**	**43,330.54**	**43,331.47**
Additions	-	37,627.51	37,627.51
Less: Disposals	-	-	-
Balance as at September 30, 2024	**0.93**	**80,958.05**	**80,958.98**
Net Carrying Amount			
Balance as at April 1, 2023	**1.91**	**10,01,398.18**	**10,01,400.09**
Balance as at March 31, 2024	**1.29**	**10,88,669.55**	**10,88,670.84**
Balance as at September 30, 2024	**1.29**	**26,52,181.32**	**26,52,182.61**

Note:-

1. In FY 2021-22, the Group has acquired rights for Tolling, Operation, Maintenance and Transfer of five toll road projects for a period of 30 years basis Toll Concession agreements with NHAI, for a consideration of INR 7,350.40 Crore and the same have been recognised as Intangible Assets in financial statements. The Group further acquired rights during the Previous FY 2022-23 for Tolling, Operation, Maintenance and Transfer of three additional toll road projects for a period of 20 years basis Toll Concession Agreements with NHAI, for a consideration of INR 2,849.66 Crore and the same have been addition in the Intangible Assets in financial statements.

2. The Group has acquired rights (appointed date 01st April 2024) for tolling, operation, Maintenance and transfer of seven toll road projects for a period of 20 years basis Toll concession agreements with the NHAI, for a consideration of Rs. 15,699.88 Crore and the same have been recognised as Intangible Assets on appointed date in financial statements which shall be amortized basis a consumption based model (using Passanger Car Unit (PCU) projections) over the tenure of the concession agreement i.e. 20 years. In previous financial year this amount was classified as capital advance to NHAI as appointed date for these seven projects was 1st April 2024.

3.Toll Collection Rights has been amortized on the basis of Consumption based model (using Passenger Car Unit (PCU) projections) over the tenure of the Concession Agreement i.e. 30 years and 20 years basis respective concession agreements for those toll road projects.

4. The Group has capitalised the initial improvement works amounting to Rs. 342.08 crores (Undiscounted Value) on appointed date i.e. 01-04-2024 (for NEPPL). During the previous year, the Group has capitalised Initial Improvement Works amounting to Rs. 1,212.28 Crores (Undiscounted Value) to Intangible Asset (for NWPPL) (For detailed note on initial improvement works refer note no. 54).

7 Right of Use-Assets

(All amount in ₹ lakhs unless otherwise stated)

Particulars	Leasehold Office
Gross Carrying :	
Balance as at April 1, 2024	**-**
Additions	**621.73**
Less: Disposals	**-**
Balance as at September 30, 2024	**621.73**
Accumulated Depreciation:	
Balance as at April 1, 2024	**-**
Additions	**11.77**
Less: Disposals	**-**
Balance as at September 30, 2024	**11.77**
Net Carrying Amount:	
As at September 30, 2024	**609.95**

* Office Buildings are taken on lease; Quarterly/monthly installments are paid as per agreed terms and conditions.

8 Other Financial Assets: Non Current

(All amount in ₹ lakhs unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Investment in Fixed Deposits		
Fixed Deposits with banks*	30,150.03	9,916.99
Security Deposits	35.17	3.38
Interest receivable on Debenture recovery expense fund	1.78	1.32
Interest receivable on fixed deposits	464.27	241.17
Deposit - Debenture Recovery Expense Fund for NCD's	15.00	15.00
	30,666.24	**10,177.86**

*The Fixed Deposits are kept in Debt Servicing Reserve Account (DSRA) as per borrowing agreements with lenders and as per terms of the debenture trust deed, to be utilized at the end of tenure of long term borrowings from Senior Lenders and to maintain DSRA balance for Debenture holders, hence classified as Other Financial Assets- Non Current irrespective of date of maturity.

9 Deferred Tax Assets (Net)

(All amount in ₹ lakhs unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Deferred Tax Assets arising on account of:		
- Unabsorbed depreciation	1,87,188.77	1,19,086.98
-Provision on Initial improvement	25,328.02	25,179.31
Total (A)	**2,12,516.79**	**1,44,266.29**
Deferred Tax Liabilities arising on account of:		
- Difference between Book & Tax base related to Intangible assets & PPE	1,90,890.26	1,32,743.09
Total (B)	**1,90,890.26**	**1,32,743.09**
Net (A-B)	**21,626.53**	**11,523.20**

Reconciliation of Deferred Tax Asset/ (Liabilities)

(All amount in ₹ lakhs unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Opening Balance - Deferred Tax Asset	11,523.20	4,685.32
Deferred tax income/ (expense) during the period recognised in profit & loss	10,103.32	6,837.88
Closing Balance - Deferred Tax Asset	**21,626.53**	**11,523.20**

As at September 30, 2024, based on the expected future profitability of the NWPPL & NEPPL (SPVs), the management has recognised deferred tax assets on the unabsorbed tax depreciation carried forward only and not recognised Deferred Tax Assets on major maintainance obligation and business losses for the period, as carried forward business losses will not be available for utilisation within the time limit allowable as per the Income Tax Act based on the future projections of the profitability of the entity in accordance with provision of Ind AS 12 "Income Taxes".

10 Non Current Tax Assets (Net)

(All amount in ₹ lakhs unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Income tax refundable (net of provision)	48.64	22.38
	48.64	**22.38**

11 Other non current assets

(All amount in ₹ lakhs unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Capital advances	126.42	565.57
Advance paid to NHAI for acquisition of R3 asset*	-	15,69,988.18
Prepaid Expenses - Non Current	20.85	-
Processing fees paid for undrawn loan	64.85	95.43
	212.12	**15,70,649.18**

*This amount pertains to concession fees paid to NHAI by NEPPL for the acquisition of seven projects. The appointed date for these acquisitions is with effect from 1st April 2024 , therefore the amount paid to NHAI was classified as capital advance in previous financial year. In current year this has been capitalised as Toll Collection Rights under Intangible Assets (Refer Note 6- Other Intangible Assets)

12 Trade Receivables: Current

(All amount in ₹ lakhs unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Considered good-unsecured	4,696.79	385.20
Trade Receivables - Credit Impaired (unsecured)	59.60	59.60
	4,756.39	**444.80**
Less:- Allowances for expected credit loss	(59.60)	(59.60)
	4,696.79	**385.20**

The receivables are hypothecated by way of first ranking exclusive charge to secure senior lenders and non convertible debenture holders in Trust.

Trade Receivables ageing schedule as on September 30, 2024

Particulars	Outstanding for following period from due date of payment.					Total
	0-6 Months	6 Months -1 Year	1-2 Years	2-3 Years	More than 3 years	
Undisputed trade receivables						
i) Considered good	4,696.79	-	-	-	-	**4,696.79**
ii) Which have significant increase in credit risk	-	-	-	-	-	**-**
iii) Credit impaired	-	-	59.60	-	-	**59.60**
Disputed trade receivables						
i) Considered good	-	-	-	-	-	**-**
ii) Which have significant increase in credit risk	-	-	-	-	-	**-**
iii) Credit impaired	-	-	-	-	-	**-**
Total	**4,696.79**	**-**	**59.60**	**-**	**-**	**4,756.39**

Trade Receivables ageing schedule as on March 31, 2024

Particulars	Outstanding for following period from due date of payment.					Total
	0-6 Months	6 Months -1 Year	1-2 Years	2-3 Years	More than 3 years	
Undisputed trade receivables						
i) Considered good	385.20	-	-	-	-	**385.20**
ii) Which have significant increase in credit risk	-	-	-	-	-	**-**
iii) Credit impaired	-	-	59.60	-	-	**59.60**
Disputed trade receivables						
i) Considered good	-	-	-	-	-	**-**
ii) Which have significant increase in credit risk	-	-	-	-	-	**-**
iii) Credit impaired	-	-	-	-	-	**-**
Total	**385.20**	**-**	**59.60**	**-**	**-**	**444.80**

13 Cash and Cash Equivalents*

(All amount in ₹ lakhs unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Balances with Banks		
In Current Accounts	4,136.59	1,260.12
In Escrow Accounts	1,031.77	467.42
Unpaid Distribution Account**	4.55	-
Cash in Hand	25.11	15.17
Fixed Deposits (having original maturity of less than 3 months)	14,817.06	6,163.15
Overnight mutual fund***	28,642.37	38,494.92
	48,657.44	**46,400.78**

*Cash and Cash Equivalents includes Rs. 14,888.75 Lakhs (March 31, 2024: Rs. 6,209.70 Lakhs) which are unutilised balance in Project SPVs' - NWPPL & NEPPL for initial improvement works of R1, R2 & R3 Projects.

The balances in escrow accounts are hypothecated by way of first ranking exclusive charge to secure senior lenders and non convertible debenture holders in Trust.

**The amount lying in unpaid distribution account is pertaining to the unclaimed distribution of the unitholders. The said amount is transferred to this account as per SEBI InvIT Regulations, 2014.

*** Investment in Mutual Funds includes Rs. 15,000 Lakhs raised in previous year from unit issue for leap projects, to be utilised for creation of DSRA against loans raised for leap projects. Further these Investments includes Rs. 2,883 Lakhs pertaining to one time issue related expenses in respect of issuance of units during Round 3 lying unutilized as on 30-09-2024.

14 Bank Balance Other than Cash and Cash Equivalent

(All amount in ₹ lakhs unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Bank Deposits with original maturity of more than 3 Months*	518.33	504.26
Interest Accrued on bank deposits	17.46	8.72
		-
	535.78	**512.98**

* Fixed deposits amounting to Rs. 504.26 Lakhs (March 31, 2024: Rs. 504.26 Lakhs) is lien marked in favour of Bank of Maharashtra and kept as Margin Money against the Bank Guarantee issued to NHAI for R-2 Projects by the group.

15 Other Financial Assets: Current

(All amount in ₹ lakhs unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Security deposits	42.33	4.54
Advance to Employee	8.50	-
	50.84	**4.54**

16 Other Current Assets

(All amount in ₹ lakhs unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Prepaid expenses	864.81	470.02
GST Input	723.23	523.36
Processing fees paid for undrawn loan	98.47	152.84
Advance to suppliers	28.11	1,157.23
Others	6.44	0.44
	1,721.06	**2,303.89**

17 Unit Capital

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	As at September 30, 2024		As at March 31, 2024	
	No of Units	Amount	No of Units	Amount
Unit Capital*				
Opening balance	1,31,22,00,600	14,67,093.46	72,64,05,200	7,41,604.32
Add: Units issued during the period/year	-	-	58,57,95,400	7,27,206.41
Less: Issue expenses (refer note below)	-	(145.66)	-	(1,717.27)
Balance at period/year end	**1,31,22,00,600**	**14,66,947.80**	**1,31,22,00,600**	**14,67,093.46**

* 58,57,95,400 units issued at Rs. 124.14 per unit during previous financial year.
In previous year the Trust offered an issue of 58,57,95,400 units of National Highways Infra Trust ("NHIT"), for cash at a price of 124.14 per unit (the "issue price"), aggregating to Rs 7,27,206.41 lakhs through Institutional and preferential placement in accordance with the Securities and Exchange Board of India (Infrastructure Investment Trust) Regulations, 2014 including the rules, circulars and guidelines issued thereunder.

Issue expenses of Rs. 145.66 lakhs (March 31, 2024: Rs 1,717.27 lakhs) incurred in connection with issue of units have been reduced from the Unitholders capital in accordance with Ind AS 32 Financial Instruments: Presentation

Rights/ preferences and restrictions attached to Unit Capital

Subject to the provisions of the InvIT Regulations, the indenture of funds, and applicable rules, regulations and guidelines, the rights of the unit holders include:

a) The beneficial interest of each unitholder shall be equal and limited to the proportion of the number of the units held by that unitholder to the total number of units.

b) Right to receive income or distributions with respect to the units held.

c) Right to attend the annual general meeting and other meetings of unit holders of the Trust.

d) Right to vote upon any matters/resolutions proposed in relation to the Trust.

e) Right to receive periodic information having a bearing on the operation or performance of the Trust in accordance with the InvIT Regulations.

f) Right to apply to the Trust to take up certain issues at meetings for unit holders approval.

g) Right to receive additional information, if any, in accordance with InvIT documents filed with Placement Memorandum.

In accordance with the InvIT Regulations, no unit holders shall enjoy superior voting or any other rights over any other unit holders, and there shall not be multiple classes of units. There shall be only one denomination of units. Not withstanding the above, subordinate units may be issued only to the Sponsor and its Associates, where such subordinate units shall carry only inferior voting or any other rights compare to the other units.

Under the provisions of the InvIT Regulations, not less than 90% of the net distributable cash flows of the Trust is required to be distributed to the unitholders, and in accordance with such statutory obligation the Trust has formulated a distribution policy to declare and distribute the distributable cash flows to its unitholders atleast once every financial year as approved by the Board of Directors of the Investment Manager. The distributions made by Trust to its unitholders are based on the Net Distributable Cash Flows (NDCF) of the Trust under the InvIT Regulations. The distribution in proportion to the number of units held by the unitholders. The Trust declares and pays in distributions in indian rupees.

Limitation to the Liability of the unit holders

The liability of each unit holders towards the payment of any amount (that may arise in relation to the Trust including any taxes, duties, fines, levies, liabilities, costs or expenses) shall be limited only to the extent of the capital contribution of such unit holders and after such capital contribution shall have been paid in full by the unit holders, the unit holders shall not be obligated to make any further payments.

The unit holders shall not have any personal liability or obligation with respect to the Trust.

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Classification of Unit Holders' Funds

Under the provisions of the InvIT Regulations, NHIT is required to distribute to Unitholders not less than ninety percent of the net distributable cash flows of NHIT for each financial year. Accordingly, a portion of the unitholders' funds contains a contractual obligation of the Trust to pay to its Unitholders cash distributions. The Unitholders' funds could therefore have been classified as compound financial instrument which contain both equity and liability components in accordance with Ind AS 32 - Financial Instruments: Presentation. However, in accordance with SEBI Circulars (No. CIR/IMD/DF/114/2016 dated 20-Oct-2016 and No. CIR/IMD/DF/127/2016 dated 29-Nov-2016) issued under the InvIT Regulations, the unitholders' funds have been classified as equity in order to comply with the mandatory requirements of Section H of Annexure A to the SEBI Circular dated 20-Oct-2016 dealing with the minimum disclosures for key financial statements. In line with the above, the distribution payable to unit holders is recognised as liability when the same is approved by the Investment Manager.

Details of Unitholders Holding More Than 5% Units In The Trust

Name of Unitholders	As at September 30, 2024		As at March 31, 2024	
	No of Units	%	No of Units	%
Ontario Limited	32,80,50,150	25.00%	32,80,50,150	25.00%
CPP Investment Board Private Holdings Inc.	32,80,50,150	25.00%	32,80,50,150	25.00%
SBI Balanced Advantage Trust	6,31,60,260	4.81%	6,31,60,260	4.81%
National Highways Authority of India (NHAI)	20,30,72,000	15.48%	20,30,72,000	15.48%

As per records of the Trust, including its register of unitholders and other declaration received from unitholders regarding beneficial interest, the above unitholding represent both legal and beneficial ownership of units.

The Trust has not allotted any fully paid-up units by way of bonus units nor has it bought back any class of units from the date of incorporation till the balance sheet date. Further the Trust has not issued any units for consideration other than cash during the year.

Reconciliation of number of units outstanding

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	As at September 30, 2024		As at March 31, 2024	
	No of Units	Amount*	No of Units	Amount*
Number of Units at the beginning of the period/year	1,31,22,00,600	14,71,372.08	72,64,05,200	7,44,165.67
Units issued during the period/year	-	-	58,57,95,400	7,27,206.41
Number of Units at the end of the period/year	1,31,22,00,600	14,71,372.08	1,31,22,00,600	14,71,372.08

* Amount related to issue expenses are not deducted in the reconciliation of number of unit capital outstanding.

18 Other equity

(All amounts in ₹ lakh unless otherwise stated)

Reserves and Surplus	As at September 30, 2024	As at March 31, 2024
Retained Earnings		
Balance at the beginning of the period/year	**(27,541.44)**	**(2,469.86)**
Total comprehensive income for the period/year	13,852.80	29,419.57
Other Comprehensive Income for the period/year	(4.55)	0.13
Less:		
Distribution to unit holders^		
Interest	32,529.45	53,701.68
Other Income	406.78	789.60
Balance at the closing of the period/year	**(46,629.45)**	**(27,541.44)**

^This distribution for the Half Year ended 30th September 2024 includes for the period February 01, 2024 to June 30, 2024 and does not include the distribution relating the period 1st July 2024 to 30th September 2024. The distributions for the previous year includes for the period 1st January 2023 upto 31st January 2024. The distributions by the Trust to its unit holders are based on the Net Distributable Cash Flows of the Trust under the SEBI InvIT Regulations.

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19 Borrowings: Non Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Secured		
Non-Convertible Debenture	1,50,000.00	1,50,000.00
Less: Unamortized Borrowing Cost	1,333.85	1,360.91
Total (A)	**1,48,666.15**	**1,48,639.09**

Note:- Other terms and conditions of NCD

i) Interest rate	7.90% p.a payable semi annually.
ii) Terms of repayment	Redemption of respective STRPP shall be made in equal instalments i) STRPP A - starting from eigth anniversary of deemed date of allotment till thirteenth anniversary. ii) STRPP-B- starting from thirteenth anniversary of deemed date of allotment till eighteenth anniversary. iii) STRPP-C- starting from eighteenth anniversary of deemed date of allotment till twenty fifth anniversary.

Term Loan:		
From Banks	7,59,439.77	7,21,927.70
From Financial Institution	3,03,932.11	3,05,000.00
Term Loan from Related Party	-	-
	10,63,371.88	**10,26,927.70**
Less: Current Maturities of Long Term borrowings (Refer Note 23)	11,442.50	10,054.00
Less: Unamortised Borrowing Cost	2,132.35	2,117.85
Total (B)	**10,49,797.03**	**10,14,755.85**
Grand Total C = (A+B)	**11,98,463.18**	**11,63,394.94**

During the previous year ended 31st March 2024, the Trust has obtained the sanction of Rs. 877 Crores from the Axis bank for initial improvement works of Round 2 Assets and has obtained sanction of Rs. 9,000 Crores from banks and financial institution for acquistion of Round 3 Assets and has taken a disbursement of Rs. 8,658 Crore during the previous year.

Loan from Banks include loan received from IDBI Bank which is Promoter of IDBI Trusteeship Services Limited (ITSL) - Trustee of the Trust, therefore the transactions with IDBI Bank are disclosed in Related Party Transaction.

Note:- Other terms and conditions of Term Loans

i) Interest rate	Benchmark Rate plus spread applicable on each reset date for facility agreement.
ii) Terms of repayment	Repayable in unstructured quarterly instalments with last repayment date upto March 31, 2041 & March 31, 2042 for facility agreement of R1 & R2 Assets respectively. Repayable in unstructured quarterly instalments with last repayment date upto March 31, 2042 for facility agreement of R3 Asset.

Security for Term Loans :

The loan is secured by,

- first pari passu charge on all immovable assets (if any), movable assets and receivables of the Trust including but not limited to,
(i) the interest and principal repayments on the loans advanced by the Trust to Project SPVs
(ii) dividends to be paid by Project SPVs to the Trust
- first pari passu Security Interest on Trust Escrow account and all sub-accounts thereunder, including DSRA.
- pledge of 100% equity shares of Project SPVs' (NWPPL & NEPPL) in dematerialized form held by the Trust
- assignment of loans advanced by the Trust to Project SPVs (NWPPL & NEPPL) and securities created by the Trust including the assignment of rights of substitution, termination and invocation of provision of Escrow agreement in case of default.
- negative lien on immovable assets (including current assets and cash flows) of the Project SPVs (NWPPL & NEPPL) subject to sale of obsolete items or cars/ ambulances, old toll equipment etc., under normal business practice, subject to maximum cumulative value of INR 5 Crore in any financial year for R1 projects / INR 2 Crore per project in any financial year for R2 & R3.

The senior lenders of the Trust have also been provided with a corporate guarantee from Project SPV (NWPPL) to guarantee upto the secured obligations of the Trust. The funds have been raised at Trust level from unitholders and domestic lenders, and the same have been lent to Project SPV (NWPPL) for payment of concession fee by NWPPL to NHAI. The cashflows viz., toll collections are lying in NWPPL. Accordingly, corporate guarantee amounting upto the secured obligations of the Trust via Corporate Guarantee Deed dated 14.03.2022 and 08.01.2024, valid across the tenure of the loan of the Trust i.e. up to 31.03.2041 and 31.03.2042 respectively, which was provided by the Project SPV (NWPPL) to the senior lenders of the Trust has been released post March 31, 2024.

Nature of Security for Non Convertible debentures:

The debenture holders are secured by :

a) a first ranking pari passu Security Interest over the Trust's immovable assets (if any), both present and future. The Trust does not own any immovable property at the present time. In the event, the Trust acquires any immovable property in future, the Trust shall mortgage said property within 180 (one hundred eighty) days from the date of acquisition of such immovable assets. The Debenture Trustee shall be authorised to do all acts, deeds, and enter into necessary documents, agreement, amendments and/or modifications, as may be required to give effect the same, including carrying out the due diligence as may be required by Debenture Trustee;
b) a first ranking pari passu Security Interest over the Hypothecated Assets (including Receivables), both present and future; and
c) Negative Lien Undertaking

The non convertible debenture holders of the Trust acting through debenture trustee have also been provided with a corporate guarantee from Project SPV (NWPPL) to guarantee the repayment of amount raised from non convertible debenture holders by the Trust. The funds have been raised at Trust level from debentureholders, have been lent to Project SPV (NWPPL) for payment of concession fee by NWPPL to NHAI. The corporate guarantee amounting to INR 1500 crores or the secured obligations as on the date of invocation via corporate guarantee deed executed on 21.10.2022 valid across the tenure of the debentures of NHIT i.e till all outstanding principal and accrued interest thereon by the Trust are satisfied by the company to the debenture holders of NHIT. Following approval from the SBI Trustee for the waiver and cancellation of these corporate guarantees, an application was submitted to the stock exchange on September 27, 2024, seeking approval for the waiver and cancellation. The corporate guarantees were officially waived and cancelled, as approved by both BSE and NSE on October 11, 2024.

There have been no breaches in financial covenants with respect to the borrowings from either senior lenders or debenture holders.

20 Lease Liabilties - Non Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars		As at September 30, 2024	As at March 31, 2024
Lease liabilities	(Refer Note 47)	538.32	-
Total		**538.32**	**-**

21 Other Financial liabilities: Non Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Creditors for capital supplies and services	161.25	80.90
	161.25	**80.90**

22 Provisions: Non Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars		As at September 30, 2024	As at March 31, 2024
Provision for employees benefits			
Gratuity (unfunded)		46.73	25.31
Leave Encashment (unfunded)		55.27	33.39
Provision for major maintenance	(Refer Note 53)	26,316.71	15,222.28
Provision for Infrastructure Upgrade	(Refer Note 54)	29,522.83	20,642.34
Total		**55,941.53**	**35,923.32**

a) Nature of provisions for major maintenance

The company is required to operate and maintain the project tollway during the entire concession period and hand over the project back to NHAI as per the maintenance standards prescribed in concession agreements. For this purpose, a regular maintenance along with periodic maintenance is required to be performed. Normally, periodic maintenance includes resurface of pavements, repairs of structures and other equipment and maintenance of service roads. As per industry practice, the periodic maintenance is expected to occur once in five to seven years. The provisions for MMR as per industry practice has been made based on the first cycle of of overlay expected to occur in five to seven years and not based on the total MMR cost over entire concession period. The discounting rate used for arriving at the present value for MMR provisions is government bond rate of 30 years for projects acquired in first phase and 20 years for projects acquired in second phase. The maintenance cost / bituminous overlay may vary based on the actual usage during maintenance period. Accordingly, on the grounds of matching cost concept and based on technical estimates, a provision for major maintenance expense is reviewed and is provided for in the financial statements in each reporting period. Considering that the expense to be incurred is depended on various factors including the usage, wear and tear of the toll road, bituminous overlay, etc., it is not possible to estimate the exact timing and the quantum of the cashflow.

Details of movement in Provisions

Particulars	As at September 30, 2024	As at March 31, 2024
Opening Balance	15,222.28	6,307.44
Add: Accretion during the year	-	-
Provision for Major Maintenance Obligation	10,330.53	8,444.05
Unwinding finance cost on major maintenance provision	763.90	470.79
Less: Utilized during the year	-	-
Closing Balance	**26,316.71**	**15,222.28**

23 Borrowings: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars		As at September 30, 2024	As at March 31, 2024
Current Maturities of Long Term borrowings	(Refer Note 19)	11,442.50	10,054.00
Total		**11,442.50**	**10,054.00**

24 Lease Liabilties - Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars		As at September 30, 2024	As at March 31, 2024
Lease liabilities	(Refer Note 47)	66.72	-
Total		66.72	-

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25 Trade Payables: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Total outstanding, dues of micro and small enterprises	216.53	275.99
Total outstanding, dues of creditors other than micro and small enterprises (Outstanding for less than 12 months from the due date of payment)	6,111.76	4,479.00
Total	**6,328.29**	**4,754.99**

Note:-

Details of dues to micro and small enterprises as per MSMED Act, 2006.

The group has certain dues to suppliers registered under Micro, Small and Medium Enterprises Development Act, 2006 ('MSMED Act'). The disclosures pursuant to the said MSMED Act are as follows:

	As at September 30, 2024	As at March 31, 2024
a) The principal amount remaining unpaid to any supplier at the end of the year	216.53	275.99
b) Interest accrued and due thereon to suppliers under MSMED Act on the above amount remaining unpaid to any supplier at the end of year.	-	-
c) The amount of interest paid by the buyer in terms of section 16 of the MSMED Act, 2006, along with the amount of the payment made to the supplier beyond the appointed day during the year	-	-
d) The amount of interest due and payable for the period of delay in making payment (which have been paid but beyond the appointed day during the year) but without adding the interest specified under the MSMED Act, 2006	-	-
e) The amount of interest accrued and remaining unpaid at the end of each accounting year	-	-
f) The amount of further interest remaining due and payable even in the succeeding years, until such date when the interest dues above are actually paid to the small enterprises, for the purpose of disallowance of a deductible expenditure under section 23 of the MSMED Act, 2006	-	-
Disclosure of payable to vendors as defined under the "Micro, Small and Medium Enterprise Development Act, 2006" is based on the information available with the group regarding the status of registration of such vendors under the said Act, as per the intimation received from them on requests made by the group.	-	-

Trade Payable ageing schedule as at September 30, 2024

Particulars	Not due*	Outstanding for following period from due date of payment.				
		Less than 1 Year	1-2 Years	2-3 Years	More than 3 Years	Total
i) MSME	-	216.53	-	-	-	216.53
ii) Others	5,309.96	537.82	263.78	0.20	-	6,111.76
iii) Disputed dues - MSME	-	-	-	-	-	-
iv) Disputed dues - Others	-	-	-	-	-	-
Total	5,309.96	754.36	263.78	0.20	-	6,328.29

* Trade Payables include unbilled payables amounting to Rs 5,309.96 Lakhs.

Trade Payable ageing schedule as at March 31, 2024

Particulars	Not due*	Outstanding for following period from due date of payment.				
		Less than 1 Year	1-2 Years	2-3 Years	More than 3 Years	Total
i) MSME	-	275.99	-	-	-	275.99
ii) Others	3,884.28	534.02	60.70	-	-	4,479.00
iii) Disputed dues - MSME	-	-	-	-	-	-
iv) Disputed dues - Others	-	-	-	-	-	-
Total	3,884.28	810.02	60.70	-	-	4,754.99

* Trade Payables include unbilled payables amounting to Rs 3,884.28 Lakhs.

26 Other Financial Liabilities: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Interest accrued but not due on NCD	5,145.81	5,162.05
Double toll Fee payable to NHAI	17.61	10.19
Security Deposit	4.19	4.19
Employees payable	96.75	2.18
Payable to NHIIMPL	-	41.69
Creditors for capital supplies and services	1,635.74	2,004.23
Total	**6,900.09**	**7,224.53**

27 Provisions: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Provision for Employee Benefits		
Leave Encashment (unfunded)	8.13	2.01
Gratuity (unfunded)	0.12	0.07
Provision for Infrastructure Upgrade	71,112.99	79,402.58
Total	**71,121.24**	**79,404.66**

28 Current Tax Liabilities / (Assets)

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Provision for Income Tax	(47.20)	188.74
Less: Advance Tax & TDS Receivable	-	(7.08)
Total	**(47.20)**	**181.66**

29 Other Current Liabilities

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Statutory dues payable	299.58	462.78
Advance received	20.45	0.45
Other Payables	4.53	
Total	**324.56**	**463.23**

30 Revenue from operations

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
Sale of Services			
Revenue from Toll Collection	1,12,944.76	46,557.22	94,390.77
Other Operative Revenue			
Construction Contract Revenue	-	616.22	-
Interest on delay in Toll Remittance	88.26	-	-
Total	**1,13,033.02**	**47,173.44**	**94,390.77**

31 Interest income

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
On fixed deposits with banks	948.19	470.03	871.71
Total	**948.19**	**470.03**	**871.71**

32 Profit on sale of investments

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
Profit on redemption of Mutual Funds	896.26	476.27	2,141.16
Total	**896.26**	**476.27**	**2,141.16**

33 Other Income

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
Other non operating income			
Liabilities no longer required written back	0.59	-	32.06
Unwinding Interest on Security Deposits	0.16	-	-
Other Income	35.28	14.27	27.47
Total	**36.04**	**14.27**	**59.53**

34 Operating Expenses

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
Operation and Maintenance Expenses	5,940.49	2,785.72	5,221.55
Construction Contract Expense	-	616.22	-
Major Maintenance Obligation	10,330.53	4,406.44	8,444.05
Total	**16,271.02**	**7,808.38**	**13,665.60**

35 Employee Benefit Expenses

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
Salaries and wages	843.20	389.93	961.98
Contribution to provident and other funds	54.76	26.63	65.87
Gratuity Expenses	16.92	6.05	21.09
Leave Encashment Expense	29.00	15.20	31.34
Staff Welfare Expenses	63.24	13.75	43.06
Employee Insurance Policy	30.84	12.35	29.23
Relocation and Transfer Expenses	3.51	-	4.03
Total	**1,041.48**	**463.91**	**1,156.60**

36 Finance Cost

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
Interest on Long term borrowings	42,084.47	6,229.95	13,059.49
Interest on Debentures	5,925.00	5,941.24	11,882.48
Unwinding finance cost on major maintenance provision	763.90	228.42	470.79
Unwinding interest on infrastructure upgrade	2,476.69	-	2,396.83
Unwinding Interest on Lease Liabilities	7.45	-	-
Other Finance Charges	131.64	118.56	213.58
Total	**51,389.16**	**12,518.17**	**28,023.17**

37 Depreciation and Amortization Expenses

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
Depreciation on Property, Plant and Equipment	40.67	20.75	48.30
Depreciation on Right of Use - Office Building	11.77	-	-
Amortization on Intangible Assets	37,627.73	11,443.28	24,722.74
Total	**37,680.18**	**11,464.03**	**24,771.04**

38 Audit Fees

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
Statutory audit fees	4.27	3.18	8.14
Limited review fees	3.27	5.54	8.82
Tax audit fees	0.24	0.47	1.53
Total	**7.77**	**9.19**	**18.49**
Certification and other charges	0.96	0.40	1.72
Total	**0.96**	**0.40**	**1.72**

Further an amount of Rs. Nil (March 31, 2024: Rs 3 lakh) paid to auditor as certification charges has been booked as part of one time expenses in the Unit Capital. (Refer note no 17)

39 Other Expenses

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
Advertisement expenses	3.54	19.81	19.81
Legal and Professional fees	643.67	656.98	1,262.92
Community Engagement Program	19.71	2.80	39.84
Director's sitting fees	13.22	11.33	18.88
Travelling and conveyance	105.96	25.65	81.43
Training and Seminar Expenses	38.73	-	41.42
Guest House Expenses	37.58	-	16.71
Telephone and internet charges	43.51	9.05	41.29
Power, fuel and water charges	251.25	87.20	253.79
Environment, health and safety expenses	40.32	17.16	64.22
Fee, subscription, rates & taxes	12.48	48.68	380.72
Rent Expense	106.34	-	-
Manpower Charges	27.32	-	-
Recruitment expenses	5.32	-	2.25
Bank charges	0.97	0.84	2.12
Data Management Expenses	-	2.83	1.50
Hiring charges	167.07	82.16	186.01
Repair and maintenance expenses	16.86	12.60	38.71
Preliminary Expenses written off	-	2.55	2.55
Directors Strategy Meet Expenses	7.15	15.84	16.41
Miscellaneous expenses	66.25	26.56	99.04
Total	**1,607.23**	**1,022.03**	**2,569.62**

40 Tax Expense

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
Current Tax	460.49	252.51	886.30
Provision for Taxation–Earlier years	-	0.32	(2.52)
	460.49	**252.82**	**883.78**
Deferred tax expense/(credit)	(10,103.32)	(2,885.33)	(6,837.88)
	(9,642.83)	**(2,632.50)**	**(5,954.10)**

Effective tax Reconciliation:

PARTICULARS	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
Accounting Profit before Income Taxes	4,209.97	13,020.05	23,465.47
Tax at India's statutory income tax rate for SPVs (25.17%)	(24,401.27)	(4,081.27)	(18,569.40)
Tax at India's statutory income tax rate for Business Trusts - Maximum Marginal Rate (42.744%)	39,450.78	9,934.52	41,681.52
Increase/ (reduction) in taxes on account of:			
Impact of deferred tax on reversible allowance/ disallowance of business expense and income, as per Indian Income Tax Act, 1961	14,297.95	1,195.94	11,920.25
Impact of exemption u/s 10(23FC) of the Indian Income Tax Act, 1961 available to the Trust	(38,990.29)	(9,681.69)	(40,986.47)
Income tax expense reported in the statement of profit and loss	**(9,642.83)**	**(2,632.50)**	**(5,954.10)**

41 Earning per Unit

Particulars	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
Basic and diluted EPU			
Net Profit/ loss available for unitholders (in ₹ lakh)	13,848.26	15,650.76	29,419.70
Weighted average number of units for EPU computation	1,31,22,00,600.00	72,63,05,200.00	75,36,14,275.96
EPU- Basic and diluted	**1.06**	**2.15**	**3.90**

Basic EPU amounts are calculated by dividing the profit for the period/ year attributable to Unit holders by the weighted average number of units outstanding during the period/ year. Diluted EPU amounts are calculated by dividing the profit/(loss) attributable to unit holders by the weighted average number of units outstanding during the period/ year plus the weighted average number of units that would be issued on conversion of all the dilutive potential units into unit capital.

42 Statement of Related Parties

A. List of Related Parties as per requirement of IND AS 24 – "Related Party Disclosures"

Enterprises where Control / significant influence exists	**NHIT Western Projects Private Limited (NWPPL) (Subsidiary Company)**
	NHIT Eastern Projects Private Limited (NEPPL) (Subsidiary Company)

B. List of additional related parties as per Regulation 2(1)(zv) of the SEBI InvIT Regulations

Parties to the Trust

National Highways Infra Investment Managers Private Limited (NHIIMPL) - Investment Manager (IM) of the Trust
IDBI Trusteeship Services Limited (ITSL) - Trustee of the Trust
National Highways Authority of India (NHAI)- Sponsor
National Highways InvIT Project Managers Private Limited (NHIPMPL)- Project Manager

Promoters of the Parties to the Trust specified above

Government of India (acting through Ministry of Road, Transport & Highways (MORTH)) - Promoter of NHIIMPL
IDBI Bank Limited (IDBI Bank) - Promoter of ITSL
Government of India (acting through Ministry of Road, Transport & Highways (MORTH)) - Promoter of NHAI
National Highways Authority of India (NHAI)- Promoter of NHIPMPL

Directors of the parties to the Trust specified above

Directors of NHIIMPL
Mr. Suresh Krishan Goyal
Mr. Shailendra Narain Roy
Mr. Mahavir Prasad Sharma
Mr. Pradeep Singh Kharola
Mr. N.R.V.V.M.K. Rajendra Kumar
Mr. Sumit Bose
Mr. Pushkar Vijay Kulkarni
Mr. Debapratim Hajara
Mr. Vinay Kumar
Ms. Usha Monari (Appointed as Woman Independent Director w.e.f. 16.04.2024)

Directors of NWPPL
Mr. Suresh Krishan Goyal
Mr. Shailendra Narain Roy
Mr. Mahavir Prasad Sharma
Mr. Muralidhara Rao Bugatha (Ceased to be Nominee Director w.e.f. 28.06.2024)
Mr. N.R.V.V.M.K. Rajendra Kumar

Directors of NEPPL
Mr. Suresh Krishan Goyal
Mr. Mathew George
Mr. Mahavir Prasad Sharma (Appointed as Director w.e.f. 15.04.2024)
Mr. Shailendra Narain Roy (Appointed as Director w.e.f. 15.04.2024)

Directors of ITSL
Mr. Pradeep Kumar Jain
Ms. Jayashree Vijay Ranade (Ceased to be Director w.e.f. 18.04.2024)
Mr. Arun Kumar Agarwal (Appointed as Director w.e.f. 19.07.2024)
Mr. Hare Krushna Dandapani Panda (Appointed as Director w.e.f. 19.07.2024)
Mr. Pradeep Kumar Malhotra
Ms. Baljinder Kaur Mandal
Ms. Jayakumar Subramoniapillai
Mr. Balkrishna Variar (Appointed as Director w.e.f. 24.06.2024)

Directors of NHIPMPL
Mr. Akhil Khare
Mr. Ashish Kumar Singh

C. Transactions with Related Parties

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	Half Year ended Sep 30, 2024	Year ended 31st March, 2024
National Highways Infra Investment Managers Private Limited (NHIIMPL)		
Investment Manager Fee	990.00	1,800.00
Advance Investment Manager Fee Paid	-	4.93
Expense incurred by NHIIMPL on behalf of NHIT	0.37	15.35
Interest cost Reimbursement	0.03	-
Expenses incurred on behalf of NEPPL by NHIIMPL	9.97	25.00
Other Support Services to NWPPL	47.62	22.96
Expenses incurred by NWPPL for NHIIMPL Behalf	-	0.65
National Highways Authority of India (NHAI)		
Issue of units of Trust to NHAI	-	1,09,081.07
Interest and other income distribution	5,097.11	8,641.92
O & M Expenses	48.98	96.03
Double toll fees	306.72	528.00
Reimbursement for Initial Improvement Works	19,020.34	3,146.59
Independent engineers fees	175.86	228.56
IDBI Trusteeship Services Limited (ITSL)		
Trustee Fee	4.80	9.60
Other fees related to Round 1 & 2 Assets	-	1.50
Other Fees related to Round 3 Assets ("Project Leap")	-	17.58
Other Fees related to Proposed Bonds Issuance	1.77	-
IDBI Bank Limited		
Secured Loan given to NHIT	1,078.00	10,000.00
Interest Expense incurred on Loan given to NHIT	412.55	4.38
Repayment of Principal Amount	122.78	0.00
Loan Processing Fees Paid to them	-	41.30
National Highways InVIT Project Managers Private Limited (NHIPMPL)		
Project Manager Fees for NWPPL	318.60	1,168.20
Project Manager Fees for NEPPL	389.40	-

D. Summary of Transactions with Key Managerial Personnel (KMP)

(All amounts are in ₹ lakh unless otherwise stated)

Name of KMP and Nature of Transaction	Half Year ended September 30, 2024	Year ended 31st March 2024
Mr. Suresh Krishan Goyal - Reimbursement of Expenses	-	0.79
Mr. M.P. Sharma - Director's Sitting Fees	6.61	8.00
Mr. Shailendra Narain Roy - Director's Sitting Fees	6.61	8.00
Mr. Arun Kumar Jha - Short Term Employment Benefits	50.88	69.35
Mr. Arun Kumar Jha - Reimbursement of Expenses	0.25	3.31
Mr. Bhanu Sharma (CS) - Short Term Employment Benefits	0.89	7.49
Mr. Bhanu Sharma (CS) - Long Term Employment Benefits	0.43	-
Mr. Bhanu Sharma (CS) - Reimbursement of Expenses	-	0.47
Ms. Aashima Agarwal (CS)- Short Term Employment Benefits	4.50	6.28
Ms. Aashima Agarwal (CS)- Reimbursement of Expenses	0.05	0.58

E. Closing Balances with Related Parties

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	As at Sep 30, 2024	As at March 31, 2024
National Highways Authority of India (NHAI)		
Issue of units of Trust to NHAI	2,27,003.91	2,27,003.91
O & M Expenses payable	610.54	717.98
Double toll fees payable	13.26	10.19
Independent Engineers Fees payable	515.77	451.45
Amount Payable for Initial Improvement Works	-	829.65
National Highways Infra Investment Managers Private Limited (NHIIMPL)		
Advance IM Fee	-	4.93
Payable by NWPPL for Other Support Services	23.24	16.69
Amount Payable for expenses incurred on behalf of NHIT	0.32	-
Amount Payable by NEPPL for expenses incurred on their behalf by NHIIMI	4.38	25.00
IDBI Trusteeship Services Limited		
Trustee Fee Payable	4.80	1.73
Other Fees related to Round 3 Assets ("Project Leap")	-	2.68
Other Fees payable for Proposed Bonds Issuance	1.62	-
IDBI Bank Limited		
Outstanding Secured Loan Amount	10,955.22	9,999.99
National Highways InVIT Project Managers Private Limited (NHIPMPL)		
Project Manager Fees Payable for NWPPL	321.30	540.00
Project Manager Fees Payable for NEPPL	194.70	-

43 Disclosure as per Ind AS 115, "Revenue from contracts with customers"

A Disaggregation of revenue

Revenue recognised mainly comprises of revenue from toll collections, claims with NHAI, contract revenue. Set out below is the disaggregation of the Group's revenue from contracts with customers:

(All amounts in ₹ lakh unless otherwise stated)

Description	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
Operating revenue			
(a) Toll income (User Fee) from Highways	1,12,944.76	46,557.22	94,390.77
(b) Interest on delay in Toll Remittance	88.26	-	-
Total revenue	**1,13,033.02**	**46,557.22**	**94,390.77**

The table below presents disaggregated revenues from contracts with customers based on nature, amount and timing:

S.No.	Types of Products by Nature	Types of Services by Timing	For the Half Year ended September 30, 2024	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
1	Services	At the point in time	1,13,033.02	46,557.22	94,390.77

B Assets and liabilities related to contracts with customers

The following table provides information about receivables, contract assets and contract liabilities from contract with customers:

Description	As At September 30, 2024	As At March 31, 2024
	Current	Current
Contract assets		
Trade receivables:		
- Receivables under service concession arrangements	4,696.79	385.20
Total	**4,696.79**	**385.20**

C. Performance Obligation

Income from toll collection

The performance obligation in service of toll collection is recorded as per rates notified by NHAI and approved by management and payment is generally due at the time of providing service.

Contract revenue

The performance obligation under service concession agreements ('SCA') is due on completion of work as per terms of SCA.

D. Disclosure as per Appendix - C & D of Ind AS 115 - " Service Concession Arrangements"

All the below service concession arrangement have been accounted under intangible asset model

Till Half Year ended September 30, 2024

Name of Concessionaire	Start of Concession period under concession agreement (Appointed Date)	End of Concession period under concession agreement	Period of Concession since the appointed date (in days)
NHIT Western Projects Private Limited	16.12.2021	15.12.2051	1020
NHIT Western Projects Private Limited	29.10.2022	28.10.2042	703
NHIT Eastern Projects Private Limited	01.04.2024	31.03.2044	183

The above TOT projects shall have following rights / obligations in accordance with the Concession Agreement entered into with the respective Government Authorities

a. Right to use the Specified Assets

b. Obligations to provide or rights to except provision of services

c. Obligations to deliver or rights to receive at the end of concession

44 Disclosure pursuant to IND AS 36 "Impairment of Assets"

Based on impairment testing done which involves review of the future discounted cash flows of the subsidiary, the recoverable amount is higher than the carrying amount of the investment made in the subsidiary and accordingly, no provision for impairment is required to be recognised in the books as on the reporting date. In case of goodwill based on impairment testing recoverable amount is higher then the carrying value as on the reporting date, hence no provision for impairment is required to be recognised in the books as on reporting date.

45 Financial Instrument by Category

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at 30th September 2024			As at 31st March, 2024		
	Amortized Cost	At FTVPL	At FVOCI	Amortized Cost	At FTVPL	At FVOCI
Assets:						
Trade Receivables	4,696.79	-	-	385.20	-	-
Cash and Cash Equivalents	48,657.44	-	-	46,400.78	-	-
Bank Balances Other than Cash & Cash Equivalents	535.78	-	-	512.98	-	-
Other Financial Assets	30,717.08	-	-	10,182.40	-	-
Total	**84,607.09**	**-**	**-**	**57,481.35**	**-**	**-**
Liabilities:						
Borrowings	12,09,905.68	-	-	11,73,448.94	-	-
Trade Payables	6,328.29	-	-	4,754.99	-	-
Other Financial Liabilities	7,061.35	-	-	7,305.43	-	-
Total	**12,23,295.32**	**-**	**-**	**11,85,509.36**	**-**	**-**

Defaults and breaches

There are no defaults during the period/year with respect to repayment of principal and payment of interest and no breaches of the terms and conditions of the borrowings.

There are no breaches during the period/year which permitted lender to demand accelerated payment.

46 Fair Values of Assets and Liabilities

The carrying amount of all financial assets and liabilities appearing in the financial statements is reasonable approximation of fair values. Fair value of the financial assets and liabilities is the amount at which the instrument could be exchanged in a current transaction between willing parties, other than in a forced or liquidation sale.

The Group is required to present the Statement of total assets at fair value and Statement of total returns at fair value as per SEBI Circular No. CIR/IMD/DF/114/2016 dated October 20, 2016 as a part of these financial statements - Refer Statement of Net assets at fair value and Statement of Total Returns at fair value

Fair Value Hierarchy

The Group uses the following hierarchy for fair value measurement of the Group's financial assets and liabilities:

Level 1 - Quoted prices (unadjusted) in active markets for identical assets or liabilities.

Level 2 – Inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly (i.e. as prices) or indirectly (i.e. derived from prices).

Level 3 - Inputs for the assets or liabilities that are not based on observable market data (unobservable inputs).

Fair value of financial assets and financial liabilities that are not measured at fair value (but fair value disclosures are required)

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Carrying Value		Fair Value	
	As at 30th September 2024	As at 31st March, 2024	As at 30th September 2024	As at 31st March, 2024
Financial Assets at Amortized Cost:				
Trade Receivables	4,696.79	385.20	4,696.79	385.20
Cash and Cash Equivalents	48,657.44	46,400.78	48,657.44	46,400.78
Bank Balances Other than Cash & Cash Equivalents	535.78	512.98	535.78	512.98
Other Financial Assets	30,717.08	10,182.40	30,717.08	10,182.40
Total	**84,607.09**	**57,481.36**	**84,607.09**	**57,481.36**
Financial Liabilities at Amortized Cost:				
Borrowings*	12,09,905.68	11,73,448.94	12,09,905.68	11,73,448.94
Trade Payables	6,328.29	4,754.99	6,328.29	4,754.99
Other Financial Liabilities	7,061.35	7,305.43	7,061.35	7,305.43
Total	**12,23,295.32**	**11,85,509.36**	**12,23,295.32**	**11,85,509.36**

The carrying value of financial assets and other financial liabilities measured at amortised cost are considered to be same as their fair values largely due to their short term nature.

*The carrying value of borrowings approximates the fair value as the instruments are at prevailing market rate

47 Leases

(a) Company as lessee

The Group has taken office premises on lease. These leases typically run for 9 years that include extension and termination options and variable lease payments.

Information about the leases for which the Company is a lessee is presented below:

Right-of-use assets:

Set out below are the carrying amounts of Right-of-use assets and the movement during the period:

Particulars	Leasehold Office
Total right of use as at April 1, 2024	**-**
Addition during the period	621.73
Deletion/termination during the period	-
Depreciation	11.77
Total right of use as at September 30, 2024	**609.95**

Lease liabilities:

Set out below are the carrying amounts of lease liabilities and the movement during the period:

Particulars	Total
Total lease liabilities as at April 1, 2024	**-**
Addition during the period	609.16
Deletion/termination during the period	-
Accretion of interest	7.45
Payments	(11.57)
Total lease liabilities as at September 30, 2024	**605.04**

Particulars	For the Half Year ended Sep 30, 2024	For the Year ended March 31, 2024
Current	66.72	-
Non-current	538.32	-
	605.04	**-**

The effective interest rate for lease liabilities is 7.39% (March 31, 2024: Nil)

Below are the amounts recognised by the Company in the statement of profit and loss:

Particulars	For the Half Year ended Sep 30, 2024	For the Year ended March 31, 2024
Depreciation of right-of-use assets	11.77	-
Interest on lease liabilities	7.45	-
Variable lease payments not included in the measurement of lease liabilities	-	-
Expenses relating to leases of short-term leases	118.82	-
Total	**138.05**	**-**

48 Statement of Contingent Liabilities/Contingent Assets

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at September 30, 2024	As at March 31, 2024
Contingent Liabilities		
Stamp Duty on Concession agreement on Belgaum Kagal Project (refer note (a) below)	6,990.00	6,990.00
Damages levied by Authority (NHAI) (refer note (d) below)	1,213.86	-
Corporate Guarantee issued in favour of Senior Lenders & Debenture Trsutee of the Trust (refer note (c))	-	4,37,700.00
Contingent Assets		
Stamp Duty on Concession agreement on Belgaum Kagal Project (refer note (b) below)	6,990.00	6,990.00

Note : a) Stamp Duty on Concession agreement on Belgaum Kagal Project - The Group has received notice from Office of Deputy Registrar of Stamps, Government of Karnataka. As per this notice additional stamp duty of Rs 69.90 crore has been imposed on the company for the concession agreement entered into for Belgaum-Kagal road.

Stamp legislation in certain states (including Karnataka) also specifies that copy of the main document in respect of any property, or any business within the state also needs to be stamped with original amount of stamp duty, if the original document has not been stamped with full amount of the stamp duty applicable for place of business .

As regards to the applicability of stamp duty on Concession Agreement, it may please be noted that there is no specific entry in respect of the concession agreement. Such agreements are stamped under the residuary category of the agreements and a nominal amount was paid on such agreements. We are given to understand that the Karnataka State Govt. has given instructions to procure copies of licence /Agreement of toll collecting agencies in respect of roads passing through state of Karnataka. We have further been issued a notice for recovery of shortfall in stamp duty.

Various judicial pronouncements by various high courts have divergent views and the issue is debatable and there is no clarity on the same.

The Group is contesting this imposition of deficit stamp duty on concession agreement notice with Government of Karnataka. We are also in receipt of copies of letters sent by NHAI to the Karnataka State Govt clarifying the issue. The Group is in the process of filing injuction with the Dharwad bench of Karnataka High Court.

b) Contingent Assets

Stamp Duty on Concession agreement on Belgaum Kagal Project- In the event of the stamp duty becoming payable, it shall be reimbursed by NHAI as confirmed by them vide letter No. NHAI/F&A/InVIT/2021-22/CLFN_GST&SD(E-106870) dated 28.09.2021. Since no provision has been recognised in the books with respect to stamp duty, the reimbursement has not been recognised as an asset considering the guidance in Ind AS 37.

c) Corporate Guarantees

30th September 2024	Nil
31st March 2024	Rs 4,37,700.00 Lakh

The Project SPV Company (NWPPL) issued corporate guarantees amounting Rs. 1500 crore on October 21, 2022, to secure obligations in favor of the Debenture Trustee for the benefit of NCD holders. Following approval from the SBI Trustee for the waiver and cancellation of these corporate guarantees, an application was submitted to the stock exchange on September 27, 2024, seeking approval for the waiver and cancellation. The corporate guarantees were officially waived and cancelled, as approved by both BSE and NSE on October 11, 2024. Additionally, the corporate guarantees provided to the banks were released after March 31, 2024.

(d) Damages levied by Authority

Damages has been levied by NHAI for not carrying out items mandated in Schedule B of Concession agreement vide letter no. 21021/InvIT/2024/ABP/3196 dated 25/11/2024.

The same has been contested by the group and request for withdrawal of damages has been submitted to NHAI vide letter no. NHIPPL/OPS/SITE/PIU/AB/24-25/163 dated 27/11/2024. In light of the above same has been disclosed as Contingent liability in Financial statements.

49 Financial Information of Investment Manager

The summary financials of Investment Manager are not disclosed alongwith these financials as its networth is not materially eroded.

50 The Code on Social Security. 2020 ('Code') relating to employee benefits during employment and post-employment benefits received Presidential assent in September 2020. The Code has been published in the Gazette of lndia. However, the date on which the Code will come into effect has not been notified The Group will assess the impact of the Code when it comes into effect and will record any related impact in the period the Code becomes effective.

51 Distribution made*

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the half year ended September 30, 2024	For the year ended March 31, 2024
Interest	23,514.63	42,240.46
Return of capital	-	-
Dividend	-	-
Other income of the Trust	170.59	602.92
Total	**23,685.22**	**42,843.38**

* The distribution mentioned above is declared and paid for the same financial year/period.

52 Details of Project Management Fees and Investment Management Fees

Details of fees paid to project manager and investment manager as required pursuant to SEBI Circular No. CIR/MD/DF/127/2016, dated 29th November 2016 are as under:

Project Management Fees:

The project manager National Highways InVIT Project Managers Private Limited ('NHIPMPL') for NWPPL (R1 & R2 assets) and is entitled to fixed fees based on the Project Implementation and Management Agreement (PIMA) signed by both the parties dated 30th March 2021 as amended on 6th March 2024. NHIPMPL is also Project Manager for NEPPL (R3 assets) w.e.f 1st April 2024 as per deed of adherence signed on 7th March 2024. PM fee for NWPPL is Rs. 53.10 Lakhs per month including GST and for NEPPL is Rs. 64.90 Lakhs per month including GST w.e.f. 01.04.2024.

Investment Management Fees:

i) The Investment Management Agreement is revised and the fee with effect from 1st April 2023 has been agreed at Rs 1,800 Lakhs (Rupees Eighteen hundred lakhs) for the Financial Year 2023-24.
ii) The management fee set out in paragraph (i) above shall be subject to escalation on an annual basis at the rate of 10% of the management fee for the previous year.
iii) The Investment Management Agreement is revised and the fee with effect from 1st April 2024 has been agreed at Rs 1,980 Lakhs (Rupees Nineteen hundred and Eighty Lakhs) for the Financial Year 2024-25
iv) Any applicable taxes, cess or charges, as the case may be, shall be in addition to the management fee and shall be payable by National Highways Infra Trust (NHIT) to the Investment Manager (NHIIMPL).
Frequency of Payment: Payment of management fee shall be made by National Highways Infra Trust (NHIT) to the Investment Manager (NHIIMPL) in advance on a quarterly basis at the beginning of each quarter of a financial year.

53 Provision for Major Maintenance

The group has a contractual obligation to maintain the performance standards of the Project Highways in respect of riding quality and allied measures as per the performance parameters stipulated under the respective Concession Agreements. Cost of such obligation is measured at the best estimate of the expenditure required to settle the obligation at the balance sheet date and recognised over the period at the end of which the overlay is estimated to be carried out using Discounted Cash Flows method with the discount rate taken as the risk-free interest rate i.e. the discounting rate used for arriving at the present value for MMR provisions is government bond rate of 30 years for projects acquired in first phase and 20 years for projects acquired in second phase. The group has recognised finance cost on major maintenance provision for the period ended September 30, 2024 amounting to Rs 763.90 Lakhs (PY Rs 470.79 lakhs). The provision for Major Maintenance Obligation as at September 30, 2024 has been recognised in the financial statements at Rs. 10,330.53 Lakhs (P.Y. Rs. 8,444.05 lakhs).

54 Initial Improvement Works

As per the concession agreement between SPVs' and NHAI, the concessionaire is obligated to undertake initial improvement works as specified in Schedule B including certain improvement works required initially and then to extend required repairs maintenance, regular upkeep of the Project Highway. These obligations will require outflow of economic resources and will be fulfilled over the period of time. Therefore, a provision shall be recognised and measured as per Ind AS 37 for contractual obligations toward the Fair Value of future upgrade services and correspondingly the group has capitalized the present value of provision for upgrade services to the intangible asset at the time of acquisition.

Based on the concession agreement, capitalised the initial improvement works amounting to Rs. 34,207.88 lakhs (undiscounted value) on appointed date ie. 01-04-2024.

Further the group has recognised in the statement of Profit & Loss amounting Rs. 2173.94 Lakhs and Rs. 2476.69 Lakhs on account of amortization of initial improvement work and unwinding of interest on provision of initial improvement respectively.

Actual initial improvement work done during the period ended September 2024 is Rs. 33,037.84 Lakhs.

55 Statement of Commitments

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the half year ended September 30, 2024	For the year ended March 31, 2024
Estimated amount of contracts remaining to be executed on capital account and not provided for	35,666.82	49,698.13
Total	35,666.82	49,698.13

NATIONAL HIGWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
Notes to the Interim Consolidated Financial Statements for the Half Year ended September 30, 2024

56 Segment Reporting

The activities of the Group mainly include investing in infrastructure assets primarily in the SPVs operating in the road sector to generate cash flows for distribution to unit holders. Based on the guiding principles given in Ind AS - 108 "Operating Segments", this activity falls within a single operating segment. Further, the entire operations of the Group are only in India and hence, disclosure of secondary/ geographical segment information does not arise. Accordingly, requirement of providing disclosures under Ind AS 108 does not arise.

57 Material Developments

The name of one of the SPV has been changed from National Highways Infra Projects Private Limited to NHIT Western Projects Private Limited w.e.f. 13th May 2024.

58 The Board of Directors of the Investment Manager has declared distribution for quarter ended September 2024 of Rs.1.829 per unit which comprises of Rs. 1.806 per unit as interest and Rs. 0.023 per unit as other income on surplus funds at the Trust level in their meeting held on 12th November, 2024.

The Board of Directors of the Investment Manager has declared distribution for quarter ended June 2024 of Rs.1.805 per unit which comprises of Rs. 1.792 per unit as interest and Rs. 0.013 per unit as other income on surplus funds at the Trust level in their meeting held on 12th August, 2024.

59 Key sources of estimation

The preparation of Consolidated financial statements in conformity with Ind AS requires the Group to makes estimates and assumptions that affect the reported amounts of income and expenses of the period, the reported balances of assets and liabilities and the disclosures relating to contingent liabilities as of the date of the financial statements. The estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates include allowance for doubtful loans /other receivables, fair value measurement etc. Difference, if any, between the actual results and estimates is recognised in the period in which the results are known.

60 Disclosure pursuant to Ind AS 23 "Borrowing Costs"

Borrowing cost capitalised during the Half Year ended September 30, 2024 : Rs. Nil [March 31 , 2024 : Rs. Nil].

61 Default and breaches

There are no defaults during the period/year with respect to repayment of principal and payment of interest and no breaches of the terms and conditions of the borrowings. There are no breaches during the period/year which permitted lender to demand accelerated payment.

62 Comparatives figures have been reclassified/regrouped wherever necessary to confirm to the current period classification.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

MOHD AZAM ANSARI
Digitally signed by MOHD AZAM ANSARI
Date: 2024.12.19 16:32:50 +05'30'

CA Mohd. Azam Ansari
Partner
M.No.511623

Place : New Delhi
Date : 19th December 2024

For and on behalf of National Highways Infra Trust
(By National Highways Infra Investment Managers Private Limited)

SURESH GOYAL
Digitally signed by SURESH GOYAL
Date: 2024.12.19 16:11:57 +05'30'

Suresh Krishan Goyal
Director
DIN: 02721580

MATHEW GEORGE
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Date: 2024.12.19 16:16:58 +05'30'

Mathew George
Chief Financial Officer

GUNJAN SINGH
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Date: 2024.12.19 16:16:19 +05'30'

Gunjan Singh
Compliance Officer

A.R. & CO.
Chartered Accountants

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INDEPENDENT AUDITOR'S REPORT

To the Unit Holders of National Highways Infra Trust

Report on the Audit of the Consolidated Financial Statements

OPINION

We have audited the accompanying consolidated financial statements of National Highways Infra Trust ("the InvIT" or "the Trust") and its one subsidiary (hereinafter referred to as "National Highways Infra Projects Private Limited" or "NHIPPL") (the Trust and its subsidiary together referred to as "the Group"), which comprising of the consolidated Balance Sheet as at 31 March 2022, the consolidated Statement of Profit and Loss (including Other Comprehensive Income), the consolidated Statement of Changes in Unitholder's Equity and the consolidated Statement of Cash Flows for the year then ended, the consolidated Statement of Net Assets at fair value as at 31 March 2022, the consolidated Statement of Total Returns at fair value, the Statement of Net Distributable Cash Flows of the Trust and its subsidiary for the year then ended and notes to the consolidated financial statements including a summary of significant accounting policies and other explanatory information (hereinafter referred to as "the consolidated financial statements").

In our opinion and to the best of our information and according to the explanations given to us and based on the consideration of report of other auditor on separate financial statements and on the other financial information of the subsidiary, the aforesaid consolidated financial statements give the information required by the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014 as amended from time to time including any guidelines and circulars issued thereunder (together referred to as the "SEBI InvIT Regulations") in the manner so required and give a true and fair view in conformity with the Indian Accounting Standards as defined in Rule 2(1)(a) of the Companies (Indian Accounting Standards) Rules, 2015, as amended ("Ind AS") and other accounting principles generally accepted in India, to the extent not inconsistent with SEBI InvIT Regulations, of the consolidated state of affairs of the Group as at 31 March 2022, its consolidated profit including other comprehensive income, its consolidated cash flows, its consolidated statement of changes in Unitholders' equity for the year ended 31 March 2022, its consolidated net assets

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at fair value as at 31 March 2022, its consolidated total returns at fair value of the Group and the net distributable cash flows of the Trust and its subsidiary for the year ended 31 March 2022.

BASIS FOR OPINION

We conducted our audit of the consolidated financial statements in accordance with the Standards on Auditing ("SAs") issued by the Institute of Chartered Accountants of India. Our responsibilities under those Standards are further described in the auditor's responsibilities for the audit of the consolidated financial statements section of our report. We are independent of the Group in accordance with the Code of Ethics issued by the Institute of Chartered Accountants of India together with the ethical requirements that are relevant to our audit of the consolidated financial statements under the provisions of the SEBI InvIT Regulations, and we have fulfilled our other ethical responsibilities in accordance with these requirements and the Code of Ethics. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion on the consolidated financial statements.

KEY AUDIT MATTERS

Key audit matters are those matters that, in our professional judgment, were of most significance in our audit of the consolidated financial statements for the financial year ended 31 March 2022. These matters were addressed in the context of our audit of the consolidated financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on these matters. We have determined the matters described below to be the key audit matters to be communicated in our report.

Sr. No.	Key Audit Matter	Auditor's Response
1.	**Assessment of Impairment of Intangible Assets** The Group operates toll assets which is constructed on Toll, Operate and Transfer (TOT) basis. In accordance with its accounting policy and requirements under Ind AS 36 "Impairment of Assets", the Management is required to perform an impairment assessment by comparing the carrying value of the toll collection rights to their recoverable amount. For impairment testing, value in use has to be determined by forecasting and discounting future cash flows. Further, the value in use is highly sensitive to changes in critical variable used for forecasting the future cash flows including traffic	Our Audit Procedures included the following :- • Verifying the appropriateness of the Group's accounting policy on impairment of Intangible Assets. • Study of latest DCF Valuation • Assessing the assumptions around the key drivers of the revenue projections, future cash

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	projections and discounting rates. The determination of the recoverable amount of the toll collection right involves significant estimates and judgments and accordingly, the evaluation of impairment of toll collection rights has been determined as a key audit matter.	flow, discount rates / weighted average cost of capital that were used by the management
2.	**Computation and disclosures as prescribed in the SEBI InvIT regulations relating to Consolidated Statement of Net Assets at Fair Value and Consolidated Total Returns at Fair Value** As per SEBI InvIT regulations, the Trust is required to disclose statement of net assets at fair value and statement of total returns at fair value. The fair value is determined by forecasting and discounting future cash flows from the operations of the investee entities which involves management estimates and judgements. These estimates and judgements include discounting rates, Tax rates and inflation rates which are considered for computing the fair value. There is an inherent risk in the computation of fair value due to the use of estimates and judgements mentioned above. Therefore, computation and disclosures of Consolidated statement of net assets at fair value and Consolidated statement of total returns at fair value is considered as a Key Audit Matter. Refer statement of net assets at fair value and Statement of total returns at fair value in the Consolidated financial statements.	Our Audit Procedures included the following :- • Obtained the understanding of the requirements of SEBI InvIT regulations for disclosures relating to Consolidated Statement of Net Assets at Fair Value and Consolidated Statement of Total Returns at Fair Value. • Obtained Management representation in this respect as Management has considered fair value equal to the book value of Net Assets • Tested the arithmetical accuracy of computation in the statement of net assets and total returns at fair value. • Ensured that disclosures is in compliance with SEBI InvIT regulations relating to the statement of net assets at fair value and the statement of total returns at fair value.

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INFORMATION OTHER THAN THE CONSOLIDATED FINANCIAL STATEMENTS AND AUDITOR'S REPORT THEREON

The Board of Directors of the Investment Manager is responsible for the other information. The other information comprises the information included in the Management Discussion and Analysis, Report of Investment Manager including annexures to Investment Manager's Report and other information as required to be given by SEBI InvIT Regulations, but does not include the consolidated financial statements and our report thereon.

Our opinion on the consolidated financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.
In connection with our audit of the consolidated financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the consolidated financial statements or our knowledge obtained during the course of our audit or otherwise appears to be materially misstated.

If, based on the work we have performed on the other information that we obtained prior to the date of this auditor's report, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

RESPONSIBILITIES OF THE BOARD OF DIRECTORS OF INVESTMENT MANAGER FOR THE CONSOLIDATED FINANCIAL STATEMENTS

The Board of Directors of Investment Manager is responsible for the preparation of these consolidated financial statements that give a true and fair view of the consolidated Balance Sheet as at 31 March 2022, consolidated statement of Profit & Loss including other comprehensive income, consolidated cash flows and consolidated statement of changes in Unitholder's equity for the year ended 31 March 2022, the consolidated net assets at fair value as at 31 March 2022, the consolidated total returns at fair value of the Group and the net distributable cash flows of the Trust and its subsidiary for the year ended 31 March 2022 in accordance with the requirements of the SEBI InvIT Regulations, Indian Accounting Standards as defined in Rule 2(1) (a) of Companies (Indian Accounting Standards) Rules, 2015, as amended and other accounting principles generally accepted in India, to the extent not inconsistent with SEBI InvIT Regulations. The respective Board of Directors of the subsidiary company included in the Group are responsible for maintenance of adequate accounting records for safeguarding of the assets of the Group and for preventing and detecting frauds and other irregularities; selection and application of appropriate accounting policies; making judgements and estimates that are reasonable and prudent; and design, implementation and maintenance of adequate internal financial controls for ensuring the accuracy and completeness of accounting records, relevant to the preparation and presentation of the consolidated financial statements that give a true and fair view and are free from material misstatement, whether due to fraud and error, which have been used for the purpose of preparation of the consolidated financial statements by the Board of Directors of Investment



Manager, as aforesaid.

In preparing the consolidated financial statements, the Board of Directors of Investment Manager and respective Board of Directors of the company included in the Group are responsible for assessing the ability of the Group to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the respective Board of Directors either intends to liquidate the Group or to cease operations, or has no realistic alternative but to do so.

The Board of Directors of the Investment Manager and the respective Board of Directors of the subsidiary company included in the Group are also responsible for overseeing the financial reporting process of the Group.

AUDITOR'S RESPONSIBILITY FOR THE AUDIT OF THE CONSOLIDATED FINANCIAL STATEMENTS

Our objectives are to obtain reasonable assurance whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with SAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with SAs, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the consolidated financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Group's internal controls.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Board of Directors of the Investment Manager.
- Conclude on the appropriateness of the Board of Directors of Investment Manager use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are

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inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to continue as a going concern.

- Evaluate the overall presentation, structure and content of the consolidated financial statements, including the disclosures, and whether the consolidated financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- Obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the Group of which we are the independent auditors, to express an opinion on the consolidated financial statements. We are responsible for the direction, supervision and performance of the audit of financial statements of such entities included in the consolidated financial statements of which we are the independent auditors. For the other entities included in the consolidated financial statements, which have been audited by other auditor, such other auditor remain responsible for the direction, supervision and performance of the audits carried out by them. We remain solely responsible for our audit opinion.

Materiality is the magnitude of misstatements in the consolidated financial statements that, individually or in aggregate, makes it probable that the economic decisions of a reasonably knowledgeable user of the financial statements may be influenced. We consider quantitative materiality and qualitative factors in (i) planning the scope of our audit work and in evaluating the results of our work; and (ii) to evaluate the effect of any identified misstatements in the financial statements.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

We also provide those charged with governance with a statement that we have complied with relevant ethical requirements regarding independence, and to communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, related safeguards.

From the matters communicated with those charged with governance, we determine those matters that were of most significance in the audit of the consolidated financial statements of the current period and are therefore the key audit matters. We describe these matters in our auditor's report unless law or regulation precludes public disclosure about the matter or when, in extremely rare circumstances, we determine that a matter should not be communicated in our report because the adverse consequences of doing so would reasonably be expected to outweigh the public interest benefits of such communication.



OTHER MATTERS

We did not audit the financial statements of the subsidiary, whose financial statements reflect total assets of Rs. 7,35,774.44 Lakhs as at 31 March 2022, total revenues of Rs. 13,981.33 Lakhs, losses after taxes including other comprehensive income (net) of Rs. 11,355.90 Lakhs and net cash outflows amounting to Rs. 12,802.25 Lakhs for the period from 01 April 2021 to 31 March 2022, as considered in the consolidated financial statements. These financial statements and other financial information have been audited by other auditor, which financial statements, other financial information and auditor's reports have been furnished to us by the Management of Investment Manager and our opinion on the consolidated financial statements, in so far as it relates to the amounts and disclosures included in respect of that subsidiary is based solely on the report of the other auditor.

Our opinion on the consolidated financial statements, and our report on other legal and regulatory requirements below, are not modified in respect of the above matters with respect to our reliance on the work done by and the report of the other auditor.

REPORT ON OTHER LEGAL AND REGULATORY REQUIREMENTS

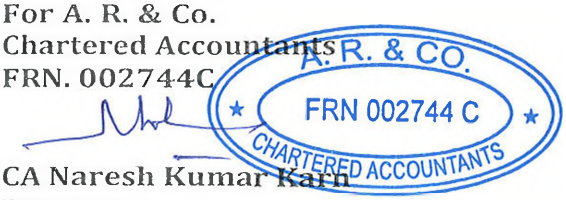
Based on our audit and as required by SEBI InvIT Regulations, we report that:

a) We have sought and obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit of the aforesaid consolidated financial statements.

b) the consolidated Balance Sheet, the consolidated Statement of Profit and Loss, the consolidated Statement of Cash Flows, the consolidated Statement of Changes in Unitholders' Equity, the consolidated Statement of Net Assets at fair value, the consolidated Statement of Total Returns at fair value and the Statement of Net Distributable Cash Flows of the Trust and its subsidiary dealt with by this Report are in agreement with the books of account.

c) In our opinion, the aforesaid financial statements comply with the Indian Accounting Standards as defined in Rule 2(1)(a) of Companies (Indian Accounting Standards) Rules, 2015, as amended, to the extent not inconsistent with SEBI InvIT regulations.

For A. R. & Co.
Chartered Accountants
FRN. 002744C



CA Naresh Kumar Karn
Partner
Membership No: 077887
UDIN: 22077887AJLTUQ6382

Place: New Delhi
Date: 23.05.2022

NATIONAL HIGHWAYS INFRA TRUST

CONSOLIDATED BALANCE SHEET AS AT 31st MARCH, 2022

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	NOTE NO.	AS AT 31st March, 2022	AS AT 31st March, 2021
ASSETS			
1) Non - Current Assets			
(a) Property, Plant and Equipment	3	0.46	-
(b) Goodwill	4	10,144.46	-
(c) Intangible assets	5	7,33,984.39	-
(d) Financial Assets			
(i) Other Financial Assets	6	3,170.81	-
(e) Deferred Tax Assets	7	262.53	-
2) Current Assets			
(a) Financial Assets			
(i) Investments	8	992.16	-
(ii) Trade receivables	9	600.47	-
(iii) Cash and Cash Equivalents	10	5,389.78	-
(iv) Other financial assets	11	5.38	0.10
(b) Other current assets	12	347.29	-
TOTAL ASSETS		7,54,897.72	0.10
EQUITY AND LIABILITIES			
EQUITY			
1) Unit Capital	13	6,01,152.00	-
2) Initial settlement amount		0.10	0.10
3) Other Equity	14	5,059.25	(67.90)
LIABILITIES			
1) Non-Current liabilities			
(a) Financial liabilities			
(i) Borrowings	15	1,45,556.94	-
(b) Provisions	16	403.37	-
2) Current Liabilities			
(a) Financial liabilities			
(i) Borrowings	17	980.86	-
(ii) Trade Payables	18		
(a) Total Outstanding, dues of micro and small enterprises		-	-
(b) Total outstanding, dues of creditors other than micro and small enterprises		1,101.23	-
(iii) Other financial liabilities	19	241.41	67.81
(b) Other current liabilities	20	240.75	0.09
(c) Provisions	21	0.03	-
(d) Current Tax Liabilities (Net)	22	161.77	
TOTAL EQUITY & LIABILITIES		7,54,897.72	0.10

Significant Accounting Policies 1 - 2

The accompanying notes form an integral part of these consolidated financial statements. 3 - 56

This is the Consolidated Balance Sheet referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

A. R. & CO. FRN 002744 C CHARTERED ACCOUNTANTS

CA Naresh Kumar Karn
Partner
M.No.077887

Date : 23.05.2022
Place : New Delhi

National Highways Infra Trust New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

CONSOLIDATED STATEMENT OF PROFIT AND LOSS FOR THE YEAR ENDED 31ST MARCH, 2022

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	NOTE NO.	YEAR ENDED 31st March, 2022	YEAR ENDED 31st March, 2021
INCOME			
Revenue from Operations	23	13,960.55	-
Other Income	24	1,014.53	-
TOTAL INCOME		14,975.08	-
EXPENSES			
Investment Manger Fee		1,931.71	-
Trusteeship Fee		3.73	4.21
Operating Expenses	25	1,140.21	-
Employee Benefits Expenses	26	2.12	-
Finance Charges	27	3,154.43	-
Depreciation & Amortization Expense	28	1,055.65	-
Other Expenses	29	676.86	63.69
TOTAL EXPENSES		7,964.71	67.90
Profit/(Loss) before Exceptional Items and Tax		7,010.37	(67.90)
Exceptional Items (net)		-	
Profit / (Loss) before Tax		7,010.37	(67.90)
Tax Expenses	30		
Current Tax		436.36	-
MAT Credit Utilized / (Entitlement)		-	-
Provision for Tax for Earlier Years		-	-
Deferred Tax expense/(credit)		(262.32)	-
Total Tax		174.04	-
Profit/ (loss) for the period		6,836.33	(67.90)
Other Comprehensive Income			
Items that will not be reclassified to Profit and Loss		-	-
Items that will be reclassified to Profit and Loss		-	-
		-	-
Total Comprehensive Income for the period		6,836.33	(67.90)
Earnings per Unit			
Basic	31	1.15	-
Diluted	31	1.15	-

Significant Accounting Policies 1 - 2
The accompanying notes form an integral part of these financial statements. 3 - 56

This is the Statement of Profit and Loss referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

A. R. & CO. FRN 002744 C CHARTERED ACCOUNTANTS

CA Naresh Kumar Karn
Partner
M.No.077887

Date : 23.05.2022
Place : New Delhi

National Highways Infra Trust New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

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Mathew George
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Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

CONSOLIDATED CASH FLOW STATEMENT FOR THE YEAR ENDED 31ST MARCH, 2022

(All amounts in ₹ lakh unless otherwise stated)

	YEAR ENDED 31st March, 2022	YEAR ENDED 31st March, 2021
A. OPERATING ACTIVITIES		
Net Profit/(Loss) Before Tax	7,010.37	
Adjustments to reconcile profit before tax to net cash flows:		
Depreciation and Amortization	1,055.65	
Loss/ (Gain) on sale of Investments (net)	(682.62)	
Loss / (Gain) on Fair Valuation of Investments	(7.38)	
Interest Accrued on Bank FD	(5.86)	
Finance Cost (net)	3,154.43	
Operating Profit/(Loss) before Working Capital Changes	**10,524.59**	
Working Capital Adjustments:		
Decrease / (Increase) in Trade & Other Receivables	(600.47)	
Decrease / (Increase) in Other Non Current Financial Assets	(3,170.81)	
Decrease / (Increase) in Other Current Financial Assets	0.59	
Decrease / (Increase) in Other Current Assets	(347.29)	
Increase / (Decrease) in Trade & Other Payables	651.07	
Increase / (Decrease) in Other Financial Liabilities	(7,34,867.55)	
Increase / (Decrease) in Provisions	403.40	
Increase / (Decrease) in Other Current Liabilities	238.59	
Increase / (Decrease) in Current Tax Liabilities	(0.59)	
	(7,37,693.06)	
Income Tax paid	(274.00)	
Net Cash Flows from/(used in) Operating Activities	**(7,27,442.47)**	
B. INVESTING ACTIVITIES		
Purchase of Property, Plant & Equipment, including CWIP, capital	(0.50)	
Purchase of Non Current Investments	(1.52)	
Purchase of Current Investments	(5,96,271.00)	
Sale of Current Investments	5,95,968.84	
Net cash flows from (used in) Investing activities	**(304.19)**	
C. FINANCING ACTIVITIES		
Proceeds from Issue of Unit Capital	5,91,000.00	
One Time Expense paid	(1,364.94)	
Proceeds from Long Term Borrowings (net of processing fees)	1,47,646.00	
Repayment of Long Term Borrowings	(1,001.59)	
Finance Costs Paid	(3,143.04)	
Net cash flows from (used in) Financing activities	**7,33,136.43**	
Net Increase/Decrease in Cash and Cash equivalents (A+B+C)	5,389.78	
Cash and cash equivalents at the beginning of the year	-	
Cash and cash equivalents at the end of the year	**5,389.78**	

This is the Cash Flow Statement referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

A. R. & CO. FRN 002744 C CHARTERED ACCOUNTANTS

CA Naresh Kumar Karn
Partner
M.No.077887

Date : 23.05.2022

National Highways Infra Trust New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

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Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

CONSOLIDATED STATEMENT OF CHANGES IN EQUITY FOR THE YEAR ENDED 31ST MARCH, 2022

A. INITIAL SETTLEMENT AMOUNT *

(All amounts in ₹ lakh unless otherwise stated)

Balance as at 1st April 2020	Changes in Unit Capital During the year	Changes in Unit Capital due to prior period errors	Balance as at 31st March, 2021	Changes in Unit Capital During the year	Changes in Unit Capital due to prior period errors	Balance as at 31st March, 2022
-	0.10	-	0.10	-	-	0.10
-	**0.10**	-	**0.10**	-	-	**0.10**

B. UNIT CAPITAL *

Balance as at 1st April 2020	Changes in Unit Capital During the year	Changes in Unit Capital due to prior period errors	Balance as at 31st March, 2021	Changes in Unit Capital During the year	Changes in Unit Capital due to prior period errors	Balance as at 31st March, 2022
-	-	-	-	6,01,152.00	-	6,01,152.00
-	-	-	-	**6,01,152.00**	-	**6,01,152.00**

C. OTHER EQUITY **

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Reserves and Surplus	Items of Other Comprehensive Income		Total
		Items that will not be reclassified to profit or loss	Items that will be reclassified to profit or	
	Retained Earnings	Remeasurement of Defined Benefit Obligation/ Plan	Fair Value Gain on Preference Shares	
Balance as at 1st April 2020	-	-	-	-
Profit/ (Loss) for the year	(67.90)	-	-	(67.90)
Balance as at 31st March, 2021	(67.90)	-	-	(67.90)
Profit/ (Loss) for the year	6,836.33	-	-	6,836.33
One time unit issue expenses	1,709.18	-	-	1,709.18
	-	-	-	-
Balance as at 31st March, 2022	5,059.25	-	-	5,059.25

* Refer Note No. 13

** Refer Note No. 14

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

A. R. & CO. FRN 002744 C CHARTERED ACCOUNTANTS

CA Naresh Kumar Karn
Partner
M.No.077887

Date : 23.05.2022

National Highways Infra Trust New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited
(Investment Manager of National Highways Infra Trust)

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Director
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DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

Disclosures pursuant to SEBI circulars (SEBI Master Circular No. CIRSEBI/HO/DDHS_Div3/P/CIR/2021/1673 dated 29 November 2021 issued under the InvIT

Consolidated Statement of Net Distributable Cash Flows (All amounts in ₹ lakh unless otherwise stated)

S. No.	PARTICULARS	YEAR ENDED 31st March, 2022	YEAR ENDED 31st March, 2021
1	**Profit after tax as per Statement of profit and loss/income and expenditure (Consolidated) (A)**	18,185.92	-
2	**Add:** Depreciation and amortization as per statement of profit and loss account. Incase of Impairment reversal, same needs to be deducted from profit and loss.	-	
3	**Add/Less:** Loss/gain on sale of infrastructure assets	-	-
4	**Add:** Proceeds from sale of infrastructure assets adjusted for the following: - related debts settled or due to be settled from sale proceeds; - directly attributable transaction costs; - proceeds reinvested or planned to be reinvested as per Regulation 18(7)(a) of the InvIT regulations	-	-
5	**Add:** Proceeds from sale of infrastructure assets not distributed pursuant to an earlier plan to re-invest, if such proceeds are not intended to be invested subsequently, net of any profit/ (loss) recognised in profit and loss account	-	-
6	**Add/ Less:** Any other item of non- cash expense/ non cash income (net of actual cash flows for these items), if deemed necessary by the Investment Manager. For example, any decrease/ increase in carrying amount of an asset or a liability recognised in profit and loss /income and expenditure on measurement of the asset or the liability at fair value; Interest cost as per effective interest rate method, deferred tax lease rents recognised on a straight line basis, etc.	(8,227.84)	
7	**Less:** Repayment of external debt (principal) / redeemable preference shares / debentures, etc. (excluding refinancing) / net cash set aside to comply with DSRA requirement under loan agreements	(5,204.50)	-
8	**Total Adjustment (B)**	(13,432.34)	-
9	**Net Distributable Cash Flows (C) = (A+B)**	4,753.58	-

The accompanying notes form an integral part of the Consolidated Financial Statements.

This is the Statement of Net Distributable Cash Flows referred to in our report of even date.

A. R. & CO. FRN 002744 C CHARTERED ACCOUNTANTS

National Highways Infra Trust New Delhi

NATIONAL HIGHWAYS INFRA TRUST

Disclosures pursuant to SEBI circulars (SEBI Master Circular No. CIRSEBI/HO/DDHS_Div3/P/CIR/2021/1673 dated 29 November 2021 issued under the InvIT

Statement of Net Distributable Cash Flows

National Highways Infra Projects Private Limited (Project SPV company)

(All amounts in ₹ lakh unless otherwise stated)

S. No.	PARTICULARS	YEAR ENDED 31st March, 2022
1	**Profit after tax as per Statement of profit and loss/income and expenditure (standalone) (A)**	**(11,355.90)**
2	**Add:** Depreciation and amortization as per statement of profit and loss account. Incase of Impairment reversal, same needs to be deducted from profit and loss.	1,055.65
3	**Add/Less:** Loss/gain on sale of infrastructure assets	-
4	**Add:** Proceeds from sale of infrastructure assets adjusted for the following: related debts settled or due to be settled from sale proceeds; directly attributable transaction costs; proceeds reinvested or planned to be reinvested as per Regulation 18(7)(a) of the InvIT regulations	-
5	**Add:** Proceeds from sale of infrastructure assets not distributed pursuant to an earlier plan to re-invest, if such proceeds are not intended to be invested subsequently, net of any profit/ (loss) recognised in profit and loss account	-
6	**Add/ Less:** Any other item of non- cash expense/ non cash income (net of actual cash flows for these items), if deemed necessary by the Investment Manager. For example, any decrease/ increase in carrying amount of an asset or a liability recognised in profit and loss /income and expenditure on measurement of the asset or the liability at fair value; Interest cost as per effective interest rate method, deferred tax lease rents recognised on a straight line basis, etc.	23,080.85
7	**Less:** Repayment of external debt (principal) / redeemable preference shares / debentures, etc. (excluding refinancing) / net cash set aside to comply with DSRA requirement under loan agreements	-
8	**Total Adjustment (B)**	24,136.50
9	**Net Distributable Cash Flows (C) = (A+B)**	**12,780.61**

Statement of Reconciliation of NDCF with distributions for FY 2021-22

(All amounts in ₹ lakh unless otherwise stated)

S. No.	PARTICULARS	YEAR ENDED 31st March, 2022
1	**Net Distributable Cash Flows for the year ended on 31st March, 2022**	12,780.61
2	Amount distributed as Interest on borrowing from NHIT	12,192.00
3	**Cash and Cash Equivalents at the end of the reporting period**	**588.61**

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NATIONAL HIGHWAYS INFRA TRUST

Disclosures pursuant to SEBI circulars (SEBI Master Circular No. CIRSEBI/HO/DDHS_Div3/P/CIR/2021/1673 dated 29 November 2021 issued under the InvIT regulations)

Consolidated Statement of Net Assets at Fair Value (All amounts in ₹ lakh unless otherwise stated)

	As at 31st March, 2022		As at 31st March, 2021	
Particulars	**Book value**	**Fair value^**	**Book value**	**Fair value^**
A. Assets	7,54,898	7,54,898	-	-
B. Liabilities (at book value)	1,48,686	1,48,686	-	-
C. Net assets (A-B)	**6,06,211**	**6,06,211**	-	-
D. No of units	59,52,00,000	59,52,00,000	-	-
E. NAV (C/D)	**101.85**	**101.85**	-	-

^Fair values of total assets relating to the Trust as at 31 March, 2022 as disclosed above are based on the best estimates of the management.

Consolidated Statement of Total Return at Fair Value: (All amounts in ₹ lakh unless otherwise stated)

Particulars	**For the period ended 31st March, 2022**	**For the year ended 31st March 2021**
Total comprehensive income for the year/period (As per the Consolidated Statement of Profit and Loss)	6,836.33	(67.90)
Add: Other changes in fair value for the year *	-	-
Total return	**6,836.33**	**(67.90)**

* In the above statement, other changes in fair value for the year ended 31 March, 2022 have been computed based on best estimates of the management.

The accompanying notes form an integral part of the Consolidated Financial Statements.

This is the Consolidated Statement of Net Assets at Fair Value and Consolidated Statement of Total Return at Fair Value referred to in our report of even date.

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National Highways Infra Trust New Delhi

NATIONAL HIGHWAYS INFRA TRUST

Consolidated Summary of significant accounting policies and other explanatory information

3. Property, Plant and Equipment

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Computer	Total
Gross Carrying Amount		
Balance as at March 31, 2020	-	-
Additions	-	-
Less: Disposals	-	-
Balance as at March 31, 2021	-	-
Additions	0.50	0.50
Less: Disposals	-	-
Balance as at March 31, 2022	**0.50**	**0.50**
Accumulated Depreciation		
Balance as at March 31, 2020	-	-
Additions	-	-
Less: Disposals	-	-
Balance as at March 31, 2021	-	-
Additions	0.04	0.04
Less: Disposals	-	-
Balance as at March 31, 2022	**0.04**	**0.04**
Net Carrying Amount		
As at March 31, 2020	-	-
As at March 31, 2021	-	-
As at March 31, 2022	0.46	0.46

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4. Goodwill arising on Consolidation

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Gross Carrying Amount		
Balance as at March 31, 2020	-	-
Additions	-	-
Less: Disposals	-	-
Less: Impairment	-	-
Balance as at March 31, 2021	-	-
Additions*	10,144.46	-
Less: Disposals	-	-
Less: Impairment	-	-
Balance as at March 31, 2022	10,144.46	-

The carrying amount relates to goodwill arising on acquisition of Project SPV company (NHIPPL) by the Trust and has been tested for impairment against the respective cash generating unit (CGU). The calculation uses cash flow forecast based on approved financial budgets/strategic forecast which cover future periods of 30 years.

Based on a review of the future discounted cash flows of the intangible assets (Toll Collection Rights) held by the subsidiary (NHIPPL), the recoverable amount is higher than the carrying amount of the assets, and accordingly no impairment loss has been recognised in the statement of profit and loss for the year ended March 31, 2022.

*Refer Note 34

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5. Intangible Assets

(All amounts in ₹ lakh unless otherwise stated)

Particulars	License to charge users of Toll Road					
	Abu Road-Swaroopganj	Abu Road-Palanpur	Belgaum- Kagal	Chittorgarh- Kota	Kolthakota-Kurnool	Total
Gross Carrying Amount:						
Balance as at March 31, 2021	-	-	-	-	-	-
Additions	74,170.00	1,14,650.00	2,32,870.00	1,19,340.00	1,94,010.00	7,35,040.00
Less: Disposals	-	-	-	-	-	-
Balance as at March 31, 2022	**74,170.00**	**1,14,650.00**	**2,32,870.00**	**1,19,340.00**	**1,94,010.00**	**7,35,040.00**
Accumulated Amortization:		-				
Balance as at March 31, 2021	-	-	-	-	-	-
Additions	102.06	156.78	366.53	156.35	273.89	1,055.61
Less: Disposals	-	-				
Balance as at March 31, 2022	**102.06**	**156.78**	**366.53**	**156.35**	**273.89**	**1,055.61**
Net Carrying Amount						
Balance as at March 31, 2021	-	-	-	-	-	-
Balance as at March 31, 2022	**74,067.94**	**1,14,493.22**	**2,32,503.47**	**1,19,183.65**	**1,93,736.11**	**7,33,984.39**

Note:-

The Project SPV (NHIPPL) has acquired rights for Tolling, Operation, Maintenance and Transfer of five toll road projects for a period of 30 years from the appointed date of 16.12.2021 basis Toll Concession agreements with the NHAI, for a consideration of INR 7,350.40 Crore and the same have been recognised as Other Intangible Assets in financial statements.

Toll Collection Rights shall be amortized basis a Consumption based model (using Passenger Car Unit (PCU) projections) over the tenure of the Concession Agreement i.e. 30 years.

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Consolidated Summary of significant accounting policies and other explanatory information

6. Other Financial Assets: Non Current

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Investment in Fixed Deposits		
Fixed Deposits with banks*	3,170.81	-
	3,170.81	-

* The Fixed Deposits are earmarked for Debt Servicing Reserve Account (DSRA), to be utilized at the end of tenure of long term borrowings from Senior Lenders, hence classified as Other Financial Assets- Non Current irrespective of date of maturity.

7. Deferred Tax Assets (Net)

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Deferred Tax Assets arising on account of:		
- Expense disallowed as per Income Tax Act, 1961, allowable in future years	0.03	-
- Unabsorbed depreciation & Carried forward tax losses	23,124.38	-
Total (A)	**23,124.41**	-
Deferred Tax Liabilities arising on account of:		
- Difference between book & tax base related to Intangible assets	22,858.70	-
- Difference between book & tax base related to Investments	3.16	
- Expense disallowed earlier as per Income Tax Act, 1961, allowed now	0.03	-
Total (B)	**22,861.88**	-
Net Asset (A) - (B)	**262.53**	-

Reconciliation of Deferred Tax Asset/ (Liabilities)

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Opening Balance - Deferred Tax Asset	-	-
Deferred tax income/ (expense) during the period recognised in profit & loss	262.53	-
Deferred tax income/ (expense) during the period recognised in Other Comprehensive Income	-	-
Closing Balance - Deferred Tax Asset	**262.53**	-

8. Investments: Current

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
In Mutual Funds - Quoted at FVTPL		
Overnight Mutual Funds (28,664.02 units @ NAV of Rs. 3,461.3538 per unit)	992.16	-
Total	**992.16**	-

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9. Trade Receivables: Current

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Outstanding for the following period from the due date of payment:		
Undisputed trade receivables- considered good*	600.47	-
(Outstanding for less than 6 months from the due date of payment)		
Disputed trade receivables- considered good	-	-
	600.47	-

* Undisputed Trade Receivables include unbilled receivables amounting to Rs. 401.12 Lakh

10. Cash and Cash Equivalents

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Cash & Cash Equivalents		
Balances with Banks		
In Current Accounts	1,004.69	-
In Escrow Accounts	35.09	-
Fixed Deposits (having original maturity of less than 3 months)	4,350.00	-
	5,389.78	-

11. Other Financial Assets: Current

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Interest receivable	-	-
Interest receivable on investment in Fixed Deposits	5.28	-
Other Financial Assets	0.10	-
Total	5.38	-

12. Other Current Assets

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Prepaid expenses	347.29	-
Total	347.29	-

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13. Unit Capital*

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022		AS AT 31st March, 2021	
	NO. OF UNITS	AMOUNT	NO. OF UNITS	AMOUNT
Unit Capital	59,52,00,000	6,01,152.00	-	-

Rights/ preferences and restrictions attached to Unit Capital

Subject to the provisions of the InvIT Regulations, the indenture of funds, and applicable rules, regulations and guidelines, the rights of the unit holders include:

a) The beneficial interest of each unitholder shall be equal and limited to the proportion of the numbers of the units held by that unitholder to the total number of the units.
b) Right to receive income or distributions with respect to the units held.
c) Right to attend the annual general meeting and other meetings of the unit holders of the Trust.
d) Right to vote upon any matters/resolutions proposed in relation to the Trust.
e) Right to receive periodic information having a bearing on the operation or performance of the Trust in accordance with the InvIT Regulations; and
f) Right to apply to the Trust to take up certain issues at meetings for unit holders approval.
g) Right to receive additional information, if any, in accordance with InvIT documents filed with Placement Memorandum.
h) The non-sponsor unit holders ("Eligible Persons") of the Trust are entitled to representation on the Board of Directors of the Investment Manager through appointment of up to two (2) directors ("Non-Sponsor Directors"), provided that no Eligible Person shall have the right to nominate more than one Director at a time for appointment on the Board of Directors.

In accordance with the InvIT Regulations, no unit holders shall enjoy superior voting or any other rights over any other unit holders, and there shall not be multiple classes of units. There shall be only one denomination of units. Not withstanding the above, subordinate units may be issued only to the Sponsor and its Associates, where such subordinate units shall carry only inferior voting or any other rights compare to the other units.

Under the provisions of the InvIT Regulations, not less than ninety percent of the net distributable cash flows of the Trust is required to be distributed to the unitholders, and in accordance with such statutory obligation the Trust has formulated a distribution policy to declare and distribute the distributable cash flows to its unitholders once every quarter of a financial year as approved by the Board of Directors of the Investment Manager. The distributions made by Trust to its unitholders are based on the Net Distributable Cash Flows (NDCF) of the Trust under the InvIT Regulations and represent repayment of proportionate capital and share of profit.

Limitation to the Liability of the unit holders

The liability of each unit holders towards the payment of any amount (that may arise in relation to the Trust including any taxes, duties, fines, levies, liabilities, costs or expenses) shall be limited only to the extent of the capital contribution of such unit holders and after such capital contribution shall have been paid in full by the unit holders, the unit holders shall not be obligated to make any further payments.
The unit holders shall not have any personal liability or obligation with respect to the Trust.

DETAILS OF UNITHOLDERS HOLDING MORE THAN 5% SHARES IN THE COMPANY

NAME OF SHAREHOLDER	AS AT 31st March, 2022		AS AT 31st March, 2021	
	NO. OF UNITS	%	NO. OF UNITS	%
Ontario Limited	14,88,00,000	25.00%	-	-
CPP Investment Board Private Holdings Inc.	14,88,00,000	25.00%	-	-
SBI Balanced Advantage Fund	5,68,00,000	9.54%	-	-
National Highways Authority of India (NHAI)	9,56,00,000	16.06%	-	-

As per records of the Trust, including its register of unitholders and other declaration received from unitholders regarding beneficial interest, the above unitholding represent both legal and beneficial ownership of units.
The Trust has issued 1,00,51,485 nos. of units at the rate of Rs. 101 per unit for consideration other than cash to the Sponsor (National Highways Authority of India), as consideration for purchase of 1,00,000 equity shares of Project SPV - NHIPPL.
No units were bought back since inception of the Trust.

THE RECONCILIATION OF THE NUMBER OF SHARES OUTSTANDING IS SET OUT BELOW:

PARTICULARS	AS AT 31st March, 2022		AS AT 31st March, 2021	
	NO. OF SHARES	AMOUNT	NO. OF SHARES	AMOUNT
Number of Units at the Beginning	-	-	-	-
Units issued during the year	59,52,00,000	6,01,152.00	-	-
Number of Units at the End	59,52,00,000	6,01,152.00	-	-

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14. Other Equity **

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Reserves and Surplus	Items of Other Comprehensive Income		Total
		Items that will not be reclassified to profit or loss	Items that will be reclassified to profit or loss	
	Retained Earnings	Remeasurement of Defined Benefit Obligation/ Plan	Fair Value Gain on Preference Shares	
Balance as at 1st April 2020	-	-	-	-
Profit/ (Loss) for the year	(67.90)	-	-	(67.90)
Balance as at 31st March, 2021	**(67.90)**	-	-	(67.90)
Profit/ (Loss) for the year	6,836.33	-	-	6,836.33
One time units issue expense	1,709.18	-	-	1,709.18
Balance as at 31st March, 2022	5,059.25	-	-	5,059.25

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15. Borrowings: Non Current

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Secured		
Term Loan:		
From Banks	1,46,998.41	-
From other parties	-	-
	1,46,998.41	-
Less: Current Maturities of Long Term borrowings (Refer Note 17)	980.86	-
Less: Unamortized Borrowing Cost	460.61	-
	1,45,556.94	-
Total	**1,45,556.94**	-

*Transaction Cost amounting to Rs. 1.18 Crore was not yet paid as at the end of reporting period to the Senior Lenders, however the same has been considered for the purpose of EIR in the forthcoming periods.

The Trust had availed loan cumulating to INR 1,480 Crore (sanctioned amount Rs. 2,000 Crore) from three banks at the rate of 7.20% p.a. via Facility Agreement dated 29.09.2021 for the purpose of investment of Trusts in Project SPV (NHIPPL).

The loan was disbursed on 14.12.2021 and is repayable on quarterly basis over 78 quarterly instalments of Principal and Interest up to 31st March 2041, and the next instalment due on 30th June 2022.

Security:

The loan is secured by,

- first pari passu charge on all immovable assets (if any), movable assets and receivables of the Trust including but not limited to, (i) the interest and principal repayments on the loans advanced by the Trust to Project SPV (ii) dividends to be paid by Project SPV to the Trust
- first pari passu Security Interest on Trust Escrow account and all sub-accounts thereunder, including DSRA.
- first pari Passu charge on the Senior Debt Service Account, Sub-Debt Servicing Account and Surplus/ Dividend Account or any other account of the Project SPV where free cash flows of the Project SPV are credited.
- pledge of 100% equity shares of Project SPV (NHIPPL) held by the Trust.
- assignment of loans advanced by the Trust to Project SPV (NHIPPL) and securities created by the Trust including the assignment of rights of submission, termination and invocation of provision of Escrow agreement in case of default.
- negative lien on immovable assets (including current assets and cash flows) of the Project SPV (NHIPPL) subject to sale of obsolete items or cars/ ambulances, old toll equipment etc., under normal business practice, subject to maximum cumulative value of INR 5 Crore in any financial year.

The senior lenders of the Trust have also been provided with a corporate guarantee from Project SPV (NHIPPL) to guarantee the repayment of senior debt by the Trust. The funds have been raised at Trust level by unitholders and domestic lenders, and the same have been lent to Project SPV (NHIPPL) for payment of concession fee by NHIPPL to NHAI. The cashflows viz., toll collections are lying in NHIPPL. Accordingly, corporate guarantee amounting to INR 2,000 Crore via Corporate Guarantee Deed dated 14.03.2022, valid across the tenure of the loan of the Trust i.e. up to 31.03.2041, has been provided by the Project SPV (NHIPPL) to the senior lenders of the Trust.

There have been no breaches in financial covenants with respect to the borrowings from Senior lenders.

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16. Provisions: Non Current

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Provision for employees benefits		
Gratuity	0.05	-
Compensated Absences	0.03	-
Provision for Major Maintenance*		
Abu Road- Swaroopganj	7.45	-
Abu Road- Palanpur	28.39	-
Belgaum- Kagal	30.36	-
Chittorgarh- Kota	264.32	-
Kolthakota- Kurnool	72.78	-
Total	403.37	-

Provision for Major Maintenance*

The Company has a contractual obligation to maintain the performance standards of the Project Highways in respect of riding quality and allied measures as per the performance parameters stipulated under the respective Concession Agreements. Cost of such obligation is measured at the best estimate of the expenditure required to settle the obligation at the balance sheet date and recognised over the period at the end of which the overlay is estimated to be carried out using Discounted Cash Flows method with the discount rate taken as the risk free interest rate i.e. GOI 30 yr. Bond Yield. The next major overlay for one of the Project Highways is expected to be carried out in FY 2024-25.

Details of movement in Provisions

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Opening Balance	-	-
Add: Accretion during the year	403.29	-
Less: Utilized during the year	-	-
Closing Balance	403.29	-

17. Borrowings: Current

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Current Maturities of Long Term borrowings (Refer Note No. 15)	980.86	-
	-	
	980.86	-

18. Trade Payables: Current

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Total outstanding, dues of micro and small enterprises	-	-
Total outstanding, dues of creditors other than micro and small enterprises (Outstanding for less than 12 months from the due date of payment)	1,101.23	-
Total	1,101.23	-

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19. Other Financial Liabilities: Current

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Others		
Cash Toll Collection payable to NHAI	97.85	-
Payables towards other expenses	143.56	67.81
Total	**241.41**	**67.81**

20. Other Current Liabilities

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Statutory Liabilities (GST, TDS, TCS and PF)	240.75	0.09
Total	**240.75**	**0.09**

21. Provisions: Current

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Provision for Employee Benefits		
Compensated Absences	0.03	-
Total	**0.03**	**-**

22. Current Tax Liabilities (Net)

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Provision for Income Tax	161.77	-
Total	**161.77**	**-**

Reconciliation of Current Tax Liabilities

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Opening Balance	-	-
Add: Income Tax Payable for the year	436.36	-
Less: Taxes Paid	274.59	-
Closing Balance	**161.77**	**-**

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23. Revenue from operations

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Sale of Services		
Revenue from Toll Collection	13,941.94	-
Other Operative Revenue		
Interest on delay in Toll Remittance	18.61	-
Total	**13,960.55**	-

24. Other Income

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Interest Income		
On fixed deposits with banks	5.86	-
Other non operating income		
Net Gain on fair valuation of investments designated at FVTPL	7.38	-
Gain on sale of investments	682.62	-
Other Income	318.67	-
Total	**1,014.53**	-

25. Operating Expenses

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Project Management Fees	290.43	-
Operation and Maintenance Expenses	446.48	-
Provision for Major Maintenance Obligation	403.29	
Total	**1,140.21**	-

26. Employee Benefit Expenses

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Salaries and wages	1.75	-
Contribution to provident and other funds	0.13	-
Gratuity	0.05	-
Compensated absences	0.06	-
Staff welfare expenses	0.13	-
Total	**2.12**	-

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27. Finance Charges

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Interest on Long Term Borrowings	3,149.19	-
Other Financial Charges	5.24	-
Total	**3,154.43**	-

28. Depreciation and Amortization Expenses

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Depreciation on Property, Plant and Equipment	3,730.59	-
Amortization on Intangible Assets	10,55,61,372.95	-
Total	**10,55,65,103.54**	-

29. Other Expenses

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Advertisement expenses	8.47	-
Professional fees	203.13	47.55
Fee, subscription & taxes	291.63	15.27
Insurance expenses	166.04	-
Bank charges	0.04	-
Auditors' remuneration:		
Statutory Audit fees	4.57	0.87
Tax Audit fees	0.30	-
Certification and other charges	0.52	-
Data Management Expenses	1.31	-
Miscellaneous expenses	0.87	-
Total	**676.86**	**63.69**

30. Tax Expense

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Current Tax	436.36	-
Provision for Taxation–Earlier years	-	-
	436.36	-
Deferred tax expense/(credit)	(262.32)	-
	174.04	-

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Effective tax Reconciliation:

Numerical reconciliation of tax expense applicable to (profit)/ loss before tax at the latest statutory enacted tax rate in India to income tax expense reported is as follows:

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Accounting Profit before Income Taxes	7,010.37	
Tax at India's statutory income tax rate for Companies (25.17%)	(2,925.10)	
Tax at India's statutory income tax rate for Business Trusts - Maximum Marginal Rate (42.744%)	7,963.95	
Increase/ (reduction) in taxes on account of:		
Impact of deferred tax on reversible allowance/ disallowance of business expense and income, as per Indian Income Tax Act, 1961	2,662.78	
Impact of exemption u/s 10(23FC) of the Indian Income Tax Act, 1961 available to the Trust	(7,542.34)	
Provision for interest on delayed deposit of income tax	14.75	
Income tax expense reported in the statement of profit and loss	**174.04**	

31. Earning per Unit

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Basic and diluted EPU		
Net Profit/ loss available for unitholders (in ₹ lakh)	6,836.33	-
Weighted average number of units for EPU computation	59,52,00,000	-
EPU- Basic and diluted	**1.15**	-

32. Contingent Liabilities

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	AS AT 31st March, 2022	AS AT 31st March, 2021
Contingent Liabilities:		
Corporate Guarantee issued by the Project SPV company (NHIPPL) to the lenders of NHIT	2,00,000.00	-
Total	**2,00,000.00**	-

The Project SPV company (NHIPPL) has issued a Corporate Guarantee amounting to INR 2,000 Crore on 14.03.2022 in favour of lenders of NHIT as part of debt covenants of the loan received from NHIT, to secure the term loan of INR 2,000 Crore availed by NHIT from external lenders. The Corporate Guarantee is valid across the tenure of the loan till March 31, 2047, till the external loans of the Trust are satisfied.

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33. Revenue from contracts with customers

(All amounts in ₹ lakh unless otherwise stated)

1 Disaggregation of revenue

Revenue recognised mainly comprises of revenue from toll collections, claims with NHAI, contract revenue. Set out below is the disaggregation of the Trust's revenue from contracts with customers:

Description	For the year ended 31st March, 2022	For the year ended 31st March, 2021
Operating revenue		
(a) Toll income from Expressway	13,941.94	-
(b) Interest on delay in Toll Remittance	18.61	-
Total revenue	**13,960.55**	-

The table below presents disaggregated revenues from contracts with customers based on nature, amount and timing for the year ended 31 March 2022 and 31 March 2021:

S.No.	Types of Products by Nature	Types of Services by timing	For the year ended 31st March, 2022	For the year ended 31st March, 2021
1	Toll Income	Over the period of time	13,960.55	-

2 Assets and liabilities related to contracts with customers

The following table provides information about receivables, contract assets and contract liabilities from contract with customers:

Description	As at 31st March, 2022	As at 31st March, 2021
	Current	Current
Contract assets		
Trade receivables:		
Receivables under service concession arrangements	600.47	-
Total	**600.47**	-
Contract liabilities		
Trade Payables	1,101.23	-
Other Payables	241.41	-
Total	**1,342.64**	-

3 Performance obligation

Income from toll collection

The performance obligation in service of toll collection is recorded as per rates notified by NHAI and approved by management and payment is generally due at the time of providing service.

Contract revenue

The performance obligation under service concession agreements ('SCA') is due on completion of work as per terms of SCA.

4 Disclosure under Appendix - C & D to Ind AS 115 - " Service Concession Arrangements"

All the below service concession arrangement have been accounted under intangible asset model

Name of Concessionaire	Start of Concession period under concession agreement (Appointed Date)	End of Concession period under concession agreement	Period of Concession since the appointed date (in days)
National Highways Infra Projects Private Limited	16.12.2021	15.12.2051	106

i) The above TOT projects shall have following rights / obligations in accordance with the Concession Agreement entered into with the respective Government Authorities

a. Right to use the Specified Assets

b. Obligations to provide or rights to except provision of services

c. Obligations to deliver or rights to receive at the end of concession

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34. DISCLOSURES PURSUANT TO IND AS 103 "BUSINESS COMBINATIONS"

(All amounts in ₹ lakh unless otherwise stated)

a) **Acquisition of subsidiaries**

i) Pursuant to the Share Purchase Agreement dated September 30, 2021, the Trust acquired the entire equity share capital of the the Project SPV company (NHIPPL) on December 14, 2021 for an equity consideration of Rs. 1,39,553.52 Lakhs. Accordingly, the financial statements of the subsidiary NHIPPL for the period from December 14, 2021 to March 31,2022 have been considered in the consolidated financial statements of the Trust. Funding for the said acquisition was raised through preferential issue of units of the Trust. The Group has carried out a fair valuation of the net assets of the Project SPV at the time of acquisition and accordingly the goodwill has been recorded in the consolidated financial statements.

ii) **Details of the purchase consideration:**

Particulars	Total
Cash Consideration	1,29,400.00
Unit capital issued	10,153.52
Total purchase consideration	**1,39,553.52**

The fair value of Rs 139,553.52 lakhs paid for acquisition of the above mentioned project SPVs includes consideration in cash amounting to Rs. 1,294 Crore and consideration in form of issuance of 10.05 Lakh units of Trust at the rate of Rs. 101 per unit. Issue costs of Rs 1.52 Lakh directly attributable to the issue of the units have been added to the purchase consideration.

ii) **Assets acquired and liabilities recognised on the date of acquisition are as follows:**

Particulars	Amount
Non - Current Assets:	
Intangible assets	7,35,040.00
Deferred Tax Assets (net)	0.21
Current Assets:	
Financial Assets	
Cash and Cash Equivalents	10.00
Total Assets	**7,35,050.21**
Current Liabilities:	
Financial liabilities	
Other financial liabilities	7,35,041.12
Other current liabilities	0.02
Total Liabilities	**7,35,041.14**
Net assets acquired	**9.07**

iii) **Calculation of Goodwill / (Capital Reserve)**

Particulars	Amount
Purchase Consideration	1,39,553.52
Less: Fair Value of Net Assets acquired	9.07
Less: Acquisition of fresh issue of shares of NHIPPL by the Trust	1,29,400.00
Goodwill	**10,144.46**

iv) Goodwill on acquisiion has been accounted for under Non Current Assets in the Balance Sheet.

v) **Entity wise Revenue and Profit after tax from the date of acquisition till March 31, 2022:**

Particulars	Amount
Revenue	13,960.55
Profit after Tax	**6,836.33**

vi) **Entity wise Revenue and Profit after tax for the financial year 2020-21**

Particulars	Amount
Revenue	-
Profit after Tax	**(67.90)**

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NATIONAL HIGHWAYS INFRA TRUST

NOTES FORMING PART OF CONSOLIDATED FINANCIAL STATEMENTS FOR THE YEAR ENDED ON MARCH 31, 2022

1. GROUP INFORMATION AND NATURE OF OPERATIONS

The consolidated financial statements comprise financial statements of NHAI Infra Trust ("the Trust" or "InvIT") and its subsidiary (collectively, the Group).

The Trust is an irrevocable trust registered under the provisions of the Indian Trusts Act, 1882 on October 19, 2020. It is registered under the Securities and Exchange Board of India (Infrastructure Investment Trust) Regulations, 2014 on October 28, 2020 having registration number IN/InvIT/20-21/0014.

The Trust was setup by National Highways Authority of India ("NHAI" or the "Sponsor"), an infrastructure development Trust in India. The Trustee to the Trust is IDBI Trusteeship Services Limited (the "Trustee") and Investment Manager for the Trust is National Highways Infra Investment Managers Private Limited ("Investment Manager").

The Trust has been formed to invest in infrastructure assets primarily being in the road sector in India. The Trust's road projects are implemented and held through special purpose vehicles ("Project SPVs"/ "Subsidiaries"). The units of the Trust were listed in Bombay Stock Exchange and National Stock Exchange on November 10, 2021.

During the year ended March 31, 2022, the Trust acquired 100% equity control in National Highway Infra Projects Private Limited (the "Project SPV") from the Sponsor with effect from November 03, 2021. During the year ended 31.03.2021, the project SPV entered into five Concession Agreements for 30 years with the Sponsor (National Highways Authority of India – NHAI) on Toll, Operate and Transfer ('TOT') basis.

The registered office of the Investment Manager is G-5 & 6, Setor-10, Dwarka, Delhi - 110075.

The consolidated financial statements were authorised for issue in accordance with resolution passed by the board of directors of the Investment Manager on May 23, 2022.

2. SIGNIFICANT ACCOUNTING POLICIES

2.1 Basis of Preparation

The Consolidated financial statements of the Group have been prepared in accordance with Indian Accounting Standards as defined in Rule 2(1)(a) of the Companies (Indian Accounting Standards) Rules, 2015, as amended, prescribed under Section 133 of the Companies Act, 2013 ("Ind AS") read with Securities and Exchange Board of India (Infrastructure Investment Group) Regulations, 2014, as amended and the circulars issued thereunder ("SEBI InvIT Regulations") and other accounting principles generally accepted in India.

Accordingly, the Group has prepared these Consolidated Financial Statements comprising of the Balance Sheet as on March 31, 2022, the Statement of Profit and Loss for the year ended on March 31, 2022, the Statement of Cash Flows for the year ended on March 31, 2022, the Statement of Changes of Equity for the year ended on March 31, 2022 and Notes to Accounts (together hereinafter referred to as "Consolidated Financial Statements").

These Financial Statements have been prepared on accrual basis under the historical cost convention, except certain financial assets and liabilities which have been measured at Fair Value. Accounting policies have been consistently applied, except where a newly issued Accounting Standard is initially adopted or a revision to an existing Accounting Standard requires a change in the accounting policy hitherto in use. Further, these standalone financial statements have been prepared on a going concern basis.

The financial statements are presented in Indian Rupees (INR) which is the Group's functional and presentation currency and all amounts are rounded to the nearest Lakh (` 00,000) and two decimals thereof, except as otherwise stated.

2.2 Basis of Consolidation

The consolidated financial statements incorporate the financial statements of the Trust and it's subsidiary (Project SPV- NHIPPL) from date of acquisition i.e. November 3, 2021.

For the purpose of consolidation, an entity which is, directly or indirectly, controlled by the Group is treated as subsidiary. Control exists when the Group, directly or indirectly, has power over the investee, is exposed to variable returns from its involvement with the investee and has the ability to use its power to affect its returns.

Consolidation of a subsidiary begins when the Group, directly or indirectly, obtains control over the subsidiary and ceases when the Group, directly or indirectly, loses control of the subsidiary. Income and expenses of a subsidiary acquired or disposed of during the period are included in the consolidated statement of profit and loss from the date the Group, directly or indirectly, gains control until the date when the Group, directly or indirectly, ceases to control the subsidiary.

The consolidated financial statements of the Group combine financial statements of the Trust and its subsidiaries on line-by-line basis by adding together the like items of assets, liabilities, income and expenses. All intra-group assets, liabilities, income, expenses and unrealised profits/losses on intra-group transactions are eliminated on consolidation unless the transaction provides evidence of an impairment of transferred asset. The carrying amount of the Group's investment in each subsidiary and the Group's portion of equity of each subsidiary are offset with each other in the consolidated financial statements.

Ind AS 12 'Income Taxes' applies to temporary differences that arise from the elimination of profits and losses resulting from intragroup transactions.

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The accounting policies of subsidiaries have been harmonised to ensure the consistency with the policies adopted by the Group. The consolidated financial statements have been presented to the extent possible, in the same manner as Group's standalone financial statements. Profit or loss and each component of other comprehensive income are attributed to the unit holders of the Group and to the non-controlling interests, even if this results in the non-controlling interests having a deficit balance.

Non-controlling interest (if any) represents that part of the total comprehensive income and net assets of subsidiaries attributable to interests which are not owned, directly or indirectly, by the Group and are excluded in the consolidated financial statements from the total comprehensive income and net assets.

2.3 Business Combination/ Goodwill on Acquisition

Business combinations are accounted for using the acquisition method. The cost of an acquisition is measured as the aggregate of the consideration transferred, measured at acquisition date fair value and the amount of any non-controlling interests in the acquiree. For each business combination, the Group elects whether to measure the non-controlling interests in the acquiree at fair value or at the proportionate share of the acquiree's identifiable net assets. Acquisition related costs are recognised in the statement of profit and loss as incurred.

The acquiree's identifiable assets, liabilities and contingent liabilities that meet the condition for recognition are recognised at their fair values at the acquisition date.

Goodwill is initially measured at cost, being the excess of the aggregate of the consideration transferred and the amount recognised for non-controlling interests, and any previous interest held, over the net identifiable assets acquired and liabilities assumed. If the fair value of the net assets acquired is in excess of the aggregate consideration transferred, the Group re-assesses whether it has correctly identified all of the assets acquired and all of the liabilities assumed and reviews the procedures used to measure the amounts to be recognised at the acquisition date. If the reassessment still results in an excess of the fair value of net assets acquired over the aggregate consideration transferred, then the gain is recognised in other comprehensive income and accumulated in equity as capital reserve. However, if there is no clear evidence of gain on bargain purchase, the entity recognises the gain directly in equity as capital reserve, without routing the same through other comprehensive income.

Goodwill arising on consolidation is not amortised, however, it is tested for impairment annually. In the event of cessation of operations of a subsidiary, the unimpaired goodwill is written off fully. For the purpose of impairment testing, goodwill acquired in a business combination is, from the acquisition date, allocated to each of the Group's cash-generating units that are expected to benefit from the combination, irrespective of whether other assets or liabilities of the acquire are assigned to those units. A cash generating unit to which goodwill has been allocated is tested for impairment annually, or more frequently when there is an indication that the unit may be impaired. If the recoverable amount of the cash generating unit is less than it's carrying amount, the impairment loss is allocated first to reduce the carrying amount of any goodwill allocated to the unit and then to the other assets of the unit pro-rata based on the carrying amount of each asset in the unit.

Any impairment loss for goodwill is recognised in the consolidated statement of profit or loss. An impairment loss recognised for goodwill is not reversed in subsequent periods. Where goodwill has been allocated to a cash generating unit and part of the operation within that unit is disposed of, the goodwill associated with the disposed operation is included in the carrying amount of the operation when determining the gain or loss on disposal.

Goodwill disposed in these circumstances is measured based on the relative values of the disposed operation and the portion of the cash-generating unit retained.

2.4 Use of Judgement and Estimates

The preparation of financial statements is in conformity with the generally accepted accounting principles in India, and requires the Investment Manager to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent liabilities at the date of the financial statements and the results of operations during the reporting period end. Although these estimates are based upon Investment Manager's best knowledge of current events and actions, actual results could differ from these estimates.

Current versus non-current classification

Assets and Liabilities in the Consolidated Balance Sheet have been classified as either Current or Non–Current based upon the requirements of Schedule III notified under the Companies Act, 2013.

An asset has been classified as Current if,

(a) it is expected to be realized in, or is intended for sale or consumption in, the Group's normal operating cycle; or

(b) it is held primarily for the purpose of being traded; or

(c) it is expected to be realized within twelve months after the reporting date; or

(d) it is cash or cash equivalent unless it is restricted from being exchanged or used to settle a liability for at least twelve months after the reporting date.

All other assets have been classified as Non–Current.

A liability has been classified as Current when,

(a) it is expected to be settled in the Group's normal operating cycle; or

(b) it is held primarily for the purpose of being traded; or

(c) it is due to be settled within twelve months after the reporting date; or





(d) the Group does not have an unconditional right to defer settlement of the liability for at least twelve months after the reporting date.
All other liabilities have been classified as Non–Current.

The operating cycle is the time between the acquisition of assets for processing and their realisation in cash and cash equivalents. The group has identified twelve months as its operating cycle.

Deferred tax assets and liabilities are classified as non-current assets and liabilities.

2.5 Revenue Recognition

Revenue is recognised to the extent that it is probable that the economic benefits will flow to the Group and the revenue can be reliably measured, regardless of when the payment is being made. Revenue is measured at the fair value of the consideration received or receivable, taking into account contractually defined terms of payment and excluding taxes or duties collected on behalf of the government.
The specific recognition criteria described below must also be met before revenue is recognised:

Toll Revenue - Toll Revenue from users of toll roads held by subsidiary company is recognised in respect of toll revenue accrued for respective toll road projects.
Interest income - Interest is recognised on time proportion basis taking into account the amount outstanding and the rates applicable. For all Debt instruments measured either at Amortized Cost or Fair Value through Other Comprehensive Income, interest income is recorded using EIR method that is the rate that exactly discounts estimated future cash receipts through the expected life of the financial instrument to the net carrying amount of the financial asset.
Dividends - Dividend income is recognised when the Group's right to receive the payment is established, which is generally when shareholders approve the dividend.
Fair value gains on current investments carried at fair value are included in other income.
Claims with National Highways Authority of India ('NHAI') and other government authorities are accounted as and when the money is received from the respective authorities, in cases of monetary compensations.
Other items - Other items of income are recognised as and when the right to receive the income arises.

2.6 Property, plant and equipment

Property, Plant and Equipment (PPE) is recognised when it is probable that future economic benefits associated with the item will flow to the Group and the cost of the item can be measured reliably.

PPE are stated at acquisition cost less accumulated depreciation and cumulative impairment. Such cost includes the cost of replacing part of the plant and equipment and borrowing costs for long-term construction projects if the recognition criteria are met.

Recognition:
The cost of an item of property, plant and equipment shall be recognised as an asset if, and only if:
(a) it is probable that future economic benefits associated with the item will flow to the entity; and
(b) the cost of the item can be measured reliably.

When significant parts of plant and equipment are required to be replaced at intervals, Group depreciates them separately based on their specific useful lives.

Gains or losses arising from de - recognition of Property, plant and equipment are measured as the difference between the net disposable proceeds and the carrying amount of the asset and are recognized in the Consolidated Statement of Profit and Loss when the asset is derecognized.

Depreciation on Property, plant and equipment
Depreciation on Property, plant and equipment ("PPE") is provided on straight line method, up to the cost of the asset (net of residual value), in accordance with the useful lives prescribed under Schedule II to the Companies Act, 2013.

Depreciation on additions is being provided on a pro-rata basis from the date of such additions. Similarly, depreciation on assets sold/disposed off during the year is being provided up to the dates on which such assets are sold/disposed off. Modification or extension to an existing asset, which is of capital nature and which becomes an integral part thereof is depreciated prospectively over the remaining useful life of that asset.

The estimated residual value of the PPE has been taken as 5% in line with the provisions of Schedule II to the Companies Act, 2013.

Fixed assets amounting up to INR 5,000 are recognised in Consolidated Statement of Profit and Loss in entirety in the first year of purchase.

The residual values, useful lives and methods of depreciation of property, plant and equipment are reviewed at each financial year end and adjusted prospectively, if appropriate.

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Depreciation charge for impaired assets is adjusted in future periods in such a manner that the revised carrying amount of the asset is allocated over its remaining useful life.

2.7 Intangible assets

In accordance with Ind AS 38 "Intangible Assets", Intangible assets are recognised when it is probable that the future economic benefits that are attributable to the asset will flow to the Group and the cost of the asset can be measured reliably.

Pre-operative expenses including administrative and other general overhead expenses that are specifically attributable to the development or acquisition of intangible assets are allocated and capitalised as a part of the cost of the intangible assets.

Intangible assets not ready for the intended use on the date of the Consolidated Balance Sheet are disclosed as "intangible assets under development". Intangible assets are derecognised when no future economic benefits are expected from use or disposal.

The cost of intangible assets acquired in an amalgamation in the nature of purchase is their fair value as at the date of amalgamation. Following initial recognition, intangible assets are carried at cost less accumulated amortization and accumulated impairment losses, if any.

The useful lives of intangible assets are assessed as either finite or indefinite.

Rights under Service Concession Arrangements – Toll Collection Rights

The Group has acquired rights for Tolling, Operation, Maintenance and Transfer of five toll road projects for a period of 30 years basis Toll Concession agreements with NHAI, and the same have been recognised as Other Intangible Assets in the financial statements.

Extension of concession period by the Authority in compensation for claims made by the Group are capitalised as part of Toll Collection Rights on acceptance of the claim. Where the Group has a contractual right to an extension in the concession period as per the concession agreement, the same is capitalized when the right to extension in the concession period is established at the estimated amount of eligible claims.

Amortisation of Intangible Assets

Intangible assets with finite lives are amortised over the useful economic life and assessed for impairment whenever there is an indication that the intangible asset may be impaired. The amortisation period and the amortisation method for an intangible asset with a finite useful life are reviewed at least at the end of each reporting period. Changes in the expected useful life or the expected pattern of consumption of future economic benefits embodied in the asset are considered to modify the amortisation period or method, as appropriate, and are treated as changes in accounting estimates. The amortisation expense on intangible assets with finite lives is recognised in the Consolidated Statement of Profit and Loss unless such expenditure forms part of carrying value of another asset.

In accordance with Ind AS 38 "Intangible Assets", Intangible assets should be amortized by a method which reflects the pattern in which the asset's future economic benefits are expected to be consumed by the entity.

Toll Collection Rights shall be amortized basis a Consumption based model (using Passenger Car Unit (PCU) projections) over the tenure of the Concession Agreement i.e. 30 years.

Other intangible assets - Software purchased is amortized over a period of three to six years on straight line basis from the month in which the addition is made.

Gains or losses arising from derecognition of an intangible asset are measured as the difference between the net disposal proceeds and the carrying amount of the asset and are recognised in the statement of profit or loss when the asset is derecognised.

Amortisation on impaired assets is provided by adjusting the amortisation charge in the remaining periods so as to allocate the assets' revised carrying amount over its remaining useful life.

2.8 Employee benefits

Employee benefits include provident fund, gratuity, compensated absences, long service awards and medical benefits.

i. Short term employee benefits

Employee benefits such as salaries, short term compensated absences, expected cost of bonus, ex-gratia and performance linked rewards falling due wholly within twelve months of rendering the service are classified as short-term employee benefits and are expensed in the period in which the employee renders the related service.

ii. Post-Employment Benefits

Defined contribution plan: A defined contribution plan is a post-employment plan under which an entity pays fixed contributions and will have no legal or constructive obligations to pay further amounts. The Group contributes to provident fund and employees deposit linked insurance scheme, and have no further obligations beyond making its contributions. The Group's contribution to the above funds are charg[illegible]nent of Profit and Loss.

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Defined benefit plan: The Group has an un-funded benefit plan for post-employment benefits in the form of Gratuity. The value of obligation under the plan is determined by the group based on best estimate of the present value of the estimated future cash flows towards the gratuity obligation. Defined benefit costs comprising current service cost, past service cost and gains or losses on settlements are recognised in the Consolidated Statement of Profit and Loss as employee benefits expense. Gains or losses on the curtailment or settlement of any defined benefit plan are recognised when the curtailment or settlement occurs.

iii. Termination benefits

Termination benefits such as compensation under employee separation schemes (wherever applicable) are recognised as expense in the Consolidated Statement of Profit and Loss. Liability for the same is recognised at the earlier of when the group can no longer withdraw the offer of the termination benefit.

iv. Other long-term employee benefits

The present value of the obligation under long term employee benefit plans such as compensated absences is determined and is recognised in a similar manner as in the case of defined benefit plans.

Long term employee benefit costs comprising current service cost and gains or losses on curtailments and settlements, re-measurements are recognised in the Consolidated Statement of Profit and Loss as employee benefit expenses. Interest cost implicit in long term employee benefit cost is recognised in the Consolidated Statement of Profit and Loss under finance cost.

2.9 Leases

(i) The determination of whether an arrangement is or contains a lease is based on the substance of the arrangement at the inception of the lease.

i.i) Property, plant, and equipment acquired under leases with lease term more than 12 months is long term lease. The lease liability is recognised for the obligation to make the lease payments and a right of use of asset for the underlying property, plant and equipment for the lease term. The lease liability is measured at the present value of the lease payments to be made over the lease term. The right of use property, plant and equipment are initially measured at the amount of the lease liability, adjusted for lease prepayments, lease incentives received and the initial direct costs such as commissions and an estimate cost of restoration, removal and dismantling of property, plant and equipment. Lease liabilities are increased to reflect the interest cost and are reduced with lease payments.

i.ii) Property, plant, and equipment having lease term 12 months or less than 12 months are recognised on a straight-line basis.

(ii) Property, plant and equipment leased out under operating leases are continued to be capitalised by the Group. Rental income is recognised on a straight-line basis over the term of the relevant lease.

2.10 Borrowing costs

Borrowing Cost consist of interest and other ancillary costs incurred in connection with the arrangement of borrowings. Borrowing costs directly attributable to the acquisition, construction or production of an asset that necessarily takes a substantial period of time to get ready for its intended use or sale are capitalized as part of the cost of the respective asset.

All other borrowing costs are charged to the Consolidated Statement of Profit and Loss in the period they occur. In case of significant Long term loans, other costs incurred in connection with the borrowing of funds are amortized over the period of respective Loan. Borrowing cost also includes exchange differences to the extent regarded as an adjustment to the borrowing costs.

2.11 Financial Instruments

Financial assets and/or financial liabilities are recognised when the Group becomes party to a contract embodying the related financial instruments. A financial instrument is any contract that gives rise to a financial asset of one entity and a financial liability or equity instrument of another entity. A financial asset and a financial liability are offset and presented on net basis in the Consolidated Balance Sheet when there is a current legally enforceable right to set-off the recognised amounts and it is intended to either settle on net basis or to realise the asset and settle the liability simultaneously.

Financial assets

Initial recognition and measurement

All financial assets are recognised initially at fair value plus, in the case of financial assets not recorded at fair value through profit or loss, transaction costs that are attributable to the acquisition of the financial asset. Purchases or sales of financial assets that require delivery of assets within a time frame established by regulation or convention in the market place (regular way trades) are recognised on the trade date, i.e., the date that the Group commits to purchase or sell the asset. Trade receivables and trade payables that do not contain a significant financing component are initially measured at their transaction price.

Subsequent measurement

For purposes of subsequent measurement, financial assets are classified in following categories;

- at amortised cost
- at fair value through profit or loss (FVTPL)
- at fair value through other comprehensive income (FVOCI)

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Financial Assets at amortised cost

A financial asset is classified and subsequently measured at the amortised cost if both the following conditions are met:

a) The asset is held within a business model whose objective is to hold assets for collecting contractual cash flows, and
b) Contractual terms of the asset give rise on specified dates to cash flows that are solely payments of principal and interest (SPPI) on the principal amount outstanding.

This category is the most relevant to the Group. All the Loans and other receivables under financial assets (except Investments) are non-derivative financial assets with fixed or determinable payments that are not quoted in an active market.

After initial measurement, such financial assets are subsequently measured at amortised cost using the effective interest rate (EIR) method. Amortised cost is calculated by taking into account any discount or premium on acquisition and fees or costs that are an integral part of the EIR. The losses arising from impairment are recognised in the Consolidated Statement of Profit and Loss.

Investments in equity instruments of Subsidiaries are recognised at original cost in accordance with Ind AS 27. Impairment testing of Investment in subsidiary that are accounted for at cost as per Ind AS 27 are within scope of Ind AS 36 Impairment of Assets. Any impairment in value of investment in equity investments in Subsidiaries is recognised in the Consolidated Statement of Profit and Loss.

Financial Assets at Fair Value through Other Comprehensive Income (FVOCI)

A financial asset is classified and subsequently measured at FVTOCI if both of the following criteria are met:

a) The asset is held within a business model whose objective is achieved both by collecting contractual cash flows and selling the financial assets, and
b) Contractual terms of the asset give rise on specified dates to cash flows that are solely payments of principal and interest (SPPI).

Investment in Debt instruments included within the FVTOCI category are measured initially as well as at each reporting date at fair value. Fair value movements are recognized in the other comprehensive income (OCI). However, the Group recognizes interest income, impairment losses & reversals and foreign exchange gain or loss in the Consolidated Statement of Profit and Loss.

Interest earned whilst holding FVTOCI debt instrument is reported as interest income using the EIR method.

Financial Assets at Fair Value through Profit and Loss (FVTPL)

A financial asset which is not classified in any of the above categories are subsequently fair valued through profit or loss. Financial assets included within the FVTPL category are measured at fair value with all changes recognized in the Consolidated statement of profit and loss. The Group measures its investments which are classified as equity instruments (other than investment in shares of Subsidiaries, Joint Ventures and Associates) at fair value through profit and loss account.

Any debt instrument, which does not meet the criteria for categorization as at amortized cost or as FVTOCI, is classified as at FVTPL. In addition, the Group may elect to designate a debt instrument, which otherwise meets amortized cost or FVTOCI criteria, as at FVTPL. However, such election is allowed only if doing so reduces or eliminates a measurement or recognition inconsistency (referred to as 'accounting mismatch'). The Group has not designated any debt instrument as at FVTPL.

The Group has investment in debt oriented mutual funds which are held for trading, and the same are classified as at FVTPL. The Group makes such election on an instrument by instrument basis. The classification is made on initial recognition and is irrevocable. The gain/ loss on sale of investments are recognised in the Consolidated Statement of Profit and Loss.

Reclassification of Financial Assets

The Group determines classification of financial assets on initial recognition. After initial recognition, no reclassification is made for financial assets which are equity instruments and financial liabilities. For financial assets which are debt instruments, a reclassification is made only if there is a change in the business model for managing those assets. Changes to the business model are expected to be infrequent. The Investment Manager of the Group determines change in the business model as a result of external or internal changes which are significant to the Group's operations. Such changes are evident to external parties. A change in the business model occurs when the Group either begins or ceases to perform an activity that is significant to its operations.
If the Group reclassifies financial assets, it applies the reclassification prospectively from the reclassification date which is the first day of the immediately next reporting period following the change in business model. The Group does not restate any previously recognised gains, losses (including impairment gains or losses) or interest.

The following table shows various reclassification and how they are accounted for:

Original Classification	Revised Classification	Accounting Treatment
Amortized Cost	FVTPL	Fair value is measured at reclassification date. Difference between previous amortised cost and fair value is recognised in Consolidated statement of profit and loss.
FTVPL	Amortized Cost	Fair value at reclassification date becomes its new gross carrying amount.
Amortized Cost	FVOCI	Fair value is measured at reclassification date. Difference between previous amortised cost and fair value is recognised in other comprehensive income.

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		No Change in EIR due to reclassification.
FVOCI	Amortized Cost	Fair value at reclassification date becomes its new gross carrying amount. However cumulative gain or loss in other comprehensive income is adjusted against Fair value. Consequently, the asset is measured as if it had always been measured at amortised cost.
FTVPL	FVOCI	Fair value at reclassification date becomes its new carrying amount. No other adjustment is required.
FVOCI	FTVPL	Assets continue to be measured fair value. Cumulative gain or loss previously recognized in other comprehensive income is reclassified to Consolidated statement of profit and loss at the reclassification date.

Derecognition
A financial asset (or, where applicable, a part of a financial asset or part of Group's similar financial assets) is primarily derecognised (i.e. removed from the Consolidated Balance Sheet) when:

- The rights to receive cash flows from the asset have expired, or
- The group has transferred its rights to receive cash flows from the asset or has assumed an obligation to pay the received cash flows in full without material delay to a third party under a 'pass-through' arrangement; and either (a) the group has transferred substantially all the risks and rewards of the asset, or (b) the group has neither transferred nor retained substantially all the risks and rewards of the asset, but has transferred control of the asset.

When the Group has transferred its rights to receive cash flows from an asset or has entered into a pass-through arrangement, it evaluates if and to what extent it has retained the risks and rewards of ownership. When it has neither transferred nor retained substantially all of the risks and rewards of the asset, nor transferred control of the asset, the group continues to recognise the transferred asset to the extent of the group's continuing involvement. In that case, the group also recognises an associated liability. The transferred asset and the associated liability are measured on a basis that reflects the rights and obligations that the group has retained.
Continuing involvement that takes the form of a guarantee over the transferred asset is measured at the lower of the original carrying amount of the asset and the maximum amount of consideration that the group could be required to repay.

Financial liabilities

Initial recognition and measurement

Financial liabilities are classified, at initial recognition, as financial liabilities at fair value through profit or loss, loans and borrowings, payables, as appropriate.
All financial liabilities are recognised initially at fair value and, in the case of loans and borrowings and payables, net of directly attributable transaction costs.
The Group's financial liabilities include trade and other payables, loans and borrowings etc.

Subsequent measurement
Financial liabilities designated upon initial recognition at fair value through profit or loss are designated as such at the initial date of recognition, and only if the criteria in Ind AS 109 are satisfied. For liabilities designated as FVTPL, fair value gains/ losses attributable to changes in own credit risk are recognized in OCI. These gains/losses are not subsequently transferred to Consolidated statement of profit and loss. However, the Group may transfer the cumulative gain or loss within equity. All other changes in fair value of such liability are recognised in the Consolidated statement of profit and loss. The Group has not designated any financial liability as at fair value through profit and loss.

Loans and borrowings
This is the category most relevant to the Group. After initial recognition, interest-bearing loans and borrowings are subsequently measured at amortised cost using the EIR method. Gains and losses are recognised in Statement of Profit or Loss when the liabilities are derecognised as well as through the EIR amortisation process. Amortised cost is calculated by taking into account any discount or premium on acquisition and fees or costs that are an integral part of the EIR. The EIR amortisation is included as finance costs in the Consolidated Statement of Profit and Loss.
This category generally applies to borrowings and security deposits received.

Derecognition
A financial liability is derecognised when the obligation under the liability is discharged or cancelled or expires. When an existing financial liability is replaced by another from the same lender on substantially different terms, or the terms of an existing liability are substantially modified, such an exchange or modification is treated as the derecognition of the original liability and the recognition of a new liability. The difference in the respective carrying amounts is recognised in the statement of profit or loss.





Offsetting financial instrument

Financial assets and liabilities are offset and the net amount is reported in the Consolidated Balance Sheet where there is a legally enforceable right to offset the recognised amounts and there is an intention to settle financial asset and liability on a net basis or realise the asset and settle the liability simultaneously. The legally enforceable right must not be contingent on future events and must be enforceable in the normal course of business and in the event of default, insolvency or bankruptcy of the Company or the counterparty.

2.12 Fair Value measurement

The Group measures financial instruments at fair value at each financial statement date.
Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The fair value measurement is based on the presumption that the transaction to sell the asset or transfer the liability takes place either:
i) In the principal market for the asset or liability, or
ii) In the absence of a principal market, in the most advantageous market for the asset or liability

The principal or the most advantageous market must be accessible by the Group.

The fair value of an asset or a liability is measured using the assumptions that market participants would use when pricing the asset or liability, assuming that market participants act in their economic best interest.

A fair value measurement of a non-financial asset takes into account a market participant's ability to generate economic benefits by using the asset in its highest and best use or by selling it to another market participant that would use the asset in its highest and best use.

The Group uses valuation techniques that are appropriate in the circumstances and for which sufficient data are available to measure fair value, maximising the use of relevant observable inputs and minimising the use of unobservable inputs.

All assets and liabilities for which fair value is measured or disclosed in the financial statements are categorised within the fair value hierarchy, described as follows, based on the lowest level input that is significant to the fair value measurement as a whole:
Level 1 — Quoted prices (unadjusted) in active markets for identical assets or liabilities
Level 2 — Inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly (i.e. as prices) or indirectly (i.e. derived from prices)
Level 3 — Inputs for the assets or liabilities that are not based on observable market data (unobservable inputs).

For assets and liabilities that are recognised in the financial statements on a recurring basis, the Group determines whether transfers have occurred between levels in the hierarchy by re-assessing categorisation (based on the lowest level input that is significant to the fair value measurement as a whole) at the end of each reporting period.

The Group determines the policies and procedures for both recurring fair value measurement, such as derivative instruments and unquoted financial assets measured at fair value, and for non-recurring measurement, such as assets held for distribution in discontinued operations.

At each reporting date, the Group analyses the movements in the values of assets and liabilities which are required to be remeasured or re-assessed as per the Group's accounting policies. For this analysis, the Group verifies the major inputs applied in the latest valuation by agreeing the information in the valuation computation to contracts and other relevant documents.

The Group also compares the change in the fair value of each asset and liability with relevant external sources to determine whether the change is reasonable.
On an annual basis, the Board of Directors of the Investment Manager presents the valuation results to the Audit Committee and the Group's independent auditors. This includes a discussion of the major assumptions used in the valuations. For the purpose of fair value disclosures, the Group has determined classes of assets and liabilities on the basis of the nature, characteristics and risks of the asset or liability and the level of the fair value hierarchy as explained above. This note summarises accounting policy for fair value. Other fair value related disclosures are given in the relevant notes.

2.13 Cash and Cash Equivalents

Cash and cash equivalents in the Consolidated Balance Sheet comprise cash at banks and on hand and short-term deposits with an original maturity of three months or less, which are subject to an insignificant risk of changes in value.
For the purpose of the Consolidated statement of cash flows, cash and cash equivalents consist of cash and short-term deposits, as defined above, net of outstanding bank overdrafts as they are considered an integral part of the Group's cash management.





2.14 Impairment of Assets

Impairment of Financial Assets

All financial assets except for those designated at FVTPL are subject to review for impairment at least each reporting date to identify whether there is any objective evidence that a financial asset or group of financial assets is impaired. In accordance with Ind AS 109, the group applies expected credit loss (ECL) model for measurement and recognition of impairment loss for financial assets carried at amortized cost.

For recognition of impairment loss on other financial assets and risk exposure, the group determines that whether there has been a significant increase in the credit risk since initial recognition. If credit risk has not increased significantly, 12-month ECL is used to provide for impairment loss. However, if credit risk has increased significantly, lifetime ECL is used. If, in a subsequent period, credit quality of the instrument improves such that there is no longer a significant increase in credit risk since initial recognition, then the entity reverts to recognising impairment loss allowance based on 12-month ECL.

Lifetime ECL are the expected credit losses resulting from all possible default events over the expected life of a financial instrument. The 12-month ECL is a portion of the lifetime ECL which results from default events that are possible within 12 months after the reporting date.

ECL is the difference between all contractual cash flows that are due to the group in accordance with the contract and all the cash flows that the entity expects to receive (i.e., all cash shortfalls), discounted at the original EIR. When estimating the cash flows, an entity is required to consider:

- All contractual terms of the financial instrument (including prepayment, extension, call and similar options) over the expected life of the financial instrument. However, in rare cases when the expected life of the financial instrument cannot be estimated reliably, then the entity is required to use the remaining contractual term of the financial instrument
- Cash flows from the sale of collateral held or other credit enhancements that are integral to the contractual terms

ECL impairment loss allowance (or reversal) recognized during the year is recognized as income/ expense in the Consolidated Statement of Profit and Loss (P&L). This amount is reflected under the head 'other expenses' in the P&L.

Impairment of Non- Financial Assets

The Group assesses, at each reporting date, whether there is an indication that an asset may be impaired. If any indication exists, or when annual impairment testing for an asset is required, the Group estimates the asset's recoverable amount. An asset's recoverable amount is the higher of an asset's or cash-generating unit's (CGU) fair value less costs of disposal and its value in use. Recoverable amount is determined for an individual asset unless the asset does not generate cash inflows that are largely independent of those from other assets or Group's assets. When the carrying amount of an asset or CGU exceeds its recoverable amount, the asset is considered impaired and is written down to its recoverable amount. In assessing value in use, the estimated future cash flows are discounted to their present value using a pre—tax discount rate that reflects current market assessments of the time value of money and the risks specific to the asset. In determining net selling price, recent market transactions are taken into account, if available. If no such transactions can be identified, an appropriate valuation model is used. Impairment losses of continuing operations are recognized in the Consolidated statement of profit and loss, except for previously revalued tangible fixed assets, where the revaluation was taken to revaluation reserve. In this case, the impairment is also recognized in the revaluation reserve up to the amount of any previous revaluation. After impairment, depreciation is provided on the revised carrying amount of the asset over its remaining useful life.

An assessment is made at each reporting date as to whether there is any indication that previously recognized impairment losses may no longer exist or may have decreased. If such indication exists, the group estimates the asset's CGU's recoverable amount. A previously recognized impairment loss is reversed only if there has been a change in the assumptions used to determine the assets recoverable amount since the last impairment loss was recognized. The reversal is limited so that the carrying amount of the asset does not exceed its recoverable amount, nor exceed the carrying amount that would have been determined, net of depreciation, had no impairment loss been recognized for the asset in prior years. Such reversal is recognized in the Consolidated statement of profit and Loss unless the asset is carried at a revalued amount, in which case the reversal is treated as a revaluation increase.

2.15 Foreign currency transactions

The Group's financial statements are presented in INR, which is group's functional currency.

Foreign currency transactions are recorded at the exchange rate prevailing on the date of the respective transactions between the functional currency and the foreign currency.

Monetary foreign currency assets and liabilities remaining unsettled at the Financial Statement date are translated at the rates of exchange prevailing on that date.

Gains / losses arising on account of realisation / settlement of foreign currency transactions and on translation of foreign currency assets and liabilities are recognized in the Consolidated Statement of Profit and Loss.

Exchange differences arising on the settlement of monetary items at rates different from those at which they were initially recorded during the year, or reported in previous financial statements, are recognized as income or as expenses in the year in which they arise.





Non - Monetary items which are carried in terms of historical cost denominated in a foreign currency are reported using the exchange rate at the date of the transaction; and Non - Monetary items which are carried at fair value or other similar valuation denominated in a foreign currency, are reported using the exchange rates that existed when the values were determined.

The gain or loss arising on translation of Non-Monetary items measured at fair value is treated in line with the recognition of the gain or loss on the change in Fair value of the item (i.e., translation differences on items whose fair value gain or loss is recognised in OCI or profit or loss are also recognised in OCI or profit or loss, respectively).

2.16 Taxes on income

Tax expense comprises of Current and Deferred tax.
Current income tax is measured at the amount expected to be paid to the tax authorities in accordance with the Income Tax Act, 1961.

Current income tax assets and liabilities are measured at the amount expected to be recovered from or paid to the taxation authorities. The tax rates and tax laws used to compute the amount are those that are enacted or substantively enacted, at the reporting date. The tax rates and tax laws used to compute the amount are those that are enacted or substantively enacted, at the reporting date.
Current income tax relating to items recognised outside profit or loss is recognised outside profit or loss (either in other comprehensive income or in equity).
Current tax items are recognised in correlation to the underlying transaction either in OCI or directly in equity.
Investment Manager periodically evaluates positions taken in the tax returns with respect to situations in which applicable tax regulations are subject to interpretation and establishes provisions where appropriate.

Deferred tax is provided using the liability method on temporary differences between the tax bases of assets and liabilities and their carrying amounts for financial reporting purposes at the reporting date.

Deferred tax assets and liabilities are measured at the tax rates that are expected to apply in the year when the asset is realised or the liability is settled, based on tax rates (and tax laws) that have been enacted or substantively enacted at the reporting date.

Deferred tax assets are recognised for all deductible temporary differences, the carry forward of unused tax credits and any unused tax losses. Deferred tax assets are recognised to the extent that it is probable that taxable profit will be available against which the deductible temporary differences, and the carry forward of unused tax credits and unused tax losses can be utilised. The carrying amount of deferred tax assets is reviewed at each reporting date and reduced to the extent that it is no longer probable that sufficient taxable profit will be available to allow all or part of the deferred tax asset to be utilised.

Deferred tax relating to items recognised outside profit or loss is recognised outside profit or loss (either in other comprehensive income or in equity).

Deferred tax assets and deferred tax liabilities are offset if a legally enforceable right exists to set off current tax assets against current tax liabilities and the deferred taxes relate to the same taxable entity and the same taxation authority.

2.17 Provisions, Contingent Liabilities, Contingent Assets and Capital Commitments

Contingent Liabilities
A contingent liability is a possible obligation that arises from past events whose existence will be confirmed by the occurrence or non–occurrence of one or more uncertain future events beyond the control of the Group or a present obligation that is not recognized because it is not probable that an outflow of resources will be required to settle the obligation. A contingent liability also arises in extremely rare cases where there is a liability that cannot be recognized because it cannot be measured reliably. Contingent Liabilities are reviewed at each reporting date. The Group does not recognize a contingent liability but discloses its existence in the financial statements, however discloses its existence in the financial statements in the notes to accounts.

Contingent Assets
Contingent assets usually arise from unplanned or other unexpected events that give rise to the possibility of an inflow of economic benefits to the entity.
Contingent assets are recognized when the realisation of income is virtually certain, in which case the related asset is not a contingent asset and its recognition is appropriate.
Contingent assets are reviewed at each reporting date. A contingent asset is disclosed where an inflow of economic benefits is probable.

Provisions
Provisions are recognised when the Group has a present obligation (legal or constructive) as a result of a past event, it is probable that an outflow of resources embodying economic benefits will be required to settle the obligation and a reliable estimate can be made of the amount of the obligation. When the Group expects some or all of a provision to be reimbursed, for example, under an insurance contract, the reimbursement is recognised as a separate asset, but only when the reimbursement is virtually certain. The expense relating to a provision is presented in the Consolidated statement of profit and loss net of any reimbursement.

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If the effect of the time value of money is material, provisions are discounted using a current pre-tax rate that reflects, when appropriate, the risks specific to the liability. When discounting is used, the increase in the provision due to the passage of time is recognised as a finance cost.

Commitments

Commitments are future liabilities for contractual expenditure, classified and disclosed as follows:

- estimated amount of contracts remaining to be executed on capital account and not provided for;
- funding related commitment to subsidiary companies; and
- other non-cancellable commitments, if any, to the extent they are considered material and relevant in the opinion of management.

Other commitments related to services to be rendered / procurements made in the normal course of business are not disclosed to avoid excessive details.

2.18 Consolidated Statement of Cash Flows

Consolidated Statement of Cash Flows is prepared segregating the cash flows into operating, investing and financing activities. Cash flow from operating activities is reported using indirect method adjusting the net profit for the effects of:

- changes during the period in operating receivables and payables, transactions of a non-cash nature;
- non-cash items such as depreciation, provisions, deferred taxes, unrealised foreign currency gains and losses;
- all other items for which the cash effects are investing or financing cash flows.

Cash and cash equivalents (including bank balances) shown in the Consolidated Statement of Cash Flows exclude items which are not available for general use as at the date of Consolidated Balance Sheet.

2.19 Assets held for sale

Non-current assets or disposal groups comprising of assets and liabilities are classified as 'held for sale' when all of the following criteria's are met: (i) decision has been made to sell. (ii) the assets are available for immediate sale in its present condition. (iii) the assets are being actively marketed and (iv) sale has been agreed or is expected to be concluded within 12 months of the Consolidated Balance Sheet date.
Subsequently, such non-current assets and disposal groups classified as held for sale are measured at the lower of its carrying value and fair value less costs to sell. Non-current assets held for sale are not depreciated or amortised.

2.20 Unit Capital

Units are classified as equity. Incremental costs attributable to the issue of units are directly recorded in Other Equity, net of tax.

2.21 Distribution to unit holders

The Group recognises a liability to make cash distributions to unit holders when the distribution is authorised and a legal obligation has been created. As per the SEBI InvIT Regulations, a distribution is authorised when it is approved by the Board of Directors of the Investment Manager. A corresponding amount is recognised directly in equity.

2.22 Earnings per Unit (EPU)

Basic EPU amounts are calculated by dividing the profit for the period attributable to unitholders by the weighted average number of units outstanding during the period.

Diluted EPU amounts are calculated by dividing the profit/(loss) attributable to unitholders by the weighted average number of units outstanding during the period plus the weighted average number of units that would be issued on conversion of all the dilutive potential units into unit capital.





35 Related Party Disclosures

A. List of additional related parties as per Regulation 2(1)(zv) of the SEBI InvIT Regulations

Parties to the Trust

- National Highways Infra Investment Managers Private Limited (NHIIMPL) - Investment Manager (IM) of the Trust
- IDBI Trusteeship Services Limited (ITSL) - Trustee of the Trust
- National Highways Authority of India (NHAI)- Sponsor
- National Highways InvIT Project Managers Private Limited (NHIPMPL)- Project Manager

Promoters of the Parties to the Trust specified above

- President of India - Promoter of NHIIMPL
- IDBI Bank Limited (IDBI Bank) - Promoter of ITSL
- President of India - Promoter of NHAI
- National Highways Authority of India (NHAI)- Promoter of NHIPMPL

Directors of the parties to the Trust specified above

- **Directors of NHIIMPL**

  Mr. Suresh Krishan Goyal
  Mr. Vivek Rae
  Mr. Shailendra Narain Roy
  Mr. Balasubramanyam Sriram
  Mr. Mahavir Parsad Sharma
  Mr. Pradeep Singh Kharola
  Mr. Amit Kumar Ghosh
  Mrs. Kavita Saha
  Mr. Bruce Ross Crane
  Mr. N.R.V.V.M.K. Rajendra Kumar

- **Directors of ITSL**

  Mr. Padma Vinod Betai
  Mr. Samuel Joseph Jebaraj
  Ms. Madhuri Jayant Kulkarni
  Mr. Pradeep Kumar Jain
  Ms. Jayashree Ranade

- **Directors of NHIPMPL**

  Mr. Ashish Asati
  Mr. Muralidhara Rao Bugatha

B. Transactions with Related Parties during the period

(Amounts in ₹ lakh)

Name of Entity	Particulars	For the period ended March 31, 2022	For the period ended March 31, 2021
Parties to the Trust as per Regulation 2(1)(zv) of the SEBI InvIT Regulations			
National Highways Infra Investment Managers Private Limited (NHIIMPL)	Payment of Investment Manager Fee	1,931.71	-
	Reimbursement of Pre-Issue expenses of NHIT by NHIIMPL	214.80	-
National Highways Authority of India (NHAI)	Reimbursement of Pre-Issue expenses of NHIT by NHAI	578.02	67.03

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	Purchase of equity shares of Project SPV (NHIPPL) by the Trust from NHAI	10,153.52	-
	Issue of units of Trust to NHAI	96,556.00	-
IDBI Trusteeship Services Limited (ITSL)	Payment of Trustee Fee	12.15	-
	Initial Settlement Amount	-	0.10

C. Closing Balance with Related Parties

(Amounts in ₹ lakh)

Name of Entity	Particulars	As on March 31, 2022	As on March 31, 2021
Parties to the Trust as per Regulation 2(1)(zv) of the SEBI InvIT Regulations			
National Highways Authority of India (NHAI)	Issue of units of Trust to NHAI (9,56,00,000 units)	96,556.00	-
IDBI Trusteeship Services Limited	Initial Settlement Amount	0.10	0.10
	Other Payables	2.77	-

36 Capital Management

For the purpose of the Group's capital management, capital includes issued unit capital and all other reserves attributable to the unit holders of the Group.

The primary objective of the Group's capital management is to ensure that it maintains a strong credit rating and healthy capital ratios in order to support its business and maximise unit holder value.

The Group manages its capital structure and makes adjustments to it in light of changes in economic conditions and the requirements of the financial covenants. To maintain or adjust the capital structure, the Group may adjust the dividend payment / income distribution to unit holders (subject to the provisions of SEBI InvIT Regulations which require distribution of at least 90%of the net distributable cash flows of the Group to unit holders), return capital to unit holders or issue new units. The Group monitors capital using a gearing ratio, which is net debt divided by total capital plus net debt. The Group's policy is to keep the gearing ratio optimum.

(Amounts in ₹ lakh)

Particulars	As at March 31, 2022	As at March 31, 2021
Net Debt Components:		
Long Term Borrowings (Non-Current portion)	145,556.94	-
Current Maturities of Long-Term Borrowings	980.86	-
Less: Cash and Cash Equivalents	(5,389.79)	-
Less: Bank Balances other than cash and cash equivalents	(3,170.81)	-
Less: Current Investments	(992.16)	-
Net Debt (i)	**1,36,985.04**	-
Capital Components:		
Unit Capital	6,01,152.00	-
Initial Settlement Amount	0.10	-
Other Equity	5,059.25	-
Total Capital (ii)	**6,06,211.35**	-
Capital and Debt [(iii) = (i) + (ii)]	**7,46,363.55**	-
Gearing Ratio (i)/(iii)	**18.35%**	-

In order to achieve this overall objective, the Board of Directors of Investment Manager, amongst other things, aims to ensure that it meets financial covenants attached to the interest-bearing loans and borrowings that define capital structure requirements. Breaches in meeting the financial covenants would permit the lenders to call loans and borrowings. There have been no breaches in the financial covenants of any interest-bearing loans and borrowing in the current period.

No changes were made in the objectives, policies or processes for managing capital during the years ended March 31, 2022 and March 31, 2021.

37 Financial Risk Management Objectives and Policies

The Group is in the process of formulation of its risk management policies with an objective of identification and analysis of risks faced by the Group, to set appropriate risk limits and controls, and to monitor risks and adherence to limits. Risk management policies shall be reviewed regularly to reflect changes in market conditions and the Group's activities.

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The Board of Directors of Investment Manager has overall responsibility for the establishment and oversight of the Group's risk management framework.
In performing its operating, investing and financing activities, the Group is exposed to the Credit risk, Liquidity risk and Market risk.

Market Risk
Market risk is the risk that the fair value of future cash flows of a financial instrument will fluctuate because of changes in market prices. Market risk comprises three types of risk: interest rate risk, currency risk and other price risk. Financial instruments affected by market risk include loans and borrowings, Receivable and Payables and Investments measured at FVTPL.
The sensitivity analyses in the following sections relate to the position as at March 31, 2022 and March 31, 2021.
The sensitivity analyses have been prepared on the basis that the amount of net debt, the ratio of fixed to floating interest rates of the debt are all constant.

The following assumptions have been made in calculating the sensitivity analyses:
The sensitivity of the relevant profit or loss item is the effect of the assumed changes in respective market risks. This is based on the financial assets and financial liabilities held at March 31, 2022 & March 31, 2021.

Foreign Currency Risk
Foreign currency risk is the risk that the fair value or future cash flows of an exposure will fluctuate because of changes in foreign exchange rates. The Group transacts business primarily in Indian Rupees only, and hence, the sensitivity of profit and loss of the Group to a possible change in foreign exchange rates is non-existent as on 31st March, 2022.

Interest Rate Risk
Interest rate risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market interest rates. Exposure to risk of changes in market interest rates generally relates primarily to long-term debt obligations with floating interest rates.

The following table provides a break-up of the Company's fixed and floating rate borrowings:

(Amounts in ₹ lakh)

Particulars	As at March 31, 2022	As at March 31, 2021
Floating Rate Borrowings	1,46,537.80	-

The Group's exposure to interest rate risk due to variable interest rate borrowings is as follows:

(Amounts in ₹ lakh)

Particulars	As at March 31, 2022	As at March 31, 2021
Term Loan from Bank	11,201.41	-

Sensitivity analysis based on average outstanding Debt:

(Amounts in ₹ lakh)

Particulars	As at March 31, 2022	As at March 31, 2021
Increase or decrease in interest rate by 25 basis points	388.94	-

Price Risk

Price risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market prices (other than those arising from interest rate risk or currency risk).
The Group is exposed to price risk due to investments in mutual funds and classified as fair value through profit and loss. The Group measures risk through sensitivity analysis.
The Group's risk management policy is to mitigate the risk by investments in mutual funds. The Group has investment in mutual funds amounting Rs 992.16 Lakh as at March 31, 2022 (March 31, 2021: Rs. Nil) and accordingly is expose to price risk.

Sensitivity analysis:

(Amounts in ₹ lakh)

Particulars	Impact on profit / (loss) before tax	
	As at March 31, 2022	As at March 31, 2021
Increase or decrease in NAV by 2%	19.84	-

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Credit risk

Credit risk is the risk that counterparty will not meet its obligations under a financial instrument or customer contract, leading to a financial loss. With respect to credit risk arising from other financial assets of the Group, which comprise Balances with banks, Trade Receivables, Loans and Advances and Investments. The Group's exposure to credit risk arises from default of the counterparty, with maximum exposure equal to the carrying amount of these instrument.

The carrying value of financial assets represents the maximum credit risk. The maximum exposure to credit risk was Rs. 10,158.59 Lakh and Rs. 0.10 Lakh as at March 31, 2022 and March 31, 2021 respectively, being the total carrying value of Loans and Advances, Trade receivables, Investments, Balances with bank, bank deposits and other financial assets.

Liquidity Risk

Liquidity risk is the risk that an entity will encounter difficulty in meeting obligations associated with financial liabilities that are settled by delivering cash or another financial assets.

The Group is exposed to liquidity risk due to bank borrowings and trade and other payables.

The Group measures risk by forecasting cash flows.

The Group's approach to managing liquidity is to ensure, as far as possible, that it will always have sufficient liquidity to meet its liabilities when due without incurring unacceptable losses or risking damage to the Group's reputation. The Group ensures that it has sufficient funds to meet expected operational expenses, servicing of financial obligations.

In addition, processes and policies related to such risk are overseen by senior management. Management monitors the Group's net liquidity position through rolling forecast on the basis of expected cash flows.

The table below summarises the maturity profile of the group's financial liabilities based on contractual undiscounted payments.

(Amounts in ₹ lakh)

As at 31-03-2022	Carrying Amount	<1 Yr.	1-3 Yrs.	>3 Yrs.
Borrowings	1,46,537.80	1000.00	8,000.00	1,37,537.80
Trade Payables	1,101.23	1,101.23	-	-
Other Financial Liabilities	241.41	241.41	-	-
Total	**1,47,880.44**	**2,342.64**	**8000.00**	**1,37,537.80**

As at 31-03-2021	Carrying Amount	<1 Yr.	1-3 Yrs.	>3 Yrs.
Borrowings	-	-	-	-
Trade Payables	-	-	-	-
Other Financial Liabilities	67.81	67.81	-	-
Total	**67.81**	**67.81**	-	-

38 Disclosure pursuant to IND AS 36 "Impairment of Assets"

Based on management review on expected future cash flows and economic conditions of the assets of the Group, no indicators of impairment of assets exist as on the reporting date. In case of Goodwill, the recoverable amount is higher than the carrying amount as on reporting date. Hence no provision for impairment has been recognised in the books as on the reporting date.

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39 Disclosure of Financial Instruments by Category

(Amounts in ₹ lakh)

Particulars	As at March 31, 2022			As at March 31, 2021		
	Amortized Cost	FTVPL		Amortized Cost	FTVPL	
		At Cost	At Fair Value		At Cost	At Fair Value
Assets:						
Cash and Cash Equivalents	5,389.78	-	-	-	-	-
Trade Receivables	600.47					
Other Financial Assets	3,176.18	-	-	-	-	-
Investments in Mutual Funds	-	-	992.16	-	-	-
Total	**9,166.43**	-	**992.16**	-	-	-
Liabilities:						
Borrowings	1,46,537.80	-	-	-	-	-
Trade Payables	1,101.23	-	-	-	-	-
Other Financial Liabilities	241.41	-	-	67.81	-	-
Total	**1,47,880.44**	-	-	**67.81**	-	-

Defaults and Breaches

There are no defaults during the year with respect to repayment of principal and payment of interest and no breaches of the terms and conditions of the borrowings.

There are no breaches during the year which permitted lender to demand accelerated payment.

40 Fair Values of Assets and Liabilities

The carrying amount of all financial assets and liabilities appearing in the financial statements is reasonable approximation of fair values. Fair value of the financial assets and liabilities is the amount at which the instrument could be exchanged in a current transaction between willing parties, other than in a forced or liquidation sale.

The Group is required to present the Statement of total assets at fair value and Statement of total returns at fair value as per SEBI Circular No. CIR/IMD/DF/114/2016 dated October 20, 2016 as a part of these financial statements - Refer Statement of Net assets at fair value and Statement of Total Returns at fair value.

41 Fair Value Hierarchy

All financial instruments for which fair value is recognised or disclosed are categorised within the fair value hierarchy described as follows, based on the lowest level input that is significant to the fair value measurement as a whole.

Level 1 - Quoted prices (unadjusted) in active markets for identical assets or liabilities.

Level 2 – Inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly (i.e. as prices) or indirectly (i.e. derived from prices).

Level 3 - Inputs for the assets or liabilities that are not based on observable market data (unobservable inputs).

Class wise composition and comparison of carrying amounts and fair values of financial assets and liabilities that are recognised in the financial statements along with Fair Value Hierarchy details are given below:

(Amounts in ₹ lakh)

Particulars	Fair Value Hierarchy Level	Carrying Value		Fair Value	
		As at March 31, 2022	As at March 31, 2021	As at March 31, 2022	As at March 31, 2021
Financial Assets at Amortized Cost:					
Cash and Cash Equivalents	Level 3	5,389.78	-	5,389.78	-
Trade Receivables	Level 3	600.47	-	600.47	-
Other Financial Assets	Level 3	3,176.18	-	3,176.18	-
Financial Assets at FVTPL:					-
Investments in Mutual Funds	Level 1	992.16	-	992.16	-





Total		**10,158.59**	**-**	**10,158.59**	**-**
Financial Liabilities at Amortized Cost:					
Borrowings	Level 3	1,46,537.80	-	1,46,537.80	-
Trade Payables	Level 3	1,101.23	-	1,101.23	-
Other Financial Liabilities	Level 3	241.41	67.81	241.41	67.81
Total		**1,47,880.44**	**67.81**	**1,47,880.44**	**67.81**

There are no transfers between level 1 and level 2 during the year.
The policy of the Group is to recognise transfers into and transfer out of fair values hierarchy levels as at the end of the reporting period.

Valuation technique and inputs used to determine fair value

Financial assets and liabilities	Valuation method	Inputs
Financial assets		
Investment in Mutual Funds	Market Approach	NAV
Investments in equity shares of subsidiaries	Income	Cash Flow
Loans	Income	Effective Rate of Interest
Financial liabilities		
Term loans from Bank	Income	Effective Rate of Borrowings
Non-Convertible Debentures	Income	Effective Rate of Borrowings

42 Disclosure of segment information pursuant to IND AS 108 "Operating Segments"

The activities of the Group mainly include investing in infrastructure assets primarily in the SPVs operating in the road sector to generate cash flows for distribution to unit holders. Based on the guiding principles given in Ind AS - 108 "Operating Segments", this activity falls within a single operating segment. Further, the entire operations of the Group are only in India and hence, disclosure of secondary / geographical segment information does not arise. Accordingly, requirement of providing disclosures under Ind AS 108 does not arise.

43 Details of dues To Micro and Small Enterprises as per MSMED Act, 2006

There are no Micro and Small Enterprises as defined in the Micro and Small Enterprises Development Act, 2006 to whom the Group owes dues on account of principal amount together with interest and accordingly no additional disclosures have been made. The above information regarding Micro and Small Enterprises has been determined to the extent such parties has been identified on the basis of information available with the Group.

44 Disclosure pursuant to IND AS 19 "Employee Benefits"

Defined contribution plan:
Contributions to Provident Fund scheme and the Employee Deposit Linked Insurance scheme of the government of India, as a specified percentage of monthly payroll costs comprise the only obligations of the Group with respect to defined contribution plans for the employees.
An amount of Rs. 0.13 Lakh for the reporting period (March 31, 2021: Rs. Nil), being contribution made to these funds is recognised as expense under Employee Benefit expense (Note 26) in the Consolidated Statement of Profit and Loss.

Defined Benefit Plan:

Gratuity:
The benefit is governed by Payment of Gratuity Act, 1972, and is calculated as follows:

Components	Particulars
Benefits offered	15/ 26 × Salary × Duration of Service
Salary Definition	Basic Salary including Dearness Allowance (if any)
Vesting Conditions	5 years of continuous service (Not applicable in case of death/disability)
Benefit Eligibility	Upon Death or Resignation / Withdrawal or Retirement
Retirement Age	58 years

45 Disclosure pursuant to IND AS 23 "Borrowing Costs"

Borrowing cost capitalised during the year Rs. Nil [March 31, 2021: Rs. Nil]

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46 Details of Project Management Fees and Investment Management Fees

Details of fees paid to project manager and investment manager as required pursuant to SEBI Circular No. CIR/MD/DF/127/2016, dated November 29, 2016 are as under:

Project Management Fees

The Project Manager (NHIPMPL) for managing the initial portfolio of assets is entitled to a Project Management fee which is a percentage of the gross revenue earned by the project SPV (NHIPPL). The same is based on the Project Implementation and Management Agreement (PIMA) signed by both the parties dated 30th March, 2021.

The project SPV (NHIPPL) proposed a fees of Rs. 70.00 Lakh (Rupees Seventy Lakh Only) per month, as project manager's fees against the services offered by the project manager, for a period of 18 months starting from the date of the Concession agreement. The Project Manager's fees for the period after the expiry of 18 months shall be a percentage of gross revenue earned by the project SPV (NHIPPL), which is mutually agreed between the parties in the PIMA.

Investment Management Fees

i) The investment manager's fee will initially be Rs. 1,100 Lakh (Rupees Eleven Hundred Lakh) per annum, exclusive of applicable taxes as per agreement dated 21st October, 2020.

ii) The investment manager's fee set out in above shall be subject to escalation on an annual basis at the rate of 10% of the management fee for the previous year.

iii) Any applicable taxes, cess or charges shall be in addition to the investment manager's fee and shall be payable by National Highways Infra Trust (NHIT) to the Investment Manager (NHIIMPL).

iv) The payment of investment manager's fee shall be made by National Highways Infra Trust (NHIT) to the investment manager (NHIIMPL) in advance on a quarterly basis.

47 Significant accounting judgements, estimates and assumptions

The preparation of the Group's financial statements requires management to make judgements, estimates and assumptions that affect the reported amounts of revenues, expenses, assets and liabilities, and the accompanying disclosures, and the disclosure of contingent liabilities. Uncertainty about these assumptions and estimates could result in outcomes that require a material adjustment to the carrying amount of assets or liabilities affected in future periods.

Judgements

In the process of applying the Group's accounting policies, management has made the following judgments, apart from those involving estimations, which have the most significant effect on the amounts recognised in the financial statements:

Classification of unit holders Funds

Under the provisions of the SEBI InvIT Regulations, the Group is required to distribute to its Unit holders not less than ninety percent of the net distributable cash flows of the Group for each financial year. Accordingly, a portion of the unit holders' funds contain a contractual obligation of the Group to pay to its Unit holders cash distributions.
The Unit holder's funds could therefore have been classified as compound financial instrument which contain both equity and debt components in accordance with Ind AS 32 'Financial Instruments: Presentation'. However, in accordance with SEBI Circulars (Circular no. CIR/IMD/DF/114/2016 dated October 20, 2016 and No. CIR/IMD/ DF/127/2016 dated November 29, 2016) issued under the SEBI InvIT Regulations, the unit holders' funds have been classified as equity in order to comply with the mandatory requirements of Section H of Annexure A to
the SEBI Circular dated October 20, 2016 dealing with the minimum disclosures for key financial statements. In line with the above, the income distribution payable to unit holders is recognized as liability when the same is approved by Board of Directors of the Investment Manager.

Fair valuation and disclosures

SEBI Circulars issued under the SEBI InvIT Regulations requires disclosures relating to net assets at fair value and total returns at fair value. In estimating the fair value of investments in subsidiaries (which constitute substantial portion of the net assets), the Group engages independent qualified external valuers to perform the valuation. The Investment Manager works closely with the valuers to establish the appropriate valuation techniques and inputs to the model. The valuation report and findings are discussed at the meeting of the Board of Directors on yearly basis to understand the changes in the fair value of the subsidiaries. The inputs to the valuation models are taken from observable markets, where possible, but where this is not feasible, a degree of judgement is required in establishing fair values. Judgements include considerations of inputs such as weighted average cost of capital, tax rates, inflation rates, etc. Changes in assumptions about these factors could affect the fair value.





Taxes

In accordance with section 10 (23FC) of the Income Tax Act, 1961, the income of business groups in the form of interest received or receivable from subsidiaries is exempt from tax. Accordingly, the Group is not required to provide any current tax liability. Further, deferred tax asset on carry forward losses is not created since there is no reasonable certainty of reversal of the same in the near future.

Major Maintenance Expenses / Resurfacing Expenses

As per industry practice, the company is required to carry out resurfacing of the roads under the Concession. For this purpose, a regular maintenance along with periodic maintenances is required to be performed. Normally, periodic maintenance includes resurface of pavements, repairs of structures and other equipment and maintenance of service roads. The maintenance cost / bituminous overlay may vary based on the actual usage during maintenance period. Accordingly, on the grounds of matching cost concept and based on technical estimates, a provision for major maintenance expenses is reviewed and is provided for in the accounts annually.

Expected Credit Loss on financial assets

As per Ind AS 109, Financial Assets that are measured at amortised cost are required to compute the Expected Credit Loss (ECL). As at the reporting period, Investment manager of the Group assessed the credit risk of the financial assets and concluded that no provision for ECL is required.

48 Contingent Liabilities

The Project SPV company (NHIPPL) has issued a Corporate Guarantee amounting to Rs. 2,000 Crore on 14.03.2022 in favour of lenders of the Trust as part of debt covenants of the loan received from the Trust, to secure the term loan of Rs. 2,000 Crore availed by the Trust from external lenders. The Corporate Guarantee is valid till the external loans to the Trust are satisfied.

49 Subsequent Events

On May 23, 2022, the Board of Directors of the Investment Manager approved distribution of Rs. 0.79 per unit (Return on capital of Rs. 0.71 per unit, return of capital of Rs. Nil per unit, Dividend of Rs. Nil per unit and other income on surplus funds at Group of Rs. 0.08 per unit) for the period October 01, 2021 to March 31, 2022 to be paid on or before 15 days from the date of declaration.

50 Capital and Other Commitments

There are no capital and other commitments as at March 31, 2022 (March 31, 2021: Rs. Nil)

51 Distributions Made

(Amounts in ₹ lakh)

Particulars	FY 2021-22	FY 2020-21
Interest (Return on capital)	4,198.27	-
Return of capital	-	-
Dividend	-	-
Other income on surplus fund at Group	503.81	-
Total	**4,702.08**	-

52 Reconciliation of Financing Activities in Cash Flow Statement

Net Debt Recognition

(Amounts in ₹ lakh)

Particulars	31st March, 2022 (Long Term Borrowing)	31st March, 2021 (Long Term Borrowing)
Carrying amount of debt at the beginning of the year/period	-	-
Additional borrowings during the year/period	1,48,000.00	-
Repayments during the year/period	(1,001.59)	-
Other adjustments/settlements during the year/period	-	-
- Impact in equity	-	-
- Transaction Costs	(472.00)	-
- Unwinding of interest	11.39	
Carrying amount of debt at the end of the year/period	**1,46,537.80**	-

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53 **Additional Regulatory Information**

Financial Ratios as on March 21, 2022

S. No.	Particulars	As on March 31, 2022	As on March 31, 2021
1	Current Asset ratio (Current Assets /Current Liability)	2.69	-
2	Debt- Equity ratio (Debt/ Equity)	0.24	-
3	Debt service coverage ratio (Net Operating Cash flow/ Debt Service Obligation)	2.58	-
4	ROE ratio (Net Profit/ Equity)	1.13%	-
5	Inventory turnover ratio	-	-
6	Trade receivable turnover ratio	-	-
7	Trade payable turnover ratio	-	-
8	Net Capital turnover ratio (Total Income / Net Working Capital)	3.25	-
9	Net profit ratio (Net profit / Total Income)	45.65%	-
10	Return on capital employed ratio ((Net Profit plus Finance Cost)/ (Equity + Debt))	1.35%	-
11	Return on investment (Income on Investment / Average Cost of Investment)	15.69%	-

54 **Disclosure pursuant to IND AS 33 "Earnings per Unit"**

Basic and Diluted Earnings per Unit (EPU) computed in accordance with Ind AS 33 "Earnings per Share":

(Amounts in ₹ lakh)

Particulars	FY 2021-22	FY 2020-21
Basic and Diluted		
Profit attributable to unit holders of the Fund (A)	6,836.33	-
Weighted average number of units (B)	5,952.00	-
Earnings Per Unit (In Rs.) (A/B)	**1.15**	-
Face value per Unit (In Rs.)	**101**	-

55 **Key sources of estimation**

The preparation of financial statements in conformity with Ind AS requires the Group makes estimates and assumptions that affect the reported amounts of income and expenses of the period, the reported balances of assets and liabilities and the disclosures relating to contingent liabilities as of the date of the financial statements. The estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates include allowance for doubtful loans /other receivables, fair value measurement etc. Difference, if any, between the actual results and estimates is recognised in the period in which the results are known.

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56 **Previous Year Figures**

Previous year's numbers have been regrouped / reclassified, wherever necessary to conform to current year's classification.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

CA Naresh Kumar Karn
Partner
M.No.077887
Date: 23.05.2022
Place: New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

A.R. & CO.
Chartered Accountants

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INDEPENDENT AUDITOR'S REPORT

To the Unit Holders of National Highways Infra Trust

Report on the Audit of the Consolidated Financial Statements

OPINION

We have audited the accompanying consolidated financial statements of National Highways Infra Trust (hereinafter referred to as "the InvIT" or "the Trust") and its one subsidiary (hereinafter referred to as "National Highways Infra Projects Private Limited" or "NHIPPL") (the Trust and its subsidiary together referred to as "the Group"), which comprising of the consolidated Balance Sheet as at 31 March 2023, the consolidated Statement of Profit and Loss (including Other Comprehensive Income), the consolidated Statement of Changes in Unitholder's Equity and the consolidated Statement of Cash Flows for the year then ended, the consolidated Statement of Net Assets at fair value as at 31 March 2023, the consolidated Statement of Total Returns at fair value, the Statement of Net Distributable Cash Flows of the Trust and its subsidiary for the year then ended and notes to the consolidated financial statements including a summary of significant accounting policies and other explanatory information (hereinafter referred to as "the consolidated financial statements").

In our opinion and to the best of our information and according to the explanations given to us and based on the consideration of our report on financial statements of subsidiary and on the other financial information of the subsidiary, the aforesaid consolidated financial statements give the information required by the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014 as amended from time to time including any guidelines and circulars issued thereunder (together referred to as the "SEBI InvIT Regulations") in the manner so required and give a true and fair view in conformity with the Indian Accounting Standards as defined in Rule 2(1)(a) of the Companies (Indian Accounting Standards) Rules, 2015, as amended ("Ind AS") and other accounting principles generally accepted in India, to the extent not inconsistent with SEBI InvIT Regulations, of the consolidated state of affairs of the Group as at 31 March 2023, its consolidated profit including other comprehensive income, its consolidated cash flows, its consolidated statement of changes in Unitholders' equity for the year ended 31 March 2023, its consolidated net assets at fair value as at 31 March 2023, its consolidated total returns at fair value of the Group and

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the net distributable cash flows of the Trust and its subsidiary for the year ended 31 March 2023.

BASIS FOR OPINION

We conducted our audit of the consolidated financial statements in accordance with the Standards on Auditing ("SAs") issued by the Institute of Chartered Accountants of India. Our responsibilities under those Standards are further described in the auditor's responsibilities for the audit of the consolidated financial statements section of our report. We are independent of the Group in accordance with the Code of Ethics issued by the Institute of Chartered Accountants of India together with the ethical requirements that are relevant to our audit of the consolidated financial statements under the provisions of the SEBI InvIT Regulations, and we have fulfilled our other ethical responsibilities in accordance with these requirements and the Code of Ethics. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion on the consolidated financial statements.

KEY AUDIT MATTERS

Key audit matters are those matters that, in our professional judgment, were of most significance in our audit of the consolidated financial statements for the financial year ended 31 March 2023. These matters were addressed in the context of our audit of the consolidated financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on these matters. We have determined the matters described below to be the key audit matters to be communicated in our report.

Sr. No.	Key Audit Matter	Auditor's Response
1.	**Assessment of Impairment of Intangible Assets in form of Toll Collection Rights** The Group operates toll assets which is constructed on Toll, Operate and Transfer (TOT) basis. The carrying value of the toll collection rights as at March 31, 2023 is Rs. 10,01,398.18 Lakhs. In accordance with its accounting policy and requirements under Ind AS 36 "Impairment of Assets", the Management has performed an impairment assessment by comparing the carrying value of the toll collection rights to their recoverable amount. For impairment testing, value in use has been determined by forecasting and discounting future cash flows. Further, the value in use is highly sensitive to changes in critical variable used for forecasting the	Our Audit Procedures included the following :- • Verified the appropriateness of the Group's accounting policy on impairment of Intangible Assets and Valuation Methodology applied in determining the recoverable amount. • Checked the Impairment Sheet provided by the Management. • Obtained the Management Representation on the assumptions around the key drivers of the revenue

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	future cash flows including traffic projections and discounting rates. The determination of the recoverable amount of the toll collection right involves significant estimates and judgments and accordingly, the evaluation of impairment of toll collection rights has been determined as a key audit matter. (Refer Note No. 2.7 for accounting policy relating to Intangible Assets and Note No. 42 and 49 of Consolidated Financial Statements for the year ended 31.03.2023)	projections, future cash flow, discount rates / weighted average cost of capital that were used by them. • Tested the arithmetical accuracy of the Impairment sheet.
2.	**Assessment of Impairment of Goodwill on Consolidation** Goodwill on consolidation is tested for impairment as per Ind AS 36 on an annual basis by the Group using enterprise value of respective subsidiary company to which the goodwill relates to. Enterprise value calculation involves use of future cashflow projections, discounted to present value, terminal value and other variables. These use of management projections and estimates results in inherent risk of error with respect to the valuation of Goodwill and accuracy of impairment loss, if any. Goodwill amounting to Rs. 10,144.46 Lakhs as on March 31, 2023 (March 31, 2022: 10,144.46 Lakhs) arising out of business combination as per Ind AS 103 has been tested for impairment by the management. (Refer Note No. 2.3 for accounting policy relating to Goodwill on Consolidation, Note No. 42 and 49 of Consolidated Financial Statements for the year ended 31.03.2023) Therefore, Impairment of Goodwill has been considered as a Key Audit Matter.	Our Audit Procedures included the following :- • Verified the appropriateness of the Group's accounting policy on impairment of Goodwill and Valuation Methodology applied in determining the enterprise value. • Checked the Impairment Sheet provided by the Management. • Obtained the Management Representation on the assumptions around the key drivers of the revenue projections, future cash flow, discount rates / weighted average cost of capital that were used by them. • Tested the arithmetical accuracy of the Impairment sheet.
3.	**Provisioning of Major Maintenance/Periodic Maintenance/resurfacing expenses (Refer Note No. 16 and 61 of the Consolidated Financial Statements)** As per Concession Agreement, the Group is obligated to perform regular maintenance	Our Audit Procedures included the following :- • Understood the Group's Process associated with the estimation of resurfacing obligation.



	along with periodic maintenance of road assets during the entire concession period. The Periodic maintenance includes resurface of pavements, repairs of structures and other equipment and maintenance of service roads. The Group has estimated the provision required towards major maintenance in accordance with Ind AS 37 "Provisions, Contingent Liabilities and Contingent Assets". The Provision made by the Group over the Concession involves detailed Calculation and Judgement and accordingly, the major maintenance expense is considered to be the Key audit Matter.	• Verified the requirement under Concession agreement and Group's accounting policy. • Tested the assumption used in determining the major maintenance provision. • Tested the arithmetical accuracy and also verified the disclosure in the Consolidated Financial Statements.
4.	**Computation and disclosures as prescribed in the SEBI InvIT regulations relating to Consolidated Statement of Net Assets at Fair Value and Consolidated Total Returns at Fair Value** As per SEBI InvIT regulations, the Trust is required to disclose statement of net assets at fair value and statement of total returns at fair value. The fair value is determined by forecasting and discounting future cash flows from the operations of the investee entities which involves management estimates and judgements. These estimates and judgements include discounting rates, Tax rates and inflation rates which are considered for computing the fair value. There is an inherent risk in the computation of fair value due to the use of estimates and judgements mentioned above. Therefore, computation and disclosures of Consolidated statement of net assets at fair value and Consolidated statement of total returns at fair value is considered as a Key Audit Matter. Refer Note-49 Significant Accounting Assumptions – Fair Value and Disclosures and Statement of net assets at fair value and Statement of total returns at fair value in the Consolidated financial statements.	Our Audit Procedures included the following :- • Obtained the understanding of the requirements of SEBI InvIT regulations for disclosures relating to Consolidated Statement of Net Assets at Fair Value and Consolidated Statement of Total Returns at Fair Value. • Assessed the Valuation Report issued by the Independent Valuer engaged by the management. Also assessed the appropriateness of the Trust's valuation methodology applied in determining the fair values. • Obtained Management representation in this respect. • Tested the arithmetical accuracy of computation in the statement of net assets and total returns at fair value.



		• Ensured that disclosures is in compliance with SEBI InvIT regulations relating to the statement of net assets at fair value and the statement of total returns at fair value.

INFORMATION OTHER THAN THE CONSOLIDATED FINANCIAL STATEMENTS AND AUDITOR'S REPORT THEREON

The Board of Directors of the Investment Manager is responsible for the other information. The other information comprises the information included in the Management Discussion and Analysis, Report of Investment Manager including annexures to Investment Manager's Report and other information as required to be given by SEBI InvIT Regulations, but does not include the consolidated financial statements and our report thereon.

Our opinion on the consolidated financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.
In connection with our audit of the consolidated financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the consolidated financial statements or our knowledge obtained during the course of our audit or otherwise appears to be materially misstated.

If, based on the work we have performed on the other information that we obtained prior to the date of this auditor's report, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

RESPONSIBILITIES OF THE BOARD OF DIRECTORS OF INVESTMENT MANAGER FOR THE CONSOLIDATED FINANCIAL STATEMENTS

The Board of Directors of Investment Manager is responsible for the preparation of these consolidated financial statements that give a true and fair view of the consolidated Balance Sheet as at 31 March 2023, consolidated statement of Profit & Loss including other comprehensive income, consolidated cash flows and consolidated statement of changes in Unitholder's equity for the year ended 31 March 2023, the consolidated net assets at fair value as at 31 March 2023, the consolidated total returns at fair value of the Group and the net distributable cash flows of the Trust and its subsidiary for the year ended 31 March 2023 in accordance with the requirements of the SEBI InvIT Regulations, Indian Accounting Standards as defined in Rule 2(1) (a) of Companies (Indian Accounting Standards) Rules, 2015, as amended and other accounting principles generally accepted in India, to the extent not inconsistent with SEBI InvIT Regulations. The respective Board of Directors of the subsidiary company included in the Group are responsible for maintenance of adequate accounting records for safeguarding of the assets of the Group and for preventing and detecting frauds and other irregularities; selection and application of appropriate accounting policies;



making judgements and estimates that are reasonable and prudent; and design, implementation and maintenance of adequate internal financial controls for ensuring the accuracy and completeness of accounting records, relevant to the preparation and presentation of the consolidated financial statements that give a true and fair view and are free from material misstatement, whether due to fraud and error, which have been used for the purpose of preparation of the consolidated financial statements by the Board of Directors of Investment Manager, as aforesaid.

In preparing the consolidated financial statements, the Board of Directors of Investment Manager and respective Board of Directors of the company included in the Group are responsible for assessing the ability of the Group to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the respective Board of Directors either intends to liquidate the Group or to cease operations, or has no realistic alternative but to do so.

The Board of Directors of the Investment Manager and the respective Board of Directors of the subsidiary company included in the Group are also responsible for overseeing the financial reporting process of the Group.

AUDITOR'S RESPONSIBILITY FOR THE AUDIT OF THE CONSOLIDATED FINANCIAL STATEMENTS

Our objectives are to obtain reasonable assurance whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with SAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with SAs, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the consolidated financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Group's internal controls.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Board of Directors of the Investment Manager.



- Conclude on the appropriateness of the Board of Directors of Investment Manager use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the consolidated financial statements, including the disclosures, and whether the consolidated financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- Obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the Group of which we are the independent auditors, to express an opinion on the consolidated financial statements. We are responsible for the direction, supervision and performance of the audit of financial statements of such entities included in the consolidated financial statements of which we are the independent auditors. We remain solely responsible for our audit opinion.

Materiality is the magnitude of misstatements in the consolidated financial statements that, individually or in aggregate, makes it probable that the economic decisions of a reasonably knowledgeable user of the financial statements may be influenced. We consider quantitative materiality and qualitative factors in (i) planning the scope of our audit work and in evaluating the results of our work; and (ii) to evaluate the effect of any identified misstatements in the financial statements.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

We also provide those charged with governance with a statement that we have complied with relevant ethical requirements regarding independence, and to communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, related safeguards.

From the matters communicated with those charged with governance, we determine those matters that were of most significance in the audit of the consolidated financial statements of the current period and are therefore the key audit matters. We describe these matters in our auditor's report unless law or regulation precludes public disclosure about the matter or when, in extremely rare circumstances, we determine that a matter should not be communicated in our report because the adverse consequences of doing so would reasonably be expected to outweigh the public interest benefits of such communication.



REPORT ON OTHER LEGAL AND REGULATORY REQUIREMENTS

Based on our audit and as required by SEBI InvIT Regulations, we report that:

a) We have sought and obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit of the aforesaid consolidated financial statements.

b) the consolidated Balance Sheet, the consolidated Statement of Profit and Loss, the consolidated Statement of Cash Flows, the consolidated Statement of Changes in Unitholders' Equity, the consolidated Statement of Net Assets at fair value, the consolidated Statement of Total Returns at fair value and the Statement of Net Distributable Cash Flows of the Trust and its subsidiary dealt with by this Report are in agreement with the books of account.

c) In our opinion, the aforesaid financial statements comply with the Indian Accounting Standards as defined in Rule 2(1)(a) of Companies (Indian Accounting Standards) Rules, 2015, as amended, to the extent not inconsistent with SEBI InvIT regulations.

For A. R. & Co.
Chartered Accountants
FRN. 002744C



CA Kailash Chand Gupta
Partner
Membership No: 085003
UDIN: 23085003BGWVFJ8283

Place: New Delhi
Date: 22.05.2023

NATIONAL HIGHWAYS INFRA TRUST

CONSOLIDATED BALANCE SHEET AS AT MARCH 31, 2023

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Note No.	As At March 31, 2023	As At March 31, 2022
ASSETS			
1) Non - Current Assets			
(a) Property, Plant and Equipment	3	125.17	0.46
(b) Goodwill	4	10,144.46	10,144.46
(c) Intangible assets	5	10,01,400.09	7,33,984.39
(d) Financial Assets			
(i) Other Financial Assets	6	9,672.44	3,170.81
(e) Deferred Tax Assets (net)	7	4,685.32	262.53
(f) Non -Current Tax Assets (Net)	8	12.06	-
Total non-current assets		**10,26,039.54**	**7,47,562.64**
2) Current Assets			
(a) Financial Assets			
(i) Trade receivables	9	350.87	600.47
(ii) Cash and Cash Equivalents	10	21,124.08	6,381.94
(iii) Other financial assets	11	297.36	5.38
(b) Other current assets	12	1,343.35	347.29
Total current assets		**23,115.66**	**7,335.07**
TOTAL ASSETS		**10,49,155.20**	**7,54,897.72**
EQUITY AND LIABILITIES			
EQUITY			
1) Unit Capital	13	7,41,604.32	5,99,442.82
2) Initial settlement amount		0.10	0.10
3) Other Equity	14	(2,469.86)	6,768.43
Total Equity		**7,39,134.56**	**6,06,211.35**
LIABILITIES			
1) Non-Current liabilities			
(a) Financial liabilities			
(i) Borrowings	15	2,92,158.33	1,45,556.94
(b) Provisions	16	6,318.81	403.37
Total non-current liabilities		**2,98,477.14**	**1,45,960.32**
2) Current liabilities			
(a) Financial liabilities			
(i) Borrowings	17	2,000.00	980.86
(ii) Trade Payables	18		
(a) Total Outstanding, dues of micro and small enterprises		137.23	-
(b) Total outstanding, dues of creditors other than micro and small enterprises		3,871.17	1,244.79
(iii) Other financial liabilities	19	5,284.95	97.85
(b) Other current liabilities	20	240.61	240.75
(c) Provisions	21	0.56	0.03
(d) Current Tax Liabilities (Net)	22	8.98	161.77
Total current liabilities		**11,543.50**	**2,726.06**
TOTAL EQUITY & LIABILITIES		**10,49,155.20**	**7,54,897.72**
Significant Accounting Policies	1 - 2		
The accompanying notes form an integral part of these consolidated financial statements.	3 - 64		

This is the Consolidated Balance Sheet referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

CA Kailash Chand Gupta
Partner
M.No.085003

Date : 22.05.2023
Place : New Delhi

For and on behalf Board of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

CONSOLIDATED STATEMENT OF PROFIT AND LOSS FOR THE YEAR ENDED MARCH 31, 2023

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Note No.	For the year ended March 31 2023	For the year ended March 31 2022
INCOME			
Revenue from Operations	23	68,717.20	13,960.55
Interest Income	24	373.43	5.86
Profit on sale of investments	25	671.17	690.00
Other Income	26	326.11	318.67
TOTAL INCOME		**70,087.91**	**14,975.08**
EXPENSES			
Investment Manger Fee		1,263.70	1,931.71
Trusteeship Fee		9.60	3.73
Valuation expenses		4.00	-
Annual listing fees		20.00	-
Rating fees		0.20	0.57
Insurance expenses		628.74	166.04
Custodian Fees		0.84	-
Project Management Fees		991.20	290.43
Operating Expenses	27	9,025.05	849.77
Employee Benefits Expenses	28	311.33	2.12
Finance Cost	29	16,621.32	3,154.43
Depreciation & Amortization Expense	30	17,560.63	1,055.65
Other Expenses	31	1,901.95	504.87
Audit Fees	32		
- Statutory audit fees		7.73	4.86
- Other audit services (including certification)		0.93	0.52
TOTAL EXPENSES		**48,347.23**	**7,964.71**
Profit / (Loss) before Tax		**21,740.68**	**7,010.37**
Tax Expenses	33		
Current Tax		473.89	436.36
Current tax - earlier years		0.01	
Deferred Tax expense/(credit)		(4,422.79)	(262.32)
Total Tax	-	(3,948.89)	174.04
Profit/ (loss) for the year	-	**25,689.57**	**6,836.33**
Other Comprehensive Income			
Items that will not be reclassified to Profit and Loss		-	-
Items that will be reclassified to Profit and Loss		-	-
		-	-
Total Comprehensive Income for the year	-	**25,689.57**	**6,836.33**
Earnings per Unit			
Basic	34	3.91	1.15
Diluted	34	3.91	**1.15**
Significant Accounting Policies	1 - 2		
The accompanying notes form an integral part of these consolidated financial statements.	3 - 64		

This is the Statement of Profit and Loss referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

CA Kailash Chand Gupta
Partner
M.No.085003
Date : 22.05.2023
Place : New Delhi

For and on behalf Board of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

CONSOLIDATED CASH FLOW STATEMENT FOR THE YEAR ENDED MARCH 31, 2023

(All amounts in ₹ lakh unless otherwise stated)

	Particulars	For the year ended March 31 2023	For the year ended March 31 2022
A.	**OPERATING ACTIVITIES**		
	Net Profit/(Loss) Before Tax	21,740.68	7,010.37
	Adjustments for :		
	Depreciation and Amortization	17,560.63	1,055.65
	Profit on redemption of mutual funds	(671.17)	(682.62)
	Interest income from FDR	(373.43)	(5.86)
	Finance Cost (net)	16,590.17	3,154.43
	Provision for major maintenance expenses	5,879.20	403.29
	Unwinding interest on major maintenance provision	24.95	-
	Provision for Lacave encashment and Gratuity	11.93	0.11
	Provision for expected credit loss	59.60	-
	Bad debts written off	9.90	-
	Operating Profit/(Loss) before Working Capital Changes	**60,832.46**	**10,935.37**
	Working Capital Adjustments:		
	Decrease / (Increase) in Trade & Other Receivables	180.10	(600.47)
	Decrease / (Increase) in Other Non Current Financial Assets	(208.85)	(0.00)
	Decrease / (Increase) in Other Non Current/Current Assets	(834.96)	(347.29)
	Decrease / (Increase) in Other Current Financial Assets	(293.53)	0.59
	Increase / (Decrease) in Trade & Other Payables	3,267.01	651.07
	Increase / (Decrease) in Other Financial Liabilities	57.50	(7,34,867.55)
	Increase / (Decrease) in Provisions	(0.11)	0.00
	Increase / (Decrease) in Other Current Liabilities	(0.14)	238.59
	Increase / (Decrease) in Current Tax Liabilities	-	(0.59)
		2,167.02	**(7,34,925.66)**
	Income Tax paid	(626.67)	(274.00)
	Net Cash Flows from/(used in) Operating Activities	**62,372.81**	**(7,24,264.28)**
B.	**INVESTING ACTIVITIES**		
	Purchase of Property, Plant & Equipment, including CWIP, capital	(2,85,101.04)	(0.50)
	Purchase of Non Current Investments	-	(1.52)
	Investment in FDR	(6,299.19)	(3,170.81)
	Interest received on maturity of FDR	189.55	-
	Profit on redemption of mutual funds	671.17	682.62
	Net cash flows from (used in) Investing activities	**(2,90,539.51)**	**(2,490.21)**
C.	**FINANCING ACTIVITIES**		
	Proceeds from Issue of Unit Capital	1,43,013.67	5,91,000.00
	Expense incurred towards initial public debt offering	(1,689.00)	-
	Expense incurred towards institutional unit allotment	(1,099.13)	(1,364.94)
	Distribution to Unit Holders	(34,927.86)	-
	Proceeds from Long Term Borrowings (net of processing fees)	1,50,000.00	1,47,646.00
	Financing charges paid	(197.00)	-
	Repayment of Long Term Borrowings	(1,010.98)	(1,001.59)
	Finance Costs Paid	(11,180.86)	(3,143.04)
	Net cash flows from (used in) Financing activities	**2,42,908.84**	**7,33,136.43**
	Net Increase/Decrease in Cash and Cash equivalents (A+B+C)	**14,742.14**	**6,381.94**
	Cash and cash equivalents at the beginning of the year	6,381.94	-
	Cash and cash equivalents at the end of the year	**21,124.08**	**6,381.94**

This is the Consolidated Cash Flow Statement referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

A.R. & CO. FRN 002744 C CHARTERED ACCOUNTANTS

CA Kailash Chand Gupta
Partner
M.No.085003
Date : 22.05.2023
Place : New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

CONSOLIDATED STATEMENT OF CHANGES IN UNIT HOLDER'S EQUITY FOR THE YEAR ENDED MARCH 31, 2023

A. INITIAL SETTLEMENT AMOUNT

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Amount
Balance as at April 1, 2021	0.10
Changes in unit capital	-
Balance as at March 31 2022	0.10
Changes in unit capital	-
Balance as at March 31 2023	0.10

B. UNIT CAPITAL *

Particulars	Number of unit	Amount
Balance as at April 1, 2021	-	-
Changes in unit capital	59,52,00,000	6,01,152.00
One time issue expenses		(1,709.18)
Balance as at 31 March 2022	**59,52,00,000**	**5,99,442.82**
Changes in unit capital	13,12,05,200	1,43,013.67
One time issue expenses		(852.17)
Balance as at March 31 2023	**72,64,05,200**	**7,41,604.32**

C. OTHER EQUITY **

Particulars	Reserves and Surplus	Items of Other Comprehensive Income	Total
		Items that will not be reclassified to profit or loss	
	Retained Earnings	Remeasurement of Defined Benefit Obligation/ Plan	
Balance as at April 1, 2021	**(67.90)**	-	**(67.90)**
Profit/ (Loss) for the year	**6,836.33**	-	**6,836.33**
Balance as at 31 March 2022	**6,768.43**	-	**6,768.43**
Profit/ (Loss) for the year	25,689.57	-	25,689.57
Less:			
Distribution to unit holders^			
Interest	34,183.66	-	34,183.66
Other Income	744.20	-	744.20
Balance as at March 31 2023	**(2,469.86)**	-	**(2,469.86)**

^The distribution relates to the distributions during the financial year along with the distribution related to the last quarter of FY 2021-22 and does not include the distribution relating to the period January 01, 2023 to March 31, 2023 which will be paid after March 31, 2023. The distributions by the Trust to its unit holders are based on the Net Distributable Cash Flows of the Trust under the SEBI InvIT Regulations.

* Refer Note No. 13
** Refer Note No. 14

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

A.R. & CO. FRN 002744 C CHARTERED ACCOUNTANTS

CA Kailash Chand Gupta
Partner
M.No.085003

Date : 22.05.2023
Place : New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

Disclosures pursuant to SEBI circulars (SEBI Master Circular No. CIRSEBI/HO/DDHS_Div3/P/CIR/2021/1673 dated 29 November 2021 issued under the InvIT regulations)

Consolidated Statement of Net Assets at Fair Value (All amounts in ₹ lakh unless otherwise stated)

	March 31, 2023		March 31, 2022	
Particulars	**Book value**	**Fair value^**	**Book value**	**Fair value^**
A. Assets	10,49,155.20	11,68,122.00	7,54,897.72	7,54,897.72
B. Liabilities	3,10,020.64	3,10,020.64	1,48,686.37	1,48,686.37
C. Net assets (A-B)	**7,39,134.56**	**8,58,101.36**	**6,06,211.35**	**6,06,211.35**
D. No of units	72,64,05,200	72,64,05,200	59,52,00,000	59,52,00,000
E. NAV (C/D)	**101.75**	**118.13**	**101.85**	**101.85**

^Fair values of total assets relating to the Trust as at March 31, 2023 as disclosed above are based on the independent valuer report.

Note: The trust has only one SPV i.e. NHIPPL hence SPV wise break up of fair value of assets are not required

Consolidated Statement of Total Return at Fair Value: (All amounts in ₹ lakh unless otherwise stated)

Particulars	**March 31, 2023**	**March 31, 2022**
Total comprehensive income for the year/period (As per the Consolidated Statement of Profit and Loss)	25,689.57	6.836.33
Add: Other changes in fair value for the year *	1.18.966.80	-
Total return	**1,44,656.37**	**6,836.33**

* In the above statement, other changes in fair value for the year ended 31 March, 2023 have been computed based independent valuers report.

The accompanying notes form an integral part of the Consolidated Financial Statements.

This is the Consolidated Statement of Net Assets at Fair Value and Consolidated Statement of Total Return at Fair Value referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

A.R. & CO. FRN 002744 C CHARTERED ACCOUNTANTS

CA Kailash Chand Gupta
Partner
M.No.085003

Date : 22.05.2023
Place : New Delhi

For and on behalf Board of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

Disclosures pursuant to SEBI circulars (SEBI Master Circular No. CIRSEBI/HO/DDHS_Div3/P/CIR/2021/1673 dated 29 November 2021 issued under the InvIT

Consolidated Statement of Net Distributable Cash Flows (All amounts in ₹ lakh unless otherwise stated)

S. No.	Particulars	March 31, 2023	March 31, 2022
1	**Profit after tax as per Statement of profit and loss/income and expenditure (Standalone) (A)**	**77,236.17**	**18,192.23**
2	Add: Income recognised in previous year and received in this year	10,651.13	-
3	**Add:** Depreciation and amortization as per statement of profit and loss account. Incase of Impairment reversal, same needs to be deducted from profit and loss.	-	-
4	**Add/Less:** Loss/gain on sale of infrastructure assets	-	-
5	**Add:** Proceeds from sale of infrastructure assets adjusted for the following: - related debts settled or due to be settled from sale proceeds; - directly attributable transaction costs; - proceeds reinvested or planned to be reinvested as per Regulation 18(7)(a) of the InvIT regulations	-	-
6	**Add:** Proceeds from sale of infrastructure assets not distributed pursuant to an earlier plan to re-invest, if such proceeds are not intended to be invested subsequently, net of any profit/ (loss) recognised in profit and loss account	-	-
7	**Add/ Less:** Any other item of non- cash expense/ non cash income (net of actual cash flows for these items), if deemed necessary by the Investment Manager. For example, any decrease/ increase in carrying amount of an asset or a liability recognised in profit and loss /income and expenditure on measurement of the asset or the liability at fair value; Interest cost as per effective interest rate method, deferred tax lease rents recognised on a straight line basis, etc.	(42,570.15)	(8,233.88)
8	**Less:** Repayment of external debt (principal) / redeemable preference shares / debentures, etc. (excluding refinancing) / net cash set aside to comply with DSRA requirement under loan agreements	(1,010.98)	(5,204.50)
9	**Total Adjustment (B)**	(32,930.01)	(13,438.39)
10	**Net Distributable Cash Flows (C) = (A+B)**	**44,306.16**	**4,753.84**
11	**Less: NDCF already distributed to Unitholders in Q1,Q2 and Q3**	30,225.78	-
12	**Balance Net Distributable Cash Flows**	**14,080.39**	**4,753.84**
13	**Less: Amounts setaside for payment of financial liabilites and other liabilities**	(2,431.84)	-
14	**Balance Net Distributable Cash Flows for Q4**	**11,648.55**	**4,753.84**

A.R. & CO. FRN 002744 C CHARTERED ACCOUNTANTS

NATIONAL HIGHWAYS INFRA TRUST

Disclosures pursuant to SEBI circulars (SEBI Master Circular No. CIRSEBI/HO/DDHS_Div3/P/CIR/2021/1673 dated 29 November 2021 issued under the InvIT

Statement of Net Distributable Cash Flows

National Highways Infra Projects Private Limited (Project SPV)

(All amounts in ₹ lakh unless otherwise stated)

S. No.	Particulars	March 31, 2023	March 31, 2022
1	**Profit after tax as per Statement of profit and loss/income and expenditure (standalone) (A)**	**(51,546.61)**	**(11,355.90)**
2	**Add:** Depreciation and amortization as per statement of profit and loss account. Incase of Impairment reversal, same needs to be deducted from profit and loss.	17,560.63	1,055.65
3	**Add/Less:** Loss/gain on sale of infrastructure assets	-	-
4	**Add:** Proceeds from sale of infrastructure assets adjusted for the following: related debts settled or due to be settled from sale proceeds; directly attributable transaction costs; proceeds reinvested or planned to be reinvested as per Regulation 18(7)(a) of the InvIT regulations	-	-
5	**Add:** Proceeds from sale of infrastructure assets not distributed pursuant to an earlier plan to re-invest, if such proceeds are not intended to be invested subsequently, net of any profit/ (loss) recognised in profit and loss account	(134.38)	-
6	**Add/ Less:** Any other item of non- cash expense/ non cash income (net of actual cash flows for these items), if deemed necessary by the Investment Manager. For example, any decrease/ increase in carrying amount of an asset or a liability recognised in profit and loss /income and expenditure on measurement of the asset or the liability at fair value; Interest cost as per effective interest rate method, deferred tax lease rents recognised on a straight line basis, etc.	40,575.45	10,888.85
7	**Less:** Repayment of external debt (principal) / redeemable preference shares / debentures, etc. (excluding refinancing) / net cash set aside to comply with DSRA requirement under loan agreements	(4,004.00)	-
8	**Total Adjustment (B)**	53,997.70	11,944.50
9	**Net Distributable Cash Flows (C) = (A+B)**	**2,451.09**	**588.61**

A.R. & CO. FRN 002744 C CHARTERED ACCOUNTANTS

NATIONAL HIGHWAYS INFRA TRUST

SIGNIFICANT ACCOUNTING POLICIES FORMING PART OF CONSOLIDATED FINANCIAL STATEMENTS FOR THE YEAR ENDED ON MARCH 31, 2023

1. GROUP INFORMATION AND NATURE OF OPERATIONS

The consolidated financial statements comprise financial statements of National Highways Infra Trust ("the Trust" or "InvIT") and its subsidiary (Project SPV – National Highways Infra Projects Private Limited (NHIPPL)) (collectively, the Group).

The Trust is an irrevocable trust registered under the provisions of the Indian Trusts Act, 1882 on October 19, 2020. It is registered under the Securities and Exchange Board of India (Infrastructure Investment Trust) Regulations, 2014 on October 28, 2020 having registration number IN/InvIT/20-21/0014.

The Trust was setup by National Highways Authority of India ("NHAI" or the "Sponsor"), an Infrastructure Development Trust in India. The Trustee to the Trust is IDBI Trusteeship Services Limited (the "Trustee") and Investment Manager for the Trust is National Highways Infra Investment Managers Private Limited ("Investment Manager").

The Trust has been formed to invest in infrastructure assets primarily being in the road sector in India. The Trust's road projects are implemented and held through special purpose vehicles ("Project SPVs"/ "Subsidiaries"). The units of the Trust were listed in Bombay Stock Exchange and National Stock Exchange on November 10, 2021.

During the year ended March 31, 2022, the Trust acquired 100% equity control in National Highway Infra Projects Private Limited (the "Project SPV") from the Sponsor with effect from November 03, 2021. During the year ended 31.03.2021, the project SPV entered into five Concession Agreements for 30 years with the Sponsor (National Highways Authority of India – NHAI) on Toll, Operate and Transfer ('TOT') basis and in year ended 31.03.23 further signed three new Concession Agreements for 20 years with National Highways Authority of India on Toll, Operate and Transfer ('TOT') basis.

The registered office of the Investment Manager is G-5 & 6, Sector-10, Dwarka, Delhi - 110075.

The consolidated financial statements were authorised for issue in accordance with resolution passed by the board of directors of the Investment Manager on May 22, 2023.

2. SIGNIFICANT ACCOUNTING POLICIES

2.1 Basis of Preparation

The Consolidated financial statements of the Group have been prepared in accordance with Indian Accounting Standards as defined in Rule 2(1)(a) of the Companies (Indian Accounting Standards) Rules, 2015, as amended, prescribed under Section 133 of the Companies Act, 2013 ("Ind AS") read with Securities and Exchange Board of India (Infrastructure Investment Group) Regulations, 2014, as amended and the circulars issued thereunder ("SEBI InvIT Regulations") and other accounting principles generally accepted in India.

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Accordingly, the Group has prepared these Consolidated Financial Statements comprising of the Balance Sheet as on March 31, 2023, the Statement of Profit and Loss for the year ended on March 31, 2023, the Statement of Cash Flows for the year ended on March 31, 2023, the Statement of Changes of Equity for the year ended on March 31, 2023 and Notes to Accounts (together hereinafter referred to as "Consolidated Financial Statements").

These Financial Statements have been prepared on accrual basis under the historical cost convention, except certain financial assets and liabilities which have been measured at Fair Value. Accounting policies have been consistently applied, except where a newly issued Accounting Standard is initially adopted or a revision to an existing Accounting Standard requires a change in the accounting policy hitherto in use. Further, these consolidated financial statements have been prepared on a going concern basis.

The financial statements are presented in Indian Rupees (INR) which is the Group's functional and presentation currency and all amounts are rounded to the nearest Lakh (`00,000) and two decimals thereof, except as otherwise stated.

2.2 Basis of Consolidation

The consolidated financial statements incorporate the financial statements of the Trust and it's subsidiary (Project SPV- NHIPPL) from date of acquisition i.e. November 3, 2021.

For the purpose of consolidation, an entity which is, directly or indirectly, controlled by the Group is treated as subsidiary. Control exists when the Group, directly or indirectly, has power over the investee, is exposed to variable returns from its involvement with the investee and has the ability to use its power to affect its returns.

Consolidation of a subsidiary begins when the Group, directly or indirectly, obtains control over the subsidiary and ceases when the Group, directly or indirectly, loses control of the subsidiary. Income and expenses of a subsidiary acquired or disposed of during the period are included in the consolidated statement of profit and loss from the date the Group, directly or indirectly, gains control until the date when the Group, directly or indirectly, ceases to control the subsidiary.

Consolidation procedure:

- Combine like items of assets, liabilities, equity, income, expenses and cash flows of the parent with those of its subsidiary. For this purpose, income and expenses of the Subsidiaries are based on the amounts of the assets and liabilities recognised in the Consolidated financial statements at the acquisition date.

- Offset (eliminate) the carrying amount of the parent's investment in each subsidiary and the parent's portion of equity of each subsidiary. Business combinations policy explains how to account for any related goodwill.

- Eliminate in full intragroup assets and liabilities, equity, income, expenses and cash flows relating to transactions between entities of the group (profits or losses resulting from intragroup transactions that are recognised in assets, such as inventory and fixed assets, are eliminated in full. Intragroup losses may indicate an impairment that requires recognition in the consolidated financial statements.

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- The carrying amount of the Group's investment in each subsidiary and the Group's portion of equity of each subsidiary are offset with each other in the consolidated financial statements.

Ind AS 12 - Income Taxes applies to temporary differences that arise from the elimination of profits from intragroup transactions.

The accounting policies of subsidiaries have been harmonised to ensure the consistency with the policies adopted by the Group. The consolidated financial statements have been presented to the extent possible, in the same manner as Group's standalone financial statements.

2.3 Business Combination/ Goodwill on Acquisition

Business combinations are accounted for using the acquisition method. The cost of an acquisition is measured as the aggregate of the consideration transferred, measured at acquisition date fair value and the amount of any non-controlling interests in the acquiree. For each business combination, the Group elects whether to measure the non-controlling interests in the acquiree at fair value or at the proportionate share of the acquiree's identifiable net assets. Acquisition related costs are recognised in the statement of profit and loss as incurred.
The acquiree's identifiable assets, liabilities and contingent liabilities that meet the condition for recognition are recognised at their fair values at the acquisition date.

At the acquisition date, the identifiable assets acquired and the liabilities assumed are recognised at their acquisition date fair values. For this purpose, the liabilities assumed include contingent liabilities representing present obligation and they are measured at their acquisition fair values irrespective of the fact that outflow of resources embodying economic benefits is not probable

Goodwill is initially measured at cost, being the excess of the aggregate of the consideration transferred and the amount recognised for non-controlling interests, and any previous interest held, over the net identifiable assets acquired and liabilities assumed. If the fair value of the net assets acquired is in excess of the aggregate consideration transferred, the Group re-assesses whether it has correctly identified all of the assets acquired and all of the liabilities assumed and reviews the procedures used to measure the amounts to be recognised at the acquisition date. If the reassessment still results in an excess of the fair value of net assets acquired over the aggregate consideration transferred, then the gain is recognised in other comprehensive income and accumulated in equity as capital reserve. However, if there is no clear evidence of gain on bargain purchase, the entity recognises the gain directly in equity as capital reserve, without routing the same through other comprehensive income.

Goodwill arising on consolidation is not amortised, however, it is tested for impairment annually. In the event of cessation of operations of a subsidiary, the unimpaired goodwill is written off fully. For the purpose of impairment testing, goodwill acquired in a business combination is, from the acquisition date, allocated to each of the Group's cash-generating units that are expected to benefit from the combination, irrespective of whether other assets or liabilities of the acquire are assigned to those units. A cash generating unit to which goodwill has been allocated is tested for impairment annually, or more frequently when there is an indication that the unit may be impaired. If the recoverable amount of the cash generating unit is less than it's carrying amount, the impairment loss is allocated first to reduce the carrying amount of any goodwill allocated to the unit and then to the other assets of the unit pro-rata based on the carrying amount of each asset in the unit.

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Any impairment loss for goodwill is recognised in the consolidated statement of profit or loss. An impairment loss recognised for goodwill is not reversed in subsequent periods. Where goodwill has been allocated to a cash generating unit and part of the operation within that unit is disposed of, the goodwill associated with the disposed operation is included in the carrying amount of the operation when determining the gain or loss on disposal.

Goodwill disposed in these circumstances is measured based on the relative values of the disposed operation and the portion of the cash-generating unit retained.

2.4 Use of Judgement and Estimates

The preparation of financial statements is in conformity with the generally accepted accounting principles in India, and requires the Investment Manager to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent liabilities at the date of the financial statements and the results of operations during the reporting period end. Although these estimates are based upon Investment Manager's best knowledge of current events and actions, actual results could differ from these estimates.

Current versus non-current classification

Assets and Liabilities in the Consolidated Balance Sheet have been classified as either Current or Non–Current based upon the requirements of Schedule III notified under the Companies Act, 2013.

An asset has been classified as Current if,

(a) it is expected to be realized in, or is intended for sale or consumption in, the Group's normal operating cycle; or

(b) it is held primarily for the purpose of being traded; or

(c) it is expected to be realized within twelve months after the reporting date; or

(d) it is cash or cash equivalent unless it is restricted from being exchanged or used to settle a liability for at least twelve months after the reporting date.

All other assets have been classified as Non–Current.

A liability has been classified as Current when,

(a) it is expected to be settled in the Group's normal operating cycle; or

(b) it is held primarily for the purpose of being traded; or

(c) it is due to be settled within twelve months after the reporting date; or

(d) the Group does not have an unconditional right to defer settlement of the liability for at least twelve months after the reporting date.

All other liabilities have been classified as Non–Current.

The operating cycle is the time between the acquisition of assets for processing and their realisation in cash and cash equivalents. The group has identified twelve months as its operating cycle.

Deferred tax assets and liabilities are classified as non-current assets and liabilities.

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2.5 Revenue Recognition

Revenue is recognised to the extent that it is probable that the economic benefits will flow to the Group and the revenue can be reliably measured, regardless of when the payment is being made. Revenue is measured at the fair value of the consideration received or receivable, taking into account contractually defined terms of payment and excluding taxes or duties collected on behalf of the government.

The specific recognition criteria described below must also be met before revenue is recognised:

Toll Revenue - Toll Revenue from users of toll roads held by subsidiary company is recognised in respect of toll revenue accrued for respective toll road projects. Revenue from electronic toll collection is recognised on accrual basis.

Interest income - Interest is recognised on time proportion basis taking into account the amount outstanding and the rates applicable. For all Debt instruments measured either at Amortized Cost or Fair Value through Other Comprehensive Income, interest income is recorded using EIR method that is the rate that exactly discounts estimated future cash receipts through the expected life of the financial instrument to the net carrying amount of the financial asset.

Dividends - Dividend income is recognised when the Group's right to receive the payment is established, which is generally when shareholders approve the dividend.

Fair value gains on current investments carried at fair value are included in other income.

Claims with National Highways Authority of India ('NHAI') and other government authorities are accounted as and when the money is received from the respective authorities, in cases of monetary compensations.

Other items - Other items of income are recognised as and when the right to receive the income arises.

2.6 Property, plant and equipment

Property, Plant and Equipment (PPE) is recognised when it is probable that future economic benefits associated with the item will flow to the Group and the cost of the item can be measured reliably.

PPE are stated at acquisition cost less accumulated depreciation and cumulative impairment. Such cost includes the cost of replacing part of the plant and equipment and borrowing costs for long-term construction projects if the recognition criteria are met.

Recognition:

The cost of an item of property, plant and equipment shall be recognised as an asset if, and only if:

(a) it is probable that future economic benefits associated with the item will flow to the entity; and

(b) the cost of the item can be measured reliably.

When significant parts of plant and equipment are required to be replaced at intervals, Group depreciates them separately based on their specific useful lives.

Gains or losses arising from de - recognition of Property, plant and equipment are measured as the difference between the net disposable proceeds and the carrying amount of the asset and are recognized in the Consolidated Statement of Profit and Loss when the asset is derecognized.

The Group has estimated following useful

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Asset Class	Useful Life
Office Equipments	5 Years
Computers	3 Years
Furniture & Fixtures	10 Years

Depreciation on Property, plant and equipment

Depreciation on Property, plant and equipment ("PPE") is provided on straight line method, up to the cost of the asset (net of residual value), in accordance with the useful lives prescribed under Schedule II to the Companies Act, 2013.

Depreciation on additions is being provided on a pro-rata basis from the date of such additions. Similarly, depreciation on assets sold/disposed off during the year is being provided up to the dates on which such assets are sold/disposed off. Modification or extension to an existing asset, which is of capital nature and which becomes an integral part thereof is depreciated prospectively over the remaining useful life of that asset.

The estimated residual value of the PPE has been taken as 5% in line with the provisions of Schedule II to the Companies Act, 2013.

Fixed assets amounting up to INR 5,000 are recognised in Consolidated Statement of Profit and Loss in entirety in the first year of purchase.

The residual values, useful lives and methods of depreciation of property, plant and equipment are reviewed at each financial year end and adjusted prospectively, if appropriate.

Depreciation charge for impaired assets is adjusted in future periods in such a manner that the revised carrying amount of the asset is allocated over its remaining useful life.

2.7 Intangible assets

In accordance with Ind AS 38 "Intangible Assets", Intangible assets are recognised when it is probable that the future economic benefits that are attributable to the asset will flow to the Group and the cost of the asset can be measured reliably.

Pre-operative expenses including administrative and other general overhead expenses that are specifically attributable to the development or acquisition of intangible assets are allocated and capitalised as a part of the cost of the intangible assets.

Intangible assets not ready for the intended use on the date of the Consolidated Balance Sheet are disclosed as "intangible assets under development". Intangible assets are derecognised when no future economic benefits are expected from use or disposal.

The cost of intangible assets acquired in an amalgamation in the nature of purchase is their fair value as at the date of amalgamation. Following initial recognition, intangible assets are carried at cost less accumulated amortization and accumulated impairment losses, if any.

The useful lives of intangible assets are assessed as either finite or indefinite.

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Rights under Service Concession Arrangements – Toll Collection Rights
The Group has acquired rights for Tolling, Operation, Maintenance and Transfer of five toll road projects for a period of 30 years basis Toll Concession agreements with NHAI, group further acquired rights during the current financial year for Tolling, Operation, Maintenance and Transfer of three additional toll road projects for a period of 20 years basis Toll Concession agreements with NHAI, and the same have been recognised as Other Intangible Assets in the financial statements.

Extension of concession period by the Authority in compensation for claims made by the Group are capitalised as part of Toll Collection Rights on acceptance of the claim. Where the Group has a contractual right to an extension in the concession period as per the concession agreement, the same is capitalized when the right to extension in the concession period is established at the estimated amount of eligible claims.

Amortisation of Intangible Assets
Intangible assets with finite lives are amortised over the useful economic life and assessed for impairment whenever there is an indication that the intangible asset may be impaired. The amortisation period and the amortisation method for an intangible asset with a finite useful life are reviewed at least at the end of each reporting period. Changes in the expected useful life or the expected pattern of consumption of future economic benefits embodied in the asset are considered to modify the amortisation period or method, as appropriate, and are treated as changes in accounting estimates. The amortisation expense on intangible assets with finite lives is recognised in the Consolidated Statement of Profit and Loss unless such expenditure forms part of carrying value of another asset.

In accordance with Ind AS 38 "Intangible Assets", Intangible assets should be amortized by a method which reflects the pattern in which the asset's future economic benefits are expected to be consumed by the entity.

Toll Collection Rights shall be amortized basis a Consumption based model (using Passenger Car Unit (PCU) projections) over the tenure of the Concession Agreement.

Other intangible assets - Software purchased is amortized over a period of three to six years on straight line basis from the month in which the addition is made.

Gains or losses arising from derecognition of an intangible asset are measured as the difference between the net disposal proceeds and the carrying amount of the asset and are recognised in the statement of profit or loss when the asset is derecognised.

Amortisation on impaired assets is provided by adjusting the amortisation charge in the remaining periods so as to allocate the assets' revised carrying amount over its remaining useful life.

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2.8 Employee benefits

Employee benefits include provident fund, gratuity, compensated absences, long service awards and medical benefits.

i. **Short term employee benefits**

Employee benefits such as salaries, short term compensated absences, expected cost of bonus, ex-gratia and performance linked rewards falling due wholly within twelve months of rendering the service are classified as short-term employee benefits and are expensed in the period in which the employee renders the related service.

ii. **Post-Employment Benefits**

Defined contribution plan: A defined contribution plan is a post-employment plan under which an entity pays fixed contributions and will have no legal or constructive obligations to pay further amounts. The Group contributes to provident fund and employees deposit linked insurance scheme, and have no further obligations beyond making its contributions. The Group's contribution to the above funds are charged to the Consolidated Statement of Profit and Loss.

Defined benefit plan: The Group has an un-funded benefit plan for post-employment benefits in the form of Gratuity. The value of obligation under the plan is determined by the group based on best estimate of the present value of the estimated future cash flows towards the gratuity obligation. Defined benefit costs comprising current service cost, past service cost and gains or losses on settlements are recognised in the Consolidated Statement of Profit and Loss as employee benefits expense. Gains or losses on the curtailment or settlement of any defined benefit plan are recognised when the curtailment or settlement occurs.

iii. **Termination benefits**

Termination benefits such as compensation under employee separation schemes (wherever applicable) are recognised as expense in the Consolidated Statement of Profit and Loss. Liability for the same is recognised at the earlier of when the group can no longer withdraw the offer of the termination benefit.

iv. **Other long-term employee benefits**

The present value of the obligation under long term employee benefit plans such as compensated absences is determined and is recognised in a similar manner as in the case of defined benefit plans.

Long term employee benefit costs comprising current service cost and gains or losses on curtailments and settlements, re-measurements are recognised in the Consolidated Statement of Profit and Loss as employee benefit expenses. Interest cost implicit in long term employee benefit cost is recognised in the Consolidated Statement of Profit and Loss under finance cost.

2.9 Leases

(i) The determination of whether an arrangement is or contains a lease is based on the substance of the arrangement at the inception of the lease.

i.i) Property, plant, and equipment acquired under leases with lease term more than 12 months is long term lease. The lease liability is recognised for the obligation to make the lease

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payments and a right of use of asset for the underlying property, plant and equipment for the lease term. The lease liability is measured at the present value of the lease payments to be made over the lease term. The right of use property, plant and equipment are initially measured at the amount of the lease liability, adjusted for lease prepayments, lease incentives received and the initial direct costs such as commissions and an estimate cost of restoration, removal and dismantling of property, plant and equipment. Lease liabilities are increased to reflect the interest cost and are reduced with lease payments.

i.ii) Property, plant, and equipment having lease term 12 months or less than 12 months are recognised on a straight-line basis.

(ii) Property, plant and equipment leased out under operating leases are continued to be capitalised by the Group. Rental income is recognised on a straight-line basis over the term of the relevant lease.

2.10 Borrowing costs

Borrowing Cost consist of interest and other ancillary costs incurred in connection with the arrangement of borrowings. Borrowing costs directly attributable to the acquisition, construction or production of an asset that necessarily takes a substantial period of time to get ready for its intended use or sale are capitalized as part of the cost of the respective asset.

All other borrowing costs are charged to the Consolidated Statement of Profit and Loss in the period they occur. In case of significant Long term loans, other costs incurred in connection with the borrowing of funds are amortized over the period of respective Loan. Borrowing cost also includes exchange differences to the extent regarded as an adjustment to the borrowing costs.

2.11 Financial Instruments

Financial assets and/or financial liabilities are recognised when the Group becomes party to a contract embodying the related financial instruments. A financial instrument is any contract that gives rise to a financial asset of one entity and a financial liability or equity instrument of another entity. A financial asset and a financial liability are offset and presented on net basis in the Consolidated Balance Sheet when there is a current legally enforceable right to set-off the recognised amounts and it is intended to either settle on net basis or to realise the asset and settle the liability simultaneously.

Financial assets

Initial recognition and measurement

All financial assets are recognised initially at fair value plus, in the case of financial assets not recorded at fair value through profit or loss, transaction costs that are attributable to the acquisition of the financial asset. Purchases or sales of financial assets that require delivery of assets within a time frame established by regulation or convention in the market place (regular way trades) are recognised on the trade date, i.e., the date that the Group commits to purchase or sell the asset. Trade receivables and trade payables that do not contain a significant financing component are initially measured at their transaction price.

Subsequent measurement

For purposes of subsequent measurement, financial assets are classified in following categories;

- at amortised cost
- at fair value through profit or loss (FVTPL)
- at fair value through other comprehensive income (FVOCI)

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Financial Assets at amortised cost

A financial asset is classified and subsequently measured at the amortised cost if both the following conditions are met:

a) The asset is held within a business model whose objective is to hold assets for collecting contractual cash flows, and
b) Contractual terms of the asset give rise on specified dates to cash flows that are solely payments of principal and interest (SPPI) on the principal amount outstanding.

This category is the most relevant to the Group. All the Loans and other receivables under financial assets (except Investments) are non-derivative financial assets with fixed or determinable payments that are not quoted in an active market.

After initial measurement, such financial assets are subsequently measured at amortised cost using the effective interest rate (EIR) method. Amortised cost is calculated by taking into account any discount or premium on acquisition and fees or costs that are an integral part of the EIR. The losses arising from impairment are recognised in the Consolidated Statement of Profit and Loss.

Investments in equity instruments of Subsidiaries are recognised at original cost in accordance with Ind AS 27. Impairment testing of Investment in subsidiary that are accounted for at cost as per Ind AS 27 are within scope of Ind AS 36 Impairment of Assets. Any impairment in value of investment in equity investments in Subsidiaries is recognised in the Consolidated Statement of Profit and Loss.

Financial Assets at Fair Value through Other Comprehensive Income (FVOCI)

A financial asset is classified and subsequently measured at FVTOCI if both of the following criteria are met:

a) The asset is held within a business model whose objective is achieved both by collecting contractual cash flows and selling the financial assets, and
b) Contractual terms of the asset give rise on specified dates to cash flows that are solely payments of principal and interest (SPPI).

Investment in Debt instruments included within the FVTOCI category are measured initially as well as at each reporting date at fair value. Fair value movements are recognized in the other comprehensive income (OCI). However, the Group recognizes interest income, impairment losses & reversals and foreign exchange gain or loss in the Consolidated Statement of Profit and Loss.

Interest earned whilst holding FVTOCI debt instrument is reported as interest income using the EIR method.

Financial Assets at Fair Value through Profit and Loss (FVTPL)

A financial asset which is not classified in any of the above categories are subsequently fair valued through profit or loss. Financial assets included within the FVTPL category are measured at fair value with all changes recognized in the Consolidated statement of profit and loss. The Group measures its investments which are classified as equity instruments (other than investment in shares of Subsidiaries, Joint Ventures and Associates) at fair value through profit and loss account.

Any debt instrument, which does not meet the criteria for categorization as at amortized cost or as FVTOCI, is classified as at FVTPL. In addition, the Group may elect to designate a debt instrument, which otherwise meets amortized cost or FVTOCI criteria, as at FVTPL. However, such election is allowed only if doing so reduces or eliminates a measurement or recognition

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inconsistency (referred to as 'accounting mismatch'). The Group has not designated any debt instrument as at FVTPL.

The Group has investment in debt oriented mutual funds which are held for trading, and the same are classified as at FVTPL. The Group makes such election on an instrument by instrument basis. The classification is made on initial recognition and is irrevocable. The gain/ loss on sale of investments are recognised in the Consolidated Statement of Profit and Loss.

Reclassification of Financial Assets

The Group determines classification of financial assets on initial recognition. After initial recognition, no reclassification is made for financial assets which are equity instruments and financial liabilities. For financial assets which are debt instruments, a reclassification is made only if there is a change in the business model for managing those assets. Changes to the business model are expected to be infrequent. The Investment Manager of the Group determines change in the business model as a result of external or internal changes which are significant to the Group's operations. Such changes are evident to external parties. A change in the business model occurs when the Group either begins or ceases to perform an activity that is significant to its operations. If the Group reclassifies financial assets, it applies the reclassification prospectively from the reclassification date which is the first day of the immediately next reporting period following the change in business model. The Group does not restate any previously recognised gains, losses (including impairment gains or losses) or interest.

The following table shows various reclassification and how they are accounted for:

Original Classification	**Revised Classification**	**Accounting Treatment**
Amortized Cost	FVTPL	Fair value is measured at reclassification date. Difference between previous amortised cost and fair value is recognised in Consolidated statement of profit and loss.
FTVPL	Amortized Cost	Fair value at reclassification date becomes its new gross carrying amount.
Amortized Cost	FVOCI	Fair value is measured at reclassification date. Difference between previous amortised cost and fair value is recognised in other comprehensive income. No Change in EIR due to reclassification.
FVOCI	Amortized Cost	Fair value at reclassification date becomes its new gross carrying amount. However cumulative gain or loss in other comprehensive income is adjusted against Fair value. Consequently, the asset is measured as if it had always been measured at amortised cost.
FTVPL	FVOCI	Fair value at reclassification date becomes its new carrying amount. No other adjustment is required.
FVOCI	FTVPL	Assets continue to be measured fair value. Cumulative gain or loss previously recognized in other comprehensive income is

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		reclassified to Consolidated statement of profit and loss at the reclassification date.

Derecognition

A financial asset (or, where applicable, a part of a financial asset or part of Group's similar financial assets) is primarily derecognised (i.e. removed from the Consolidated Balance Sheet) when:

- The rights to receive cash flows from the asset have expired, or
- The group has transferred its rights to receive cash flows from the asset or has assumed an obligation to pay the received cash flows in full without material delay to a third party under a 'pass-through' arrangement; and either (a) the group has transferred substantially all the risks and rewards of the asset, or (b) the group has neither transferred nor retained substantially all the risks and rewards of the asset, but has transferred control of the asset.

When the Group has transferred its rights to receive cash flows from an asset or has entered into a pass-through arrangement, it evaluates if and to what extent it has retained the risks and rewards of ownership. When it has neither transferred nor retained substantially all of the risks and rewards of the asset, nor transferred control of the asset, the group continues to recognise the transferred asset to the extent of the group's continuing involvement. In that case, the group also recognises an associated liability. The transferred asset and the associated liability are measured on a basis that reflects the rights and obligations that the group has retained.
Continuing involvement that takes the form of a guarantee over the transferred asset is measured at the lower of the original carrying amount of the asset and the maximum amount of consideration that the group could be required to repay.

Financial liabilities

Initial recognition and measurement

Financial liabilities are classified, at initial recognition, as financial liabilities at fair value through profit or loss, loans and borrowings, payables, as appropriate.
All financial liabilities are recognised initially at fair value and, in the case of loans and borrowings and payables, net of directly attributable transaction costs.
The Group's financial liabilities include trade and other payables, loans and borrowings etc.

Subsequent measurement

Financial liabilities designated upon initial recognition at fair value through profit or loss are designated as such at the initial date of recognition, and only if the criteria in Ind AS 109 are satisfied. For liabilities designated as FVTPL, fair value gains/ losses attributable to changes in own credit risk are recognized in OCI. These gains/losses are not subsequently transferred to Consolidated statement of profit and loss. However, the Group may transfer the cumulative gain or loss within equity. All other changes in fair value of such liability are recognised in the Consolidated statement of profit and loss. The Group has not designated any financial liability as at fair value through profit and loss.

Loans and borrowings

This is the category most relevant to the Group. After initial recognition, interest-bearing loans and borrowings are subsequently measured at amortised cost using the EIR method. Gains and

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losses are recognised in Statement of Profit or Loss when the liabilities are derecognised as well as through the EIR amortisation process. Amortised cost is calculated by taking into account any discount or premium on acquisition and fees or costs that are an integral part of the EIR. The EIR amortisation is included as finance costs in the Consolidated Statement of Profit and Loss.
This category generally applies to borrowings and security deposits received.

Derecognition
A financial liability is derecognised when the obligation under the liability is discharged or cancelled or expires. When an existing financial liability is replaced by another from the same lender on substantially different terms, or the terms of an existing liability are substantially modified, such an exchange or modification is treated as the derecognition of the original liability and the recognition of a new liability. The difference in the respective carrying amounts is recognised in the statement of profit or loss.

Offsetting financial instrument

Financial assets and liabilities are offset and the net amount is reported in the Consolidated Balance Sheet where there is a legally enforceable right to offset the recognised amounts and there is an intention to settle financial asset and liability on a net basis or realise the asset and settle the liability simultaneously. The legally enforceable right must not be contingent on future events and must be enforceable in the normal course of business and in the event of default, insolvency or bankruptcy of the Company or the counterparty.

2.12 Fair Value measurement
The Group measures financial instruments at fair value at each financial statement date.
Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The fair value measurement is based on the presumption that the transaction to sell the asset or transfer the liability takes place either:
i) In the principal market for the asset or liability, or
ii) In the absence of a principal market, in the most advantageous market for the asset or liability

The principal or the most advantageous market must be accessible by the Group.

The fair value of an asset or a liability is measured using the assumptions that market participants would use when pricing the asset or liability, assuming that market participants act in their economic best interest.

A fair value measurement of a non-financial asset takes into account a market participant's ability to generate economic benefits by using the asset in its highest and best use or by selling it to another market participant that would use the asset in its highest and best use.

The Group uses valuation techniques that are appropriate in the circumstances and for which sufficient data are available to measure fair value, maximising the use of relevant observable inputs and minimising the use of unobservable inputs.

All assets and liabilities for which fair value is measured or disclosed in the financial statements are categorised within the fair value hierarchy, described as follows, based on the lowest level input that is significant to the fair value measurement as a whole:
Level 1 — Quoted prices (unadjusted) in active markets for identical assets or liabilities

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Level 2 — Inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly (i.e. as prices) or indirectly (i.e. derived from prices)
Level 3 — Inputs for the assets or liabilities that are not based on observable market data (unobservable inputs).

For assets and liabilities that are recognised in the financial statements on a recurring basis, the Group determines whether transfers have occurred between levels in the hierarchy by re-assessing categorisation (based on the lowest level input that is significant to the fair value measurement as a whole) at the end of each reporting period.

The Group determines the policies and procedures for both recurring fair value measurement, such as derivative instruments and unquoted financial assets measured at fair value, and for non-recurring measurement, such as assets held for distribution in discontinued operations.

At each reporting date, the Group analyses the movements in the values of assets and liabilities which are required to be remeasured or re-assessed as per the Group's accounting policies. For this analysis, the Group verifies the major inputs applied in the latest valuation by agreeing the information in the valuation computation to contracts and other relevant documents.

The Group also compares the change in the fair value of each asset and liability with relevant external sources to determine whether the change is reasonable.
On an annual basis, the Board of Directors of the Investment Manager presents the valuation results to the Audit Committee and the Group's independent auditors. This includes a discussion of the major assumptions used in the valuations. For the purpose of fair value disclosures, the Group has determined classes of assets and liabilities on the basis of the nature, characteristics and risks of the asset or liability and the level of the fair value hierarchy as explained above. This note summarises accounting policy for fair value. Other fair value related disclosures are given in the relevant notes.

2.13 Cash and Cash Equivalents

Cash and cash equivalents in the Consolidated Balance Sheet comprise cash at banks and on hand and short-term deposits with an original maturity of three months or less, which are subject to an insignificant risk of changes in value.

For the purpose of the Consolidated statement of cash flows, cash and cash equivalents consist of cash and short-term deposits, as defined above, net of outstanding bank overdrafts as they are considered an integral part of the Group's cash management.

2.14 Impairment of Assets

Impairment of Financial Assets

All financial assets except for those designated at FVTPL are subject to review for impairment at least each reporting date to identify whether there is any objective evidence that a financial asset or group of financial assets is impaired. In accordance with Ind AS 109, the group applies expected credit loss (ECL) model for measurement and recognition of impairment loss for financial assets carried at amortized cost.

For recognition of impairment loss on other financial assets and risk exposure, the group determines that whether there has been a significant increase in the credit risk since initial



recognition. If credit risk has not increased significantly, 12-month ECL is used to provide for impairment loss. However, if credit risk has increased significantly, lifetime ECL is used. If, in a subsequent period, credit quality of the instrument improves such that there is no longer a significant increase in credit risk since initial recognition, then the entity reverts to recognising impairment loss allowance based on 12-month ECL.

Lifetime ECL are the expected credit losses resulting from all possible default events over the expected life of a financial instrument. The 12-month ECL is a portion of the lifetime ECL which results from default events that are possible within 12 months after the reporting date.
ECL is the difference between all contractual cash flows that are due to the group in accordance with the contract and all the cash flows that the entity expects to receive (i.e., all cash shortfalls), discounted at the original EIR. When estimating the cash flows, an entity is required to consider:

- All contractual terms of the financial instrument (including prepayment, extension, call and similar options) over the expected life of the financial instrument. However, in rare cases when the expected life of the financial instrument cannot be estimated reliably, then the entity is required to use the remaining contractual term of the financial instrument
- Cash flows from the sale of collateral held or other credit enhancements that are integral to the contractual terms

ECL impairment loss allowance (or reversal) recognized during the year is recognized as income/ expense in the Consolidated Statement of Profit and Loss (P&L). This amount is reflected under the head 'other expenses' in the P&L.

Impairment of Non- Financial Assets
The Group assesses, at each reporting date, whether there is an indication that an asset may be impaired. If any indication exists, or when annual impairment testing for an asset is required, the Group estimates the asset's recoverable amount. An asset's recoverable amount is the higher of an asset's or cash-generating unit's (CGU) fair value less costs of disposal and its value in use. Recoverable amount is determined for an individual asset unless the asset does not generate cash inflows that are largely independent of those from other assets or Group's assets. When the carrying amount of an asset or CGU exceeds its recoverable amount, the asset is considered impaired and is written down to its recoverable amount. In assessing value in use, the estimated future cash flows are discounted to their present value using a pre tax discount rate that reflects current market assessments of the time value of money and the risks specific to the asset. In determining net selling price, recent market transactions are taken into account, if available. If no such transactions can be identified, an appropriate valuation model is used. Impairment losses of continuing operations are recognized in the Consolidated statement of profit and loss, except for previously revalued tangible fixed assets, where the revaluation was taken to revaluation reserve. In this case, the impairment is also recognized in the revaluation reserve up to the amount of any previous revaluation. After impairment, depreciation is provided on the revised carrying amount of the asset over its remaining useful life.

An assessment is made at each reporting date as to whether there is any indication that previously recognized impairment losses may no longer exist or may have decreased. If such indication exists, the group estimates the asset's CGU's recoverable amount. A previously recognized impairment loss is reversed only if there has been a change in the assumptions used to determine the assets recoverable amount since the last impairment loss was recognized. The reversal is limited so that the carrying amount of the asset does not exceed its recoverable amount, nor exceed the carrying amount that would have been determined, net of depreciation, had no impairment loss been

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recognized for the asset in prior years. Such reversal is recognized in the Consolidated statement of profit and Loss unless the asset is carried at a revalued amount, in which case the reversal is treated as a revaluation increase.

2.15 Foreign currency transactions

The Group's financial statements are presented in INR, which is group's functional currency.
Foreign currency transactions are recorded at the exchange rate prevailing on the date of the respective transactions between the functional currency and the foreign currency.

Monetary foreign currency assets and liabilities remaining unsettled at the Financial Statement date are translated at the rates of exchange prevailing on that date.

Gains / losses arising on account of realisation / settlement of foreign currency transactions and on translation of foreign currency assets and liabilities are recognized in the Consolidated Statement of Profit and Loss.

Exchange differences arising on the settlement of monetary items at rates different from those at which they were initially recorded during the year, or reported in previous financial statements, are recognized as income or as expenses in the year in which they arise.

Non - Monetary items which are carried in terms of historical cost denominated in a foreign currency are reported using the exchange rate at the date of the transaction; and Non - Monetary items which are carried at fair value or other similar valuation denominated in a foreign currency, are reported using the exchange rates that existed when the values were determined.

The gain or loss arising on translation of Non-Monetary items measured at fair value is treated in line with the recognition of the gain or loss on the change in Fair value of the item (i.e., translation differences on items whose fair value gain or loss is recognised in OCI or profit or loss are also recognised in OCI or profit or loss, respectively).

2.16 Taxes on income

Tax expense comprises of Current and Deferred tax.
Current income tax is measured at the amount expected to be paid to the tax authorities in accordance with the Income Tax Act, 1961.

Current income tax assets and liabilities are measured at the amount expected to be recovered from or paid to the taxation authorities. The tax rates and tax laws used to compute the amount are those that are enacted or substantively enacted, at the reporting date. The tax rates and tax laws used to compute the amount are those that are enacted or substantively enacted, at the reporting date.
Current income tax relating to items recognised outside profit or loss is recognised outside profit or loss (either in other comprehensive income or in equity).
Current tax items are recognised in correlation to the underlying transaction either in OCI or directly in equity.
Investment Manager periodically evaluates positions with respect to situations in which applicable tax regulations are establishes provisions where appropriate.

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Deferred tax is provided using the liability method on temporary differences between the tax bases of assets and liabilities and their carrying amounts for financial reporting purposes at the reporting date.

Deferred tax assets and liabilities are measured at the tax rates that are expected to apply in the year when the asset is realised or the liability is settled, based on tax rates (and tax laws) that have been enacted or substantively enacted at the reporting date.

Deferred tax assets are recognised for all deductible temporary differences, the carry forward of unused tax credits and any unused tax losses. Deferred tax assets are recognised to the extent that it is probable that taxable profit will be available against which the deductible temporary differences, and the carry forward of unused tax credits and unused tax losses can be utilised. The carrying amount of deferred tax assets is reviewed at each reporting date and reduced to the extent that it is no longer probable that sufficient taxable profit will be available to allow all or part of the deferred tax asset to be utilised.

Deferred tax relating to items recognised outside profit or loss is recognised outside profit or loss (either in other comprehensive income or in equity).

Deferred tax assets and deferred tax liabilities are offset if a legally enforceable right exists to set off current tax assets against current tax liabilities and the deferred taxes relate to the same taxable entity and the same taxation authority.

2.17 Provisions, Contingent Liabilities, Contingent Assets and Capital Commitments

Contingent Liabilities

A contingent liability is a possible obligation that arises from past events whose existence will be confirmed by the occurrence or non–occurrence of one or more uncertain future events beyond the control of the Group or a present obligation that is not recognized because it is not probable that an outflow of resources will be required to settle the obligation. A contingent liability also arises in extremely rare cases where there is a liability that cannot be recognized because it cannot be measured reliably. Contingent Liabilities are reviewed at each reporting date. The Group does not recognize a contingent liability but discloses its existence in the financial statements, however discloses its existence in the financial statements in the notes to accounts.

Contingent Assets

Contingent assets usually arise from unplanned or other unexpected events that give rise to the possibility of an inflow of economic benefits to the entity.
Contingent assets are recognized when the realisation of income is virtually certain, in which case the related asset is not a contingent asset and its recognition is appropriate.
Contingent assets are reviewed at each reporting date. A contingent asset is disclosed where an inflow of economic benefits is probable.

Provisions

Provisions are recognised when the Group has ...structive) as a result of a past event, it is probable that an out... benefits will be required to settle the obligation and a re...nt of the obligation. When the Group expects some or ...xample, under an insurance contract, the reimbursemei... a separate asset, ...nly when

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the reimbursement is virtually certain. The expense relating to a provision is presented in the Consolidated statement of profit and loss net of any reimbursement.
If the effect of the time value of money is material, provisions are discounted using a current pre-tax rate that reflects, when appropriate, the risks specific to the liability. When discounting is used, the increase in the provision due to the passage of time is recognised as a finance cost.

Commitments
Commitments are future liabilities for contractual expenditure, classified and disclosed as follows:

- estimated amount of contracts remaining to be executed on capital account and not provided for;
- funding related commitment to subsidiary companies; and
- other non-cancellable commitments, if any, to the extent they are considered material and relevant in the opinion of management.

Other commitments related to services to be rendered / procurements made in the normal course of business are not disclosed to avoid excessive details.

2.18 Consolidated Statement of Cash Flows

Consolidated Statement of Cash Flows is prepared segregating the cash flows into operating, investing and financing activities.
Cash flow from operating activities is reported using indirect method adjusting the net profit for the effects of:

- changes during the period in operating receivables and payables, transactions of a non-cash nature;
- non-cash items such as depreciation, provisions, deferred taxes, unrealised foreign currency gains and losses;
- all other items for which the cash effects are investing or financing cash flows.

Cash and cash equivalents (including bank balances) shown in the Consolidated Statement of Cash Flows exclude items which are not available for general use as at the date of Consolidated Balance Sheet.

2.19 Assets held for sale

Non-current assets or disposal groups comprising of assets and liabilities are classified as 'held for sale' when all of the following criteria's are met: (i) decision has been made to sell. (ii) the assets are available for immediate sale in its present condition. (iii) the assets are being actively marketed and (iv) sale has been agreed or is expected to be concluded within 12 months of the Consolidated Balance Sheet date.
Subsequently, such non-current assets and disposal groups classified as held for sale are measured at the lower of its carrying value and fair value less costs to sell. Non-current assets held for sale are not depreciated or amortised.

2.20 Unit Capital

Units are classified as equity. Incremental costs attributable to the issue of units are directly reduced from equity as per requirements of Ind AS 32.

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2.21 Distribution to unit holders

The Group recognises a liability to make cash distributions to unit holders when the distribution is authorised and a legal obligation has been created. As per the SEBI InvIT Regulations, a distribution is authorised when it is approved by the Board of Directors of the Investment Manager. A corresponding amount is recognised directly in other equity.

2.22 Earnings per Unit (EPU)

Basic EPU amounts are calculated by dividing the profit for the period attributable to unitholders by the weighted average number of units outstanding during the period.

Diluted EPU amounts are calculated by dividing the profit/(loss) attributable to unitholders by the weighted average number of units outstanding during the period plus the weighted average number of units that would be issued on conversion of all the dilutive potential units into unit capital.

2.23 Recent Pronouncements

Ministry of Corporate Affairs ("MCA") notifies new standards or amendments to the existing standards under Companies (Indian Accounting Standards) Rules as issued from time to time. On March 31, 2023, MCA amended the Companies (Indian Accounting Standards) Amendment Rules, 2023, as below:

Ind AS 1 - Presentation of Financial Statements - This amendment requires the entities to disclose their material accounting policies rather than their significant accounting policies. The effective date for adoption of this amendment is annual periods beginning on or after April I, 2023. The Group has evaluated the amendment and the impact of the amendment is insignificant in the Group's financial statements.

Ind AS 8 - Accounting Policies, Changes in Accounting Estimates and Errors_- This amendment has introduced a definition of 'accounting estimates' and included amendments to Ind AS 8 to help entities distinguish changes in accounting policies from changes in accounting estimates. The effective date for adoption of this amendment is annual periods beginning on or after April I, 2023. The Group has evaluated the amendment and there is no impact on its consolidated financial statements.

Ind AS 12 - Income Taxes - This amendment has narrowed the scope of the initial recognition exemption so that it does not apply to transactions that give rise to differences. The effective date for adoption of this amendment is annual periods beginning on or after April 1, 2023. The Group has evaluated the amendment and there is no impact on its consolidated financial statement.



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Notes to Consolidated Financial Statements for the year ended March 31, 2023

3 Property, Plant and Equipment

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Temporary Structure	Computer	Office Equipments	Furniture & Fixtures	Total
Gross Carrying Amount:					
Balance as at April 1, 2021	-	-	-	-	-
Additions	-	**0.50**	-	-	**0.50**
Less: Disposals	-	-	-		-
Balance as at March 31, 2022	-	**0.50**	-	-	**0.50**
Additions	25.59	44.94	17.42	44.27	**132.22**
Less: Disposals	-	-	-	-	-
Balance as at March 31, 2023	**25.59**	**45.44**	**17.42**	**44.27**	**132.72**
Accumulated Depreciation:					-
Balance as at April 1, 2021	-	-	-	-	-
Additions	-	**0.04**	-	-	0.04
Less: Disposals	-	-	-	-	-
Balance as at March 31, 2022	-	**0.04**	-	-	**0.04**
Additions	1.49	4.32	0.82	0.88	7.51
Less: Disposals	-	-	-	-	-
Balance as at March 31, 2023	**1.49**	**4.36**	**0.82**	**0.88**	**7.55**
Net Carrying Amount:					
Balance as at March 31, 2022	-	**0.46**	-	-	**0.46**
Balance as at March 31, 2023	**24.10**	**41.08**	**16.60**	**43.39**	**125.17**

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Notes to Consolidated Financial Statements for the year ended March 31, 2023

4. Goodwill arising on Consolidation

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	As At March 31, 2023	As At March 31, 2022
Gross Carrying Amount		
Balance at the beginning of the year	10,144.46	-
Additions*	-	10,144.46
Less: Disposals	-	-
Less: Impairment	-	-
Balance at the closing of the year	**10,144.46**	**10,144.46**

The carrying amount relates to goodwill arising on acquisition of Project SPV (NHIPPL) by the Trust and has been tested for impairment against the respective cash generating unit (CGU). The calculation uses cash flow forecast based on financial models which cover remaining future periods of respective concession periods of toll assets.

Based on a review of the future discounted cash flows of the intangible assets (Toll Collection Rights) held by the subsidiary (NHIPPL), the recoverable amount is higher than the carrying amount of the assets, and accordingly no impairment loss has been recognised in the statement of profit and loss for the year ended March 31, 2023.

*Refer Note 37

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Notes to Consolidated Financial Statements for the year ended March 31, 2023

5: Intangible Assets

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Software	Toll collection rights	Total
Gross Carrying Amount:			
Balance as at April 1, 2021		**7,35,040.00**	**7,35,040.00**
Additions	-	-	-
Less: Disposals		-	-
Balance as at March 31, 2022	-	**7,35,040.00**	**7,35,040.00**
Additions	2.16	2,84,966.66	2,84,968.82
Less: Disposals	-		-
Balance as at March 31, 2023	**2.16**	**10,20,006.66**	**10,20,008.82**
Accumulated Amortization:			
Balance as at April 1, 2021	-		-
Additions		**1,055.61**	**1,055.61**
Less: Disposals			-
Balance as at March 31, 2022	-	**1,055.61**	**1,055.61**
Additions	0.25	17,552.87	**17,553.12**
Less: Disposals	-	-	-
Balance as at March 31, 2023	**0.25**	**18,608.48**	**18,608.73**
Net Carrying Amount			
Balance as at March 31, 2022	-	**7,33,984.39**	**7,33,984.39**
Balance as at March 31, 2023	**1.91**	**10,01,398.18**	**10,01,400.09**

Note:-

1. The project SPV (NHIPPL) has acquired rights for Tolling, Operation, Maintenance and Transfer of five toll road projects for a period of 30 years basis Toll Concession agreements with NHAI, for a consideration of INR 7,350.40 Crore and the same have been recognised as Other Intangible Assets in financial statements. The project SPV (NHIPPL) further acquired rights during the current financial year for Tolling, Operation, Maintenance and Transfer of three additional toll road projects for a period of 20 years basis Toll Concession agreements with NHAI, for a consideration of INR 2,849.66 Crore and the same have been addition in the Other Intangible Assets in financial statements.

2.Toll Collection Rights shall be amortized on the basis of Consumption based model (using Passenger Car Unit (PCU) projections) over the tenure of the Concession Agreement i.e. 30 years and 20 years basis respective concession agreements for those toll road projects.

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6 Other Financial Assets: Non Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Investment in Fixed Deposits		
Fixed Deposits with banks*	9,469.99	3,170.81
Security Deposits	1.60	-
Interest receivable on REF	0.42	
Interest receivable on fixed deposits	185.43	-
Deposit - Debenture Recovery Expense Fund for NCD's	15.00	-
Total	**9,672.44**	**3,170.81**

* The Fixed Deposits are kept in Debt Servicing Reserve Account (DSRA) as per borrowing agreements with lenders and as per terms of the debenture trust deed, to be utilized at the end of tenure of long term borrowings from Senior Lenders and to maintain DSRA balance for Debenture holders, hence classified as Other Financial Assets- Non Current irrespective of date of maturity.

7 Deferred Tax Assets (Net)

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Deferred Tax Assets arising on account of:		
- Expense disallowed as per Income Tax Act, 1961, allowable in future years	0.00	0.03
- Unabsorbed depreciation	72,562.41	23,124.38
Total (A)	72,562.41	**23,124.41**
Deferred Tax Liabilities arising on account of:		
- Difference between book & tax base related to Intangible assets	67,877.09	22,858.70
- Difference between book & tax base related to Investments	-	3.16
- Expense disallowed earlier as per Income Tax Act, 1961, allowed now	-	0.03
Total (B)	67,877.09	**22,861.88**
Net Asset (A) - (B)	**4,685.32**	**262.53**

Reconciliation of Deferred Tax Asset/ (Liabilities)

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Opening Balance - Deferred Tax Asset	262.53	-
Deferred tax income/ (expense) during the period recognised in profit & loss	4,422.79	262.53
Deferred tax income/ (expense) during the period recognised in Other Comprehensive Income	-	-
Closing Balance - Deferred Tax Asset	**4,685.32**	**262.53**

8 Non Current Tax Assets (Net)

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Income tax refundable (net of provision)	12.06	-
Total	**12.06**	-

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9 Trade Receivables: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Considered good-unsecured	350.87	600.47
Trade Receivables - Credit Impaired (unsecured)	59.60	-
	410.47	**600.47**
Less:- Allowances for expected credit loss	(59.60)	-
Total	**350.87**	**600.47**

The receivables are hypothecated by way of first ranking exclusive charge to secure senior lenders and non convertible debenture holders in Trust.

Trade Receivables ageing schedule as on March 31, 2023

Particulars	Outstanding for following period from due date of payment.					
	0-6 Months	6 Month -1 Year	1-2 Years	2-3 Years	More than 3 years	Total
i) Undisputed Trade Receivables - considered good	350.87	-	-	-	-	350.87
ii) Undisputed Trade Receivables - which have significant increase in credit risk	-	-	-	-	-	-
iii) Undisputed Trade Receivables - credit impaired	-	59.60	-	-	-	59.60

Trade Receivables ageing schedule as on March 31, 2022

Particulars	Outstanding for following period from due date of payment.					
	0-6 Months	6 Month - 1 Year	1-2 Years	2-3 Years	More than 3 years	Total
i) Undisputed Trade Receivables - considered good	600.47	-	-	-	-	600.47
ii) Undisputed Trade Receivables - which have significant increase in credit risk	-	-	-	-	-	-
iii) Undisputed Trade Receivables - credit impaired	-	-	-	-	-	-

10 Cash and Cash Equivalents

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Balances with Banks		
In Current Accounts	735.06	1,004.69
In Escrow Accounts	338.04	35.09
Draft in Hand	8.14	-
Cash in Hand	7.93	-
Fixed Deposits (having original maturity of less than 3 months)	10,000.00	4,350.00
SBI Overnight mutual fund	10,034.91	992.16
	21,124.08	**6,381.94**

11 Other Financial Assets: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Security deposits	2.92	-
Interest receivable on Fixed Deposits	3.73	5.28
Others receivables*	290.71	0.10
Total	**297.36**	**5.38**

* These receivables to be recovered from new SPV (NHIT Eastern Projects Private Limited) for expenses incurred on its behalf.

12 Other Current Assets

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Prepaid expenses	592.15	347.29
GST Input	642.12	-
Processing fees paid for undrawn loan	103.49	-
Advance to suppliers	5.59	-
Total	**1,343.35**	**347.29**

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Notes to Consolidated Financial Statements for the year ended March 31, 2023

13 Unit Capital

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2023		As at March 31, 2022	
	No of Units	Amount	No of Units	Amount
Unit Capital*				
Opening balance	59,52,00,000	5,99,442.82	-	-
Add: Units issued during the year	13,12,05,200	1,43,013.67	59,52,00,000	6,01,152.00
Less: Issue expenses (refer note below)	-	(852.17)	-	(1,709.18)
Balance	**72,64,05,200**	**7,41,604.32**	**59,52,00,000**	**5,99,442.82**

* 13,12,05,200 unit issued at Rs 109 per unit and 59,52,00,000 unit issued at Rs 101 per unit.

The Trust offered an issue of 13,12,05,200 units of National Highways Infra Trust ("NHIT") during the current financial year and such units, the "units"), for cash at a price of 109.00 per unit (the "issue price"), aggregating to ` Rs 1,43,013.67 lacs through Institutional and preferential placement in accordance with the Securities and Exchange Board of India (Infrastructure Investment Trust) Regulations, 2014 including the rules, circulars and guidelines issued thereunder. The issue opened on September 30, 2022 and closed on October 03, 2022. The Board of Directors of National Highways Infra Investment Managers Private Limited considered and approved allotment of 13,12,05,200 units to the eligible unitholders of Trust on October 12, 2022.

Issue expenses of Rs 852.17 lakhs (previous year Rs 1,709.18) incurred in connection with issue of units have been reduced from the Unit holders capital in accordance with Ind AS 32 Financial Instruments: Presentation

Rights/ preferences and restrictions attached to Unit Capital

Subject to the provisions of the InvIT Regulations, the indenture of funds, and applicable rules, regulations and guidelines, the rights of the unit holders include:

a) The beneficial interest of each unitholder shall be equal and limited to the proportion of the number of the units held by that unitholder to the total number of units.

b) Right to receive income or distributions with respect to the units held.

c) Right to attend the annual general meeting and other meetings of unit holders of the Trust.

d) Right to vote upon any matters/resolutions proposed in relation to the Trust.

e) Right to receive periodic information having a bearing on the operation or performance of the Trust in accordance with the InvIT

f) Right to apply to the Trust to take up certain issues at meetings for unit holders approval.

g) Right to receive additional information, if any, in accordance with InvIT documents filed with Placement Memorandum.

h) The non-sponsor unit holders ("Eligible Persons") of the Trust are entitled to representation on the Board of Directors of the Investment Manager through appointment of up to two (2) directors ("Non-Sponsor Directors"), provided that no Eligible Person shall have the right to nominate more than one Director at a time for appointment on the Board of Directors.

In accordance with the InvIT Regulations, no unit holders shall enjoy superior voting or any other rights over any other unit holders, and there shall not be multiple classes of units. There shall be only one denomination of units. Not withstanding the above, subordinate units may be issued only to the Sponsor and its Associates, where such subordinate units shall carry only inferior voting or any other rights compare to the other units.

Under the provisions of the InvIT Regulations, not less than ninety percent of the net distributable cash flows of the Trust is required to be distributed to the unitholders, and in accordance with such statutory obligation the Trust has formulated a distribution policy to declare and distribute the distributable cash flows to its unitholders atleast once every financial year as approved by the Board of Directors of the Investment Manager. The distributions made by Trust to its unitholders are based on the Net Distributable Cash Flows (NDCF) of the Trust under the InvIT Regulations and represent repayment of proportionate capital and share of profit. The distribution in proportion to the number of units held by the unitholders. The Trust declares and pays distributions in INR.

Limitation to the Liability of the unit holders

The liability of each unit holders towards the payment of any amount (that may arise in relation to the Trust including any taxes, duties, fines, levies, liabilities, costs or expenses) shall be limited only to the extent of the capital contribution of such unit holders and after such capital contribution shall have been paid in full by the unit holders, the unit holders shall not be obligated to make any further payments.

The unit holders shall not have any personal liability or obligation with respect to the Trust.

Details of Unitholders Holding More Than 5% Units In The Trust

Name of Unitholders	As at March 31, 2023		As at March 31, 2022	
	No of Units	%	No of Units	%
Ontario Limited	18,16,01,300	25.00%	14,88,00,000	25.00%
CPP Investment Board Private Holdings Inc.	18,16,01,300	25.00%	14,88,00,000	25.00%
SBI Balanced Advantage Trust	6,31,60,260	8.69%	5,68,00,000	9.54%
National Highways Authority of India (NHAI)	11,52,02,600	15.86%	9,56,00,000	16.06%

As per records of the Trust, including its register of unitholders and other declaration received from unitholders regarding beneficial interest, the above unitholding represent both legal and beneficial ownership of units.

The Trust has not allotted any fully paid-up units by way of bonus units nor has it bought back any class of units from the date of incorporation till the balance sheet date. Further the Trust has not issued any units for consideration other than cash during the year.

Reconciliation of number of units outstanding is set out below:

Particulars	As at March 31, 2023		As at March 31, 2022	
	No of Units	Amount (amounts in ₹ lakh)*	No of Units	Amount (amounts in ₹ lakh)*
Number of Units at the beginning of the year	59,52,00,000	6,01,152.00	-	-
Units issued during the year	13,12,05,200	1,43,013.67	59,52,00,000	6,01,152.00
Number of Units at the end of the year	72,64,05,200	7,44,165.67	59,52,00,000	6,01,152.00

* Amount related to issue expenses are not deducted in the reconciliation of number of unit capital outstanding.

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Notes to Consolidated Financial Statements for the year ended March 31, 2023

14 Other equity (All amounts in ₹ lakh unless otherwise stated)

Reserves and Surplus	As At March 31, 2023	As At March 31, 2022
Retained Earnings		
Balance at the beginning of the year	**6,768.43**	**(67.90)**
Total comprehensive income for the year	25,689.57	6,836.33
Less:		
Distribution to unit holders^		
Interest	34,183.66	-
Other Income	744.20	-
Balance at the closing of the year	**(2,469.86)**	**6,768.43**

^The distribution relates to the distributions during the financial year along with the distribution related to the last quarter of FY 2021-22 and does not include the distribution relating to the period January 01, 2023 to March 31, 2023 which will be paid after March 31, 2023. The distributions by the Trust to its unit holders are based on the Net Distributable Cash Flows of the Trust under the SEBI InvIT Regulations.

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Notes to Consolidated Financial Statements for the year ended March 31, 2023

15 Borrowings: Non Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Secured		
Non-Convertible Debenture	1,50,000.00	-
Less: Unamortized Borrowing Cost	1,411.80	-
Total (A)	**1,48,588.20**	

Note:- Other terms and conditions of NCD

i) Interest rate	7.90% p.a payable semi annually.
ii) Terms of repayment	Redemption of respective STRPP shall be made in equal instalments i) STRPP A - starting from eigth anniversary of deemed date of allotment till thirteenth anniversary. ii) STRPP-B- starting from thirteenth anniversary of deemed date of allotment till eighteenth anniversary. iii) STRPP-C- starting from eighteenth anniversary of deemed date of allotment till twentyfifth anniversary.

Term Loan:		
From Banks	1,45,987.43	1,46,998.41
	1,45,987.43	1,46,998.41
Less: Current	2,000.00	980.86
Less: Unamortised Borrowing Cost	417.30	460.61
Total (B)	**1,43,570.13**	**1,45,556.94**
Grand Total C = (A+B)	**2,92,158.33**	**1,45,556.94**

Note:- Other terms and conditions of Term Loans

i) Interest rate	Marginal Cost of fund based lending rate (MCLR) plus spread applicable on each reset date.
ii) Terms of repayment	Repayable in unstructured quarterly instalments with last repayment date upto March 31, 2041.

Security for Term Loans :
The loan is secured by,
- first pari passu charge on all immovable assets (if any), movable assets and receivables of the Trust including but not limited to,
(i) the interest and principal repayments on the loans advanced by the Trust to Project SPV
(ii) dividends to be paid by Project SPV to the Trust
- first pari passu Security Interest on Trust Escrow account and all sub-accounts thereunder, including DSRA.
- pledge of 100% equity shares of Project SPV (NHIPPL) in dematerialized form held by the Trust
- assignment of loans advanced by the Trust to Project SPV (NHIPPL) and securities created by the Trust including the assignment of rights of submission, termination and invocation of provision of Escrow agreement in case of default.
- negative lien on immovable assets (including current assets and cash flows) of the Project SPV (NHIPPL) subject to sale of obsolete items or cars/ ambulances, old toll equipment etc., under normal business practice, subject to maximum cumulative value of INR 5 Crore in any financial year.

The senior lenders of the Trust have also been provided with a corporate guarantee from Project SPV (NHIPPL) to guarantee upto the secured obligations of the Trust. The funds have been raised at Trust level from unitholders and domestic lenders, and the same have been lent to Project SPV (NHIPPL) for payment of concession fee by NHIPPL to NHAI. The cashflows viz., toll collections are lying in NHIPPL. Accordingly, corporate guarantee amounting upto the secured obligations of the Trust via Corporate Guarantee Deed dated 14.03.2022, valid across the tenure of the loan of the Trust i.e. up to 31.03.2041, has been provided by the Project SPV (NHIPPL) to the senior lenders of the Trust.

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Nature of Security for Non Convertible debentures:

The debenture holders are secured by :

a) a first ranking pari passu Security Interest over the immovable assets (if any) both present and future. There are no immovable properties at the present time. In the event, the group acquires any immovable property in future, the group shall mortgage said property within 180 (one hundred eighty) days from the date of acquisition of such immovable assets. The Debenture Trustee shall be authorised to do all acts, deeds, and enter into necessary documents, agreement, amendments and/or modifications, as may be required to give effect the same, including carrying out the due diligence as may be required by Debenture Trustee;

b) a first ranking pari passu Security Interest over the Hypothecated Assets (including Receivables), both present and future; and

c) Negative Lien Undertaking;

d) corporate guarantee executed by the Project SPV in favour of the Debenture Trustee for guaranteeing the due repayment of the secured obligations in accordance with the terms in the Debenture Trust Deed.

The non convertible debenture holders of the Trust acting through debenture trustee have also been provided with a corporate guarantee from Project SPV (NHIPPL) to guarantee the repayment of amount raised from non convertible debenture holders by the Trust. The funds have been raised at Trust level from debentureholders, have been lent to Project SPV (NHIPPL) for payment of concession fee by NHIPPL to NHAI. Accordingly, corporate guarantee amounting upto the secured obligations via Corporate Guarantee Deed dated 21.10.2022 is valid till all outstanding principal and accrued interest payable by the Trust are satisfied to the non convertible debenture holders of the Trust.

There have been no breaches in financial covenants with respect to the borrowings from Senior lenders.

16 Provisions: Non Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Provision for employees benefits		
Gratuity (unfunded)	4.41	0.05
Leave Encashment (unfunded)	6.96	0.03
Provision for major maintenance*	6,307.44	403.29
Total	**6,318.81**	**403.37**

Provision for Major Maintenance*

The group is required to operate and maintain the project tollway during the entire concession period and hand over the project back to NHAI as per the maintenance standards prescribed in concession agreements. For this purpose, a regular maintenance along with periodic maintenance is required to be performed. Normally, periodic maintenance includes resurface of pavements, repairs of structures and other equipment and maintenance of service roads. As per industry practice, the periodic maintenance is expected to occur once in five to seven years. The provisions for MMR has been made based on the first cycle of of overlay expected to occur in five to seven years and not based on the total MMR cost over entire concession period as per industry practice. The discounting rate used for arriving at the present value for MMR provisions is government bond rate of 30 years for projects acquired in first phase and 20 years for projects acquired in second phase. The maintenance cost / bituminous overlay may vary based on the actual usage during maintenance period. Accordingly, on the grounds of matching cost concept and based on technical estimates, a provision for major maintenance expense is reviewed and is provided for in the financial statements in each reporting period. Considering that the expense to be incurred is depended on various factors including the usage, wear and tear of the toll road, bituminous overlay, etc., it is not possible to estimate the exact timing and the quantum of the cashflow.

Details of movement in Provisions

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Opening Balance	403.29	-
Add: Accretion during the year	-	403.29
Provision for Major Maintenance Obligation	5,879.20	-
Unwinding finance cost on major maintenance provision	24.95	-
Less: Utilized during the year	-	-
Closing Balance	**6,307.44**	**403.29**

17 Borrowings: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Current Maturities of Long Term borrowings (Refer Note No. 15)	2,000.00	980.86
Total	**2,000.00**	**980.86**

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Notes to Consolidated Financial Statements for the year ended March 31, 2023

18 Trade Payables: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Total outstanding, dues of micro and small enterprises	137.23	-
Total outstanding, dues of creditors other than micro and small enterprises (Outstanding for less than 12 months from the due date of payment)	3,871.18	1,244.79
Total	**4,008.41**	**1,244.79**

Note:-

Details of dues to micro and small enterprises as per MSMED Act, 2006.

The group has certain dues to suppliers registered under Micro, Small and Medium Enterprises Development Act, 2006 ('MSMED Act'). The disclosures pursuant to the said MSMED Act are as follows:

	As At March 31, 2023	As At March 31, 2022
a) The principal amount remaining unpaid to any supplier at the end of the year	137.23	-
b) Interest accrued and due thereon to suppliers under MSMED Act on the above amount remaining unpaid to any supplier at the end of year.	-	-
c) The amount of interest paid by the buyer in terms of section 16 of the MSMED Act, 2006, along with the amount of the payment made to the supplier beyond the appointed day during the year	-	-
d) The amount of interest due and payable for the period of delay in making payment (which have been paid but beyond the appointed day during the year) but without adding the interest specified under the MSMED Act, 2006	-	-
e) The amount of interest accrued and remaining unpaid at the end of each accounting year	-	-
f) The amount of further interest remaining due and payable even in the succeeding years, until such date when the interest dues above are actually paid to the small enterprises, for the purpose of disallowance of a deductible expenditure under section 23 of the MSMED Act, 2006	-	-
Disclosure of payable to vendors as defined under the "Micro, Small and Medium Enterprise Development Act, 2006" is based on the information available with the group regarding the status of registration of such vendors under the said Act, as per the intimation received from them on requests made by the group.	-	-

Trade Payable ageing schedule as at March 31, 2023

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Not due*	Outstanding for following period from due date of payment.				
		Less than 1 Year	1-2 Years	2-3 Years	More than 3 Years	Total
i) MSME	-	137.24	-	-	-	137.24
ii) Others	2,468.10	1,403.08	-	-	-	3,871.18
iii) Disputed dues - MSME	-	-	-	-	-	-
iv) Disputed dues - Others	-	-	-	-	-	-

* Trade Payables include unbilled payables amounting to Rs 2,468.10 Lakh (Previous year: Rs.920.00 Lakh)

Trade Payable ageing schedule as at March 31, 2022

Particulars	Not due*	Outstanding for following period from due date of payment.				
		Less than 1 Year	1-2 Years	2-3 Years	More than 3 Years	Total
i) MSME	-	-	-	-	-	-
ii) Others	920.00	324.79	-	-	-	1,244.79
iii) Disputed dues - MSME	-	-	-	-	-	-
iv) Disputed dues - Others	-	-	-	-	-	-

* Trade Payables include unbilled payables amounting to Rs 920.00 Lakh (Previous year: Rs.Nil Lakh)

** The total outstanding of MSME vendors include Rs 24.72 lacs outstandings which are due for more than 45 days and payments have not been released against these due to queries raised to vendors in respect of these have not been resolved by these vendors.

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19 Other Financial Liabilities: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Interest accrued but not due on NCD	5,129.59	-
Double toll Fee payable to NHAI	151.17	97.85
Security Deposit	4.19	-
Total	**5,284.95**	**97.85**

20 Other Current Liabilities

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Statutory dues payable	226.85	240.75
Unearned Revenue	2.12	-
- Advance received	5.00	-
- Employees payable	6.64	-
Total	**240.61**	**240.75**

21 Provisions: Current

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Provision for Employee Benefits (refer note no 39A)		
Leave Encashment (unfunded)	0.55	0.03
Gratuity (unfunded)	0.01	
Total	**0.56**	**0.03**

22 Current Tax Liabilities (Net)

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Provision for Income Tax	8.98	161.77
Total	**8.98**	**161.77**

Reconciliation of Current Tax Liabilities

Particulars	As At March 31, 2023	As At March 31, 2022
Opening Balance	161.77	-
Add: Income Tax Payable for the year	473.89	436.36
Less: Taxes Paid	626.68	274.59
Closing Balance	**8.98**	**161.77**

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23 Revenue from operations

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Sale of Services		
Revenue from Toll Collection	68,708.93	13,941.94
Other Operative Revenue		
Interest on delay in Toll Remittance	8.27	18.61
Total	**68,717.20**	**13,960.55**

24 Interest income

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
On fixed deposits with banks	373.43	5.86
Total	**373.43**	**5.86**

25 Profit on sale of investments

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Profit on redemption of Mutual Funds	671.17	682.62
Net Gain on fair valuation of investments designated at FVTPL	-	7.38
Total	**671.17**	**690.00**

26 Other Income

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Other non operating income		
Other Income	326.11	318.67
Total	**326.11**	**318.67**

27 Operating Expenses

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Operation and Maintenance Expenses	3,145.85	446.48
Major Maintenance Obligation	5,879.20	403.29
Total	**9,025.05**	**849.77**

28 Employee Benefit Expenses

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Salaries and wages	222.98	1.75
Contribution to provident and other funds (Refer Note 39 (i))	15.27	0.13
Gratuity Expenses (Refer Note 39A)	4.42	0.05
Leave Encashment Expense (Refer Note 39B)	7.51	0.06
Staff Welfare Expenses	46.05	0.13
Director's sitting fees	15.10	
Total	311.33	2.12

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29 Finance Cost

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Interest on Long term borrowings	11,244.91	3,149.19
Interest on Debentures	5,129.59	-
Finance Charges	221.87	5.24
Unwinding finance cost on major maintenance provision	24.95	-
Total	**16,621.32**	**3,154.43**

30 Depreciation and Amortization Expenses

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Depreciation on Property, Plant and Equipment	7.51	0.04
Amortization on Intangible Assets	17,553.12	1,055.61
Total	**17,560.63**	**1,055.65**

31 Other Expenses

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Advertisement expenses	35.75	8.47
Legal and Professional fees	1,542.22	202.56
Travelling and conveyance	19.80	-
Telephone and internet charges	6.58	-
Power and fuel	58.78	-
Environment, health and safety expenses	13.06	-
Fee, subscription & taxes	43.42	291.63
Bank charges	1.53	0.04
Data Management Expenses	3.00	1.31
Provision for expected credit loss	59.60	-
Vehicle hire charges	63.58	-
Repair and maintenance expenses	14.71	-
Miscellaneous expenses	30.03	0.87
Bad Debts Written Off	9.90	
Total	**1,901.95**	**504.87**

32 Audit Fees

Statutory audit fees	4.53	4.57
Limited review fees	2.26	-
Tax audit fees	0.94	0.30
Total	**7.73**	**4.86**
Certification and other charges	0.93	0.52
Total	**0.93**	**0.52**

Further an amount of Rs 6 lakh paid to auditor as certification charges has been booked as part of one time expenses in the Unit Capital. (Refer note no 13)

33 Tax Expense

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Current Tax	473.89	436.36
Provision for Taxation–Earlier years	0	-
		36.36
Deferred tax expense/(credit)	(4,422.79)	(262.32)

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Effective tax Reconciliation:

Numerical reconciliation of tax expense applicable to (profit)/ loss before tax at the latest statutory enacted tax rate in India to income tax expense reported is as follows:

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	As At March 31, 2023	As At March 31, 2022
Accounting Profit before Income Taxes	21,740.68	7,015.74
Tax at India's statutory income tax rate for Companies (25.17%)	(14,086.70)	(2,925.10)
Tax at India's statutory income tax rate for Business Trusts - Maximum Marginal Rate (42.744%)	33,215.05	7,963.95
Increase/ (reduction) in taxes on account of:		
Impact of deferred tax on reversible allowance/ disallowance of business expense and income, as per Indian Income Tax Act, 1961	9,663.91	2,662.78
Impact of exemption u/s 10(23FC) of the Indian Income Tax Act, 1961 available to the Trust	(32,741.15)	(7,542.34)
Provision for interest on delayed deposit of income tax	-	14.75
Income tax expense reported in the statement of profit and loss	**(3,948.89)**	**174.04**

34 Earning per Unit

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Basic and diluted EPU		
Net Profit/ loss available for unitholders (in ₹ lakh)	25,689.57	6,836.33
Weighted average number of units for EPU computation	65,66,68,737.53	59,52,00,000
EPU- Basic and diluted	**3.91**	**1.15**

35 Contingent Liabilities

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Contingent Liabilities:		
Corporate Guarantee issued by the Project SPV (NHIPPL) to the lenders of NHIT	2,00,000.00	2,00,000.00
Corporate Guarantee issued by the Project SPV (NHIPPL) to debenture trustee for debenture holders of NHIT	1,50,000.00	
Total	**3,50,000.00**	**2,00,000.00**

The SPV (NHIPPL) has issued a Corporate Guarantee amounting to INR 2,000 Crore on 14.03.2022 in favour of Security Trustee for the lenders of NHIT as part of debt covenants of the loan received from NHIT, to secure the term loan of INR 2,000 Crore availed by NHIT from external lenders. The Corporate Guarantee is valid across the tenure of the loan till March 31, 2041 till the external loans to the Trust are satisfied

'The SPV(NHIPPL) has issued a Corporate Guarantee amounting to INR 1,500 Crore on October 21, 2022 in favour of debenture trustee for the benefit of debenture holders of NHIT , to secure the Non Convertible debenture borrowings of INR 1,500 Crore availed by NHIT from debenture holders. The Corporate Guarantee is valid across the tenure of the loan till all outstanding principal and accrued interest thereon by the Trust are satisfied.

In previous year, the SPV (NHIPPL) had provided a corporate guarantee for an amount not exceeding INR 2000 crore, to Security Trustee for the lenders of NHIT in respect of the long-term borrowing obtained by the Holding entity. During the year, the Project SPV (NHIPPL) had carried out a fair valuation of said corporate guarantee from an independent external valuer. Basis such valuation report, fair value of corporate guarantee is estimated to Nil.

During the year, the SPV (NHIPPL) have provided a corporate guarantee for an amount not exceeding INR 1500 crores, to Debenture Trustee (for the benefit of the lenders to National Highways Infra Trust ('NHIT'), the Holding entity) in respect of non-convertible debentures obtained by the Holding entity. The Project SPV (NHIPPL) have carried out a fair valuation of said corporate guarantee from an independent external valuer. Basis such valuation report, fair value of corporate guarantee was estimated to Nil.

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36 Disclosure as per Ind AS 115, "Revenue from contracts with customers"

(All amounts in ₹ lakh unless otherwise stated)

1 Disaggregation of revenue

Revenue recognised mainly comprises of revenue from toll collections, claims with NHAI, contract revenue etc. Set out below is the disaggregation of the Trust's revenue from contracts with customers:

Description	As At March 31, 2023	As At March 31, 2022
Operating revenue		
(a) Toll income from Expressway	68,708.93	13,941.94
(b) Interest on delay in Toll Remittance	8.27	18.61
Total revenue	**68,717.20**	**13,960.55**

The table below presents disaggregated revenues from contracts with customers based on nature, amount and timing for the year ended 31 March 2023 and 31 March 2022:

S.No.	Types of Products by Nature	Types of Services by timing	As At March 31, 2023	As At March 31, 2022
1	Toll Income	Over the period of time	68,717.20	13,960.55

2 Assets and liabilities related to contracts with customers

The following table provides information about receivables, contract assets and contract liabilities from contract with customers:

Description	As At March 31, 2023	As At March 31, 2022
	Current	Current
Contract assets		
Trade receivables:		
Receivables under service concession arrangements	350.87	600.47
Total	**350.87**	600.47
Contract liabilities		
Trade Payables	4,008.41	1,244.79
Other Payables	5,284.95	97.85
Total	**9,293.36**	1,342.64

3 Performance obligation

Income from toll collection

The performance obligation in service of toll collection is recorded as per rates notified by NHAI and approved by management and payment is generally due at the time of providing service.

Contract revenue

The performance obligation under service concession agreements ('SCA') is due on completion of work as per terms of SCA.

4 Disclosure under Appendix - C & D to Ind AS 115 - " Service Concession Arrangements"

All the below service concession arrangement have been accounted under intangible asset model

Name of Concessionaire	Start of Concession period under concession agreement (Appointed Date)	End of Concession period under concession agreement	Period of Concession since the appointed date till March 31, 2023 (in days)
National Highways Infra Projects Private Limited	16.12.2021 (Five Projects)	15.12.2051	471
National Highways Infra Projects Private Limited	29.10.2022 (Three Projects)	28.10.2042	154

i) The above TOT projects shall have following rights / obligations in accordance with the Concession Agreement entered into with the respective Government Authorities

a. Right to use the Specified Assets

b. Obligations to provide or rights to except provision of services

c. Obligations to deliver or rights to receive at the end of concession

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37 DISCLOSURES PURSUANT TO IND AS 103 "BUSINESS COMBINATIONS"

(All amounts in ₹ lakh unless otherwise stated)

a) Acquisition of subsidiaries

i) Pursuant to the Share Purchase Agreement dated September 30, 2021, the Trust acquired the entire equity share capital of the the Project SPV (NHIPPL) on December 14, 2021 for an equity consideration of Rs. 1,39,553.52 Lakhs. Accordingly, the financial statements of the subsidiary NHIPPL for the period from December 14, 2021 to March 31.2022 have been considered in the consolidated financial statements of the Trust. Funding for the said acquisition was raised through preferential issue of units of the Trust. The Group has carried out a fair valuation of the net assets of the Project SPV at the time of acquisition and accordingly the goodwill has been recorded in the consolidated financial statements.

ii) **Details of the purchase consideration:**

Particulars	Amount
Cash Consideration	1,29,400.00
Unit capital issued	10.153.52
Total purchase consideration	**1,39,553.52**

The fair value of Rs 139,553.52 lakhs paid for acquisition of the above mentioned project SPVs includes consideration in cash amounting to Rs. 1,294 Crore and consideration in form of issuance of 10.05 Lakh units of Trust at the rate of Rs. 101 per unit. Issue costs of Rs 1.52 Lakh directly attributable to the issue of the units have been added to the purchase consideration.

ii) **Assets acquired and liabilities recognised on the date of acquisition are as follows:**

Particulars	Amount
Non - Current Assets:	
Intangible assets	7,35,040.00
Deferred Tax Assets (net)	0.21
Current Assets:	
Financial Assets	
Cash and Cash Equivalents	10.00
Total Assets	**7,35,050.20**
Current Liabilities:	
Financial liabilities	
Other financial liabilities	7,35,041.12
Other current liabilities	0.02
Total Liabilities	**7,35,041.14**
Net assets acquired	**9.06**

iii) **Calculation of Goodwill / (Capital Reserve)**

Particulars	Amount
Purchase Consideration	1,39,553.52
Less: Fair Value of Net Assets acquired	9.06
Less: Acquisition of fresh issue of shares of NHIPPL by the Trust	1,29,400.00
Goodwill	**10,144.46**

iv) Goodwill on acquisiion has been accounted for under Non Current Assets in the Balance Sheet.

v) **Entity wise Revenue and Profit after tax from the date of acquisition till March 31, 2022:**

Particulars	Amount
Revenue	13,960.55
Profit after Tax	**6,836.33**

vi) **Entity wise Revenue and Profit after tax for the financial year 2020-21**

Particulars	nount
Revenue	-
Profit after Tax	**(67.90)**

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NATIONAL HIGHWAYS INFRA TRUST

Additional disclosure as required by paragraph 6 of Annexure A to the SEBI Circular No. CIR/IMD/DF/127/2016

38 Statement of Related Parties

A. List of Related Parties as per requirement of IND AS 24 – "Related Party Disclosures"

Enterprises where Control / significant influence exists	**National Highways Infra Projects Private Limited (Subsidiary Company)**

B. List of additional related parties as per Regulation 2(1)(zv) of the SEBI InvIT Regulations

Parties to the Trust

National Highways Infra Investment Managers Private Limited (NHIIMPL) - Investment Manager (IM) of the Trust
IDBI Trusteeship Services Limited (ITSL) - Trustee of the Trust
National Highways Authority of India (NHAI)- Sponsor
National Highways InvIT Project Managers Private Limited (NHIPMPL)- Project Manager

Promoters of the Parties to the Trust specified above

Government of India ((acting through Ministry of Road, Transport & Highways (MORTH)) - Promoter of NHIIMPL
IDBI Bank Limited (IDBI Bank) - Promoter of ITSL
Government of India ((acting through Ministry of Road, Transport & Highways (MORTH)) - Promoter of NHAI
National Highways Authority of India (NHAI)- Promoter of NHIPMPL

Directors of the parties to the Trust specified above

Directors of NHIIMPL

Mr. Suresh Krishan Goyal
Mr. Shailendra Narain Roy
Mr. Balasubramanyam Sriram (Ceased to be Director w.e.f. 31.03.2023)
Mr. Mahavir Prasad Sharma
Mr. Pradeep Singh Kharola
Mr. Amit Kumar Ghosh
Mrs. Kavita Saha (Ceased to be Director w.e.f. 29.11.2022, however reappointed on 06.01.2023)
Mr. Bruce Ross Crane (Ceased to be Director w.e.f. 29.11.2022, however reappointed on 06.01.2023)
Mr. N.R.V.V.M.K. Rajendra Kumar
Mr. Vivek Rae (Ceased to be Director w.e.f 12.07.2022)
Mr. Sumit Bose (Appointed w.e.f. 11.01.2023)

Directors of ITSL

Mr. J. Samuel Joseph
Mr. Pradeep Kumar Jain
Ms. Jayashree Ranade
Ms. Madhuri Jayant Kulkarni (Ceased to be Director w.e.f. 06.12.2022)
Ms. Padma Vinod Betai (Ceased to be Director w.e.f. 31.12.2022)
Mr. Pradeep Kumar Malhotra (Appointed w.e.f. 14.12.22)
Ms. Baljinder Kaur Mandal (Appointed w.e.f. 17.01.2023)

Directors of NHIPMPL

Mr. Ashish Asati (Ceased to be Director w.e.f. 28.10.2022)
Mr. Akhil Khare (Appointed w.e.f. 28.10.2022)
Mr. Muralidhara Rao Bugatha (Ceased to be Director w.e.f 17.01.2023)
Mr. Ashish Kumar Singh (Appointed w.e.f. 17.01.2023)

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Additional disclosure as required by paragraph 6 of Annexure A to the SEBI Circular No. CIR/IMD/DF/127/2016

C. Transactions with Related Parties during the year

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
National Highways Infra Investment Managers Private Limited (NHIIMPL)		
Transaction during the year		
Investment Manager Fees	1,491.17	1,931.71
Advance Investment Manager Fees	86.06	-
Reimbursement of Expenses to NHIIMPL	39.79	214.80
National Highways Authority of India (NHAI)		
Transaction during the year		
Reimbursement of Pre-Issue expenses of NHIT by NHAI	-	578.02
Purchase of equity shares of Project SPV (NHIPPL) by the Trust from NHAI	-	10,153.52
Issue of units of Trust to NHAI	21,366.83	96,556.00
Interest and other income distribution	5,589.34	-
O & M Expenses	1,152.32	-
Payment for acquiring intangible assets (Toll)	2,84,966.66	7,35,040.00
Double toll fees	679.17	-
Independent engineers fees	345.38	-
National Highways InvIT Project Managers Private Limited (NHIPMPL)		
Transaction during the year		
Project Manager fees	991.20	290.43
IDBI Trusteeship Services Limited (ITSL)		
Transaction during the year		
Trusteeship Fee	12.73	12.15
Other fees	3.54	-

D. Closing Balance with Related Parties

Particulars	As At March 31, 2023	As At March 31, 2022
National Highways Authority of India (NHAI)		
Balance outstanding at the end of the year		
Issue of units of Trust to NHAI	1,17,922.83	96,556.00
O & M Expenses payable	880.35	-
Double toll fees payable	148.21	-
Independent Engineers Fees payable	276.03	-
National Highways Infra Investment Managers Private Limited (NHIIMPL)		
Balance outstanding at the end of the year		
IM Fees Payable	1.89	-
GST Amount payable	0.48	
National Highways InvIT Project Managers Private Limited (NHIPMPL)		
Balance outstanding at the end of the year		
Project Manager fees Payable	762.50	290.43
IDBI Trusteeship Services Limited		
Balance outstanding at the end of the year		
Initial Settlement Amount	-	0.10
Trusteeship Fee Payable	1.73	2.77

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Additional disclosure as required by paragraph 6 of Annexure A to the SEBI Circular No. CIR/IMD/DF/127/2016

E. Summary of transactions with Key Managerial Personnel (KMP)

For the year ended March 31, 2023 (All amounts in ₹ lakh unless otherwise stated)

	Remuneration					
Details of Key Managerial Personnel	**Sitting Fees**	**Short term employment benefits**	**Post employement benefits**	**Other long term employment benefits**	**Termination benefits**	**Outstanding Loans/Advances /Receivables**
Mr. Suresh Krishan Goyal*	-	0.39	-	-	-	-
Mr. M P Sharma	6.40	-	-	-	-	-
Mr. Shailendra Narain Roy	6.40	-	-	-	-	-
Mr. N.R.V.V.M.K. Rajendra Kumar	-	-	-	-	-	-
Mrs. Ajanta Sen	-	1.84	-	-	-	-
Mrs. Bhanu Sharma (CS)	-	3.83	-	0.08	-	-

* This is reimbursement of expenses.

For the year ended March 31, 2022

	Remuneration					
Details of Key Managerial Personnel	**Sitting Fees**	**Short term employment benefits**	**Post employement benefits**	**Other long term employment benefits**	**Termination benefits**	**Outstanding Loans/Advances /Receivables**
Mr. Suresh Krishan Goyal	-	-	-	-	-	-
Mr. B.M. Rao	-	-	-	-		-
Mrs. Ajanta Sen	-	1.52	-	0.24	-	-

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Notes to the Consolidated Financial Statements for the year ended March 31, 2023

40 Capital Management

For the purpose of the Group's capital management, capital includes issued unit capital and all other reserves attributable to the unit holders of the Group.

The primary objective of the Group's capital management is to ensure that it maintains a strong credit rating and healthy capital ratios in order to support its business and maximise unit holder value.

The Group manages its capital structure and makes adjustments to it in light of changes in economic conditions and the requirements of the financial covenants. To maintain or adjust the capital structure, the Group may adjust the dividend payment / income distribution to unit holders (subject to the provisions of SEBI InvIT Regulations which require distribution of at least 90%of the net distributable cash flows of the Group to unit holders), return capital to unit holders or issue new units. The Group monitors capital using a gearing ratio, which is net debt divided by total capital plus net debt. The Group's policy is to keep the gearing ratio optimum.

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2023	As at March 31, 2022
Net Debt Components:		
Long Term Borrowings (Non-Current portion)	2,92,158.33	1,45,556.94
Current Maturities of Long-Term Borrowings	2,000.00	980.86
Trade Payables	4,008.41	1,244.79
Other financial liabilities	5,284.95	97.85
Less: Cash and Cash Equivalents	(21,124.08)	(6,381.94)
Less: Bank Balances other than cash and cash equivalents	(4,685.32)	(3,170.81)
Net Debt (i)	**2,77,642.28**	**1,38,327.70**
Capital Components:		
Unit Capital	7,41,604.32	5,99,442.82
Initial Settlement Amount	0.10	0.10
Other Equity	(2,469.86)	6,768.43
Total Capital (ii)	**7,39,134.56**	**6,06,211.35**
Capital and Debt [(iii) = (i) + (ii)]	**10,16,776.84**	**7,44,539.04**
Gearing Ratio (i)/(iii)	**27.31%**	**18.58%**

In order to achieve this overall objective, the Board of Directors of Investment Manager, amongst other things, aims to ensure that it meets financial covenants attached to the interest-bearing loans and borrowings that define capital structure requirements. Breaches in meeting the financial covenants would permit the lenders to call loans and borrowings. There have been no breaches in the financial covenants of any interest-bearing loans and borrowing in the current year. No changes were made in the objectives, policies or processes for managing capital during the years ended March 31, 2023 and March 31, 2022.

41 Financial Risk Management Objectives and Policies

The Group is in the process of formulation of its risk management policies with an objective of identification and analysis of risks faced by the Group, to set appropriate risk limits and controls, and to monitor risks and adherence to limits. Risk management policies shall be reviewed regularly to reflect changes in market conditions and the Group's activities.

The Board of Directors of Investment Manager has overall responsibility for the establishment and oversight of the Group's risk management framework.

In performing its operating, investing and financing activities, the Group is exposed to the Credit risk, Liquidity risk and Market risk.

Market Risk

Market risk is the risk that the fair value of future cash flows of a financial instrument will fluctuate because of changes in market prices. Market risk comprises three types of risk: interest rate risk, currency risk and other price risk. Financial instruments affected by market risk include loans and borrowings, Receivable and Payables and Investments measured at FVTPL.

The sensitivity analyses in the following sections relate to the position as at March 31, 2023 and March 31, 2022.

The sensitivity analyses have been prepared on the basis that the amount of net debt, the ratio of fixed to floating interest rates of the debt are all constant.

The following assumptions have been made in calculating the sensitivity analyses:

The sensitivity of the relevant profit or loss item is the effect of the assumed changes in respective market risks. This is based on the financial assets and financial liabilities held at March 31, 2023 & March 31, 2022.

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Foreign Currency Risk

Foreign currency risk is the risk that the fair value or future cash flows of an exposure will fluctuate because of changes in foreign exchange rates. The Group transacts business primarily in Indian Rupees only, and hence, the sensitivity of profit and loss of the Group to a possible change in foreign exchange rates is non-existent as on 31st March, 2023 and 31st March, 2022.

Interest Rate Risk

Interest rate risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market interest rates. Exposure to risk of changes in market interest rates generally relates primarily to long-term debt obligations with floating interest rates.

The following table provides a break-up of the group fixed and floating rate borrowings:

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2023	As at March 31, 2022
Floating Rate Borrowings	1,43,570.13	1,46,537.80

The Group's exposure to interest rate risk due to variable interest rate borrowings is as follows:

Sensitivity analysis based on average outstanding Debt:

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2023	As at March 31, 2022
Increase or decrease in interest rate by 25 basis points	358.93	388.94

Price Risk

Price risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market prices (other than those arising from interest rate risk or currency risk).

Credit risk

Credit risk is the risk that counterparty will not meet its obligations under a financial instrument or customer contract, leading to a financial loss. With respect to credit risk arising from other financial assets of the Group, which comprise Balances with banks, Trade Receivables, Loans and Advances and Investments. The Group's exposure to credit risk arises from default of the counterparty, with maximum exposure equal to the carrying amount of these instrument.

The carrying value of financial assets represents the maximum credit risk. The maximum exposure to credit risk was Rs. 31,444.75 Lakh and Rs. 10,158.59 Lakh as at March 31, 2022 respectively, being the total carrying value of Loans and Advances, Trade receivables, Investments, Balances with bank, bank deposits and other financial assets.

Liquidity Risk

Liquidity risk is the risk that an entity will encounter difficulty in meeting obligations associated with financial liabilities that are settled by delivering cash or another financial assets.

The Group is exposed to liquidity risk due to bank borrowings and trade and other payables.

The Group measures risk by forecasting cash flows.

The Group's approach to managing liquidity is to ensure, as far as possible, that it will always have sufficient liquidity to meet its liabilities when due without incurring unacceptable losses or risking damage to the Group's reputation. The Group ensures that it has sufficient funds to meet expected operational expenses, servicing of financial obligations.

In addition, processes and policies related to such risk are overseen by senior management. Management monitors the Group's net liquidity position through rolling forecast on the basis of expected cash flows.

The table below summarises the maturity profile of the group's financial liabilities based on contractual undiscounted payments.

(All amounts in ₹ lakh unless otherwise stated)

As at 31-03-2023	Carrying Amo	<1 Yr.	1-3 Yrs.	>3 Yrs.
Borrowings	2,94,158.33	2,000.00	6,000.00	2,86,158.33
Trade Payables	4,008.41	4,008.41	-	-
Other Financial Liabilities	5,284.95	5,284.95	-	-
Total	**3,03,451.68**	**11,293.36**	**6,000.00**	**2,86,158.33**

As at 31-03-2022	Carrying	<1 Yr.	1-3 Yrs.	>3 Yrs.
Borrowings	1,46,537.80	1,000.00	8,000.00	1,37,537.80
Trade Payables	1,244.79	1,244.79	-	-
Other Financial Liabilities	97.85	97.85	-	-
Total	**1,47,880.44**	**2,342.64**	**8,000.00**	**1,37,537.80**

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Notes to the Consolidated Financial Statements for the year ended March 31, 2023

42 Disclosure pursuant to IND AS 36 "Impairment of Assets"

Based on impairment testing done which involves review of the future discounted cash flows of the subsidiary, the recoverable amount is higher than the carrying amount of the investment made in the subsidiary and accordingly, no provision for impairment is required to be recognised in the books as on the reporting date. In case of goodwill based on impairment testing recoverable amount is higher then the carrying value as on the reporting date, hence no provision for impairment is required to be recognised in the books as on reporting date.

43 Disclosure of Financial Instruments by Category

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2023			As at March 31, 2022		
	Amortized Cost	FTVPL		Amortized Cost	FTVPL	
		At Cost	At Fair Value		At Cost	At Fair Value
Assets:						
Cash and Cash Equivalents	21,124.08	-	-	6,381.94	-	-
Trade Receivables	350.87	-	-	600.47	-	-
Other Financial Assets	9,969.80	-	-	3,176.18	-	-
Total	**31,444.75**	-	-	**10,158.59**	-	-
Liabilities:						
Borrowings	2,94,158.33	-	-	1,46,537.80	-	-
Trade Payables	4,008.41	-	-	1,244.79	-	-
Other Financial Liabilities	5,284.95	-	-	97.85	-	-
Total	**3,03,451.68**	-	-	**1,47,880.44**	-	-

Defaults and Breaches

There are no defaults during the year with respect to repayment of principal and payment of interest and no breaches of the terms and conditions of the borrowings.

There are no breaches during the year which permitted lender to demand accelerated payment

44 Fair Values of Assets and Liabilities

The carrying amount of all financial assets and liabilities appearing in the financial statements is reasonable approximation of fair values. Fair value of the financial assets and liabilities is the amount at which the instrument could be exchanged in a current transaction between willing parties, other than in a forced or liquidation sale.

The Group is required to present the Statement of total assets at fair value and Statement of total returns at fair value as per SEBI Circular No. CIR/IMD/DF/114/2016 dated October 20, 2016 as a part of these financial statements - Refer Statement of Net assets at fair value and Statement of Total Returns at fair value.

45 Fair Value Hierarchy

All financial instruments for which fair value is recognised or disclosed are categorised within the fair value hierarchy described as follows, based on the lowest level input that is significant to the fair value measurement as a whole.

Level 1 - Quoted prices (unadjusted) in active markets for identical assets or liabilities.

Level 2 – Inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly (i.e. as prices) or indirectly (i.e. derived from prices).

Level 3 - Inputs for the assets or liabilities that are not based on observable market data (unobservable inputs).

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Class wise composition and comparison of carrying amounts and fair values of financial assets and liabilities that are recognised in the financial statements along with Fair Value Hierarchy details are given below:

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Fair Value Hierarchy Level	Carrying Value		Fair Value	
		As at March 31, 2023	As at March 31, 2022	As at March 31, 2023	As at March 31, 2022
Financial Assets at Amortized Cost:					
Cash and Cash Equivalents	Level 3	21,124.08	6,381.94	21,124.08	6,381.94
Trade Receivables	Level 3	350.87	600.47	350.87	600.47
Other Financial Assets	Level 3	9,969.80	3,176.18	9,969.80	3,176.18
Total		**31,444.75**	**10,158.59**	**31,444.75**	**10,158.59**
Financial Liabilities at Amortized Cost:					
Borrowings	Level 3	2,94,158.33	1,46,537.80	2,94,158.33	1,46,537.80
Trade Payables	Level 3	4,008.41	1,244.79	4,008.41	1,244.79
Other Financial Liabilities	Level 3	5,284.95	97.85	5,284.95	97.85
Total		**3,03,451.68**	**1,47,880.44**	**3,03,451.68**	**1,47,880.44**

There is one transfer during the year from Level 1 to Level 3 for Investment in Mutual Funds as these have been been grouped into cash and cash equivalents

The policy of the Group is to recognise transfers into and transfer out of fair values hierarchy levels as at the end of the reporting period.

Valuation technique and inputs used to determine fair value

Financial assets and liabilities	Valuation method	Inputs
Financial assets		
Investments in equity shares of subsidiaries	Income	Cash Flow
Loans	Income	Effective Rate of Interest
Financial liabilities		
Term loans from Bank	Income	Effective Rate of Borrowings
Non-Convertible Debentures	Income	Effective Rate of Borrowings

46 Disclosure of segment information pursuant to IND AS 108 "Operating Segments"

The activities of the Group mainly include investing in infrastructure assets primarily in the SPVs operating in the road sector to generate cash flows for distribution to unit holders. Based on the guiding principles given in Ind AS - 108 "Operating Segments", this activity falls within a single operating segment. Further, the entire operations of the Group are only in India and hence, disclosure of secondary / geographical segment information does not arise. Accordingly, requirement of providing disclosures under Ind AS 108 does not arise.

47 Disclosure pursuant to IND AS 23 "Borrowing Costs"

Borrowing cost capitalised during the year Rs. Nil [March 31, 2022: Rs. Nil]

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48 Details of Project Management Fees and Investment Management Fees

Details of fees paid to project manager and investment manager as required pursuant to SEBI Circular No. CIR/MD/DF/127/2016, dated November 29, 2016 are as under:

Project Management Fees

The project manager National Highways InVIT Project Managers Private Limited ('NHIPMPL') for initial portolio of assets and assets acquired in current financial year is entitled to fixed fees of Rs 991.20 lakh per annum (Previous year Rs 290.43 lakh) inclusive of taxes.The same is based on the Project Implementation and Management Agreement (PIMA) signed by both the parties dated 30th March, 2021.

Investment Management Fees

i) The investment manager's fee will initially be Rs. 1,100 Lakh (Rupees Eleven Hundred Lakh) per annum, exclusive of applicable taxes as per agreement dated 21st October, 2020.

ii) The investment manager's fee set out in above shall be subject to escalation on an annual basis at the rate of 10% of the management fee for the previous year.

iii) Any applicable taxes, cess or charges shall be in addition to the investment manager's fee and shall be payable by National Highways Infra Trust (NHIT) to the Investment Manager (NHIIMPL).

iv) The payment of investment manager's fee shall be made by National Highways Infra Trust (NHIT) to the investment manager (NHIIMPL) in advance on a quarterly basis.

49 Significant accounting judgements, estimates and assumptions

The preparation of the Group's financial statements requires management to make judgements, estimates and assumptions that affect the reported amounts of revenues, expenses, assets and liabilities, and the accompanying disclosures, and the disclosure of contingent liabilities. Uncertainty about these assumptions and estimates could result in outcomes that require a material adjustment to the carrying amount of assets or liabilities affected in future periods.

Judgements

In the process of applying the Group's accounting policies, management has made the following judgments, apart from those involving estimations, which have the most significant effect on the amounts recognised in the financial statements:

Classification of unit holders Funds

Under the provisions of the SEBI InvIT Regulations, the Trust is required to distribute to its Unit holders not less than ninety percent of the net distributable cash flows of the Trust for each financial year. Accordingly, a portion of the unit holders' funds contain a contractual obligation of the Trust to pay to its Unit holders cash distributions.

The Unit holder's funds could therefore have been classified as compound financial instrument which contain both equity and debt components in accordance with Ind AS 32 'Financial Instruments: Presentation'. However, in accordance with SEBI Circulars (Circular no. CIR/IMD/DF/114/2016 dated October 20, 2016 and No. CIR/IMD/ DF/127/2016 dated November 29, 2016) issued under the SEBI InvIT Regulations, the unit holders' funds have been classified as equity in order to comply with the mandatory requirements of Section H of Annexure A to the SEBI Circular dated October 20, 2016 dealing with the minimum disclosures for key financial statements. In line with the above, the income distribution payable to unit holders is recognized as liability when the same is approved by Board of Directors of the Investment Manager.

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Fair valuation and disclosures

SEBI Circulars issued under the SEBI InvIT Regulations requires disclosures relating to net assets at fair value and total returns at fair value. In estimating the fair value of investments in subsidiaries (which constitute substantial portion of the net assets), the Group engages independent qualified external valuers to perform the valuation. The Investment Manager works closely with the valuers to establish the appropriate valuation techniques and inputs to the model. The valuation report and findings are discussed at the meeting of the Board of Directors on yearly basis to understand the changes in the fair value of the subsidiaries. The inputs to the valuation models are taken from observable markets, where possible, but where this is not feasible, a degree of judgement is required in establishing fair values. Judgements include considerations of inputs such as weighted average cost of capital, tax rates, inflation rates etc. Changes in assumptions about these factors could affect the fair value.

Taxes

In accordance with section 10 (23FC) of the Income Tax Act, 1961, the income of business groups in the form of interest received or receivable from subsidiaries is exempt from tax. Accordingly, the Group is not required to provide any current tax liability. Further, deferred tax asset on carry forward losses is not created since there is no reasonable certainty of reversal of the same in the near future.

Defined benefit plans (gratuity benefits)

A liability in respect of defined benefit plans is recognised in the balance sheet and is measured as the present value of the defined benefit obligation at the reporting date. The present value of the defined benefit obligation is based on expected future payments at the reporting date, calculated annually by independent actuaries. Consideration is given to expected future salary levels, experience of employee departures and periods of service.

Impairment of intangible assets

Impairment exists when the carrying value of an asset or cash generating unit exceeds its recoverable amount, which is the higher of its fair value less costs of disposal and its value in use. The recoverable amounts for the intangible assets are based on value in use of the underlying projects. The value in use calculation is based on a DCF model. The cash flows are derived from budgets/ forecasts over the life of the projects.

Major Maintenance Expenses / Resurfacing Expenses

As per industry practice, the Project SPV (NHIPPL) is required to carry out resurfacing of the roads under the Concession. For this purpose, a regular maintenance along with periodic maintenances is required to be performed. Normally, periodic maintenance includes resurface of pavements, repairs of structures and other equipment and maintenance of service roads. The maintenance cost / bituminous overlay may vary based on the actual usage during maintenance period. Accordingly, on the grounds of matching cost concept and based on technical estimates, a provision for major maintenance expenses is reviewed and is provided for in the accounts annually.

The provisions for MMR as per industry practice has been made based on the first cycle of of overlay expected to occur in five to seven years and not based on the total MMR cost over entire concession period. The discounting rate used for arriving at the present value for MMR provisions is government bond rate of 30 years for projects acquired in first phase and 20 years for projects acquired in second phase.

Expected Credit Loss on financial assets

As per Ind AS 109, Financial Assets that are measured at amortised cost are required to compute the Expected Credit Loss (ECL). As at the reporting period, Investment manager of the Group assessed the credit risk of the financial assets and concluded that no provision for ECL is required.

50 Other Statutory information

i) The Group have not traded or invested in Crypto currency or Virtual Currency during the financial year.

ii) The Group does not hold benami property and no proceedings under benami transaction (Prohibition) Act 1988 have been initiated against the Group.

iii) The Group do not have any transactions with companies struck off.

iv) The Group have not any such transaction which is not recorded in the books of accounts that has been surrendered or disclosed as income during the year in the tax assessments under the Income Tax Act, 1961 (such as search or surveyor any other relevant provisions of the Income Tax Act, 1961).

v) The Group have not received any fund from any person(s) or entity(ies), including foreign entities (Funding Party) with the understanding (whether recorded in writing or otherwise) that the Group shall:

(a) directly or indirectly lend or invest in other persons or entities identified in any manner whatsoever by or on behalf of the Funding Party (Ultimate Beneficiaries) or

(b) provide any guarantee, security or the like on behalf of the Ultimate Beneficiaries.

vi) The Group have not advance or loaned or invested (either from borrowed fund or share premium or any other source or kind of fund) by the company to or in any person(s) or entity(ies), including foreign entities (Funding Party) with the understanding (whether recorded in writing or otherwise) that the Group shall:

(a) directly or indirectly lend or invest in other persons or entities identified in any manner whatsoever by or on behalf of the Group (Ultimate Beneficiaries) or

(b) provide any guarantee, security or the like on behalf of the Ultimate Beneficiaries.

vii) The Group did not have any long-term contracts including derivative contract for which there were any material foreseeable losses.

viii) The Group has not declared a wilful defaulter by any bank financial institution or any other lender during the year.

51 Subsequent Events

The Board of Directors of the Investment Manager has declared distribution for Quarter 4 FY 22-23 of Rs. 1.6035 per unit was made which comprised of Rs. 1.5778 per unit as interest and Rs 0.0257 per unit as other income on surplus funds at Trust level in their meeting held on 22nd May 2023 to be paid on or before 15 days from the date of declaration.

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52 Capital and Other Commitments

There are no capital and other commitments as at March 31, 2023 (March 31, 2022: Rs. Nil)

53 Distributions Made

(All amounts in ₹ lakh unless otherwise stated)

Particulars	FY 2022-23	FY 2021-22
Interest (Return on capital)	29,985.39	4,198.27
Return of capital	-	-
Dividend	-	-
Other income on surplus fund at Group	240.39	503.81
Total	**30,225.78**	**4,702.08**

54 Reconciliation of Financing Activities in Cash Flow Statement

Net Debt Reconciliation

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2023 (Long Term Borrowing)	As at March 31, 2022 (Long Term Borrowing)
a) Carrying amount of debt at the beginning of the year/period	1,46,537.80	-
b) Additional borrowings during the year/period	1,50,000.00	1,48,000.00
c) Repayments during the year/period	(1,010.98)	(1,001.59)
d) Other adjustments/settlements during the year/period	-	-
- Impact in equity	-	
- Transaction Costs	(1,432.55)	(472.00)
- Unwinding of interest	64.06	11.39
Carrying amount of debt at the end of the year/period	**2,94,158.33**	**1,46,537.80**

55 Additional Regulatory Information

Financial Ratios as on March 31, 2023 and March 31, 2022

S. No.	Particulars	As at March 31, 2023	As at March 31, 2022
1	Current Asset ratio (Current Assets /Current Liability)	2.00	2.69
2	Debt- Equity ratio (Debt/ Equity)	0.40	0.24
3	Debt service coverage ratio (Net Operating Cash flow/ Debt Service Obligation)	4.60	2.58
4	Interest service coverage ratio (EBIT/Finance Cost)	2.31	3.22
5	Networth (Unit Capital + Other Equity)	7,39,134.56	6,06,211.35
6	Asset Cover Ratio	3.21	-
7	Return on Equity (ROE ratio) (Net Profit/ Equity)	3.48%	1.13%
8	Total Debt to total assets	0.28	0.19
9	Net profit after tax	25,689.57	6,836.33
10	Outstanding redeemable preference shares (quantity and value) :	-	-
11	Capital redemption reserve/debenture redemption reserve :	-	-
12	Long term debt to working capital	25.25	31.58
13	Earning per unit	3.91	1.15
14	Inventory turnover ratio	-	-
15	Trade receivable turnover ratio	36.12	46.50
16	Trade payable turnover ratio	0.86	1.37
17	Bad debt to account receivable ratio	-	-
18	Net Capital turnover ratio (Total Income / Net Working Capital)	6.06	3.25
19	Operating margin %	79.39%	73.11%
20	Net profit after tax ratio (Net profit / Total Income)	36.65%	45.65%
21	Return on capital employed ratio ((Net Profit plus Finance Cost)/ (Equity + Debt))	4.09%	1.35%
22	Return on investment (Income on Investment / Average Cost of Investment)	6.07%	15.69%

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56 Disclosure pursuant to IND AS 33 "Earnings per Unit"

Basic and Diluted Earnings per Unit (EPU) computed in accordance with Ind AS 33 "Earnings per Share":

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at March 31, 2023	As at March 31, 2022
Basic and Diluted		
Profit attributable to unit holders of the Fund (A)	25,689.57	6,836.33
Weighted average number of units (B)	6,566.69	5,952.00
Earnings Per Unit (In Rs.) (A/B)	**3.91**	**1.15**

1312.052 lakh units issued at Rs 109 per unit and 5952 lakh unit capital issued at Rs 101

57 The Code on Social Security, 2020 ('Code') relating to employee benefits during employment and post-employment benefits received Presidential assent in September 2020. The Code has been published in the Gazette of India. However, the date on which the Code will come into effect has not been notified The Group will assess the impact of the Code when it comes into effect and will record any related impact in the period the Code becomes effective.

58 Financial Information of Investment Manager

The summary financials of Investment Manager are not disclosed alongwith these financials as its networth is not materially eroded.

59 Withholding Tax liability for interest accrued but not due on non convertible debentures

The Trust has issued publicly listed non convertible debentures ("NCDs") with interest payable on semi-annual basis. Interest on these NCDs was due for payment on 25 April 2023 and for the purpose of payment of interest, record date was 10 April 2023 and debenture-holders existing as on 10 April 2023 are entitled to the coupon interest. Trust has recorded liability of interest accrued till 31st March 2023 and there is no credit in favour of any payee at the time of creating such provision as entitled payee will be identifiable as on record date i.e., on 10 April 2023.

As on the year end March 2023, there is uncertainty with respect to the ultimate recipient of interest income, and such uncertainty would only become clear on the record date i.e., 10 April 2023 when the obligation of payment of interest by NHIT arises and therefore Trust has not withheld any taxes at the time of creating these provisions.

60 Salient aspects of the Tolling Concession Arrangement

The Project SPV (NHIPPL) has entered into five concession agreements with National Highway Authority of India ("NHAI") on March 30, 2021 for Tolling, Management, Maintenance and Transfer of five toll road projects for a period of 30 years from the Appointed Date. The Appointed Date has commenced on 16.12.2021. The toll roads covered under the concession agreement as follows:

- Palanpur/ Khemana – Abu Road Project on NH-27 with total length of 45 kms, connecting the states of Gujrat and Rajasthan
- Abu Road- Swaroopganj Project on NH-27 with total length of 31 kms, in the state of Rajasthan
- Maharashtra Karnataka Border (Kagal) – Belgaum Project on NH-48 with a length of 77.7 Kms, connecting the states of Karnataka and Maharashtra
- Chitorgarh- Kota & Chittorgarh Project on NH-27 with total length of 160.5 Kms, in the state of Rajasthan
- Kothakota Bypass- Kurnool Highway Project on NH-44 with total length of 74.6 Kms, connecting the states of Telangana and Andhra Pradesh

The project SPV (NHIPPL) acquired rights for Tolling, Management and Maintenance of the five toll roads under the concession agreement for consideration of INR 7,350.40 Crore, and the rights have been recognized in the financial statements as Intangible Assets.

In current financial year, the project SPV (NHIPPL) entered into three new concession agreements with National Highway Authority of India ("NHAI") on September 26, 2022 for Tolling, Management, Maintenance and Transfer of three toll road projects for a period of 20 years from the Appointed Date. The Appointed Date has commenced on 29.10.2022. The toll roads covered under the concession agreement as follows:

- Agra bypass Section (from km 0.000 to km 32.800) of NH-19 in the state of Uttar Pradesh
- Borkhedi-Wadner-Deodhari-Kelapur Section (from km 36.600 to km 175.000) of NH-44 in the state of Maharashtra
- Shivpuri – Jhansi Section (from km 1305.087 to km 1380.387) of NH-27 in the states of Madhya Pradesh and Uttar Pradesh.

The project SPV (NHIPPL) has acquired rights for Tolling, Management and Maintenance of these three toll roads at a consideration of INR 2,849.66 Crore, and the rights have been recognized in the financial statements as Intangible Assets.

The project SPV (NHIPPL) is required to operate and maintain the Project/ Project Facilities in accordance with the provision of the Agreement, Applicable Laws and Applicable permits.

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61 Disclosures as per Ind AS 37 "Provisions, Contingent Liabilities and Contingent assets"

a) Nature of provisions

The project SPV (NHIPPL)is required to operate and maintain the project tollway during the entire concession period and hand over the project back to NHAI as per the maintenance standards prescribed in concession agreements. For this purpose, a regular maintenance along with periodic maintenance is required to be performed. Normally, periodic maintenance includes resurface of pavements, repairs of structures and other equipment and maintenance of service roads. As per industry practice, the periodic maintenance is expected to occur once in five to seven years. The provisions for MMR as per industry practice has been made based on the first cycle of of overlay expected to occur in five to seven years and not based on the total MMR cost over entire concession period. The discounting rate used for arriving at the present value for MMR provisions is government bond rate of 30 years for projects acquired in first phase and 20 years for projects acquired in second phase. The maintenance cost / bituminous overlay may vary based on the actual usage during maintenance period. Accordingly, on the grounds of matching cost concept and based on technical estimates, a provision for major maintenance expense is reviewed and is provided for in the financial statements in each reporting period. Considering that the expense to be incurred is depended on various factors including the usage, wear and tear of the toll road, bituminous overlay, etc., it is not possible to estimate the exact timing and the quantum of the cashflow.

62 Assets pledged as security

Under security provisions for external lenders, the shares of project SPV i.e. NHIPPL held by NHIT (Trust) are pledged to external lenders to Trust. Whereas the loans provided by Trust to NHIPPL is assigned to the external lenders. Also it may be noted that the shares are not pledged to debenture holders. The carrying amounts of assets pledged as security for current and non current borrowings are :

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As At March 31, 2023	As At March 31, 2022
Current		
Financial assets		
First Charge		
Trade receivables	350.87	600.47
Cash and cash equivalents	21,124.08	6,381.94
Other financial assets	297.36	5.38
Non Financial assets	-	-
First Charge	-	-
Other current assets	1,343.35	347.29
Total current assets pledged as	**23,115.65**	**7,335.07**
Non Current		
Other financial assets	9,672.44	3,170.81
Non -current tax assets (Net)	12.06	-
Total non current assets	9,684.50	3,170.81
Total assets pledged as security	**32,800.16**	**10,505.88**

63 Key sources of estimation

The preparation of financial statements in conformity with Ind AS requires the Group makes estimates and assumptions that affect the reported amounts of income and expenses of the period, the reported balances of assets and liabilities and the disclosures relating to contingent liabilities as of the date of the financial statements. The estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates include allowance for doubtful loans /other receivables, fair value measurement etc. Difference, if any, between the actual results and estimates is recognised in the period in which the results are known.

64 Previous Year Figures

Previous year's numbers have been regrouped / reclassified, wherever necessary to conform to current year's classification.

For A.R. & Co.
Chartered Accountants

Firm Registration no. 002744C

A.R. & Co. FRN 002744 C CHARTERED ACCOUNTANTS

CA Kailash Chand Gupta
Partner
M.No.085003
Date : 22.05.2023
Place: New Delhi

For and on behalf Board of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

ANNEXURE B

VALUATION REPORTS

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Ernst & Young Merchant Banking Services LLP
Registered Valuer
Registration No. IBBI/RV-E/05/2021/155
14th Floor, The Ruby,
29 Senapati Bapat Marg,
Dadar West,
Mumbai - 400 028, India

Tel: +91 22 61920000
Fax: +91 22 61920000
ey.com

28 February 2025

To,

National Highways Infra Investment Managers Private Limited
G-5 & 6, Sector-10, Dwarka
Delhi, 110075

Re: Report on Valuation of the Specified Asset for National Highways Infra Trust as at 28 February 2025 as per Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014, as amended ("SEBI InvIT Regulations")

Dear Sir/Madam,

In accordance with instructions of National Highways Infra Investment Managers Private Limited ("Client" or "you" or "NHIIMPL" or "Investment Manager") on behalf of National Highways Infra Trust ("NHIT" or "InvIT" or the "Trust"), Ernst & Young Merchant Banking Services LLP ("EYMBSLLP") have performed the work set out in our Letter of Award dated 09 August 2024 ("Engagement Agreement"). We are pleased to present the following report ("Report") in connection with the Enterprise Valuation of the Specified Asset (defined later on page 5) ("Specified Asset" or "InvIT Asset" or "SPV") as at 28 February 2025 ("Valuation Date").

It may be noted that for carrying out the valuation, we have relied upon information provided by the management of NHIIMPL and NHIT (the "Management"). We have been given to understand that the information provided is correct and accurate and that the Management was duly authorized to provide us the same.

Purpose of our Report and restrictions on its use

EYMBSLLP has been appointed by National Highways Infra Investment Managers Private Limited as an independent valuer as per Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014, as amended and the circulars, notifications and guidelines issued thereunder ("SEBI InvIT Regulations"), to undertake an independent Enterprise Valuation of the Specified Asset for NHIT (defined later on page 5) ("Specified Asset" or "InvIT Asset" or "SPV") as on 28 February 2025 for their internal management analysis, disclosure to unit holders and regulatory filings under Chapter V Regulation 21(4) and Regulation 21(5) of the SEBI InvIT Regulations ("Purpose"). This Report was prepared solely for the above Purpose and should not be used or relied upon for any other purpose.

We accept no responsibility or liability to any person other than to the Client, or to such party to whom we have agreed in writing to accept a duty of care in respect of the Report, and accordingly if such other persons choose to rely upon any of the contents of the Report, they do so at their own risk.

Nature and scope of the services

The nature and scope of the services, including the basis and limitations, are detailed in the Engagement Agreement. The contents of our Report have been reviewed by the Client, who have confirmed to us the factual accuracy of the Report.

Whilst each part of our Report may address various aspects of the work we have agreed to perform, the

entire Report should be read for a full understanding of our findings and advice.

Please note that the Report must be read in conjunction with the Statement of limiting conditions contained in Section 4 of this Report. This letter, the Report and the summary of valuation included herein can be provided to the Trust's advisors and may be made available for the inspection to the public and with the SEBI, the stock exchanges and any other regulatory and supervisory authority, as may be required in connection with the specified Purpose. The valuation analysis should not be construed as an investment advice; specifically, EYMBSLLP does not express any opinion on the suitability or otherwise of entering into any financial or other transaction with the Trust.

The valuation conclusion included here-in, and the Report complies with the SEBI InvIT Regulations and guidelines, circular or notification issued by Securities and Exchange Board of India ("SEBI") thereunder.

This letter should be read in conjunction with the attached Report.

Yours faithfully,



Nilesh Jain
Partner
Membership No. IBBI/RV/05/2024/15540
Ernst & Young Merchant Banking Services LLP
Registration No. IBBI/RV-E/05/2021/155
LLPIN: AAO-2287

Date: 28 February 2025
Report No. EYMBS/RV/2024-25/148

Building a better working world

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I. Executive Summary

National Highways Infra Trust ("NHIT" or "InvIT" or the "Trust") is registered as an infrastructure investment trust with Securities and Exchange Board of India ("SEBI") pursuant to the SEBI (Infrastructure Investment Trusts) Regulations, 2014, as amended ("the SEBI InvIT Regulations"). It was registered on October 28, 2020 [Registration No.: IN/InvIT/20-21/0014].

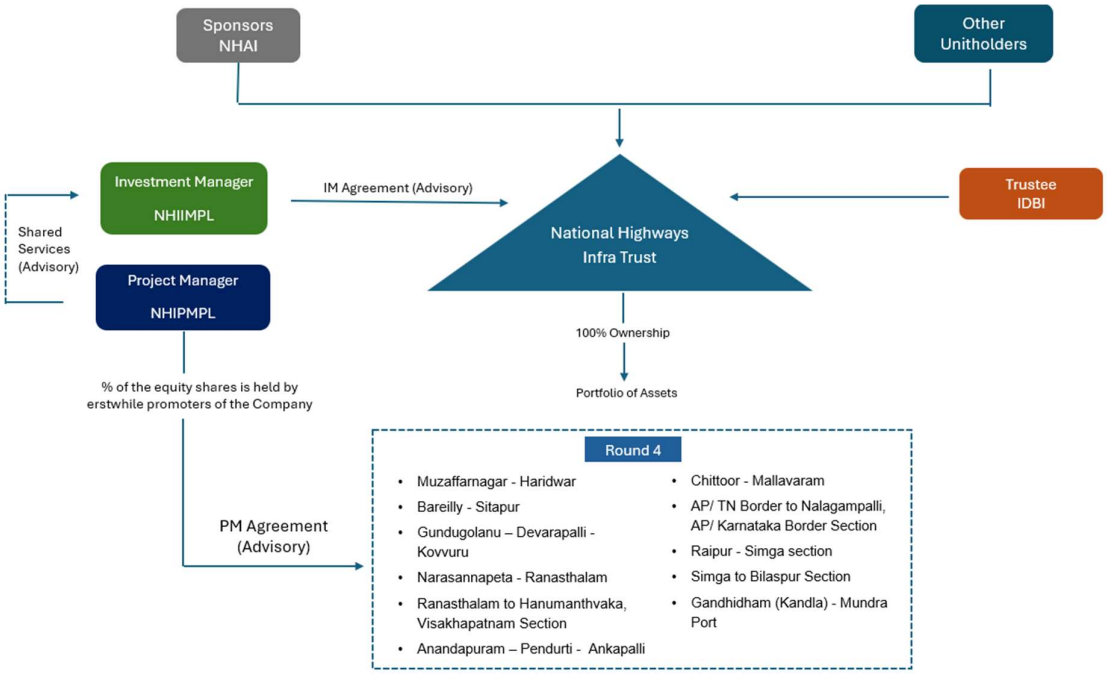
National Highways Infra Investment Managers Private Limited ("NHIIMPL" or "Investment Manager") acts as the investment manager to the Trust. NHIIMPL is a private limited company incorporated on 25 July 2020 under the Companies Act, 2013 and is a wholly owned subsidiary of the Government of India acting through the Ministry of Road Transport & Highways (MoRTH).

National Highways Authority of India ("NHAI" or "Sponsor") acts as the sponsor to the Trust. NHAI was set up by an act of the Parliament, NHAI Act, 1988 "An Act to provide for the constitution of an Authority for the development, maintenance and management of national highways and for matter connected therewith or incidental thereto".

IDBI Trustee Services Limited ("IDBI" or "Trustee") acts as the trustee to the Trust. IDBI holds registration under SEBI regulations as a debenture trustee. IDBI was jointly established by IDBI Bank, LIC, and GIC to provide corporate and other trusteeship services and is located in Mumbai, India.

National Highways Infra Project Managers Private Limited ("NHIPMPL" or "Project Manager") was incorporated as a private limited company on 9 March 2021 under the Companies Act 2013. The Project Manager is a wholly owned subsidiary of NHAI and undertakes operations and maintenance of the Specified Assets, including making arrangements for maintenance of the assets held by the Trust.

The following chart represents the structure of the Trust:



Source: About us - National Highways Infra Trust

We understand that NHIT is proposing to acquire Round 4 Assets ("R4" or "InvIT Asset" or "SPV" or "Specified Asset") have an aggregate length of ~819 kms (5,444 lane kms) spread across 5 states from NHAI in a related party transaction ("Proposed Transaction"). In this regard, valuation of the Specified Assets is required as at Valuation Date for internal management analysis, disclosures to unit holders if required, any corporate action and/or regulatory filings as per SEBI InvIT Regulations ("Purpose").

R4 has entered into concession agreements with NHAI to operate, maintain and transfer seven toll road projects, under the Toll, Operate and Transfer ("TOT") model (together referred to as the "R4 Projects" and individually referred to as the "Project").

The following is the list of the R4 Projects:

1. Muzaffarnagar- Haridwar
2. Bareilly- Sitapur
3. Gundugolanu- Devarapalli-Kovvuru
4. AP Corridor 1, which includes 3 road projects:
    a. Narasannapeta- Ranasthalam
    b. Ranasthalam to Hanumanthvaka, Visakhapatnam Section
    c. Anandapuram- Pendurthi- Anakapalle
5. AP Corridor 2, which includes 2 road projects:
    a. Chittoor- Mallavaram
    b. AP/ TN Border to Nalagampalli, AP/ Karnataka Border Section
6. Chhattisgarh Corridor, which includes 2 road projects:
    a. Raipur- Simga section
    b. Simga to Bilaspur Section
7. Gandhidham (Kandla)- Mundra Port

EYMBSLLP has been appointed as an independent valuer to undertake Enterprise Valuation of the InvIT Asset as on 28 February 2025, in accordance with Regulation 21(4) and Regulation 21(5) of the SEBI InvIT Regulations.

EYMBSLLP is appointed to undertake financial valuation only. We are placing reliance on other consultants appointed by the Client for traffic and other technical inputs. This report is our deliverable for the aforementioned Purpose.

EYMBSLLP is duly registered, as a Limited Liability Partnership under the Limited Liability Partnership Act, 2008, with the Ministry of Corporate Affairs (identified with a unique LLPIN: AAO-2287) and as a Registered Valuer with Insolvency and Bankruptcy Board of India ("IBBI") for securities or financial assets under Section 247 of the Companies Act, 2013 bearing registration number IBBI/RV-E/05/2021/155.

Identity of the Valuer

Name of entity registered	Ernst & Young Merchant Banking Services LLP
LLPIN	AAO-2287
Registration Number (for Registered Valuer)	IBBI/RV-E/05/2021/155
Registration (for Registered Valuer) valid from	01 November 2021

Disclosure of Valuer's Interest or Conflict

EYMBSLLP, Nilesh Jain and the team working on the valuation of the InvIT Asset do not have any present or planned future interest in the Trust, the InvIT Asset or the Investment Manager. EYMBSLLP is neither associated with nor carrying out any relationship with the Client, except carrying out valuation service.

Accordingly, there is no conflict of interest for carrying out the valuation.
The information provided by the Management have been appropriately reviewed in carrying out the valuation. Sufficient time and information were provided to us to carry out the valuation.

Declaration

- We hereby confirm on behalf of EYMBSLLP that EYMBSLLP is competent to undertake this valuation in terms of SEBI InvIT Regulations.
- We further confirm that EYMBSLLP is independent in terms of the SEBI InvIT Regulations and that this report has been prepared on a fair and unbiased basis in compliance with Regulation 13(1) and Regulation 21 of the SEBI InvIT Regulations.
- We have at least two partners having experience of 5 years each in the valuation of infrastructure assets.

This Report covers all the disclosures required as per the SEBI InvIT Regulations and the valuation of the InvIT Asset is impartial, true and fair and in compliance with the SEBI InvIT Regulations.

II. Valuation Analysis

Income approach, specifically Discounted Cash Flow ("DCF") method has been considered for arriving at the fair enterprise value of the InvIT Asset as on 28 February 2025. The valuation exercise has been carried out basis the financial projections of the InvIT Asset provided to us by the Management. Free Cash Flow to Firm approach under DCF method has been considered to determine the Enterprise Value of the InvIT Asset. The Enterprise Value has been computed by discounting the free cash flows to the firm from 01 March 2025 until the end of the concession period, using an appropriate Weighted Average Cost of Capital ("WACC"). The WACC parameters are based as on 31 December 2024 which is in line with the existing assets of NHIT, that is, NHIT Western Projects Private Limited ("NWPPL") and NHIT Eastern Projects Private Limited ("NEPPL").

The Investment Manager has appointed independent consultants to carry out traffic study for estimation of toll revenue and technical study for estimation of operating and maintenance expenses and major maintenance expenses, for the InvIT Asset over the concession period. The traffic study reports have been provided to us in final form. These reports presented an update of the traffic and revenue forecasts based on primary surveys undertaken in 2024, with actual traffic data up to November 2024 and other macro-economic assumptions. We have relied upon financial projections, traffic study reports, technical reports provided by independent consultants and other information provided to us for carrying out the valuation of the InvIT Asset.

The valuation is based on various assumptions with respect to the InvIT Asset, including their respective present and future financial condition, business strategies and the environment in which they will operate in the future. These assumptions are based on the information that we have been provided with and our discussions with the Management, and reflect current expectations and views regarding future events, and therefore necessarily involve known and unknown risks and uncertainties.

The summary of valuation of the InvIT Asset is presented below:

SPV Currency: INR mn	Enterprise Value Feb'25
R4	176,405

Source: Calculation

Our views are based on the current economic, market, industry, regulatory, monetary and other conditions and on the information made available to us, as of the date of this Report. Such conditions may change significantly over a relatively brief period of time and we assume no responsibility and are not required to update, revise or reaffirm our conclusion set out in this Report to reflect events or developments subsequent to the date of the Report.

III. Sources of Information

The following sources of information have been utilized in conducting the valuation exercise:

- **SPV specific information** – The following information, as provided by the Management, have inter-alia been used in the Enterprise Valuation of the InvIT Asset:
  - Financial projections of the InvIT Asset from 01 March 2025 till the end of concession period including underlying assumptions (It includes forecasts of profit and loss statements, major maintenance expenditures, working capital requirements and respective underlying assumptions)
  - Concession Agreements entered into between the InvIT Asset and NHAI.
  - Traffic assessment reports and technical assessment reports by independent consultants for the InvIT Asset.
  - Background information regarding the InvIT Assets provided through emails or during discussions

- Besides the above listing, there may be other information provided by the Management which may not have been perused by EYMBSLLP in any detail, if not considered relevant for the defined scope.

- **Industry and economy information**: EYMBSLLP has relied on publicly available information, proprietary databases subscribed to by EYMBSLLP or its member firms, and discussions with the Management for analysing the industry and the competitors.

- In addition to the above, EYMBSLLP has also obtained such other information and explanations from the Management as were considered relevant for the purpose of the valuation.

It may be mentioned that the Client has been provided an opportunity to review factual information in our draft report as part of our standard practice to make sure that factual inaccuracies/omissions/etc. are avoided in our final report.

IV. Statement of Limiting Conditions

- Provision of valuation opinions and consideration of the issues described herein are areas of our regular valuation practice. The services do not represent accounting, assurance, accounting / tax due diligence, consulting or tax related services that may otherwise be provided by us or our affiliates.
- The estimate of value contained herein are not intended to represent value of the InvIT Asset at any time other than the dates specifically mentioned for each valuation result, as per the agreed scope of our engagement and as required under the SEBI InvIT Regulations. Changes in market/industry conditions could result in opinions of value substantially different than those presented.
- The valuation report was prepared for the purpose of internal management analysis, disclosure to unitholders, any corporate action and/or regulatory filings as required under Regulation 21(4) and Regulation 21(5) of the SEBI InvIT Regulations. Its suitability and applicability of any other use has not been checked by us.
- The user to which this valuation is addressed should read the basis upon which the valuation has been done and be aware of the potential for later variations in value due to factors that are unforeseen at the valuation date. Due to possible changes in market forces and circumstances, this valuation report can only be regarded as relevant as at the Valuation Date.
- This Report has been prepared for the purposes stated herein and should not be relied upon for any other purpose. Our Client is the only authorized user of this report and is restricted for the purpose indicated in the engagement letter. This restriction does not preclude the Client from providing a copy of the report to third-party advisors whose review would be consistent with the intended use. We do not take any responsibility for the unauthorized use of this report.
- While our work has involved an analysis of financial information and accounting records, our engagement does not include an audit in accordance with generally accepted auditing standards of the client existing business records. Accordingly, we express no audit opinion or any other form of assurance on this information.
- In no event shall we be liable for any loss, damages, cost or expenses arising in any way from fraudulent acts, misrepresentations or wilful default on part of the client or companies, their directors, employees or agents.
- The Client and its Management/representatives warranted to us that the information they supplied was complete, accurate, true and correct to the best of their knowledge. We have relied upon the representations of the clients, their Management and other third parties, if any, concerning the financial data, operational data and other information, except as specifically stated to the contrary in the report. We shall not be liable for any loss, damages, cost or expenses arising from fraudulent acts, misrepresentations, or wilful default on part of the companies, their directors, employee or agents.
- EYMBSLLP is not aware of any contingency, commitment or material issue which could materially affect the economic environment and future performance of the InvIT Asset and therefore, the fair value of the InvIT Asset.
- We do not provide assurance on the achievability of the results forecast by the Management as events and circumstances do not occur as expected; differences between actual and expected results may be material. We express no opinion as to how closely the actual results will correspond to those projected/forecast as the achievement of the forecast results is dependent on actions, plans and assumptions of Management.
- The Report assumes that the InvIT Asset complies fully with relevant laws and regulations applicable in its area of operations and usage unless otherwise stated, and that the InvIT Asset will be managed in a competent and responsible manner. Further, as specifically stated to the contrary, this report has given no consideration to matters of a legal nature, including issues of

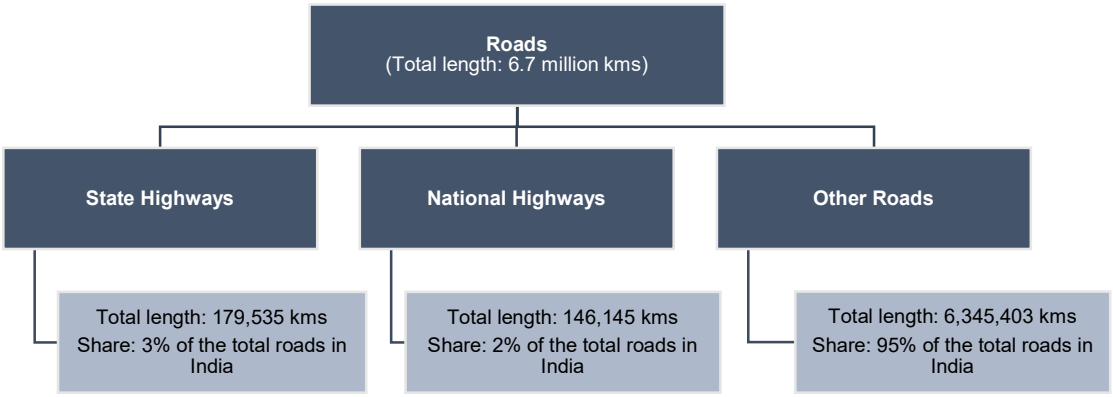
legal title and compliance with local laws, and litigations and other contingent liabilities that are not recorded/reflected in the balance sheet/fixed assets register provided to us.

- The valuation analysis and result are governed by concept of materiality.
- It has been assumed that the required and relevant policies and practices have been adopted by Company and would be continued in the future.
- The fee for the Report is not contingent upon the results reported.
- The figures in the tables in this report may not sum or cross cast, due to rounding differences.
- We owe responsibility to only to the client that has appointed us under the terms of the engagement letters. We will not be liable for any losses, claims, damages or liabilities arising out of the actions taken, omissions or advice given by any other person.
- The actual transacted value achieved may be higher or lower than our estimate of value (or value range of value) depending upon the circumstances of the transaction (for example the competitive bidding environment), the nature of the business (for example the purchaser's perception of potential synergies). The knowledge, negotiating ability and motivation of the buyers and sellers will also affect the transaction value achieved.
- We have also relied on data from external sources to conclude the valuation. These sources are believed to be reliable and therefore, we assume no liability for the truth or accuracy of any data, opinions or estimates furnished by others that have been used in this analysis. Where we have relied on data, opinions or estimates from external sources, reasonable care has been taken to ensure that such data has been correctly extracted from those sources and /or reproduced in its proper form and context.

V. Industry Overview

1. Road Network in India

The Roads sector in India is a crucial component of the country's infrastructure, facilitating transportation, connectivity, and economic growth. India has the second-largest road network in the world, spanning a total of 6.7 million kilometres (kms). This road network plays a pivotal role in India's road infrastructure as it facilitates the transportation of 64.5% of all goods within the country, while 90% of India's total passenger traffic relies on roads for commuting. The road network is sub-divided into three categories:



Source: IBEF Roads Report, November 2024

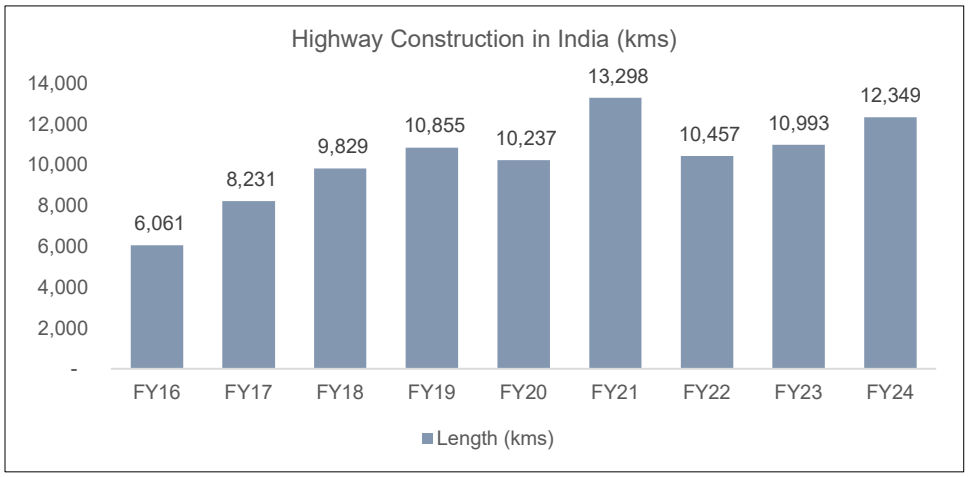
2. Key Statistics

Highway construction in India increased at a CAGR of 9.30% between FY16-FY24 and the roads sector is expected to account for 18% capital expenditure over FY 2019-25. The Government aims to construct 65,000 kms of national highways under Bharatmala Pariyojana Project at a cost of INR 5.35 lakh crore (USD 64.17 billion) and twenty-three new national highways by 2025.

India's road network has expanded significantly, growing by 59% in the last nine years to become the second largest in the world. Under the Union Budget 2024-25, the Government of India has allocated a substantial sum of INR 2.70 lakh crore (USD 32.68 billion) to the Ministry of Road Transport and Highways, highlighting the prioritization of infrastructure development.

In November 2024, the Government of India allocated INR 111 lakh crore (USD 13.14 billion) under the National Infrastructure Pipeline for the period FY19-FY25, indicating a long-term commitment to infrastructure development across various sectors.

The private sector invested INR 15,164 crore (USD 1.98 billion) in road infrastructure development in FY22, indicating continued interest and participation in the sector. Additionally, NHAI raised the highest-ever amount of over INR 15,624 crore (USD 1.88 billion) through Infrastructure Investment Trust (InvIT) mode, reflecting investor confidence in NHAI projects.



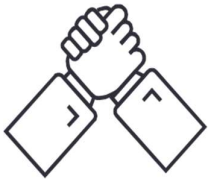
Source: IBEF Roads Report, November 2024

3. Growth Drivers



Growing Vehicular Demand

Growing domestic trade flows have led to rise in commercial vehicles and freight movement; supported by rise in production of commercial vehicles. This increase in commercial and freight vehicles will lead to strong tourist and trade flows between states, increasing the traffic and revenue.



Government Initiatives

During FY23-24 Budget, INR 276 crore (USD 34.04 million) has been announced to be designated for the Pradhan Mantri Gram Sadak Yojana (PMGSY).

Under Phase-I of Bharatmala Pariyojana, the Ministry has sanctioned the development of 34,800 km of national highways over a period of 5 years, with a budget allocation of INR 5,35,000 crore (US$ 76.55 billion).

Central Road and Infrastructure Fund (CRF): In the Union Budget 2022-23, government has planned for an increase in allocation for the central road fund by 19%, the total fund was INR 2.95 lakh crores (US$ 38.86 million).



Growth in Private Participation

As of July 2024, there were 826 roads projects PPP out of 1883 total projects in India.

The government has successfully rolled out over 60 road projects in India worth over USD 10 billion based on the Hybrid Annuity Model (HAM).

100% Foreign Direct Investment (FDI) is allowed under the automatic route in the road and highways sector, subject to applicable laws and regulation.



Lower tax burdens

Companies enjoy 100% tax exemption in road projects for the first 5 years and 30% relief over the next 5 years.

Interest payment on external commercial borrowings for infrastructure are now subject to a lower withholding tax of 5% vis-a-vis 20% earlier.

The GST on construction equipment has been reduced to 18% from 28%, which is expected to boost infrastructure development in the country.

4. E-Initiatives

a. Land Acquisition

The primary hurdle facing the sector involves land acquisition issues, prompting MoRTH to introduce the Bhoomi Raashi initiative to address this concern. The Bhoomi Rashi portal is an online platform launched by the Ministry of Road Transport and Highways (MoRTH) in India. It serves as a centralized database for land acquisition-related information for highway projects across the country.

The portal provides various functionalities related to land acquisition, including land records, ownership details, compensation disbursement, and project status updates. It aims to streamline the land acquisition process, enhance transparency, and facilitate efficient decision-making for highway development projects. The Bhoomi Rashi portal plays a crucial role in ensuring smooth implementation of infrastructure projects while addressing land acquisition-related challenges and avoid parking of public funds with the Competent Authority for Land Acquisition (CALA).

Since the launch of the portal, a total of 8629 land acquisition notifications have been issued using the portal. Additionally, as on December 2023, the Bhoomi Rashi Portal had incorporated 1467 projects of the National Highways Authority of India (NHAI).

b. Toll collection and Revenue Leakages

Before the introduction of FASTag, toll collection processes typically involved manual cash payments at toll booths, which often resulted in long queues, delays, and traffic congestion, especially during peak hours and busy travel periods.

To ensure seamless movement of traffic through fee plazas and increase transparency in collection of user fee using FASTag, the National Electronic Toll Collection (NETC) programme, the flagship initiative of Ministry of Road Transport and Highways, has been implemented on pan-India basis.

With FASTag, vehicles are equipped with a prepaid RFID tag that is linked to the vehicle's registration and a prepaid account. As vehicles approach the toll plaza, the RFID tag is automatically scanned, and the toll amount is deducted from the prepaid account, allowing for seamless and hassle-free passage through toll booths. As of March 2024, a total of 8.81 crore FASTags have been issued by thirty-nine banks, resulting in a cumulative collection of INR 5,938.86 crores.

The constant growth and adoption of FASTag by highway users is very encouraging and has helped increase efficiency in toll operations as it not only addresses the challenge of long queues and delays but also promotes digital payments, transparency, and accountability in toll collection operations.

Further, the industry offers abundant prospects for expansion and advancement, especially with the advent of technologies such as smart transportation systems, intelligent traffic management, and sustainable construction methods. Efforts are also underway to tackle environmental and safety issues, with a heightened emphasis on enhancing road safety protocols, mitigating traffic congestion, and advocating for the adoption of eco-friendly materials in road infrastructure development.

5. Future Outlook

The Roads sector in India is continually expanding, driven by numerous factors including urbanization, population growth, and the escalating demand for efficient transportation infrastructure. The surge in domestic trade flows has led to an increase in commercial vehicles and freight movement, further bolstering the sector's prospects.

The government's unwavering support, coupled with strategic investments and the adoption of advanced technologies, is expected to propel the sector forward, contributing to India's economic development and global competitiveness.

- NHAI has been allocated INR 1.70 lakh crore (USD 20 billion) during FY 2025-26 Budget.
- To improve commuting experience, Wayside Amenities (WSA) are planned to be developed at more than six hundred locations on National Highways and Expressways by FY25, with amenities at every 40-60 km.
- NHAI is also working towards the development of around 10,000 km of Optic Fibre Cables (OFC) infrastructure across the country by FY25, with the implementation of integrated utility corridors along National Highways to develop OFC infrastructure through National Highways Logistics Management Limited (NHLML).
- The Government plans to install charging stations at every 40 to 60 kilometres on national highways, with approximately 700 e-vehicle charging stations expected to be installed, covering 35,000 to 40,000 kilometres of national highways.
- Gati Shakti-National Master Plan aims to create a digital platform that would enable sixteen ministries to collaborate on integrated planning and coordinated implementation of projects. The plan will also bring together departments such as railways, roads & highways and others and implementation will be done with the help of geo-satellite imaging and Big Data, land and logistics.
- The Government has engaged a consultant to provide guidance on the integration of innovative technologies such as GNSS for toll collection without barriers. A pilot program for GNSS-based Electronic Toll Collection will be conducted in conjunction with FASTag on specific National Highways.
- The Ministry of Environment, Forests, and Climate Change (MoEF & CC) has directed the National Highways Authority of India (NHAI) and other relevant agencies to utilize fly ash in road construction projects located within a 300-kilometer radius of coal or lignite-based thermal power plants. This directive aims to encourage sustainable practices in road construction.

With ongoing projects and initiatives aimed at transforming the infrastructure landscape, the future outlook for the roads sector in India appears promising, poised to meet the evolving needs of the nation's growing economy and population.

VI. Background of the SPVs

1.1. Muzaffarnagar – Haridwar

Muzaffarnagar – Haridwar is a four-lane road on NH-334 with a project length of 78.56 Kms. It starts near Muzaffarnagar in Uttar Pradesh at 130.56 Kms of the Haridwar- Bulandshahr highway of NH-334 and ends near Haridwar in Uttarakhand at 209.12 Kms of the Haridwar- Bulandshahr highway of NH-334. The Project has two toll plazas, that is, Chhapar and Bahadrabad at 138.55 Kms and 187.37 Kms, respectively.

The following table presents a summary of the concession:

Particulars	Details
State	Uttar Pradesh and Uttarakhand
Employer	NHAI
Project type	Toll, Operate and Transfer ("TOT")
Highway and lane configuration	NH-334; four-lane
Toll Plaza	Chhapar and Bahadrabad
Length of the asset	78.56 Kms
Commencement of operations	01 April 2025
Concession period	20 years
Concession end	31 March 2045

Source: Management

Muzaffarnagar – Haridwar route caters to the following type of strategic movements:

1. Meerut/Muzaffarnagar/Panipat and surroundings to Roorke/Dehradun and surroundings and to Haridwar/Rishikesh/West UP/Punjab and beyond
2. Delhi/Ghaziabad/Noida and surroundings to Roorke/Dehradun and surroundings and to Haridwar/Rishikesh/West UP/Punjab and beyond
3. East UP to Roorke/Dehradun and surroundings and to Haridwar/Rishikesh/West UP/Punjab and beyond
4. Rajasthan/Central/South India to Roorke/Dehradun and surroundings and to Haridwar/Rishikesh/West UP/Punjab and beyond

The forecast major maintenance expenses for the Project are shown in the tables below:

(INR mn)	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
Muzaffarnagar - Haridwar	15	-	-	0	8	-	1,406	934	10	-

(INR mn)	FY36	FY37	FY38	FY39	FY40	FY41	FY42	FY43	FY44	FY45
Muzaffarnagar - Haridwar	-	-	11	145	-	-	13	2,156	-	-

Source: Management

The pictures of the asset are shown below:



Chhapar Toll Plaza



Bahadrabad Toll Plaza

Note: Site visit to Chhapar Toll Plaza and Bahadrabad Toll Plaza conducted by EYMBSLLP personnel on 01 February 2025 and 02 February 2025 respectively

1.2. Bareilly – Sitapur

Bareilly – Sitapur is a four-lane road on NH-30 (Old NH-24) with a project length of 157.59 Kms. It starts at Bareilly at 262.00 Kms of NH-30 and ends at Sitapur in Uttar Pradesh at 419.59 Kms of NH-30. The Project has two toll plazas, that is, Faridpur and Maigalganj at 267.00 Kms and 372.10 Kms, respectively.

The following table presents a summary of the concession:

Particulars	Details
State	Uttar Pradesh
Employer	NHAI
Project type	Toll, Operate and Transfer ("TOT")
Highway and lane configuration	NH-30; four-lane
Toll Plaza	Faridpur and Maigalganj
Length of the asset	157.59 Kms
Commencement of operations	01 April 2025
Concession period	20 years
Concession end	31 March 2045

Source: Management

Bareilly – Sitapur route caters to the following type of strategic movements:

1. Car trips originating from Uttrakhand and Delhi states
2. Truck traffic originating from Uttrakhand, Delhi, Haryana, Bihar, etc
3. Major origin-destination pairs such as Bareilly-Lucknow, Bareilly-Faridpur, Lucknow-Delhi, Bareilly-Shahjahanpur, Shahjahanpur-Lucknow, etc.

The forecast major maintenance expenses for the Project are shown in the tables below:

(INR mn)	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
Bareilly - Sitapur	13	-	47	0	3,327	1,309	392	-	77	39

(INR mn)	FY36	FY37	FY38	FY39	FY40	FY41	FY42	FY43	FY44	FY45
Bareilly - Sitapur	4,346	1,421	9	508	53	165	3,363	-	52	573

Source: Management

The pictures of the asset are shown below:



Faridpur Toll Plaza



Maigalganj Toll Plaza

Note: Site visit conducted by EYMBSLLP personnel on 03 January 2025

1.3. Gundugolanu – Devarapalli – Kovvuru

Gundugolanu – Devarapalli – Kovvuru is a six-lane road on NH-16 with a project length of 69.88 Kms. It starts at Gundugolanu at 15.32 Kms and ends at Kovvuru in Andhra Pradesh at 85.20 Kms. The Project has one toll plaza, that is, Veeravalli at 53.70 Kms.

The following table presents a summary of the concession:

Particulars	Details
State	Andhra Pradesh
Employer	NHAI
Project type	Toll, Operate and Transfer ("TOT")
Highway and lane configuration	NH-16; six-lane
Toll Plaza	Veeravalli
Length of the asset	69.88 Kms
Commencement of operations	01 April 2025
Concession period	20 years
Concession end	31 March 2045

Source: Management

Gundugolanu – Devarapalli – Kovvuru route caters to the following type of strategic movements:

1. Eluru/Vijayawada & surroundings to Devarapalli/Rajamahendravaram & surroundings
2. travelling from/to Suryapet/Hyderabad and beyond to/from Devarapalli and beyond
3. travelling between Eluru/Vijayawada surroundings and Devarapalli/Rajamahendravaram & surroundings
4. from/to Bengaluru & surrounding-Devarapalli & beyond

The forecast major maintenance expenses for the Project are shown in the tables below:

(INR mn)	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
Gundugolanu Devarapalli Kovvur	-	-	-	-	-	-	37	-	-	-

(INR mn)	FY36	FY37	FY38	FY39	FY40	FY41	FY42	FY43	FY44	FY45
Gundugolanu Devarapalli Kovvur	-	-	-	93	-	-	47	1,752	2,112	-

Source: Management

The pictures of the asset are shown below:





Note: Site visit conducted by EYMBSLLP personnel on 21 January 2025

1.4. AP Corridor 1

1.4.1. Narasannapeta- Ranasthalam

Narasannapeta- Ranasthalam is a six-lane road on NH-16 with a project length of 53.80 Kms. It starts at Narasannapeta at 580.67 Kms of NH-16 and ends at Ranasthalam at 634.47 Kms in Andhra Pradesh of NH-16. The Project has one toll plaza, that is, Madapam at 589.55 Kms.

The following table presents a summary of the concession:

Particulars	Details
State	Andhra Pradesh
Employer	NHAI
Project type	Toll, Operate and Transfer ("TOT")
Highway and lane configuration	NH-16; six-lane
Toll Plazas	Madapam
Length of the asset	53.80 kms
Commencement of operations	01 April 2025
Concession period	20 years
Concession end	31 March 2045

Source: Management

Narasannapeta- Ranasthalam route caters to the following type of strategic movements:

1. Majority of passenger traffic from Andhra Pradesh followed by Odisha
2. Majority of freight traffic from Andhra Pradesh followed by Odisha and West Bengal
3. Zones beyond Madapam toll plaza to Srikakulam, Vizianagaram, Sabbavaram/Anakapalle, Rajahmundry, Kakinada, Vijayawada/Hyderabad and surroundings
4. Rest of Andhra Pradesh/Bhubaneswar to Vizag City & port, Bangalore/Chennai and beyond

5. Kolkata/Jharkhand/East& North India to Vizag City & port, Bangalore/Chennai and beyond
6. Zones beyond Madapam toll plaza to Maharashtra/Gujarat & rest of Central/West India

The pictures of the asset are shown below:





Note: Site visit conducted by EYMBSLLP personnel on 22 January 2025

1.4.2. **Ranasthalam to Hanumanthvaka, Visakhapatnam Section**

Ranasthalam to Hanumanthvaka, Visakhapatnam Section is a four/six-lane road on NH-16 with a project length of 66.54 Kms. It is six-lane from Ranasthalam to Anandapuram at 634.00 Kms at NH-16 and four-lane from Anandapuram to Hanumanthvaka (Visakhapatnam) at 700.54 Kms at NH-16 in state of Andhra Pradesh. The Project has one toll plaza, that is, Nathavalasa at 656.70 Kms.

The following table presents a summary of the concession:

Particulars	Details
State	Andhra Pradesh
Employer	NHAI
Project type	Toll, Operate and Transfer ("TOT")
Highway and lane configuration	NH-16; four/six-lane
Toll Plazas	Nathavalasa
Length of the asset	66.54 kms
Commencement of operations	01 April 2025
Concession period	20 years
Concession end	31 March 2045

Source: Management

Ranasthalam to Hanumanthvaka, Visakhapatnam Section route caters to the following type of strategic movements:

1. Majority of passenger traffic from Andhra Pradesh followed by Odisha
2. Majority of freight traffic from Andhra Pradesh followed by Odisha and West Bengal
3. Beyond Srikakulam – Vizianagaram, Sabbavaram/Anakapalle, Srikakulam – Rajahmundry, Kakinada, Srikakulam – Vijayawada/Hyderabad and surroundings
4. Srikakulam and surroundings to Vizag City & port, Bangalore/Chennai and beyond
5. Rest of Andhra Pradesh/Bhubaneswar to Vizag City & port, Bangalore/Chennai and beyond
6. Kolkata/Jharkhand/East& North India to Vizag City & port, Bangalore/Chennai and beyond
7. Srikakulam and surroundings to Maharashtra/Gujarat & rest of Central/West India

The pictures of the asset are shown below:





Note: Site visit conducted by EYMBSLLP personnel on 22 January 2025

1.4.3. Anandapuram-Pendurthi-Anakapalle

Anandapuram-Pendurthi-Anakapalle is six-lane road on NH-16 with a project length of 48.60 Kms. It starts at Anandapuram at 682.98 Kms of NH-16 and ends at Ankapalli at 731.59 Kms in Andhra Pradesh of NH-16. The Project has two toll plazas, that is, Dukkavanipalem and Marripalem at 686.54 Kms and 722.17 Kms, respectively.

The following table presents a summary of the concession:

Particulars	Details
State	Andhra Pradesh
Employer	NHAI
Project type	Toll, Operate and Transfer ("TOT")
Highway and lane configuration	NH-16; six-lane
Toll Plaza	Dukkavanipalem and Marripalem
Length of the asset	48.60 kms
Commencement of operations	01 April 2025
Concession period	20 years
Concession end	31 March 2045

Source: Management

Anandapuram-Pendurthi-Anakapalle route caters to the following type of strategic movements:

1. Majority of passenger traffic from Andhra Pradesh followed by Odisha and Telangana
2. Majority of freight traffic from Andhra Pradesh followed by Odisha, West Bengal and Tamil Nadu
3. Vizianagaram/Srikakulam & beyond to Sabbavaram/Anakapalle, Vizag City & port, Rajahmundry/Kakinada, Vijayawada/Hyderabad and surroundings
4. Vizianagaram/Srikakulam & beyond to Bangalore/Chennai & beyond and to Maharashtra/Gujarat & Rest of Central/West India
5. Kolkata/Jharkhand/East& North India to Vizag City & port and Bangalore/Chennai & beyond
6. Sabbavaram/Vishakhapatnam/Vizianagaram & beyond to Anakapalle, Rajahmundry/Kakinada, Vijayawada/Hyderabad and surroundings
7. Sabbavaram/Vishakhapatnam/Vizianagaram & beyond to Bangalore/Chennai & beyond and to Maharashtra/Gujarat & Rest of Central/West India

The pictures of the asset are shown below:



Dukkavanipalem Toll Plaza



Marripalem Toll Plaza

Note: Site visit conducted by EYMBSLLP personnel on 21 January 2025

The forecast major maintenance expenses for AP Corridor 1 are shown in the tables below:

(INR mn)	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
AP Corridor 1	-	-	-	-	159	-	461	126	1	19

(INR mn)	FY36	FY37	FY38	FY39	FY40	FY41	FY42	FY43	FY44	FY45
AP Corridor 1	81	328	1,119	-	241	2,818	6,189	128	836	1,620

Source: Management

1.5. AP Corridor 2

1.5.1. Chittoor – Mallavaram

Chittoor – Mallavaram is a six-lane road on NH-140 with a project length of 61.13 Kms. It starts from Chittoor at 0.00 Kms of NH-140 and ends to Mallavaram at 61.13 Kms in Andhra Pradesh of NH-140. Further, it connects Bengaluru in the west via Kolar (NH-75) and to Nellore in the northeast via NH-71 and also connects to Coimbatore, Kerala via Vellore. The Project has one toll plaza, that is, Gadanki at 37.25 Kms.

The following table presents a summary of the concession:

Particulars	Details
State	Andhra Pradesh
Employer	NHAI
Project type	Toll, Operate and Transfer ("TOT")
Highway and lane configuration	NH-140; six-lane
Toll Plaza	Gadanki
Length of the asset	61.13 kms
Commencement of operations	01 April 2025
Concession period	20 years
Concession end	31 March 2045

Source: Management

Chittoor – Mallavaram route caters to the following type of strategic movements:

1. Connection to Bangalore in the west, passing through Kolar via NH-75
2. Connection to Nellore in the northeast via NH-71

3. Connection to Anantapur in the northwest via NH-42
4. Connection to Chennai in the southeast via NH-48
5. Connection to major cities such as Mangalore, Kochi, Vishakhapatnam, Hyderabad, Pune and Goa
6. Significant car and truck traffic generating from Karnataka and Tamil Nadu

The pictures of the asset are shown below:





Note: Site visit conducted by EYMBSLLP personnel on 20 January 2025

1.5.2. **AP/ TN Border to Nalagampalli, AP/ Karnataka Border Section**

AP/ TN Border – Nalagampalli - AP/ Karnataka Border Section is a four-lane road on NH-4 with a project length of 84.80 Kms. It starts at TN/AP Border at 134.89 Kms of NH-4 and extends to Nalagampalli at 219.69 Kms of NH-4 to the Andhra Pradesh/ Karnataka border. Further, it connects to Bengaluru in the west via Kolar (NH-75), to Anantapur in the northwest via NH-42, and to Chennai in the southeast via NH-48. The Project has one toll plaza, that is, Mahasamudram at 164.10 Kms.

The following table presents a summary of the concession:

Particulars	Details
State	Andhra Pradesh
Employer	NHAI
Project type	Toll, Operate and Transfer ("TOT")
Highway and lane configuration	NH-4; four-lane
Toll Plaza	Mahasamudram
Length of the asset	84.80 kms
Commencement of operations	01 April 2025
Concession period	20 years
Concession end	31 March 2045

Source: Management

TN/AP Border - Nalagampalli - AP/ Karnataka Border Section caters to the following type of strategic movements:

1. Connection to Bangalore in the west, passing through Kolar via NH-75
2. Connection to Nellore in the northeast via NH-71
3. Connection to Anantapur in the northwest via NH-42
4. Connection to Chennai in the southeast via NH-48
5. Connection to major cities such as Mangalore, Kochi, Vishakhapatnam, Hyderabad, Pune and Goa
6. Significant car and truck traffic generating from Karnataka and Tamil Nadu

The pictures of the asset are shown below:





Note: Site visit conducted by EYMBSLLP personnel on 20 January 2025

The forecast major maintenance expenses for AP Corridor 2 are shown in the tables below:

(INR mn)	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
AP Corridor 2	3	-	86	-	1	53	31	705	579	19

(INR mn)	FY36	FY37	FY38	FY39	FY40	FY41	FY42	FY43	FY44	FY45
AP Corridor 2	819	132	85	78	70	1,597	2,047	-	-	749

Source: Management

1.6. Chhattisgarh Corridor

1.6.1. Raipur – Simga section

Raipur – Simga section is a four and six-lane road on NH-30 (Old NH-200) with a project length of 48.58 Kms. It starts at Raipur at 0.00 Kms of NH-30 and ends at Simga at 48.58 Kms of NH-30 in the state of Chhattisgarh. The Project has one toll plaza, that is, Tarpongi at 32.01 Kms.

The following table presents a summary of the concession:

Particulars	Details
State	Chhattisgarh
Employer	NHAI
Project type	Toll, Operate and Transfer ("TOT")
Highway and lane configuration	NH-30; four and six-lane
Toll Plaza	Tarpongi
Length of the asset	48.58 kms
Commencement of operations	01 April 2025
Concession period	20 years
Concession end	31 March 2045

Source: Management

Raipur – Simga section caters to the following type of strategic movements:

1. Connects Raipur to Jabalpur in the north while also passing through Jagdalpur, Sukma, Bhadrachalam, and Kothagudem before terminating in Vijayawada in the south
2. Significant car and truck traffic generating from Maharashtra and Madhya Pradesh

The pictures of the asset are shown below:





Note: Site visit conducted by EYMBSLLP personnel on 20 January 2025

1.6.2. Simga to Bilaspur Section

Simga to Bilaspur is a four-lane road on NH-130 (Old NH-200) and NH-49 including Bilaspur Bypass with a project length of 77.95 Kms. The Project has two toll plazas, that is, Bhojpuri and Mudipar at 97.52 Kms and 110.29 Kms, respectively.

The following table presents a summary of the concession:

Particulars	Details
State	Chhattisgarh
Employer	NHAI
Project type	Toll, Operate and Transfer ("TOT")
Highway and lane configuration	NH-130 and NH-49; four lane
Toll Plaza	Bhojpuri and Mudipar
Length of the asset	77.95 kms
Commencement of operations	01 April 2025
Concession period	20 years
Concession end	31 March 2045

Source: Management

Simga to Bilaspur caters to the following type of strategic movements:

1. Connects Raipur with Bilaspur, Katghora, and Ambikapur.
2. Significant car traffic generating from Jharkhand, Maharashtra and Madhya Pradesh
3. Significant truck traffic generating from Jharkhand, Maharashtra, Odhisha and Madhya Pradesh

The pictures of the asset are shown below:



Bhojpuri Toll Plaza



Mudipar Toll Plaza

Note: Site visit conducted by EYMBSLLP personnel on 20 January 2025

The forecast major maintenance expenses for Chhattisgarh corridor is shown in the tables below:

(INR mn)	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
Chhattisgarh Corridor	10	-	226	-	5	2,203	-	212	60	-

(INR mn)	FY36	FY37	FY38	FY39	FY40	FY41	FY42	FY43	FY44	FY45
Chhattisgarh Corridor	-	642	3	-	460	89	3	528	3,509	-

Source: Management

1.7. Gandhidham (Kandla) – Mundra Port

Gandhidham (Kandla) – Mundra Port is a four-lane road on NH-41 with a project length of 71.40 Kms. The Project has one toll plaza, that is, Mokha at 44.50 Kms.

The following table presents a summary of the concession:

Particulars	Details
State	Gujarat
Employer	NHAI
Project type	Toll, Operate and Transfer ("TOT")
Highway and lane configuration	NH-41; four lane
Toll Plaza	Mokha
Length of the asset	71.40 kms
Commencement of operations	01 April 2025
Concession period	20 years
Concession end	31 March 2045

Source: Management

Gandhidham (Kandla) – Mundra Port caters to the following type of strategic movements:

1. Traffic from Mundra port, Gandhidham and Anjar region due to the presence of warehouses storing agro products, plywood, FMCG, etc
2. Key areas which contribute to the Project's traffic is from Mundra, Gandhidham and Morbi
3. Other areas influencing the Project's traffic includes Rajasthan, North India, Ahmedabad and south Gujarat

The forecast major maintenance expenses for the Project are shown in the tables below:

(INR mn)	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35
Gandhidham-Mundra Port	-	-	-	-	-	-	39	-	-	-

(INR mn)	FY36	FY37	FY38	FY39	FY40	FY41	FY42	FY43	FY44	FY45
Gandhidham-Mundra Port	-	-	-	99	-	-	-	-	2,066	1,547

Source: Management

The pictures of the asset are shown below:



Note: Site visit conducted by EYMBSLLP personnel on 21 January 2025

VII. Procedures Adopted

We have carried out the Valuation of the InvIT Asset, in accordance with valuation standards as specified / applicable as per SEBI InvIT Regulations to the extent applicable.

In connection with this analysis, we have adopted the following procedures to carry out the valuation analysis:

- Discussed with the Investment Manager on background of the SPV– business and fundamental factors that affect its earning-generating capacity and historical and expected financial performance;
- Requested and received financial and qualitative information relating to the InvIT Asset;
- Considered the key terms of Concession Agreements;
- Considered the traffic study reports and technical reports;
- Analysis of the Management projections;
- Analysis of the key economic and industry factors which may affect the valuation of the SPV;
- Analysis of the information available in public domain/ subscribed databases in respect of the comparable companies/ comparable transactions, as considered relevant by us;
- Analysis of other publicly available information, as considered relevant by us;
- Conducted site visits to assess the operating condition of the InvIT Asset as per the requirements of SEBI InvIT Regulations;
- Selection of valuation approach and valuation methodology/(ies), in accordance with SEBI InvIT Regulations, as considered appropriate and relevant by us; and
- Determination of Enterprise Value of the InvIT Asset as on the Valuation date.

VIII. Valuation Methodology

To determine the value of enterprises, three traditional approaches can be considered:

A. Market approach

The market approach measures value based on what other purchasers in the market have paid for assets that can be considered reasonably similar to those being valued.

B. Income approach

The income approach determines the value of a business based on its ability to generate desired economic benefit for the owners. The key objective of the income-based methods is to determine the business value as a function of the economic benefit.

C. Asset approach

The asset approach seeks to determine the business value based on the value of its assets.

Summary of various methods used / not used in this engagement is as given below:

Valuation Methodology	Used	Remarks
Income Approach		
Discounted Cash Flows method	Yes	DCF method is considered to be one of the most scientific methods of valuation. The individual InvIT Asset have definite concession periods and estimable cash flows for the entire length of the concession. We have therefore relied on the DCF method using the financial projections provided to us.
Market Approach		
Market Price method	No	Not applicable as the SPV is not publicly listed
Comparable Companies' multiples method	No	There are no listed companies comparable to the SPV in terms of concession period, type or region
Comparable Transactions' multiples method	No	There were no recent transactions in comparable assets where sufficient information was available in the public domain.
Cost approach		
Net Asset Value method	No	Does not capture the earning capacity of the business and hence, NAV would not be representative of the fair value

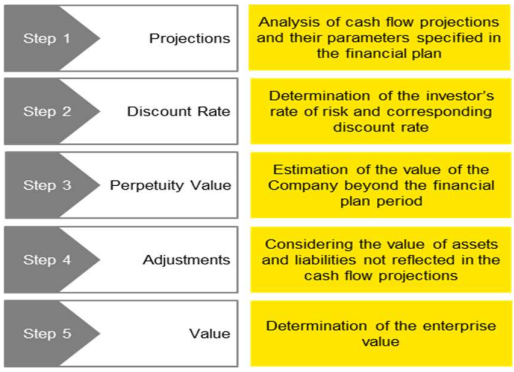
In the case of this SPV, the Discounted Cash Flow method was considered the most appropriate method for valuation based on the characteristics of the assets being valued (as mentioned above).

Discounted Cash Flow method

Income Based Approach

- Taking into consideration the specifics of the InvIT Asset and the business environment, we have used the discounted cash flow (DCF) method (specifically, the Free Cash Flow to Firm approach) to determine the Enterprise value of the InvIT Asset.
- The profit and loss account forecast covers the remaining concession period of individual InvIT Asset.

DCF Methodology



Calculation of Weighted Average Cost of Capital ("WACC")

Purpose of a discount rate

The application of the income approach requires the determination of an appropriate discount rate at which future cash flows are discounted to their present value as of the Valuation Date.

The discount rate reflects the time value of money and the risk associated with projected future cash flows. It is derived on the basis of the expected return on capital and the price of the best alternative investment. Therefore, the discount rate indicates the minimum required return from the asset being valued if the investor is not to be worse off than he would be if he had invested his money in the next best alternative. The return on this alternative investment must be comparable in terms of dimensions, timing and certainty, with the net cash flows expected to be derived from the subject asset.

To derive the discount rate, the weighted average cost of capital ("WACC"), which refers to the total capital invested (equity and debt), is used and adjusted for risk premiums or discounts, depending on the asset's specific risk compared to the risk of the overall enterprise. To determine the appropriate WACC, it is adequate to consider cost of equity and cost of debt separately.

The derivation of the WACC is based on a group of guideline companies (peer group) which are operating in the same industry/sector as the InvIT Asset (so called "potential acquirers"). To calculate the WACC, cost of equity, cost of debt and the capital structure have to be determined based on market data of the group of "potential acquirers." The WACC parameters used for the valuation of the InvIT Asset are based as at 31 December 2024, which is in line with the existing projects of NHIT, that is, NWPPL and NEPPL.

Formula for WACC Computation

Calculation for WACC

$$WACC = W_E * R_E + W_D * R_D$$

where:

W_E	=	Value of equity/value of total capital, E/E+D
K_E	=	Cost of equity
W_D	=	Value of interest-bearing debt/value of total capital, D/E+D
R_D	=	After-tax cost of interest-bearing debt

Calculation of Cost of equity

For the estimation of the cost of equity for the InvIT Asset, the capital asset pricing model ("CAPM") is applied. According to the CAPM, cost of equity consists of a risk-free interest rate and a risk premium. The risk premium is calculated by multiplying the market risk premium by the beta-factor, a company-specific measure of the systematic risk of an equity investment in a company.

To determine the cost of equity, its components, that is, risk-free rate and risk premium have to be analysed.

1. Risk-free rate

The starting point for the calculation of an appropriate equity rate of return is the calculation of the risk-free rate, which corresponds to the minimum return that an investor can expect from an investment "without" risk. This risk-free rate of return is therefore generally derived from the rate of return on a high-quality long-term government bond. The risk-free rate is based on current YTMs as on 31 December 2024 of Gilt Bonds with 10-year residual maturity (rounded).

2. Risk premium

i. Market risk premium

According to CAPM, long-term capital market studies have shown that historically investments in shares have yielded higher returns than investments in low-risk bonds. Market Risk Premium ("MRP") has been considered based on EYMBSLLP internal study on the prevailing MRP in India (Annexure 1)

ii. Beta coefficient

According to the CAPM in arriving at the appropriate risk premium, non-systematic risk, which attaches to the specific enterprise and can therefore generally be eliminated by diversifying, is distinguished from systematic risk. A risk premium will only be required to compensate for systematic risk, which cannot be eliminated by diversification. In practice, systematic risk is measured in terms of the beta coefficient and the market risk premium. The market risk premium is defined as the difference between the expected return on a market portfolio and the risk-free rate. The beta coefficient indicates the risk of the equity of the enterprise that is being valued relative to the average market risk (for stocks), which is represented by the market risk premium. A beta higher than one implies that the systematic risk of the company's stock is higher than the market risk. The risk premium is calculated by multiplying the market risk premium by the enterprise's beta coefficient.

Beta reported in public sources are "leveraged," which means that the additional risk to a stockholder due to the debt financing of the company is incorporated in the corresponding beta coefficient.

We have used the re-levered beta which means that the impact of the capital structure of the target company is incorporated in the beta coefficient. It is derived by adjusting the unlevered beta using the company's debt equity ratio and tax rate.

We have used the re-levered beta (based on a three-year data considering monthly returns) of listed Indian companies that are engaged in primarily in construction and operation of road assets in India.

In order to arrive at the comparable companies, we have carried out screening on S&P Capital IQ while applying the following selection criteria:

a. Indian companies listed on either Bombay Stock Exchange or National Stock Exchange (provides a set of 9,442 companies)
b. Industry classification as mentioned below (provides a set of 90 companies):
    i. Sector: Industrial; Sub-sector: Construction and Engineering; and Sub-sub-sector: Highways and Street Construction
    ii. Sector: Industrial; Sub-sector: Transportation Infrastructure; and Sub-sub-sector: Highways and Rail Tracks
c. The set of 90 companies were further shortlisted on the basis of the availability of their market capitalization (provides a set of 86 companies)
d. Basis the above list of 86 companies, we have further filtered the companies by applying a filter on the business description of the companies using the keywords "Road" or "Highway" or "Develop" (provides a set of 46 companies)
e. From the list of 46 companies, we have considered only those companies for which majority revenue contribution is from road assets and construction activities (provides a set of 32 companies)
f. On the set of 32 companies, we separately applied a filter on the business segment of the companies using the following keywords:
    i. "BOT" or "Road" to arrive at a set of 7 companies.
    ii. "Engineering" and "Construction" to arrive at set of additional 5 companies.
g. From these 12 companies, we analysed the segment reporting basis the information available in the annual report and ruled out 5 companies who were majorly engaged in EPC and/or revenue contribution from BOT/TOT was minimal

Accordingly, we arrived at a set of 7 companies. Further, we have also added one listed InvIT fund which has sufficient trading history and has toll road assets in its portfolio.

Based on above screening criteria, we shortlisted a total of 8 companies. Please refer Appendix 2.1.1 for the list of comparable companies used for computation of beta.

iii. Additional Risk Premium

An additional risk premium is generally applied to account for any non-systematic risk, that is, company/enterprise specific risk. Based on the fact that the InvIT Asset do not have traffic history, an additional risk premium has been applied appropriately.

Formula for Cost of Equity Computation

Calculation for COE		
$COE = R_f + B^* MRP + ARP$		
where:		
R_f	=	Risk-free rate
B	=	Re-levered beta
MRP	=	Market risk premium
ARP	=	Additional Risk premium

Calculation of Cost of Debt

To determine the cost of debt, its components, that is, pre-tax cost of debt and tax rate have to be analysed.

1. Pre-tax cost of debt

The pre-tax cost of debt is the effective interest rate or the total amount of interest that a company or individual owes on any liabilities, such as bonds and loans. Pre-tax cost of debt of SPV has been considered basis discussions with the Management regarding the effective interest rate.

2. Tax Rate

Tax rate to be considered for computation of post-tax cost of debt should be the effective rate of the company. The effective tax rate represents the present value of the percentage of taxable income paid in taxes as at the Valuation Date. Tax rate of the SPV has been considered basis the effective tax rate of the SPV.

Calculation of Weighted Average Cost of Capital

The Summary of WACC computed for the InvIT Asset is presented below:

Particulars	Weights	R4
Weighted cost of debt (%)	50.0	3.29
Weighted cost of equity (%)	50.0	7.24
WACC (rounded) (%)		**10.55**

Source: Calculation

The computed WACC is 10.55% for R4. Detailed WACC Calculation has been provided in Appendix 2.

IX. Valuation Assumptions

Key underlying assumptions as provided by the Management are as follows:

- **Operating Revenue:** Operating revenue for the InvIT Asset is projected based on the traffic study reports of independent consultants appointed by the Management. The traffic study reports have been provided to us in final form. These reports presented an update of the traffic and revenue forecasts based on primary surveys undertaken in 2024, with actual traffic data up to November 2024 and other macro-economic assumptions. Operating revenue for Toll-Operate-Transfer ("TOT") assets have been projected by the Management basis these traffic study reports, dated January/February 2025.

  Further, the toll rates for each of these assets is in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto. The toll rates have been estimated based on annual base rate increase (if applicable) and forecast of macro-economic factors such as Wholesale Price Index ("WPI") upto 40% on an overall basis over the concession period.

  WPI of 2.4% and 4.5% has been considered in FY26 and FY27-28 respectively which have been estimated on the basis of the analysis of WPI observed in FY22-24. Further, it has been assumed that WPI will subsequently converge to the long-term rate of 3.5% from FY28. The long term WPI has been employed based on the research conducted by the traffic consultants from various research articles and recent traffic due diligence studies. Based on our understanding of the market and data available on public sources, i.e., Oxford Economics, Trading Economics, etc., the long term WPI used by the Management seems to be within a reasonable range.

- **Operational Expenditure:** Operational expenditure includes base operating expenditure, admin expenses, insurance costs, PM expenses, one-time expenses, IM fees, SPV costs and other miscellaneous expenses. These expenses are estimated by the Management over the concession period and based on the Technical Due Diligence ("TDD") reports shared by independent technical consultants.

- **Routine Repair and Maintenance Expenses:** Routine repair and maintenance expenses are estimated by the Management over the projected period and based on the TDD reports shared by independent technical consultants.

- **Major Maintenance Expenses (MMR / Periodic maintenance):** Periodic maintenance expenses are incurred to bring the road asset back to an earlier condition or to keep the road asset operating at its present condition. MMR expenditures have been estimated based on TDD reports shared by independent technical consultants appointed by the Trust and internal estimates by the Management over the concession period.

- **Depreciation and Amortization:** In relation to the TOT Assets, the concession fee paid to NHAI has been capitalized in the books of the respective SPVs as an intangible asset. The said intangible asset has been amortized basis WDV depreciation method over the respective period of concession. Since depreciation and amortization is a non-cash expenditure, it has been added back to arrive at the net cash flows.

- **Taxes:** Income taxes are estimated considering, as appropriate, brought forward losses, unabsorbed depreciation, tax depreciation/ amortisation policy proposed to be followed by the InvIT

Assets and applicable corporate income tax rate of 25.17%.

Working Capital: Considering the nature of the business of operating toll road projects, incremental working capital requirement is expected to be zero for the projected period.

- **Capital expenditure:** Initial capital expenditure in relation to the InvIT Assets as shown below has been projected by the Management based on based on TDD reports shared by independent technical consultants appointed by the Trust and internal estimates by the Management over the concession period.

SPV (INR mn)	FY25 (1M)	FY26	FY27
R4	-	4,761	649

Source: Management

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X. Basis and Premise of Valuation

1. Basis of Valuation

Valuation Base means the indication of the type of value being used in an engagement. In the present case, we have determined the fair value of the SPV at the Enterprise level. Fair Value Bases defined as under:

Fair Value/Market Value

For this valuation, we have considered the International Valuation Standards ("IVS") and have adopted a definition of Market Value as given in IVS 104, "Market Value is the estimated amount for which an asset or liability should exchange on the Valuation Date between a willing buyer and a willing seller in an arm's length transaction, after proper marketing and where the parties had each acted knowledgeably, prudently and without compulsion". The Fair Value referred elsewhere in the Report is same as Market Value as defined above

2. Valuation Date

Valuation Date is the specific date at which the value of the assets to be valued gets estimated or measured. Valuation is time specific and can change with the passage of time inter-alia due to changes in the condition of the asset to be valued and market parameters. Accordingly, valuation of an asset as at a particular date can be different from other date(s).

The Valuation Date considered for the Enterprise Valuation of the InvIT Asset is 28 February 2025. Our Report does not take account of events or circumstances arising after Valuation Date and we have no responsibility to update the Report for such events or circumstances.

Premise of Value

Premise of Value refers to the conditions and circumstances of how an asset is deployed. In the present case, we have determined the Fair Enterprise Value of the SPV on a Going Concern Value defined as under:

Going concern value is the value of a business enterprise that is expected to continue to operate in the future. The intangible elements of going concern value result from factors such as having a trained workforce, an operational plant, the necessary licenses, systems, procedures in place, etc.

XI. Valuation Conclusion

The fair valuation of the InvIT Asset as on 28 February 2025 has been carried out basis the Discounted Cash Flow method of valuation. We have considered the financial projections of the InvIT Asset provided to us by the Management. Free Cash Flow to Firm approach under DCF method has been considered to determine the Enterprise Value of the InvIT Asset. The Enterprise Value has been computed by discounting the free cash flows to the firm from 01 March 2025 until the end of the concession period, using an appropriate WACC. The WACC parameters are based as on 31 December 2024 which is in line with the existing assets of NHIT, that is, NWPPL and NEPPL.

The Management has appointed independent consultants to carry out traffic study and estimation of toll revenue and technical study for estimation of operating and maintenance expenses and major maintenance expenses for the InvIT Asset over the concession period. We have relied upon the financial projections, traffic study reports, technical reports provided by independent consultants and other information provided to us for carrying out the valuation of the InvIT Asset.

The valuation is based on various assumptions with respect to the InvIT Asset, including their respective present and future financial condition, business strategies and the environment in which they will operate in the future. These assumptions are based on the information that we have been provided with and our discussions with the Management, and reflect current expectations and views regarding future events, and therefore necessarily involve known and unknown risks and uncertainties.

The summary of valuation of the InvIT Asset is presented below:

SPV Currency: INR mn	Enterprise Value Feb'25
R4	176,405

Source: Calculation

Our views are based on the current economic, market, industry, regulatory, monetary and other conditions and on the information made available to us, as of the date of this Report. Such conditions may change significantly over a relatively brief period of time and we assume no responsibility and are not required to update, revise or reaffirm our conclusion set out in this letter to reflect events or developments subsequent to the date of the Report.

XII. Project Wise Valuation Conclusion

The summary of project-wise valuation of R4 Assets is presented below:

Asset Currency: INR mn	Enterprise Value Feb'25
Muzaffarnagar- Haridwar	16,522
Bareilly- Sitapur	14,591
Gundugolanu Devarapalli Kovvur	21,829
AP Corridor 1	
Narasannapeta- Ranasthalam	13,883
Ranasthalam to Hanumanthvaka, Visakhapatnam Section	17,953
Anandapuram- Pendurthi- Anakapalle	10,421
AP Corridor 2	
Chittoor- Mallavaram	15,302
AP/ TN Border to Nalagampalli, AP/ Karnataka Border Section	12,618
Chhattisgarh Corridor	
Raipur- Simga section	13,040
Simga to Bilaspur Section	13,071
Gandhidham-Mundra Port	27,176
Total	**176,405**

Source: Calculation

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XIII. Appendices

1. Discounted Cash flow workings for the InvIT Asset as at 28 February 2025

Currency: INR Mn Number of months	Mar25 1	Mar26 12	Mar27 12	Mar28 12	Mar29 12	Mar30 12	Mar31 12	Mar32 12	Mar33 12	Mar34 12
Net revenue	-	**16,511**	**18,197**	**19,710**	**21,449**	**23,490**	**25,641**	**28,049**	**30,446**	**33,272**
Operating expenses	-	(1,869)	(3,191)	(3,404)	(3,672)	(4,142)	(4,379)	(4,269)	(4,617)	(4,869)
Gross profit	-	**14,642**	**15,007**	**16,305**	**17,777**	**19,348**	**21,262**	**23,780**	**25,829**	**28,402**
Major maintenance expenses	-	(42)	-	(359)	(0)	(3,501)	(3,564)	(2,365)	(1,978)	(727)
EBITDA	-	**14,600**	**15,007**	**15,946**	**17,777**	**15,847**	**17,698**	**21,415**	**23,852**	**27,675**
Depreciation and amortisation (as per tax)	-	(45,291)	(34,131)	(25,598)	(19,199)	(14,399)	(10,799)	(8,099)	(6,075)	(4,556)
EBIT	-	**(30,691)**	**(19,124)**	**(9,652)**	**(1,422)**	**1,448**	**6,899**	**13,316**	**17,777**	**23,119**
Tax expense	-	-	-	-	-	-	-	-	-	(420)
Debt free net income	-	**(30,691)**	**(19,124)**	**(9,652)**	**(1,422)**	**1,448**	**6,899**	**13,316**	**17,777**	**22,699**
Add: Depreciation and amortisation (as per tax)	-	45,291	34,131	25,598	19,199	14,399	10,799	8,099	6,075	4,556
(Increase)/ Decrease in net working capital	-	-	-	-	-	-	-	-	-	-
Less: Capital expenditure	-	(4,761)	(649)	-	-	-	-	-	-	-
Debt free cash flow	-	**9,839**	**14,357**	**15,946**	**17,777**	**15,847**	**17,698**	**21,415**	**23,852**	**27,255**
Discount rate (%)	10.55	10.55	10.55	10.55	10.55	10.55	10.55	10.55	10.55	10.55
Present value factor- Mid year discounting	1.00	0.94	0.85	0.77	0.70	0.63	0.57	0.52	0.47	0.42
Present value debt free cash flow	-	**9,277**	**12,246**	**12,303**	**12,406**	**10,004**	**10,107**	**11,062**	**11,145**	**11,520**
Present value for explicit period	176,405									
Enterprise value	**176,405**									

Currency: INR Mn Number of months	Mar35 12	Mar36 12	Mar37 12	Mar38 12	Mar39 12	Mar40 12	Mar41 12	Mar42 12	Mar43 12	Mar44 12	Mar45 12
Net revenue	**36,028**	**39,195**	**42,710**	**46,295**	**50,213**	**53,943**	**57,769**	**61,858**	**64,062**	**58,844**	**49,743**
Operating expenses	(4,870)	(5,451)	(6,469)	(7,086)	(7,532)	(7,808)	(8,311)	(10,126)	(10,413)	(10,855)	(9,976)
Gross profit	**31,158**	**33,743**	**36,241**	**39,209**	**42,681**	**46,135**	**49,459**	**51,732**	**53,649**	**47,989**	**39,767**
Major maintenance expenses	(77)	(5,246)	(2,521)	(1,227)	(923)	(824)	(4,668)	(11,662)	(4,564)	(8,575)	(4,489)
EBITDA	**31,080**	**28,498**	**33,719**	**37,982**	**41,758**	**45,311**	**44,791**	**40,070**	**49,085**	**39,414**	**35,278**
Depreciation and amortisation (as per tax)	(3,417)	(2,563)	(1,922)	(1,442)	(1,081)	(811)	(608)	(456)	(342)	(257)	(192)
EBIT	**27,663**	**25,935**	**31,797**	**36,541**	**40,677**	**44,500**	**44,183**	**39,614**	**48,743**	**39,158**	**35,085**
Tax expense	(6,962)	(6,527)	(8,003)	(9,197)	(10,238)	(11,200)	(11,120)	(9,970)	(12,268)	(9,855)	(8,830)
Debt free net income	**20,701**	**19,408**	**23,795**	**27,344**	**30,440**	**33,300**	**33,063**	**29,644**	**36,476**	**29,303**	**26,255**
Add: Depreciation and amortisation (as per tax)	3,417	2,563	1,922	1,442	1,081	811	608	456	342	257	192
(Increase)/ Decrease in net working capital	-	-	-	-	-	-	-	-	-	-	-
Less: Capital expenditure	-	-	-	-	-	-	-	-	-	-	-
Debt free cash flow	**24,118**	**21,970**	**25,717**	**28,786**	**31,521**	**34,111**	**33,671**	**30,100**	**36,818**	**29,559**	**26,447**
Discount rate (%)	10.55	10.55	10.55	10.55	10.55	10.55	10.55	10.55	10.55	10.55	10.55
Present value factor- Mid year discounting	0.38	0.35	0.31	0.28	0.26	0.23	0.21	0.19	0.17	0.16	0.14
Present value debt free cash flow	**9,221**	**7,598**	**8,045**	**8,146**	**8,069**	**7,899**	**7,053**	**5,703**	**6,310**	**4,583**	**3,709**

Source: Calculation

2. Detailed WACC Computation

2.1 Computation of Cost of Equity

Based on the parameters mentioned above, the cost of equity for the InvIT Asset is computed in the following table:

Particulars	Notes	R4
Risk-free rate (%)	a	7.00
Beta	b	1.00
Equity market risk premium (%)	c	7.00
Additional risk premium (%)	d	0.50
Cost of equity capital (%)		**14.48**

Source: Calculation

Notes:

a) Based on current YTMs of Gilt Bonds with 10-year residual maturity (rounded) as on 31 December 2024.

b) Please refer the table for Beta working below
c) Based on EYMBSLLP understanding of prevailing market risk premium in India
d) Based on the traffic risk of the InvIT Asset

2.1.1 Calculation of Beta

Currency: ₹ mn	Equity beta	Market capitalisation	Net debt	Enterprise value	Debt-EV ratio based on 3 year average	Effective tax rate (%)	Unlevered beta based on 3 year debt-equity	Re-levered beta
IRB Infrastructure Developers Limited	1.36	3,37,206	88,726	4,25,931	37.93	25.17	0.93	1.69
PNC Infratech Limited	1.04	83,698	61,969	1,45,667	38.51	25.17	0.71	1.28
Dilip Buildcon Limited	2.07	76,347	27,386	1,03,733	47.33	25.17	1.24	2.23
Bharat Road Network Limited	0.85	4,941	10,591	15,532	75.75	25.17	0.25	0.46
IRB InvIT Fund	0.05	35,013	27,929	62,942	38.10	25.17	0.04	0.06
Ashoka Buildcon Limited	0.81	87,628	45,131	1,32,760	58.08	25.17	0.40	0.71
Sadbhav Infrastructure Project Limited	1.37	2,397	32,169	34,566	95.27	25.17	0.09	0.15
KNR Constructions Limited	0.86	94,865	7,203	1,02,068	8.88	25.17	0.80	1.45
Average	**1.05**				**49.98**		**0.56**	**1.01**
Median	**0.95**				**42.92**		**0.55**	**1.00**

Source: Capital IQ

2.2 Computation of Cost of Debt

Based on the parameters mentioned above, the cost of debt for the InvIT Asset is computed in the following table:

Particulars	Notes	R4
Debt borrowing rate (%)	a	8.15
Expected income tax rate (%)	b	19.38
After-tax cost of debt (%)		**6.57**

Source: Calculation

Notes:
a) Based on cost of borrowing applicable to the SPV
b) Based on effective tax rate of the SPV

2.3 Calculation of WACC

Considering the finite life of the asset, the cashflows being prone to traffic and inflation risk and the current & expected debt to equity structure of the InvIT and comparable companies, we have considered a long-term debt-to-equity ratio of 50:50 for the SPV.

Particulars	Weights	R4
Weighted cost of debt (%)	50.0	3.29
Weighted cost of equity (%)	50.0	7.24
WACC (rounded) (%)		**10.55**

Source: Calculation

The computed WACC is 10.55% for the InvIT Asset.

3. Statement of Asset

Since NHIT is envisaging to acquire stake in the SPV, hence, as at the Valuation Date, the Statement of Asset for the SPV is shown in the table below:

Currency: INR mn	Net Tangible assets	Net Intangible assets	Non-Current Assets	Current Assets	Total
R4	-	-	-	-	-

Source: Management

4. Details of capex for the SPV

4.1 Forecast expenses relating to the initial capital expenditures:

The forecast expenses relating to the initial capital expenditures for the InvIT Asset are shown in the tables below:

SPV (INR mn)	FY25 (1M)	FY26	FY27
R4	-	4,761	649

Source: Management

5. Disclosures regarding list of one-time sanctions/approvals which are obtained or pending

The Management has informed that the disclosures regarding list of one-time sanctions/approvals which are obtained for the InvIT Asset are not available with the Trust.

6. Disclosures regarding list of up to date/overdue periodic clearances

The Management has informed that all other material permits, registrations, licenses, approvals, consents and other authorizations (collectively "Governmental Licenses") shall be obtained as per individual project requirement once the Management assumes the right and obligations. The new project SPV under the Trust would in due course and as required under applicable law procure all the Governmental Licenses issued by, and shall make all material declarations and filings with, the applicable Governmental Authority to own, lease, license, operate and use its properties and assets and to conduct the business by the Project SPV, as will be described in the placement documents. Further, no notice or proceedings have been received relating to the revocation or modification of any Government Licenses, which would have a Material Adverse Effect. The general list of Governmental Licenses are as below:

Sr. No.	Statutory Permission
1	Environmental Clearance
2	Forest Clearance
3	Tree Cutting permission
4	Borrow Area permission from state & local panchayat office
5	Boulder Extraction permission from state & local panchayat office
6	Quarry permission
7	Drilling & Blasting Explosive License & permissing
8	Permission from State to draw Ground Water from river/ reservoir
9	Factory License for Camp Setup
10	Shop & Establishment License for Setting up of Office other than Camp
11	Labour License
12	Inspector of Factories - For Setting up of Crusher, Batching Plant and HMP (CTE)
13	Inspector of Factories & Local Panchayat – For Consent to Operate - Crusher, Batching Plant and HMP (CTO)
14	CPCB permission for Batching plant, HMP and Crusher Setup
15	CPCB Permission/ State permission forusing DG sets in camp and Construction projects
16	Approval /permission from Utility Shifting Agency - Electricity, Gas, Water pipelines for Excavations & elevated structure erection
17	Approval of Railways for ROB/ RUB Construction
18	RTO permission to Operate and Run Construction equipment (movable) which does not have registration
19	Other any, as per local body/state

Source: Management

7. On-going material litigations including tax disputes and claims in relation to the assets

The Management has confirmed that there are no litigations pending against the Specified Asset, which may have a bearing on the operations of NHIT and the new SPV formed, in the respective Concession Agreement.

8. Other Disclosures

8.1 Details of revenue pendency including local authority rates associated with SPV and compounding charges

The Management has confirmed that there are no revenue pendencies including local authority taxes or compounding charges associated with the Specified Asset

8.2 Vulnerability to natural or induced hazards that may not have been covered in town planning/building control

The Management has confirmed that any natural or induced hazards would be adequately covered by insurance

8.3 Any other matters which may affect the project or its value

There are no other matters which may affect the project or its value

9. Forecast Profit and Loss Statement

The forecast profit and loss statement for the InvIT Asset is shown in the table below:

Currency: INR Mn	Mar25	Mar26	Mar27	Mar28	Mar29	Mar30	Mar31	Mar32	Mar33	Mar34	Mar35
Number of months	1	12	12	12	12	12	12	12	12	12	12
Muzaffarnagar- Haridwar	-	1,922	1,800	2,118	2,290	2,502	2,743	2,994	3,243	3,552	3,575
Bareilly- Sitapur	-	2,345	2,418	2,306	2,518	2,744	2,994	3,277	3,567	3,890	4,236
Gundugolanu Devarapalli Kovvur	-	1,784	2,030	2,240	2,429	2,659	2,898	3,148	3,426	3,731	4,053
AP Corridor 1	-	3,576	4,091	4,624	5,147	5,673	6,179	6,749	7,334	8,003	8,742
AP Corridor 2	-	2,518	2,985	3,004	3,117	3,422	3,755	4,110	4,494	4,915	5,368
Chhattisgarh Corridor	-	2,428	2,756	3,078	3,375	3,693	4,031	4,370	4,688	5,122	5,593
Gandhidham-Mundra Port	-	1,938	2,117	2,339	2,573	2,797	3,042	3,401	3,694	4,060	4,461
Net Sales	**-**	**16,511**	**18,197**	**19,710**	**21,449**	**23,490**	**25,641**	**28,049**	**30,446**	**33,272**	**36,028**
Tolling Operations cost	-	(438)	(1,012)	(1,087)	(1,162)	(1,397)	(1,396)	(1,384)	(1,431)	(1,538)	(1,653)
Incident Management cost	-	(160)	(346)	(371)	(399)	(454)	(508)	(463)	(498)	(535)	(505)
Routine Maintenance cost	-	(247)	(524)	(543)	(621)	(661)	(700)	(638)	(668)	(693)	(599)
Repairs cost	-	(85)	(178)	(184)	(199)	(217)	(258)	(213)	(237)	(248)	(211)
ATMS	-	(23)	(173)	(179)	(185)	(201)	(214)	(187)	(194)	(201)	(170)
PM Expenses	-	(72)	(77)	(83)	(89)	(96)	(103)	(111)	(119)	(128)	(138)
Transition Costs	-	(99)	-	-	-	-	-	-	-	-	-
Insurance Expenses	-	(142)	(148)	(154)	(160)	(167)	(174)	(185)	(192)	(209)	(219)
SPV Costs + IE Fees	-	(430)	(585)	(643)	(708)	(776)	(834)	(890)	(965)	(1,069)	(1,113)
Periodic SPV Expenses	-	(63)	(25)	(26)	(1)	(11)	(13)	(1)	(98)	(13)	(2)
CSR expenses	-	-	-	-	-	-	-	-	-	-	-
IM expenses	-	(111)	(122)	(134)	(147)	(162)	(178)	(196)	(216)	(237)	(261)
Pre-MMR Operating EBITDA	**-**	**14,642**	**15,007**	**16,305**	**17,777**	**19,348**	**21,262**	**23,780**	**25,829**	**28,402**	**31,158**
MMR expenses	-	(42)	-	(359)	(0)	(3,501)	(3,564)	(2,365)	(1,978)	(727)	(77)
Operating EBITDA	**-**	**14,600**	**15,007**	**15,946**	**17,777**	**15,847**	**17,698**	**21,415**	**23,852**	**27,675**	**31,080**

Currency: INR Mn	Mar36	Mar37	Mar38	Mar39	Mar40	Mar41	Mar42	Mar43	Mar44	Mar45
Number of months	12	12	12	12	12	12	12	12	12	12
Muzaffarnagar- Haridwar	3,847	4,462	4,823	5,232	5,685	6,143	6,646	4,519	-	-
Bareilly- Sitapur	4,578	4,945	5,316	5,747	6,292	6,752	7,263	7,826	8,429	9,025
Gundugolanu Devarapalli Kovvur	4,405	4,759	5,154	5,571	6,031	6,494	6,996	7,526	2,569	-
AP Corridor 1	9,481	10,221	11,075	11,967	12,283	12,878	13,384	14,406	15,539	10,280
AP Corridor 2	5,888	6,365	6,925	7,541	8,199	8,844	9,579	10,354	11,274	10,144
Chhattisgarh Corridor	6,109	6,642	7,225	7,838	8,548	9,212	9,947	10,752	11,647	10,244
Gandhidham-Mundra Port	4,886	5,315	5,779	6,318	6,905	7,446	8,042	8,679	9,386	10,051
Net Sales	**39,195**	**42,710**	**46,295**	**50,213**	**53,943**	**57,769**	**61,858**	**64,062**	**58,844**	**49,743**
Tolling Operations cost	(1,777)	(1,911)	(2,054)	(2,208)	(2,373)	(2,551)	(2,743)	(2,822)	(2,665)	(2,378)
Incident Management cost	(628)	(888)	(1,060)	(1,140)	(1,041)	(1,119)	(1,528)	(1,585)	(1,852)	(1,597)
Routine Maintenance cost	(704)	(910)	(974)	(1,008)	(895)	(926)	(1,376)	(1,321)	(1,383)	(1,322)
Repairs cost	(249)	(333)	(339)	(351)	(308)	(319)	(505)	(482)	(584)	(588)
ATMS	(197)	(268)	(287)	(297)	(248)	(257)	(385)	(376)	(421)	(389)
PM Expenses	(148)	(159)	(171)	(184)	(198)	(213)	(229)	(237)	(222)	(191)
Transition Costs	-	-	-	-	-	-	-	-	-	-
Insurance Expenses	(245)	(357)	(427)	(442)	(476)	(493)	(520)	(512)	(511)	(431)
SPV Costs + IE Fees	(1,200)	(1,328)	(1,409)	(1,506)	(1,645)	(1,783)	(2,041)	(2,128)	(2,067)	(1,765)
Periodic SPV Expenses	(16)	-	(17)	-	(125)	(21)	(17)	-	-	-
CSR expenses	-	-	-	(13)	(79)	(167)	(273)	(392)	(535)	(640)
IM expenses	(287)	(316)	(347)	(382)	(420)	(462)	(508)	(559)	(615)	(676)
Pre-MMR Operating EBITDA	**33,743**	**36,241**	**39,209**	**42,681**	**46,135**	**49,459**	**51,732**	**53,649**	**47,989**	**39,767**
MMR expenses	(5,246)	(2,521)	(1,227)	(923)	(824)	(4,668)	(11,662)	(4,564)	(8,575)	(4,489)
Operating EBITDA	**28,498**	**33,719**	**37,982**	**41,758**	**45,311**	**44,791**	**40,070**	**49,085**	**39,414**	**35,278**

Source: Management

10. Abbreviations

Particulars	Abbreviation
Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014, as amended	SEBI Invit Regulations
National Highways Infra Investment Managers Private Limited	Client/you/NHIIMPL /Investment Manager
National Highways Infra Trust	NHIT/InvIT/Trust
Ernst & Young Merchant Banking Services LLP	EYMBSLLP
Letter of Award dated 09 August 2024	Engagement Agreement
Report	Report
Round 4 Assets	Specified Asset/SPV/InvIT Asset
28 February 2025	Valuation Date
Management of NHIT and NHIIMPL	Management
Securities and Exchange Board of India	SEBI
National Highways Authority of India	NHAI/Sponsor
IDBI Trustee Services Limited	IDBI/Trustee
National Highways Infra Project Managers Private Limited	NHIPMPL/Project Manager
Toll, Operate and Transfer	TOT
Individual R4 project	Project
Insolvency and Bankruptcy Board of India	IBBI
Discounted Cash Flow	DCF
Weighted Average Cost of Capital	WACC
Capital Asset Pricing Model	CAPM
Market Risk Premium	MRP
Technical Due Diligence	TDD
International Valuation Standards	IVS
Material permits, registrations, licenses, approvals, consents and other authorizations	Governmental Licenses

India Equity Market Risk Premium: EY Study

Equity Market Risk Premium (EMRP or MRP) is the excess return earned by an investor over a risk free rate, when they invest in the stock market. This return compensates investors for taking on the higher risk of equity investing.

There are various approaches to estimating MRP like surveying investors, or calculating MRP implied in stock prices via forward forecasts. One of the most objective approach is to calculate MRP by analysing historical MRP earned over a long period of time. EY has used this approach. This has involved the following steps

Time period to be considered:

A relatively long time period is selected, as in the short term markets can be volatile leading to under/over-estimation of MRP depending upon near term market performance. stock market data is available from 1979 onwards. Further a period commencing from 1990 onwards is also suitable as it coincides with India's economic liberalization.

Rm: Market Return

Returns on BSE Sensex/BSE100 Index or NSE Nifty may be considered as a proxy for the market returns. Since data for NSE Nifty is available only from 1994, returns on BSE Sensex and BSE 100 have been considered for analysis of a longer period of data.

Rf: Risk Free Rate

Hypothetically, risk free rate is the return on security or portfolio securities that has no default risk and is completely uncorrelated with returns on anything else in the economy. In India, the yield on 10-year residual maturity government bond is considered as a reasonable proxy for the risk-free rate.

Adjustment for dividend yields

Return on equities is derived from a combination of dividend receipts and increase in share prices/ index. Since BSE Sensex and BSE100 Index are price return indices, the dividend yields for them are added to the average MRP to arrive at total return on equities.

Choice between Arithmetic and Geometric Mean

Geometric mean is preferred on the grounds that it takes compounding into account over the sample period.

Since the dividends are paid out in cash, it is assumed they are not re-invested, hence arithmetic mean of the dividend yield is added to the MRP.

Conclusion

Rf calculated for each of the year is deducted from Rm, which includes both returns on the stock index and the dividend yield of the index. The difference Rm- Rf is averaged over the period by using Geometric Mean.

The calculations of the study show that Market Risk Premium, while varying as per period and choice of index, converges around 7% (rounded). This is then considered a reasonable benchmark for India's Market Risk Premium.

ANNEXURE C

TRAFFIC REPORTS

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Intended for

NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED

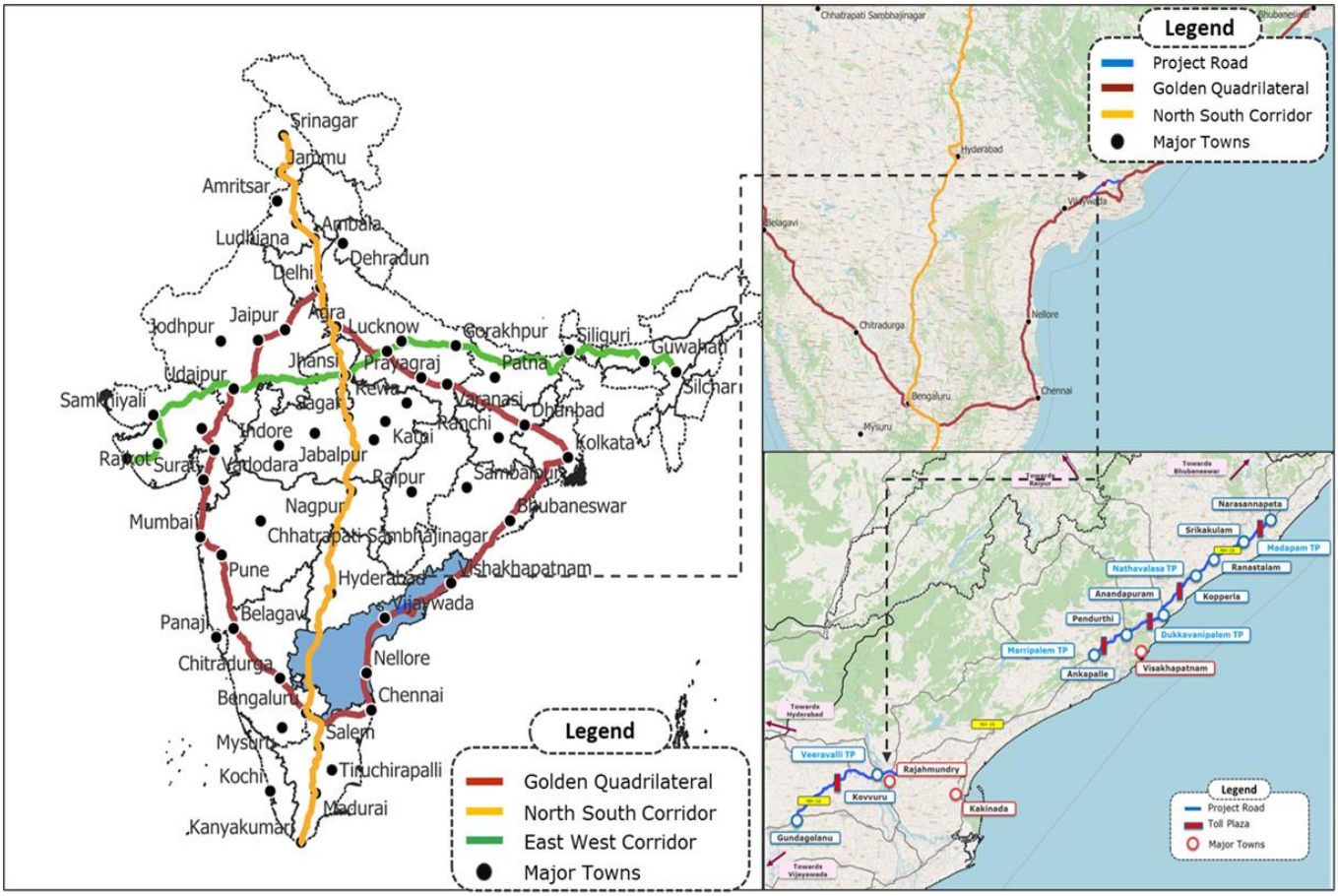
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TRAFFIC STUDY FOR NARSANNAPETA - ANAKAPALLI SECTION OF NH-16 IN THE STATE OF ANDHRA PRADESH



RAMBOLL

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ABBREVIATIONS

$/US$/USD	United States Dollar
%	Percentage
₹/Rs	Indian Rupees
2A	2 Axle Truck
3A	3 Axle Truck
AADT	Annual Average Daily Traffic
AC	Air Conditioners
AR	Alternate Route
BIA	Broad Influence Area
BOT	Build, Operate & Transfer
CA	Concession Agreement
CAGR	Compounded Annual Growth Rate
CJV	Car/Jeep/Van
COVID	Corona Virus Disease
CSO	Central Statistical Organisation
DPIIT	Department for Promotion of Industry and Internal Trade
EI	Economic Indicator
ETC	Electronic Toll Collection
FDI	Foreign Direct Investment
FY	Financial Year
GDP	Gross Domestic Product
GSDP	Gross State Domestic Product
H2	2nd Half of FY
IHMCL	Indian Highways Management Company Limited
IIA	Immediate Influence Area
IOCL	Indian Oil Corporation Ltd
IRC	Indian Roads Congress
km	Kilometre
LCV	Light Commercial Vehicle
MAV	Multi Axle Vehicle
M Bus	Mini-Bus
MLCV	Mini Light Commercial Vehicle
NH	National highway
NHAI	National Highway Authority of India
NHDP	National Highway Development Programme
OD	Origin & Destination
PCU	Passenger Car Unit
PIA	Project Influence Area
PR	Project Road
Q1	1st Quarter of FY
RBI	Reserve Bank of India
RRR	Regional Ring Road
SCF	Seasonal Correction Factor

SCH M	Schedule M
SEZ	Special Economic Zone
SH	State Highway
SPV	Special Purpose Vehicle
sq.km	Square Kilometre
TOT	Toll – Operate – Transfer
TP	Toll Plaza
TP01	Toll Plaza 01/ Madapam
TP02	Toll Plaza 02/ Nathavalasa
TP03	Toll Plaza 03/ Dukkavanipalem
TP04	Toll Plaza 04/ Marripalem
VIP	Very Important Person
WPI	Wholesale Price Index
YOY	Year on Year

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EXECUTIVE SUMMARY

Project Overview

The project highway, NH-16, runs parallel to the eastern coast of India envisaged under National Highway Development Program. The total length of NH-16 is roughly 1,764 km starting from Kolkata in West Bengal and ending at Chennai in Tamil Nadu while passing through the states of West Bengal, Odisha, Andhra Pradesh, and Tamil Nadu. NH–16 connects important tourist and industrial cities and towns like Kolkata, Bhubaneswar, Srikakulam, Vizianagaram, Visakhapatnam, Rajahmundry, Vijayawada, Bengaluru, and Chennai etc.

The Narsannapeta to Anakapalli road sections with an aggregate length of 170 kilometers of NH-16 (Old NH-5) in the state of Andhra Pradesh referred to as Project Road (PR), has been offered by NHAI to National Highways Infra Investment Managers Private Limited (NHIIMPL) for transfer to InvIT in the fourth round for a concession period of 20 years with maximum extension till 30 years.

Figure 0-1 shows the context and alignment of project road with major places along the highway.

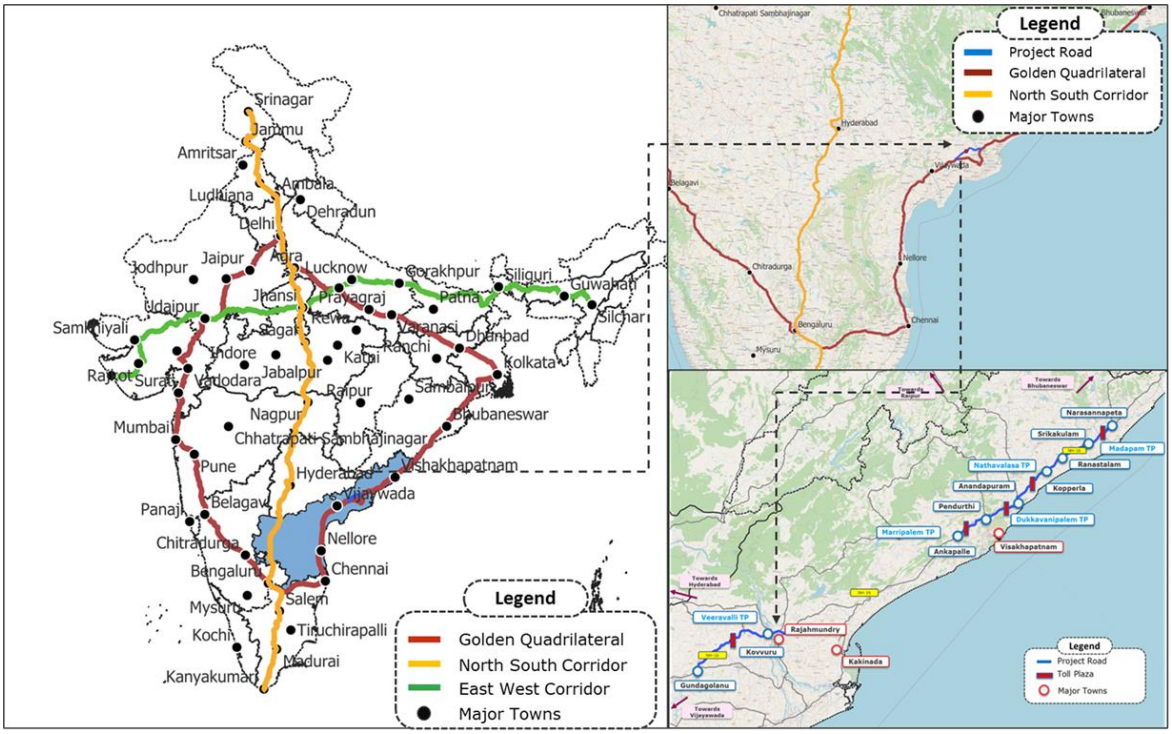


Figure 0-1: Alignment of Project Road and Location of Toll Plazas

Project Road Characteristics and Profile of Influencing Districts

The project road in wider context serves the long-distance traffic, which is majorly plying from/to Anakapalli and beyond (towards Bengaluru/Tirupati/Chennai/rest of Tamil Nadu) to/from Bhubaneshwar/Cuttack and beyond (towards Kolkata/Kharagpur). Apart from long distance traffic, it also serves the short-distance traffic between Nandigama/ Srikakulam/ Kopperia and Anadapuram/ Visakhapatnam/ Anakapalli areas.

The project road traverses a diverse industrial landscape, marked by strategically positioned clusters that drive regional economic activity. A significant hub of industrial operations is located in Visakhapatnam, particularly near the Gangavaram Port area, where a mixed cluster of coal plants and metal industries thrives. Prominent companies in this region include Venkatadri Metal Industries, Jindal Stainless Steel Ltd, and various other metal processing units.

Additionally, Gajuwaka is a center for glass and metal manufacturing, with industries like Matrix Glass Industries and Om Glass & Ply Industries. Stone quarrying is concentrated in Kothavalasa above TP03 and Mamidipalem near Anakapalli, supporting firms such as Sri Siva Stones Exports and Sairam Kadapa & Granite Slabs, which contribute to the region's construction sector.

The project road falls under the jurisdiction of three districts in the state of Andhra Pradesh *viz.* Srikakulam, Vizianagaram and Vishakhapatnam district.

- Srikakulam's economy is primarily agricultural, with rice, maize, and pulses as major crops, and cashew designated as its One District One Product (ODOP). The district also has a presence of small-scale industries and fishing activities.
- Vizianagaram, known for its rice production and mango-based ODOP products, has growing industrial and handloom sectors.
- Visakhapatnam serves as a key economic hub with Visakhapatnam Port, shipbuilding, steel, petrochemicals, and a strong tourism industry.

Annual Average Daily Traffic (AADT)

The estimation for FY25 AADT is done after annualising the behaviour of April 2024 - November 2024 traffic. For Madapam and Nathavalasa, SCF is derived from the months of April to Nov of FY23 and FY24 of respective toll plazas and the average of both years has been adopted. However, for MAVs at Nathavalasa, the SCF of Madapam TP has been considered due to the MAVs being abnormally high in few months of FY24.

The MOM traffic pattern at TP03 and TP04 show initial ramp up of traffic after opening of Vizag bypass in April 2022. Therefore, for Dukkavanipalem and Marripalem, the SCF is derived from the traffic data of adjacent toll plazas (Madapam and Vempadu). For this purpose, Average of FY23 and FY24 of Madapam TP and FY23 Vempadu TP is considered.

For TP02, TP03, and TP04, cash and exempt traffic from FY25 (Apr to Nov) have been added to the estimated ETC traffic of respective toll plaza. However, for TP01 cash and exempt traffic from Jan-2023 to Dec-2023 is used, considering the disruption in traffic since Jan 2024.

FY25 AADT derived from the ETC traffic data along with SCF, cash traffic, exempt traffic and ADT of April to November of FY25 is presented in **Table 0-1**.

	Traffic / Mode	CJV	LCV	2-Axle	3-Axle	MAV	OSV	PCU
TP01 - Madapam								
A.	ETC FY25(Apr - Nov)	5,402	397	1,773	1,026	2,894	3	27,431
B.	SCF (Avg of FY23 & FY24)	1.03	1.00	1.01	1.01	1.01	1.01	
C.	ETC * SCF	5,561	399	1,791	1,033	2,926	3	27,812
D.	Cash (Jan23 – Dec23)	75	3	3	2	1	1	104
E.	Exempt (Jan23 – Dec23)	339	7	2	11	13	1	452
F.	AADT FY25 (Estimated)= C+D+E	5,975	409	1,795	1,046	2,940	5	28,364
TP02 - Nathavalasa								
A.	ETC FY25(Apr - Nov)	6,368	504	2,055	1,123	3,605	4	32,899
B.	SCF (Avg of FY23 & FY24)	1.03	1.01	1.01	1.01	1.01	1.01	
C.	ETC * SCF	6,555	508	2,076	1,139	3,645	4	33,383
D.	Cash (Apr24 – Nov24)	651	16	15	22	2	2	804
E.	Exempt (Apr24 – Nov24)	0	0	0	0	0	0	0
F.	AADT FY25 (Estimated)= C+D+E	7,206	524	2,091	1,161	3,712	6	34,479
TP03 - Dukkavanipalem								
A.	ETC FY25(Apr - Nov)	2,867	453	1,299	1,054	2,987	4	24,065
B.	SCF (Avg of FY23-Vempadu and Avg of FY23 & FY24-Madapam)	1.02	1.00	1.00	1.00	1.02	1.02	
C.	ETC * SCF	2,937	452	1,303	1,050	3,036	4	24,354
D.	Cash (Apr24 – Nov24)	55	4	4	6	1	1	100
E.	Exempt (Apr24 – Nov24)	326	2	1	2	2	0	347
F.	AADT FY25 (Estimated)= C+D+E	3,318	457	1,308	1,058	3,039	5	24,800
TP04 - Marripalem								
A.	ETC FY25(Apr - Nov)	3,722	463	1,319	1,068	2,965	4	24,938
B.	SCF (Avg of FY23-Vempadu and Avg of FY23 & FY24-Madapam)	1.02	1.00	1.00	1.00	1.02	1.02	
C.	ETC * SCF	3,813	462	1,323	1,064	3,013	4	25,244
D.	Cash (Apr24 – Nov24)	96	3	2	2	1	1	122
E.	Exempt (Apr24 – Nov24)	644	2	1	4	1	0	667
F.	AADT FY25 (Estimated)= C+D+E	4,552	467	1,327	1,071	3,016	5	26,041

Table 0-1: AADT for FY25

Travel Pattern

- Car traffic shows a strong local component across all toll plazas
- Freight traffic primarily exhibits the long-distance movement patterns with predominant movement between Kolkata/Jharkhand/East& North India and Bangalore/Chennai & beyond across all four toll plaza locations along the PR.
- The passenger traffic on the road were found to be for the purpose of work and business at the toll plaza locations.

Network Impacts

In context of the project road, three road network developments which may impact the traffic on the project road are:

1. *Impact of Raipur-Visakhapatnam (Vizag) Expressway & Sabbavaram to Sheela Nagar Port Connectivity Road*

The assessment for the traffic plying between Raipur/Salur & beyond and Vizag City/Port has been done to understand the impact of the completion of Raipur-Vizag Expressway coupled with Elevated Sabbavaram to Sheela Nagar port connectivity road.

The total diverted traffic estimated for FY25 after the operation of Raipur-Vizag Expressway and Elevated Sabbavaram to Sheela Nagar port connectivity under close tolling is presented in **Table 0-2**.

Modes	Car	LCV	2A	3A	MAV	PCU
Adduru to Pinagadi Ticket type	2,219	150	59	132	779	6,523

Table 0-2: Total Impact Due to Raipur-Vizag Expressway and Sabbavaram–Sheela Nagar Port Connectivity Road – FY25

This traffic has been grown and considered appropriately in the respective years of impact. In context of the timelines, the 100 percent of the considered diverted traffic is assumed to shift by FY30, following the implementation of close tolling and the completion of construction on the RVE and port connectivity road.

2. *Impact of Sabbavaram-Sheela Nagar Port connectivity road on Route Choice between Anandapuram/Anakapalli & beyond to Vizag port*

The impact of completion of port connectivity road has been studied for two streams of traffic:

- Traffic from/to Anandapuram & beyond to/from Vizag City/Port - Northern Approach
- Traffic from/to Anakapalli & beyond to/from Vizag City/Port – Southern Approach

Net divertible traffic (Resultant gain) estimated for FY25 due to completion of Sabbavaram-Sheela Nagar port connectivity road is presented in **Table 0-3**.

Resultant Upside	2A	3A	MAV	PCU
North Traffic			199	896
South Traffic	39	83	1,257	6,023

Table 0-3: Diversion Analysis for Anandapuram/Anakapalli & Beyond to Vizag Port Traffic - FY25

The Sabbavaram-Sheela Nagar Road is expected to add 199 MAVs (896 PCUs) for Dukkavanipalem to Pinagdi ticket type and 6,023 PCUs for Marripalem to Pinagadi ticket type for Vizag Port bound traffic from Northern and Sothern Approaches respectively. This traffic has been grown and considered appropriately in the respective years of impact.

In context of the timelines, the 100 percent of the considered diverted traffic is assumed to shift by FY30, following the implementation of close tolling and the completion of construction on port connectivity road.

3. Impact of Kharagpur – Vizag Expressway

The assessment for the route between Kharagpur and Vizag city/Port has been done for the two traffic streams:

- Traffic from/to Bhubaneswar & beyond to/from Vizag City/Port
- Traffic from/to Bhubaneswar & beyond to/from Anakapalli & beyond

The total diverted traffic estimated for FY25 after the operation of Kharagpur-Vizag Expressway at the two toll plazas is presented in **Table 0-4**.

Diverted Traffic As % AADT	Car	LCV	2A	3A	MAV	PCUs
Diverted Traffic % Based on Diversion Analysis						
Madapam (TP01)	4.3	23.3	36.0	38.7	41.1	31.4
Nathavalasa (TP02)	3.5	18.1	32.2	34.9	32.6	25.9
Adopted @ 50%						
Madapam (TP01)	2.1	11.6	18.0	19.4	20.6	15.7
Nathavalasa (TP02)	1.8	9.1	16.1	17.4	16.3	12.9

Table 0-4: Total Impact Due to Kharagpur-Vizag Expressway – FY25

This traffic has been grown and considered appropriately in the respective years of impact.

The project is a part of phase 2 of vision 2047, it is anticipated the whole process may take 10-15 years for completion. In view of this and pre-bid responses from NHAI, impact of this development has been considered from FY40 onwards. In addition, there would be some captive traffic of the PR due to distribution points along the route, familiarity of the existing route and roadside facilities. In view of this, 50 percent of this traffic is considered to shift to greenfield expressway. In terms of phasing for traffic shift, it is assumed that 50% of the diverted traffic will shift to the alternate route by FY40, 75% by FY41, and 100% by FY42.

Traffic Growth rates

The estimated traffic growth rates for the project road based on the elasticity approach applicable across all the three toll plazas have been presented till FY55 in line with the maximum extendable concession period of 30 years in **Table 0-5**.

FY/Modes	TP01 & TP02					TP03 & TP04				
	Car	LCV	2A	3A	MAV/ OSV	Car	LCV	2A	3A	MAV/ OSV
FY26	8.0	3.3	5.3	2.6	6.6	8.1	3.3	5.3	2.6	6.6
FY27	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY28	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY29	7.6	3.1	5.0	2.5	6.2	7.6	3.1	5.0	2.5	6.2
FY30	6.8	2.8	4.5	2.2	5.6	6.9	2.8	4.5	2.2	5.6
FY31	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1

FY/Modes	TP01 & TP02					TP03 & TP04				
	Car	LCV	2A	3A	MAV/ OSV	Car	LCV	2A	3A	MAV/ OSV
FY32	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY33	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY34	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY35	6.2	2.8	3.9	2.2	5.0	6.2	2.8	3.9	2.2	5.0
FY36	5.5	2.7	3.3	1.6	4.3	5.5	2.7	3.3	1.6	4.4
FY37	5.4	2.7	3.2	1.6	4.3	5.4	2.7	3.2	1.6	4.3
FY38	5.3	2.6	3.1	1.6	4.2	5.3	2.6	3.2	1.6	4.2
FY39	5.2	2.6	3.1	1.5	4.1	5.2	2.6	3.1	1.5	4.1
FY40	5.1	2.5	3.0	1.5	4.0	5.1	2.5	3.0	1.5	4.0
FY41	5.0	2.5	3.0	1.5	3.5	5.0	2.5	3.0	1.5	3.5
FY42	4.9	2.4	2.9	1.4	3.4	4.9	2.4	2.9	1.4	3.4
FY43	4.8	2.4	2.9	1.4	3.3	4.8	2.4	2.9	1.4	3.3
FY44	4.7	2.3	2.8	1.4	3.2	4.7	2.3	2.8	1.4	3.3
FY45 and beyond	4.6	2.3	2.7	1.4	3.2	4.6	2.3	2.7	1.3	3.2

Table 0-5: Projected Traffic Growth Rates for Project Road (%)

Implied Traffic Growth rates

The implied traffic growth rates for the project road after considering the impact of diversions at all the toll plazas have been presented in **Table 0-6** and **Table 0-7**.

FY/Modes	TP01					TP02				
	Car	LCV	2A	3A	MAV/ OSV	Car	LCV	2A	3A	MAV/ OSV
FY26	8.0	3.3	5.3	2.6	6.6	8.0	3.3	5.3	2.6	6.6
FY27	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY28	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY29	7.6	3.1	5.0	2.5	6.2	7.6	3.1	5.0	2.5	6.2
FY30	6.8	2.8	4.5	2.2	5.6	6.8	2.8	4.5	2.2	5.6
FY31	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY32	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY33	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY34	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY35	6.2	2.8	3.9	2.2	5.0	6.2	2.8	3.9	2.2	5.0
FY36	5.5	2.7	3.3	1.6	4.3	5.5	2.7	3.3	1.6	4.3
FY37	5.4	2.7	3.2	1.6	4.3	5.4	2.7	3.2	1.6	4.3
FY38	5.3	2.6	3.1	1.6	4.2	5.3	2.6	3.1	1.6	4.2
FY39	5.2	2.6	3.1	1.5	4.1	5.2	2.6	3.1	1.5	4.1
FY40	4.0	-3.4	-6.2	-8.3	-6.7	4.2	-2.1	-5.3	-7.4	-4.4
FY41	4.5	-0.1	-1.1	-2.9	-1.3	4.6	0.5	-0.6	-2.4	-0.2
FY42	4.2	-1.5	-3.4	-5.4	-4.1	4.3	-0.5	-2.7	-4.6	-2.3
FY43	4.8	2.4	2.9	1.4	3.3	4.8	2.4	2.9	1.4	3.3
FY44	4.7	2.3	2.8	1.4	3.2	4.7	2.3	2.8	1.4	3.2
FY45 and beyond	4.6	2.3	2.7	1.4	3.2	4.6	2.3	2.7	1.4	3.2

Table 0-6: Implied Traffic Growth Rates for PR After Diversion for TP01 and TP02 (%)

FY/Modes	TP03					TP04				
	Car	LCV	2A	3A	MAV/ OSV	Car	LCV	2A	3A	MAV/ OSV
FY26	8.1	3.3	5.3	2.6	6.6	8.1	3.3	5.3	2.6	6.6
FY27	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY28	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY29	7.6	3.1	5.0	2.5	6.2	7.6	3.1	5.0	2.5	6.2
FY30	6.9	2.8	4.5	2.2	5.6	6.9	2.8	4.5	2.2	5.6
FY31	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1

FY/Modes	TP03					TP04				
	Car	LCV	2A	3A	MAV/ OSV	Car	LCV	2A	3A	MAV/ OSV
FY32	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY33	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY34	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY35	6.2	2.8	3.9	2.2	5.0	6.2	2.8	3.9	2.2	5.0
FY36	5.5	2.7	3.3	1.6	4.4	5.5	2.7	3.3	1.6	4.4
FY37	5.4	2.7	3.2	1.6	4.3	5.4	2.7	3.2	1.6	4.3
FY38	5.3	2.6	3.2	1.6	4.2	5.3	2.6	3.2	1.6	4.2
FY39	5.2	2.6	3.1	1.5	4.1	5.2	2.6	3.1	1.5	4.1
FY40	5.1	2.5	3.0	1.5	4.0	5.1	2.5	3.0	1.5	4.0
FY41	5.0	2.5	3.0	1.5	3.5	5.0	2.5	3.0	1.5	3.5
FY42	4.9	2.4	2.9	1.4	3.4	4.9	2.4	2.9	1.4	3.4
FY43	4.8	2.4	2.9	1.4	3.3	4.8	2.4	2.9	1.4	3.3
FY44	4.7	2.3	2.8	1.4	3.3	4.7	2.3	2.8	1.4	3.3
FY45 and Beyond	4.6	2.3	2.7	1.3	3.2	4.6	2.3	2.7	1.3	3.2

Table 0-7: Implied Traffic Growth Rates for PR After Diversion for TP03 and TP04 (%)

Traffic Projections

Mode-wise projected traffic for the toll plazas of the project road under the base case after considering diversion impacts till FY55 is presented in **Table 0-8 and Table 0-9**.

FY/ Modes	TP01						TP02					
	Car	LCV	2A	3A	MAV	OSV	Car	LCV	2A	3A	MAV	OSV
FY25	5,975	409	1,795	1,046	2,940	5	7,206	524	2,091	1,161	3,712	6
FY26	6,455	423	1,890	1,073	3,134	5	7,786	542	2,202	1,191	3,958	6
FY27	6,967	436	1,989	1,101	3,338	6	8,402	560	2,317	1,222	4,215	7
FY28	7,518	451	2,093	1,130	3,556	6	9,068	578	2,438	1,254	4,490	7
FY29	8,087	465	2,197	1,158	3,777	6	9,753	596	2,560	1,285	4,769	7
FY30	8,640	478	2,297	1,184	3,989	7	10,420	613	2,675	1,313	5,037	8
FY31	9,182	492	2,387	1,210	4,191	7	11,073	630	2,781	1,343	5,292	8
FY32	9,757	506	2,482	1,237	4,403	7	11,768	648	2,891	1,373	5,560	9
FY33	10,369	520	2,580	1,265	4,626	8	12,506	667	3,005	1,403	5,841	9
FY34	11,019	535	2,682	1,293	4,860	8	13,290	685	3,124	1,435	6,137	10
FY35	11,698	549	2,786	1,322	5,102	9	14,108	704	3,245	1,466	6,442	10
FY36	12,341	564	2,877	1,343	5,323	9	14,884	724	3,351	1,490	6,722	10
FY37	13,008	580	2,969	1,364	5,550	9	15,688	743	3,458	1,514	7,008	11
FY38	13,697	595	3,062	1,386	5,782	10	16,519	763	3,567	1,537	7,301	11
FY39	14,409	610	3,157	1,407	6,020	10	17,378	782	3,677	1,561	7,601	12
FY40	14,982	589	2,960	1,290	5,618	11	18,103	766	3,483	1,446	7,263	12
FY41	15,663	589	2,927	1,253	5,546	11	18,940	770	3,461	1,411	7,247	13
FY42	16,324	580	2,826	1,185	5,320	11	19,761	766	3,368	1,346	7,079	13
FY43	17,108	594	2,907	1,202	5,497	12	20,710	784	3,464	1,365	7,314	14
FY44	17,912	608	2,988	1,219	5,675	12	21,683	802	3,560	1,384	7,551	14
FY45	18,735	622	3,070	1,235	5,855	13	22,680	821	3,658	1,403	7,791	15
FY46	19,597	636	3,154	1,252	6,041	13	23,723	839	3,757	1,422	8,039	15
FY47	20,499	651	3,240	1,269	6,233	13	24,815	859	3,860	1,441	8,294	15
FY48	21,442	666	3,328	1,286	6,431	14	25,956	878	3,966	1,461	8,558	16
FY49	22,428	681	3,419	1,303	6,636	14	27,150	898	4,074	1,480	8,829	16
FY50	23,460	696	3,513	1,321	6,846	15	28,399	919	4,185	1,501	9,110	17

FY/ Modes	TP01						TP02					
	Car	LCV	2A	3A	MAV	OSV	Car	LCV	2A	3A	MAV	OSV
FY51	24,539	712	3,609	1,339	7,064	15	29,705	940	4,300	1,521	9,399	18
FY52	25,667	729	3,707	1,357	7,288	16	31,072	961	4,417	1,541	9,698	18
FY53	26,848	745	3,809	1,375	7,520	16	32,501	983	4,538	1,562	10,006	19
FY54	28,083	762	3,913	1,394	7,759	17	33,996	1,006	4,662	1,583	10,324	19
FY55	29,375	780	4,019	1,413	8,005	17	35,560	1,029	4,789	1,605	10,652	20

Table 0-8: Projected Mode-wise Traffic at TP01 and TP02

FY/ Modes	TP03						TP04					
	Car	LCV	2A	3A	MAV	OSV	Car	LCV	2A	3A	MAV	OSV
FY25	3,318	457	1,308	1,058	3,039	5	4,552	467	1,327	1,071	3,016	5
FY26	3,585	472	1,378	1,086	3,240	5	4,919	483	1,398	1,099	3,216	5
FY27	3,870	488	1,450	1,114	3,452	6	5,309	498	1,471	1,127	3,426	6
FY28	4,177	504	1,526	1,143	3,677	6	5,730	515	1,548	1,157	3,649	6
FY29	4,493	520	1,602	1,171	3,906	6	6,164	531	1,625	1,185	3,877	6
FY30	4,801	534	1,674	1,197	4,396	7	6,586	546	1,748	1,305	5,802	7
FY31	5,102	549	1,741	1,223	4,619	7	7,000	562	1,818	1,335	6,096	7
FY32	5,423	565	1,809	1,251	4,854	7	7,439	577	1,889	1,364	6,405	7
FY33	5,763	581	1,881	1,279	5,100	8	7,906	594	1,964	1,395	6,730	8
FY34	6,125	598	1,955	1,307	5,359	8	8,403	611	2,042	1,426	7,071	8
FY35	6,503	614	2,031	1,336	5,626	9	8,921	628	2,121	1,457	7,424	9
FY36	6,861	631	2,098	1,357	5,870	9	9,413	645	2,191	1,481	7,747	9
FY37	7,232	648	2,165	1,379	6,121	9	9,922	662	2,261	1,504	8,078	9
FY38	7,616	665	2,234	1,400	6,378	10	10,449	680	2,332	1,527	8,416	10
FY39	8,013	682	2,303	1,422	6,640	10	10,993	697	2,405	1,551	8,762	10
FY40	8,422	700	2,373	1,443	6,908	11	11,554	715	2,478	1,574	9,116	11
FY41	8,844	717	2,443	1,464	7,147	11	12,133	733	2,551	1,597	9,431	11
FY42	9,278	735	2,515	1,485	7,389	11	12,729	751	2,626	1,620	9,751	11
FY43	9,724	752	2,586	1,506	7,635	12	13,341	769	2,701	1,643	10,075	12
FY44	10,182	770	2,659	1,527	7,883	12	13,969	787	2,776	1,666	10,403	12
FY45	10,651	787	2,731	1,548	8,134	13	14,612	805	2,852	1,688	10,734	13
FY46	11,142	805	2,806	1,568	8,393	13	15,285	823	2,930	1,711	11,076	13
FY47	11,655	824	2,883	1,590	8,660	13	15,990	842	3,011	1,734	11,428	13
FY48	12,192	843	2,962	1,611	8,936	14	16,726	861	3,093	1,757	11,792	14
FY49	12,754	862	3,043	1,633	9,220	14	17,497	881	3,178	1,781	12,168	14
FY50	13,341	882	3,126	1,655	9,514	15	18,303	901	3,265	1,805	12,555	15
FY51	13,956	902	3,212	1,677	9,817	15	19,146	922	3,354	1,829	12,955	15
FY52	14,599	923	3,300	1,700	10,129	16	20,029	943	3,446	1,854	13,367	16
FY53	15,272	944	3,390	1,723	10,452	16	20,951	964	3,540	1,879	13,793	16
FY54	15,975	965	3,483	1,746	10,785	17	21,917	987	3,637	1,905	14,232	17
FY55	16,711	987	3,578	1,770	11,128	17	22,927	1,009	3,737	1,930	14,685	17

Table 0-9: Projected Mode-wise Traffic at TP03 and TP04

Projections of the total PCUs based on the most likely growth rates before and after considering diversion impacts is presented in **Table 0-10**.

FY/ Modes	Before Diversion					After Diversion				
	TP01	TP02	TP03	TP04	Average	TP01	TP02	TP03	TP04	Average
FY25	28,364	34,479	24,800	26,041	28,421	28,364	34,479	24,800	26,041	28,421
FY26	30,109	36,615	26,289	27,627	30,160	30,109	36,615	26,289	27,627	30,160
FY27	31,941	38,857	27,850	29,292	31,985	31,941	38,857	27,850	29,292	31,985
FY28	33,891	41,246	29,510	31,064	33,928	33,891	41,246	29,510	31,064	33,928
FY29	35,874	43,674	31,196	32,864	35,902	35,874	43,674	31,196	32,864	35,902
FY30	37,780	46,008	32,814	34,593	37,799	37,780	46,008	32,814	34,593	37,799
FY31	39,603	48,241	34,360	36,249	39,613	39,603	48,241	34,360	36,249	39,613
FY32	41,520	50,589	35,984	37,989	41,520	41,520	50,589	35,984	37,989	41,520
FY33	43,535	53,057	37,688	39,817	43,524	43,535	53,057	37,688	39,817	43,524
FY34	45,653	55,652	39,478	41,738	45,630	45,653	55,652	39,478	41,738	45,630
FY35	47,841	58,333	41,325	43,721	47,805	47,841	58,333	41,325	43,721	47,805
FY36	49,842	60,787	43,008	45,534	49,793	49,842	60,787	43,008	45,534	49,793
FY37	51,895	63,305	44,732	47,392	51,831	51,895	63,305	44,732	47,392	51,831
FY38	53,998	65,884	46,496	49,295	53,918	53,998	65,884	46,496	49,295	53,918
FY39	56,150	68,524	48,300	51,243	56,054	56,150	68,524	48,300	51,243	56,054
FY40	58,351	71,224	50,142	53,233	58,237	53,944	66,779	50,142	53,233	56,024
FY41	60,458	73,805	51,876	55,121	60,315	54,092	67,382	51,876	55,121	57,118
FY42	62,604	76,432	53,639	57,042	62,429	53,222	66,968	53,639	57,042	57,717
FY43	64,786	79,104	55,428	58,993	64,578	55,113	69,347	55,428	58,993	59,720
FY44	67,002	81,818	57,242	60,974	66,759	57,036	71,764	57,242	60,974	61,754
FY45	69,251	84,571	59,079	62,982	68,971	58,988	74,219	59,079	62,982	63,817
FY46	71,580	87,423	60,980	65,062	71,261	61,012	76,763	60,980	65,062	65,954
FY47	73,993	90,377	62,945	67,214	73,632	63,110	79,400	62,945	67,214	68,167
FY48	76,493	93,438	64,978	69,443	76,088	65,285	82,134	64,978	69,443	70,460
FY49	79,084	96,610	67,081	71,750	78,631	67,541	84,968	67,081	71,750	72,835
FY50	81,768	99,896	69,256	74,140	81,265	69,880	87,906	69,256	74,140	75,295
FY51	84,549	103,302	71,506	76,614	83,993	72,305	90,952	71,506	76,614	77,844
FY52	87,432	106,831	73,834	79,176	86,818	74,820	94,111	73,834	79,176	80,485
FY53	90,419	110,488	76,242	81,830	89,745	77,429	97,387	76,242	81,830	83,222
FY54	93,515	114,279	78,734	84,578	92,777	80,135	100,784	78,734	84,578	86,058
FY55	96,725	118,208	81,312	87,425	95,918	82,941	104,307	81,312	87,425	88,997
CAGR (FY25 to FY45)	4.6%	4.6%	4.4%	4.5%	4.5%	3.7%	3.9%	4.4%	4.5%	4.1%

Table 0-10: Projected Traffic (in PCUs)

Tolling Segmentation

The tolling stream distribution for each toll plaza location has been derived using the respective electronic toll collection (ETC) data of FY25 from April to November. The cash and exemption traffic data for FY25 (April–November) has been added into the ETC traffic distribution for Nathavalasa TP, Dukkavanipalem TP, and Marripalem TP. However, for Madapam TP, cash and exemption traffic data from January 2023 to December 2023 has been considered due to data disruptions since January 2024. The resultant tolling segmentation is presented in **Table 0-11**.

Ticket Type/Modes	Car	LCV	2A Truck	3A Truck	MAV	OSV
TP01 -Madapam						
Single	22.2	55.6	54.4	85.2	91.0	100.0
Return	58.4	34.3	21.7	9.1	7.4	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	9.1					
Local commercial	4.4	8.5	23.8	4.6	1.1	
Exempt	5.9	1.6	0.1	1.1	0.4	
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP02 - Nathavalasa						
Single	35.6	54.5	49.5	82.8	83.0	100.0
Return	62.1	40.4	43.5	16.7	16.3	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	2.0					
Local commercial	0.3	5.0	2.5	0.5	0.7	
Exempt	0.0	0.0	4.5	0.0	0.0	
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP03 - Dukkavanipalem						
Single	51.0	64.7	80.0	88.6	89.7	100.0
Return	38.3	34.9	19.9	11.2	10.1	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	0.5					
Local commercial	0.0	0.0	0.0	0.0	0.1	
Exempt	10.1	0.4	0.1	0.2	0.1	
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP04 - Marripalem						
Single	48.8	67.6	81.6	89.5	89.8	100.0
Return	36.4	31.6	18.2	10.0	10.1	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	0.2					
Local commercial	0.0	0.3	0.1	0.2	0.0	
Exempt	14.5	0.5	0.1	0.4	0.0	
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 0-11: Tolling Distribution

In order to arrive at the traffic at different points, the relevant streams have been worked out from OD survey conducted at the TP03 and TP04. The adopted closed tolling segmentation is presented in **Table 0-12**.

Ticket Type/Modes	Car	LCV	2A Truck	3A Truck	MAV	OSV
TP03 - Dukkavanipalem						
Single	51.0	64.7	80.0	88.6	89.7	100.0
Return	38.9	34.9	19.9	11.2	10.3	
Exempt	10.1	0.4	0.1	0.2	0.1	
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP04 - Marripalem						
Single	48.8	67.6	81.6	89.5	89.8	100.0
Return	36.7	31.9	18.3	10.1	10.1	
Exempt	14.5	0.5	0.1	0.4	0.0	
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 0-12: Tolling Distribution for Closed Tolling

Additionally, after completion of Raipur Vizag Expressway additional ticket will be introduced for Aduru to Pinagadi. The segmentation adopted for Aduru to Pinagadi is presented in **Table 0-13**.

Ticket Type/Modes	Car	LCV	2A Truck	3A Truck	MAV	OSV
Single	95.0	95.0	95.0	95.0	95.0	95.0
Return	5.0	5.0	5.0	5.0	5.0	5.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 0-13: Tolling Distribution for Aduru to Pinagadi

Tollable Length and Toll Rates

The details of existing normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being charged at toll plaza locations are presented in **Table 0-14**.

TP	TP01	TP02	TP03	TP04
Base Length				
Normal	48.105	65.707	16.776	19.169
Bypass	4.470	0.000	6.311	5.499
Eq structure	1.195	0.837	0.433	0.417
Total Length	53.770	66.544	23.520	25.085
Tolling Length				
Tolling Length	66.76	74.077	30.0325	31.5875

Table 0-14: Existing Tolling Lengths at PR

The Schedule M lengths have been considered from FY25 onwards. The details of normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being/ to be charged at the toll plazas from FY25 onwards as per the Schedule - M notification are presented in **Table 0-15**.

SCH M Tolling Lengths (FY25 onwards)					
TP	TP01		TP02	TP03	TP04
	Before Construction (FY25 – till 30th Sept in FY28)	After Construction (from 1st October FY28)			
Base Length					
Normal	48.105	47.339	65.691	16.776	19.169
Bypass	4.47	4.470	0.000	6.311	5.499
Eq structure	1.195	1.990	0.853	0.433	0.417
Total Length	53.77	53.799	66.544	23.520	25.085
Tolling Length					
Tolling Length	66.76	73.944	74.2174	30.5725	31.5875

Table 0-15: Schedule – M Tolling Lengths (Km)

The net effective length for which fee shall be due and payable in closed tolling section from FY30 onwards is as presented in **Table 0-16**.

Distance matrix for total Tollable road length (Including equivalent length of structures >60 m length)						
From	To	Km 686+540 Fee Plaza at Dukkavanipalem Village, Dist. Visakhapatnam	Km 703+921 Fee Plaza at Mudapaka Village, Dist. Visakhapatnam	Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam	Km 713+880 Fee Plaza at Pinagadi Village, Dist. Visakhapatnam	Km 722+170 Fee Plaza at Marripalem Village, Dist. Visakhapatnam
	Km	682.980	703.921	711.050	713.880	731.585
Km 686+540 Fee Plaza at Dukkavanipalem Village, Dist. Visakhapatnam	682.980	0.000	22.840	32.588	36.777	56.255
Km 703+921 Fee Plaza at Mudapaka	703.921	22.840	0.000	9.748	13.937	33.415

Distance matrix for total Tollable road length (Including equivalent length of structures >60 m length)						
From	To	Km 686+540 Fee Plaza at Dukkavanipalem Village, Dist. Visakhapatnam	Km 703+921 Fee Plaza at Mudapaka Village, Dist. Visakhapatnam	Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam	Km 713+880 Fee Plaza at Pinagadi Village, Dist. Visakhapatnam	Km 722+170 Fee Plaza at Marripalem Village, Dist. Visakhapatnam
Village, Dist. Visakhapatnam						
Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam	711.050	32.588	9.748	0.000	4.189	23.667
Km 713+880 Fee Plaza at Pinagadi Village, Dist. Visakhapatnam	713.880	36.777	13.937	4.189	0.000	19.478
Km 722+170 Fee Plaza at Marripalem Village, Dist. Visakhapatnam	731.585	56.255	33.415	23.667	19.478	0.000

Table 0-16: Distance Matrix for Total Tollable Road Length (Including equivalent length of structures >60 m length)

The stream of existing toll rates being charged at the toll plaza of the project road in cardinal years till FY25 is presented in **Table 0-17** The toll fee has been rounded to nearest 5 Rupees as per toll fee rules.

TP/Mode	Car	LCV	2A Truck	3A Truck	MAV	OSV
TP01- Madapam	100	160	330	360	520	635
TP02-Nathavalasa	110	175	370	400	575	700
TP03- Dukkavanipalem	45	70	150	165	235	285
TP04-Marripalem	45	75	155	170	245	300

Table 0-17: Existing Toll Rates

The stream of toll rates likely to be charged basis schedule -M lengths and adopted WPI assumptions at the toll plazas of the project road in cardinal years till FY55 is presented in **Table 0-18**. The toll fee has been rounded to nearest 5 Rupees as per toll fee rules.

FY End	Car/ MLCV	LCV/ M Bus	Bus / 2A Truck	3A Truck	MAV	OSV	Car Local
TP01-Madapam							
2025	100	160	330	360	520	635	340
2030	135	215	450	490	710	860	415
2035	165	265	550	600	865	1,050	510
2040	200	320	675	735	1,055	1,285	620
2045	245	390	820	895	1,290	1,570	760
2050	295	480	1,005	1,095	1,575	1,915	925
2055	365	585	1,225	1,340	1,925	2,345	1,130
TP02-Nathavalasa							
2025	110	175	370	400	580	705	340
2030	135	215	455	495	710	865	415
2035	165	265	555	605	870	1,055	510
2040	200	320	675	735	1,060	1,290	620
2045	245	395	825	900	1,295	1,575	760
2050	300	480	1,010	1,100	1,580	1,925	925
2055	365	590	1,230	1,345	1,930	2,350	1,130
TP03- Dukkavanipalem							
2025	45	70	150	165	240	290	340

FY End	Car/ MLCV	LCV/ M Bus	Bus / 2A Truck	3A Truck	MAV	OSV	Car Local
2030	55	90	185	205	295	355	415
2035	65	110	230	250	355	435	510
2040	80	135	280	305	435	530	620
2045	100	160	340	370	535	650	760
2050	125	200	415	455	650	790	925
2055	150	240	505	555	795	970	1,130
TP04-Marripalem							
2025	45	75	155	170	245	300	340
2030	55	90	195	210	300	370	415
2035	70	110	235	255	370	450	510
2040	85	135	285	315	450	550	620
2045	105	170	350	385	550	670	760
2050	125	205	430	470	675	820	925
2055	155	250	525	570	820	1,000	1,130

Table 0-18: Toll Rates at Project Road Toll Plazas (in Rs)

Project Road Revenue

The project road revenue under the base case considering the impact of all the diversions is presented in **Table 0-19**.

FY	TP01	TP02	TP03 & TP04 (Vizag Bypass)	Total
FY25	1,019.6	1,417.6	912.2	3,349.3
FY26	1,120.6	1,555.1	998.8	3,674.5
FY27	1,244.0	1,721.4	1,114.0	4,079.4
FY28	1,457.2	1,918.7	1,240.0	4,615.9
FY29	1,680.1	2,107.7	1,354.8	5,142.6
FY30	1,841.4	2,309.1	1,520.4	5,670.9
FY31	2,004.4	2,519.3	1,655.8	6,179.5
FY32	2,188.5	2,749.9	1,810.6	6,749.0
FY33	2,385.3	2,988.1	1,961.5	7,334.9
FY34	2,596.9	3,264.1	2,142.7	8,003.7
FY35	2,831.6	3,570.6	2,340.7	8,743.0
FY36	3,075.4	3,875.5	2,531.1	9,482.0
FY37	3,313.0	4,178.3	2,730.1	10,221.4
FY38	3,589.9	4,530.0	2,955.6	11,075.5
FY39	3,877.3	4,903.5	3,186.9	11,967.7
FY40	3,860.1	4,960.3	3,463.4	12,283.8
FY41	3,992.3	5,175.5	3,710.8	12,878.6
FY42	4,066.1	5,328.4	3,990.6	13,385.1
FY43	4,368.1	5,739.5	4,299.6	14,407.2
FY44	4,714.9	6,203.0	4,622.2	15,540.0
FY45	5,054.2	6,654.4	4,959.6	16,668.2
FY46	5,431.2	7,152.3	5,321.4	17,904.9
FY47	5,835.5	7,689.5	5,714.6	19,239.5
FY48	6,293.2	8,296.2	6,156.1	20,745.6
FY49	6,742.8	8,906.2	6,589.3	22,238.4
FY50	7,252.9	9,582.3	7,085.5	23,920.7
FY51	7,813.2	10,308.4	7,592.4	25,714.0
FY52	8,403.8	11,127.2	8,210.4	27,741.5
FY53	9,020.0	11,945.6	8,781.7	29,747.3

FY	TP01	TP02	TP03 & TP04 (Vizag Bypass)	Total
FY54	9,726.5	12,852.0	9,427.8	32,006.3
FY55	10,455.1	13,826.9	10,137.5	34,419.5

Table 0-19: Base Case Revenue in Rs Million

The project road revenues will have a CAGR of 8.4 percent for the period up to FY45 under the base case.

1. INTRODUCTION

1.1 General

National Highways Authority of India (NHAI) has setup NHAI InvIT to monetize its completed and operational national highways projects with the objective of mobilizing additional resources through capital markets. The Narsannapeta to Anakapalli road sections with an aggregate length of 170 kilometers of NH-16 (Old NH-5) in the state of Andhra Pradesh referred to as Project Road (PR), has been offered by NHAI to National Highways Infra Investment Managers Private Limited (NHIIMPL) for transfer to InvIT in the fourth round for a concession period of 20 years with maximum extension till 30 years.

NH-16 runs parallel to the eastern coast of India was developed under National Highway Development Program. The total length of NH-16 is roughly 1,764 km starting from Kolkata in West Bengal and ending at Chennai in Tamil Nadu while passing through the states of West Bengal, Odisha, Andhra Pradesh, and Tamil Nadu. NH–16 connects important tourist and industrial cities and towns like Kolkata, Bhubaneswar, Srikakulam, Vizianagaram, Visakhapatnam, Rajahmundry, Vijayawada, Bengaluru, and Chennai etc. **Figure 1-1** shows the alignment of NH-16 with major places along the highway.



Figure 1-1: Alignment of NH-16 With Major Places

National Highways Infra Investment Managers Private Limited, the Investment Manager to InvIT has appointed Ramboll India Private Ltd as the Traffic Consultant to carry out a study for assessing the present traffic levels, travel pattern and future traffic & revenue estimation till year FY55 duly considering the network characteristics, future economic perspective in the influence area of the project

1.2 Scope of Services

The scope of the study includes the following:

- Undertake Traffic Survey on the highway section as per the following:
  - Seven days 24 hours Videography Traffic Counts at or near the existing toll plaza locations on the project road to derive the Average Daily Traffic (ADT)
  - One day Origin-Destination survey at or near the existing toll plaza locations to assess the existing travel pattern of vehicles plying on the project road – origin and destination.
- Estimation of the base year AADT FY25
- Analysis of OD data to cover:
  - Regional distribution of traffic and influence factors for different zones contributing traffic on the corridor
  - Identification of Project Influence Area from analysis of travel pattern - regional distribution of traffic,
  - Main traffic generators (industrial areas, towns, ports etc.)
  - Commodity composition- Goods type distribution
  - Top OD pairs by vehicle types
- Review of past traffic studies, traffic/toll data and other relevant reports as may be available to determine category wise volume of traffic for past years as well as for current year
- To identify competing route and analyse the network conditions, traffic characteristics & level of toll charged and the advantage/ disadvantage of the competing road and their impact on the project traffic
- Carry out a study of past economic performance of influence area
- Diversion analysis, wherever needed – cost ratio-based diversion analysis using spreadsheets to be carried out for respective potential OD pairs.
- Preparation of traffic projections till year FY55 in three scenarios – low, most likely and high
- Capacity analysis of the road or any other requirements for potential capacity

augmentation

- Estimation of tollable traffic streams by toll category and estimation of toll revenue as per categories of traffic streams stipulated in the tolling schedule for the study period
- Review future road and transportation network developments in the area of influence of the project and identify those schemes that may impact positively or negatively traffic on the toll road
- Identify factors which may have a positive and / or negative impact on the traffic - all major developments like DFC, industrial corridors, economic corridors, ports, Bharatmala, Sagarmala
- Scenario Analysis of toll revenue – Critical parameters of diversion (if applicable) and three scenarios of traffic growth (most likely, low and high).

1.3 Report Structure

This report is divided into four chapters, including this introduction chapter. Chapter 2 details upon the project road characteristics and socio – economic profile of the districts in the project influence area including the estimation of AADT and travel characteristics in the Project Influence Area (PIA). Chapter 3 contains the details on the derivation of traffic growth rates used for traffic forecasting and presents traffic projections for the study period. Chapter 4 presents the details regarding tolling strategy, toll rates and the revenue projections for the duration of the concession.

2. TRAFFIC SURVEY AND ANALYSIS

2.1 General

In order to understand the traffic characteristics, the volume of traffic and travel pattern of vehicles plying on the project road were collected through primary surveys. This chapter presents the details of the project road characteristics, traffic surveys carried out, their analysis and the salient findings. The results of the analysis will be utilized in assessing the traffic growth and estimation of traffic and revenue forecast on the project road for the concession period.

2.2 Project Road Characteristics

The project road section, starts near Narsannapeta and ends at Anakapalli with a total length of about 170 km. It is divided into two sections with four operational toll plaza locations and falls under the jurisdiction of Srikakulam, Vizianagaram and Visakhapatnam districts. The corridor passes through major settlements such as Srikakulam, Ranasthalam, Anandapuram, and Anakapalli. The details of the project road sections with location, length, chainage of toll plazas and the districts in which the toll plazas are located are presented in **Table 2-1**.

Project Section	Toll Plaza Location	Length (km)	District under which TP falls
Nandigam – Srikakulam & Champavati – Visakhapatnam	Madapam (km 589.554)	120	Srikakulam
	Nathavalasa TP (km 656.704)		Vizianagaram
Anandapuram-Pendurti-Anakapalli	Dukkavanipalem TP (km 686.540)	50	Visakhapatnam
	Marripalem TP (km 722.170)		

Table 2-1: Detail of Project Sections and Toll Plazas

Dukkavanipalem and Marripalem toll plazas serve as key tolling points on the Visakhapatnam Bypass, facilitating smooth traffic movement along the corridor. The alignment of project road and toll plaza locations is shown in **Figure 2-1**.

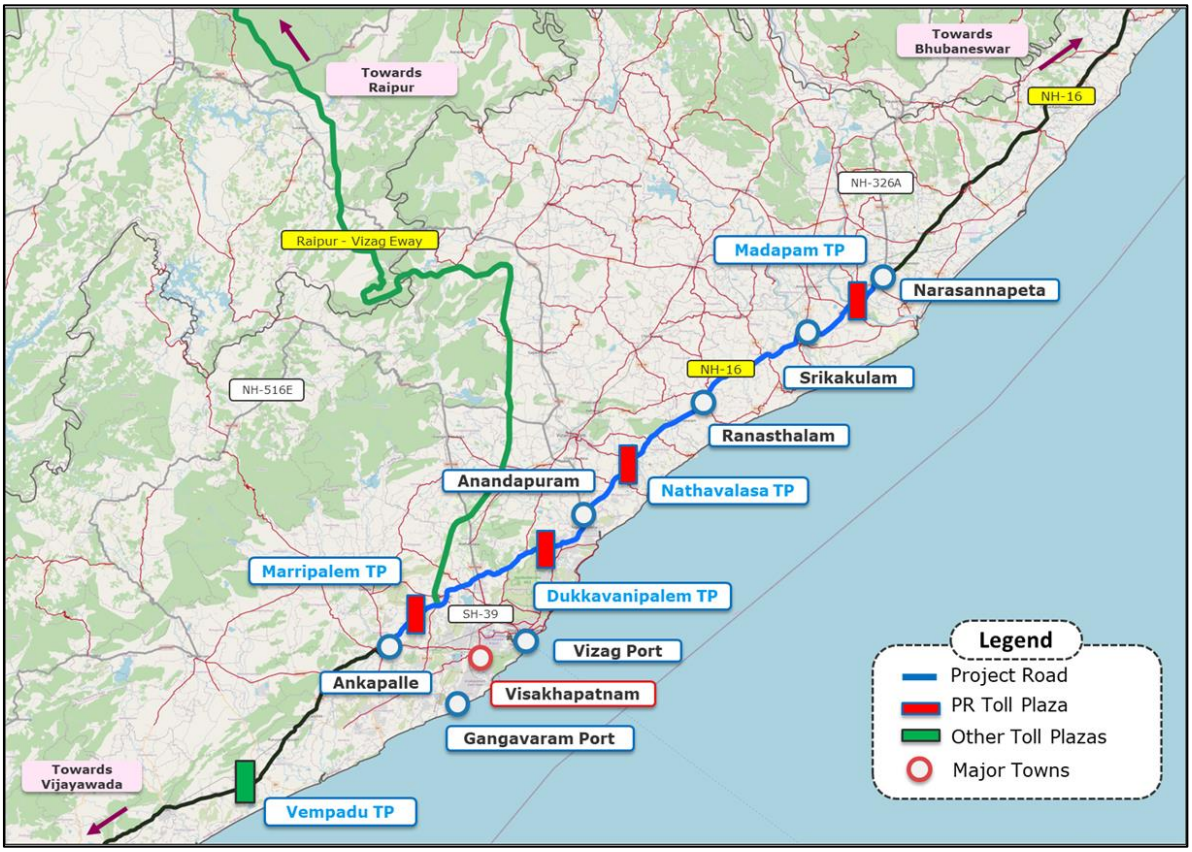


Figure 2-1: Project Road and Location of Toll Plazas

The project road in wider context serves the long-distance traffic, which is majorly plying from/to Anakapalli and beyond (towards Bengaluru/Tirupati/Chennai/rest of Tamil Nadu) to/from Bhubaneshwar/Cuttack and beyond (towards Kolkata/Kharagpur). Apart from long distance traffic, it also serves the short-distance traffic between Nandigama/ Srikakulam/ Kopperia and Anadapuram/ Visakhapatnam/ Anakapalli areas.

A four-lane service road runs parallel to the project section from Km 580.671 near Narsannapeta to Km 714.0 near Anakapalli, providing access for local traffic from surrounding settlements. At the Madapam and Nathavalasa toll plazas, the service road merges with the main highway, ensuring that traffic cannot bypass the toll plazas. However, existing median openings on Vizag Bypass allow vehicles to move between the service lanes and the main carriageway, enabling some traffic to bypass one or both Marripalem and Dukkavaniapalem toll plazas.

The alignment of project road and service lane along with tentative locations of proposed entry/exit toll plaza locations on Vizag Bypass is shown in **Figure 2-1**.

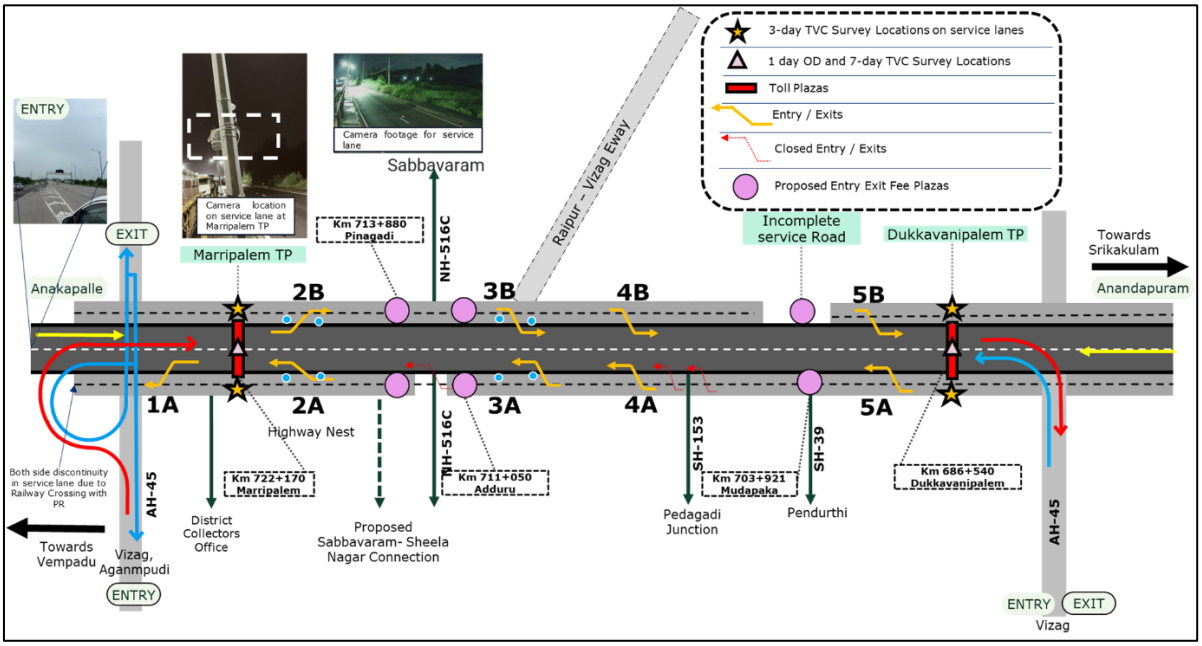


Figure 2-2: Anandapuram - Anakapalli Bypass Project Section and Location of Toll Plazas

At present, discontinuities in service lane at Anakapalli due to a railway crossing and due to interchange construction at Sabbavaram and Pendurthi the seamless movement of through traffic between Anakapalli and Anandapuram is restricted.

With the introduction of closed tolling, all these entries and exit points between the main carriageway and service roads may soon be closed by the Authority and access will be allowed only at interchanges - Km 703+921 (Mudapaka), Km 711+050 (Adduru), and Km 713+880 (Pinagadi).

It is worth mentioning here that, the project road traverses a diverse industrial landscape, marked by strategically positioned clusters that drive regional economic activity. A significant hub of industrial operations is located in Visakhapatnam, particularly near the Gangavaram Port area, where a mixed cluster of coal plants and metal industries thrive. Prominent companies in this region include Venkatadri Metal Industries, Jindal Stainless Steel Ltd, and various other metal processing units.

The corridor is further enhanced by two major chemical and pharmaceutical clusters: one at Pydibhimavaram and the other at Lankelapalem. These clusters are home to leading companies such as SNF India, Synergene Active Ingredients, Pharmazell India, Pfizer India Pvt Ltd, Mylan Laboratories Ltd, and Natco Pharma Limited.

In addition, the glass and metal manufacturing sector is a notable contributor in the Gajuwaka region of Visakhapatnam, hosting companies like Matrix Glass Industries, Gaap Tuff Glass LLP, and Om Glass & Ply Industries.

The stone quarrying sector is prominently represented in two key locations: the Kothavalasa area, above the Dukkavanipalem Toll Plaza, and near Anakapalli in Mamidipalem. These areas support numerous stone quarrying and processing operations, including Sri Siva Stones Exports, Sairam Kadapa & Granite Slabs, and several other

granite and marble units. The location of major industries located in the proximity of the project corridor is presented in the **Figure 2-3**.

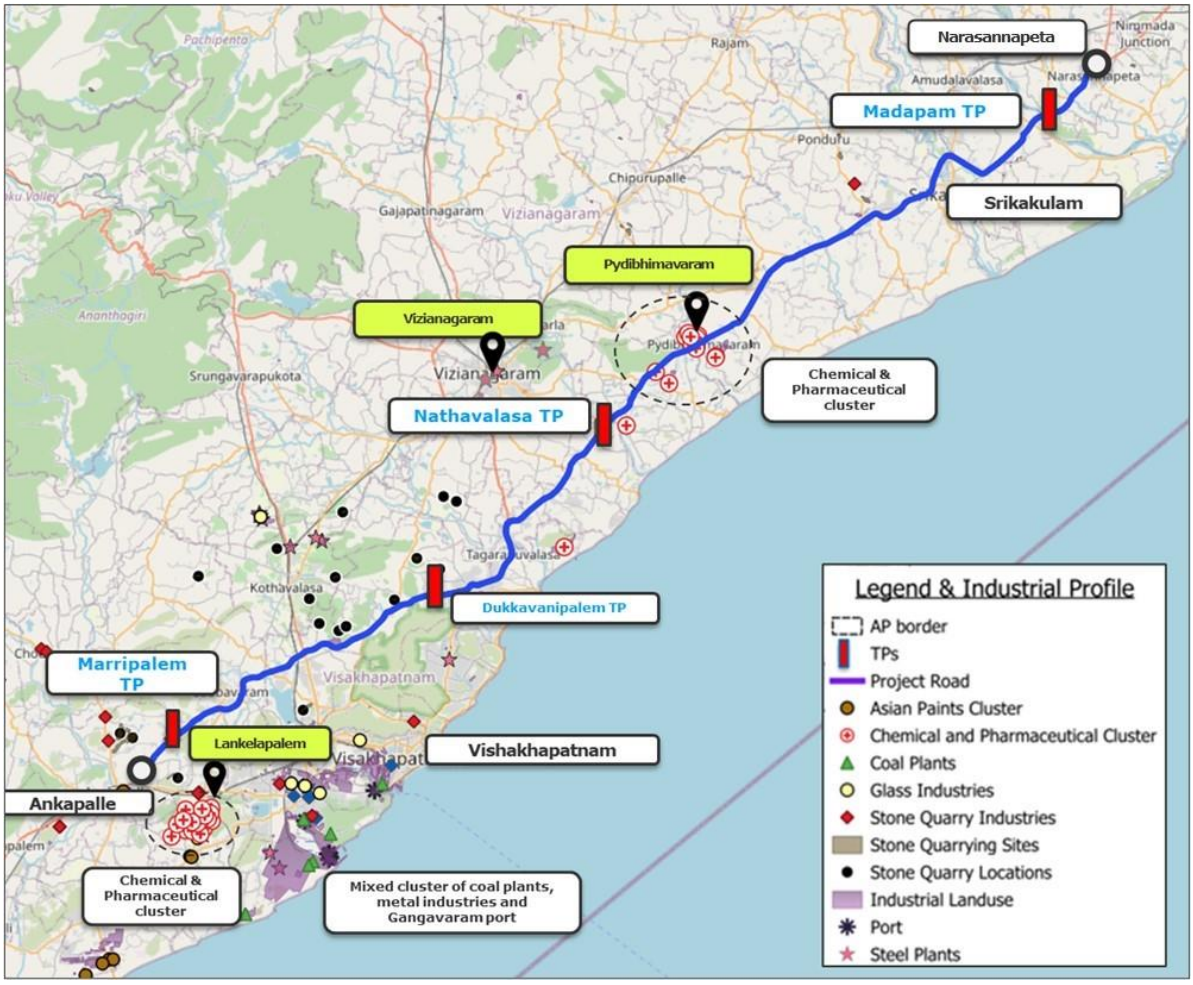


Figure 2-3: Industries Located in the Proximity of the Project Corridor

2.2.1 Profile of Project Influence Area District

The project section falls under the jurisdiction of Srikakulam, Vizianagaram and Visakhapatnam districts in the state of Andhra Pradesh. A brief description of the profile of these three districts is presented below.

Srikakulam District

Srikakulam district is in the northeastern part of Andhra Pradesh, India. It is bordered by the Bay of Bengal to the east, the districts of Vizianagaram and Visakhapatnam to the south, and the state of Odisha to the north. The district covers an area of approximately 5,837 sq.km.

According to the 2011 census, Srikakulam district had a population of about 2.6 million people, with a population density of around 445 persons per square kilometre.

Srikakulam's economy is largely driven by agriculture, with major crops including rice, jowar, maize, and various pulses. The district is known for its agricultural production and has significant paddy fields. Cashew nut products are designated as the One District One

Product (ODOP) for Srikakulam, emphasizing the region's focus on enhancing the production and marketing of various cashew-based items.

The district also has a presence of small-scale industries and traditional handicrafts. Coastal areas support fishing activities, contributing to the local economy. Srikakulam is well-connected by road and rail. The district's railway network includes key stations such as Srikakulam Road and Tilaru, which are part of the East Coast Railway zone. The district is served by a network of national (NH16) and state highways that facilitate transportation to neighbouring districts and states.

Vizianagaram District

Vizianagaram district is situated in the northeastern part of Andhra Pradesh, India. It is bordered by the districts of Srikakulam to the north, Visakhapatnam to the south, and the state of Odisha to the west. The district spans an area of approximately 6,539 sq.km.

As per the 2011 census, Vizianagaram district had a population of around 2.5 million people, with a population density of about 382 persons per square kilometre. The economy of Vizianagaram is primarily based on agriculture, with major crops including rice, sugarcane, and pulses. The district is known for its agricultural productivity and is often referred to as a significant rice bowl of the state. Mango-based products are recognized as the One District One Product (ODOP) for Vizianagaram. In addition to agriculture, the district has growing industrial activities, including small-scale industries and manufacturing. The city of Vizianagaram is also known for its traditional industries such as handloom weaving and handicrafts. The Vizianagaram Railway Station is an important railway hub on the Howrah-Chennai main line, facilitating both passenger and freight transportation. The district has a network of national and state highways that connect it to major cities and neighbouring districts.

Vizianagaram is rich in cultural heritage and historical significance. The district is known for its historic sites, temples, and traditional festivals. Notable attractions include the Vizianagaram Fort and several ancient temples. The district's cultural practices and festivals reflect its historical and traditional roots.

Vishakhapatnam District

Vishakhapatnam district is situated in the southeastern coastal region of Andhra Pradesh, India. It is bordered by the Bay of Bengal to the east, the districts of Srikakulam to the north, Vizianagaram to the west, and the district of East Godavari to the south.

The district covers an area of approximately 11,161 sq.km. As per the 2011 census, Vishakhapatnam district had a population of about 4.3 million people, with a population density of around 386 persons per square kilometre. Vishakhapatnam is a significant economic hub with a diverse economy. It is known for its major port, Visakhapatnam Port, which is one of the largest and busiest ports in India. The district has a thriving industrial sector, including shipbuilding, steel production, and petrochemicals.

The city is also renowned for its tourism, with attractions such as beaches, hills, and cultural sites. Vishakhapatnam is an important transportation node, with well-connected road, rail, and air infrastructure. The city is served by the Visakhapatnam Railway Station, which is a key junction on the Howrah-Chennai line, and it is connected to major cities via national highways (NH16, NH516C).

Vishakhapatnam is known for its vibrant culture and historical significance. The district hosts various cultural festivals and events, reflecting its rich heritage. Sugarcane is the One District One Product (ODOP) of Visakhapatnam district in Andhra Pradesh, with the state government promoting the production and marketing of sugarcane-based products like jaggery and jaggery-based sweets.

2.3 Traffic Surveys

In order to understand the characteristics and the volume of traffic using the project road, data on road network, traffic and travel pattern of vehicles plying on the project road were collected through primary traffic surveys. Traffic volume video graphic survey for seven days and origin-destination (OD) survey as roadside interview for one day at toll plaza locations were conducted on the project road. The schedule of the traffic surveys and locations on the project road are given in **Table 2-2**.

Location	Chainage	Duration	Date(s)
Classified Traffic Volume Counts			
TP01 – Madapam	589.554	7 Days	21st July 2024 to 28th July 2024
TP02 – Nathavalasa	656.704		
TP03 – Dukkavanipalem	686.540		
TP04 – Marripalem	722.170		
Origin and Destination Survey			
TP01 – Madapam	589.554	1 Day	25th July 2024
TP02 – Nathavalasa	656.704		
TP03 – Dukkavanipalem	686.540		24th July 2024
TP04 – Marripalem	722.170		

Table 2-2: Traffic Survey Locations and Schedule

Trained enumerators were engaged for conducting traffic surveys under the supervision of experienced transport planner. The vehicle classification as generally used in the traffic surveys of NHAI studies along with their PCU values, as suggested in IRC: 64 – 1990, are presented in **Table 2-3**.

Vehicle Type	PCU Factor
Motorized Vehicles	
Car, Jeep, Van &Taxi	1.0
Two –Wheeler	0.5
Three-Wheeler (Auto-Rickshaw)	1.0
Mini-Bus/ School Bus	1.5
Govt. Bus/ Private Bus	3.0
Mini LCV/Max Pick Up	1.0

Vehicle Type	PCU Factor
Light Commercial Vehicle (LCV)	1.5
2-Axle Truck	3.0
3-Axle Truck	3.0
Multi-Axle Vehicle (MAV 4-6 Axle)	4.5
HME	4.5
Agricultural Tractor	1.5
Agricultural Tractor with Trailer	4.5
Non – Motorised Vehicles	
Cycle	0.5
Cycle Rickshaw	2.0
Animal Drawn Cart	6.0

Table 2-3: Vehicle Classification and PCU Factors

2.4 Traffic Characteristics

The data collected from the traffic volume count survey was analysed in order to get the results with respect to existing traffic intensity, flow pattern, hourly variation and composition of traffic on the study road network. The various traffic characteristics have been analysed under the following heads:

- Average Daily Traffic (ADT)
- Daily variation, Hourly variation and Traffic composition
- Annual Average Daily Traffic (AADT)

2.4.1 Average Daily Traffic (ADT)

The traffic volume data collected at the toll plaza locations during the seven days survey has been analysed. The summary of ADT in terms of vehicles and PCUs is presented in **Table 2-4**.

Mode	TP01 – Madapam	TP02 – Nathavalasa	TP03 - Dukkavanipalem	TP04 - Marripalem
Tollable vehicles				
Car/Jeep/Van/Taxi	4,149	5,446	2,292	3,047
Mini Bus	91	75	24	28
Standard Bus	642	788	56	67
Mini LCV	845	772	556	548
LCV	976	1,134	1,076	1,117
2 Axle	584	697	678	654
3 Axle	996	1,132	1,052	1,075
MAV (4-6 Axle)	2,686	3,576	2,747	2,694
HMV/ MAV (=>7 Axle)	4	6	2	3
Non Tollable vehicles				
Two-Wheeler	12,561	6,478	1,845	2,074
Auto Rickshaw	1,659	1,265	147	203
Agri. Tractors	91	63	4	5
Total Non-Motorised	118	37	5	5

Mode	TP01 – Madapam	TP02 – Nathavalasa	TP03 - Dukkavanipalem	TP04 - Marripalem
Total Vehicles/PCUs				
Total Tollable Vehicles	10,974	13,625	8,484	9,232
Total Non Tollable Vehicles	14,429	7,842	2,000	2,287
Total Vehicles	25,403	21,467	10,484	11,518
Total PCU	33,933	36,815	23,315	24,093
Tollable PCU	25,368	32,000	22,229	22,835

Table 2-4: Average Daily Traffic Along the PR

- The observed total vehicles are around 25,403 at Madapam TP and around 21,467 at Nathavalasa TP, while about 10,000 – 11,000 vehicles are observed at Vizag bypass toll plaza location (10,484 at Dukkavanipalem TP & 11,518 at Marripalem TP. This is primarily due to the significantly lower share of non-tollable vehicle traffic on the Vizag Bypass.
- Share of car traffic is varying between 16 percent to 26 percent along the project corridor. TP01 and TP02 has an average share of car traffic of about 20 percent while about 24.8 percent of car traffic is observed along Vizag bypass.
- The Vizag Bypass carries a higher share of freight traffic, accounting for about 55 percent of the total vehicle flow, whereas Madapam TP and Nathavalasa TP observe a comparatively lower freight traffic share of around 25–30 (24.3 percent at Madapam TP, 34.4 percent at Nathavalasa TP).
- Vizag bypass toll plaza location recorded the highest share of tollable traffic, each accounting for about 80-81 percent followed by 63.5 percent at Nathavalasa TP and 43.2 percent at Madapam TP.
- Other motorised non-tollable vehicles (two-wheeler, auto rickshaw and tractor) account for about 56.8 percent at Madapam TP, about 36.5 percent at Nathavalasa TP, about 19-20 percent at each TP of Vizag Bypass.

2.4.2 Daily Variation, Hourly Variation, and Traffic Composition

The day wise variation, hourly variation and the traffic composition at the toll plaza locations is presented in **Figure 2-4**.

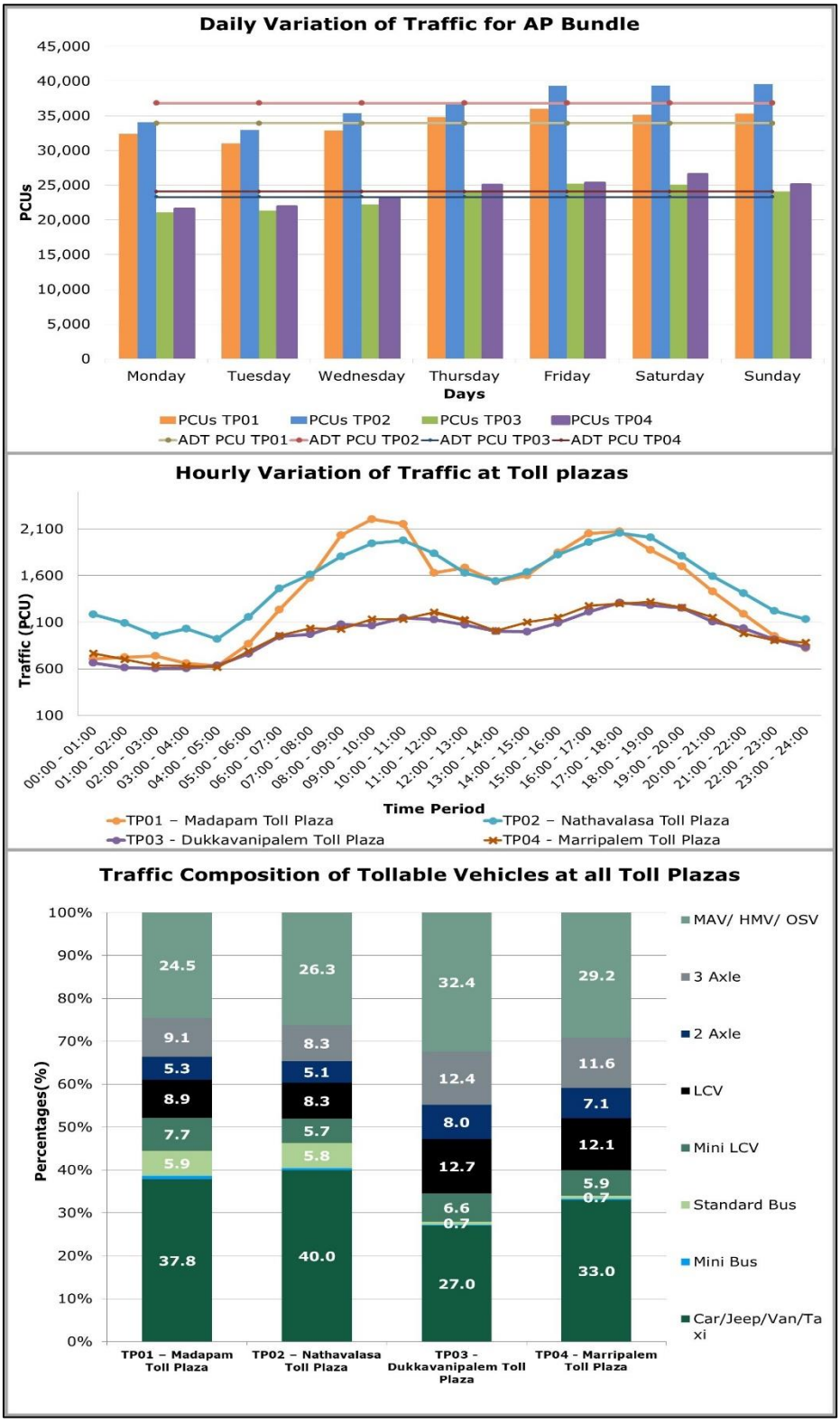


Figure 2-4: Daily & Hourly Variation and Traffic Composition

- It was observed that the traffic at the toll plazas is consistent with minor fluctuations during the days of volume count survey.
- The directional distribution at the toll plaza location is almost equal with Kolkata – Chennai having a directional distribution of about 49 percent at Madapam TP and Nathavalasa TP each and about 47 percent at each TP of Vizag bypass.

2.4.3 Comparison of Toll Data with TVC

Toll Data vs TVC

The TVC survey was conducted from 21st July 2024 to 28th July 2024. A comparison between TVC and toll data for the days of the survey is presented in **Table 2-5.**

Day/Date	CJV	LCV	2-Axle	3-Axle	MAV/ OSV	Total	PCUs
TP01- Madapam							
ETC	4,842	391	1,725	1,010	2,721	10,688	25,875
TVC	4,995	1,067	1,226	996	2,690	10,974	25,368
ETC-TVC	-152	-677	498	14	31	-286	507
% Variation	-3.0%	-63.4%	40.6%	1.4%	1.1%	-2.6%	2.0%
TP02-Nathavalasa							
ETC	5,884	496	2,006	1,121	3,620	13,127	32,301
TVC	6,218	1,209	1,485	1,132	3,582	13,625	32,000
ETC-TVC	-334	-713	521	-10	38	-498	301
% Variation	-5.4%	-59.0%	35.1%	-0.9%	1.1%	-3.7%	0.9%
TP03-Dukkavanipalem							
ETC	2,419	406	1,204	1,000	2,613	7,641	21,397
TVC	2,848	1,100	734	1,052	2,749	8,484	22,229
ETC-TVC	-430	-694	469	-53	-136	-842	-831
% Variation	-15.1%	-63.1%	63.9%	-5.0%	-4.9%	-9.9%	-3.7%
TP04-Marripalem							
ETC	3,263	430	1,277	1,061	2,726	8,758	23,192
TVC	3,595	1,144	721	1,075	2,697	9,232	22,835
ETC-TVC	-331	-714	556	-14	29	-473	358
% Variation	-9.2%	-62.4%	77.2%	-1.3%	1.1%	-5.1%	1.6%

Table 2-5: Comparison Between TVC and Toll Data

The main observations from the comparison are:

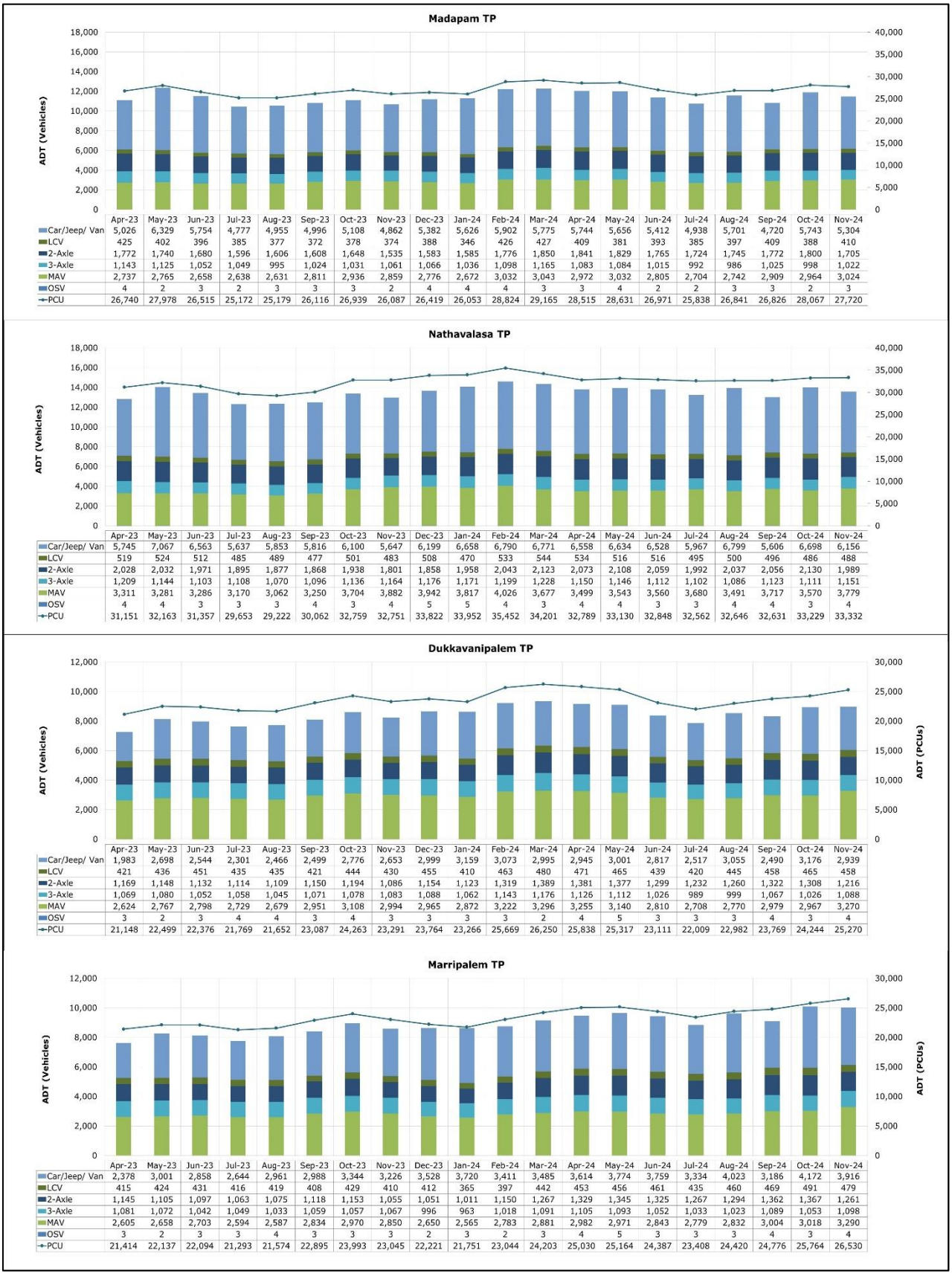
- Across all toll plaza locations, TVC generally exceeds the Toll Data, particularly in the CJV and LCV categories.
- CJV toll data traffic is consistently lower than the TVC traffic with a variation of about 3-5 percent at TP01 & TP02 and 9-15 percent at TP03 &TP04. This variation could be due to the cash and exemptions data which is not recorded in ETC.
- LCVs and 2A trucks show high variation in the comparison which could be due to the cross-classification issue between these two categories of trucks.
- In case of MAVs, Dukkavanipalem TP has shown variation of about 5 percent, while Madapam TP, Nathavalasa TP and Marripalem TP each exhibit a minor variation of about 1 percent.

2.4.4 Annual Average Daily Traffic (AADT)

The traffic plying on any road generally varies over different periods of the year depending on the cycle of different socio-economic activities in the regions through which it passes. Therefore, in order to have a more realistic picture of the traffic on the project road, it is required to assess its seasonal variation to estimate the annual average daily traffic (AADT).

The past toll traffic data for all the toll plazas was made available by the client from April 2022 to November 2024 as presented in **Appendix 2.1**.

The month-on-month mode wise traffic for the period from April 2024 to November 2024 for all project road toll plaza locations is presented in **Figure 2-5**



Madapam TP	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24
Car/Jeep/ Van	5,026	6,329	5,754	4,777	4,955	4,996	5,108	4,862	5,382	5,626	5,902	5,775	5,744	5,656	5,412	4,938	5,701	4,720	5,743	5,304
LCV	425	402	396	385	377	372	378	374	388	346	426	427	409	381	393	385	397	409	388	410
2-Axle	1,772	1,740	1,680	1,596	1,606	1,608	1,648	1,535	1,583	1,585	1,776	1,850	1,841	1,829	1,765	1,724	1,745	1,772	1,800	1,705
3-Axle	1,143	1,125	1,052	1,049	995	1,024	1,031	1,061	1,066	1,036	1,098	1,165	1,083	1,084	1,015	992	986	1,025	998	1,022
MAV	2,737	2,765	2,658	2,638	2,631	2,811	2,936	2,859	2,776	2,672	3,032	3,043	2,972	3,032	2,805	2,704	2,742	2,909	2,964	3,024
OSV	4	2	3	2	3	3	3	2	4	4	4	3	3	4	2	2	3	3	2	3
PCU	26,740	27,978	26,515	25,172	25,179	26,116	26,939	26,087	26,419	26,053	28,824	29,165	28,515	28,631	26,971	25,838	26,841	26,826	28,067	27,720

Nathavalasa TP	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24
Car/Jeep/ Van	5,745	7,067	6,563	5,637	5,853	5,816	6,100	5,647	6,199	6,658	6,790	6,771	6,558	6,634	6,528	5,967	6,799	5,606	6,698	6,156
LCV	519	524	512	485	489	477	501	483	508	470	533	544	534	516	516	495	500	496	486	488
2-Axle	2,028	2,032	1,971	1,895	1,877	1,868	1,938	1,801	1,858	1,958	2,043	2,123	2,073	2,108	2,059	1,992	2,037	2,056	2,130	1,989
3-Axle	1,209	1,144	1,103	1,108	1,070	1,096	1,136	1,164	1,176	1,171	1,199	1,228	1,150	1,146	1,112	1,102	1,086	1,123	1,111	1,151
MAV	3,311	3,281	3,286	3,170	3,062	3,250	3,704	3,882	3,942	3,817	4,026	3,677	3,499	3,543	3,560	3,680	3,491	3,717	3,570	3,779
OSV	4	4	3	3	3	4	3	4	5	5	4	3	4	4	3	3	4	4	3	4
PCU	31,151	32,163	31,357	29,653	29,222	30,062	32,759	32,751	33,822	33,952	35,452	34,201	32,789	33,130	32,848	32,562	32,646	32,631	33,229	33,332

Dukkavanipalem TP	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24
Car/Jeep/ Van	1,983	2,698	2,544	2,301	2,466	2,499	2,776	2,653	2,999	3,159	3,073	2,995	2,945	3,001	2,817	2,517	3,055	2,490	3,176	2,939
LCV	421	436	451	435	435	421	444	430	455	410	463	480	471	465	439	420	445	458	465	458
2-Axle	1,169	1,148	1,132	1,114	1,109	1,150	1,194	1,086	1,154	1,123	1,319	1,389	1,381	1,377	1,299	1,232	1,260	1,322	1,308	1,216
3-Axle	1,069	1,080	1,052	1,058	1,045	1,071	1,078	1,083	1,088	1,062	1,143	1,176	1,126	1,112	1,026	989	999	1,067	1,026	1,088
MAV	2,624	2,767	2,798	2,729	2,679	2,951	3,108	2,994	2,965	2,872	3,222	3,296	3,255	3,140	2,810	2,708	2,770	2,979	2,967	3,270
OSV	3	2	3	4	4	3	4	3	3	3	3	2	4	5	3	3	3	4	3	4
PCU	21,148	22,499	22,376	21,769	21,652	23,087	24,263	23,291	23,764	23,266	25,669	26,250	25,838	25,317	23,111	22,009	22,982	23,769	24,244	25,270

Marripalem TP	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24
Car/Jeep/ Van	2,378	3,001	2,858	2,644	2,961	2,988	3,344	3,226	3,528	3,720	3,411	3,485	3,614	3,774	3,759	3,334	4,023	3,186	4,172	3,916
LCV	415	424	431	416	419	408	429	410	412	365	397	442	453	456	461	435	460	469	491	479
2-Axle	1,145	1,105	1,097	1,063	1,075	1,118	1,153	1,055	1,051	1,011	1,150	1,267	1,329	1,345	1,325	1,267	1,294	1,362	1,367	1,261
3-Axle	1,081	1,072	1,042	1,049	1,033	1,059	1,057	1,067	996	963	1,018	1,091	1,105	1,093	1,052	1,033	1,023	1,089	1,053	1,098
MAV	2,605	2,658	2,703	2,594	2,587	2,834	2,970	2,850	2,650	2,565	2,783	2,881	2,982	2,971	2,843	2,779	2,832	3,004	3,018	3,290
OSV	3	2	3	3	4	3	3	3	2	3	2	3	4	5	3	3	3	4	3	4
PCU	21,414	22,137	22,094	21,293	21,574	22,895	23,993	23,045	22,221	21,751	23,044	24,203	25,030	25,164	24,387	23,408	24,420	24,776	25,764	26,530

Figure 2-5: Month on Month Traffic Data

The estimation for FY25 AADT is done after annualising the behaviour of April 2024 - November 2024 traffic. For Madapam and Nathavalasa, SCF is derived from the months

of April to Nov of FY23 and FY24 of respective toll plazas and the average of both years has been adopted. However, for MAVs at Nathavalasa TP, the SCF of Madapam TP has been considered due to the MAVs being abnormally high in few months of FY24.

The MOM traffic pattern at TP03 and TP04 show initial ramp up of traffic after opening of Vizag bypass in April 2022. Therefore, for Dukkavanipalem TP and Marripalem TP, the SCF is derived from the traffic data of adjacent toll plazas (Madapam and Vempadu). For this purpose, Average of FY23 and FY24 of Madapam TP and FY23 Vempadu TP is considered.

For Nathavalasa TP, Dukkavanipalem TP and Marripalem TP, cash and exempt traffic from FY25 (Apr to Nov) have been added to the estimated ETC traffic of respective toll plaza. However, for TP01 cash and exempt traffic from Jan-2023 to Dec-2023 is used, considering the disruption in traffic since Jan 2024.

FY25 AADT derived from the ETC traffic data along with SCF, cash traffic, exempt traffic and ADT of April to November of FY25 is presented in **Table 2-6**.

	Traffic / Mode	CJV	LCV	2-Axle	3-Axle	MAV	OSV	PCU
TP01- Madapam								
A.	ETC FY25(Apr - Nov)	5,402	397	1,773	1,026	2,894	3	27,431
B.	SCF (Avg of FY23 & FY24)	1.03	1.00	1.01	1.01	1.01	1.01	
C.	ETC * SCF	5,561	399	1,791	1,033	2,926	3	27,812
D.	Cash (Jan23 – Dec23)	75	3	3	2	1	1	104
E.	Exempt (Jan23 – Dec23)	339	7	2	11	13	1	452
F.	AADT FY25 (Estimated)= C+D+E	5,975	409	1,795	1,046	2,940	5	28,364
TP02-Nathavalasa								
A.	ETC FY25(Apr - Nov)	6,368	504	2,055	1,123	3,605	4	32,899
B.	SCF (Avg of FY23 & FY24)	1.03	1.01	1.01	1.01	1.01	1.01	
C.	ETC * SCF	6,555	508	2,076	1,139	3,645	4	33,383
D.	Cash (Apr24 – Nov24)	651	16	15	22	2	2	804
E.	Exempt (Apr24 – Nov24)	0	0	0	0	0	0	0
F.	AADT FY25 (Estimated)= C+D+E	7,206	524	2,091	1,161	3,712	6	34,479
TP03 - Dukkavanipalem								
A.	ETC FY25(Apr - Nov)	2,867	453	1,299	1,054	2,987	4	24,065
B.	SCF (Avg of FY23-Vempadu and Avg of FY23 & FY24-Madapam)	1.02	1.00	1.00	1.00	1.02	1.02	
C.	ETC * SCF	2,937	452	1,303	1,050	3,036	4	24,354
D.	Cash (Apr24 – Nov24)	55	4	4	6	1	1	100
E.	Exempt (Apr24 – Nov24)	326	2	1	2	2	0	347
F.	AADT FY25 (Estimated)= C+D+E	3,318	457	1,308	1,058	3,039	5	24,800
TP04 - Marripalem								
A.	ETC FY25(Apr - Nov)	3,722	463	1,319	1,068	2,965	4	24,938
B.	SCF (Avg of FY23-Vempadu and Avg of FY23 & FY24-Madapam)	1.02	1.00	1.00	1.00	1.02	1.02	
C.	ETC * SCF	3,813	462	1,323	1,064	3,013	4	25,244
D.	Cash (Apr24 – Nov24)	96	3	2	2	1	1	122
E.	Exempt (Apr24 – Nov24)	644	2	1	4	1	0	667
F.	AADT FY25 (Estimated)= C+D+E	4,552	467	1,327	1,071	3,016	5	26,041

Table 2-6: AADT for FY25

2.5 Travel Characteristics

2.5.1 Survey Methodology

In order to understand the travel demand pattern in the region and tollable traffic streams, origin and destination (OD) surveys were carried out at the toll plaza locations. The OD survey was carried out for 24 hours, by roadside interview method as described in IRC: 102-1988. Both passenger and commercial vehicles plying on the project road were stopped on a random sampling basis and interviewed.

The travel characteristics obtained by OD survey facilitate the identification of:

1. Local and through traffic on the project road.
2. Potential divertible traffic to/from project road to various alternative routes.

Trained enumerators under the supervision of transport planners collected the trip characteristics using survey forms designed for this purpose. The OD survey elicited characteristics like origin, destination, purpose of trip for passenger vehicles and commodity being transported for goods vehicles. The information pertaining to origin and destination of trips collected during roadside interviews was analysed to obtain the trip distribution based on a zoning system suitably designed for the present study.

2.5.2 Traffic Zoning System

To understand the spatial dimensions of the trip characteristics of the vehicles interviewed during the O-D survey, a detailed zoning system was developed giving due consideration to the following factors:

- The road network catering to the traffic on the project road and its generating points
- Important towns, villages, factories and industrial centres around the project road area
- Administrative boundaries of districts and states.
- Configuration of the project road in the regional road network with respect to other roads

Two major types of areas were identified for analysis purpose: -

Immediate Influence Area (IIA): It includes the cities/towns/villages and districts along the project road and adjacent to it, which generate/attract trips to the project road. In this study, it consists of districts of Srikakulam, Vizianagaram and Visakhapatnam districts in the state of Andhra Pradesh.

Broad Influence Area (BIA): It includes the remaining districts of Andhra Pradesh and Odisha and other neighbouring states such as Telangana, Tamil Nadu and remaining states of India.

Detailed zoning system is prepared for IIA, while more aggregate or broad zoning is developed for BIA. The zoning system adopted for data collection was based on 110 zones and is presented in **Appendix 2.2**.

2.5.3 Sample Size

The toll traffic data does not provide the individual traffic volume count of all categories of vehicles. The seven-day traffic volume video count at the existing toll plazas was analysed to get the individual volume count of all categories of vehicles along with the direction split.

The vehicles during the OD surveys were interviewed on a random sample basis. **Table 2-7** shows the AADT and the sample size (both in absolute numbers and in percentage terms) captured during the exercise.

Mode	Car	Mini Bus	Bus	Mini - LCV	LCV	2Axle	3Axle	MAV	Total
TP01- Madapam									
Sample	1,870	11	596	388	237	405	760	1,124	5,391
AADT	5,154	20	708	822	388	1,088	1,046	2,945	12,171
Percentage	36.3%	54.6%	84.2%	47.2%	61.0%	37.2%	72.6%	38.2%	44.3%
TP02-Nathavalasa									
Sample	2,799	20	626	356	311	694	1,061	1,795	7,662
AADT	6,538	48	877	668	476	1,214	1,161	3,718	14,700
Percentage	42.8%	41.3%	71.4%	53.3%	65.3%	57.2%	91.4%	48.3%	52.1%
TP03 - Dukkavanipalem									
Sample	1,188	4	51	234	264	558	637	1,268	4,204
AADT	2,822	8	79	496	449	1,229	1,058	3,044	9,185
Percentage	42.1%	48.4%	64.3%	47.1%	58.8%	45.4%	60.2%	41.7%	45.8%
TP04 - Marripalem									
Sample	1,320	6	31	215	272	680	772	1,243	4,539
AADT	3,953	11	89	600	457	1,238	1,071	3,020	10,438
Percentage	33.4%	55.2%	34.8%	35.9%	59.6%	54.9%	72.1%	41.2%	43.5%
Vempadu TP									
Sample	2,640	14	236	421	461	690	852	1,494	6,808
AADT	6,612	34	1,033	949	912	1,753	1,443	4,286	17,022
Percentage	39.9%	40.9%	22.8%	44.4%	50.5%	39.4%	59.0%	34.9%	40.0%

Table 2-7: Sample Size Collected in OD Survey Along the PR

Based on the sample size of different categories of vehicles interviewed during the OD survey, direction-wise expansion factors were calculated based on FY25 AADT. The OD matrices for all vehicle categories were generated and analysis was done in terms of regional distribution, travel pattern and commodity distribution.

2.5.4 Regional Distribution

Based on the OD matrices, the regional distribution of tollable vehicles at the toll plaza locations has been calculated. **Table 2-8** gives the distribution indicating the attraction and generation zones for the traffic along the Madapam TP and Nathavalasa TP.

Region/Modes	Car	M Bus	Bus	MLCV	LCV	2A	3A	MAV
TP01-Madapam								
Andhra Pradesh	91.3	95.0	95.6	91.4	45.0	36.9	38.9	33.3
Odisha	5.9	0.0	2.5	8.6	17.3	17.3	16.9	19.2
Tamil Nadu	0.5	0.0	0.2	0.0	9.0	12.3	10.3	11.5
Karnataka	0.2	0.0	0.3	0.0	5.0	6.9	5.6	6.1
West Bengal	0.7	5.0	0.1	0.0	9.2	16.8	17.7	15.2
Telangana	0.8	0.0	1.1	0.0	6.2	4.6	3.3	3.7
Jharkhand	0.1	0.0	0.1	0.0	1.7	1.1	2.1	3.2
Rest of India	0.5	0.0	0.2	0.0	6.6	4.1	5.3	7.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
TP02-Nathavalasa								
Andhra Pradesh	92.3	96.4	92.3	92.2	55.6	48.2	43.8	46.2
Odisha	3.6	0.0	3.1	4.3	11.3	13.4	13.4	14.7
Tamil Nadu	0.7	0.0	1.1	0.2	5.6	9.1	9.7	7.6
Karnataka	0.3	0.0	0.4	0.0	5.6	5.6	6.6	7.3
West Bengal	1.3	0.0	1.4	3.1	12.1	13.4	14.7	10.2
Telangana	1.2	0.0	1.7	0.2	4.5	4.1	4.2	4.1
Jharkhand	0.0	0.0	0.0	0.0	1.0	0.9	1.8	2.8
Rest of India	0.6	3.6	0.1	0.0	4.3	5.3	5.7	7.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
TP01 & TP02 - Combined								
Andhra Pradesh	91.8	96.0	93.8	91.8	50.8	42.8	41.5	40.5
Odisha	4.6	0.0	2.8	6.7	14.0	15.3	15.1	16.7
Tamil Nadu	0.6	0.0	0.7	0.1	7.1	10.6	10.0	9.3
Karnataka	0.3	0.0	0.3	0.0	5.3	6.2	6.1	6.8
West Bengal	1.0	1.5	0.8	1.4	10.8	15.0	16.1	12.5
Telangana	1.0	0.0	1.4	0.1	5.2	4.3	3.8	3.9
Jharkhand	0.0	0.0	0.0	0.0	1.3	1.0	2.0	3.0
Rest of India	0.6	2.5	0.2	0.0	5.4	4.7	5.5	7.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 2-8: Regional Distribution of Tollable Traffic (in %) - TP01 & TP02

Passenger traffic:

- Andhra Pradesh dominates car traffic across all toll plazas, contributing about 91.8 percent along both toll plazas. Odisha is the second-largest contributor, with about 4.6 percent across both toll plazas. Other states like Tamil Nadu, Karnataka, West Bengal, and Telangana contribute minimally, generally less than 2 percent each.
- In case of bus traffic, Andhra Pradesh still leads with about 93.8 percent followed by Odisha and Telangana with about 2.8 percent and 1.4 percent respectively.

Freight Traffic

- For LCV traffic, Andhra Pradesh shows the highest share, contributing about 50.8 percent across both toll plazas. Odisha follows with about 14 percent, while West Bengal and Tamil Nadu contributes significantly, ranging from 7–11 percent.

- In case of 2A trucks, Andhra Pradesh contributes about 42.8 percent of traffic, while West Bengal and Odisha contributes significantly with about 15 percent each. Tamil Nadu also has substantial contribution of about 10.6 percent.
- For 3A trucks and MAVs, Andhra Pradesh remains the primary contributor, with shares between 41–42 percent in each category. Odisha and West Bengal has a strong presence with contribution of about 12–17 percent each.

Table 2-9 gives the distribution indicating the attraction and generation zones for the traffic along the Vizag bypass toll plaza locations (TP03 and TP04).

Region/Modes	Car	M Bus	Bus	MLCV	LCV	2A	3A	MAV
TP03 – Dukkavanipalem								
Andhra Pradesh	89.7	50.0	63.3	87.4	53.7	44.5	41.6	41.0
Odisha	4.0	37.5	12.1	4.8	10.5	13.4	10.1	14.2
Tamil Nadu	1.9	0.0	4.0	2.1	6.3	7.8	11.1	9.7
Karnataka	0.7	0.0	5.6	0.5	4.9	7.3	6.2	7.4
West Bengal	1.6	0.0	5.2	2.9	15.2	14.5	17.8	12.8
Telangana	1.6	0.0	5.4	2.0	6.4	6.1	5.0	5.2
Jharkhand	0.0	0.0	0.0	0.0	0.4	1.3	1.3	1.9
Rest of India	0.3	12.5	4.6	0.3	2.7	5.1	7.0	7.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
TP04 – Marripalem								
Andhra Pradesh	91.4	93.8	65.1	94.2	54.5	42.3	38.8	40.5
Odisha	2.5	6.3	11.2	3.3	9.8	11.4	10.3	11.2
Tamil Nadu	1.3	0.0	4.7	0.2	7.3	11.6	13.3	10.4
Karnataka	0.9	0.0	1.8	0.2	7.2	8.4	7.4	9.6
West Bengal	0.5	0.0	3.3	0.5	10.4	15.0	19.0	15.1
Telangana	2.9	0.0	9.5	1.2	6.2	6.0	4.2	4.1
Jharkhand	0.0	0.0	1.5	0.0	0.1	0.9	1.4	2.1
Rest of India	0.5	0.0	2.9	0.4	4.5	4.4	5.6	6.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
TP03 & TP04 - Combined								
Andhra Pradesh	90.7	74.8	64.3	91.1	54.1	43.4	40.2	40.8
Odisha	3.1	19.8	11.6	4.0	10.2	12.4	10.2	12.7
Tamil Nadu	1.5	0.0	4.4	1.1	6.8	9.7	12.2	10.1
Karnataka	0.8	0.0	3.6	0.3	6.0	7.9	6.8	8.5
West Bengal	1.0	0.0	4.2	1.5	12.8	14.7	18.4	13.9
Telangana	2.4	0.0	7.5	1.5	6.3	6.1	4.6	4.7
Jharkhand	0.0	0.0	0.8	0.0	0.3	1.1	1.4	2.0
Rest of India	0.5	5.4	3.7	0.4	3.6	4.8	6.3	7.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 2-9: Regional Distribution of Tollable Traffic (in %) – TP03 & TP04

Passenger traffic:

- Andhra Pradesh accounts for the majority of car traffic at both Vizag bypass toll plaza locations, contributing about 90.7 percent traffic followed by neighbouring states, Odisha and Telangana which contribute around 3.1 and 2.5 percent respectively.

- In case of bus traffic, Andhra Pradesh still leads with about 64.3 percent followed by Odisha and Telangana with about 11.6 percent and 7.5 percent respectively.

Freight Traffic

- For LCV traffic, Andhra Pradesh shows the highest share, contributing 54.1 percent across Vizag bypass. West Bengal follows with 12.8 percent, while Odisha contributes significantly with about 10.2 percent.
- For 2A trucks, Andhra Pradesh's contributes about 43.4 percent, while West Bengal contributes significantly with about 14.7 percent. Tamil Nadu and Odisha also have substantial contributions of about 10 – 12 percent each.
- For 3A trucks and MAVs, Andhra Pradesh remains the primary contributor, with shares about 40-41 percent in each category followed by and West Bengal, which has a strong presence with a contribution of about 18.4 percent in 3A trucks and about 13.9 percent in MAVs

The mode wise top 20 OD pairs are given in **Appendix 2.3**.

2.5.5 Concise Travel Pattern

In order to simplify the travel pattern at PR section, the streams given above are divided into 2 major streams:

- Crossing Traffic – Trips originating/destined within the project corridor and crossing all four Toll Plazas.
- Local Traffic – Trips originating/destined between the project at all four Toll Plazas.

The summarised travel pattern on the project corridor is presented in **Table 2-10**

	Car	Mini bus	Bus	MLCV	LCV	2A	3A	MAV
TP01 – Madapam								
Through Traffic (%)	6.8	0.0	8.6	6.2	62.1	64.9	66.8	66.0
Local Traffic (%)	93.2	100.0	91.4	93.8	37.9	35.1	33.2	34.0
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AADT	5,154	20	708	822	388	1,088	1,046	2,945
TP02 – Nathavalasa								
Through Traffic (%)	7.2	7.1	13.0	5.8	43.1	51.6	56.0	51.3
Local Traffic (%)	92.8	92.9	87.0	94.2	56.9	48.4	44.0	48.7
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AADT	6,538	48	877	668	476	1,214	1,161	3,718
TP03 – Dukkavanipalem								
Through Traffic (%)	7.7	50.0	38.9	12.2	43.1	55.1	60.7	60.1
Local Traffic (%)	92.3	50.0	61.1	87.8	56.9	44.9	39.3	39.9
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AADT	2,822	8	79	496	449	1,229	1,058	3,044
TP04 – Marripalem								
Through Traffic (%)	9.6	12.5	34.9	8.9	43.5	59.0	66.3	62.6
Local Traffic (%)	90.4	87.5	65.1	91.1	56.5	41.0	33.7	37.4
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AADT	3,953	11	89	600	457	1,238	1,071	3,020

Table 2-10: Concise Travel Pattern on the Project Corridor

Madapam TP shows the highest through traffic in all major freight categories with about 66 percent in MAVs, 66.8 percent in 3A trucks and about 64.9 percent in 2A trucks, highlighting their role in long-distance freight traffic. For LCVs, through traffic ranges between 43 percent (Nathavalasa TP and Dukkavanipalem TP) and 62.1 percent (Madapam TP), indicating a mix of regional and long-distance freight movement.

In contrast, cars dominate the local traffic across all locations, with shares exceeding 90 percent across all TPs. Buses also display a high proportion of local traffic, ranging from 87–91 percent at Madapam TP and Nathavalasa TP to 61–65 percent at both the toll plaza locations of Vizag bypass. MLCVs, primarily used for regional goods transport, also show a strong inclination towards local traffic, with shares between 87.8 percent to 94.2 percent.

2.5.6 Detailed Travel Pattern

In order to assess the travel pattern of vehicles, the important streams of traffic plying on the project road are estimated. The list of the popular movements found at the toll plaza locations is presented in **Table 2-11, Table 2-12, Table 2-13 and Table 2-14**.

S. No	Crossing Plazas	Concise Traffic Stream	Car	Minibus	Bus	MLCV	LCV	2A	3A	MAV
1	1	Zones beyond Madapam TP to Srikakulam & Surroundings	58.0	81.7	68.7	66.0	17.7	13.4	10.2	6.7
2	1,2	Zones beyond Madapam TP to Vizianagaram & Surroundings	3.5	0.0	0.9	1.5	1.3	1.0	1.3	1.6
3	1,2,3	Zones beyond Madapam TP to Sabbavaram/Anakapalli & Surroundings	0.6	0.0	0.7	1.2	1.0	0.8	1.8	1.3
4	1,2,3	Rest of AP/Bhubaneswar to Vizag City & port	30.2	18.3	21.0	25.1	14.8	16.0	14.8	15.5
5	1,2,3	Kolkata/Jharkhand/East& North India to Vizag City & port	0.9	0.0	0.2	0.0	3.1	3.9	5.1	8.9
6	1,2,3,4	Zones beyond Madapam TP to Rajahmundry, Kakinada & Surroundings	1.6	0.0	2.6	5.0	6.0	6.2	13.6	7.2
7	1,2,3,4	Zones beyond Madapam TP to Vijayawada/Hyderabad & Surroundings	3.4	0.0	4.6	1.2	23.6	18.1	18.3	19.8
8	1,2,3,4	Rest of AP/Bhubaneswar to Bangalore/Chennai & beyond	1.4	0.0	1.3	0.0	15.5	13.6	11.5	14.7
9	1,2,3,4	Kolkata/Jharkhand/East& North India to Bangalore/Chennai & beyond	0.2	0.0	0.0	0.0	16.1	27.0	22.5	23.1
10	1,2,3,4	Zones beyond Madapam TP to Maharashtra/Gujarat & Rest of Central/West India	0.2	0.0	0.0	0.0	1.0	0.0	0.9	1.2
Total			100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AADT			5,154	20	708	822	388	1,088	1,046	2,945

Table 2-11: Traffic Streams at TP01-Madapam (in %)

S. No	Crossing Plazas	Concise Traffic Stream	Car	Minibus	Bus	MLCV	LCV	2A	3A	MAV
1	1,2	Beyond Srikakulam - Vizianagaram & Surroundings	15.9	7.7	4.2	8.0	2.6	1.6	1.0	1.0
2	1,2,3	Beyond Srikakulam - Sabbavaram/Anakapalli & Surroundings	7.1	7.1	3.5	6.2	5.2	4.4	3.2	2.8
3	2,3	Srikakulam & surroundings - Vizag City & port	37.2	41.2	52.8	51.2	21.2	15.5	12.9	13.9
4	1,2,3	Rest of AP/Bhubaneswar - Vizag City & port	22.9	22.0	17.3	14.1	15.1	9.9	11.4	11.4
5	1,2,3	Kolkata/Jharkhand/East& North India - Vizag City & port	1.2	0.0	0.8	3.8	5.2	7.3	7.1	9.1
6	1,2,3,4	Beyond Srikakulam - Rajahmundry/Kakinada & Surroundings	5.8	7.7	8.1	9.9	11.0	11.2	10.1	11.0
7	1,2,3,4	Beyond Srikakulam - Vijayawada/Hyderabad & Surroundings	7.6	7.1	10.3	6.4	15.1	18.3	18.6	17.9
8	1,2,3,4	Srikakulam & surroundings- Bangalore/Chennai & beyond	0.4	0.0	0.3	0.0	1.9	2.0	1.6	3.2
9	1,2,3,4	Rest of AP/Bhubaneswar - Bangalore/Chennai & beyond	1.1	0.0	1.6	0.0	7.1	10.5	10.6	11.2
10	1,2,3,4	Kolkata/Jharkhand/East& North India - Bangalore/Chennai & beyond	0.7	0.0	1.0	0.5	13.8	18.5	22.0	17.2
11	1,2,3,4	Beyond Srikakulam - Maharashtra/Gujarat & Rest of Central/West India	0.0	7.1	0.0	0.0	1.9	0.8	1.5	1.3
Total			100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AADT			6,538	48	877	668	476	1,214	1,161	3,718

Table 2-12: Traffic Streams at TP02-Nathavalasa (in %)

S. No	Crossing Plazas	Concise Traffic Stream	Car	Minibus	Bus	MLCV	LCV	2A	3A	MAV
1	2,3	Vizianagaram/Srikakulam & beyond - Sabbavaram/ Anakapalli & Surroundings	50.0	50.0	33.3	52.9	23.8	22.8	17.5	20.8
2	2,3	Vizianagaram/Srikakulam & Surroundings - Vizag City & port	9.8	0.0	2.4	7.6	1.4	2.3	3.1	1.6
3	1,2,3	Rest of AP/Bhubaneswar - Vizag City & port	4.7	0.0	0.0	0.9	2.1	3.2	1.8	0.8
4	1,2,3	Kolkata/Jharkhand/East& North India - Vizag City & port	0.1	0.0	0.0	0.0	3.8	0.3	1.7	1.5
5	2,3,4	Vizianagaram/Srikakulam & beyond - Rajahmundry/ Kakinada & Surroundings	16.9	0.0	14.7	20.8	21.0	13.7	14.4	13.1
6	2,3,4	Vizianagaram/Srikakulam & beyond - Vijayawada/ Hyderabad & Surroundings	12.9	25.0	27.0	12.6	23.7	24.1	23.0	22.5
7	2,3,4	Vizianagaram/Srikakulam & Surroundings - Bangalore/ Chennai & beyond	3.0	0.0	5.6	1.5	7.0	3.4	4.3	4.4

S. No	Crossing Plazas	Concise Traffic Stream	Car	Minibus	Bus	MLCV	LCV	2A	3A	MAV
8	1,2,3,4	Rest of AP/Bhubaneswar - Bangalore/ Chennai & beyond	1.3	0.0	10.3	2.1	4.4	8.7	9.0	11.9
9	1,2,3,4	Kolkata/Jharkhand/East& North India - Bangalore/ Chennai & beyond	1.1	0.0	5.6	1.5	11.7	19.7	23.1	20.8
10	2,3,4	Vizianagaram/Srikakulam & beyond - Maharashtra/ Gujarat & Rest of Central/ West India	0.2	25.0	1.2	0.0	1.0	1.7	2.1	2.6
Total			100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AADT			2,822	8	79	496	449	1,229	1,058	3,044

Table 2-13: Traffic Streams at TP03-Dukkavanipalem (in %)

S. No	Crossing Plazas	Concise Traffic Stream	Car	Mini bus	Bus	MLCV	LCV	2A	3A	MAV
1	3,4	Sabbavaram/Vishakhapatnam/ Vizianagaram & beyond – Anakapalli & Surroundings	40.8	37.5	16.0	42.1	19.4	14.3	13.5	17.5
2	3,4	Sabbavaram/Vishakhapatnam/ Vizianagaram & beyond- Rajahmundry/ Kakinada & Surroundings	33.9	37.5	13.0	43.0	24.8	20.5	20.6	16.9
3	3,4	Sabbavaram/Vishakhapatnam/ Vizianagaram & beyond - Vijayawada/ Hyderabad & Surroundings	20.3	25.0	55.0	13.9	24.4	22.9	21.1	20.5
4	3,4	Sabbavaram/Vishakhapatnam & surroundings - Bangalore/Chennai & beyond	2.1	0.0	0.0	0.4	2.5	1.3	1.5	2.3
5	2,3,4	Vizianagaram/Srikakulam & surroundings - Bangalore/Chennai & beyond	0.9	0.0	0.0	0.0	2.5	4.8	4.8	3.0
6	1,2,3,4	Rest of AP/Bhubaneshwar & surroundings - Bangalore/Chennai & beyond	0.8	0.0	9.5	0.0	7.5	11.7	9.3	12.2
7	1,2,3,4	Kolkata/Jharkhand/East& North India - Bangalore/Chennai & beyond	0.6	0.0	6.5	0.5	17.3	23.4	26.4	24.4
8	3,4	Sabbavaram/Vishakhapatnam/ Vizianagaram & beyond - Maharashtra/ Gujarat & Rest of Central/West India	0.5	0.0	0.0	0.0	1.8	1.1	2.7	3.3
Total			100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AADT			3,953	11	89	600	457	1,238	1,071	3,020

Table 2-14: Traffic Streams at TP04-Marripalem (in %)

Passenger Traffic:

- Car traffic shows a strong local component across all toll plazas
- About 58 percent of car traffic travelling between zones beyond Madapam TP to Srikakulam & surroundings (stream 1) at TP01 followed by about 30 percent between Rest of AP/Bhubaneswar to Vizag City & port (stream 4)
- At Nathavalasa TP, highest share (about 37.2 percent) of car traffic were found to be travelling between Srikakulam & surroundings and Vizag City & port (stream 3)
- At Dukkavanipalem TP, about half of the total of car traffic (50 percent) were found to be moving between Vizianagaram/Srikakulam & beyond to Sabbavaram/ Anakapalli & surroundings (stream 1)
- At Marripalem TP, about 40.8 percent of the car traffic were found to be travelling between Sabbavaram/Vishakhapatnam/Vizianagaram & beyond to Anakapalli & surroundings (stream 1)

Freight Traffic:

- Freight traffic primarily exhibits the long-distance movement patterns with predominant movement between Kolkata/Jharkhand/East& North India and Bangalore/Chennai & beyond across all four toll plaza locations along the PR.
- At Madapam TP, about 22-23 percent of 3A/MAVs were found to be traveling between Kolkata/Jharkhand/East & North India and Bangalore/Chennai & beyond (stream 9) followed by about 18-20 percent between zones beyond Madapam TP and Vijayawada/Hyderabad & Surroundings (stream 7).
- At Nathavalasa TP, stream 7 and stream 9 shows relatively similar share in freight vehicles. About 17.9 of MAVs and about 18.6 percent of 3A trucks travel were found to be traveling between beyond Srikakulam to Vijayawada/Hyderabad & surroundings (stream 7) while about 17.2 percent of MAVs and 22 percent of 3A trucks are travelling between Kolkata/Jharkhand/East & North India to Bangalore/Chennai & beyond (stream 10).
- Similarly, at Dukkavanipalem TP, about 22-23 percent of 3A/MAVs were found to be traveling between Vizianagaram/Srikakulam & beyond to Vijayawada/Hyderabad & surroundings (stream 6) while about 20.8 percent of MAVs and 23.1 percent of 3A trucks undertake long-distance travel between Kolkata/Jharkhand/East& North India and Bangalore/Chennai & beyond (stream 9).
- At Marripalem TP, the dominant 3A/MAV traffic (24-26 percent) were found to be traveling between Kolkata/Jharkhand/East & North India to Bangalore/Chennai (stream 7) followed by about 20-21 percent travelling between Sabbavaram/ Vishakhapatnam/Vizianagaram & beyond to Vijayawada/Hyderabad & surroundings (stream 3).

2.5.7 Commodity Distribution

The location of major cement/thermal plants and sandstone source points located in and around the project road are presented in **Figure 2-6**.

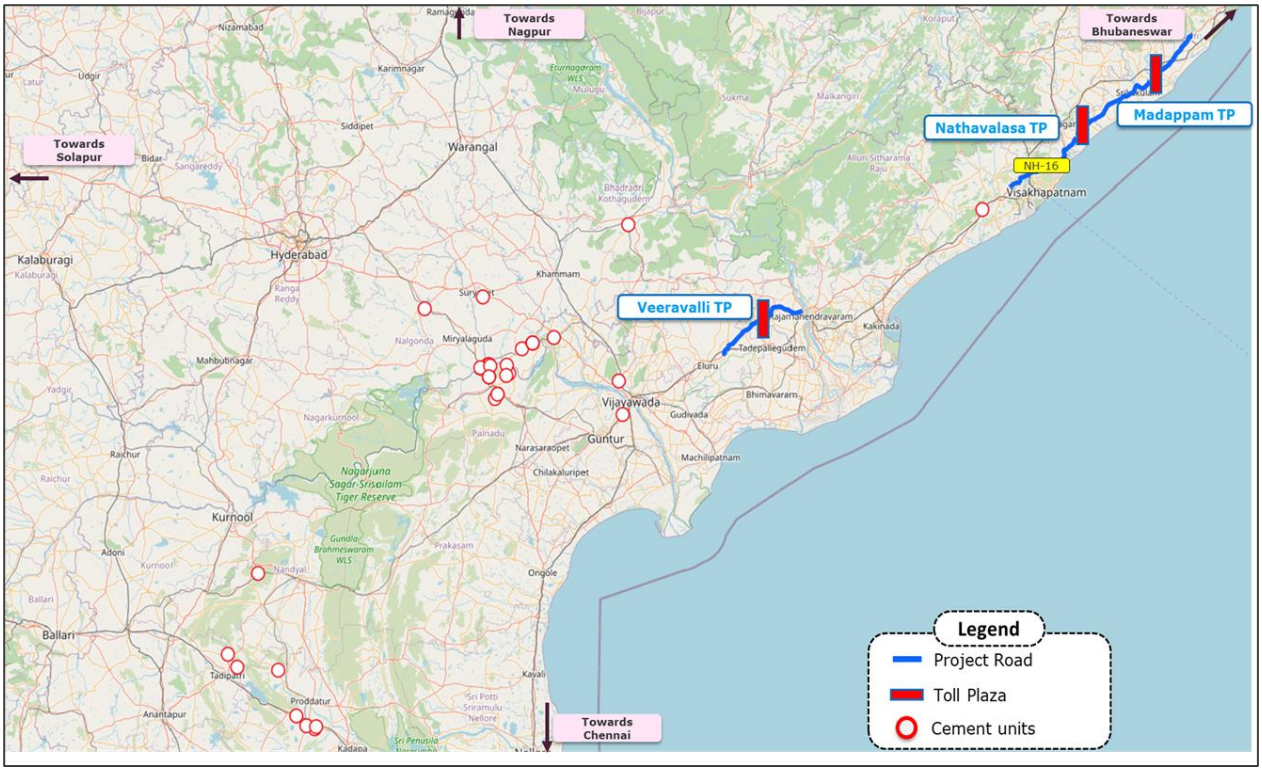


Figure 2-6: Cement Plants & Thermal Power Plants in the Vicinity of the Project Corridor

Analysis was also carried out to understand the different commercial vehicles being used to transport different commodities. The direction wise commodity distribution is presented in **Appendix 2.4**.

The commodity-wise share of the total commercial traffic at each of the toll plazas on the project road are presented in **Table 2-15**.

Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
TP01 – Madapam					
Food Grains and Cash Crops	3.4	3.8	4.4	8.7	4.3
Fruits & Vegetables	5.4	5.1	7.7	6.3	7.3
Building Materials	3.9	8.9	6.9	7.5	9.3
Iron & Steel Products	3.4	3.4	5.2	7.5	13.7
Petroleum Products, Chemicals and Gas	1.8	8.0	6.4	9.7	10.2
Heavy Machinery & Industrial Equipment	0.3	2.1	1.0	1.2	0.5
Industrial Products & Equipment	6.4	5.9	9.1	6.6	5.5
Consumer Items	9.0	7.2	11.4	12.0	7.6
Automobile and New Chassis	1.8	2.5	7.2	5.9	6.6
Containers	0.0	0.0	0.0	0.0	0.0
Ores & Minerals (Coal, Bauxite, limestone)	2.3	0.4	3.7	3.6	5.6
Miscellaneous Items (Medicines, Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	12.6	10.5	7.7	9.1	7.9
Parcels	3.4	11.4	8.4	7.0	4.7
Empty Vehicles	46.4	30.8	21.0	15.0	16.8
Total	100.0	100.0	100.0	100.0	100.0

Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
TP02 – Nathavalasa					
Food Grains and Cash Crops	4.5	2.9	3.9	4.1	5.0
Fruits & Vegetables	8.4	5.5	4.9	6.7	6.6
Building Materials	2.8	4.8	4.0	3.7	6.1
Iron & Steel Products	5.9	7.1	9.2	10.9	13.4
Petroleum Products, Chemicals and Gas	4.8	10.6	10.7	9.7	10.4
Heavy Machinery & Industrial Equipment	0.3	0.3	0.4	0.1	0.6
Industrial Products & Equipment	4.2	4.8	5.2	6.4	5.5
Consumer Items	7.3	8.0	4.6	6.0	5.3
Automobile and New Chassis	4.5	4.2	2.7	2.5	4.0
Containers	0.0	0.0	0.0	0.0	0.2
Ores & Minerals (Coal, Bauxite, limestone)	0.6	0.6	4.2	4.0	5.2
Miscellaneous Items (Medicines, Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	7.6	7.4	4.9	6.1	6.7
Parcels	8.4	21.5	23.5	22.7	12.6
Empty Vehicles	40.7	22.2	21.8	17.1	18.4
Total	100.0	100.0	100.0	100.0	100.0
TP03 - Dukkavanipalem					
Food Grains and Cash Crops	2.6	5.3	8.1	6.3	9.6
Fruits & Vegetables	6.8	4.2	8.1	7.8	4.5
Building Materials	1.7	3.0	5.2	7.5	10.1
Iron & Steel Products	3.0	4.2	3.9	5.3	14.3
Petroleum Products, Chemicals and Gas	3.0	15.2	10.9	8.9	8.8
Heavy Machinery & Industrial Equipment	0.4	0.8	0.4	0.5	0.8
Industrial Products & Equipment	6.0	8.0	4.3	5.5	4.7
Consumer Items	9.8	10.6	9.3	9.1	9.2
Automobile and New Chassis	2.1	2.3	4.1	2.8	3.6
Containers	0.0	0.0	0.2	0.2	0.1
Ores & Minerals (Coal, Bauxite, limestone)	0.4	0.8	0.7	1.6	2.5
Miscellaneous Items (Medicines, Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	8.5	6.1	6.1	9.6	4.6
Parcels	4.3	8.3	9.7	7.1	2.8
Empty Vehicles	51.3	31.4	29.0	27.8	24.4
Total	100.0	100.0	100.0	100.0	100.0
TP04 - Marripalem					
Food Grains and Cash Crops	2.8	5.1	5.9	8.0	6.2
Fruits & Vegetables	11.6	13.6	7.5	10.5	12.4
Building Materials	0.9	2.6	3.8	7.8	13.0
Iron & Steel Products	3.7	3.3	6.5	5.7	8.4
Petroleum Products, Chemicals and Gas	2.8	9.6	6.9	9.7	8.2
Heavy Machinery & Industrial Equipment	0.9	0.7	1.0	0.0	0.8
Industrial Products & Equipment	2.8	8.8	7.4	5.1	5.4
Consumer Items	9.3	9.2	6.8	10.1	6.6
Automobile and New Chassis	0.9	3.3	2.5	4.3	6.5
Containers	0.0	0.0	0.9	0.4	0.2
Ores & Minerals (Coal, Bauxite, limestone)	0.5	0.0	0.4	0.6	0.5
Miscellaneous Items (Medicines, Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	14.0	10.7	7.6	7.5	9.3
Parcels	7.9	6.3	9.7	10.1	6.0
Empty Vehicles	41.9	26.8	33.1	20.2	16.4
Total	100.0	100.0	100.0	100.0	100.0

Table 2-15: Commodity Distribution on Project Road (in %)

TP01 – Madapam

- Around 6-10 percent of 2A/3A/MAV transporting petroleum, major OD pairs between Tekkali-Srikakulam, Visakhapatnam-Rest of Odisha, Chennai-Kolkata
- Around 5-13 percent of 2A/3A/MAV transporting iron & steel, major OD pairs between Visakhapatnam-Rest of Odisha and Chennai-Kolkata
- Around 4-8 percent of LCV/2A/3A/MAV transporting parcel, major OD pairs between Chennai-Kolkata
- Around 6-9 percent of 2A/3A/MAV transporting building materials, major OD pairs between Visakhapatnam-Rest of Odisha, Rest of Odisha-Chennai, Tekkali-Srikakulam
- Around 7 percent of 2A/3A/MAV transporting fruits and vegetables, major OD pairs between Tekkali-Visakhapatnam, Bengaluru-Kolkata, Chennai-Kolkata

TP02 – Nathavalasa

- Around 10 percent of 2A/3A/MAV transporting petroleum, major OD pairs between Srikakulam-Visakhapatnam
- Around 9-13 percent of 2A/3A/MAV transporting iron & steel, major OD pairs between Srikakulam-Visakhapatnam and Chennai-Kolkata
- Around 22-23 percent of 2A/3A transporting parcel, major OD pairs between Bengaluru-Kolkata, Chennai-Kolkata
- Around 4-6 percent of 2A/3A/MAV transporting building materials, major OD pairs between Srikakulam-Visakhapatnam, Srikakulam-Chennai
- Around 5-6 percent of LCV/2A/3A/MAV transporting fruits and vegetables, major OD pairs between Srikakulam-Visakhapatnam, Bengaluru-Kolkata

TP03 - Dukkavanipalem

- Around 8-11 percent of 2A/3A/MAV transporting petroleum, major OD pairs between Tekkali-Visakhapatnam, Mettamedapalem-Anakapalli, Srikakulam-Anakapalli
- Around 5-14 percent of 3A/MAV transporting iron & steel, major OD pairs between Rest of Odisha-Bengaluru, Rest of Odisha-Chennai, Bengaluru-Kolkata
- Around 7-11 percent of 2A/3A transporting parcel, major OD pairs between Bengaluru-Kolkata, Chennai-Kolkata
- Around 6-10 percent of 2A/3A/MAV transporting building materials, major OD pairs between Srikakulam-Chennai, Mettamedapalem-Visakhapatnam, Srikakulam-Hyderabad

- Around 4-10 percent of LCV/2A/3A/MAV transporting fruits and vegetables, major OD pairs between Bengaluru-Kolkata, Mettamedapalem-Anakapalli

TP04 - Marripalem

- Around 7-8 percent of 2A/3A/MAV transporting petroleum, major OD pairs between Vizianagaram-Anakapalli, Srikakulam-Anakapalli, Tekkali-Anakapalli
- Around 6-8 percent of 2A/3A/MAV transporting iron & steel, major OD pairs between Hyderabad-Rest of Odisha, Rest of Odisha-Chennai
- Around 6-10 percent of LCV/2A/3A/MAV transporting parcel, major OD pairs between Chennai-Kolkata, Bengaluru-Kolkata
- Around 10-12 percent of 3A/MAV transporting building materials, major OD pairs between Tekkali-Kakinada, Vizianagaram-Rest of Gujrat, Srikakulam- Rest of Tamil Nadu
- Around 7-14 percent of LCV/2A/3A/MAV transporting fruits and vegetables, major OD pairs between Bhubaneswar- Bengaluru, Bengaluru-Kolkata

2.6 Traffic and Travel Characteristics of Panchvati and Jonnada Toll Plaza Locations

To gain a comprehensive understanding of the traffic and travel characteristics, Traffic Volume Count (TVC) and Origin-Destination (OD) survey were conducted at the Panchvati and Jonnada toll plazas.

The completion of under construction Raipur-Vizag expressway is likely to impact travel pattern on PR. Currently, this traffic is not crossing any of the toll plazas of the project road as it is using NH26 and further using AH45 to reach Vizag port. In order to understand the travel pattern of the traffic between Raipur/Salur & beyond to Vizag City/port, the TVC and OD survey at Jonnada Toll plaza between Vizianagram and Thagarepuvalasa on NH26 was conducted.

In addition, Traffic Volume Count (TVC) and Origin-Destination (OD) survey were conducted at the Panchvati toll plaza to assess the traffic to Vizag port from Anandapuram & beyond (Northern side) and Anakapalli and beyond (Southern side)

Location of these two TPs along with the PR toll plazas on Vizag Bypass is presented in **Figure 2-7**.



Figure 2-7: Location of Panchvati TP and Jonnada TP

The Panchvati Toll Plaza is located on the existing port road where all the traffic to/from Vizag port is being tolled. Jonnada Toll Plaza is located on NH-26 which serves as a key gateway for traffic destined towards Raipur/Chhattisgarh. The schedule of surveys conducted at these two plazas is presented in **Table 2-16**.

Sections	Location	Duration	Date(s)
Classified Traffic Volume Counts			
Port Road	Panchvati TP	3 Day	15th Oct 2024
NH 26	Jonnada TP	3 Day	15th Oct 2024
Origin and Destination Survey			
Port Road	Panchvati TP	1 Day	15th Oct 2024
NH 26	Jonnada TP	1 Day	15th Oct 2024

Table 2-16: Survey Schedule for Panchvati TP and Jonnada TP

2.6.1 Average Daily Traffic at Panchvati TP and Jonnada TP

The traffic volume data collected at these two toll plaza locations during the three days survey has been analysed. The summary of ADT in terms of vehicles and PCUs is presented in **Table 2-17**.

Modes	Panchvati TP	Jonnada TP
Tollable vehicles		
Car/Jeep/Van/Taxi	8,673	9,861
Minibus	26	124
Standard Bus	31	958
Mini LCV	587	838
LCV	404	387
2 Axle	325	154
3 Axle	480	284
MAV (4-6 Axle)	4,612	1,352
HMV/MAV (=>7Axle)	8	5

Modes	Panchvati TP	Jonnada TP
Non Tollable vehicles		
Two- Wheeler	21,728	17,622
Auto-Rickshaw	2,708	2,942
Agri. Tractors	3	33
Total Non-Motorized	61	32
Total Vehicles/PCUs		
Total Tollable vehicles	15,146	13,963
Total Non Tollable vehicles	24,501	20,628
Total Vehicles	39,647	34,592
Total PCU	46,819	33,665
Tollable PCU	33,201	21,761

Table 2-17: ADT at Panchvati TP and Jonnada TP

The observed total vehicles are around 24,501 at Panchvati toll plaza and 34,592 at Jonnada toll plaza.

2.6.2 Travel Pattern: Concise Traffic Streams at Panchvati Toll Plaza

In order to assess the travel pattern of vehicles, the important streams of traffic plying on the Panchvati TP are estimated. The list of the popular movements found at the toll plaza location is presented **Table 2-18**.

Direction	Sr. No.	Traffic Streams	Car	Mbus	Bus	MLCV	LCV	2A	3A	MAV
South	1	Anakapalli & Surroundings - Vizag Port/ Coromandel & Surroundings	8.8	0.0	10.1	12.7	11.0	14.0	10.4	12.2
South	2	Kakinada/Rajahmundry - Vizag Port/ Coromandel & Surroundings	12.4	25.0	11.1	16.1	8.0	10.2	9.9	12.7
South	3	Hyderabad/Vijayawada- Vizag Port/ Coromandel & Surroundings	8.6	0.0	14.6	7.3	10.4	8.3	15.8	12.6
South	4	Chennai/Bangalore & Surroundings - Vizag Port/ Coromandel & Surroundings	1.7	0.0	0.0	4.7	0.8	4.2	3.8	2.5
South	5	Maharashtra/Gujarat and Rest of Central & West India- Vizag Port/Coromandel & Surroundings	0.3	0.0	0.0	0.0	1.5	1.9	1.7	3.2
North	6	Vizianagaram/Srikakulam & Rest of AP - Vizag Port/ Coromandel & Surroundings	0.9	0.0	0.0	2.8	4.0	4.6	4.3	4.4
North	7	Bhubaneswar/Kolkata/Chhattisgarh/ East & North India -Vizag Port/Coromandel & Surroundings	0.6	0.0	0.0	1.8	5.4	11.8	9.0	10.8
Sabbavaram	8	Sabbavaram & Surroundings - Vizag Port/ Coromandel & Surroundings	1.2	0.0	0.0	0.0	1.6	0.0	0.7	0.8
Pendurthi	9	Pendurthi & Surroundings - Vizag Port/ Coromandel & Surroundings	1.2	0.0	0.0	0.6	3.2	0.6	1.9	2.8
Local-South	10	Gajuwaka/Autonagar/Lankelapalem/Steel Plant & Surroundings-Vizag port/ Coromandel & Surroundings	39.6	25.0	46.0	42.7	43.8	35.5	30.0	28.8
Local-North	11	NAD/Airport/Gateway CFS/MVP Colony & Surroundings - Vizag Port/ Coromandel & Surroundings	24.7	50.0	18.2	11.3	10.3	8.9	12.5	9.1
Total			100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AADT			6,439	5	21	241	137	328	436	4,212

Table 2-18: Traffic Streams at Panchvati TP (in %)

Passenger Traffic:

- The highest share of passenger traffic is found to be travelling between local zones in south direction connecting Gajuwaka/Autonagar/Lankelapalem/Steel Plant & surroundings and Vizag port/ Coromandel & surroundings (stream 10) having car traffic of about 40 percent.
- About 25 percent of car traffic is found to be travelling between local zones in north direction connecting NAD/Airport/Gateway CFS/MVP Colony & surroundings and Vizag Port/ Coromandel & surroundings (Stream 11)

Freight Traffic:

- About 29-30 percent of 3A/MAVs were found to be traveling between local zones in south direction connecting Gajuwaka/Autonagar/Lankelapalem/Steel Plant & surroundings and Vizag port/ Coromandel & surroundings (stream 10) followed by about 13- 16 percent between Hyderabad/Vijayawada and Vizag Port/ Coromandel & surroundings (stream 3).
- With the construction of Sabbavaram to Sheelanagar port connectivity road, the freight traffic under Streams 1 to 7 will have the option of using the Vizag bypass and reach the port faster via the proposed port connectivity road.

2.6.3 Travel Pattern: Concise Traffic Streams at Jonnada TP

In order to assess the travel pattern of vehicles, the important streams of traffic plying on the project road are estimated. The list of the popular movements found at the toll plaza location is presented **Table 2-19**.

S. No	Concise Traffic Stream	Car	Minibus	Bus	MLCV	LCV	2A	3A	MAV
1	Raipur & Beyond - Anakapalli & Beyond	0.8	0.0	0.5	1.9	4.3	5.3	5.8	5.6
2	Raipur & Beyond - Sabbavaram/Vizag City & Port	6.4	7.1	2.9	4.5	9.9	9.8	16.8	21.8
3	Raipur & Beyond - Pendurthi/Neelajundilu & Surroundings	0.4	0.0	0.0	0.4	0.0	3.6	1.0	0.2
4	Jagadalpur/Balangir - Anakapalli & Beyond	0.0	0.0	0.0	0.6	0.6	0.0	2.8	1.2
5	Jagadalpur/Balangir - Sabbavaram/Vizag City & Port	1.1	1.0	0.8	1.1	4.3	0.9	2.4	2.2
6	Jagadalpur/Balangir - Pendurthi/Neelajundilu & Surroundings	0.0	1.8	0.0	0.0	0.6	0.0	0.0	0.0
7	Salur & Surroundings - Anakapalli & Beyond	2.9	3.8	3.0	5.4	8.6	14.2	13.8	10.4
8	Salur & Surroundings - Sabbavaram/Vizag City & Port	21.3	20.2	23.9	17.5	18.5	24.6	26.9	33.9
9	Salur & Surroundings - Pendurthi/Neelajundilu & Surroundings	1.3	1.8	0.6	3.8	2.5	1.5	1.3	1.3
10	Vizianagaram & Surroundings - Anakapalli & Beyond	5.9	6.4	2.7	8.9	9.9	7.4	6.3	5.4
11	Vizianagaram & Surroundings - Sabbavaram/Vizag City & Port	48.7	35.7	61.6	36.1	29.6	21.0	15.7	14.4
12	Vizianagaram & beyond to Thagarupuvalasa/Nathavalasa & beyond	6.0	15.8	2.6	13.2	9.3	8.0	5.5	2.9

S. No	Concise Traffic Stream	Car	Minibus	Bus	MLCV	LCV	2A	3A	MAV
13	Vizianagaram - Pendurthi/Neelajundilu & Surroundings	5.3	6.4	1.4	6.4	1.9	3.8	1.7	0.6
Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AADT		9,861	124	958	838	387	154	284	1,357

Table 2-19: Traffic Streams at Jonnada TP (in %)

Passenger Traffic:

- The highest share of passenger traffic is found to be travelling between Vizianagaram & surroundings - Sabbavaram/Vizag city & port (stream 11) having car traffic of about 49 percent.
- About 21 percent of car traffic is found to be travelling between Salur & surroundings - Sabbavaram/Vizag City & Port (stream 8)

Freight Traffic:

- The dominant share of major fright modes (2A/3A/MAVs) were found to be traveling between Salur & surroundings - Sabbavaram/Vizag city & port (stream 8) contributing about 25 percent 2A traffic, about 27 percent 3A traffic and about 34 percent MAV traffic.
- Streams No 2, 3, 8 & 9 represent the potential traffic which currently uses AH45 to reach city/port and in future, this traffic will use the Raipur Vizag Expressway and use a small section of the PR and exit at Pendurthi interchange to reach Vizag city or port.

2.7 Closed Tolling on Vizag Bypass

The Vizag bypass (Anandapuram-Anakapalli) section of NH16 was originally designed to operate under a closed tolling system, with restricted movement between the Project Road (PR) main carriageway and 2 lane service road that runs parallel to the PR on both sides, providing access for local traffic from surrounding settlements. However, due to delays in land acquisition for interchanges at Sabbavaram and Pendurthi, an open tolling system has been implemented since September 2021.

The existing median openings provides access between the service lanes and the main carriageway, allowing some traffic to bypass one or both Marripalem and Dukkavaniapalem toll plazas. However, the service lanes are discontinuous at three locations:

- Anakapalli, due to a railway crossing
- Sabbavaram & Pendurthi due to interchange construction related activities

While local traffic can use these service lanes, the discontinuities restrict the movement of through traffic from/to Anakapalli & beyond to/from Anandapuram & beyond.

To assess the quantum of traffic bypassing the both Marripalem and Dukkavaniapalem toll plazas, a 3-day volume count has been conducted at the service lane sections

adjoining the toll plaza locations. The TVC count at the service lanes is presented in **Table 2-20**.

Modes	Dukkavanipalem TP - Service Lane	Marripalem TP - Service Lane
Tollable vehicles		
Car/Jeep/Van/Taxi	898	1,694
Minibus	6	109
Standard Bus	93	58
Mini LCV	114	295
LCV	101	206
2 Axle	65	82
3 Axle	101	79
MAV (4-6 Axle)	102	195
HMV/MAV (=>7Axle)	0	0
Non Tollable vehicles		
Two- Wheeler	2,322	3,764
Auto-Rickshaw	565	776
Agri. Tractors	9	1
Total Non-Motorized	9	2
Total Vehicles/PCUs		
Total Tollable vehicles	1,481	2,718
Total Non Tollable vehicles	2,905	4,543
Total Vehicles	4,386	7,261
Total PCU	4,181	6,662
Tollable PCU	2,411	3,999

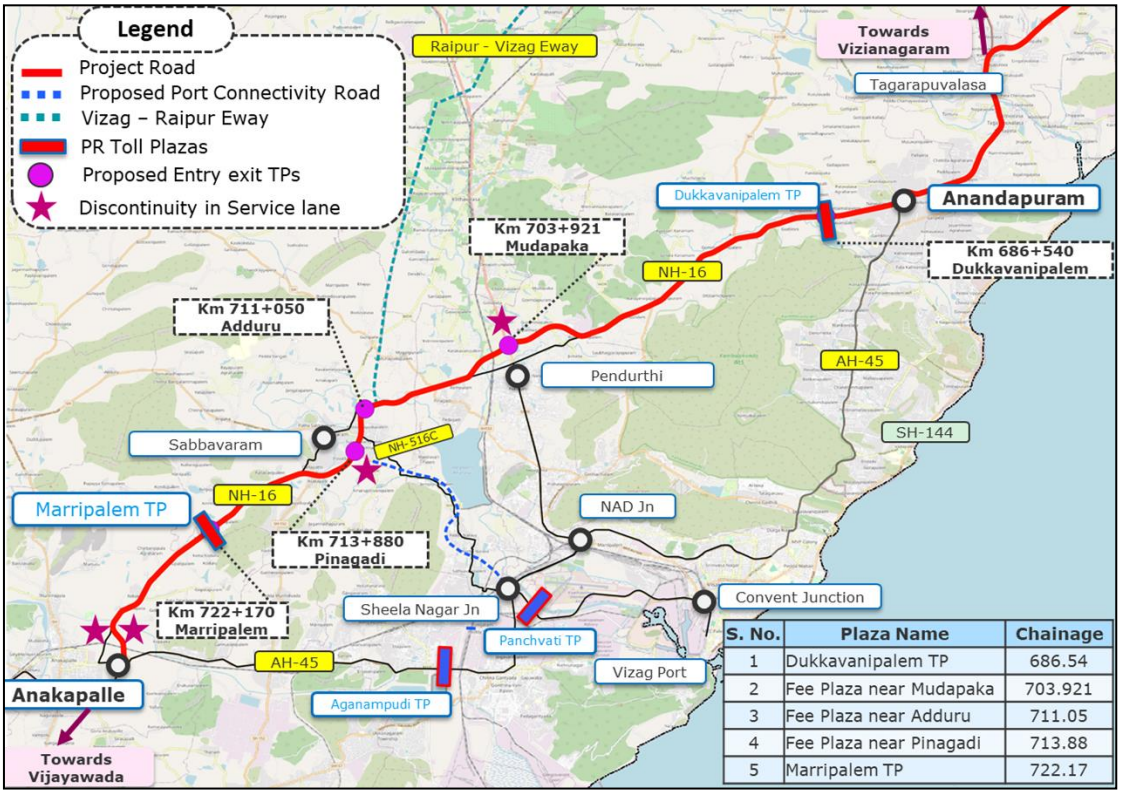
Table 2-20: ADT of Service Lanes at TP03 and TP04

The observed total vehicles are around 4,386 at Dukkavanipalem TP -Service Lane and 7,261 at Marripalem TP -Service Lane.

As the service road provides the connectivity to the towns of Sabbavaram and Pendurthi, these vehicles may be using the service road to cater to the local movement to these towns.

Once the close tolling is implemented, entry/exit may only be permitted at the interchange locations at Km 703+921 (Mudapaka), Km 711+050 (Adduru) and Km 713+880 (Pinagadi). All other entry/exit from main carriageway to service road may be closed by Authority.

Vizag Bypass Section of project road and the tentative locations of the proposed entry/exit TPs under close tolling and present discontinuities in service lane is presented in **Figure 2-8.**



S. No.	Plaza Name	Chainage
1	Dukkavanipalem TP	686.54
2	Fee Plaza near Mudapaka	703.921
3	Fee Plaza near Adduru	711.05
4	Fee Plaza near Pinagadi	713.88
5	Marripalem TP	722.17

Figure 2-8: Project Road and Tentative Location of Proposed Entry/Exit TPs Under Closed Tolling System

As per the Schedule-M notification, Vizag bypass section will operate under a closed tolling system and Schedule A mentions that closed tolling will be implemented within four years of being handed over to InvIT Concessionaire. Therefore, the implementation of closed tolling on Vizag Bypass is assumed from the year FY30.

3. TRAFFIC GROWTH RATE AND PROJECTIONS

3.1 General

The project road is a part of the NHAI InvIT Round 4 portfolio and the projections of traffic and revenue have been presented till FY55 in line with the maximum extendable concession period of 30 years. The estimation of the traffic using the tolled highway, and its future growth are important elements to assess the project's economics as these are generally the main/sole source of revenue for the project This chapter details various aspects of the current traffic of the project road and its growth potential as assessed by Ramboll.

3.2 Project Road Traffic

The traffic that is likely to use the project road was estimated on the basis of the traffic and travel characteristics gathered as part of the study. The traffic on the project road would normally consist of the following components:

- Normal Traffic
- Diverted Traffic
- Induced/Developmental Traffic

3.2.1 Normal Traffic

Normal traffic is the traffic which is already plying on the project road as assessed in section 2.4.3.

Diverted Traffic

Diverted traffic is generally dictated by the presence of an alternative route at a lower generalised cost, which is in-turn defined by the road configuration and its condition, the type of vehicle and its operating costs, the average riding speed, the route distance, and any tolling that may apply on a specific route. A detailed road network assessment along with site reconnaissance survey was conducted on the project road and vicinity to identify alternate routes.

The assessment of any likely traffic diversion from/to the Project Road (PR) has been done using the cost-ratio analysis as described below:

- Assessment of the potential divertible traffic sensitive to network improvements based on the observed travel pattern.
- Calculation of road user cost of travelling on the project road and the alternative route. The road user cost includes vehicle operating cost (VOC), travel time cost (TTC) and toll cost (TC), if any. VOC comprises of the cost of fuel, spare parts, maintenance labour, tyre, engine oil, grease, fixed cost, depreciation and crew wages.

- The toll rates for expressway have been considered as 1.5 times the normal NHAI per km toll rates (accounting for 1.25 times for normal length of expressway and increase for the likely equivalent structure length).

The road user cost is estimated based on vehicle operating cost equations presented in IRC SP-30,2019 which is based on updation of Road User Cost Study (RUCS) carried out by Central Road Research Institute in 2019 for Ministry of Road Transport and Highways. Using the likely traffic stream speeds and lane configuration, the vehicle operating, and travel time costs are estimated for each of the routes. Road user cost on the identified routes is calculated and diversion percentages are estimated using diversion curve method mainly for trucks. In this method, traffic likely to be diverted from/to the project road, was estimated using Logit model, which computes expected diversion percentage based on the ratio of perceived cost on the existing and proposed facilities. The perceived cost is the financial vehicle operating cost and the time saving cost including toll charges (if any). According to the model, a vehicle will shift if the perceived cost on an alternative route is lower in comparison to existing route. The diversion equations for estimating diversion have been adopted from Indian National Expressway Network Report, MORTH (2009) as mentioned in IRC 108:2015. These equations are presented in **Table 3-1**.

Vehicle	Cost Ratio (CR) Interval	Equations
Truck	<= 0.750	% Div. = 100 - ((CR/0.75) * 5)
	0.750 <= CR <= 1.250	% Div. = 95 - ((CR-0.75)/0.5) * 90
	1.250 <= CR <= 2.0	% Div. = ((2-CR)/0.75) * 5

Source: IRC 108-2015

Table 3-1: Diversion Equations Used for Analysis

In a broader context, few major network developments in the project road network are expected to influence travel patterns and provide additional route options for traffic currently using the project road. These network-level developments, along with the implementation of closed tolling, have been studied and analysed to assess their potential impact. The combined effect of these changes may result in a shift of traffic from PR to alternate route choices or with closed tolling in place a redistribution of traffic for certain ticket types might take place, leading to either a gain or loss to the existing traffic on PR. The proposed network developments are:

A. Raipur-Visakhapatnam (Vizag) Expressway

B. Sabbavaram to Sheela Nagar Port Connectivity Road

C. Kharagpur–Visakhapatnam (Vizag) Economic corridor

D. East Coast Dedicated Freight Corridor (ECDFC)

A. Impact of Raipur-Visakhapatnam (Vizag) Expressway & Sabbavaram to Sheela Nagar Port Connectivity Road

The completion of Raipur-Vizag Expressway coupled with elevated Sabbavaram to Sheela Nagar port connectivity road may provide an alternate route option for the long distance traffic particularly originating/destined from/to Raipur/Salur & beyond to/from Vizag City/Port.

The Raipur-Vizag Expressway is a key infrastructure project aimed at enhancing connectivity between Chhattisgarh and Andhra Pradesh. Spanning approximately 464 kilometres, the expressway will significantly reduce travel time between Raipur and Vizag by providing a high-speed, access-controlled corridor. The expressway starts near Abhanpur in Chhattisgarh and ends at Anakapalli in Andhra Pradesh, passing through Chhattisgarh, Odisha, and Andhra Pradesh.

Designed as a six-lane expressway, it has provisions for future expansion and will feature modern safety and traffic management systems. The project is part of the Bharatmala Pariyojana and aims to decongest existing highways while improving logistics efficiency for industries, ports, and economic hubs in the region. The expressway will also provide an alternative route to the NH-30 and NH-26 corridors.

As of January 2025, significant progress has been made on the expressway, with several sections under construction. The Raipur to Odisha border segment is expected to be completed by mid-2025, while the full corridor, including the stretch to Vizag, is targeted for completion by 2026. Upon completion, the expressway will serve as a vital trade and transport corridor, boosting economic development across central and eastern India.

The Sabbavaram to Sheela Nagar Elevated Port Road is a key infrastructure project aimed at enhancing connectivity between Vizag Port and National Highway 16 (PR). Spanning approximately 12.66 kilometers, this six-lane elevated corridor will provide a direct and efficient route between Sabbavaram and Sheela Nagar Junction.

Upon completion, the elevated road will provide a more efficient alternative for port-bound traffic usingthe PR and the new elevated route to bypass the congestion on AH45.

Currently, both freight and passenger traffic access the port and city via urban roads, using AH45 through Anandapuram and Anakapalli from the northern and southern approaches respectively. Upon the completion of Sheelanagar-Sabbavaram port connectivity road, the project will integrate with the existing four-lane port road from Sheelanagar Junction to Convent Junction (existing port road currently being expanded to eight lanes, with four lanes dedicated to freight movement)

Looking at the gestation period of the operational greenfield expressways, it is likely that the operation of Raipur Vizag expressway and elevated port road might get delayed and hence the completion of these two developments has been considered from FY30.

The route for port bound traffic via project road and AH45 along tentative alignment of the Raipur-Vizag expressway & Sabbavaram to Sheela Nagar port connectivity road is presented in **Figure 3-1**.

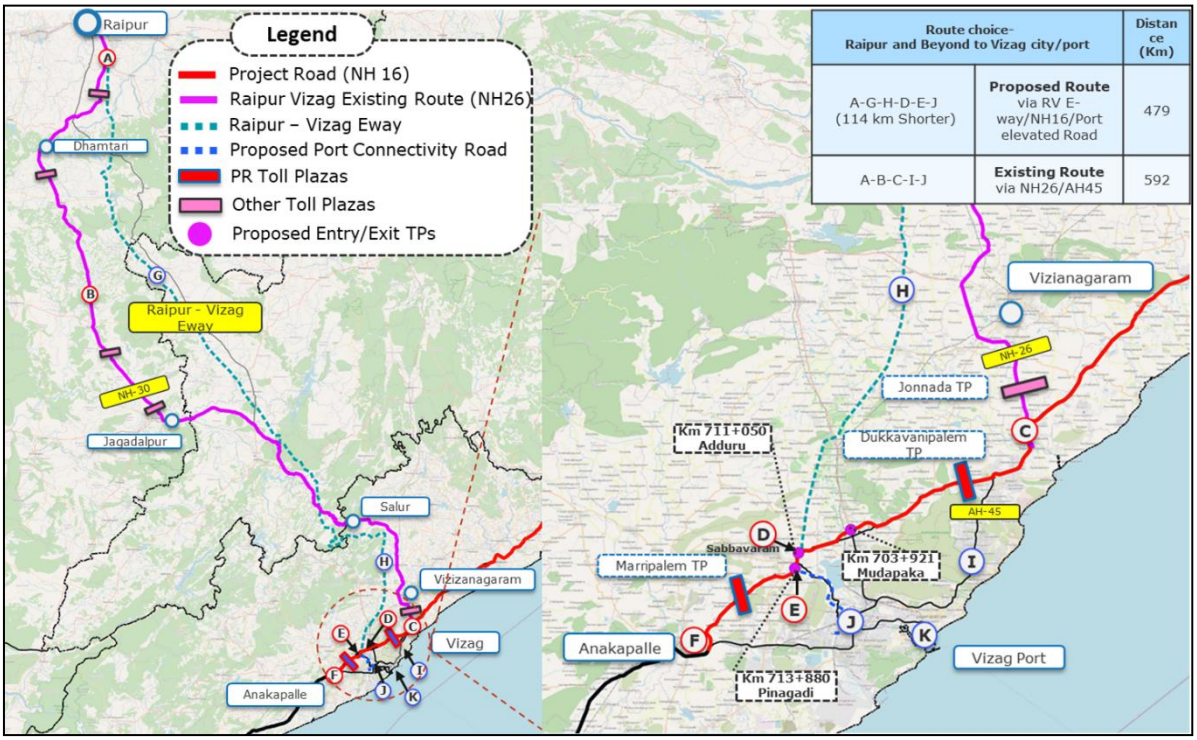


Figure 3-1: Project Road and Tentative Alignment of Raipur Vizag Exp. & Sabbavaram to Sheela Nagar Port Connectivity Road

At present the prominent route for Raipur-Vizag is via Jagadalpur-Salur-Vizianagaram, combination of NH30, NH26 & AH45 (A-B-C-I-J) which is about 592 km. The alternate route (A-G-H-D-E-J) via Raipur-Vizag Expressway (RVE) upon completion will be about 479 km for Vizag port bound traffic. Thus, making the existing route about 114 km longer than the route via RVE.

With the completion of the Raipur–Vizag Expressway up to Sabbavaram (A-G-H-D), along with the port connectivity road (E-J) and the implementation of a closed tolling system, the future route (A-G-H-D-E-J) will serve as an efficient alternate corridor to access Vizag Port and the city. Once the closed tolling system is in place, traffic using this route will primarily enter and exit through the Adduru (D) and Pinagadi (E) toll plazas, paying tolls based on the Adduru to Pinagadi ticket type for the project road.

The potential divertible traffic is the traffic plying between Raipur/Salur & beyond to Vizag City/port which has been estimated from the OD survey conducted during the present study at Jonnada Toll plaza between Vizianagram and Thagarepuvalasa on NH26. This traffic currently is not crossing any of the toll plazas of the project road as it is using NH26 and meets PR at Thagarepuvalasa further using AH45 to reach Vizag port.

The results of diversion analysis along with the potential divertible traffic, diversion percentages and diverted traffic estimated for FY25 is presented in **Table 3-2**.

Notations	Modes	Car	LCV	2A	3A	MAV	PCU
Potential for Raipur/Salur & Beyond to Vizag City & Port							
A	Jonnada TP	3,233	178	62	138	807	7,732
	Diversion % based on Cost Ratio						
B	Share of PR	68.6	84.0	95.9	95.8	96.5	
	Diverted Traffic to RVE						
C=A*B	Adduru to Pinagadi Ticket type	2,219	150	59	132	779	6,523

Table 3-2: Diversion Analysis for Raipur-Vizag Exp. & Sabbavaram-Sheela Nagar Port Connectivity Road – FY25

The proposed Raipur-Vizag Exp. & Sabbavaram-Sheela Nagar port connectivity road may result in a gain of around 6,523 PCUs in absolute terms for Adduru to Pinagadi ticket type for the Raipur/Salur & beyond traffic. This traffic has been grown and considered appropriately in the respective years of impact.

In context of the timelines, the 100 percent of the considered diverted traffic is assumed to shift by FY30, following the implementation of closed tolling and the completion of RVE and port connectivity road.

B. Impact of Sabbavaram-Sheela Nagar Port Connectivity Road on Route Choice between Anandapuram/Anakapalli & Beyond to Vizag Port

Traffic bound for Vizag Port primarily originates from Chennai and other parts of Tamil Nadu in the south, as well as from Kolkata, Bhubaneswar in the north. This movement, particularly from the eastern coastal regions of India, relies on NH-16 as the primary corridor for accessing the port. However, within Vizag city limits, traffic currently uses the congested AH45 city road from northern side to reach the port. Traffic originating/destined to/from Anakapalli and beyond uses AH45 from southern side to reach Vizag port.

Upon completion of the port connectivity road, port-bound traffic is expected to shift to this new corridor thus reducing congestion on AH45.

The impact of completion of Sabbavaram to Sheela Nagar port connectivity road has been studied under two streams of traffic:

- Traffic from/to Anandapuram & beyond to/from Vizag City/Port - Northern Approach
- Traffic from/to Anakapalli & beyond to/from Vizag City/Port – Southern Approach

B.I Route Choice between Anandapuram & beyond to Vizag Port – Northern Approach

The route via project road and the tentative alignment of the proposed port connectivity road is presented in **Figure 3-2**.

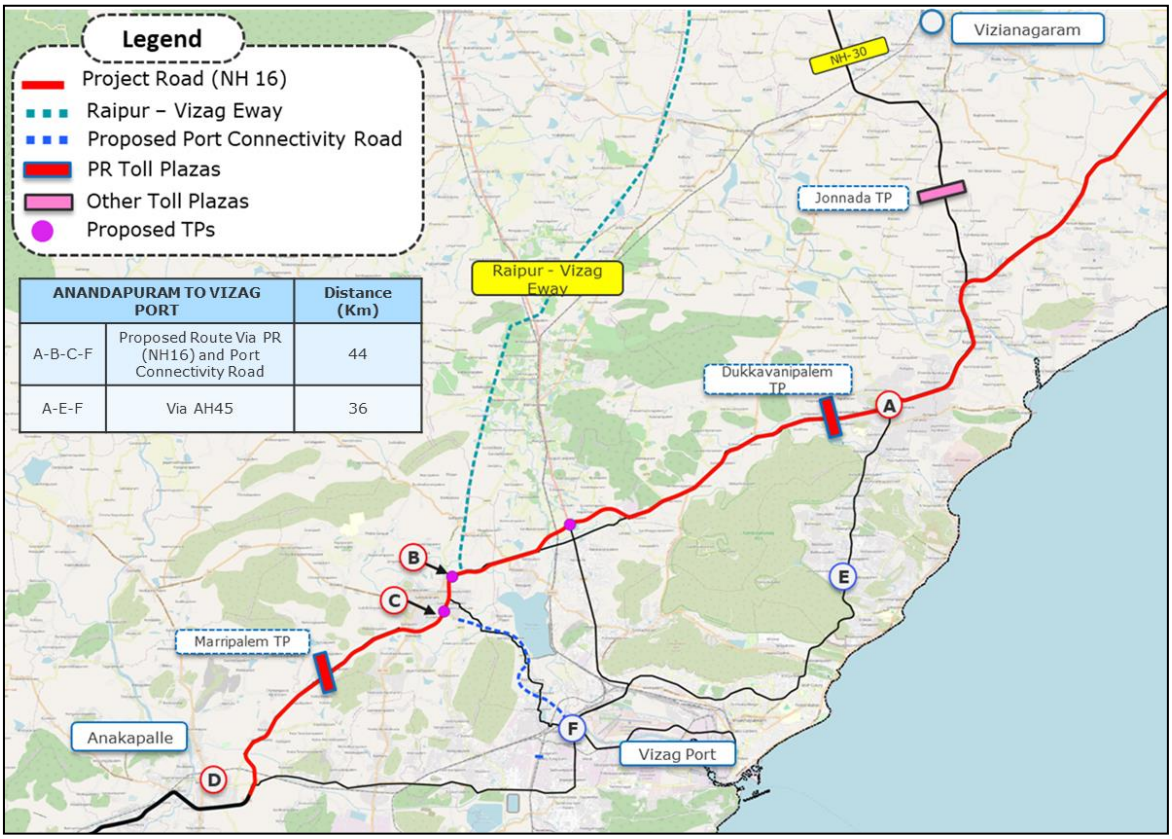


Figure 3-2: Route via Project Road and Tentative Port Connectivity Road – Anandapuram & Beyond Traffic

Currently, traffic from Anandapuram (A) and beyond can reach Vizag Port using AH45 (A-E-F), covering approximately 36 km. With competition of Sabbavaram - Sheelanagar port connectivity road, the port-bound traffic will use the route via project road (A-B-C-F), passing through, Dukkavanipalem TP and reach port by covering a distance of 44 km. This makes the proposed route approximately 8 km longer than the existing AH45 route but would provide a better six lane facility with reduced time of travel.

Despite being longer, Sabbavaram-Sheelanagar port connectivity road (C-F), once completed, is expected to attract most freight traffic currently using the congested city road via AH45 (A-E-F). While freight movement is permitted on AH45 throughout the day but due to high passenger traffic, it results in severe congestion in the peak hours. Consequently, most of the freight vehicles avoid AH45 during the day due to low operating speeds.

The potential divertible traffic for the route via Northern Approach is the traffic plying between Anandapuram & beyond to Vizag port which has been estimated from the OD surveys conducted at Panchvati toll plaza (operational plaza on the existing port road) and Dukkavanipalem toll plaza during the present study. The results of diversion analysis along with the potential divertible traffic, diversion percentages and diverted traffic estimated for FY25 is presented in **Table 3-3**.

Notations	Modes	MAV
Anandpuram and Beyond to Vizag Port		
A	At Panchavati TP	441
B	At Dukkavanipalem TP	90
C=B-A	Probable Gain	351
Diversion % based on Cost Ratio		
D	% Diversion to PR	95.6
Gain for Dukkavanipalem TP		
E=C*D	Dukkavanipalem to Pingadi Ticket type	336

Table 3-3: Diversion Analysis for Anandapuram & Beyond to Vizag Port Traffic – FY25

The proposed Sabbavaram-Sheela Nagar port connectivity road may induce a gain of around 336 MAVs (1,512 PCUs) for Dukkavanipalem to Pinagadi ticket type for the Anandapuram & beyond traffic as this traffic would exit at Pinagadi junction to use the port connectivity road till Vizag port. The impact is considered only for MAVs, as the impact estimated for other modes is negligible.

B.II Route Choice between Anakapalli & beyond and Vizag Port – Southern Approach

The route via project road and the tentative alignment of the proposed port connectivity road is presented in **Figure 3-3**.

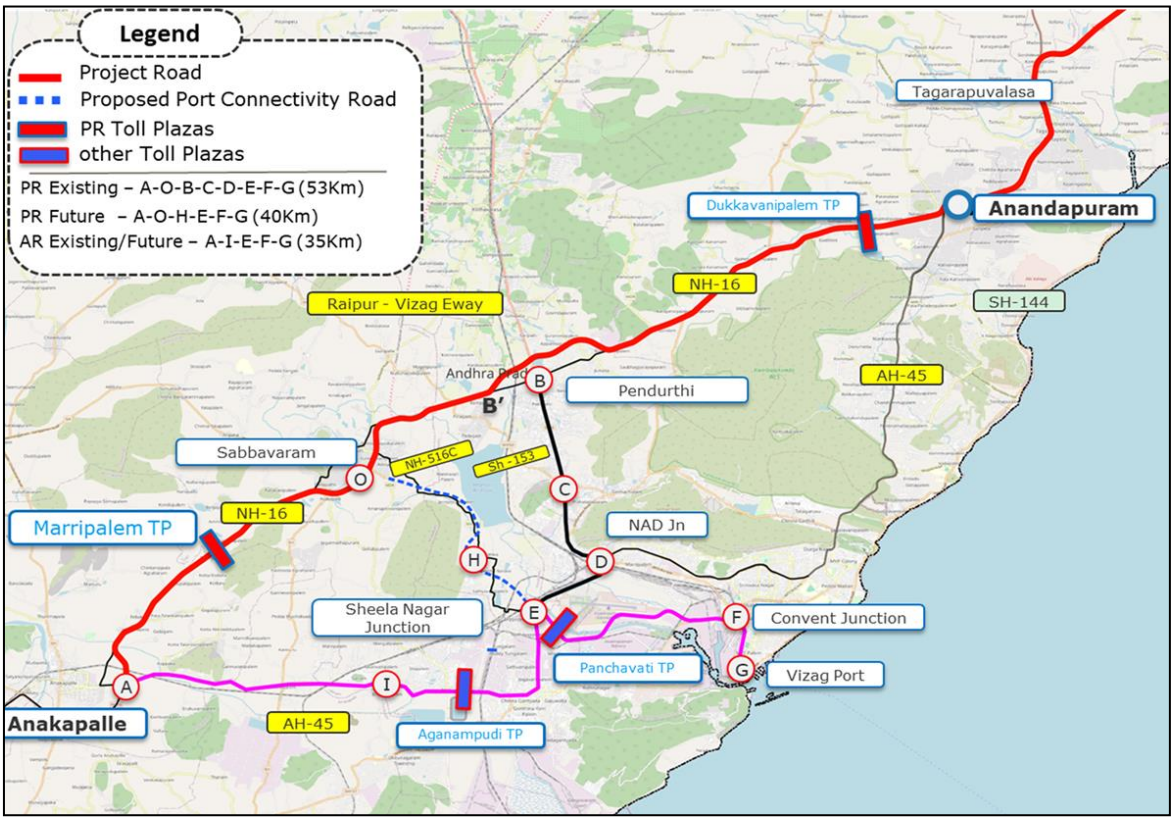


Figure 3-3: Route via Project Road and Tentative Port Connectivity Road – Anakapalli and Beyond Traffic

Currently, most freight traffic from Anakapalli and beyond can reach Vizag Port via AH45 (A-I-E-F-G), covering approximately 35 km. The current alternative route, which follows the project road through Anakapalli-Pendurthi-Sabbavaram (A-B'-B-C-D-E-F-G), is around 53 km in length for port-bound traffic. However, this route is not preferred due

to being longer in distance and the section between B-C-D despite being a four-lane road, has two central lanes designated for BRTS and intermediate service lanes on either side, making it difficult for freight movement.

After the completion of Sabbavaram-Sheela Nagar elevated section of port connectivity road, the future route via project road (A-O-H-E-F-G) will be about 40 km in length as against the route via the AH45 (A-I-E-F-G) of 35 km for the southern approach traffic. Hence, the proposed route via Sabbavaram-Sheela Nagar port Road will be about 5 km longer than the existing route via AH45. Currently, there is an existing toll plaza of Agnampudi on AH45 which has been vandalised by the public and not operational. However, as per the information collected locally it might reopen after some time.

The potential divertible traffic for the Southern Approach is the traffic plying between Anakapalli & beyond to Vizag port which has been estimated from the OD surveys conducted at Panchvati toll plaza (operational plaza on the existing port road) and Marripalem toll plaza during the present study. The results of diversion analysis along with the potential divertible traffic, diversion percentages and diverted traffic estimated for FY25 is presented in **Table 3-4**.

Notations	Modes	2A	3A	MAV	PCU
Anakapalli & Beyond - Vizag Port					
A	At Panchavati TP	127	181	1,822	9,125
B	At Maripalem TP	70	48	166	1,102
C=B-A	Probable Gain	57	133	1,656	8,023
Diversion % Based on Cost Ratio					
D	Proposed - Port Connectivity Road & Agnampudi Operational on AR	72.7	71.0	95.3	
Gain at Maripalem TP					
E=C*D	Marripalem To Pingadi Ticket type	42	94	1,579	7,512

Table 3-4: Diversion Analysis for Anakapalli & Beyond to Vizag Port Traffic – FY25

The proposed Sabbavaram-Sheela Nagar port connectivity road is expected to result in a gain of approximately 7,512 PCUs for freight traffic traveling from Anakapalli and beyond to Vizag port, for the Marriaplem to Pinagadi ticket type and this traffic would exit at Pinagadi to reach Vizag port. The impact is considered only for freight vehicles (2A, 3A, MAVs), as passenger traffic is unlikely to shift to this route.

B.III Total Diverted traffic from Northern and Southern Approach

Freight traffic approaching Vizag Port from the North and South primarily uses AH45, as there are no better alternate routes. The police check posts on minor roads restrict entry during the daytime. While freight movement is permitted on AH45 throughout the day but due to high passenger traffic, it results in severe congestion in the peak hours. Consequently, despite being allowed, most of the freight vehicles avoid AH45 during the day due to low operating speeds. However, at night, with minimal passenger traffic, AH45 functions more like a four-lane highway, offering higher speeds and becoming a more attractive route for port-bound freight.

To take account of these dynamics, a day-night distribution factor has been obtained from Panchavati Toll plaza TVC. In case of the Northern approach, night traffic is considered to continue to use the AH45 even after opening of port connectivity road whereas 100 percent of the day traffic (8 AM to 10 PM) might shift to the upcoming Sheelanagar-Sabbavaram port road.

In case of southern Approach, 100% of the day traffic (8 AM to 10 PM) is likely to shift to the port connectivity road whereas 50% of the night traffic percentage for southbound traffic is considered. These percentages have been applied to the total divertible traffic to estimate the likely shift.

The day and night traffic percentages from Panchavati toll plaza TVC along with the adopted factors applied to the total divertible traffic and resultant upside for Northern and Southern approach is presented in **Table 3-5**.

	2A	3A	MAV	PCU
Day Night Distribution from Panchvati TP TVC				
A. Day Traffic % from Panchvati toll plaza (8am to 10 pm)	85.00%	76.70%	59.20%	
B. Night Traffic % from Panchvati toll plaza	15.00%	23.30%	40.80%	
Resultant distribution				
C. For North Traffic - Day traffic % applied (A)			59.20%	
D. For South Traffic - Day traffic % +50% of Night Traffic % (A+B/2)	92.50%	88.40%	79.60%	
Gain as Result of Diversion Analysis				
E. Gain at Dukkavanipalem (North Traffic)			336	1,512
F. Gain at Maripalem (South Traffic)	42	94	1,579	7,512
Resultant Upside				
G. Gain at Dukkavanipalem (North Traffic) - C*E			199	896
H. Gain at Maripalem (South Traffic) - D*F	39	83	1,257	6,023

Table 3-5: Day Night Distribution Factors for Diversion Analysis for Anandapuram/ Anakapalli & Beyond to Vizag Port Traffic

The proposed Sabbavaram-Sheela Nagar port connectivity road is expected to create a resultant upside of approximately 199 MAVs (896 PCUs) for traffic from Anandapuram and beyond to Vizag city/ port, for the Dukkavanipalem to Pinagadi ticket type.

Additionally, an upside of about 6,023 PCUs is anticipated for freight traffic traveling from Anakapalli and beyond to Vizag city/ port, for the Marripalem to Pinagadi ticket type.

This traffic has been grown and considered appropriately in the respective years of impact. In context of the timelines, the 100 percent of the considered diverted traffic is assumed to shift by FY30, following the implementation of closed tolling and the completion of construction on port connectivity road, along with the remaining interchanges.

C. Impact of Kharagpur – Vizag Expressway

The Kharagpur–Vizag Expressway is a proposed 783 km-long, four / six-lane greenfield access-controlled expressway connecting Kharagpur in West Bengal to Vizag in Andhra Pradesh via Odisha. The project aims to significantly reduce travel time between Kharagpur and Vizag from 14 hours to approximately 8 hours, enhancing logistics, trade, and regional connectivity.

The expressway is likely to be developed under two packages:

- Package 1: Kharagpur – Chandikhol – Cuttack – Khordha – Tangi (390 km)
- Package 2: Tangi – Brahmapur – Vizag (393 km)

In November 2024, the Ministry of Road Transport and Highways (MoRTH) received a total of 18 bids for the preparation of the Detailed Project Report (DPR), with 10 bids for Package 1 and 8 bids for Package 2. If contracts are awarded in the first half of 2025, the DPR is expected to be finalized by the end of 2026. The project is currently in the planning stage, with land acquisition yet to commence.

The route via project road and the tentative alignment of the Kharagpur- Vizag Expressway is presented in **Figure 3-4**.

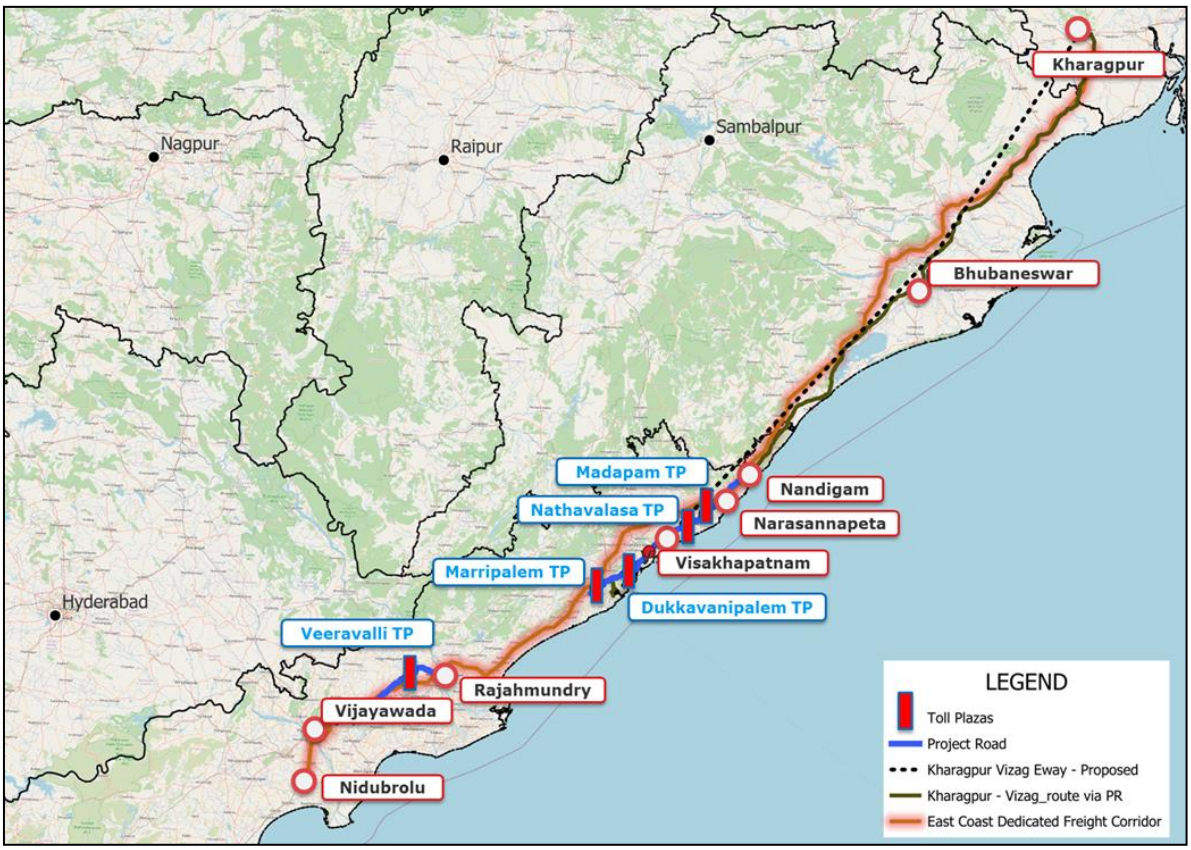


Figure 3-4: Project Road and Tentative Alignment of Kharagpur– Vizag Expressway

The current route for Kharagpur- Vizag traffic is via project road which is about 752 km and the alternate route via proposed Kharagpur – Vizag expressway is about 783 km for Vizag bound traffic and is ending near Anandpuram. Thus, the route via expressway will be about 31 km longer than the route via PR. As the expressway will be ending near

Anandpuram, Madapam TP and Nathavalasa TP will be impacted after this expressway becomes operational.

This corridor once completed may attract some of the freight vehicles which are currently using the project road. The potential divertible traffic is the traffic plying between Bhubaneswar & beyond to Vizag City & Port/Anakapalli & beyond which has been estimated from the OD survey conducted during the present study. The results of diversion analysis along with the potential divertible traffic, diversion percentages and diverted traffic estimated for FY25 is presented in **Table 3-6**.

TP/Modes	Car	LCV	2A	3A	MAV	PCUs
Bhubaneswar & Beyond to Vizag City & Port/Anakapalli and Beyond						
Madapam (TP01)	9.3%	60.4%	69.9%	75.5%	82.2%	62.8%
Nathavalasa (TP02)	7.7%	47.1%	62.6%	68.0%	65.1%	51.7%
Average Potential at TP01 & TP02	554	247	760	790	2,421	16,469
Diversion % based on Cost Ratio						
AR share	46.0	38.6	51.5	51.3	50.0	
Diverted Traffic to AR future (% AADT)						
Madapam (TP01)	4.3	23.3	36.0	38.7	41.1	31.4
Nathavalasa (TP02)	3.5	18.1	32.2	34.9	32.6	25.9
Adopted @ 50%						
Madapam (TP01)	2.1	11.6	18.0	19.4	20.6	15.7
Nathavalasa (TP02)	1.8	9.1	16.1	17.4	16.3	12.9

Table 3-6: Diversion Analysis for Kharagpur-Vizag Expressway – FY25

This impact is resulting in a loss of approximately 8,238 PCUs. Thus, the proposed expressway may take away around 30 percent of the PCUs from Madapam TP and 26 percent of PCUs at Nathavalasa TP for the Bhubaneswar and beyond traffic. This traffic has been grown and considered appropriately in the respective years of impact.

There is no information available on completion timelines as of now, however as this project is a part of phase 2 of vision 2047, it is anticipated the whole process may take 10-15 years for completion. In view of this and pre-bid responses from NHAI, impact of this development has been considered from FY40 onwards. In addition, there would be some captive traffic of the PR due to distribution points along the route, familiarity of the existing route and roadside facilities. In view of this, 50 percent of this traffic is considered to shift to greenfield expressway. In terms of phasing for traffic shift, it is assumed that 50 percent of the diverted traffic will shift to the alternate route by FY40, 70 percent by FY41, and 100 percent by FY42.

D. Impact of East Coast Dedicated Freight Corridor

The East Coast Dedicated Freight Corridor (ECDFC) is a proposed double-line, electrified freight corridor under the Indian Railways' Dedicated Freight Corridor Corporation of India (DFCCIL). Spanning approximately 1,100 km, it will connect Kharagpur in West

Bengal to Tenali in Andhra Pradesh, passing through the mineral-rich regions of Odisha and Bengal.

Designed to run parallel to the existing Kharagpur-Vijayawada coastal railway line, ECDFC will link major industrial hubs and port cities, including Visakhapatnam Port. It aims to enhance the transportation of bulk commodities such as coal, fertilizers, and iron ore, boosting economic activity along India's eastern seaboard.

Project Status: DFCCIL has submitted Detailed Project Reports (DPRs) for the ECDFC, along with two other proposed corridors: the East-West and North-South DFCs. However, recent reports suggest that the government is reconsidering these plans. Due to concerns over the estimated combined cost of ₹2 trillion and the current low-capacity utilization of existing corridors, the government is contemplating abandoning the ECDFC project in favour of developing commodity-specific rail networks.

The alignment of project Road with respect to ECDFC is presented in **Figure 3-5**.

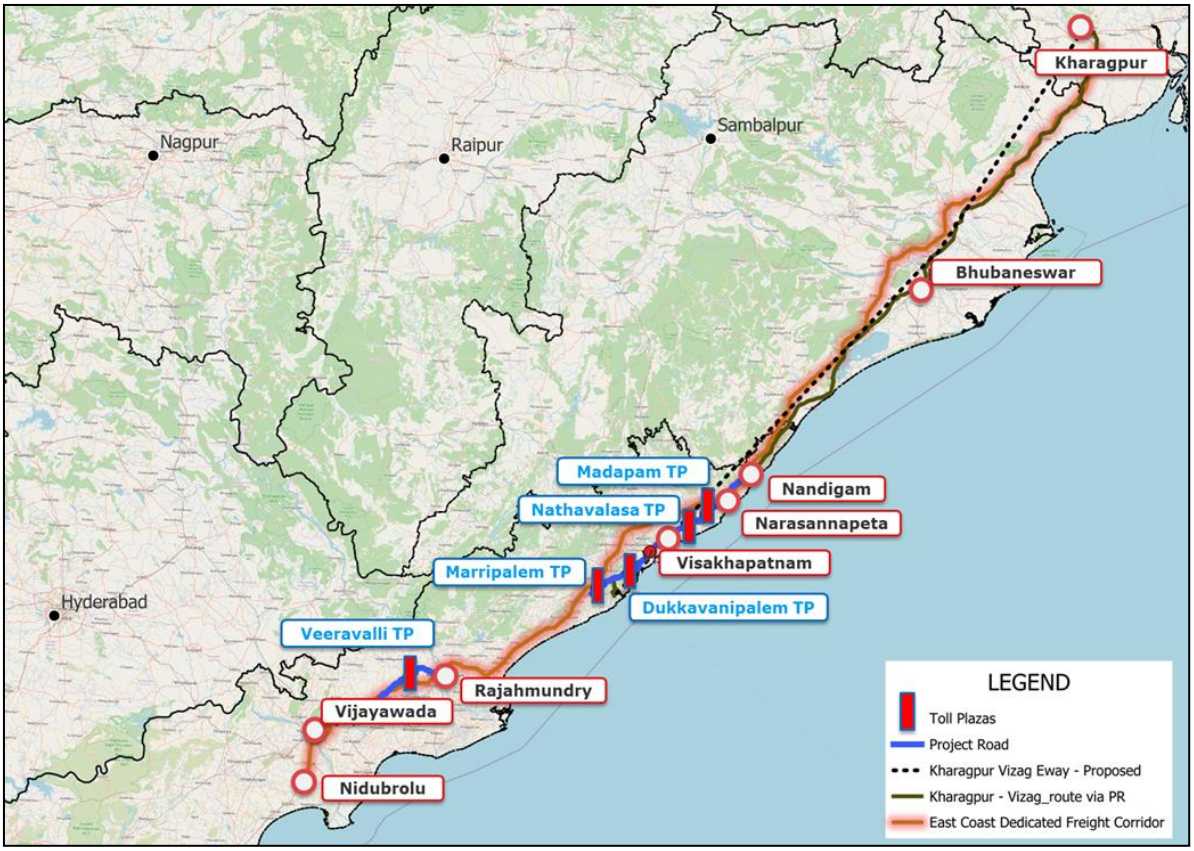


Figure 3-5: Project Road and Alignment of ECDFC

An analysis of the present traffic of the PR sections amenable to shift to ECDFC has been carried out for the traffic between from/to Bhubaneswar & beyond to Vizag City/Port/Anakapalli &beyond. The estimation process of the diverted traffic to DFC covers:

- Identification of traffic stream likely to shift to DFC

- Share of ECDFC commodities (coal, iron & steel, and containers) in the identified potential streams of traffic
- Applying the share of DFC commodities for estimation of the potential divertible traffic

Bulk commodities such as food grains, containers, iron & steel, and ores & minerals are likely to shift to the ECDFC. The corridor is primarily intended to ease congestion on existing railway lines by diverting freight traffic, thereby reducing passenger train delays. Since the DFC is expected to draw a significant share of freight from the current rail network, it is assumed that only 25% of road freight traffic will shift to the DFC.

For TP01 and TP02, the potential long-distance freight traffic expected to use ECDFC has already been factored into the diversion estimates for the Kharagpur-Vizag Expressway. Therefore, the analysis has been conducted only for TP03 and TP04. The mode wise total diverted traffic estimated for FY25 due to ECDFC is presented in **Table 3-7**.

Modes	2A	3A	MAV	PCU
Diverted Traffic As % of AADT				
Dukkavanipalem (TP03)	1.0	1.5	3.5	142
Marripalem (TP04)	1.5	1.4	1.9	88

Table 3-7: Estimated Diverted Traffic to East Coast Dedicated Freight Corridor – FY25

Since, the impact of ECDFC on TP03 and TP04 traffic is negligible and implementation of the ECDFC being uncertain, it has not been considered for further analysis.

3.2.3 Induced/ Development Traffic

Developmental /new generated traffic is the one which would be generated, over and above normal growth, because of lowering of transport costs or new developments in the immediate influence area of the project road. In case of the project road, there is no development envisaged in the vicinity of the project road.

Bharatmala Pariyojana is the second largest highways construction project in the country since NHDP, under which almost 50,000 km or highway roads were targeted across the country. It will look to improve connectivity particularly on economic corridors, border areas and far-flung areas with an aim of quicker movement of cargo and boosting exports.

It will connect 550 district headquarters to minimum 4-lane highway by raising the number of corridors to 50 (from current 6) and move 80 percent freight traffic (currently 40 percent) to national highways by connecting 24 logistics parks and 7 north east multimodal waterway ports.

The Phase-I includes economic corridors of around 9,000 km; inter-corridor and feeder routes of around 6,000 km; 5,000 km roads under the National Corridors Efficiency Program, border and international connectivity roads of around 2,000 km; coastal and

port connectivity roads of around 2,000 km; expressways of around 800 km and 10,000 km of NHDP roads. The total length in phase 1 comes to around 34,800 km.

In the context of the project road, there are a few economic corridors and inter corridors listed in the state of Andhra Pradesh. The important economic corridors/inter corridors planned in the state of project road are Raipur- Visakhapatnam, Chennai – Kurnool, Bangalore – Nellore, Pune – Vijayawada, Kadappa – Nellore (inter corridor) and Hyderabad – Ongole (inter corridor) with an aim to provide quicker movement of cargo.

As the project road caters to the long/ short distance traffic, this project section will continue to remain as an important highway and cater to the industrial needs along the corridor and may see sustained growth in the future.

3.3 Methodology for Traffic Growth Rate Estimation

Traffic growth for both passenger and freight vehicles has been estimated using the econometric approach as described in IRC-108, 1996. For freight traffic, due consideration has been given to the total tonnage transported and the shift in types of vehicles used for moving goods.

The econometric model applied, relates traffic growth to changes in state (or district) domestic product via an elasticity factor. According to IRC guidelines, elasticity based econometric model for highway projects should be derived in the following form:

$Log_e(P) = A0 + A1\ Log_e\ (EI)$, where:

P - Traffic Volume

EI - Economic Indicator

A0 - Regression Constant

A1 - Regression Co-efficient (Elasticity Index)

In order to estimate traffic on the project road, the methodology described below has been followed:

- Identify the influence area - From the analysis of OD survey data, the project influencing states and districts, which are likely to impact the traffic growth on the project road, were identified.
- Review Past traffic Data – Based on toll data available for the project road and other sections of project corridor, a review of past traffic is carried out.
- Analysis of economic growth of the Project Influencing Area (PIA) - For each PIA state, an economic profile describing past performance and outlook was prepared. This also considers India’s past economic performance and its outlook.
- Estimation of traffic elasticity to income – in order to translate economic growth into traffic growth, an elasticity factor was estimated.

- Derivation of traffic growth rates – On the basis of the weighted (based on OD shares) PIA outlook and related traffic elasticity, traffic growth rates were estimated.

The methodology thus adopted incorporates, as basic data inputs, the perspective growth envisaged in the influence area and the changes in transport demand elasticities over a period of time. The traffic growth rates by vehicle type for the project road have been determined till FY55 in line with the maximum extendable concession period of 30 years.

3.4 Identification of PIA States

The travel pattern of the project road shows that the project road traffic is primarily influenced by the states of Andhra Pradesh and Odisha along with the states of West Bengal, Tamil Nadu, Karnataka, Telangana and Jharkhand. These states have been considered as PIA states for both passenger vehicles and freight traffic. Since the regional distribution is observed to be similar in case of TP01 & TP02 and TP03 & TP04, these toll plazas have been respectively combined for further analysis.

The mode wise normalized regional distribution shares are presented in **Figure 3-6**.

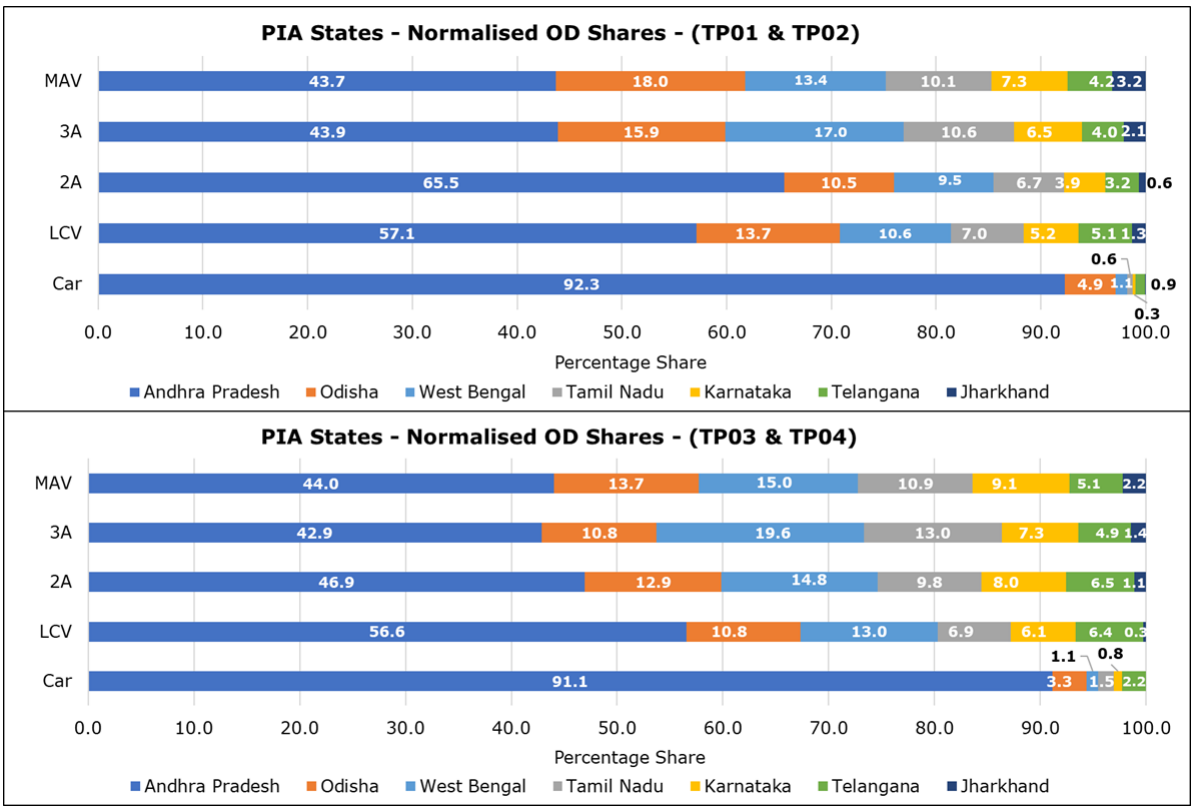


Figure 3-6: Normalised Regional Distribution (%) for the PR

In case of cars, more than 90 percent of traffic is contributed by the state of Andhra Pradesh followed by 5 percent from the state of Odisha along the project corridor.

Similarly, in case of freight modes, state of Andhra Pradesh has shown the predominance with about 40-65 percent share in each freight mode at the four toll plazas along the project road. The states of Odisha and West Bengal contribute about 10-20 percent each followed by the share of Tamil Nadu being about 7-13 percent. The states of Karnataka and Telangana also have a significant traffic contribution with about 3-9 percent of share

in each freight mode across the four toll plazas along the project road. While the state of Jharkhand contributes less than 4 percent in each freight mode along the project road.

3.5 Past Economic Growth of PIA

Growth of traffic on the project road depends on existing development and future growth prospects of the connecting regions. A number of economic indicators for the PIA states, as published by Central Statistical Organisation (2011-12 prices), have been studied to assess their past performance.

Andhra Pradesh

Past economic performance of the state has been as follows:

- Andhra Pradesh's Gross State Domestic Product (GSDP) stood at Rs 8,208.9 billion in FY24 and has been growing at a trendline growth rate of 7.0 percent since FY12.
- The tertiary sector is the largest contributor to GSDP of Andhra Pradesh, about 39.7 percent. Primary sector stood at 32.5 percent and secondary sector at 27.8 percent of the GSDP in FY24.

The change of sectoral composition of GSDP over the years is presented in **Figure 3-7**.

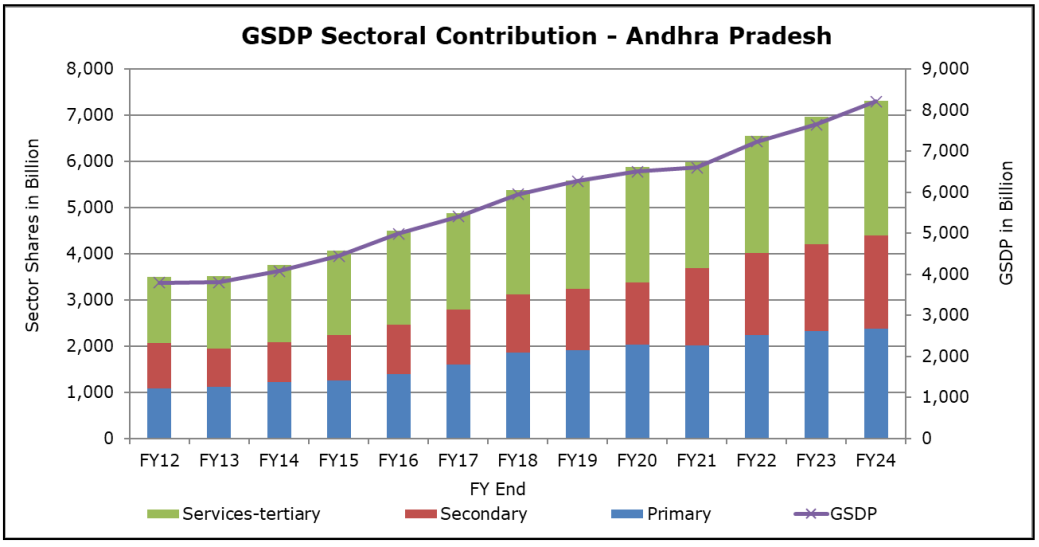


Figure 3-7: GSDP (in Rs Billion) and its Sectoral Composition for Andhra Pradesh

The performance of the state economy and its different sectors has been studied using time trend analysis. The average annual growth rates as obtained using regression analysis are presented in **Table 3-8**.

Particulars	FY12 to FY24	FY15 to FY24
GSDP	7.0	6.5
Agriculture and Allied	7.5	7.1
Industry	7.7	8.4
Services	5.6	4.5
Construction	4.5	5.1
Per Capita Income	6.3	5.7

Table 3-8 : Average Annual Growth Rates (%) of State Income for Andhra Pradesh

Andhra Pradesh is a predominant exporter of drugs, pharmaceuticals, allied chemicals, and plastics, agriculture and agro-based products, engineering products, mineral products, handicrafts and carpets, textiles, leather, animal, and marine products.

Currently, the state has 47 Special Economic Zones (SEZs). Moreover, 10 have been formally approved, 32 have been notified and five SEZs with in-principle approval. These SEZs are dispersed over a manifold range of sectors, including textiles and apparel, food processing, footwear and leather products, multi-product, pharma, IT SEZs, etc.

Under the Andhra Pradesh Petroleum, Chemicals & Petrochemicals Investment Region (AP PCPIR), the construction of 40 kilometres of national highways, 42 kilometres of state highways, and approximately 75 kilometres of major district roads is planned. These infrastructure projects are projected to be completed within the next five years.

The State Government is undertaking the construction of the Nadikudi-Srikalahasti railway line, spanning 308 kilometres. The primary objective of this project is to develop the underdeveloped areas of the Guntur, Prakasam, Nellore, and Chittoor districts, enhancing their connectivity with other states. Additionally, this project will facilitate the export of raw materials used in the cement and granite industries.

Groundwork for the Vizag Metro project, featuring a 140-kilometer mass rapid transit system, commenced in October 2020. The project, estimated to cost Rs. 22,000 crore (US$ 2.98 billion) is expected to be completed by 2028.

The upcoming international airport at Bhogapuram is being developed by the state government under the Public-Private Partnership (PPP) model and is estimated to be completed by December 2025. The project will cover 2,621.63 acres and is estimated to cost US$ 276.8 million. Moreover, the government has proposed establishing new airports in Kuppam (Chittoor), Dagadarthi (Nellore), Mulapet (Srikakulam), and Nagarjuna Sagar (Guntur).

The state of Andhra Pradesh has the second longest coastline of around 974 km in India. The state has 1 major port: Vishakhapatnam, and about 14 other non-major ports.

A new port at Ramayapatnam is being developed to address the rising cargo requirements. The port will be built using the land-lord model and will feature an artificial deep harbour. The projected cost for the initial phase is estimated at US$ 530 million.

According to the Department for Promotion of Industry and Internal Trade (DPIIT), the state has enticed the Foreign Direct Investment (FDI) equity inflows worth US$ 966.66 million during the period October 2019 to June 2024.

The state houses many pharma manufacturing units belonging to eminent global and national players. Exports of pharmaceuticals from the state stood at US$ 2.2 billion in FY24.

The state has the major share in the export of seafood products from India with export of worth US$ 3.04 billion in FY23. Andhra Pradesh contributes 36 percent of the total value of sea food exports from the country.

The per capita income of Andhra Pradesh is Rs. 154,121 in the year FY24. During FY12 to FY24, a growth of about 6.3 percent is seen in the state Andhra Pradesh. The growth in per capita income of Andhra Pradesh since FY12 is presented in **Figure 3-8**.

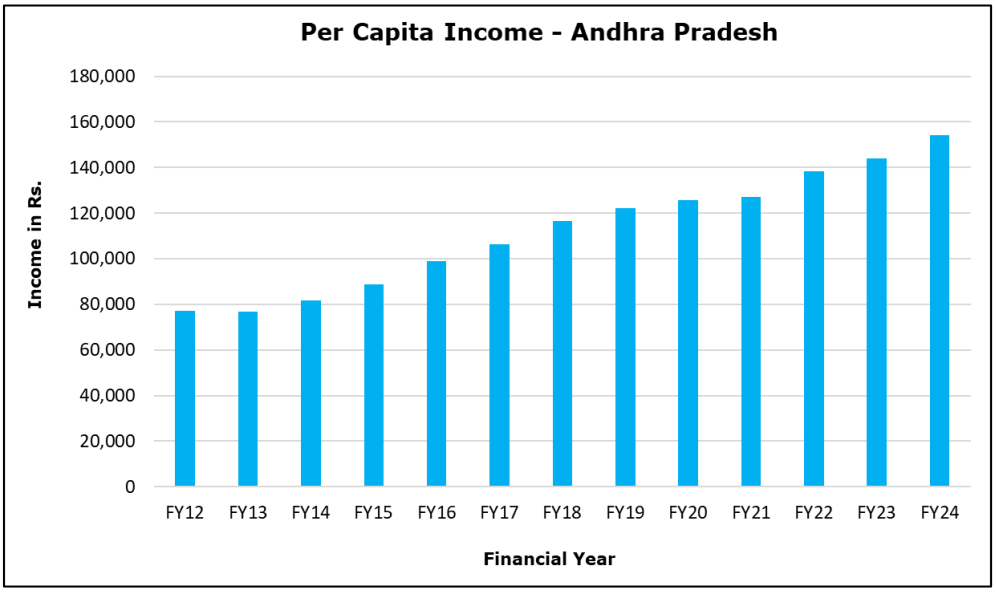


Figure 3-8: Per Capita Income of Andhra Pradesh from FY12 to FY24

Coastal Economic Zone (CEZ), Sagarmala

The Coastal Economic Zone (CEZ) is a concept introduced under Sagarmala as the focal point for development along India's coastline. The CEZs could be spatial economic regions comprising a group of coastal districts or districts with a strong port linkage. These are bounded land parcels that could actually house industrial units and requisite infrastructure. Each CEZ could be in the immediate hinterland of ports (existing and new proposed ports), within a radius of 100 km with a sizeable domestic market and export potential.

Fourteen coastal economic zones have been identified along the Indian coastline, with each coastal state having one or more CEZ. Each CEZ will consist of multiple industrial clusters categorised under energy, material and discrete industries. Competitive locations for these industries have also been shortlisted to reduce overall logistic costs.

The Sagarmala National Perspective Plan identified two coastal economic zones in Andhra Pradesh — VCIC north CEZ and VCIC central CEZ. The project road is falling under VCIC north CEZ. The VCIC north CEZ could cover seven districts of Andhra Pradesh: Srikakulam, Vizianagaram, Visakhapatnam, East Godavari, West Godavari, Krishna and Guntur. These districts constitute around 35 per cent of state population and around 30 per cent of state GDP. The location of VCIC north CEZ is presented in **Figure 3-9**.

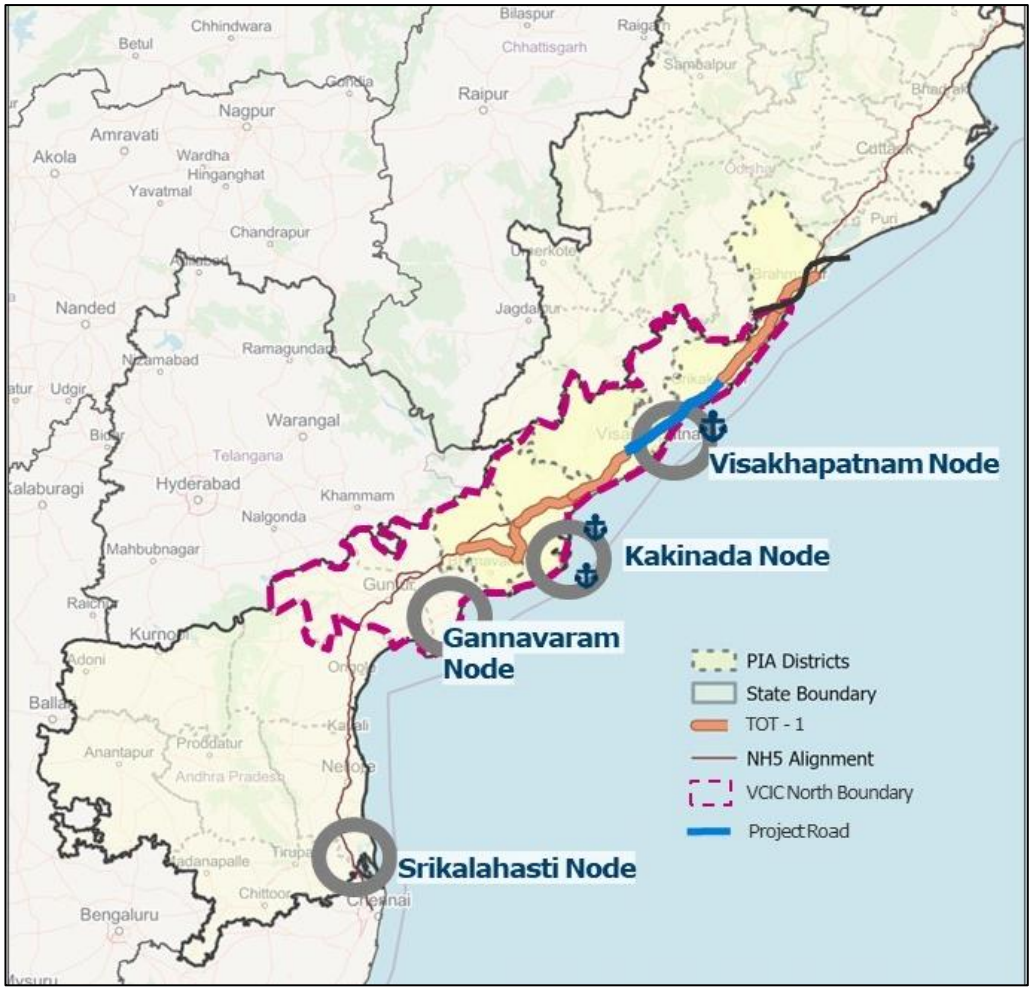


Figure 3-9: VCIC North Coastal Economic Zone

The VCIC CEZ also covers three operational ports: Visakhapatnam port, Gangavaram port and Kakinada port (deep water and anchorage).

Industrial activity in the CEZ is unevenly distributed, with agrarian districts like Srikakulam and Vizianagaram together contributing only 6 per cent to the state's industrial GDP. Visakhapatnam alone, on the other hand, contributes about 20 per cent to the state industrial GDP.

Industrial activity in the Northern Andhra Pradesh CEZ is relatively evenly distributed, with Guntur, Krishna and West Godavari. VCIC, being developed with technical assistance from ADB, has four discrete manufacturing nodes of which two, Visakhapatnam and Kakinada, fall within VCIC north CEZ.

Visakhapatnam Port

In terms of volumes, Visakhapatnam is one of the largest major ports in the country with a capacity of handling approximately 139 MMTPA of cargo. Visakhapatnam is located on the northern coast of Andhra Pradesh and serves the Central and Eastern hinterlands of the country like Telangana, Chhattisgarh, Madhya Pradesh and Southern Odisha.

The year-on-year cargo handled since FY10, and its growth is presented in the **Table 3-9**.

Year	Cargo Traffic Handled (in million Tonnes)	YoY Growth (%)
FY10	65.5	-
FY11	68.0	3.9
FY12	67.4	-0.9
FY13	59.0	-12.4
FY14	58.5	-0.9
FY15	58.0	-0.9
FY16	57.0	-1.7
FY17	61.0	7.0
FY18	63.5	4.1
FY19	65.3	2.8
FY20	72.7	11.4
FY21	69.8	-4.0
FY22	69.0	-1.2
FY23	73.7	6.9
FY24	81.1	10.0

Source: Annual reports of Ministry of Ports, Shipping & Waterways

Table 3-9: Traffic Handled at Visakhapatnam Port

Visakhapatnam Port handled about 69-70 MT of cargo in FY21 and FY22, however in FY24 about 81 MT of cargo was handled. In FY21, about 12 MTPA of thermal and coking coal and about 16 MTPA of POL (crude and products) was handled. Other major commodities include containers, fertilizers, and iron-ore.

Time series analysis of past cargo traffic data has shown an end point growth of about 4.6 percent during FY15 to FY20. However, the growth of cargo handled is 3.8 percent during FY15 to FY23. This growth slowed down in FY21 and FY22 due to the impact of Covid-19. While a recovery in cargo traffic is observed during FY22 to FY24 with growth of about 8.4 percent.

The port is well connected to the Chennai – Kolkata railway line as well as to the national highway network via NH-16. Rail traffic share is about 52 percent of the total cargo handled by the port.

Expansion Initiatives by Visakhapatnam Port Authority (VPA)

Visakhapatnam Port Authority (VPA) is implementing a series of strategic expansion projects to address the growing demands of cargo handling and passenger traffic. These initiatives are designed to enhance the region's trade capabilities and foster tourism, contributing to India’s economic growth.

One of the significant developments is the International Cruise Terminal, which has recently opened to serve as a key gateway for domestic and international cruise tourism on India’s eastern coast. The terminal spans 4,580.46 square meters and offers world-class facilities aimed at providing a transformative experience for travellers. It operates primarily as a cruise terminal from November to March, catering to international passengers, while from April to October, the berth is repurposed for coastal cargo operations. This dual utilization ensures optimal year-round functionality and supports both tourism and trade.

Another major project is the Mulapeta Port, a greenfield development located in the Srikakulam district. VPA has acquired a 49% equity stake in the project, and while the Andhra Pradesh Government is considering VPA's operational involvement, construction is progressing on a landlord model. The project was launched in April 2023, and the initial phase, which includes four berths, is now scheduled for completion by April 2026, revised from its earlier deadline of October 2025. This development aims to significantly enhance VPA's cargo handling capacity and address regional trade demands.

Additionally, VPA has explored the feasibility of developing a satellite port at Mulakedu, near Bheemunipatnam, on its own land. This initiative demonstrates VPA's proactive approach to expanding its operational footprint and meeting the growing requirements of India's maritime sector.

These expansion initiatives reflect VPA's commitment to strengthening India's port infrastructure, promoting trade, and boosting tourism. The development of the International Cruise Terminal and Mulapeta Port is poised to drive economic growth in the region, improve logistics efficiency, and position VPA as a critical player in India's maritime advancement.

Gangavaram Port

Gangavaram Port is located about 10 km south of Vishakhapatnam Port. It is a private port operated by Gangavaram Port Ltd. established under concession from Government of Andhra Pradesh (GoAP) and started operations in 2008. It has a concession period of 30 years and extendable for another 20 years. It is an all-weather, deep water (max berth depth of 19.5m), multi-purpose port capable of handling fully laden super cape size vessels of up to 200,000 DWT. It has state of the art mechanized handling systems, facilitating fast and efficient operations with minimum loss of cargo. Currently GPL operates 9 berths and has a capacity of 64 MMTPA. The hinterland for the port spreads over 8 states across eastern, southern and central India. The year-on-year cargo handled by the port is presented in **Table 3-10** .

Year	Cargo Handled (In million Tonnes)
FY14	15.8
FY15	20.7
FY16	19.4
FY17	18.0
FY18	25.8
FY19	30.4
FY20	34.5
FY21	32.8
FY22	30.0
FY23	32.0
FY24	37.2
CAGR FY14 vs FY20	13.9%
CAGR FY14 vs FY24	8.9%

Source: Annual reports of Ministry of Ports, Shipping & Waterways

Table 3-10: Cargo Handled at Gangavaram Port

Gangavaram port handled about 34.5 MMT in FY20 registering a CAGR of around 14 percent between FY14 and FY20. The cumulative impact of the spread of Covid-19 and the disruptions in supply chain operations have resulted in slight drop in cargo handled in FY21 and FY22 registering a decline of about 6.7 percent CAGR between FY20 and FY22. However, in FY24, the port has handled about 37 MMT registering about 16.4 percent growth over FY23. Major commodities handled by the port include coal, iron ore, fertilizer, limestone, bauxite, sugar, alumina, and steel.

The port is well-connected by road and rail. A 4-lane road provides connectivity to NH-16 while direct rail connectivity is present with Chennai - Howrah rail line. Out of the 30 MMT cargo volume handled in FY22, about 18 MMT cargo was rail-bound.

The port has free hold land of about 1,800 acres. As per the master plan for the port, it has planned capacity of 250 MMTPA with 31 berths. APSEZ has acquired 100 percent shareholding of GPL recently and will integrate the port with APSEZ's portfolio.

Kakinada Port

Kakinada port complex is located at Kakinada, around 170 km south of Vishakhapatnam. It consists of the Kakinada anchorage port, Kakinada deep water port, Kakinada fishing harbour and ship-breaking unit. Kakinada anchorage port is under the control of state government and has a capacity of handling about 4 MMTPA which primarily handles rice exports.

Kakinada deep water port (depth of 15 m) is a medium sized port which was commissioned by GoAP in November 1997 having a quay length of 610 m. The port was privatized in 1999 and the operations are now handled by Kakinada Seaports Ltd. The port was expanded to 2,500 m of quay length for multi-product handling and stand-alone facility for offshore supplies for deep sea exploration. The port has modernized and fully mechanized cargo handling facilities with a capacity of 20 MMTPA and vessels up to 210,000 DWT. Kakinada Container Terminal has an annual capacity of handling about 0.2 million TEUs per annum.

In terms of annual volume of cargo handled, the Kakinada deep water port handled total cargo traffic of 18 MMT in FY21and it handles commodities like iron ore and steel, coal, sugar, clinker, fertilisers, feldspar, bentonite, ball clay, forest products, LPG, liquid bulk and crude. Bulk carriers (44%), oil/chemical tankers (20%), general cargo (5%), offshore supply ships (4%), etc. are the major types of vessels regularly anchoring at the port. The annual cargo handled since FY11 is presented in **Table 3-11**.

Year	Cargo Handled (in million Tonnes)
FY11	12.0
FY12	13.0
FY13	16.3
FY14	16.1
FY15	20.7
FY16	17.0
FY17	14.5
FY18	14.3
FY19	17.8
FY20	16.5
FY21	18.0
CAGR FY19 vs FY11	5.1%
CAGR FY21 vs FY11	4.2%

Source: Annual reports of Ministry of Ports, Shipping & Waterways

Table 3-11: Cargo Handled at Kakinada Port

VK-PCPIR at Visakhapatnam & East Godavari Districts

The Visakhapatnam-Kakinada Petroleum, Chemicals, and Petrochemicals Investment Region (VK-PCPIR) is a strategic initiative aimed at fostering industrial development in the coastal districts of Andhra Pradesh, India. This ambitious project aims to attract significant investments in the petroleum, chemicals, and petrochemical sectors, positioning India as a global manufacturing hub.

Key features:

Strategic Location: The VK-PCPIR is strategically located between Visakhapatnam and Kakinada on the east coast of India, offering easy access to both domestic and international markets. It is also part of the Visakhapatnam-Chennai Industrial Corridor (VCIC), further enhancing its connectivity and attractiveness to investors.

Industry Focus: The VK-PCPIR is targeted towards petroleum, petrochemical, metals, fertilizers, and other related downstream industries. It will house various industrial clusters and Special Economic Zones (SEZs), including JNPC Pharma City, Duppituru, Krishnapalem, Parawada Phase-I, Parawada Phase-II, Pudi, Thammavaram, Vakalpudi, , BARC, Divis Laboratories.

SEZs: APSEZ at Atchutapuram, Brandix SEZ, Pharma SEZ (JNPC), Hetero Drugs Pharma SEZ, Kakinada SEZ, Deccan Chemical SEZ

Other Major Industries: The VK-PCPIR will also accommodate existing major industries such as: Visakhapatnam Steel Plant (RINL), NTPC, Coromandel Industries Limited, Spectrum Power Plant (SPGL), BARC, Divis Labs

Economic Impact: The VK-PCPIR is expected to create approximately 1.2 million jobs, contributing significantly to the region's economic growth and development.

The estimated capital investment for the VK-PCPIR project by 2031 is Rs. 19,159 Crores.

Environmental Considerations: The project emphasizes sustainable development and environmental protection. Green spaces will serve as buffers for industrial activities, and mitigation measures will be implemented to minimize the project's ecological impact.

The VK-PCPIR is a transformative project that holds the potential to revolutionize the industrial landscape of Andhra Pradesh. By attracting significant investments, creating jobs, and fostering economic growth, the VK-PCPIR will solidify India's position as a global manufacturing powerhouse.

Other PIA States

The other PIA states contributing to the traffic on the project road are Odisha, West Bengal, Tamil Nadu, Karnataka, Telangana, and Jharkhand. Economic indicators of PIA states are as follows.

- Gross State Domestic Product (GSDP) of Odisha stood at Rs 5,209.1 billion in FY24 and has been growing at a compounded annual growth rate of 7.0 percent since FY12.
- Gross State Domestic Product (GSDP) of West Bengal stood at Rs 9,040.9 billion in FY24 and has been growing at a compounded annual growth rate of 4.5 percent since FY12.
- Tamil Nadu's Gross State Domestic Product (GSDP) stood at Rs 15,713.0 billion in FY24 and has been growing at a compounded annual growth rate of 6.2 percent since FY12.
- Karnataka's Gross State Domestic Product (GSDP) for FY23 stands at Rs 14,232.3 billion, reflecting a compounded annual growth rate (CAGR) of 7.4% since FY12.
- Telangana's Gross State Domestic Product (GSDP) stood at Rs 7,929.4 billion in FY24 and has been growing at a compounded annual growth rate of 6.9 percent since FY12.
- Jharkhand's Gross State Domestic Product (GSDP) stood at Rs 2,850.7 billion in FY24 and has been growing at a compounded annual growth rate of 5.1 percent since FY12.

  The service sector is the largest contributor to GSDP in FY24 for the PIA states of Tamil Nadu with 51.7 percent, Karnataka with 65.2 percent, West Bengal with 52.0 percent and Telangana and Jharkhand with 63.1 and 44.4 percent respectively. While the share of secondary sector is prominent in the state of Odisha with 38.4 percent followed by 35.2 percent share in service sector.

The average annual growth rates as obtained using regression analysis till the last available year are presented in **Table 3-12**.

Particular/ States	Andhra Pradesh	Odisha	West Bengal	Tamil Nadu	Karnataka	Telangana	Jharkhand
	FY12 to FY24						
GSDP	7.0	7.0	4.5	6.2	7.4	6.9	5.1
Primary	7.5	4.9	2.5	5.4	5.7	5.9	1.6

Particular/ States	Andhra Pradesh	Odisha	West Bengal	Tamil Nadu	Karnataka	Telangana	Jharkhand
	FY12 to FY24						
Secondary	7.7	9.1	6.8	6.2	5.8	4.8	5.8
Tertiary	5.6	5.1	4.8	5.7	8.1	7.6	6.3
Construction	4.5	4.9	4.9	5.0	3.7	5.3	4.5
Per Capita Income	6.3	6.1	3.9	5.6	6.6	6.4	3.5

Table 3-12: Average Annual Growth Rates (%) of State Income for Other PIA States

The GSDP over the years for all the PIA states are presented in **Figure 3-10**.

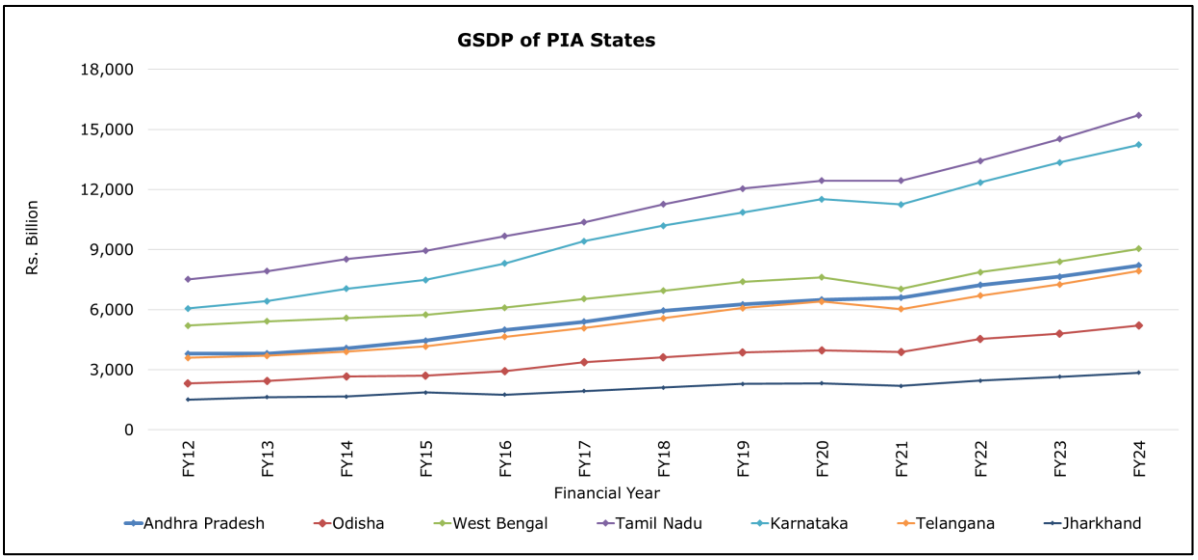


Figure 3-10: GSDP (in Rs Billion) for PIA States

3.6 India and PIA Outlook

3.6.1 India's Past Performance and Outlook for Future

India's growth trend during the recent years has been presented in **Figure 3-11**.

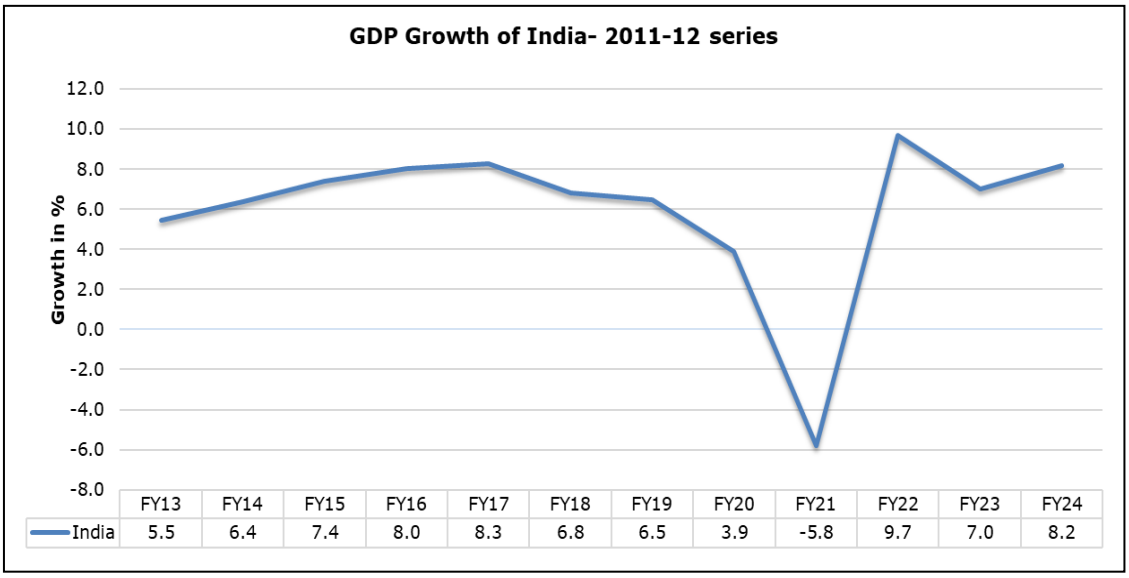


Figure 3-11: GDP Growth in India

India's economy has navigated through a series of fluctuations since FY12, from a slowdown to a sharp contraction due to the pandemic, followed by a strong recovery.

Structural reforms and global dynamics continue to play crucial roles in shaping India's economic future.

India’s economic growth has generally followed an accelerating trajectory until FY18, positioning it as one of the fastest-growing major economies in the world over the medium term. The real GDP growth rates were 8.3 percent in FY17, 6.8 percent in FY18, and 6.5 percent in FY19, reflecting a solid performance. Over the period from FY12 to FY19, the long-term average growth rate stood at 7.2 percent.

However, in FY20, the economy slowed down due to a combination of structural challenges and global economic headwinds, leading to a more modest growth rate of 3.9 percent. The outbreak of COVID-19 further exacerbated the situation, triggering a global recession and imposing significant economic disruptions. The Indian government's lockdown measures severely impacted the economy, contributing to a contraction of 5.8 percent in FY21.

India’s GDP grew by 9.7 percent in FY22 and continued its recovery with a growth of 7.0 percent in FY23 and 8.2 percent in FY24. The recent forecast by Reserve Bank of India (RBI) indicates a growth rate of 6.4 percent for FY25.

In light of the outlook being predicted by various agencies for the current and future years, the year-on-year growth for Indian economy based on the forecast of Consensus Economics (October 2024 Publication), provided by the client for FY26 and beyond as used in the analysis are presented in **Figure 3-12**.

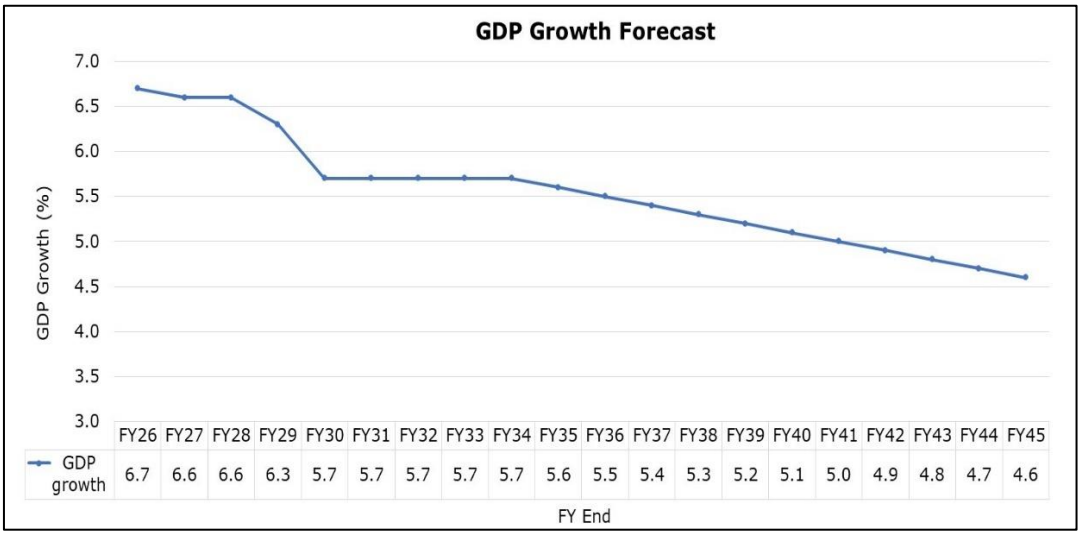


Figure 3-12: GDP Forecast of India

3.6.2 PIA States Outlook

A snapshot of the main economic indicators in the past for the PIA states is presented in **Table 3-13**.

Indicators	Andhra Pradesh	Odisha	West Bengal	Tamil Nadu	Karnataka	Telangana	Jharkhand
GSDP in Rs Billion (FY24)	8,208.9	5,209.1	9,040.9	15,713.7	14,232.3	7,929.4	2,850.7
GSDP growth (FY12 to FY24)	7.0%	7.0%	4.5%	6.2%	7.4%	6.9%	5.1%
Per capita Income in Rs. (FY24)	1,54,121	1,12,154	90,988	2,04,092	2,09,486	2,07,679	71,705
Sector Share in %, FY24							
Agriculture and allied	32.5	26.3	18.6	11.2	10.8	17.1	20.1
Industry	27.8	38.4	29.3	37.2	24.0	19.8	35.4
Services	39.7	35.2	52.0	51.7	65.2	63.1	44.4

Table 3-13: Main Economic Indicators of PIA States

To forecast the PIA states' performance, the past growth of State GDPs relative to India's GDP has been analyzed, and both short-term and long-term multipliers have been derived. In determining future multipliers, year-on-year variations and the size of the state's economy have been carefully considered. The past and adopted multipliers for PIA states to Indian economy are presented in **Table 3-14**.

Period	India	Andhra Pradesh	Odisha	West Bengal	Tamil Nadu	Karnataka	Telangana	Jharkhand
Past growth (%)								
FY12 to FY24	5.9	6.6	7.0	4.7	6.3	7.4	6.8	5.4
FY15 to FY24	5.7	7.1	7.5	5.2	6.5	7.4	7.4	4.8
Past Multipliers - Average of Years								
FY13 to FY24		0.9	1.0	0.9	0.9	1.1	1.1	0.9
FY15 to FY24		1.0	1.0	0.9	0.9	1.1	1.2	0.9
Multipliers Adopted for Future								
Adopted Multipliers		1.0	1.0	0.90	0.90	1.10	1.20	0.90

Table 3-14: Past and Future Multipliers of PIA States

3.7 Review of Past Traffic Data on Project Road

ETC traffic data has been made available for all the four toll plaza locations from March 2022 to November 2024. The yearly average of FY23 and FY24 along with annualised average of FY25 with YOY and end point growth rates has been presented in **Table 3-15**.

FY/Mode	CJV	LCV	2A Truck	3A Truck	MAV/OSV	PCU
TP01- Madapam						
FY23	4,748	381	1,550	1,120	2,646	25,234
FY24	5,374	391	1,665	1,070	2,800	26,766
FY25	5,561	399	1,791	1,033	2,929	27,810
YOY Growth (in %)						
FY23 vs FY24	13.2	2.6	7.4	-4.4	5.8	6.1
FY24 vs FY25	3.5	1.9	7.5	-3.5	4.6	3.9
End Point Growth (in %)						
FY23 vs FY25	8.2	2.2	7.5	-3.9	5.2	5.0
TP02-Nathavalasa						
FY23	5,647	475	1,845	1,170	3,099	29,350

FY/Mode	CJV	LCV	2A Truck	3A Truck	MAV/OSV	PCU
FY24	6,237	504	1,949	1,150	3,538	32,212
FY25	6,555	508	2,076	1,139	3,714	33,674
YoY Growth (in %)						
FY23 vs FY24	10.4	6.1	5.7	-1.7	14.2	9.8
FY24 vs FY25	5.1	0.9	6.5	-1.0	5.0	4.5
End Point Growth (in %)						
FY23 vs FY25	7.7	3.4	6.1	-1.3	9.5	7.1
TP03 - Dukkavanipalem						
FY23	1,638	335	887	1,009	2,364	18,465
FY24	2,679	440	1,174	1,084	2,920	23,253
FY25	2,937	452	1,303	1,050	3,040	24,355
YoY Growth (in %)						
FY23 vs FY24	63.6	31.3	32.4	7.4	23.5	25.9
FY24 vs FY25	9.7	2.6	11.0	-3.1	4.1	4.7
End Point Growth (in %)						
FY23 vs FY25	33.9	16.1	21.2	2.0	13.4	14.8
TP04 - Marripalem						
FY23	1,928	329	859	1,006	2,291	18,328
FY24	3,129	414	1,108	1,044	2,726	22,472
FY25	3,813	462	1,323	1,064	3,017	25,241
YoY Growth (in %)						
FY23 vs FY24	62.3	26.0	28.9	3.8	19.0	22.6
FY24 vs FY25	21.9	11.5	19.5	1.9	10.7	12.3
End Point Growth (in %)						
FY23 vs FY25	40.6	18.5	24.1	2.8	14.7	17.4

Table 3-15: Past Traffic and Growth Analysis

Madapam TP and Nathavalasa TP has shown moderate traffic growth while an exorbitant traffic growth has been observed at Dukkavanipalem and Marripalem toll plaza locations which could be due to the initial ramp up of traffic after opening of Vizag bypass in April 2022.

At Madapam TP and Nathavalasa TP, Car traffic has shown the highest growth of about 10-13 percent during FY23 to FY24 while the growth between FY24 and FY25 is estimated to be around 3.5 and 5.0 percent. The end point growth between FY23 and FY25 is likely to be 7-8 percent. Similarly, in case of 2A trucks an average growth of 6-7 percent is observed during FY23 and FY25.

At Dukkavanipalem TP and Marripalem TP, a comparison of car traffic shows robust growth of about 62-64 percent during FY23 to FY24 followed by 33-40 percent during FY23 to FY25. As mentioned above this could be the initial ramp up growth which any greenfield facility observes after opening to traffic. However, the growth in FY24 vs FY25 is observed at a lower rate.

MAVs have shown a 4-9 percent growth across TP01 to TP03 with TP04 showing highest growth of about 14 percent during FY23 to FY25.

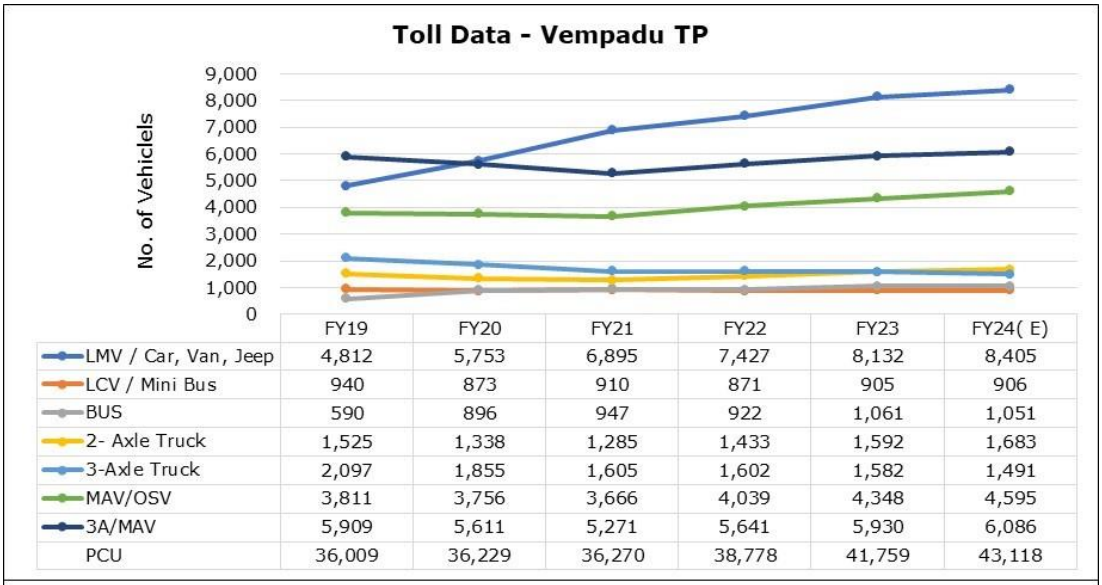
3.7.1 Past Toll Data from Adjacent Sections

In addition to the project road traffic data, past traffic of adjacent road sections awarded under TOT-1 which are in proximity to the PR has also been analysed to understand the traffic growth trends on NH-16. The consultant had access to historical traffic trends for the four TP locations from previous studies. The toll data of following four toll plaza locations has been analysed:

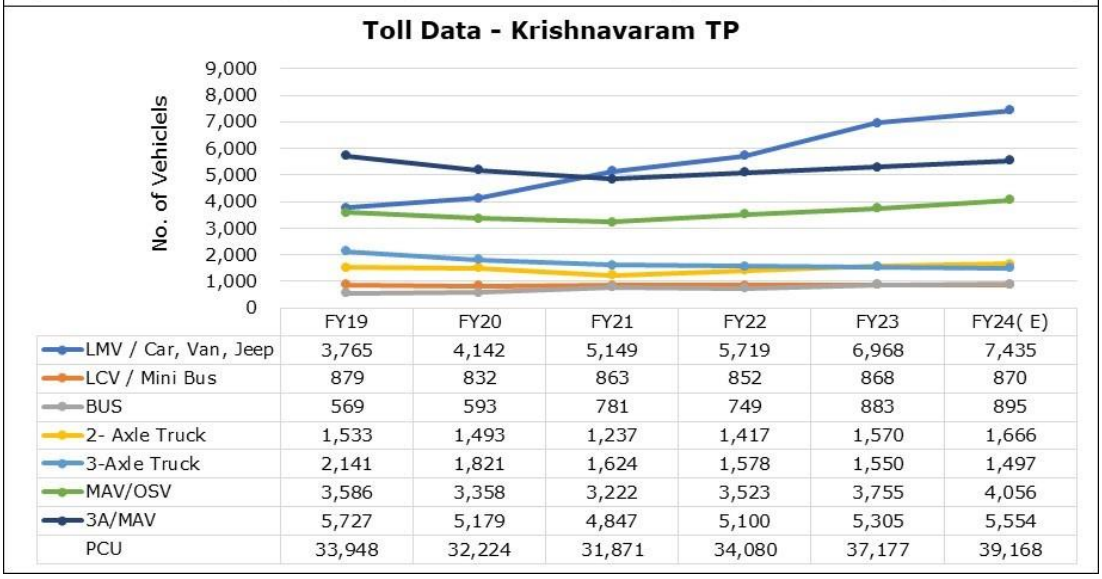
- TOT- 1 toll plazas below Anakapalli: Vempadu TP and Krishnavaram TP
- TOT -1 toll plazas above Narasannapeta: Laxmipuram TP and Karapadu TP

3.7.1.1 Past Traffic at TOT- 1 Toll Plazas Below Anakapalli: Vempadu TP and Krishnavaram TP

The available year on year toll data of Vempadu TP and Krishnavaram TP is presented in **Figure 3-13**.



	FY19	FY20	FY21	FY22	FY23	FY24(E)
LMV / Car, Van, Jeep	4,812	5,753	6,895	7,427	8,132	8,405
LCV / Mini Bus	940	873	910	871	905	906
BUS	590	896	947	922	1,061	1,051
2- Axle Truck	1,525	1,338	1,285	1,433	1,592	1,683
3-Axle Truck	2,097	1,855	1,605	1,602	1,582	1,491
MAV/OSV	3,811	3,756	3,666	4,039	4,348	4,595
3A/MAV	5,909	5,611	5,271	5,641	5,930	6,086
PCU	36,009	36,229	36,270	38,778	41,759	43,118



	FY19	FY20	FY21	FY22	FY23	FY24(E)
LMV / Car, Van, Jeep	3,765	4,142	5,149	5,719	6,968	7,435
LCV / Mini Bus	879	832	863	852	868	870
BUS	569	593	781	749	883	895
2- Axle Truck	1,533	1,493	1,237	1,417	1,570	1,666
3-Axle Truck	2,141	1,821	1,624	1,578	1,550	1,497
MAV/OSV	3,586	3,358	3,222	3,523	3,755	4,056
3A/MAV	5,727	5,179	4,847	5,100	5,305	5,554
PCU	33,948	32,224	31,871	34,080	37,177	39,168

Figure 3-13: Past Traffic at TOT- 1 TPs below Anakapalli: Vempadu and Krishnavaram TP

The end-point growth rates for Vempadu TP and Krishnavaram TP is presented in **Table 3-16**.

FY/Mode	LMV / CJV	LCV / Mini Bus	BUS	2A Truck	3A Truck	MAV/OSV	3A/MAV	PCU
End Point Growth (in %)								
Vempadu TP								
FY19 vs FY23	14.0	-0.9	15.8	1.1	-6.8	3.3	0.1	3.8
FY21 vs FY24	4.8	-1.5	2.5	7.7	-3.3	8.4	5.1	5.4
FY22 vs FY24	3.3	0.0	5.1	5.9	-4.8	7.6	4.2	4.7
Krishnavaram TP								
FY19 vs FY23	16.6	-0.3	11.6	0.6	-7.8	1.2	-1.9	2.3
FY21 vs FY24	12.2	-0.3	3.1	9.8	-5.8	8.7	4.3	6.7
FY22 vs FY24	12.8	0.2	6.9	7.5	-7.2	8.4	3.8	6.6

Table 3-16: Past Traffic at TOT- 1 TPs Below Anakapalli: Vempadu and Krishnavaram TP

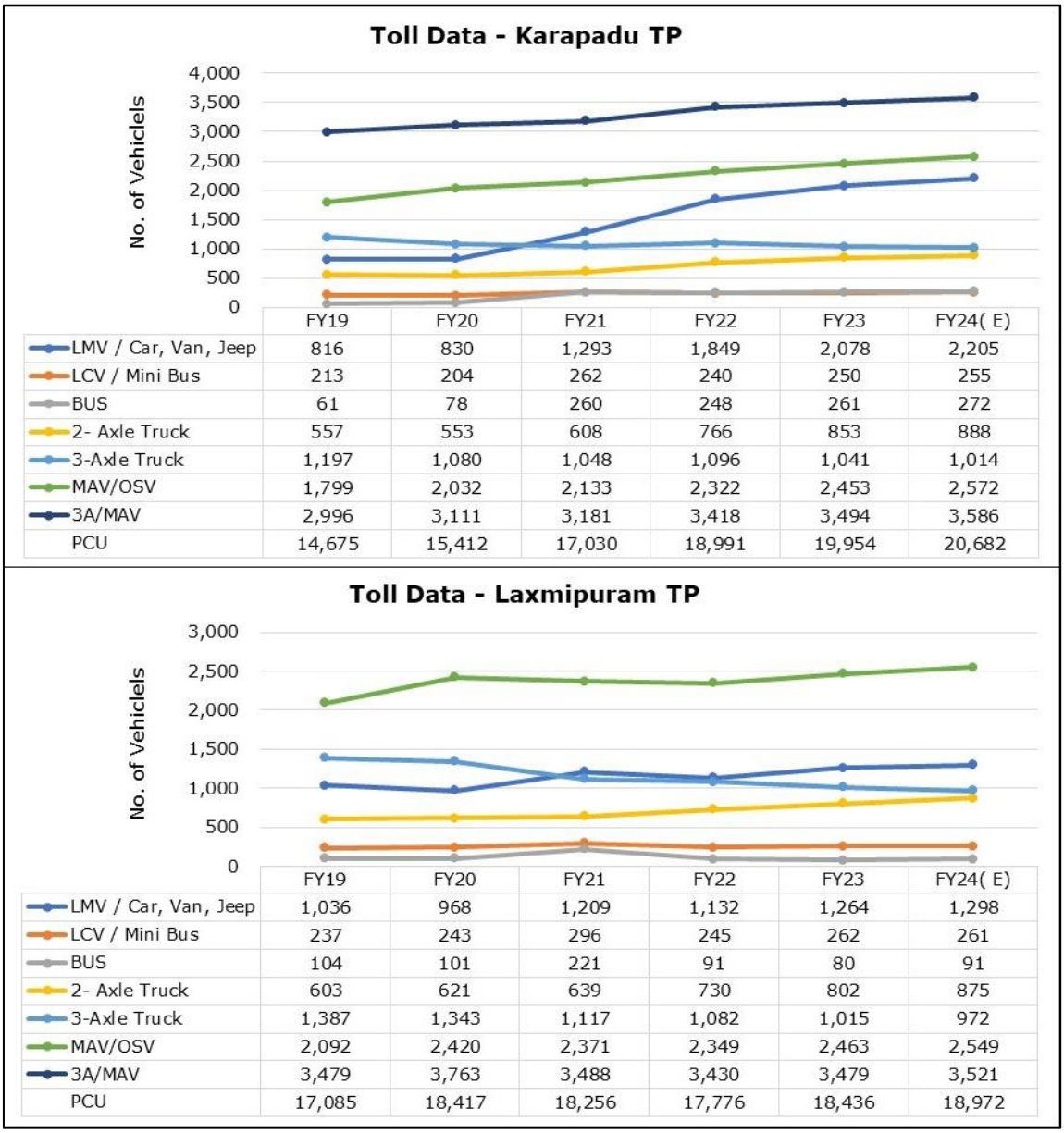
Vempadu TP shows moderate growth, with LMV/CJV traffic increasing by 14 percent from FY19 to FY23, slowing to 3-5 percent in FY21 to FY24 representing the impact of Covid. MAVs and 2A trucks maintain steady growth of about 6-8 percent during FY21/FY22 to FY24, while 3A truck traffic consistently declines which could be attributed to tonnage shifts happening from 3A to MAV trucks. However, it is worth mentioning that after the tonnage shifts stabilise in 2A/3A trucks, they start showing a minimal positive growth.

At Krishnavaram TP, double-digit end point growth of about 12-17 percent in CJV/LMV traffic is observed in LMV/CJV traffic across all comparison years. MAVs and 2A trucks also show steady increases of about 8-10 percent during FY21/FY22 to FY24.

Overall, a PCU growth of 5-7 percent has been observed across these two toll plazas below Anakapalli.

3.7.1.2 Past Traffic at TOT -1 Toll Plazas Above Narasannapeta: Karapadu TP and Laxmipuram TP

The available year on year toll data of Karapadu TP and Laxmipuram TP is presented in **Figure 3-14**.



	FY19	FY20	FY21	FY22	FY23	FY24(E)
LMV / Car, Van, Jeep	816	830	1,293	1,849	2,078	2,205
LCV / Mini Bus	213	204	262	240	250	255
BUS	61	78	260	248	261	272
2- Axle Truck	557	553	608	766	853	888
3-Axle Truck	1,197	1,080	1,048	1,096	1,041	1,014
MAV/OSV	1,799	2,032	2,133	2,322	2,453	2,572
3A/MAV	2,996	3,111	3,181	3,418	3,494	3,586
PCU	14,675	15,412	17,030	18,991	19,954	20,682

	FY19	FY20	FY21	FY22	FY23	FY24(E)
LMV / Car, Van, Jeep	1,036	968	1,209	1,132	1,264	1,298
LCV / Mini Bus	237	243	296	245	262	261
BUS	104	101	221	91	80	91
2- Axle Truck	603	621	639	730	802	875
3-Axle Truck	1,387	1,343	1,117	1,082	1,015	972
MAV/OSV	2,092	2,420	2,371	2,349	2,463	2,549
3A/MAV	3,479	3,763	3,488	3,430	3,479	3,521
PCU	17,085	18,417	18,256	17,776	18,436	18,972

Figure 3-14: Past Traffic at TOT -1 TPs Above Narasannapeta: Karapadu and Laxmipuram TP

The end-point growth rates for Karapadu TP and Laxmipuram is presented in **Table 3-17.**

FY/Mode	LMV / CJV	LCV / Mini Bus	BUS	2A Truck	3A Truck	MAV/OSV	3A/MAV	PCU
End Point Growth (in %)								
Karapadu TP								
FY19 vs FY23	26.3	4.0	44.1	11.2	-3.4	8.1	3.9	8.0
FY21 vs FY24	15.4	-3.7	-2.7	10.3	-3.0	7.5	4.3	6.0
FY22 vs FY24	3.6	-1.3	-1.8	3.2	-6.6	6.9	2.7	3.4
Laxmipuram TP								
FY19 vs FY23	5.1	2.6	-6.3	7.4	-7.5	4.2	0.0	1.9
FY21 vs FY24	-2.3	-7.4	-30.1	10.6	-5.7	3.5	0.8	1.3
FY22 vs FY24	-0.2	-2.0	-8.9	8.9	-6.9	5.8	2.0	3.3

Table 3-17: Past Traffic at TOT -1 TPs Above Narasannapeta: Karapadu and Laxmipuram TP

The end point traffic growth at Karapadu TP shows a subdued growth in LMV/CJV traffic showing a growth of about 4 percent during FY22 to FY24, however the comparison

between FY19 to FY23 shows an overall growth of 26 percent whereas 5 percent is observed at Laxmipuram toll plaza. MAVs shows 8 percent growth during FY19 to FY23 while Laxmipuram TP shows a growth of 3.3 percent between FY22 and FY24.

3.8 Past and Future Transport Demand Elasticity

The econometric model applied for the project, relates traffic growth to changes in state domestic product via an elasticity factor according to IRC guidelines.

The best measure of deriving traffic elasticity to income is time series data of traffic on the road. The past traffic data for the project road section is available since March 2022. The YOY mode wise traffic elasticity has been derived using rate of growth in the traffic vis a vis the rate of growth in income. The elasticity estimates for different time periods have been done using regression analysis with mode wise traffic as dependent variable and weighted income as independent variable. The point to point and trend line actual elasticity between weighted income (GSDP) and traffic is presented in **Table 3-18**.

FY/Modes	CJV	LCV	2A	3 Axle	MAV/OSV
TP01 – Madapam					
FY24 vs FY23	1.8	0.3	1.0	-0.6	0.8
TP02 – Nathavalasa					
FY24 vs FY23	1.4	0.8	0.8	-0.2	1.9
TP03 – Dukkavanipalem					
FY24 vs FY23	8.6	4.1	4.2	1.0	3.1
TP04 - Marripalem					
FY24 vs FY23	8.4	3.4	3.8	0.5	2.5

Table 3-18: Actual Past Traffic Elasticity on PR

Cars

- The motorization rate for cars (per 1000 population) in India has gone up from 6.6 in 2001 to 25 in 2019. Although India's car fleet has been growing at 10 percent for nearly 25 years, its motorization rate is low compared to other countries of similar wealth and much lower than developed countries with motorization rate of around 450. The low motorization rate suggests that there is room for continued growth for many years to come. With the continual increase in motorization rate and improved road network, usage of cars for inter-urban travel is showing a growing trend.
- A regression between GSDP (as independent variable) and registered vehicles (as dependent variable) of PIA state was carried out for the state of Andhra Pradesh which showed an elasticity of 0.8 during the period between FY14 and FY24.
- The past elasticity of 1.8 and 1.4 is observed for the period between FY23 and FY24 along TP01 and TP02 respectively while TP03 & TP04 has shown higher elasticity value of 8.6 and 8.4 respectively. As mentioned above this high elasticity is an indicator of the ramp-up period which is observed at any greenfield facility in the first few years

of operation till the traffic stabilises. At Vempadu and Krishnavaram TPs of TOT 1 sections, an elasticity of 1.7 and 1.3 has been observed between FY20 and FY22 whereas an elasticity of 4.4 has been observed at Karapadu TP of TOT 1.

- The elasticities and the past growth levels for cars are a result of increasing income levels, increasing vehicle ownership, and higher propensity to travel on highways in India due to network level developments and higher levels of service. These levels of growth are likely to continue in the near to medium term since car ownership levels are still very low and the road network is undergoing continual development. For the PR toll plaza, car elasticity has been considered as 1.2 for the period up to FY30 and 1.1 till FY35 and tapered thereafter to 1.0 till the end of concession period.
- It is likely that this growth would slow down over time as the market becomes more mature and saturated, therefore elasticity to GSDP can be expected to decline over time. With the anticipated growth momentum in the coming years, higher elasticity values have been considered for initial slabs and tapering has been done thereafter.

LCV/Minibus

- Predominance of Mini LCV in the LCV category for short haul traffic is being witnessed across many national highways. The LCV segments are also witnessing a smart uptick in demand in the goods carrier segment, where the 2T mini-truck and 2-3.5T pickups dominate with 90 percent share of the total LCV goods segment.
- For project road, an elasticity of 0.5 has been adopted till the end of concession period

Trucks

- In India as a whole, the freight vehicle mix has been changing in the last decade favouring MAV to 2A/3A vehicles for long-distance traffic, given the operational efficiencies achievable with larger vehicles. Considering the ongoing technical advancements in automobile industry, some of the standard 2A/3A trucks would gradually be replaced by MAVs. Mature National Highways with tolling in operation for few years, have already witnessed the shift in 2A/3A trucks to MAV for long distance movement and the limited number of 2A trucks are being used for local movements.
- In case of the project road and some of the other National Highways, 2A trucks have started showing a decent growth for local uses. In case of project road, 2A trucks have shown a double-digit growth at TP03 & TP04 between all comparison years. Therefore, an elasticity of 0.8 has been adopted till FY30 for all the toll plazas and tapered to 0.6 thereafter for FY40 and beyond.
- For the project road, an elasticity of 0.4 has been considered for 3A trucks and 1.0 for MAVs till FY30 and has been tapered to 0.3 and 0.7 respectively till the end of concession period. At the toll plazas of TOT 1 sections, an elasticity of 0.7, 0.9 and

1.2 has been observed at Vampadu, Krishnavaram and Karapadu TPs between FY19 and FY24.

It has been assumed that transport demand elasticity, for both freight and passenger traffic, would gradually decline over time, despite growth in per capita income, as regions becomes more mature, self-sufficient and with alternative mode of transport available to users. Due consideration has been given to the tonnage shifts happening in the market with Mini LCV gaining importance for short distance movements over LCVs and MAVs being preferred over 2A/3A for long distance movements due to better operational efficiencies. As per the latest industry trends, there is a shift happening between various categories of MAVs also - 4A, 5A and 6A and above. 4A trucks are likely to see a replacement soon to 5A and above axle trucks which can carry more tonnage as compared to 4A trucks.

While assigning elasticities to different modes, freight travel pattern and over all elasticity of cargo tonnage with respect to weighted GSDP has been an important consideration. The recommended elasticity values adopted for all vehicle types in line with the traffic growth being observed on other national highways and changes in freight traffic pattern observed on the project road are presented in **Table 3-19**.

Period/Modes	Car	LCV	2A	3A	MAV
Up to FY30	1.2	0.5	0.8	0.4	1.0
FY31-FY35	1.1	0.5	0.7	0.4	0.9
FY36-FY40	1.0	0.5	0.6	0.3	0.8
Beyond FY40	1.0	0.5	0.6	0.3	0.7

Table 3-19: Recommended Elasticity for Project Road

3.9 Projected Traffic Growth Rates

Based on the moderated perspective elasticity values and the projected growth rates of the income for PIA states, the future average annual compound traffic growth rates by vehicle type have been estimated for the project road by using the following relationship:

Tgr = (GSDPgr) x E; where,

Tgr – Traffic growth rate for mode

GSDPgr – Growth rate of GSDP

E – Elasticity value for mode

Using the year-on-year mode wise weighted income for PIA and elasticity for different time periods, traffic growth rates have been estimated for each year till FY55 in line with the maximum extendable concession period of 30 years. The estimated traffic growth rates for the project road have been presented in **Table 3-20**.

FY/Modes	TP01 & TP02					TP03 & TP04				
	Car	LCV	2A	3A	MAV/OSV	Car	LCV	2A	3A	MAV/OSV
FY26	8.0	3.3	5.3	2.6	6.6	8.1	3.3	5.3	2.6	6.6
FY27	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY28	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY29	7.6	3.1	5.0	2.5	6.2	7.6	3.1	5.0	2.5	6.2
FY30	6.8	2.8	4.5	2.2	5.6	6.9	2.8	4.5	2.2	5.6
FY31	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY32	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY33	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY34	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY35	6.2	2.8	3.9	2.2	5.0	6.2	2.8	3.9	2.2	5.0
FY36	5.5	2.7	3.3	1.6	4.3	5.5	2.7	3.3	1.6	4.4
FY37	5.4	2.7	3.2	1.6	4.3	5.4	2.7	3.2	1.6	4.3
FY38	5.3	2.6	3.1	1.6	4.2	5.3	2.6	3.2	1.6	4.2
FY39	5.2	2.6	3.1	1.5	4.1	5.2	2.6	3.1	1.5	4.1
FY40	5.1	2.5	3.0	1.5	4.0	5.1	2.5	3.0	1.5	4.0
FY41	5.0	2.5	3.0	1.5	3.5	5.0	2.5	3.0	1.5	3.5
FY42	4.9	2.4	2.9	1.4	3.4	4.9	2.4	2.9	1.4	3.4
FY43	4.8	2.4	2.9	1.4	3.3	4.8	2.4	2.9	1.4	3.3
FY44	4.7	2.3	2.8	1.4	3.2	4.7	2.3	2.8	1.4	3.3
FY45 and beyond	4.6	2.3	2.7	1.4	3.2	4.6	2.3	2.7	1.3	3.2

Table 3-20: Projected Traffic Growth Rates (in %)

In derivation of above growth rates, the likely shift of buses to cars in case of passenger vehicles and the replacement/ tonnage shift of 2A/3A trucks to MAV for long distance in case of freight vehicles has been duly considered.

The above growth rates relate to the most likely Base Case. In addition, two sets of traffic growth rates under low and high cases have also been considered and impact on toll revenue evaluated for both these cases. Based on the risk analysis of key parameters like economic growth and elasticity of travel demand impacting traffic growth, two additional growth scenarios have been presented. Low growth scenario considers a 20 percent reduction in growth rates relating to about 10 percent decline each in elasticity and economic growth. The High growth scenario considers a 20 percent increase in growth rates signifying about 10 percent increase each in elasticity and economic parameters.

The implied traffic growth rates under the base case after considering the impact of completion of Raipur – Vizag expressway, Sheelanagar port connectivity road for the Vizag Bypass Toll Plazas, and diversion to Vizag – Kharagpur expressway for TP01 and TP02 under the base case have been presented in **Table 3-15** and **Table 3-16**.

FY/Modes	TP01					TP02				
	Car	LCV	2A	3A	MAV/ OSV	Car	LCV	2A	3A	MAV/ OSV
FY26	8.0	3.3	5.3	2.6	6.6	8.0	3.3	5.3	2.6	6.6
FY27	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY28	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY29	7.6	3.1	5.0	2.5	6.2	7.6	3.1	5.0	2.5	6.2
FY30	6.8	2.8	4.5	2.2	5.6	6.8	2.8	4.5	2.2	5.6
FY31	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY32	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY33	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY34	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY35	6.2	2.8	3.9	2.2	5.0	6.2	2.8	3.9	2.2	5.0
FY36	5.5	2.7	3.3	1.6	4.3	5.5	2.7	3.3	1.6	4.3
FY37	5.4	2.7	3.2	1.6	4.3	5.4	2.7	3.2	1.6	4.3
FY38	5.3	2.6	3.1	1.6	4.2	5.3	2.6	3.1	1.6	4.2
FY39	5.2	2.6	3.1	1.5	4.1	5.2	2.6	3.1	1.5	4.1
FY40	4.0	-3.4	-6.2	-8.3	-6.7	4.2	-2.1	-5.3	-7.4	-4.4
FY41	4.5	-0.1	-1.1	-2.9	-1.3	4.6	0.5	-0.6	-2.4	-0.2
FY42	4.2	-1.5	-3.4	-5.4	-4.1	4.3	-0.5	-2.7	-4.6	-2.3
FY43	4.8	2.4	2.9	1.4	3.3	4.8	2.4	2.9	1.4	3.3
FY44	4.7	2.3	2.8	1.4	3.2	4.7	2.3	2.8	1.4	3.2
FY45 and beyond	4.6	2.3	2.7	1.4	3.2	4.6	2.3	2.7	1.4	3.2

Figure 3-15: Implied Traffic Growth Rates for TP01 & TP02 After Diversion (in %)

FY/Modes	TP03					TP04				
	Car	LCV	2A	3A	MAV/ OSV	Car	LCV	2A	3A	MAV/ OSV
FY26	8.1	3.3	5.3	2.6	6.6	8.1	3.3	5.3	2.6	6.6
FY27	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY28	7.9	3.3	5.2	2.6	6.5	7.9	3.3	5.2	2.6	6.5
FY29	7.6	3.1	5.0	2.5	6.2	7.6	3.1	5.0	2.5	6.2
FY30	6.9	2.8	4.5	2.2	5.6	6.9	2.8	4.5	2.2	5.6
FY31	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY32	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY33	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY34	6.3	2.8	4.0	2.2	5.1	6.3	2.8	4.0	2.2	5.1
FY35	6.2	2.8	3.9	2.2	5.0	6.2	2.8	3.9	2.2	5.0
FY36	5.5	2.7	3.3	1.6	4.4	5.5	2.7	3.3	1.6	4.4
FY37	5.4	2.7	3.2	1.6	4.3	5.4	2.7	3.2	1.6	4.3
FY38	5.3	2.6	3.2	1.6	4.2	5.3	2.6	3.2	1.6	4.2
FY39	5.2	2.6	3.1	1.5	4.1	5.2	2.6	3.1	1.5	4.1
FY40	5.1	2.5	3.0	1.5	4.0	5.1	2.5	3.0	1.5	4.0
FY41	5.0	2.5	3.0	1.5	3.5	5.0	2.5	3.0	1.5	3.5
FY42	4.9	2.4	2.9	1.4	3.4	4.9	2.4	2.9	1.4	3.4
FY43	4.8	2.4	2.9	1.4	3.3	4.8	2.4	2.9	1.4	3.3
FY44	4.7	2.3	2.8	1.4	3.3	4.7	2.3	2.8	1.4	3.3
FY45 and beyond	4.6	2.3	2.7	1.3	3.2	4.6	2.3	2.7	1.3	3.2

Figure 3-16: Implied Traffic Growth Rates for TP03 & TP04 After Diversion (in %)

3.10 Mode-wise Traffic Projections

Mode-wise projected traffic for the toll plazas of the project road under the base case after considering diversion impacts till FY55 is presented **Table 3-17** and **Table 3-18**.

FY/ Modes	TP01						TP02					
	Car	LCV	2A	3A	MAV	OSV	Car	LCV	2A	3A	MAV	OSV
FY25	5,975	409	1,795	1,046	2,940	5	7,206	524	2,091	1,161	3,712	6
FY26	6,455	423	1,890	1,073	3,134	5	7,786	542	2,202	1,191	3,958	6
FY27	6,967	436	1,989	1,101	3,338	6	8,402	560	2,317	1,222	4,215	7
FY28	7,518	451	2,093	1,130	3,556	6	9,068	578	2,438	1,254	4,490	7
FY29	8,087	465	2,197	1,158	3,777	6	9,753	596	2,560	1,285	4,769	7
FY30	8,640	478	2,297	1,184	3,989	7	10,420	613	2,675	1,313	5,037	8
FY31	9,182	492	2,387	1,210	4,191	7	11,073	630	2,781	1,343	5,292	8
FY32	9,757	506	2,482	1,237	4,403	7	11,768	648	2,891	1,373	5,560	9
FY33	10,369	520	2,580	1,265	4,626	8	12,506	667	3,005	1,403	5,841	9
FY34	11,019	535	2,682	1,293	4,860	8	13,290	685	3,124	1,435	6,137	10
FY35	11,698	549	2,786	1,322	5,102	9	14,108	704	3,245	1,466	6,442	10
FY36	12,341	564	2,877	1,343	5,323	9	14,884	724	3,351	1,490	6,722	10
FY37	13,008	580	2,969	1,364	5,550	9	15,688	743	3,458	1,514	7,008	11
FY38	13,697	595	3,062	1,386	5,782	10	16,519	763	3,567	1,537	7,301	11
FY39	14,409	610	3,157	1,407	6,020	10	17,378	782	3,677	1,561	7,601	12
FY40	14,982	589	2,960	1,290	5,618	11	18,103	766	3,483	1,446	7,263	12
FY41	15,663	589	2,927	1,253	5,546	11	18,940	770	3,461	1,411	7,247	13
FY42	16,324	580	2,826	1,185	5,320	11	19,761	766	3,368	1,346	7,079	13
FY43	17,108	594	2,907	1,202	5,497	12	20,710	784	3,464	1,365	7,314	14
FY44	17,912	608	2,988	1,219	5,675	12	21,683	802	3,560	1,384	7,551	14
FY45	18,735	622	3,070	1,235	5,855	13	22,680	821	3,658	1,403	7,791	15
FY46	19,597	636	3,154	1,252	6,041	13	23,723	839	3,757	1,422	8,039	15
FY47	20,499	651	3,240	1,269	6,233	13	24,815	859	3,860	1,441	8,294	15
FY48	21,442	666	3,328	1,286	6,431	14	25,956	878	3,966	1,461	8,558	16
FY49	22,428	681	3,419	1,303	6,636	14	27,150	898	4,074	1,480	8,829	16
FY50	23,460	696	3,513	1,321	6,846	15	28,399	919	4,185	1,501	9,110	17
FY51	24,539	712	3,609	1,339	7,064	15	29,705	940	4,300	1,521	9,399	18
FY52	25,667	729	3,707	1,357	7,288	16	31,072	961	4,417	1,541	9,698	18
FY53	26,848	745	3,809	1,375	7,520	16	32,501	983	4,538	1,562	10,006	19
FY54	28,083	762	3,913	1,394	7,759	17	33,996	1,006	4,662	1,583	10,324	19
FY55	29,375	780	4,019	1,413	8,005	17	35,560	1,029	4,789	1,605	10,652	20

Figure 3-17: Projected Mode-wise Traffic at TP01 &TP02

FY/ Modes	TP03						TP04					
	Car	LCV	2A	3A	MAV	OSV	Car	LCV	2A	3A	MAV	OSV
FY25	3,318	457	1,308	1,058	3,039	5	4,552	467	1,327	1,071	3,016	5
FY26	3,585	472	1,378	1,086	3,240	5	4,919	483	1,398	1,099	3,216	5
FY27	3,870	488	1,450	1,114	3,452	6	5,309	498	1,471	1,127	3,426	6
FY28	4,177	504	1,526	1,143	3,677	6	5,730	515	1,548	1,157	3,649	6
FY29	4,493	520	1,602	1,171	3,906	6	6,164	531	1,625	1,185	3,877	6
FY30	4,801	534	1,674	1,197	4,396	7	6,586	546	1,748	1,305	5,802	7
FY31	5,102	549	1,741	1,223	4,619	7	7,000	562	1,818	1,335	6,096	7
FY32	5,423	565	1,809	1,251	4,854	7	7,439	577	1,889	1,364	6,405	7

FY/ Modes	TP03						TP04					
	Car	LCV	2A	3A	MAV	OSV	Car	LCV	2A	3A	MAV	OSV
FY33	5,763	581	1,881	1,279	5,100	8	7,906	594	1,964	1,395	6,730	8
FY34	6,125	598	1,955	1,307	5,359	8	8,403	611	2,042	1,426	7,071	8
FY35	6,503	614	2,031	1,336	5,626	9	8,921	628	2,121	1,457	7,424	9
FY36	6,861	631	2,098	1,357	5,870	9	9,413	645	2,191	1,481	7,747	9
FY37	7,232	648	2,165	1,379	6,121	9	9,922	662	2,261	1,504	8,078	9
FY38	7,616	665	2,234	1,400	6,378	10	10,449	680	2,332	1,527	8,416	10
FY39	8,013	682	2,303	1,422	6,640	10	10,993	697	2,405	1,551	8,762	10
FY40	8,422	700	2,373	1,443	6,908	11	11,554	715	2,478	1,574	9,116	11
FY41	8,844	717	2,443	1,464	7,147	11	12,133	733	2,551	1,597	9,431	11
FY42	9,278	735	2,515	1,485	7,389	11	12,729	751	2,626	1,620	9,751	11
FY43	9,724	752	2,586	1,506	7,635	12	13,341	769	2,701	1,643	10,075	12
FY44	10,182	770	2,659	1,527	7,883	12	13,969	787	2,776	1,666	10,403	12
FY45	10,651	787	2,731	1,548	8,134	13	14,612	805	2,852	1,688	10,734	13
FY46	11,142	805	2,806	1,568	8,393	13	15,285	823	2,930	1,711	11,076	13
FY47	11,655	824	2,883	1,590	8,660	13	15,990	842	3,011	1,734	11,428	13
FY48	12,192	843	2,962	1,611	8,936	14	16,726	861	3,093	1,757	11,792	14
FY49	12,754	862	3,043	1,633	9,220	14	17,497	881	3,178	1,781	12,168	14
FY50	13,341	882	3,126	1,655	9,514	15	18,303	901	3,265	1,805	12,555	15
FY51	13,956	902	3,212	1,677	9,817	15	19,146	922	3,354	1,829	12,955	15
FY52	14,599	923	3,300	1,700	10,129	16	20,029	943	3,446	1,854	13,367	16
FY53	15,272	944	3,390	1,723	10,452	16	20,951	964	3,540	1,879	13,793	16
FY54	15,975	965	3,483	1,746	10,785	17	21,917	987	3,637	1,905	14,232	17
FY55	16,711	987	3,578	1,770	11,128	17	22,927	1,009	3,737	1,930	14,685	17

Figure 3-18: Projected Mode-wise Traffic at TP03 &TP04

It is worth mentioning here that closed tolling has been considered from FY30 at TP03 and TP04.

3.11 Traffic Projections and Capacity Analysis

Table 3-21 presents the projections of the total PCUs based on the most likely growth rates till FY55 as assessed in this study.

FY/ Modes	Before Diversion					After Diversion				
	TP01	TP02	TP03	TP04	Average	TP01	TP02	TP03	TP04	Average
FY25	28,364	34,479	24,800	26,041	28,421	28,364	34,479	24,800	26,041	28,421
FY26	30,109	36,615	26,289	27,627	30,160	30,109	36,615	26,289	27,627	30,160
FY27	31,941	38,857	27,850	29,292	31,985	31,941	38,857	27,850	29,292	31,985
FY28	33,891	41,246	29,510	31,064	33,928	33,891	41,246	29,510	31,064	33,928
FY29	35,874	43,674	31,196	32,864	35,902	35,874	43,674	31,196	32,864	35,902
FY30	37,780	46,008	32,814	34,593	37,799	37,780	46,008	32,814	34,593	37,799
FY31	39,603	48,241	34,360	36,249	39,613	39,603	48,241	34,360	36,249	39,613
FY32	41,520	50,589	35,984	37,989	41,520	41,520	50,589	35,984	37,989	41,520
FY33	43,535	53,057	37,688	39,817	43,524	43,535	53,057	37,688	39,817	43,524
FY34	45,653	55,652	39,478	41,738	45,630	45,653	55,652	39,478	41,738	45,630
FY35	47,841	58,333	41,325	43,721	47,805	47,841	58,333	41,325	43,721	47,805
FY36	49,842	60,787	43,008	45,534	49,793	49,842	60,787	43,008	45,534	49,793
FY37	51,895	63,305	44,732	47,392	51,831	51,895	63,305	44,732	47,392	51,831

FY/ Modes	Before Diversion					After Diversion				
	TP01	TP02	TP03	TP04	Average	TP01	TP02	TP03	TP04	Average
FY38	53,998	65,884	46,496	49,295	53,918	53,998	65,884	46,496	49,295	53,918
FY39	56,150	68,524	48,300	51,243	56,054	56,150	68,524	48,300	51,243	56,054
FY40	58,351	71,224	50,142	53,233	58,237	53,944	66,779	50,142	53,233	56,024
FY41	60,458	73,805	51,876	55,121	60,315	54,092	67,382	51,876	55,121	57,118
FY42	62,604	76,432	53,639	57,042	62,429	53,222	66,968	53,639	57,042	57,717
FY43	64,786	79,104	55,428	58,993	64,578	55,113	69,347	55,428	58,993	59,720
FY44	67,002	81,818	57,242	60,974	66,759	57,036	71,764	57,242	60,974	61,754
FY45	69,251	84,571	59,079	62,982	68,971	58,988	74,219	59,079	62,982	63,817
FY46	71,580	87,423	60,980	65,062	71,261	61,012	76,763	60,980	65,062	65,954
FY47	73,993	90,377	62,945	67,214	73,632	63,110	79,400	62,945	67,214	68,167
FY48	76,493	93,438	64,978	69,443	76,088	65,285	82,134	64,978	69,443	70,460
FY49	79,084	96,610	67,081	71,750	78,631	67,541	84,968	67,081	71,750	72,835
FY50	81,768	99,896	69,256	74,140	81,265	69,880	87,906	69,256	74,140	75,295
FY51	84,549	103,302	71,506	76,614	83,993	72,305	90,952	71,506	76,614	77,844
FY52	87,432	106,831	73,834	79,176	86,818	74,820	94,111	73,834	79,176	80,485
FY53	90,419	110,488	76,242	81,830	89,745	77,429	97,387	76,242	81,830	83,222
FY54	93,515	114,279	78,734	84,578	92,777	80,135	100,784	78,734	84,578	86,058
FY55	96,725	118,208	81,312	87,425	95,918	82,941	104,307	81,312	87,425	88,997
CAGR (FY25 to FY45)	4.6%	4.6%	4.4%	4.5%	4.5%	3.7%	3.9%	4.4%	4.5%	4.1%

Table 3-21: Projected Total Traffic (in PCUs) on the Project Road

Being a six laned highway, based on the projected traffic using the recommended Base Case growth rates, none of the toll plazas will reach the designed capacity of 1,20,000 during the tenure of concession period.

4. TOLL REVENUE PROJECTIONS

4.1 Tolling Strategy

The project road has an "Open System" of toll collection which enables the concessionaire to collect tolls from through traffic as well as from short distance one. As mentioned earlier, there are four toll plazas of project corridor which are presented in **Table 4-1**.

S.No	Toll Plaza Name	Chainage
1	TP01 (Madapam TP)	Km 722.170
2	TP02 (Nathavalasa TP)	km 656.704
3	TP03 (Dukkavanipalem TP)	km 686.54
4	TP04 (Marripalem TP)	km 722.17

Table 4-1: Toll Plaza on Project Road Sections

However, as per the Schedule-M notification, Vizag bypass section will operate under a closed tolling system and Schedule A mentions that closed tolling will be implemented within four years of being handed over to InvIT Concessionaire. For analysis purpose, the closed tolling is considered to become operational by FY30. The fee to be levied and collected shall be due and payable at the fee plazas as presented in **Table 4-2**.

S.no	Fee Plaza
1	Main Fee Plaza (Km 686+540 Fee Plaza at Dukkavanipalem Village, Dist. Visakhapatnam)
2	Km 703+921 Fee Plaza at Mudapaka Village, Dist. Visakhapatnam
3	Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam
4	Km 713+880 Fee Plaza at Pinagadi Village, Dist. Visakhapatnam
5	Main Fee Plaza (Km 722+170 Fee Plaza at Marripalem Village, Dist. Visakhapatnam)

Table 4-2: Toll Plaza Locations for Closed Tolling at Vizag Bypass

The vehicle entering from any Interchange Fee Plaza will be recorded at the Entry fee Plaza and user fee will be collected at Exit Interchange Fee Plaza for the road section used by the vehicle between Entry and Exit Fee Plazas.

4.2 Schedule of User Fee

As per Schedule of User Fee for the project, the per km toll rates applicable from 2007-08 for normal tolling length and permanent structures, the revision basis and concessions are provided.

The concessions to traffic have been given in the form of rates as below:

Local traffic

Car / Jeep / Vans - includes local users owning a vehicle registered for non-commercial purposes, residing within a distance of 20 km from the toll plaza and crossing the same for commuting purposes. The discounted fee for these users is currently a monthly pass of Rs. 340.0.

Commercial vehicles - includes local users owning a commercial vehicle (excluding vehicles under National Permit), registered with address on the Registration Certificate

of a particular district and uses such vehicle for commuting on a section of National Highway, permanent bridge, tunnel or bypass, as the case may be, which is located within that district, shall be levied user fee on all toll plazas which are located within that district at the rate of fifty per cent of the prescribed rate of fee (single journey rate). No such concession shall be provided, if a service road or alternative road is available for use by such commercial vehicles. Thus, local commercial traffic has to pay only 50 percent of the normal ticket.

Daily Pass

When the vehicle has to cross the tolled section more than once in a day, the user shall have the option to pay one and half times (1.5 times) of the fee for a single entry; this pass shall be valid for 2 entries within 24 hours of purchase.

Monthly Pass

A user, who makes use of the project road frequently during a month, may opt to purchase a monthly pass upon payment of a charge equal to two-thirds of the fee payable for 50 single journeys; this pass can be used for a maximum 50 one-way journeys over the month of validity.

Thus, the different categories of toll tickets are as follows:

(i) Traffic paying normal toll rates (single trip)
(ii) Traffic paying return journey rates
(iii) Traffic paying monthly pass rates
(iv) Traffic paying local personal rates
(v) Traffic paying local commercial rates

4.3 Tolling Streams

The tolling stream distribution for each toll plaza location has been derived using the respective electronic toll collection (ETC) data of FY25 from April to November. The cash and exemption traffic data for FY25 (April–November) has been added into the ETC traffic distribution for Nathavalasa TP, Dukkavanipalem TP, and Marripalem TP. However, for Madapam TP, cash and exemption traffic data from January 2023 to December 2023 has been considered due to noise in the data from January 2024. The resultant tolling segmentation is presented in **Table 4-3**.

Ticket Type/Modes	Car	LCV	2A Truck	3A Truck	MAV	OSV
TP01- Madapam						
Single	22.2	55.6	54.4	85.2	91.0	100.0
Return	58.4	34.3	21.7	9.1	7.4	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	9.1					
Local commercial	4.4	8.5	23.8	4.6	1.1	
Exempt	5.9	1.6	0.1	1.1	0.4	
Total	100.0	100.0	100.0	100.0	100.0	100.0

Ticket Type/Modes	Car	LCV	2A Truck	3A Truck	MAV	OSV
TP02-Nathavalasa						
Single	35.6	54.5	49.5	82.8	83.0	100.0
Return	62.1	40.4	43.5	16.7	16.3	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	2.0					
Local commercial	0.3	5.0	2.5	0.5	0.7	
Exempt	0.0	0.0	4.5	0.0	0.0	
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP03 - Dukkavanipalem						
Single	51.0	64.7	80.0	88.6	89.7	100.0
Return	38.3	34.9	19.9	11.2	10.1	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	0.5					
Local commercial	0.0	0.0	0.0	0.0	0.1	
Exempt	10.1	0.4	0.1	0.2	0.1	
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP04 - Marripalem						
Single	48.8	67.6	81.6	89.5	89.8	100.0
Return	36.4	31.6	18.2	10.0	10.1	
Monthly	0.0	0.0	0.0	0.0	0.0	
Local personal	0.2					
Local commercial	0.0	0.3	0.1	0.2	0.0	
Exempt	14.5	0.5	0.1	0.4	0.0	
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 4-3: Tolling Distribution Including Exemptions & Violations (in %)

In case of cars, the normal paying car traffic is observed to be highest at TP03 with share of about 51 percent followed by TP04 with about 49 percent and other two toll plaza locations having a share of about 22-36 percent each. While the share of return passenger traffic is higher with about 58 percent at TP01 and 62 percent at TP02.

In case of freight vehicles, about 80-82 percent of 2A trucks are opting for single tickets at TP03 and TP04. While the share of 2A trucks opting for return tickets at TP02 and TP01 is relatively higher with about 43 percent and 22 percent respectively. Local commercial traffic is found to be highest at TP01 which could be the local interactions between Srikakulam and Narsannapeta.

About 85-90 percent of 3A/MAVs are likely to opt for single tickets along the PR except at TP02. At TP02 (Nathavalasa TP), 3A/MAVs opting for single ticket are bit lower with about 82-83 percent and slightly more return traffic.

Trip rate for local pass users is considered as 1.0, for monthly pass it is 1.67 across all modes. For daily pass, trip rate of 2.0 has been considered for all the modes.

From FY30, it is likely that closed tolling will be implemented on Vizag Bypass. In order to arrive at the traffic falling under different interchanges, the relevant streams have been worked out from OD surveys conducted at the TP03 and TP04. The entry exit traffic

stream summary at Dukkavanipalem TP and Marripalem TP under closed tolling is presented in **Table 4-4**.

Stream/ Mode	Car	LCV	2-axle Truck	3-axle Truck	MAV	OSV
TP03 - Dukkavanipalem						
Pendurthi - Mudapaka	19.9	9.4	5.2	2.4	4.8	
Raipur vizag Eway - Adduru Village	5.6	1.8	1.6	1.8	0.5	
Sheelanagar - Pinagadi	13.7	7.2	5.7	6.5	3.9	
TP04 Marripalem (Through)	60.8	81.6	87.5	89.2	90.7	100.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP04 - Marripalem						
TP03 Dukkavanipalem (Through)	44.3	79.9	86.2	88.2	91.4	100.0
Pendurthi- Mudapaka	27.5	4.1	5.7	5.8	1.7	
Raipur-Vizag Exp- Adduru	6.6	1.3	1.2	1.6	1.4	
Sheelanagar - Pinagadi	21.6	14.6	6.8	4.5	5.5	
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 4-4: Entry Exit Traffic Stream Summary at TP03 & TP04

For tolling segmentation at these two plazas of Vizag bypass, the segmentation presented in **Table 4-3** after adjusting the local traffic in return ticket has been adopted since it less likely that users would opt for local concessions in case of closed tolling. The adopted closed tolling segmentation from FY30 onwards is presented in **Table 4-5**.

Ticket Type/Modes	Car	LCV	2A Truck	3A Truck	MAV	OSV
TP03 - Dukkavanipalem						
Single	51.0	64.7	80.0	88.6	89.7	100.0
Return	38.9	34.9	19.9	11.2	10.3	
Exempt	10.1	0.4	0.1	0.2	0.1	
Total	100.0	100.0	100.0	100.0	100.0	100.0
TP04 - Marripalem						
Single	48.8	67.6	81.6	89.5	89.8	100.0
Return	36.7	31.9	18.3	10.1	10.1	
Exempt	14.5	0.5	0.1	0.4	0.0	
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 4-5: Tolling Distribution for Closed Tolling

Additionally, after completion of Raipur Vizag Expressway, there will be some traffic which would use only Aduru to Pinagadi section for reaching Vizag Port and pay for only 4 km length. It is likely that this long-distance traffic traffic will opt for single tickets rather than return. The segmentation adopted for Aduru to Pinagadi ticket type is presented in **Table 4-6**.

Ticket Type/Modes	Car	LCV	2A Truck	3A Truck	MAV	OSV
Single	95.0	95.0	95.0	95.0	95.0	95.0
Return	5.0	5.0	5.0	5.0	5.0	5.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 4-6: Tolling Distribution for Aduru to Pinagadi

4.4 Toll Rates

This section presents details on the toll rates that are likely to be imposed on the users of the project road during the study period. The toll rates (Rs/km) for the base year 2007-08 for different vehicle categories as per toll fee rules are presented in **Table 4-7**.

Mode	Base rate per km (in Rs)
CJV	0.65
LCV	1.05
2A Truck	2.20
3ATruck	2.40
MAV	3.45
OSV	4.20
Local Passenger Traffic	150

Table 4-7: Toll Rates in Rs/km for Different Vehicle Categories

The toll notification states that the 2007 toll rates shall be increased without compounding by three per cent each year with effect from the 1st day of April 2008 and such increased rate shall be deemed to be the base rate for the subsequent years.

In addition to this, the rate of fee for use of bypass forming part of a section of a National Highway constructed with a cost of Rs 10 crore or more, for the base year 2007, shall be one and a half times of the per km base rates specified above and the length of such bypass shall be excluded from the length of such section of National Highway. Also, the fee levied and collected hereunder for permanent bridge/ structures, as the case may be, having a length of 60 m or more on the basis of the equivalent length for structure as specified shall be due and payable at the toll plaza.

The existing tolling lengths being charged at the toll plazas with details of normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths in FY24 is presented in **Table 4-8**.

TP	TP01	TP02	TP03	TP04
Base Length				
Normal	48.105	65.707	16.776	19.169
Bypass	4.470	0.000	6.311	5.499
Eq structure	1.195	0.837	0.433	0.417
Total Length	53.770	66.544	23.520	25.085
Tolling Length				
Tolling Length	66.76	74.077	30.0325	31.5875

Table 4-8: Existing Tolling Lengths (Km) for the Toll Plazas for FY24

The Schedule M lengths have been considered from FY25 onwards. The details of normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being/ to be charged at the toll plazas from FY25 onwards as per the Schedule - M notification are presented in **Table 4-9**.

SCH M Tolling Lengths (FY25 onwards)					
TP	TP01		TP02	TP03	TP04
	Before Construction (FY25 – till 30th Sept in FY28)	After Construction (from 1st October FY28)			
Base Length					
Normal	48.105	47.339	65.691	16.776	19.169
Bypass	4.47	4.470	0.000	6.311	5.499
Eq structure	1.195	1.990	0.853	0.433	0.417
Total Length	53.77	53.799	66.544	23.520	25.085
Tolling Length					
Tolling Length	66.76	73.944	74.2174	30.5725	31.5875

Table 4-9: Schedule – M Tolling Lengths (Km) for the Toll Plazas

The net effective length for which fee shall be due and payable in closed tolling section from FY30 onwards is presented in **Table 4-10**.

Distance matrix for total Tollable road length (Including equivalent length of structures >60 m length)						
From	To	Km 686+540 Fee Plaza at Dukkavanipalem Village, Dist. Visakhapatnam	Km 703+921 Fee Plaza at Mudapaka Village, Dist. Visakhapatnam	Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam	Km 713+880 Fee Plaza at Pinagadi Village, Dist. Visakhapatnam	Km 722+170 Fee Plaza at Marripalem Village, Dist. Visakhapatnam
	Km	682.980	703.921	711.050	713.880	731.585
Km 686+540 Fee Plaza at Dukkavanipalem Village, Dist. Visakhapatnam	682.980	0.000	22.840	32.588	36.777	56.255
Km 703+921 Fee Plaza at Mudapaka Village, Dist. Visakhapatnam	703.921	22.840	0.000	9.748	13.937	33.415
Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam	711.050	32.588	9.748	0.000	4.189	23.667
Km 713+880 Fee Plaza at Pinagadi Village, Dist. Visakhapatnam	713.880	36.777	13.937	4.189	0.000	19.478
Km 722+170 Fee Plaza at Marripalem Village, Dist. Visakhapatnam	731.585	56.255	33.415	23.667	19.478	0.000

Table 4-10: Distance Matrix for Total Tollable Road Length (Including equivalent length of structures >60 m length) Under Closed Tolling on Vizag Bypass

The various types of traffic movements for which the user fee will be charged on the basis of actual distance travelled in closed tolling section is presented in **Table 4-11**.

Sno.	Km	Entry from	Exit to
Traffic plying on LHS from Anandapuram to Anakapalli			
1	686+540	Main Fee Plaza (Km 686+540 Fee Plaza at Dukkavanipalem Village, Dist. Visakhapatnam)	Km 703+921 Fee Plaza at Mudapaka Village, Dist. Visakhapatnam
			Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam
			Km 713+880 Fee Plaza at Pinagadi Village, Dist. Visakhapatnam
			Km 722+170 Fee Plaza at Marripalem Village, Dist. Visakhapatnam
2	703+921	Km 703+921 Fee Plaza at Mudapaka Village, Dist. Visakhapatnam	Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam
			Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam Km 713+880 Fee Plaza at Pinagadi Village, Dist. Visakhapatnam Km 722+170 Fee Plaza at Marripalem Village, Dist. Visakhapatnam
			Visakhapatnam Km 722+170 Fee Plaza at Marripalem Village, Dist. Visakhapatnam
3	711+050	Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam	Km 713+880 Fee Plaza at Pinagadi Village, Dist. Visakhapatnam
			Km 722+170 Fee Plaza at Marripalem Village, Dist. Visakhapatnam
4	713+880	Km 713+880 Fee Plaza at Pinagadi Village, Dist. Visakhapatnam	Km 722+170 Fee Plaza at Marripalem Village, Dist. Visakhapatnam
Traffic plying on RHS from Anakapalli to Anandapuram			
1	722+170	Main Fee Plaza (Km 722+170) Fee Plaza at Marripalem Village, Dist. Visakhapatnam)	Km 713+880 Fee Plaza at Pinagadi Village, Dist. Visakhapatnam
			Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam
			Km 703+921 Fee Plaza at Mudapaka Village, Dist. Visakhapatnam
			Km 686+540 Fee Plaza at Dukkavanipalem Village, Dist. Visakhapatnam
2	713+880	Km 713+880 Fee Plaza at Pinagadi Village, Dist. Visakhapatnam	Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam
			Km 703+921 Fee Plaza at Mudapaka Village, Dist. Visakhapatnam
			Km 686+540 Fee Plaza at Dukkavanipalem Village, Dist. Visakhapatnam
3	711+050	Km 711+050 Fee Plaza at Adduru village, Dist. Visakhapatnam	Km 703+921 Fee Plaza at Mudapaka Village, Dist. Visakhapatnam
			Km 686+540 Fee Plaza at Dukkavanipalem Village, Dist. Visakhapatnam
4	703+921	Km 703+921 Fee Plaza at Mudapaka Village, Dist. Visakhapatnam	Km 686+540 Fee Plaza at Dukkavanipalem Village, Dist. Visakhapatnam

Table 4-11: Traffic Movements for User Fee Collection Under Closed Tolling on Vizag Bypass

The applicable base rates shall be revised annually with effect from April 1 each year to reflect the increase in wholesale price index for the month of December of the immediate preceding year in which such revision is undertaken but such revision shall be restricted for 40 percent of the increase in wholesale price index.

Actual WPI information for December 2024 of 155.4 under 2011-12 series converted into 1999-00 series (155.4*1.873*1.641=477.636) has been used. WPI increase of 4.5 is considered for December 2025 (for FY27) & December 2026 (for FY28), while WPI forecast for remaining years beyond December 2027 has been considered as 3.5 percent as provided by the client.

The stream of existing toll rates being charged at each of the toll plazas of the project road is presented in **Table 4-12**.

TP/Mode	Car	LCV	2A Truck	3A Truck	MAV	OSV
TP01- Madapam	100	160	330	360	520	635
TP02-Nathavalasa	110	175	370	400	575	700
TP03- Dukkavanipalem	45	70	150	165	235	285
TP04-Marripalem	45	75	155	170	245	300

**-FY25 toll rates revised on 3rd June*

Table 4-12: Existing Toll Rates

The stream of toll rates likely to be charged basis schedule -M lengths and adopted WPI assumptions at the toll plazas of the project road in cardinal years till FY55 is presented in **Table 4-13.** The toll fee has been rounded to nearest 5 Rupees as per toll fee rules.

FY End	Car/ MLCV	LCV/ M Bus	Bus / 2A Truck	3A Truck	MAV	OSV	Car Local
TP01-Madapam							
2025	100	160	330	360	520	635	340
2030	135	215	450	490	710	860	415
2035	165	265	550	600	865	1,050	510
2040	200	320	675	735	1,055	1,285	620
2045	245	390	820	895	1,290	1,570	760
2050	295	480	1,005	1,095	1,575	1,915	925
2055	365	585	1,225	1,340	1,925	2,345	1,130
TP02-Nathavalasa							
2025	110	175	370	400	580	705	340
2030	135	215	455	495	710	865	415
2035	165	265	555	605	870	1,055	510
2040	200	320	675	735	1,060	1,290	620
2045	245	395	825	900	1,295	1,575	760
2050	300	480	1,010	1,100	1,580	1,925	925
2055	365	590	1,230	1,345	1,930	2,350	1,130
TP03- Dukkavanipalem							
2025	45	70	150	165	240	290	340
2030	55	90	185	205	295	355	415
2035	65	110	230	250	355	435	510
2040	80	135	280	305	435	530	620
2045	100	160	340	370	535	650	760
2050	125	200	415	455	650	790	925
2055	150	240	505	555	795	970	1,130
TP04-Marripalem							
2025	45	75	155	170	245	300	340
2030	55	90	195	210	300	370	415
2035	70	110	235	255	370	450	510
2040	85	135	285	315	450	550	620
2045	105	170	350	385	550	670	760
2050	125	205	430	470	675	820	925
2055	155	250	525	570	820	1,000	1,130

**-FY25 toll rates revised on 3rd June*

Table 4-13: Toll Rates at Project Road Toll Plazas in Rs

The users purchasing return journey tickets will pay 1.5 times the above toll rates; the traffic opting for monthly passes will pay 33.3 times (two-thirds of 50 single journeys) the normal traffic toll rates. All passes have been rounded to the nearest 5 Rupees as per fee rules.

4.5 Toll Revenue Estimates

The total combined assured remittance amount for FY25 for the project road toll plazas is Rs. 3,267.7 million as against the modelled revenue of Rs 3,343.2 million making it 2.3 percent higher than the actual remittance as presented in **Table 4-14.**

	TP01 - Madapam	TP02- Nathavalasa	TP03 and TP04 (Vizag Bypass)	Total
Actual Remittance	977.8	1,422.0	867.9	3,267.7
FY25 Revenue (Model)	1,019.6	1,417.2	906.4	3,343.2
Variation	4.3%	-0.3%	4.4%	2.3%

Table 4-14: Remittance vs Estimated Revenue Comparison for FY25

The realised ETC revenue for FY24 is Rs. 2,996.9 million and Rs. 2,159.8 million has been achieved during FY25 (8 months) for the project road. The past revenue for each toll plaza location is presented in **Table 4-15**.

FY/TP	TP01 – Madapam	TP02 – Nathavalasa	TP03 – Dukkavanipalem	TP04 - Marripalem	Total
FY23 (9 months)	462.8	687.0	136.2	119.7	1,405.7
FY24	952.0	1,292.4	375.8	376.8	2,996.9
FY25 (8 months)	666.5	900.6	286.0	306.8	2,159.8

Table 4-15: Past ETC Revenue (in Rs. million)

As per the site findings, WIM is installed in all lanes at three out of the four toll plazas, except at Dukkavanipalem TP. However, a weighbridge is available at all toll plaza locations, and no overloading charges are currently being applied.

In view of this, 7- day axle load survey data has been provided by the technical consultants of the client which has been analysed to understand the extent of overloaded vehicles at four toll plaza locations. The analysis shows similar overloading trends across the seven days. The findings of the overloading analysis are presented in **Table 4-16**.

OVERLOADING DISTRIBUTION (BOTH DIRECTIONS)							
Mode	Within Permissible Limit	Within Tolerance upto 5%	>5%-<10%	>10%-<20%	>20%	Total	>20%* (ADOPTED)
TP01 - Madapam							
LCV	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
2A	99.3%	0.6%	0.0%	0.1%	0.0%	100.0%	
3A	94.9%	2.5%	1.1%	1.2%	0.3%	100.0%	0.1%
MAV	58.4%	9.3%	8.2%	10.4%	13.7%	100.0%	3.8%
TP02 – Nathavalasa							
LCV	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
2A	99.9%	0.0%	0.0%	0.1%	0.0%	100.0%	

OVERLOADING DISTRIBUTION (BOTH DIRECTIONS)							
Mode	**Within Permissible Limit**	**Within Tolerance upto 5%**	**>5%-<10%**	**>10%-<20%**	**>20%**	**Total**	**>20%* (ADOPTED)**
3A	92.7%	3.2%	2.4%	0.9%	0.8%	100.0%	0.5%
MAV	70.5%	6.6%	6.9%	8.0%	8.0%	100.0%	1.8%
TP03 – Dukkavaniplaem							
LCV	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
2A	99.6%	0.4%	0.1%	0.0%	0.0%	100.0%	
3A	90.4%	3.0%	2.2%	3.7%	0.6%	100.0%	0.1%
MAV	70.1%	8.0%	6.2%	8.2%	7.5%	100.0%	1.2%
TP04 – Marripalem							
LCV	99.6%	0.2%	0.2%	0.0%	0.0%	100.0%	
2A	99.1%	0.3%	0.4%	0.1%	0.0%	100.0%	
3A	91.8%	3.6%	1.9%	1.8%	0.8%	100.0%	0.3%
MAV	68.2%	8.2%	6.4%	7.6%	9.6%	100.0%	1.6%

Table 4-16: Overloaded Vehicles on the PR

As observed from the seven-day axle load analysis, around 14 percent of MAVs at TP01 and 8-10 percent of MAVs each at remaining three TPs are above 20 percent overloading limit. Additionally, around 0.3 percent 3A trucks at TP01 and around 0.6-0.8 percent 3A trucks each at other three TPs are exceeding this limit.

However, the commodities such as fruits and vegetables, petroleum products, chemicals and gas, heavy machinery and industrial equipment as well as OD pairs with lead greater than 500 km are less likely to be overloaded. The revised overloading percentage after excluding these commodities in the category of above 20 percent overloading comes out to be around 4 percent MAVs at TP01 and less than 2 percent MAVs at each toll plaza location and less than 1 percent of 3A trucks fall into the revised overloading category which has been adopted for the further analysis.

The overloading vehicles are liable to pay the overloading penalty as per the provisions of the concession agreement. The concession agreement of the latest TOT project states that overloading penalty should be charged as per the NHAI overloading circular. As per the amended National Highways Fee (Determination of Rates and Collection) Rules, 2018, "the driver or owner or person in charge of a mechanical vehicle shall be liable to pay fee, for entering the overloaded vehicle on the National Highway, to the user fee collecting agency, equal to fees as presented in **Table 4-17**.

Percentage of excess load over Maximum Permissible Gross Vehicular Weight	**Multiplying factor to base rate fees**	**Fees**
0% to 20%	Two	[(Fees applicable for such category of mechanical vehicle under sub-rule (2) of rule 4) X (Multiplying factor)]
>20% to 40%	Four	
>40% to 60%	Six	
>60% to 80%	Eight	
>80% and above	Ten	

Table 4-17: User Fee for Overloaded Vehicles

However, as per the operational overloading practices at the toll plazas where overloading penalty is being charged, it is either the next higher category toll or two times the normal fee which is usually being collected.

Continuing with the practice of two times toll, since MAVs are heavily overloaded, with WIM in place at the toll plaza locations, the practice of charging them for one-time extra payment can be put in place. Even if 20 percent of these 3A Trucks and MAVs pay one time extra, it will result in a substantial gain in revenue, but it might not be practically possible to stop each vehicle and collect extra toll.

Although the quantum of overloaded vehicles is high but after factoring in the practical number of vehicles from whom overloading can be charged, under a more pragmatic scenario, it is assumed that around 25 percent of the overloaded category is charged for one-time additional payment. This results in around less than 1 percent of 3A & MAV AADT of FY25 at each toll plaza location are paying one-time extra toll. With appointed date likely to be achieved in middle of FY26 and considering the time required for putting the systems in place for overloading revenue collection, this additional revenue from overloaded vehicles is considered from FY27. The estimated total revenue from overloading in FY27 is Rs 14.3 million (Rs 7.3 million at TP01, Rs 4.6 million at TP02, Rs 1.0 million at TP03 and Rs 1.4 million at TP04).

However, with strict overloading compliance in place in the future years, the overloading percentages are likely to decline over the years of concession - a decline of 1 percent every year has been considered starting from FY28 onwards.

The year-on-year revenue from overloading is presented in **Table 4-18**.

Financial Year (FY) ending March	TP01	TP02	Total
2027	7.3	4.6	11.2
2028	6.0	2.2	8.2
2029	4.2	0.0	4.2
2030	2.1	0.0	2.1
2031 and beyond	0.0	0.0	11.2

Table 4-18: Overloading Revenue in Rs Million

At present, since overloading is being collected at Laxmipuram TP and Karapadu TP (Safeway concessions of TOT Bundle 1) which are above Madapam TP, it may be possible to collect overloading charges at Madapam and Nathavalasa TPs. In case of Vizag Bypass plazas, it may not be plausible to collect overloading as truckers may choose to go through the city via AH-45 to avoid payment of overloading charges. Therefore, the overloading revenue has been considered for Madapam and Nathavalasa TPs and presented as a scenario in toll revenue estimation.

4.6 Toll Revenue Projections

Toll revenue streams have been calculated assuming that:

- Toll would be collected for all 365 days in a year and for 366 days in a leap year
- Toll revenues have been presented from FY25 to FY55 in line with the maximum extendable concession period of 30 years

The toll revenue for each of the toll plaza and total corridor for the base case is presented in **Table 4-19**.

FY	TP01	TP02	TP03 & TP04 (Vizag Bypass)	Total
FY25	1,019.6	1,417.6	912.2	3,349.3
FY26	1,120.6	1,555.1	998.8	3,674.5
FY27	1,244.0	1,721.4	1,114.0	4,079.4
FY28	1,457.2	1,918.7	1,240.0	4,615.9
FY29	1,680.1	2,107.7	1,354.8	5,142.6
FY30	1,841.4	2,309.1	1,520.4	5,670.9
FY31	2,004.4	2,519.3	1,655.8	6,179.5
FY32	2,188.5	2,749.9	1,810.6	6,749.0
FY33	2,385.3	2,988.1	1,961.5	7,334.9
FY34	2,596.9	3,264.1	2,142.7	8,003.7
FY35	2,831.6	3,570.6	2,340.7	8,743.0
FY36	3,075.4	3,875.5	2,531.1	9,482.0
FY37	3,313.0	4,178.3	2,730.1	10,221.4
FY38	3,589.9	4,530.0	2,955.6	11,075.5
FY39	3,877.3	4,903.5	3,186.9	11,967.7
FY40	3,860.1	4,960.3	3,463.4	12,283.8
FY41	3,992.3	5,175.5	3,710.8	12,878.6
FY42	4,066.1	5,328.4	3,990.6	13,385.1
FY43	4,368.1	5,739.5	4,299.6	14,407.2
FY44	4,714.9	6,203.0	4,622.2	15,540.0
FY45	5,054.2	6,654.4	4,959.6	16,668.2
FY46	5,431.2	7,152.3	5,321.4	17,904.9
FY47	5,835.5	7,689.5	5,714.6	19,239.5
FY48	6,293.2	8,296.2	6,156.1	20,745.6
FY49	6,742.8	8,906.2	6,589.3	22,238.4
FY50	7,252.9	9,582.3	7,085.5	23,920.7
FY51	7,813.2	10,308.4	7,592.4	25,714.0
FY52	8,403.8	11,127.2	8,210.4	27,741.5
FY53	9,020.0	11,945.6	8,781.7	29,747.3
FY54	9,726.5	12,852.0	9,427.8	32,006.3
FY55	10,455.1	13,826.9	10,137.5	34,419.5

Table 4-19: Toll Plaza wise Toll Revenue in Rs Million

Majority of the revenue is expected to come from TP02 with about 40.5 percent of the total revenue from all the combined four toll plazas. Amongst other toll plazas, TP01 represent a share of around 31.6 percent of total revenue, while TP03 and TP04 collectively contribute the remaining 27.9 percent.

On the total revenue, vehicles paying normal tolls are 78.3 percent of total toll revenues for the project road sections and 20.2 percent of the traffic may opt for daily pass category. Remaining 1.5 percent may fall in monthly pass and local concession category.

The toll revenue by mode in percentage for all the toll plazas and total corridor for the base case is presented in **Table 4-20**.

Toll Plaza	Car	LCV	2-axle Truck	3-axle Truck	MAV	OSV	Total
TP 01- Madapam	18.7	1.6	16.0	9.2	54.3	0.1	100.0
TP 02- Nathavalasa	21.0	1.7	14.9	8.2	54.0	0.1	100.0
TP 03-Dukkavanipalem	11.6	1.9	13.9	9.9	62.5	0.1	100.0
TP 04- Marripalem	12.4	1.6	11.8	8.7	65.4	0.1	100.0
Total Corridor	18.1	1.7	14.7	8.8	56.5	0.1	100.0

Table 4-20: Toll Revenue (in %) for the Project Road by Mode

Majority of the revenue is expected to come from MAVs for all the four toll plazas with about 56.6 percent for the project road as a whole. Amongst other categories, car represents a share of around 18.1 percent of total revenue followed by 14.7 percent by 2A Trucks, and about 8.8 percent by 3A Trucks. LCV/Mini-Bus category is likely to generate about 1.7 percent revenue.

4.7 Scenario Analysis

For toll road projects, revenue streams are generally based on the assessment of the traffic volume (base and future) crossing the toll plazas and the applicable toll imposed on the user of the road. There is an inherent element of uncertainty in any forecast and whilst is not possible to measure risk in a strictly statistical sense (as many of the risks are largely or partly unknown), in this section an attempt is made at quantifying the main risks that could have an impact on this forecast.

The econometric approach used to derive traffic growth, is based on the estimation of GSDP growth rates for the influence area economies and traffic demand elasticity by mode; the estimation of both variables contains a certain degree of uncertainty which can be represented in the scenario analysis. Scenario analysis has been done in the following subheadings for the base case:

High Case

The high case is based on a more optimistic economic outlook for future years and higher elasticity values as compared to the base case. Therefore, traffic growth rates of 20 percent higher than the base case for every year and for all the mode are considered.

Low Case

A growth rate of 20 percent lower than base case for all types of vehicles has been considered in the present analysis to reflect uncertainty with regard to economic performance of PIA states and lower elasticity values.

With Overloading Revenue at Madapam and Nathavalasa

As mentioned above, this scenario includes the overloading revenue from Madapam and Nathavalasa TPs.

The results of different scenarios are presented in **Table 4-21**. A comparison versus base case has been presented for the Present Value of the project (at 12 percent discount rate) and the compounded annual growth rate (CAGR) from FY25 to FY45/FY55.

FY End	Base without overloading- Closed tolling from FY30	High Growth (+20%)	Low Growth (-20%)	With Overloading at Madapam and Nathavalasa
2025	3,349.3	3,349.3	3,349.3	3,349.3
2026	3,674.5	3,716.3	3,632.6	3,674.5
2027	4,079.4	4,172.5	3,987.4	4,090.6
2028	4,615.9	4,775.0	4,460.5	4,624.0
2029	5,142.6	5,378.3	4,915.1	5,146.8
2030	5,670.9	5,991.2	5,365.1	5,673.0
2031	6,179.5	6,588.9	5,792.6	6,179.5
2032	6,749.0	7,262.4	6,268.5	6,749.0
2033	7,334.9	7,966.4	6,749.7	7,334.9
2034	8,003.7	8,773.9	7,296.9	8,003.7
2035	8,743.0	9,673.3	7,897.5	8,743.0
2036	9,482.0	10,576.0	8,496.3	9,482.0
2037	10,221.4	11,491.9	9,086.3	10,221.4
2038	11,075.5	12,551.0	9,768.4	11,075.5
2039	11,967.7	13,667.8	10,473.9	11,967.7
2040	12,283.8	14,142.9	10,664.1	12,283.8
2041	12,878.6	14,935.0	11,100.7	12,878.6
2042	13,385.1	15,635.7	11,454.1	13,385.1
2043	14,407.2	16,945.7	12,245.0	14,407.2
2044	15,540.0	18,402.4	13,119.4	15,540.0
2045	16,668.2	19,870.4	13,979.1	16,668.2
2046	17,904.9	21,487.0	14,917.9	17,904.9
2047	19,239.5	23,243.7	15,924.0	19,239.5
2048	20,745.6	25,231.4	17,057.2	20,745.6
2049	22,238.4	27,229.9	18,163.1	22,238.4
2050	23,920.7	29,488.9	19,406.9	23,920.7
2051	25,714.0	31,916.5	20,721.8	25,714.0
2052	27,741.5	34,669.6	22,205.0	27,741.5
2053	29,747.3	37,430.9	23,650.7	29,747.3
2054	32,006.3	40,552.8	25,273.9	32,006.3
2055	34,419.5	43,911.3	26,995.9	34,419.5
PV12 FY25 till FY45	50,480.0	55,080.3	46,369.1	50,496.6
PV12 till FY45 vs base		9.1%	-8.1%	0.03%
CAGR FY25 to FY45	8.4%	9.3%	7.4%	8.4%
PV12 FY25 till FY55	62,884.1	70,393.8	56,422.0	62,900.7
PV12 till FY55 vs base		11.9%	-10.3%	0.03%
CAGR FY25 to FY55	8.1%	9.0%	7.2%	8.1%

Table 4-21: Comparison of Base Revenues to Alternate Traffic Growth Assumptions for the Total Corridor (in Rs. million)

The high case scenario has a positive increase on revenue PV of about 9.1 percent versus base case (till FY45) whereas low case may result in a lower PV than base case by 8.1 percent. The revenue from overloading scenario is marginally higher than the base case by 0.03 percent.

The project road revenues will have a CAGR of 8.4 percent for the period up to FY45 under the base case.

APPENDICES

APPENDIX 2.1
MONTH ON MONTH PAST TRAFFIC DATA

Traffic Study for Narsannapeta - Anakapalli Section of NH-16 in the State of Andhra Pradesh

Month on Month Past Traffic Data

Madapam TP								
Month	**CJV**	**LCV**	**2-Axle**	**3-Axle**	**MAV**	**OSV**	**Total Traffic**	**PCUs**
Apr-22	4,645	395	1,646	1,237	2,696	3	10,621	26,029
May-22	5,291	404	1,657	1,166	2,651	3	11,171	26,306
Jun-22	5,012	401	1,566	1,186	2,632	3	10,800	25,726
Jul-22	4,317	365	1,497	1,078	2,695	3	9,955	24,729
Aug-22	4,868	370	1,508	1,049	2,594	4	10,393	24,784
Sep-22	4,105	382	1,513	1,090	2,606	4	9,701	24,233
Oct-22	4,337	336	1,440	1,016	2,443	4	9,577	23,224
Nov-22	4,282	387	1,446	1,090	2,683	3	9,891	24,556
Dec-22	4,635	390	1,487	1,080	2,603	2	10,198	24,645
Jan-23	4,929	335	1,526	1,114	2,609	2	10,515	25,099
Feb-23	5,404	394	1,666	1,182	2,749	3	11,398	26,921
Mar-23	5,147	413	1,646	1,148	2,756	2	11,112	26,558
Apr-23	5,026	425	1,772	1,143	2,737	4	11,106	26,740
May-23	6,329	402	1,740	1,125	2,765	2	12,363	27,978
Jun-23	5,754	396	1,680	1,052	2,658	3	11,542	26,515
Jul-23	4,777	385	1,596	1,049	2,638	2	10,447	25,172
Aug-23	4,955	377	1,606	995	2,631	3	10,568	25,179
Sep-23	4,996	372	1,608	1,024	2,811	3	10,815	26,116
Oct-23	5,108	378	1,648	1,031	2,936	3	11,104	26,939
Nov-23	4,862	374	1,535	1,061	2,859	2	10,693	26,087
Dec-23	5,382	388	1,583	1,066	2,776	4	11,199	26,419
Jan-24	5,626	346	1,585	1,036	2,672	4	11,270	26,053
Feb-24	5,902	426	1,776	1,098	3,032	4	12,237	28,824
Mar-24	5,775	427	1,850	1,165	3,043	3	12,262	29,165
Apr-24	5,744	409	1,841	1,083	2,972	3	12,051	28,515
May-24	5,656	381	1,829	1,084	3,032	4	11,987	28,631
Jun-24	5,412	393	1,765	1,015	2,805	2	11,392	26,971
Jul-24	4,938	385	1,724	992	2,704	2	10,744	25,838
Aug-24	5,701	397	1,745	986	2,742	3	11,574	26,841
Sep-24	4,720	409	1,772	1,025	2,909	3	10,837	26,826
Oct-24	5,743	388	1,800	998	2,964	2	11,895	28,067
Nov-24	5,304	410	1,705	1,022	3,024	3	11,467	27,720

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Month on Month Past Traffic Data

Nathavalasa TP								
Month	CJV	LCV	2-Axle	3-Axle	MAV	OSV	Total Traffic	PCUs
Apr-22	5,430	470	1,837	1,280	3,186	3	12,207	29,839
May-22	6,152	507	1,937	1,241	3,167	2	13,006	30,710
Jun-22	6,101	510	1,915	1,210	3,231	3	12,969	30,792
Jul-22	5,250	475	1,820	1,136	3,110	3	11,795	28,840
Aug-22	5,847	469	1,849	1,130	2,990	5	12,289	28,964
Sep-22	4,918	459	1,810	1,132	2,955	4	11,278	27,747
Oct-22	5,184	418	1,755	1,051	2,750	3	11,162	26,622
Nov-22	5,050	466	1,717	1,090	3,150	4	11,477	28,363
Dec-22	5,675	489	1,755	1,155	3,101	3	12,178	29,107
Jan-23	6,174	443	1,859	1,156	3,026	3	12,660	29,513
Feb-23	6,175	489	1,950	1,229	3,243	3	13,089	31,052
Mar-23	5,809	504	1,933	1,229	3,242	3	12,719	30,651
Apr-23	5,745	519	2,028	1,209	3,311	4	12,815	31,151
May-23	7,067	524	2,032	1,144	3,281	4	14,052	32,163
Jun-23	6,563	512	1,971	1,103	3,286	3	13,439	31,357
Jul-23	5,637	485	1,895	1,108	3,170	3	12,299	29,653
Aug-23	5,853	489	1,877	1,070	3,062	3	12,354	29,222
Sep-23	5,816	477	1,868	1,096	3,250	4	12,510	30,062
Oct-23	6,100	501	1,938	1,136	3,704	3	13,382	32,759
Nov-23	5,647	483	1,801	1,164	3,882	4	12,980	32,751
Dec-23	6,199	508	1,858	1,176	3,942	5	13,687	33,822
Jan-24	6,658	470	1,958	1,171	3,817	5	14,080	33,952
Feb-24	6,790	533	2,043	1,199	4,026	4	14,595	35,452
Mar-24	6,771	544	2,123	1,228	3,677	3	14,346	34,201
Apr-24	6,558	534	2,073	1,150	3,499	4	13,817	32,789
May-24	6,634	516	2,108	1,146	3,543	4	13,950	33,130
Jun-24	6,528	516	2,059	1,112	3,560	3	13,778	32,848
Jul-24	5,967	495	1,992	1,102	3,680	3	13,238	32,562
Aug-24	6,799	500	2,037	1,086	3,491	4	13,917	32,646
Sep-24	5,606	496	2,056	1,123	3,717	4	13,002	32,631
Oct-24	6,698	486	2,130	1,111	3,570	3	13,998	33,229
Nov-24	6,156	488	1,989	1,151	3,779	4	13,568	33,332

Traffic Study for Narsannapeta - Anakapalli Section of NH-16 in the State of Andhra Pradesh

Month on Month Past Traffic Data

Dukkavanipalem TP								
Month	CJV	LCV	2-Axle	3-Axle	MAV	OSV	Total Traffic	PCUs
Apr-22	1,728	356	941	1,118	2,359	4	6,505	19,068
May-22	1,998	376	966	1,096	2,388	2	6,826	19,505
Jun-22	1,966	381	936	1,093	2,528	2	6,905	20,005
Jul-22	1,634	362	912	1,049	2,560	4	6,520	19,595
Aug-22	1,723	337	898	986	2,351	6	6,301	18,487
Sep-22	1,365	340	918	1,014	2,335	4	5,975	18,193
Oct-22	1,271	265	761	864	1,971	2	5,135	15,425
Nov-22	1,318	288	780	915	2,247	3	5,551	16,958
Dec-22	1,503	308	793	948	2,281	3	5,835	17,464
Jan-23	1,696	284	800	935	2,237	2	5,953	17,400
Feb-23	1,654	333	917	1,009	2,484	2	6,399	19,120
Mar-23	1,798	390	1,022	1,077	2,593	3	6,883	20,361
Apr-23	1,983	421	1,169	1,069	2,624	3	7,269	21,148
May-23	2,698	436	1,148	1,080	2,767	2	8,131	22,499
Jun-23	2,544	451	1,132	1,052	2,798	3	7,980	22,376
Jul-23	2,301	435	1,114	1,058	2,729	4	7,641	21,769
Aug-23	2,466	435	1,109	1,045	2,679	4	7,737	21,652
Sep-23	2,499	421	1,150	1,071	2,951	3	8,095	23,087
Oct-23	2,776	444	1,194	1,078	3,108	4	8,605	24,263
Nov-23	2,653	430	1,086	1,083	2,994	3	8,248	23,291
Dec-23	2,999	455	1,154	1,088	2,965	3	8,664	23,764
Jan-24	3,159	410	1,123	1,062	2,872	3	8,629	23,266
Feb-24	3,073	463	1,319	1,143	3,222	3	9,224	25,669
Mar-24	2,995	480	1,389	1,176	3,296	2	9,337	26,250
Apr-24	2,945	471	1,381	1,126	3,255	4	9,182	25,838
May-24	3,001	465	1,377	1,112	3,140	5	9,100	25,317
Jun-24	2,817	439	1,299	1,026	2,810	3	8,394	23,111
Jul-24	2,517	420	1,232	989	2,708	3	7,869	22,009
Aug-24	3,055	445	1,260	999	2,770	3	8,533	22,982
Sep-24	2,490	458	1,322	1,067	2,979	4	8,320	23,769
Oct-24	3,176	465	1,308	1,026	2,967	3	8,946	24,244
Nov-24	2,939	458	1,216	1,088	3,270	4	8,974	25,270

Traffic Study for Narsannapeta - Anakapalli Section of NH-16 in the State of Andhra Pradesh

Month on Month Past Traffic Data

Marripalem TP								
Month	CJV	LCV	2-Axle	3-Axle	MAV	OSV	Total Traffic	PCUs
Apr-22	2,182	369	940	1,136	2,340	3	6,970	19,510
May-22	2,492	385	957	1,090	2,320	3	7,245	19,659
Jun-22	2,423	376	919	1,082	2,417	3	7,219	19,878
Jul-22	1,874	350	866	1,009	2,387	4	6,489	18,779
Aug-22	2,043	329	863	974	2,273	3	6,485	18,290
Sep-22	1,596	325	876	989	2,227	4	6,018	17,719
Oct-22	1,484	263	763	874	1,944	2	5,330	15,547
Nov-22	1,568	282	768	920	2,176	1	5,716	16,854
Dec-22	1,783	302	781	960	2,239	3	6,068	17,547
Jan-23	1,851	273	739	951	2,208	1	6,024	17,274
Feb-23	1,741	314	865	1,012	2,414	2	6,347	18,711
Mar-23	2,097	377	978	1,073	2,521	1	7,047	20,166
Apr-23	2,378	415	1,145	1,081	2,605	3	7,627	21,414
May-23	3,001	424	1,105	1,072	2,658	2	8,261	22,137
Jun-23	2,858	431	1,097	1,042	2,703	3	8,133	22,094
Jul-23	2,644	416	1,063	1,049	2,594	3	7,769	21,293
Aug-23	2,961	419	1,075	1,033	2,587	4	8,079	21,574
Sep-23	2,988	408	1,118	1,059	2,834	3	8,410	22,895
Oct-23	3,344	429	1,153	1,057	2,970	3	8,955	23,993
Nov-23	3,226	410	1,055	1,067	2,850	3	8,611	23,045
Dec-23	3,528	412	1,051	996	2,650	2	8,639	22,221
Jan-24	3,720	365	1,011	963	2,565	3	8,629	21,751
Feb-24	3,411	397	1,150	1,018	2,783	2	8,761	23,044
Mar-24	3,485	442	1,267	1,091	2,881	3	9,170	24,203
Apr-24	3,614	453	1,329	1,105	2,982	4	9,486	25,030
May-24	3,774	456	1,345	1,093	2,971	5	9,644	25,164
Jun-24	3,759	461	1,325	1,052	2,843	3	9,442	24,387
Jul-24	3,334	435	1,267	1,033	2,779	3	8,852	23,408
Aug-24	4,023	460	1,294	1,023	2,832	3	9,634	24,420
Sep-24	3,186	469	1,362	1,089	3,004	4	9,114	24,776
Oct-24	4,172	491	1,367	1,053	3,018	3	10,104	25,764
Nov-24	3,916	479	1,261	1,098	3,290	4	10,047	26,530

APPENDIX 2.2
TRAFFIC ZONING SYSTEM

Traffic Study for Narsannapeta – Anakapalli Section of NH-16 in the State of Andhra Pradesh
Traffic Zoning System

Zone	Place/Region	District/ State	State
1	Nandigam	PR Zones	Andhra Pradesh
2	Seethapuram/Thirlangi/Polavaram		
3	Tekkali/Savarapeta		
4	Kotabommali/Kothapeta/Jonnalapadu		
5	Tamarapalli/Vandrada/Jarjangi		
6	Narasannapeta/Jaduru/Vandrada/Nimmada		
7	Srirampuram/Ravulavalasa/Devadi		
8	Vamashadara river/Bhyri Village		
9	Singupuram/Booravilli/Gara		
10	Adavaram/Lingalavalasa/Sativada/Ampolu		
11	Patrunivalasa/Rayipadu/NetalRammurthipalem/Tandemvalasa		
12	Pedapadu/Sanivada/Vanavanipeta		
13	Srikakulam		
14	Natavalasa/Pusapatirega		
15	Vizianagaram/Denkada		
16	Munjeru/Uppadapeta/Rellipeta/ Boddapalem/Tallavalusa/Thagarapuvalasa		
17	Mettamedapalem/Anandapuram/Peddipalem/Thatituru		
18	Neelakundilu/Sontyam/Gudilova		
19	Gandigundam/BhairavaKona/Mamidilova		
20	Jangalapalem/Saripalli/Gorapalli/Mudapaka/HPCL Steel Plant/NausenaBaugh/SciIndia Junction		
21	Visakhapatnam city		
22	Gangavaram Port		
23	Vizag Port		
24	Vepagunta/Gurrampalem/Rampuram/Juttada		
25	Erukunaidupalem/Amrutapuram/Moglipuram/Gollapalem/LakshmiPuram		
26	Pallavanipalem/Lagisettipalem/Devipuram/Nakkavanipalem/Sabbavaram		
27	Batajangalapalem/Yerukunaidupalem/Pedamusidivada/Asakapalle/Iruvada/MantripalemColony		
28	Thummapala/Bojajanna Konda/Narapadu		
29	Gopalapuram/Golagam/Sankaram/Bhatlapudi		
30	Anakapalli		
31	Eluru/Rajahmundry/Devarapalli	Eluru District	
32	Vijayawada/Machilipatnam/Amaravathi	Krishna District	
33	Guntur	Guntur District	
34	Kakinada/Pithampuram	Kakinada District	
35	Kakinada Port	Kakinada District	
36	Chodavaram/Narsipatnam/Madugula	Anakapalli District	
37	Araku Valley/Borra Caves/ Hukumpeta/Chintapalle	Visakhapatnam District	
38	Ballipeta/Pedamerangi/Vangara/Kotturu	Parvathipuran District	
39	Ongole/Nellore/Kandukur	Prakasam District	
40	Tirupati/Puttur/SriCity/Chittoor	Tirupati District	
41	Kurnool/Raichur/Wanaparthy	Kurnool District	
42	Nandyala/Anantapur/Kadapa	Nandayal District	
43	Rest of Andhra Pradesh	Rest of Andhra Pradesh	
44	Khammam	Telangana	Telangana
45	Suryapet/Nalgonda/Kodad	Telangana	
46	Karimnagar/Warangal	Telangana	
47	Hyderabad	Telangana	
48	Nizamabad/Nirmal/Adilabad	Telangana	
49	Mancherial/Bellampalle/Ramagundam	Telangana	
50	Jadcherla/Mahbubnagar/nagarkurnool/Rest of Telangana	Telangana	
51	Jeypore/Koraput/Nowrangpur	Odisha	Odisha
52	Raygada/Bhawanipatna/Muniguda	Odisha	
53	Balangir/Sambalpur/Jharsuguda/Sundargarh	Odisha	
54	Rourkela/Deogarh	Odisha	
55	Brahmapur	Odisha	
56	Gopalpur Ports Limited Arjyapalli	Odisha	
57	Bhubaneswar/Puri	Odisha	
58	Cuttack	Odisha	
59	Paradeep Port	Odisha	
60	Chandikhol/Bhadrak/Balasore	Odisha	
61	Rest of Odisha	Odisha	
62	Raipur/Durg/Bhilai	Chhattisgarh	Chhattisgarh
63	Bilaspur/Korba/Ambikapur	Chhattisgarh	
64	Rest of Chhattisgarh	Chhattisgarh	
65	Chennai Port	Tamil Nadu	Tamil Nadu
66	Chennai	Tamil Nadu	
67	Ennore Port	Tamil Nadu	
68	Salem/Erode/Coimbatore	Tamil Nadu	
69	Thoothukudi Port	Tamil Nadu	
70	Madurai/Trichy/Thanjavur	Tamil Nadu	
71	Puducherry	Tamil Nadu	
72	Krishnagiri/Tirupathur/Rayakottai	Tamil Nadu	
73	Vellore	Tamil Nadu	
74	Rest of Tamil Nadu	Tamil Nadu	
75	Kalaburagi/Kodli/Kalgi	Karnataka	Karnataka
76	Vijayapura/Mangoli/Tikota	Karnataka	
77	Ballari/Davangere/Chitradurga	Karnataka	
78	Hubbli/Belgavi/Haveri	Karnataka	
79	Udupi/Mangalore	Karnataka	
80	Mysore/Mandya	Karnataka	
81	Bengaluru	Karnataka	
82	Rest of Karnataka	Karnataka	
83	Nagpur/Bhandara/Amravati/Wardha	Maharashtra	Maharashtra
84	Aurangabad/Jalna/Ahmednagar/Latur/Nanded	Maharashtra	
85	Mumbai/Pune/Nashik	Maharashtra	
86	Solapur/Kolhapur/Sangli/Satara	Maharashtra	
87	Rest of Maharashtra/Goa	Maharashtra	
88	Kochi/Allepy/Thrissur	Kerala	Kerala
89	Trivandum/Kollam	Kerala	
90	Rest of Kerala	Kerala	
91	Kharagpur/Durgapur/Bardhaman	West Bengal	West Bengal
92	Haldia Port	West Bengal	
93	Kolkata/Howrah	West Bengal	
94	Rest of West Bengal	West Bengal	
95	Ranchi/Jamshedpur/Dhanbad	Jharkhand	Jharkhand
96	Rest of Jharkhand	Jharkhand	
97	Bhopal/Indore/Ujjain	Madhya Pradesh	Madhya Pradesh
98	Jabalpur/Satna/Rewa	Madhya Pradesh	
99	Rest of Madhya Pradesh	Madhya Pradesh	
100	Surat/Ahmedabad/Vadodara/Bharuch	Gujarat	
101	Rest of Gujarat	Gujarat	
102	Jaipur/Jodhpur/Rest of Rajasthan	Rajasthan	Rajasthan
103	Delhi	Delhi	Delhi
104	Lucknow/Kanpur	Uttar Pradesh	Uttar Pradesh
105	Prayagraj/Varanasi	Uttar Pradesh	
106	Rest of Uttar Pradesh	Uttar Pradesh	
107	Patna/Gaya/Rest of Bihar	Bihar	Bihar
108	Haryana/Punjab	Haryana/Punjab	Haryana/Punjab
109	Uttarakhand/Himachal Pradesh/Jammu & Kashmir	Uttarakhand/Himachal Pradesh/Jammu & Kashmir	Uttarakhand/Himachal Pradesh/Jammu & Kashmir
110	Sikkim/Rest of North Eastern States	Sikkim/Rest of North Eastern States	Sikkim/Rest of North Eastern States

Confidential

APPENDIX 2.3
TOP 20 OD PAIRS

Traffic Study for Narsannapeta - Anakapalli Section of NH-16 in the State of Andhra Pradesh - Madapam (TP01)

TOP 20 Origin Destination Pairs

Car

S.No.	Origin	Destination	% of total
1	Tekkali/Savarapeta	Srikakulam	26%
2	Narasannapeta/Jaduru/Vandrada/Nimmada	Srikakulam	17%
3	Tekkali/Savarapeta	Visakhapatnam city	16%
4	Narasannapeta/Jaduru/Vandrada/Nimmada	Visakhapatnam city	5%
5	Kotabommali/Kothapeta/Jonnalapadu	Srikakulam	4%
6	Visakhapatnam city	Rest of Odisha	3%
7	Kotabommali/Kothapeta/Jonnalapadu	Visakhapatnam city	2%
8	Tekkali/Savarapeta	Vamashadara river/Bhyri Village	2%
9	Seethapuram/Thirlangi/Polavaram	Srikakulam	2%
10	Visakhapatnam city	Brahmapur	2%
11	Tekkali/Savarapeta	Vizianagaram/Denkada	2%
12	Srikakulam	Rest of Odisha	1%
13	Visakhapatnam city	Bhubaneswar/Puri	1%
14	Tamarapalli/Vandrada/Jarjangi	Srikakulam	1%
15	Tekkali/Savarapeta	Hyderabad	1%
16	Narasannapeta/Jaduru/Vandrada/Nimmada	Vamashadara river/Bhyri Village	1%
17	Srikakulam	Brahmapur	1%
18	Narasannapeta/Jaduru/Vandrada/Nimmada	Vizianagaram/Denkada	1%
19	Seethapuram/Thirlangi/Polavaram	Visakhapatnam city	1%
20	Srikakulam	Bhubaneswar/Puri	1%
		Total	**89%**

MiniBus

S.No.	Origin	Destination	% of total
1	Tekkali/Savarapeta	Srikakulam	28%
2	Narasannapeta/Jaduru/Vandrada/Nimmada	Srikakulam	25%
3	Seethapuram/Thirlangi/Polavaram	Srikakulam	18%
4	Tekkali/Savarapeta	Visakhapatnam city	18%
5	Srikakulam	Kolkata/Howrah	10%
		Total	**100%**

Bus

S.No.	Origin	Destination	% of total
1	Tekkali/Savarapeta	Srikakulam	41%
2	Tekkali/Savarapeta	Visakhapatnam city	18%
3	Seethapuram/Thirlangi/Polavaram	Srikakulam	14%
4	Narasannapeta/Jaduru/Vandrada/Nimmada	Srikakulam	6%
5	Kotabommali/Kothapeta/Jonnalapadu	Srikakulam	4%
6	Tekkali/Savarapeta	Hyderabad	1%
7	Tekkali/Savarapeta	Vijayawada/Machlipatnam/Amaravathi	1%
8	Tekkali/Savarapeta	Kakinada Port	1%
9	Tekkali/Savarapeta	Vamashadara river/Bhyri Village	1%
10	Visakhapatnam city	Rest of Odisha	1%
11	Narasannapeta/Jaduru/Vandrada/Nimmada	Vamashadara river/Bhyri Village	1%
12	Kotabommali/Kothapeta/Jonnalapadu	Visakhapatnam city	1%
13	Tekkali/Savarapeta	Anakapalli	1%
14	Narasannapeta/Jaduru/Vandrada/Nimmada	Visakhapatnam city	1%
15	Srikakulam	Rest of Odisha	0%
16	Tekkali/Savarapeta	Vizianagaram/Denkada	0%
17	Tekkali/Savarapeta	Kakinada/Pithampuram	0%
18	Narasannapeta/Jaduru/Vandrada/Nimmada	Vizianagaram/Denkada	0%
19	Srikakulam	Bhubaneswar/Puri	0%
20	Hyderabad	Bhubaneswar/Puri	0%
		Total	**95%**

Mini LCV

S.No.	Origin	Destination	% of total
1	Tekkali/Savarapeta	Srikakulam	29%
2	Narasannapeta/Jaduru/Vandrada/Nimmada	Srikakulam	19%
3	Tekkali/Savarapeta	Visakhapatnam city	9%
4	Kotabommali/Kothapeta/Jonnalapadu	Srikakulam	5%
5	Visakhapatnam city	Rest of Odisha	4%
6	Narasannapeta/Jaduru/Vandrada/Nimmada	Visakhapatnam city	4%
7	Seethapuram/Thirlangi/Polavaram	Srikakulam	3%
8	Kakinada/Pithampuram	Rest of Odisha	3%
9	Srikakulam	Brahmapur	2%
10	Visakhapatnam city	Brahmapur	2%
11	Srikakulam	Rest of Odisha	2%
12	Vizag Port	Rest of Odisha	1%
13	Tekkali/Savarapeta	Kakinada Port	1%
14	Tekkali/Savarapeta	Vamashadara river/Bhyri Village	1%
15	Narasannapeta/Jaduru/Vandrada/Nimmada	Vijayawada/Machlipatnam/Amaravathi	1%
16	Tekkali/Savarapeta	Vizag Port	1%
17	Narasannapeta/Jaduru/Vandrada/Nimmada	Vamashadara river/Bhyri Village	1%
18	Kotabommali/Kothapeta/Jonnalapadu	Visakhapatnam city	1%
19	Tamarapalli/Vandrada/Jarjangi	Srikakulam	1%
20	Narasannapeta/Jaduru/Vandrada/Nimmada	Vizag Port	1%
		Total	**91%**

Traffic Study for Narsannapeta - Anakapalli Section of NH-16 in the State of Andhra Pradesh - Madapam (TP01)

TOP 20 Origin Destination Pairs

LCV

S.No.	Origin	Destination	% of total
1	Tekkali/Savarapeta	Srikakulam	10%
2	Chennai	Kolkata/Howrah	6%
3	Tekkali/Savarapeta	Visakhapatnam city	5%
4	Hyderabad	Rest of Odisha	5%
5	Visakhapatnam city	Rest of Odisha	3%
6	Tekkali/Savarapeta	Hyderabad	3%
7	Vijayawada/Machlipatnam/Amaravathi	Rest of Odisha	2%
8	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	2%
9	Hyderabad	Kolkata/Howrah	2%
10	Rest of Odisha	Chennai	2%
11	Bengaluru	Kolkata/Howrah	2%
12	Tekkali/Savarapeta	Vijayawada/Machlipatnam/Amaravathi	2%
13	Bhubaneswar/Puri	Chennai	2%
14	Narasannapeta/Jaduru/Vandrada/Nimmada	Salem/Erode/Coimbatore	1%
15	Srikakulam	Brahmapur	1%
16	Rest of Odisha	Rest of Kerala	1%
17	Tekkali/Savarapeta	Kakinada/Pithampuram	1%
18	Kakinada/Pithampuram	Bhubaneswar/Puri	1%
19	Hyderabad	Patna/Gaya/Rest of Bihar	1%
20	Brahmapur	Bengaluru	1%
		Total	**56%**

2 Axle

S.No.	Origin	Destination	% of total
1	Chennai	Kolkata/Howrah	8%
2	Bengaluru	Kolkata/Howrah	6%
3	Tekkali/Savarapeta	Visakhapatnam city	6%
4	Hyderabad	Kolkata/Howrah	5%
5	Visakhapatnam city	Rest of Odisha	4%
6	Rest of Tamil Nadu	Kolkata/Howrah	4%
7	Tekkali/Savarapeta	Vijayawada/Machlipatnam/Amaravathi	3%
8	Tekkali/Savarapeta	Srikakulam	3%
9	Rest of Odisha	Bengaluru	3%
10	Visakhapatnam city	Kolkata/Howrah	2%
11	Rest of Odisha	Chennai	2%
12	Srikakulam	Rest of Odisha	2%
13	Kakinada/Pithampuram	Bhubaneswar/Puri	2%
14	Bhubaneswar/Puri	Chennai	1%
15	Chennai	Patna/Gaya/Rest of Bihar	1%
16	Narasannapeta/Jaduru/Vandrada/Nimmada	Srikakulam	1%
17	Tekkali/Savarapeta	Hyderabad	1%
18	Rest of Odisha	Rest of Tamil Nadu	1%
19	Srikakulam	Kolkata/Howrah	1%
20	Rest of Kerala	Kolkata/Howrah	1%
		Total	**59%**

3 Axle

S.No.	Origin	Destination	% of total
1	Chennai	Kolkata/Howrah	6%
2	Bengaluru	Kolkata/Howrah	6%
3	Visakhapatnam city	Rest of Odisha	5%
4	Tekkali/Savarapeta	Visakhapatnam city	4%
5	Tekkali/Savarapeta	Srikakulam	4%
6	Hyderabad	Kolkata/Howrah	2%
7	Kakinada/Pithampuram	Kolkata/Howrah	2%
8	Rest of Tamil Nadu	Kolkata/Howrah	2%
9	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	2%
10	Rest of Odisha	Chennai	2%
11	Visakhapatnam city	Kolkata/Howrah	2%
12	Tekkali/Savarapeta	Vijayawada/Machlipatnam/Amaravathi	2%
13	Rest of Odisha	Bengaluru	1%
14	Kakinada Port	Rest of Odisha	1%
15	Visakhapatnam city	Brahmapur	1%
16	Kakinada/Pithampuram	Rest of Odisha	1%
17	Eluru/Rajahmundry/Devarapalli	Kolkata/Howrah	1%
18	Visakhapatnam city	Bhubaneswar/Puri	1%
19	Rest of Odisha	Rest of Tamil Nadu	1%
20	Vizag Port	Kolkata/Howrah	1%
		Total	**50%**

MAV

S.No.	Origin	Destination	% of total
1	Chennai	Kolkata/Howrah	7%
2	Visakhapatnam city	Rest of Odisha	6%
3	Bengaluru	Kolkata/Howrah	4%
4	Visakhapatnam city	Kolkata/Howrah	3%
5	Rest of Odisha	Chennai	3%
6	Tekkali/Savarapeta	Visakhapatnam city	3%
7	Rest of Odisha	Bengaluru	2%
8	Hyderabad	Kolkata/Howrah	2%
9	Hyderabad	Rest of Odisha	2%
10	Tekkali/Savarapeta	Vijayawada/Machlipatnam/Amaravathi	2%
11	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	2%
12	Bhubaneswar/Puri	Chennai	1%
13	Visakhapatnam city	Rest of Chhattisgarh	1%
14	Visakhapatnam city	Bhubaneswar/Puri	1%
15	Rest of Tamil Nadu	Kolkata/Howrah	1%
16	Visakhapatnam city	Brahmapur	1%
17	Vijayawada/Machlipatnam/Amaravathi	Rest of Odisha	1%
18	Visakhapatnam city	Cuttack	1%
19	Rest of Odisha	Rest of Tamil Nadu	1%
20	Chennai	Sikkim/Rest of North Eastern States	1%
		Total	**48%**

Traffic Study for Narsannapeta - Anakapalli Section of NH-16 in the State of Andhra Pradesh - Nathavalasa (TP02)

TOP 20 Origin Destination Pairs

Car

S.No.	Origin	Destination	% of total
1	Srikakulam	Visakhapatnam city	31%
2	Tekkali/Savarapeta	Visakhapatnam city	14%
3	Srikakulam	Vizianagaram/Denkada	7%
4	Natavalasa/Pusapatirega	Visakhapatnam city	5%
5	Visakhapatnam city	Rest of Odisha	2%
6	Srikakulam	Vijayawada/Machlipatnam/Amaravathi	2%
7	Srikakulam	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	2%
8	Narasannapeta/Jaduru/Vandrada/Nimmada	Visakhapatnam city	2%
9	Srikakulam	Kakinada/Pithampuram	2%
10	Srikakulam	Munjeru/Uppadapeta/Rellipeta/ Boddapalem/Tallavalusa/Thagarapuvalasa	1%
11	Tekkali/Savarapeta	Anakapalli	1%
12	Seethapuram/Thirlangi/Polavaram	Visakhapatnam city	1%
13	Kotabommali/Kothapeta/Jonnalapadu	Visakhapatnam city	1%
14	Srikakulam	Kakinada Port	1%
15	Srikakulam	Anakapalli	1%
16	Natavalasa/Pusapatirega	Munjeru/Uppadapeta/Rellipeta/ Boddapalem/Tallavalusa/Thagarapuvalasa	1%
17	Visakhapatnam city	Brahmapur	1%
18	Natavalasa/Pusapatirega	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	1%
19	Visakhapatnam city	Bhubaneswar/Puri	1%
20	Srikakulam	Vepagunta/Gurrampalem/Rampuram/Juttada	1%
		Total	**79%**

MiniBus

S.No.	Origin	Destination	% of total
1	Srikakulam	Visakhapatnam city	41%
2	Tekkali/Savarapeta	Visakhapatnam city	22%
3	Srikakulam	Kakinada Port	8%
4	Tekkali/Savarapeta	Vijayawada/Machlipatnam/Amaravathi	7%
5	Narasannapeta/Jaduru/Vandrada/Nimmada	Anakapalli	7%
6	Srikakulam	Aurangabad/Jalna/Ahmednagar/Latur/Nanded	7%
7	Srikakulam	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	4%
8	Natavalasa/Pusapatirega	Munjeru/Uppadapeta/Rellipeta/ Boddapalem/Tallavalusa/Thagarapuvalasa	4%
		Total	**100%**

Bus

S.No.	Origin	Destination	% of total
1	Srikakulam	Visakhapatnam city	46%
2	Tekkali/Savarapeta	Visakhapatnam city	16%
3	Singupuram/Booravilli/Gara	Visakhapatnam city	4%
4	Tekkali/Savarapeta	Vijayawada/Machlipatnam/Amaravathi	3%
5	Srikakulam	Vizianagaram/Denkada	2%
6	Srikakulam	Kakinada Port	2%
7	Natavalasa/Pusapatirega	Visakhapatnam city	2%
8	Srikakulam	Kakinada/Pithampuram	2%
9	Tekkali/Savarapeta	Kakinada Port	1%
10	Srikakulam	Vijayawada/Machlipatnam/Amaravathi	1%
11	Srikakulam	Hyderabad	1%
12	Anakapalli	Bhubaneswar/Puri	1%
13	Natavalasa/Pusapatirega	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	1%
14	Visakhapatnam city	Kolkata/Howrah	1%
15	Hyderabad	Bhubaneswar/Puri	1%
16	Seethapuram/Thirlangi/Polavaram	Visakhapatnam city	1%
17	Srikakulam	Anakapalli	1%
18	Srikakulam	Jangalapalem/Saripalli/Gorapalli/Mudapaka/HPCL Steel Plant/NausenaBaugh/SciIndia Junction	0%
19	Visakhapatnam city	Rest of Odisha	0%
20	Guntur	Bhubaneswar/Puri	0%
		Total	**87%**

Mini LCV

S.No.	Origin	Destination	% of total
1	Srikakulam	Visakhapatnam city	18%
2	Tekkali/Savarapeta	Visakhapatnam city	5%
3	Bengaluru	Kolkata/Howrah	5%
4	Visakhapatnam city	Rest of Odisha	4%
5	Srikakulam	Anakapalli	3%
6	Hyderabad	Kolkata/Howrah	3%
7	Chennai	Kolkata/Howrah	3%
8	Rest of Odisha	Chennai	2%
9	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	2%
10	Visakhapatnam city	Kolkata/Howrah	2%
11	Rest of Odisha	Bengaluru	2%
12	Srikakulam	Hyderabad	1%
13	Natavalasa/Pusapatirega	Visakhapatnam city	1%
14	Srikakulam	Kakinada Port	1%
15	Seethapuram/Thirlangi/Polavaram	Visakhapatnam city	1%
16	Vizag Port	Kolkata/Howrah	1%
17	Visakhapatnam city	Cuttack	1%
18	Vizag Port	Rest of Odisha	1%
19	Eluru/Rajahmundry/Devarapalli	Kolkata/Howrah	1%
20	Hyderabad	Cuttack	1%
		Total	**58%**

Traffic Study for Narsannapeta - Anakapalli Section of NH-16 in the State of Andhra Pradesh - Nathavalasa (TP02)			
TOP 20 Origin Destination Pairs			
LCV			
S.No.	**Origin**	**Destination**	**% of total**
1	Rajamahendravaram	Vijayawada/Machlipatnam/Amaravathi	8%
2	Vijayawada/Machlipatnam/Amaravathi	Visakhapatnam city	7%
3	Visakhapatnam city	Chennai	5%
4	Visakhapatnam city	Bengaluru	5%
5	Eluru/Hanuman Junction	Rajamahendravaram	4%
6	Bengaluru	Kolkata/Howrah	4%
7	Eluru/Hanuman Junction	Visakhapatnam city	4%
8	Visakhapatnam city	Hyderabad	4%
9	Vijayawada/Machlipatnam/Amaravathi	Kakinada/Pithampuram	3%
10	Eluru/Hanuman Junction	Kovvur/SrinagarColony/Arikirevula	3%
11	Kovvur/SrinagarColony/Arikirevula	Vijayawada/Machlipatnam/Amaravathi	2%
12	Kakinada/Pithampuram	Chennai	2%
13	Chennai	Kolkata/Howrah	2%
14	Rajamahendravaram	Chennai	2%
15	Avapadu/Marellamudi/Nallajerla/Gopalpuram/Chodavaram/Telikicherla	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	1%
16	Rajamahendravaram	Bengaluru	1%
17	Guntur	Visakhapatnam city	1%
18	Rajamahendravaram	Hyderabad	1%
19	Eluru/Hanuman Junction	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	1%
20	Eluru/Hanuman Junction	Kakinada/Pithampuram	1%
		Total	**63%**
2 Axle			
S.No.	**Origin**	**Destination**	**% of total**
1	Srikakulam	Visakhapatnam city	10%
2	Bengaluru	Kolkata/Howrah	5%
3	Chennai	Kolkata/Howrah	5%
4	Visakhapatnam city	Kolkata/Howrah	4%
5	Rest of Odisha	Chennai	3%
6	Srikakulam	Vizag Port	3%
7	Hyderabad	Kolkata/Howrah	2%
8	Visakhapatnam city	Rest of Odisha	2%
9	Tekkali/Savarapeta	Visakhapatnam city	2%
10	Hyderabad	Rest of Odisha	2%
11	Srikakulam	Anakapalli	2%
12	Vizag Port	Rest of Odisha	2%
13	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	2%
14	Bhubaneswar/Puri	Chennai	2%
15	Natavalasa/Pusapatirega	Visakhapatnam city	2%
16	Srikakulam	Vijayawada/Machlipatnam/Amaravathi	1%
17	Vijayawada/Machlipatnam/Amaravathi	Rest of Odisha	1%
18	Rest of Odisha	Bengaluru	1%
19	Srikakulam	Kakinada/Pithampuram	1%
20	Srikakulam	Kakinada Port	1%
		Total	**54%**
3 Axle			
S.No.	**Origin**	**Destination**	**% of total**
1	Srikakulam	Visakhapatnam city	8%
2	Bengaluru	Kolkata/Howrah	6%
3	Chennai	Kolkata/Howrah	6%
4	Visakhapatnam city	Rest of Odisha	4%
5	Tekkali/Savarapeta	Visakhapatnam city	3%
6	Hyderabad	Kolkata/Howrah	3%
7	Visakhapatnam city	Kolkata/Howrah	3%
8	Natavalasa/Pusapatirega	Visakhapatnam city	2%
9	Rest of Odisha	Chennai	2%
10	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	2%
11	Rest of Odisha	Bengaluru	2%
12	Vizag Port	Rest of Odisha	2%
13	Srikakulam	Vizag Port	2%
14	Hyderabad	Rest of Odisha	2%
15	Srikakulam	Hyderabad	1%
16	Srikakulam	Vijayawada/Machlipatnam/Amaravathi	1%
17	Kakinada/Pithampuram	Rest of Odisha	1%
18	Rest of Tamil Nadu	Kolkata/Howrah	1%
19	Vizag Port	Kolkata/Howrah	1%
20	Bhubaneswar/Puri	Bengaluru	1%
		Total	**53%**
MAV			
S.No.	**Origin**	**Destination**	**% of total**
1	Srikakulam	Visakhapatnam city	10%
2	Bengaluru	Kolkata/Howrah	5%
3	Visakhapatnam city	Rest of Odisha	4%
4	Visakhapatnam city	Kolkata/Howrah	3%
5	Rest of Odisha	Chennai	3%
6	Rest of Odisha	Bengaluru	2%
7	Natavalasa/Pusapatirega	Visakhapatnam city	2%
8	Tekkali/Savarapeta	Visakhapatnam city	2%
9	Hyderabad	Kolkata/Howrah	2%
10	Srikakulam	Bengaluru	1%
11	Srikakulam	Vijayawada/Machlipatnam/Amaravathi	1%
12	Bhubaneswar/Puri	Chennai	1%
13	Visakhapatnam city	Bhubaneswar/Puri	1%
14	Chennai	Kolkata/Howrah	1%
15	Hyderabad	Rest of Odisha	1%
16	Srikakulam	Kakinada Port	1%
17	Srikakulam	Hyderabad	1%
18	Vizag Port	Bhubaneswar/Puri	1%
19	Bhubaneswar/Puri	Bengaluru	1%
20	Chennai	Rest of Jharkhand	1%
		Total	**46%**

Traffic Study for Narsannapeta - Anakapalli Section of NH-16 in the State of Andhra Pradesh - Dukkavanipalem (TP03)

TOP 20 Origin Destination Pairs

Car

S.No.	Origin	Destination	% of total
1	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Vepagunta/Gurrampalem/Rampuram/Juttada	9%
2	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Anakapalli	8%
3	Vizianagaram/Denkada	Vepagunta/Gurrampalem/Rampuram/Juttada	7%
4	Vizianagaram/Denkada	Anakapalli	5%
5	Srikakulam	Anakapalli	4%
6	Srikakulam	Vepagunta/Gurrampalem/Rampuram/Juttada	4%
7	Srikakulam	Visakhapatnam city	4%
8	Vizianagaram/Denkada	Kakinada/Pithampuram	3%
9	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Visakhapatnam city	3%
10	Vizianagaram/Denkada	Visakhapatnam city	2%
11	Vizianagaram/Denkada	Vijayawada/Machlipatnam/Amaravathi	2%
12	Srikakulam	Vijayawada/Machlipatnam/Amaravathi	2%
13	Tekkali/Savarapeta	Visakhapatnam city	2%
14	Vizianagaram/Denkada	Eluru/Rajahmundry/Devarapalli	2%
15	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Kakinada/Pithampuram	2%
16	Srikakulam	Kakinada Port	1%
17	Munjeru/Uppadapeta/Rellipeta/ Boddapalem/Tallavalusa/Thagarapuvalasa	Eluru/Rajahmundry/Devarapalli	1%
18	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Vijayawada/Machlipatnam/Amaravathi	1%
19	Srikakulam	Kakinada/Pithampuram	1%
20	Vizianagaram/Denkada	Kakinada Port	1%
		Total	**63%**

MiniBus

S.No.	Origin	Destination	% of total
1	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Jangalapalem/Saripalli/Gorapalli/Mudapaka/HPCL Steel Plant/NausenaBaugh/SciIndia Junction	25%
2	Vepagunta/Gurrampalem/Rampuram/Juttada	Rest of Odisha	25%
3	Vijayawada/Machlipatnam/Amaravathi	Rest of Odisha	25%
4	Bhubaneswar/Puri	Rest of Maharashtra/Goa	25%
		Total	**100%**

Bus

S.No.	Origin	Destination	% of total
1	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Vepagunta/Gurrampalem/Rampuram/Juttada	16%
2	Srikakulam	Vijayawada/Machlipatnam/Amaravathi	13%
3	Srikakulam	Vepagunta/Gurrampalem/Rampuram/Juttada	8%
4	Srikakulam	Bengaluru	6%
5	Kakinada/Pithampuram	Kolkata/Howrah	6%
6	Kakinada Port	Rest of Odisha	6%
7	Bhubaneswar/Puri	Bengaluru	6%
8	Thoothukudi Port	Patna/Gaya/Rest of Bihar	6%
9	Srikakulam	Hyderabad	4%
10	Seethapuram/Thirlangi/Polavaram	Vijayawada/Machlipatnam/Amaravathi	2%
11	Seethapuram/Thirlangi/Polavaram	Hyderabad	2%
12	Vizianagaram/Denkada	Kakinada Port	2%
13	Vepagunta/Gurrampalem/Rampuram/Juttada	Kolkata/Howrah	2%
14	Hyderabad	Bhubaneswar/Puri	2%
15	Hyderabad	Rest of Odisha	2%
16	Srikakulam	Mumbai/Pune/Nashik	1%
17	Vizianagaram/Denkada	Visakhapatnam city	1%
18	Munjeru/Uppadapeta/Rellipeta/ Boddapalem/Tallavalusa/Thagarapuvalasa	Vepagunta/Gurrampalem/Rampuram/Juttada	1%
19	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Neelakundilu/Sontyam/Gudilova	1%
20	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Visakhapatnam city	1%
		Total	**88%**

Mini LCV

S.No.	Origin	Destination	% of total
1	Vizianagaram/Denkada	Anakapalli	8%
2	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Anakapalli	7%
3	Srikakulam	Anakapalli	6%
4	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Vepagunta/Gurrampalem/Rampuram/Juttada	6%
5	Vizianagaram/Denkada	Erukunaidupalem/Amrutapuram/Moglipuram/Gollapalem/LakshmiPuram	3%
6	Srikakulam	Vepagunta/Gurrampalem/Rampuram/Juttada	3%
7	Srikakulam	Kakinada Port	3%
8	Vizianagaram/Denkada	Visakhapatnam city	3%
9	Natavalasa/Pusapatirega	Anakapalli	2%
10	Tekkali/Savarapeta	Anakapalli	2%
11	Vepagunta/Gurrampalem/Rampuram/Juttada	Ballipeta/Pedamerangi/Vangara/Kotturu	2%
12	Kakinada/Pithampuram	Ballipeta/Pedamerangi/Vangara/Kotturu	2%
13	Srikakulam	Vijayawada/Machlipatnam/Amaravathi	2%
14	Srikakulam	Visakhapatnam city	2%
15	Vizianagaram/Denkada	Vepagunta/Gurrampalem/Rampuram/Juttada	2%
16	Srikakulam	Guntur	2%
17	Munjeru/Uppadapeta/Rellipeta/ Boddapalem/Tallavalusa/Thagarapuvalasa	Eluru/Rajahmundry/Devarapalli	2%
18	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Kakinada/Pithampuram	2%
19	Vizianagaram/Denkada	Kakinada Port	2%
20	Kakinada/Pithampuram	Rest of Odisha	2%
		Total	**62%**

Traffic Study for Narsannapeta - Anakapalli Section of NH-16 in the State of Andhra Pradesh - Dukkavanipalem (TP03)

TOP 20 Origin Destination Pairs

LCV

S.No.	Origin	Destination	% of total
1	Chennai	Kolkata/Howrah	5%
2	Srikakulam	Anakapalli	5%
3	Hyderabad	Kolkata/Howrah	4%
4	Bengaluru	Kolkata/Howrah	3%
5	Vizianagaram/Denkada	Anakapalli	3%
6	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Vepagunta/Gurrampalem/Rampuram/Juttada	3%
7	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Kakinada Port	2%
8	Anakapalli	Kolkata/Howrah	2%
9	Kakinada/Pithampuram	Kolkata/Howrah	2%
10	Gangavaram Port	Kolkata/Howrah	2%
11	Srikakulam	Hyderabad	2%
12	Kakinada/Pithampuram	Rest of Odisha	2%
13	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Kakinada/Pithampuram	2%
14	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Anakapalli	2%
15	Anakapalli	Rest of Odisha	2%
16	Hyderabad	Bhubaneswar/Puri	2%
17	Kakinada Port	Bhubaneswar/Puri	2%
18	Ongole/Nellore/Kandukur	Kolkata/Howrah	2%
19	Visakhapatnam city	Rest of Odisha	2%
20	Kakinada Port	Kolkata/Howrah	2%
		Total	**52%**

2 Axle

S.No.	Origin	Destination	% of total
1	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Anakapalli	8%
2	Bengaluru	Kolkata/Howrah	7%
3	Chennai	Kolkata/Howrah	5%
4	Hyderabad	Kolkata/Howrah	4%
5	Rest of Odisha	Chennai	3%
6	Srikakulam	Anakapalli	2%
7	Kakinada/Pithampuram	Rest of Odisha	2%
8	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	2%
9	Anakapalli	Kolkata/Howrah	2%
10	Hyderabad	Rest of Odisha	2%
11	Rest of Odisha	Bengaluru	2%
12	Srikakulam	Hyderabad	2%
13	Anakapalli	Rest of Odisha	2%
14	Bhubaneswar/Puri	Bengaluru	1%
15	Visakhapatnam city	Rest of Odisha	1%
16	Kakinada/Pithampuram	Ballipeta/Pedamerangi/Vangara/Kotturu	1%
17	Srikakulam	Vijayawada/Machlipatnam/Amaravathi	1%
18	Vizianagaram/Denkada	Anakapalli	1%
19	Srikakulam	Kakinada Port	1%
20	Vizianagaram/Denkada	Bengaluru	1%
		Total	**52%**

3 Axle

S.No.	Origin	Destination	% of total
1	Chennai	Kolkata/Howrah	6%
2	Bengaluru	Kolkata/Howrah	5%
3	Rest of Odisha	Bengaluru	3%
4	Hyderabad	Kolkata/Howrah	3%
5	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	3%
6	Rest of Tamil Nadu	Kolkata/Howrah	3%
7	Rest of Odisha	Chennai	2%
8	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Anakapalli	2%
9	Eluru/Rajahmundry/Devarapalli	Kolkata/Howrah	2%
10	Srikakulam	Anakapalli	2%
11	Srikakulam	Kakinada Port	2%
12	Hyderabad	Rest of Odisha	2%
13	Anakapalli	Kolkata/Howrah	1%
14	Kakinada Port	Kolkata/Howrah	1%
15	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Visakhapatnam city	1%
16	Kakinada/Pithampuram	Rest of Odisha	1%
17	Kakinada/Pithampuram	Kolkata/Howrah	1%
18	Srikakulam	Chennai	1%
19	Chennai	Rest of West Bengal	1%
20	Chennai	Sikkim/Rest of North Eastern States	1%
		Total	**44%**

MAV

S.No.	Origin	Destination	% of total
1	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Anakapalli	8%
2	Bengaluru	Kolkata/Howrah	6%
3	Rest of Odisha	Bengaluru	3%
4	Rest of Odisha	Chennai	3%
5	Chennai	Kolkata/Howrah	3%
6	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	2%
7	Hyderabad	Rest of Odisha	2%
8	Hyderabad	Kolkata/Howrah	2%
9	Srikakulam	Anakapalli	2%
10	Anakapalli	Rest of Odisha	2%
11	Kakinada Port	Rest of Odisha	2%
12	Srikakulam	Hyderabad	2%
13	Rest of Odisha	Rest of Tamil Nadu	2%
14	Kakinada/Pithampuram	Rest of Odisha	1%
15	Vijayawada/Machlipatnam/Amaravathi	Rest of Odisha	1%
16	Rest of Tamil Nadu	Kolkata/Howrah	1%
17	Srikakulam	Vijayawada/Machlipatnam/Amaravathi	1%
18	Anakapalli	Kolkata/Howrah	1%
19	Srikakulam	Kakinada Port	1%
20	Kakinada/Pithampuram	Kolkata/Howrah	1%
		Total	**48%**

Traffic Study for Narsannapeta - Anakapalli Section of NH-16 in the State of Andhra Pradesh - Marripalem (TP04)

TOP 20 Origin Destination Pairs

Car

S.No.	Origin	Destination	% of total
1	Vepagunta/Gurrampalem/Rampuram/Juttada	Anakapalli	12%
2	Visakhapatnam city	Anakapalli	5%
3	Vizianagaram/Denkada	Anakapalli	5%
4	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Anakapalli	4%
5	Vepagunta/Gurrampalem/Rampuram/Juttada	Kakinada/Pithampuram	3%
6	Visakhapatnam city	Kakinada/Pithampuram	3%
7	Vizianagaram/Denkada	Kakinada/Pithampuram	3%
8	Erukunaidupalem/Amrutapuram/Moglipuram/Gollapalem/LakshmiPuram	Anakapalli	2%
9	Vepagunta/Gurrampalem/Rampuram/Juttada	Eluru/Rajahmundry/Devarapalli	2%
10	Tekkali/Savarapeta	Kakinada/Pithampuram	2%
11	Visakhapatnam city	Kakinada Port	2%
12	Visakhapatnam city	Eluru/Rajahmundry/Devarapalli	2%
13	Srikakulam	Kakinada/Pithampuram	2%
14	Vepagunta/Gurrampalem/Rampuram/Juttada	Chodavaram/Narsipatnam/Madugula	2%
15	Srikakulam	Anakapalli	2%
16	Vepagunta/Gurrampalem/Rampuram/Juttada	Kakinada Port	2%
17	Srikakulam	Vijayawada/Machlipatnam/Amaravathi	2%
18	Visakhapatnam city	Vijayawada/Machlipatnam/Amaravathi	2%
19	Vizianagaram/Denkada	Eluru/Rajahmundry/Devarapalli	2%
20	Visakhapatnam city	Hyderabad	2%
		Total	**59%**

MiniBus

S.No.	Origin	Destination	% of total
1	Visakhapatnam city	Kakinada/Pithampuram	25%
2	Vepagunta/Gurrampalem/Rampuram/Juttada	Chodavaram/Narsipatnam/Madugula	25%
3	Vizianagaram/Denkada	Kakinada Port	13%
4	Jangalapalem/Saripalli/Gorapalli/Mudapaka/HPCL Steel Plant/NausenaBaugh/SciIndia Junction	Vijayawada/Machlipatnam/Amaravathi	13%
5	Vepagunta/Gurrampalem/Rampuram/Juttada	Anakapalli	13%
6	Nandyala/Anantapur/Kadapa	Bhubaneswar/Puri	13%
		Total	**100%**

Bus

S.No.	Origin	Destination	% of total
1	Visakhapatnam city	Anakapalli	10%
2	Visakhapatnam city	Vijayawada/Machlipatnam/Amaravathi	7%
3	Vepagunta/Gurrampalem/Rampuram/Juttada	Vijayawada/Machlipatnam/Amaravathi	7%
4	Srikakulam	Hyderabad	7%
5	Visakhapatnam city	Hyderabad	7%
6	Srikakulam	Kakinada/Pithampuram	4%
7	Eluru/Rajahmundry/Devarapalli	Rayagada/Bhawanipatna/Muniguda	4%
8	Vijayawada/Machlipatnam/Amaravathi	Bhubaneswar/Puri	4%
9	Ballipeta/Pedamerangi/Vangara/Kotturu	Tirupati/Puttur/SriCity/Chittoor	4%
10	Bhubaneswar/Puri	Rest of Tamil Nadu	4%
11	Bengaluru	Rest of West Bengal	4%
12	Nandigam	Anakapalli	3%
13	Singupuram/Booravilli/Gara	Vijayawada/Machlipatnam/Amaravathi	3%
14	Srikakulam	Vijayawada/Machlipatnam/Amaravathi	3%
15	Vizianagaram/Denkada	Anakapalli	3%
16	Vepagunta/Gurrampalem/Rampuram/Juttada	Kakinada/Pithampuram	3%
17	Vepagunta/Gurrampalem/Rampuram/Juttada	Tirupati/Puttur/SriCity/Chittoor	3%
18	Erukunaidupalem/Amrutapuram/Moglipuram/Gollapalem/LakshmiPuram	Kakinada Port	3%
19	Guntur	Prayagraj/Varanasi	3%
20	Tirupati/Puttur/SriCity/Chittoor	Rest of Odisha	3%
		Total	**85%**

Mini LCV

S.No.	Origin	Destination	% of total
1	Vepagunta/Gurrampalem/Rampuram/Juttada	Anakapalli	9%
2	Vizianagaram/Denkada	Anakapalli	7%
3	Srikakulam	Anakapalli	7%
4	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Anakapalli	5%
5	Vizianagaram/Denkada	Kakinada Port	5%
6	Visakhapatnam city	Anakapalli	5%
7	Srikakulam	Kakinada Port	4%
8	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Kakinada Port	3%
9	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Kakinada/Pithampuram	3%
10	Srikakulam	Kakinada/Pithampuram	2%
11	Kakinada/Pithampuram	Rest of Odisha	2%
12	Vizianagaram/Denkada	Kakinada/Pithampuram	2%
13	Vepagunta/Gurrampalem/Rampuram/Juttada	Kakinada/Pithampuram	2%
14	Erukunaidupalem/Amrutapuram/Moglipuram/Gollapalem/LakshmiPuram	Anakapalli	2%
15	Kakinada Port	Ballipeta/Pedamerangi/Vangara/Kotturu	2%
16	Tekkali/Savarapeta	Anakapalli	2%
17	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Eluru/Rajahmundry/Devarapalli	2%
18	Tekkali/Savarapeta	Kakinada/Pithampuram	2%
19	Srikakulam	Vijayawada/Machlipatnam/Amaravathi	2%
20	Visakhapatnam city	Kakinada/Pithampuram	2%
		Total	**69%**

Traffic Study for Narsannapeta - Anakapalli Section of NH-16 in the State of Andhra Pradesh - Marripalem (TP04)

TOP 20 Origin Destination Pairs

LCV

S.No.	Origin	Destination	% of total
1	Bengaluru	Kolkata/Howrah	7%
2	Vizianagaram/Denkada	Anakapalli	5%
3	Chennai	Kolkata/Howrah	4%
4	Visakhapatnam city	Hyderabad	3%
5	Srikakulam	Hyderabad	3%
6	Rest of Odisha	Bengaluru	3%
7	Visakhapatnam city	Kakinada Port	2%
8	Srikakulam	Kakinada Port	2%
9	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Anakapalli	2%
10	Visakhapatnam city	Anakapalli	2%
11	Hyderabad	Kolkata/Howrah	2%
12	Srikakulam	Vijayawada/Machlipatnam/Amaravathi	2%
13	Kakinada/Pithampuram	Rest of Odisha	2%
14	Vizianagaram/Denkada	Kakinada Port	2%
15	Anakapalli	Kolkata/Howrah	2%
16	Visakhapatnam city	Chennai	1%
17	Vepagunta/Gurrampalem/Rampuram/Juttada	Kakinada Port	1%
18	Anakapalli	Rest of Odisha	1%
19	Natavalasa/Pusapatirega	Anakapalli	1%
20	Visakhapatnam city	Kakinada/Pithampuram	1%
		Total	**50%**

2 Axle

S.No.	Origin	Destination	% of total
1	Chennai	Kolkata/Howrah	8%
2	Bengaluru	Kolkata/Howrah	7%
3	Hyderabad	Kolkata/Howrah	4%
4	Rest of Odisha	Chennai	3%
5	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Anakapalli	2%
6	Kakinada/Pithampuram	Rest of Odisha	2%
7	Srikakulam	Anakapalli	2%
8	Bhubaneswar/Puri	Chennai	2%
9	Hyderabad	Rest of Odisha	2%
10	Bhubaneswar/Puri	Bengaluru	2%
11	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	2%
12	Visakhapatnam city	Anakapalli	1%
13	Vizianagaram/Denkada	Anakapalli	1%
14	Vepagunta/Gurrampalem/Rampuram/Juttada	Anakapalli	1%
15	Srikakulam	Kakinada Port	1%
16	Rest of Odisha	Bengaluru	1%
17	Bengaluru	Sikkim/Rest of North Eastern States	1%
18	Kakinada/Pithampuram	Kolkata/Howrah	1%
19	Visakhapatnam city	Kakinada/Pithampuram	1%
20	Vepagunta/Gurrampalem/Rampuram/Juttada	Vijayawada/Machlipatnam/Amaravathi	1%
		Total	**48%**

3 Axle

S.No.	Origin	Destination	% of total
1	Chennai	Kolkata/Howrah	11%
2	Bengaluru	Kolkata/Howrah	8%
3	Rest of Odisha	Chennai	3%
4	Hyderabad	Kolkata/Howrah	3%
5	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	3%
6	Eluru/Rajahmundry/Devarapalli	Kolkata/Howrah	2%
7	Kakinada Port	Kolkata/Howrah	2%
8	Srikakulam	Chennai	2%
9	Rest of Tamil Nadu	Kolkata/Howrah	2%
10	Rest of Odisha	Bengaluru	2%
11	Vepagunta/Gurrampalem/Rampuram/Juttada	Anakapalli	2%
12	Kakinada/Pithampuram	Kolkata/Howrah	2%
13	Vizianagaram/Denkada	Anakapalli	1%
14	Srikakulam	Anakapalli	1%
15	Hyderabad	Rest of Odisha	1%
16	Srikakulam	Kakinada Port	1%
17	Kakinada/Pithampuram	Rest of Odisha	1%
18	Anakapalli	Rest of Odisha	1%
19	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Anakapalli	1%
20	Anakapalli	Kolkata/Howrah	1%
		Total	**50%**

MAV

S.No.	Origin	Destination	% of total
1	Bengaluru	Kolkata/Howrah	9%
2	Vizianagaram/Denkada	Anakapalli	6%
3	Chennai	Kolkata/Howrah	4%
4	Rest of Odisha	Bengaluru	3%
5	Hyderabad	Kolkata/Howrah	3%
6	Rest of Odisha	Chennai	3%
7	Mettamedapalem/Anandapuram/Peddipalem/Thatituru	Anakapalli	2%
8	Bhubaneswar/Puri	Chennai	2%
9	Kakinada Port	Kolkata/Howrah	1%
10	Kakinada/Pithampuram	Rest of Odisha	1%
11	Bhubaneswar/Puri	Bengaluru	1%
12	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	1%
13	Kakinada/Pithampuram	Kolkata/Howrah	1%
14	Srikakulam	Anakapalli	1%
15	Eluru/Rajahmundry/Devarapalli	Kolkata/Howrah	1%
16	Anakapalli	Rest of Odisha	1%
17	Chennai	Patna/Gaya/Rest of Bihar	1%
18	Visakhapatnam city	Chennai	1%
19	Rest of Tamil Nadu	Kolkata/Howrah	1%
20	Rest of Kerala	Kolkata/Howrah	1%
		Total	**47%**

APPENDIX 2.4
COMMODITY DISTRIBUTION AT TOLL PLAZA LOCATIONS

Traffic Study for Narsannapeta - Anakapalli Section of NH-16 in the State of Andhra Pradesh
Commodity Distribution on Toll Plaza Locations

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
			Madugula (TP01)			
1	Food Grains and Cash Crops	5.4	5.8	8.8	6.7	8.3
2	Fruits & Vegetables	5.4	5.1	7.7	6.3	7.3
3	Building Materials	6.9	6.9	6.9	7.3	6.1
4	Iron & Steel Products	3.4	3.4	5.2	7.5	13.7
5	Petroleum Products, Chemicals and Gas	1.8	6.0	6.4	6.7	10.2
6	Heavy Machinery & Industrial Equipments	0.3	0.1	1.2	1.2	0.1
7	Industrial Products & Equipment	6.4	5.9	9.1	8.6	5.3
8	Consumer Items	6.3	7.2	11.4	12.5	7.6
9	Automobile and New Chasis	1.8	2.5	3.2	6.9	6.6
10	Containers	0.0	0.0	0.0	0.0	0.0
11	Ores & Minerals (Coal , Bauxite, Iron stone)	2.3	0.4	3.7	3.6	5.2
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	13.6	10.5	7.7	6.1	7.9
13	Perdko	3.4	11.4	6.4	7.0	4.7
14	Empty Vehicles	46.4	36.0	21.5	15.8	16.8
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
			Nidugunta (TP02)			
1	Food Grains and Cash Crops	6.1	5.8	7.8	6.0	7.7
2	Fruits & Vegetables	13.9	11.3	14.3	15.4	15.7
3	Building Materials	5.4	13.6	9.6	7.5	10.9
4	Iron & Steel Products	5.4	4.3	7.6	7.6	9.1
5	Petroleum Products, Chemicals and Gas	2.3	6.3	5.0	11.8	9.6
6	Heavy Machinery & Industrial Equipments	0.3	0.4	0.6	1.7	1.1
7	Industrial Products	13.1	9.3	11.2	8.3	8.0
8	Consumer Items	9.2	12.5	16.8	17.1	11.8
9	Automobile and New Chasis	2.3	5.0	10.4	8.6	10.0
10	Containers	0.0	0.0	0.0	0.0	0.0
11	Ores & Minerals (Coal , Bauxite, Iron stone)	0.9	0.0	1.7	2.0	2.8
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	21.5	13.0	14.3	14.7	14.9
13	Perdko	5.8	13.0	11.7	6.8	4.3
14	Empty Vehicles	10.3	7.5	2.2	5.4	5.1
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
			Chinyar (TP03)			
1	Food Grains and Cash Crops	1.9	3.8	5.0	10.6	8.1
2	Fruits & Vegetables	1.2	1.9	2.7	1.2	1.2
3	Building Materials	3.1	5.4	8.0	7.5	8.4
4	Iron & Steel Products	2.3	4.5	7.1	11.7	10.3
5	Petroleum Products, Chemicals and Gas	1.8	8.9	7.0	8.0	10.7
6	Heavy Machinery & Industrial Equipments	0.4	1.3	1.3	0.7	0.2
7	Industrial Products	3.1	5.7	7.0	6.3	4.7
8	Consumer Items	0.9	4.5	7.1	7.3	3.1
9	Automobile and New Chasis	1.8	1.3	4.4	3.0	4.1
10	Containers	0.0	0.0	0.0	0.0	0.0
11	Ores & Minerals (Coal , Bauxite, Iron stone)	3.1	0.4	3.1	4.9	7.7
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	8.1	8.9	2.2	4.4	2.1
13	Perdko	3.1	4.0	5.8	7.0	4.0
14	Empty Vehicles	61.6	41.7	35.3	24.4	25.3
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
			Rathnavaram (TP04)			
1	Food Grains and Cash Crops	4.3	3.3	3.0	4.1	3.0
2	Fruits & Vegetables	8.4	5.5	4.0	6.7	6.0
3	Building Materials	3.4	4.4	4.0	5.7	5.1
4	Iron & Steel Products	5.9	7.1	9.2	10.3	13.4
5	Petroleum Products, Chemicals and Gas	4.8	10.6	10.7	6.7	10.4
6	Heavy Machinery & Industrial Equipments	0.3	0.3	0.4	0.1	0.0
7	Industrial Products & Equipment	4.7	4.8	3.2	6.8	3.5
8	Consumer Items	7.3	6.8	4.0	6.0	5.3
9	Automobile and New Chasis	4.3	4.2	2.7	2.3	4.0
10	Containers	0.0	0.8	0.0	0.0	0.2
11	Ores & Minerals (Coal , Bauxite, Iron stone)	0.0	0.0	4.2	4.0	5.2
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	7.4	7.4	4.0	6.1	4.7
13	Perdko	8.4	11.2	21.3	21.2	12.8
14	Empty Vehicles	40.7	22.2	21.3	17.1	18.4
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
			Ramavaram (TP05)			
1	Food Grains and Cash Crops	1.9	3.2	1.0	0.1	2.7
2	Fruits & Vegetables	6.5	8.2	4.0	6.7	10.3
3	Building Materials	3.9	7.0	4.0	3.3	6.2
4	Iron & Steel Products	7.1	5.1	6.1	5.4	7.0
5	Petroleum Products, Chemicals and Gas	3.8	13.3	10.3	11.7	11.5
6	Heavy Machinery & Industrial Equipments	0.6	0.6	1.0	0.0	0.1
7	Industrial Products	4.5	4.3	2.7	0.3	3.2
8	Consumer Items	10.4	9.5	4.0	7.3	4.2
9	Automobile and New Chasis	3.2	3.4	3.0	3.0	3.2
10	Containers	0.0	0.0	0.0	0.0	0.2
11	Ores & Minerals (Coal , Bauxite, Iron stone)	0.0	0.0	0.0	0.0	0.1
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	7.1	8.2	6.4	6.0	5.4
13	Perdko	13.3	13.4	15.3	27.1	20.4
14	Empty Vehicles	33.7	10.0	7.7	6.9	7.9
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
			Rathnavaram (TP02)			
1	Food Grains and Cash Crops	6.4	2.6	6.7	6.1	6.9
2	Fruits & Vegetables	9.9	9.8	1.0	1.1	2.0
3	Building Materials	2.0	2.0	3.4	4.1	6.0
4	Iron & Steel Products	9.0	9.0	11.7	10.1	10.2
5	Petroleum Products, Chemicals and Gas	3.4	7.8	8.7	7.8	9.5
6	Heavy Machinery & Industrial Equipments	0.1	0.1	0.0	0.2	0.1
7	Industrial Products	4.0	3.1	3.1	6.3	6.6
8	Consumer Items	5.2	6.1	4.4	6.8	5.8
9	Automobile and New Chasis	5.4	4.6	1.0	0.0	1.0
10	Containers	0.0	0.0	0.0	0.0	0.1
11	Ores & Minerals (Coal , Bauxite, Iron stone)	0.5	0.7	2.1	2.2	4.6
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	7.9	6.5	2.1	3.7	5.3
13	Perdko	5.4	19.6	21.9	16.5	6.2
14	Empty Vehicles	40.1	14.0	30.1	29.3	20.4
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
			Vaikuntapuram (TP03)			
1	Food Grains and Cash Crops	2.8	5.3	8.1	6.3	9.6
2	Fruits & Vegetables	6.8	4.2	8.1	7.8	4.8
3	Building Materials	1.7	3.0	5.2	7.5	10.1
4	Iron & Steel Products	3.0	4.2	5.9	6.3	14.2
5	Petroleum Products, Chemicals and Gas	3.8	13.2	10.3	8.7	9.5
6	Heavy Machinery & Industrial Equipments	0.4	0.8	0.4	0.5	0.0
7	Industrial Products & Equipment	6.9	6.3	6.3	9.5	4.7
8	Consumer Items	9.8	10.6	9.3	9.1	9.2
9	Automobile and New Chasis	2.1	2.3	4.1	2.0	3.6
10	Containers	0.0	0.0	0.0	0.0	0.1
11	Ores & Minerals (Coal , Bauxite, Iron stone)	0.4	0.8	0.7	1.0	2.3
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	6.5	6.1	6.1	6.0	4.0
13	Perdko	4.3	9.3	6.7	7.1	2.0
14	Empty Vehicles	51.3	31.4	20.8	17.8	14.4
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
			Vaikuntapuram (TP03)			
1	Food Grains and Cash Crops	3.0	0.8	0.0	0.0	3.0
2	Fruits & Vegetables	7.7	5.3	6.0	0.0	5.0
3	Building Materials	6.7	4.8	6.0	6.1	6.0
4	Iron & Steel Products	10.3	9.8	11.4	9.8	10.8
5	Petroleum Products, Chemicals and Gas	69.3	79.1	71.3	73.8	70.4
6	Heavy Machinery & Industrial Equipments	0.0	0.0	0.0	0.0	0.0
7	Industrial Products	0.0	0.0	0.0	0.0	0.0
8	Consumer Items	0.0	0.0	0.0	0.0	0.0
9	Automobile and New Chasis	0.0	0.0	0.0	0.0	0.0
10	Containers	0.0	0.0	0.0	0.0	0.0
11	Ores & Minerals (Coal , Bauxite, Iron stone)	0.0	0.0	0.0	0.0	0.0
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	0.0	0.0	0.0	0.0	0.0
13	Perdko	0.0	0.0	0.0	0.0	0.0
14	Empty Vehicles	0.0	0.0	0.0	0.0	0.0
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
			Vaikuntapuram (TP03)			
1	Food Grains and Cash Crops	0.0	0.5	0.0	1.4	1.4
2	Fruits & Vegetables	4.3	3.2	1.0	0.8	1.0
3	Building Materials	1.1	4.8	2.0	1.4	0.0
4	Iron & Steel Products	36.7	28.0	16.3	18.8	13.7
5	Petroleum Products, Chemicals and Gas	46.9	48.7	67.0	61.8	69.9
6	Heavy Machinery & Industrial Equipments	0.0	0.0	0.0	0.0	0.0
7	Industrial Products	0.0	0.0	0.0	0.0	0.0
8	Consumer Items	0.0	0.0	0.0	0.0	0.0
9	Automobile and New Chasis	0.0	0.0	0.0	0.0	0.0
10	Containers	0.0	0.0	0.0	0.1	0.0
11	Ores & Minerals (Coal , Bauxite, Iron stone)	0.0	1.3	2.0	3.6	1.7
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	0.0	0.3	1.3	1.2	0.0
13	Perdko	0.0	3.2	7.7	0.1	11.3
14	Empty Vehicles	9.6	9.4	0.0	6.7	0.9
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
			Munipalem (TP04)			
1	Food Grains and Cash Crops	2.8	4.2	5.0	8.0	6.2
2	Fruits & Vegetables	11.6	13.6	7.0	10.5	11.4
3	Building Materials	0.9	3.6	3.0	1.8	1.0
4	Iron & Steel Products	3.7	3.1	4.0	6.7	8.4
5	Petroleum Products, Chemicals and Gas	2.8	9.4	6.0	8.7	8.2
6	Heavy Machinery & Industrial Equipments	0.0	0.7	1.0	0.0	0.0
7	Industrial Products & Equipment	3.8	3.8	3.4	5.1	3.4
8	Consumer Items	9.3	9.3	6.0	15.1	6.0
9	Automobile and New Chasis	0.0	3.1	2.0	4.3	6.0
10	Containers	0.0	0.0	0.0	0.4	0.2
11	Ores & Minerals (Coal , Bauxite, Iron stone)	0.5	0.0	0.4	0.0	0.0
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	14.6	10.7	7.0	7.5	9.3
13	Perdko	7.3	9.3	9.7	10.1	9.0
14	Empty Vehicles	41.9	20.0	35.1	16.7	16.4
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
			Munipalem (TP04)			
1	Food Grains and Cash Crops	1.8	2.9	2.0	5.0	6.0
2	Fruits & Vegetables	13.5	17.4	17.7	16.7	16.0
3	Building Materials	0.9	3.1	4.0	11.2	16.3
4	Iron & Steel Products	0.3	1.7	3.0	2.0	3.0
5	Petroleum Products, Chemicals and Gas	4.3	11.6	9.0	10.1	9.0
6	Heavy Machinery & Industrial Equipments	0.9	0.8	0.0	0.0	0.7
7	Industrial Products	2.7	10.5	8.7	4.7	6.1
8	Consumer Items	13.5	12.2	7.0	10.3	7.2
9	Automobile and New Chasis	0.3	4.7	3.0	0.7	3.0
10	Containers	0.0	0.0	0.0	0.7	0.7
11	Ores & Minerals (Coal , Bauxite, Iron stone)	0.9	0.0	0.0	0.0	0.1
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	17.6	11.0	7.0	7.0	9.4
13	Perdko	8.0	7.5	14.3	11.4	7.5
14	Empty Vehicles	35.7	10.0	13.7	9.6	5.0
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
			Munipalem (TP04)			
1	Food Grains and Cash Crops	3.9	9.0	7.7	11.1	6.5
2	Fruits & Vegetables	10.7	7.8	7.7	3.2	7.5
3	Building Materials	1.0	2.3	3.2	3.1	7.7
4	Iron & Steel Products	6.8	4.0	6.4	10.3	13.9
5	Petroleum Products, Chemicals and Gas	1.8	4.8	5.7	6.3	6.1
6	Heavy Machinery & Industrial Equipments	1.0	1.0	1.2	0.0	1.0
7	Industrial Products	2.9	6.8	6.3	5.6	4.2
8	Consumer Items	9.8	8.0	6.3	9.0	3.6
9	Automobile and New Chasis	1.0	1.0	0.7	0.0	2.5
10	Containers	0.0	0.8	0.0	0.0	0.0
11	Ores & Minerals (Coal , Bauxite, Iron stone)	0.2	0.0	0.5	1.2	1.0
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	9.7	9.3	7.7	7.4	6.2
13	Perdko	7.8	4.0	7.0	7.7	3.8
14	Empty Vehicles	40.5	44.0	46.3	34.5	33.9
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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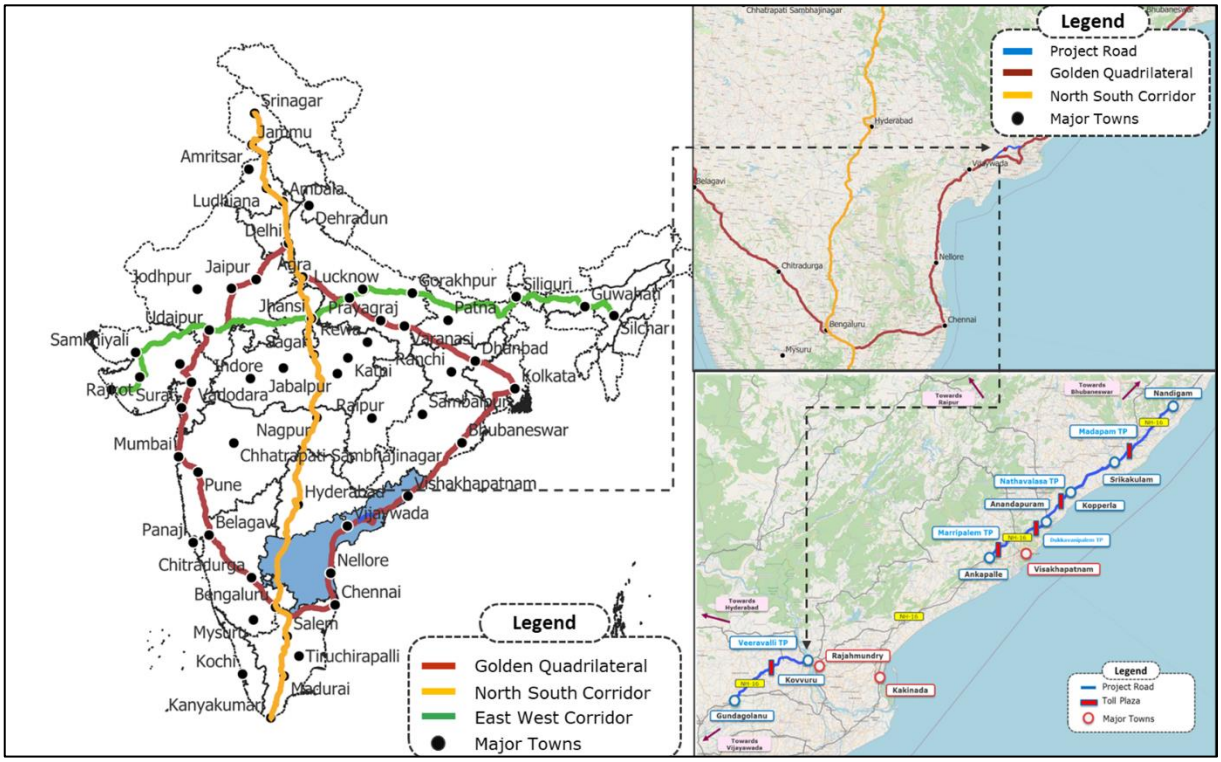
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Traffic Study Report

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February 2025

TRAFFIC STUDY FOR GUNDUGOLANU - DEVARAPALLI – KOVVURU SECTION OF NH-16 IN THE STATE OF ANDHRA PRADESH



RAMBOLL

Revision	**00**
Date	**21/02/2025**
Made by	**Priyanka/Harpreet**
Checked by	**Meenakshi Asija**
Approved by	**Srinivas Chekuri** C. Srinivas
Description	**Traffic Study Report**

Ramboll
The Epitome
Building No.5, Tower–B
Floor-17
DLF Cyber Terrace Phase-III
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ABBREVIATIONS

%	Percentage
2A	2 Axle truck
3A	3 Axle truck
AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
AR	Alternate Route
BIA	Broad Influence Area
CAGR	Compounded Annual Growth Rate
FY	Financial Year
GDP	Gross Domestic Product
GSDP	Gross State Domestic Product
IIA	Immediate Influence Area
IRC	Indian Road Congress
Km	Kilometre
LCV	Light Commercial Vehicle
M Bus	Minibus
MAV	Multi Axle Vehicle
MLCV	Mini LCV
NH	National Highway
NHAI	National Highway Authority of India
NHDP	National Highway Development Program
NHIIMPL	National Highways Infra Investment Managers Private Limited
NPV	Net Present Value
OD	Origin-Destination survey
PCU	Passenger Car Unit
PIA	Project Influence Area
PR	Project Road
PV	Present Value
Rs/₹	Rupees
SEZ	Special Economic Zone
Sq.km	Square Kilometre
TP	Toll Plaza
WPI	Wholesale Price Index
YOY	Year on Year

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Appendix 2.1: Month on Month Past Traffic Data

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Appendix 2.4: Commodity Distributions

EXECUTIVE SUMMARY

Project Overview

The project highway, NH-16, is the major highway in India that runs along the eastern coast, connecting Dankuni, West Bengal with Chennai, Tamil Nadu and is a crucial part of the Golden Quadrilateral project aimed at enhancing connectivity between major cities in India. The NH 16 highway covers 1,764 kilometres and passes through the states of West Bengal, Odisha, Andhra Pradesh and Tamil Nadu.

The project road section, Gundugolanu-Devarapalli-Kovvuru starts at km 15.320 near Gundugolanu and ends at km 85.204 at Kovvuru with a length of about 70 km. The project road falls under the jurisdiction of Eluru and East Godavari districts passing through settlements of Kovvuru, Pangidi, Devarapalli, Veerampalem, Pullalapadu, Avapadu, Hanumanlagudem, and Gundugolanu. There is one operational toll plaza on the project road near Veeravalli (km 53.700) as part of the concession. This project has been offered by NHAI to National Highways Infra Investment Managers Private Limited (NHIIMPL) for transfer to InvIT in the fourth round for a concession period of 20 years with maximum extension till 30 years.

Figure 0-1 shows the context and alignment of project road with major places along the highway.

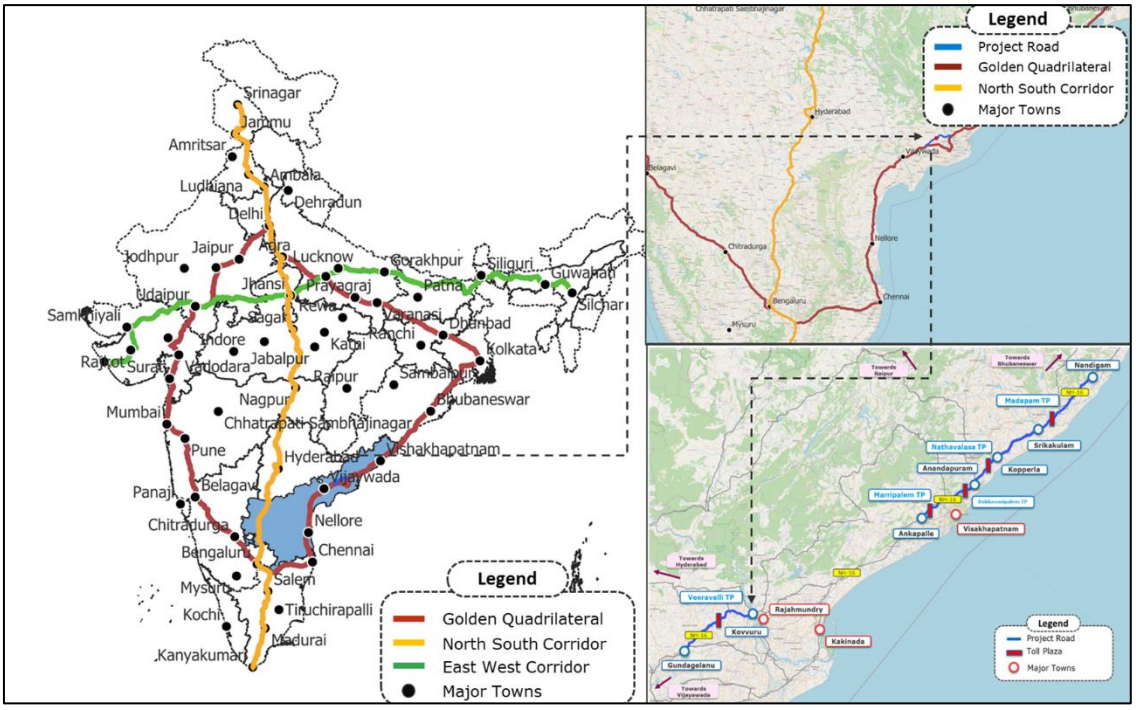


Figure 0-1: Gundugolanu-Kovvuru Section and Location of Toll Plaza

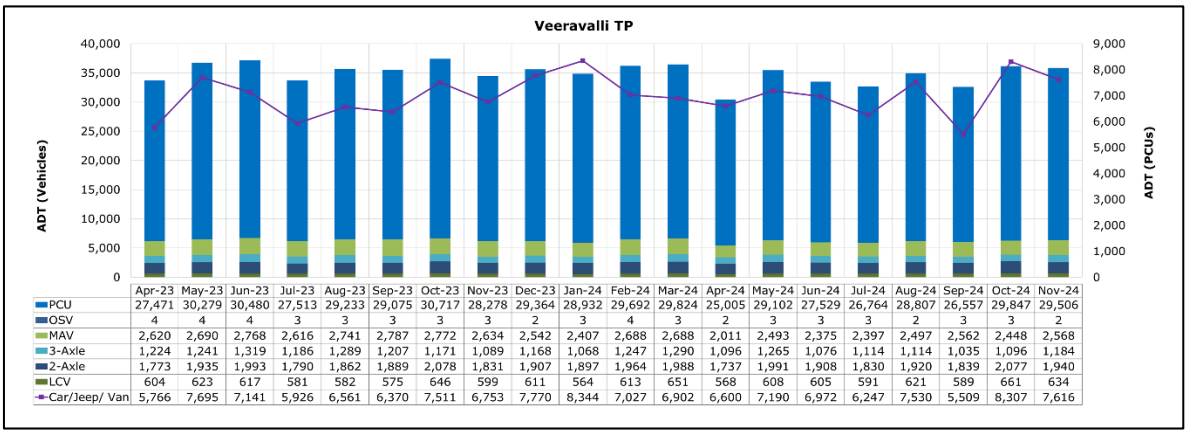
Project Road Characteristics and Profile of Influencing Districts

The project road serves for long-distance traffic, which is primarily plying between Kolkata/Bhubaneswar/Visakhapatnam/northern region and Vijayawada/Bengaluru/Chennai/southern region. Apart from long-distance traffic, it also

serves the short-distance traffic, which is mainly generated between Kovvuru/Rajahmundry/Tuni/Ankapalle/Visakhapatnam located on the north of the toll plaza and Gundugolanu/Eluru/Vijayawada located on the south of the toll plaza. The project road section falls under the jurisdiction of Eluru and East Godavari districts in the state of Andhra Pradesh.

Traffic Volume and Vehicle Composition - AADT for FY25

The past toll traffic data for the toll plaza was made available by the client from April 2023 to November 2024 is presented in **Figure 0-2**.



	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24
PCU	27,471	30,279	30,480	27,513	29,233	29,075	30,717	28,278	29,364	28,932	29,692	29,824	25,005	29,102	27,529	26,764	28,807	26,557	29,847	29,506
OSV	4	4	4	3	3	3	3	3	2	3	4	3	2	3	3	3	2	3	3	2
MAV	2,620	2,690	2,768	2,616	2,741	2,787	2,772	2,634	2,542	2,407	2,688	2,688	2,011	2,493	2,375	2,397	2,497	2,562	2,448	2,568
3-Axle	1,224	1,241	1,319	1,186	1,289	1,207	1,171	1,089	1,168	1,068	1,247	1,290	1,096	1,265	1,076	1,114	1,114	1,035	1,096	1,184
2-Axle	1,773	1,935	1,993	1,790	1,862	1,889	2,078	1,831	1,907	1,897	1,964	1,988	1,737	1,991	1,908	1,830	1,920	1,839	2,077	1,940
LCV	604	623	617	581	582	575	646	599	611	564	613	651	568	608	605	591	621	589	661	634
Car/Jeep/ Van	5,766	7,695	7,141	5,926	6,561	6,370	7,511	6,753	7,770	8,344	7,027	6,902	6,600	7,190	6,972	6,247	7,530	5,509	8,307	7,616

Figure 0-2: Month on Month Traffic Data for Veeravalli TP

AADT for FY25

Due to the maintenance work on the Kovvur bridge, heavy trucks were not allowed to use the bridge from 30th March 2024 to 8th May 2024. Therefore, data from May 9, 2024, to November 2024 has been considered for freight modes. For cars, complete data from April to November (including data for the months of April and May) has been considered.

The AADT for FY25 is estimated by annualizing the ETC data from April/May 2024 to November 2024. A seasonal correction factor (SCF), based on an average of 7/8–12-month factors derived for FY23 from the toll data of the adjacent toll plazas of Krishnavaram and Vempadu under Safeway Concessions, has been adopted. Additionally, cash and exempt traffic for FY25 (Apr to Nov) have been added to the estimated ETC ADT of Veeravalli toll plaza.

FY25 AADT along with ADT, 7/8–12-month SCF, cash and exempt traffic is presented in in **Table 0-1**.

Particulars	CJV	LCV	2A	3A	MAV	OSV	PCUs
Veeravalli TP							
A. ETC (Apr-Nov)	6,996	615	1,929	1,126	2,477	3	28,244
B. SCF	1.02	1.00	1.00	1.00	1.02	1.02	
C. ETC AADT = A*B	7,164	614	1,925	1,126	2,526	3	28,619
D. Cash (Apr 24 - Nov 24)	70	2	3	2	2	2	106
E. Exempt (Apr 24 - Nov 24)	202	5		2	3	1	234
F. AADT FY25 (Estimated) = C+D+E	7,436	621	1,928	1,130	2,530	5	28,949

Table 0-1: AADT-FY25

Travel Pattern

Passenger Traffic:

- About 58.2 percent of cars and 46.9 percent of buses are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Devarapalli/Rajamahendravaram and surroundings. The traffic in this region reflects the heavy commuter movement within these prominent towns, likely driven by daily business and social interactions.
- In addition, around 11.7 percent of cars and 15.3 percent of buses are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Vishakapatnam and surroundings.
- Also, about 10.8 percent of cars and 27.0 percent of buses are found to be travelling from/to Suryapet/Hyderabad and beyond to/from Devarapalli and beyond.

Freight Traffic:

- About 59.3 percent of MLCVs and 28.1 percent of LCVs are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Devarapalli/Rajamahendravaram and surroundings.
- In case of heavy freight vehicles, about 23-27 percent of 2A & 3A trucks and around 13.4 percent of MAVs are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Devarapalli/Rajamahendravaram and surroundings.
- Additionally, around 16 percent of 2A & 3A trucks and around 12 percent of MAVs are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Vishakapatnam and surroundings.

Network Impacts

Impact of Khammam - Devarapalli Expressway

The total diverted traffic estimated for FY25 after the operation of Khammam - Devarapalli Expressway at Veeravalli TP is presented in **Table 0-2**.

Modes	Car	LCV	2A	3A	MAV
Veeravalli TP	0.0	0.7	2.2	3.8	4.1

Table 0-2: Total Impact (%) Due to Khammam - Devarapalli Expressway – FY25

This traffic has been grown and considered appropriately in the respective years of impact. The proposed expressway will be a greenfield alignment and considering gradual build-up of traffic on the alternate routes, the diversion impact is considered from FY27 onwards under Base Case. Owing to the gradual shift of traffic away from the project road, the traffic impacts have been assumed to take place in phases with about 50 percent in FY27, 75 percent in FY28 and 100 percent from FY29 onwards.

Traffic Growth Rates

The estimated traffic growth rates for the project road based on the elasticity approach along with the implied growth rates after considering the impact of diversions have been presented till FY55 in line with the maximum extendable concession period of 30 years in **Table 0-3**.

FY/Modes	Cars	LCV	Bus/ 2A	3A	MAV/ OSV	Cars	LCV	Bus/ 2A	3A	MAV/ OSV
	Normal Growth Rates					Implied Growth Rates				
FY26	7.4	3.3	3.4	2.7	6.7	7.4	3.3	3.4	2.7	6.7
FY27	7.3	3.3	3.3	2.7	6.6	7.3	3.3	2.2	0.7	4.4
FY28	7.3	3.3	3.3	2.7	6.6	7.3	3.3	2.8	1.7	5.5
FY29	7.0	3.1	3.2	2.5	6.3	7.0	3.1	2.6	1.5	5.2
FY30	6.3	2.8	2.9	2.3	5.7	6.3	2.8	2.9	2.3	5.7
FY31	5.8	2.8	2.9	2.3	5.1	5.8	2.8	2.9	2.3	5.1
FY32	5.8	2.8	2.9	2.3	5.1	5.8	2.8	2.9	2.3	5.1
FY33	5.8	2.8	2.9	2.3	5.1	5.8	2.8	2.9	2.3	5.1
FY34	5.8	2.8	2.9	2.3	5.1	5.8	2.8	2.9	2.3	5.1
FY35	5.7	2.8	2.8	2.3	5.0	5.7	2.8	2.8	2.3	5.0
FY36	5.6	2.7	2.8	1.7	4.4	5.6	2.7	2.8	1.7	4.4
FY37	5.5	2.7	2.7	1.6	4.3	5.5	2.7	2.7	1.6	4.3
FY38	5.4	2.6	2.7	1.6	4.2	5.4	2.6	2.7	1.6	4.2
FY39	5.2	2.6	2.6	1.6	4.2	5.2	2.6	2.6	1.6	4.2
FY40	5.1	2.5	2.6	1.5	4.1	5.1	2.5	2.6	1.5	4.1
FY41	5.0	2.5	2.5	1.5	3.5	5.0	2.5	2.5	1.5	3.5
FY42	4.9	2.4	2.5	1.5	3.4	4.9	2.4	2.5	1.5	3.4
FY43	4.8	2.4	2.4	1.5	3.4	4.8	2.4	2.4	1.5	3.4
FY44	4.7	2.3	2.4	1.4	3.3	4.7	2.3	2.4	1.4	3.3
FY45 and beyond	4.6	2.3	2.3	1.4	3.2	4.6	2.3	2.3	1.4	3.2

Table 0-3: Projected Traffic Growth Rates for Project Road (%)

Projected Mode-wise Traffic

Mode-wise projected traffic for the toll plaza of the project under the base case after considering diversion impacts till FY55 is presented in **Table 0-4**.

FY/Modes	Car	LCV	Bus/2A	3A	MAV	OSV	PCU
2025	7,436	621	1,928	1,130	2,530	5	28,949
2026	7,989	642	1,993	1,161	2,699	5	30,585
2027	8,575	663	2,038	1,169	2,818	6	31,897
2028	9,203	685	2,094	1,188	2,973	6	33,483
2029	9,847	706	2,149	1,207	3,127	6	35,073
2030	10,470	726	2,211	1,234	3,305	7	36,799
2031	11,073	747	2,275	1,263	3,474	7	38,473
2032	11,710	768	2,341	1,292	3,653	8	40,230
2033	12,384	790	2,408	1,321	3,840	8	42,073
2034	13,096	813	2,478	1,352	4,037	8	44,007
2035	13,836	836	2,548	1,382	4,240	9	46,002
2036	14,605	859	2,619	1,405	4,427	9	47,927
2037	15,401	882	2,691	1,428	4,618	10	49,904
2038	16,225	905	2,763	1,451	4,814	10	51,931
2039	17,076	929	2,836	1,474	5,014	10	54,008
2040	17,955	952	2,909	1,497	5,219	11	56,133
2041	18,862	976	2,982	1,519	5,401	11	58,187
2042	19,795	1,000	3,056	1,542	5,586	12	60,281
2043	20,754	1,024	3,131	1,564	5,774	12	62,412
2044	21,739	1,048	3,205	1,587	5,964	12	64,579
2045	22,748	1,072	3,280	1,609	6,156	13	66,781
2046	23,804	1,097	3,356	1,631	6,354	13	69,064
2047	24,910	1,122	3,434	1,654	6,559	14	71,433
2048	26,066	1,148	3,514	1,677	6,770	14	73,889
2049	27,277	1,174	3,596	1,700	6,988	14	76,438
2050	28,543	1,201	3,680	1,724	7,213	15	79,081
2051	29,869	1,229	3,766	1,748	7,445	15	81,824
2052	31,256	1,257	3,853	1,772	7,685	16	84,671
2053	32,707	1,286	3,943	1,797	7,932	16	87,624
2054	34,226	1,315	4,035	1,822	8,188	17	90,690
2055	35,815	1,346	4,129	1,847	8,451	17	93,871

Table 0-4: Projected Mode-wise Traffic

Projected Traffic in PCUs

Total traffic in PCUs at the project road under the base case before and after considering diversion impacts is presented in **Table 0-5**.

FY End	Total Traffic Before Diversion	Total Traffic After Diversion
2025	28,949	28,949
2026	30,585	30,585
2027	32,298	31,897
2028	34,118	33,483
2029	35,962	35,073
2030	37,730	36,799
2031	39,445	38,473
2032	41,244	40,230
2033	43,131	42,073
2034	45,111	44,007
2035	47,153	46,002
2036	49,122	47,927
2037	51,143	49,904
2038	53,216	51,931
2039	55,338	54,008
2040	57,510	56,133
2041	59,607	58,187
2042	61,744	60,281
2043	63,919	62,412
2044	66,131	64,579
2045	68,377	66,781
2046	70,707	69,064
2047	73,122	71,433
2048	75,628	73,889
2049	78,226	76,438
2050	80,922	79,081
2051	83,718	81,824
2052	86,620	84,671
2053	89,630	87,624
2054	92,753	90,690
2055	95,995	93,871
CAGR (%) (FY25 to FY45)	4.4	4.3

Table 0-5: Projected Traffic at PR in PCUs

As per the traffic projections estimated above, the six-laning of the PR section is anticipated to take place in FY35 and FY36.

It is to be noted, the majority of the distinct structures on the PR section are already six-laned, and the required land for the expansion to a six-lane carriageway is available. Thus, disruptions during the construction process are expected to be minimal. Cost ratio analysis suggests a minimal change in share of PR when compared in existing 4 lane configuration (during construction with a lower speed) with 6 lane configurations. Hence, no significant impact on traffic is expected during expansion of PR.

Tolling Segmentation

The tolling stream distribution for the project road has been derived from the average of ETC toll data of FY25 from April 2024 to November 2024. The cash and exemption traffic (April – November 2024) have been added to the ETC traffic distribution and the resultant tolling segmentation is presented in **Table 0-6**.

Type	Car	LCV	Bus/2A Trucks	3A Trucks	MAV	OSV
Single	48.2	67.4	54.4	61.8	91.2	100.0
Return	45.5	30.1	36.9	23.0	8.2	
Monthly	0.0	0.0	1.3	0.0	0.0	
Local personal	3.0					
Local commercial	0.5	1.8	7.4	15.0	0.4	
Exemptions and Violations	2.9	0.7	0.0	0.2	0.1	
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 0-6: Tolling Distribution Based on Toll Data of FY25

Tollable Length and Toll Rates

In case of the project road, the details of normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being charged at Veeravalli toll plaza are presented in **Table 0-7**.

Veeravalli TP at km 53.700	FY25 onwards
A. Normal	24.3590
B. Bypass	43.6930
C. Eq. structure	1.8320
Base Length	69.8840
Tolling Length = A+(B*1.5) + (C*10)	108.2185

Table 0-7: Tolling Lengths (in km) for the Project Road

The stream of toll rates likely to be charged basis schedule -M lengths and adopted WPI assumptions at the toll plaza of the project road in cardinal years till FY55 is presented in **Table 0-8**.

FY	Car	LCV	Bus/ 2-axle Truck	3-axle Truck	MAV	O/size/ HME	Car Local
Veeravalli TP							
2025	160	255	535	585	840	1,025	340
2030	195	315	660	720	1,035	1,260	415
2035	240	385	805	880	1,265	1,540	510
2040	290	470	985	1,075	1,545	1,880	620
2045	355	575	1,205	1,310	1,885	2,295	760
2050	435	700	1,470	1,605	2,305	2,805	925
2055	530	855	1,795	1,960	2,815	3,430	1,130

Table 0-8: Toll Rates at Toll Plaza (in Rs)

Project Road Revenue

The project road revenue under the base case and considering the impact of all the diversions is presented in **Table 0-9**.

FY Ending March	Base Case
2025	1,707.0
2026	1,864.2
2027	2,030.2
2028	2,240.0
2029	2,429.2
2030	2,659.2
2031	2,897.5
2032	3,147.7
2033	3,425.9
2034	3,730.8
2035	4,053.3
2036	4,404.6
2037	4,759.0
2038	5,153.5
2039	5,570.4
2040	6,031.0
2041	6,493.9
2042	6,996.3
2043	7,525.9
2044	8,105.4
2045	8,709.0
2046	9,368.6
2047	10,071.9
2048	10,854.8
2049	11,647.3
2050	12,546.3
2051	13,496.9
2052	14,554.0
2053	15,640.8
2054	16,828.6
2055	18,102.8
PV12 FY25 to FY45	24,441.3
CAGR FY25 to FY45	8.5%
PV12 FY25 to FY55	30,946.1
CAGR FY25 to FY55	8.2%

Table 0-9: Base Case Revenue (in Rs million)

The project road will have a CAGR of 8.5 percent for the period between FY25 to FY45.

1. INTRODUCTION

1.1 General

National Highways Authority of India (NHAI) has setup NHAI InvIT to monetize its completed and operational National Highway projects with the objective of mobilizing additional resources through capital markets. The project road section with an aggregate length of 70 kilometers viz., Gundugolanu-Kovvuru of NH-16 (Old NH-4) in the state of Andhra Pradesh referred to as Project Road (PR), has been offered by NHAI to National Highways Infra Investment Managers Private Limited (NHIIMPL) for transfer to InvIT in the fourth round for a concession period of 20 years with maximum extension till 30 years.

The project highway, NH-16, is a major highway in India connecting Kolkata with Chennai and is part of the East-West corridor envisaged under the National Highway Development Program (Phase – II). NH-16 passes through the cities of Bhubaneswar, Visakhapatnam, Vijayawada, Guntur, Ongole, and Nellore, serving as a critical link between the eastern coastal regions of the country. This highway plays a vital role in facilitating trade and transportation along the eastern coast of India, contributing to regional development and connectivity. **Figure 1-1** shows the alignment of project road along NH-16.

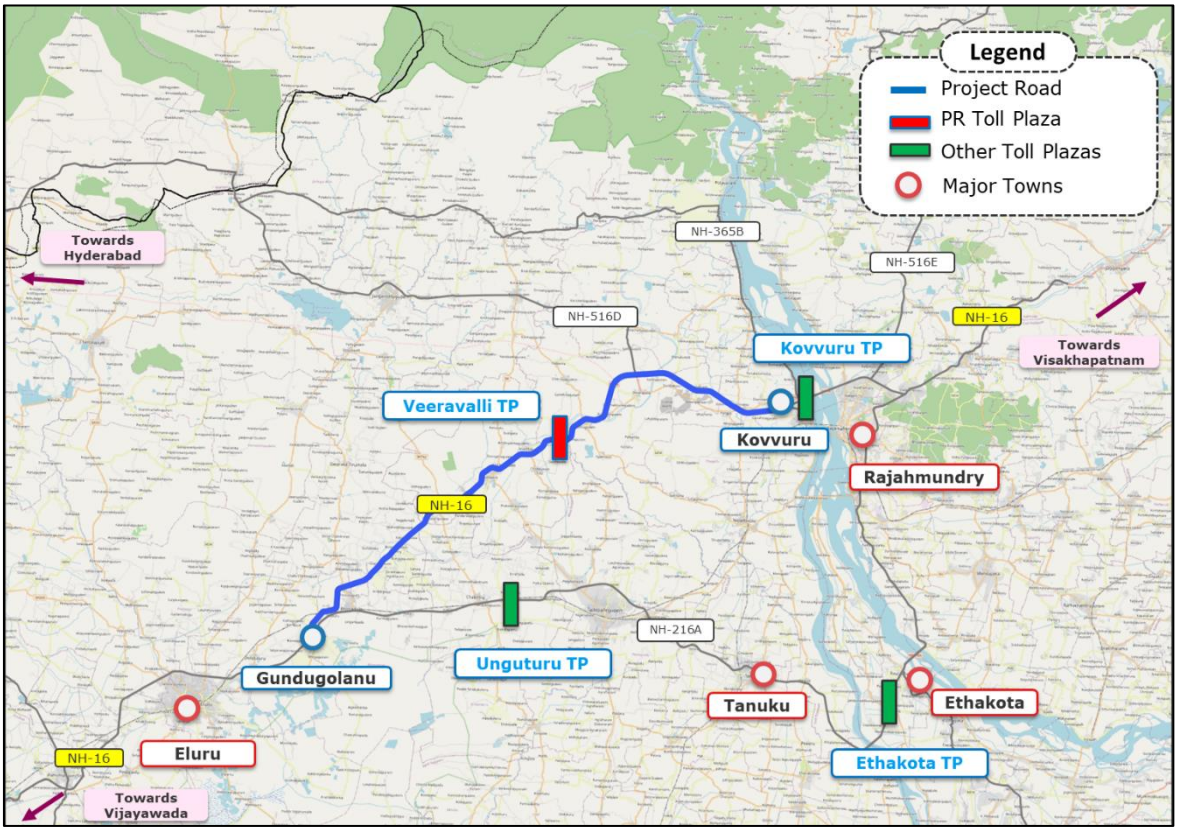


Figure 1-1: Alignment of Project Road

National Highways Infra Investment Managers Private Limited, the Investment Manager to InvIT has appointed Ramboll India Private Ltd as the traffic consultant to carry out a study for assessing the present traffic levels, travel pattern and future traffic & revenue

estimation till FY55 duly considering the network characteristics, future economic perspective in the influence area of the project.

1.2 Scope of Services

The scope of the study includes the following:

- Undertake Traffic Survey on the highway section as per the following:
  - Seven days 24 hours Videography Traffic Counts at or near the existing toll plaza locations on the project road to derive the Average Daily Traffic (ADT)
  - One day Origin-Destination survey at or near the existing toll plaza locations to assess the existing travel pattern of vehicles plying on the project road – origin and destination.
- Estimation of the base year AADT FY25
- Analysis of OD data to cover:
  - Regional distribution of traffic and influence factors for different zones contributing traffic on the corridor
  - Identification of Project Influence Area from analysis of travel pattern - regional distribution of traffic,
  - Main traffic generators (industrial areas, towns, ports etc.)
  - Commodity composition- Goods type distribution
  - Top OD pairs by vehicle types
- Review of past traffic studies, traffic/toll data and other relevant reports as may be available to determine category wise volume of traffic for past years as well as for current year
- To identify competing route and analyse the network conditions, traffic characteristics & level of toll charged and the advantage/ disadvantage of the competing road and their impact on the project traffic
- Carry out a study of past economic performance of influence area
- Diversion analysis, wherever needed – cost ratio-based diversion analysis using spreadsheets to be carried out for respective potential OD pairs.
- Preparation of traffic projections till year FY55 in three scenarios – low, most likely and high
- Capacity analysis of the road or any other requirements for potential capacity augmentation
- Estimation of tollable traffic streams by toll category and estimation of toll

revenue as per categories of traffic streams stipulated in the tolling schedule for the study period

- Review future road and transportation network developments in the area of influence of the project and identify those schemes that may impact positively or negatively traffic on the toll road
- Identify factors which may have a positive and / or negative impact on the traffic - all major developments like DFC, industrial corridors, economic corridors, ports, Bharatmala, Sagarmala
- Scenario Analysis of toll revenue – Critical parameters of diversion (if applicable) and three scenarios of traffic growth (most likely, low and high).

1.3 Structure of Report

This report is divided into four chapters, including this introduction chapter. Chapter 2 details upon the project road characteristics and socio – economic profile of the districts in the project influence area including the estimation of AADT and travel characteristics in the Project Influence Area (PIA). Chapter 3 contains the details on the derivation of traffic growth rates used for traffic forecasting and presents traffic projections for the study period. Chapter 4 presents the details regarding tolling strategy, toll rates and the revenue projections for the duration of the concession.

2. TRAFFIC SURVEY AND ANALYSIS

2.1 General

In order to understand the traffic characteristics, the volume of traffic and travel pattern of vehicles plying on the project road were collected through primary surveys. This chapter presents the details of the project road characteristics, traffic surveys carried out, their analysis and the salient findings. The results of the analysis will be utilized in assessing the traffic growth and estimation of traffic and revenue forecast on the project road for the concession period.

2.2 Project Road Characteristics

The project road section, Gundugolanu – Devarapalli - Kovvuru, a part of the NH-16 in the state of Andhra Pradesh, starts at km 15.320 near Gundugolanu and ends at km 85.204 at Kovvuru with a length of about 69.8 km. The project road falls under the jurisdiction of Eluru and East Godavari districts passing through settlements of Kovvuru, Pangidi, Devarapalli, Veerampalem, Pullalapadu, Avapadu, Hanumanlagudem, and Gundugolanu. There is one operational toll plaza on the project road near Veeravalli (km 53.700) as part of the concession. PR serves the long-distance traffic majorly plying between Chennai/Bangalore and Bhubaneswar/Kolkata.

The PR also serves the short distance traffic for both passenger and freight which is mainly generated between Eluru/Vijayawada/ Hyderabad/ to Rajahmundry/ Kakinada/ Vishakhapatnam.

There are 8 tolling lanes in each direction out of which four lanes are operational including dedicated lane for OSVs at the toll plaza location. The toll plaza is currently operated by M/s Riddhi Siddhi Associates. Moreover, a WIM (weigh in motion) is installed in tolling lanes, but currently no overloading is charged.

The alignment of project road and toll plaza location is shown in **Figure 2-1**.

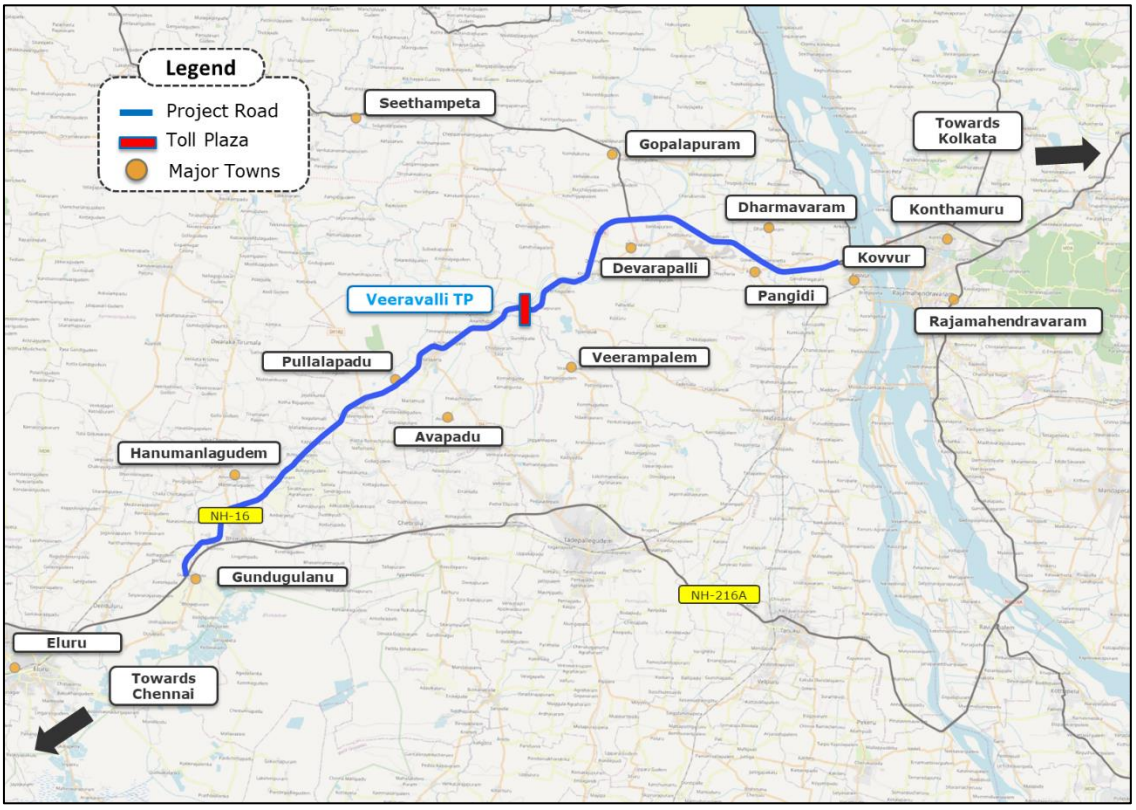


Figure 2-1: Project Road and Location of Toll Plaza

The project road provides the shorter link (by about 40 km) between Gundugolanu and Rajahmundry as compared to route via NH-216A and in wider context, serves long distance traffic originating/destined South of Gundugolanu and travelling to regions on the North of Rajahmundry and vice versa.

2.2.1 Profile of Project Influence Area Districts

The project road section passes through the districts of East Godavari and Eluru in the state of Andhra Pradesh. A brief description of the profile of the districts is presented below.

East Godavari District

East Godavari district is situated in the northeastern region of Andhra Pradesh. The district covers an area of about 12,807 square kilometers, making it one of the largest districts in the state.

Agriculture plays a crucial role in East Godavari's economy, with the fertile delta formed by the Godavari River enabling extensive paddy cultivation. The district is also known for its coconut and oil palm plantations, with oil palm covering 29,408 hectares out of a potential 51,309 hectares. There is room for expansion, particularly with government support under the Oil Palm Development Programme.

Under the Prime Minister Formalisation of Micro Food Processing Enterprises (PMFME) Scheme, banana has been selected as the One District One Product (ODOP) for East Godavari district.

Rajahmundry, the district's largest city, is a key cultural and commercial hub, with industries including paper manufacturing, textiles and food processing. Moreover, sand mining activities are prominent along the Godavari river, particularly in areas like Pithapuram and Alamuru, contributing to the district's construction industry.

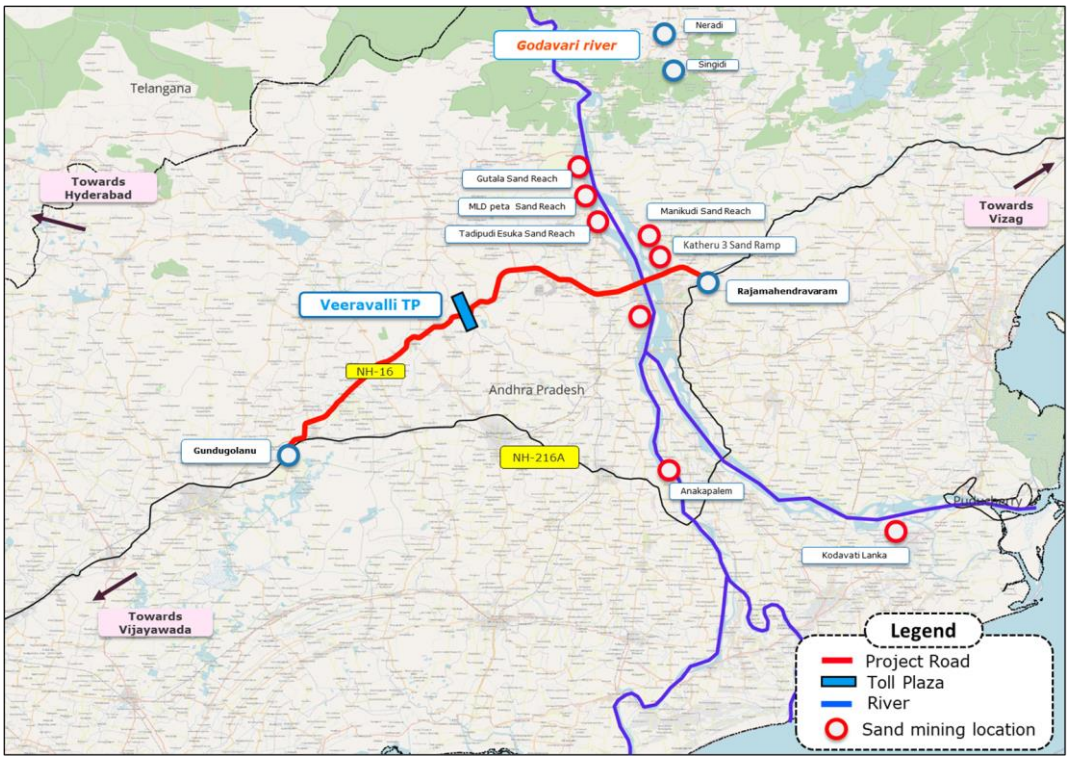


Figure 2-2: Location of Sand Mining Areas in Vicinity of PR

East Godavari district is rich in natural resources including bauxite, limestone, and natural gas, which fuel industrial development in sectors such as cement production, ceramics and chemicals. Prominent industrial estates are located in Rajahmundry, Kakinada, and Peddapuram with companies like Coromandel International and Andhra Paper leading the industrial sector.

As per the 2011 census, the district's population is approximately 5.1 million, with around 38 percent residing in urban centers like Rajahmundry, Kakinada, and Amalapuram. The working population makes up about 43 percent of the total, reflecting the district's growing urbanization and diversified economic base.

Eluru District

Eluru district is located in the western region of Andhra Pradesh. The district spans an area of approximately 6,679 square kilometers. The city of Eluru serves as the district's administrative and commercial centre, housing industries related to oil processing, textiles, and manufacturing.

Eluru is an agriculturally rich region, with fertile lands supporting the cultivation of paddy, sugarcane and coconut. Aquaculture, particularly prawn and fish farming, is a major economic activity in the coastal and deltaic areas. The district is also known for its extensive oil palm plantations, covering an area of about 2.15 lakh hectares, out of a

potential 4.77 lakh hectares. There is significant potential for further expansion of oil palm plantations. Under the PMFME Scheme, pulses i.e. black gram and green gram have been approved as the One District One Product (ODOP) for Eluru district.

Eluru district has significant mineral resources, particularly limestone, which supports cement production. Some of the major cement factories are Ambuja Cements Limited, The Ramco Cements Ltd., Zuari Cement Ltd., Shree Chakra Cement Ltd., Chettinad Cement, Andhra Cements Ltd., UltraTech Balaji Cement Works, and Dalmia Cement Factory.

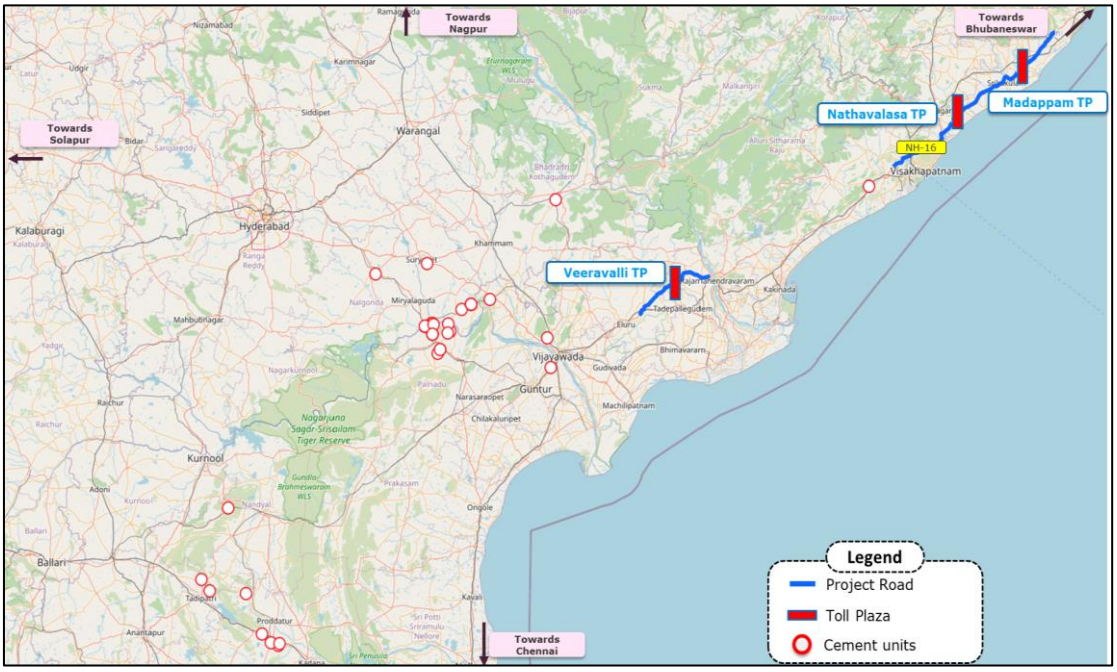


Figure 2-3: Location of Cement Factories Areas in Vicinity of PR

The major industrial estates are situated in Eluru, Bhimadole and Denduluru, where industries like food processing, oil palm refineries and textiles operate. Oil palm seed gardens are under development at Muthanaveedu and Gopannapalem in Eluru, further boosting the district's prominence in palm oil production.

According to the 2011 census, Eluru district has a population of approximately 2.4 million, with around 30 percent living in urban areas.

The overall industrial profile in the surrounding areas of the project section is presented in **Figure 2-4**.

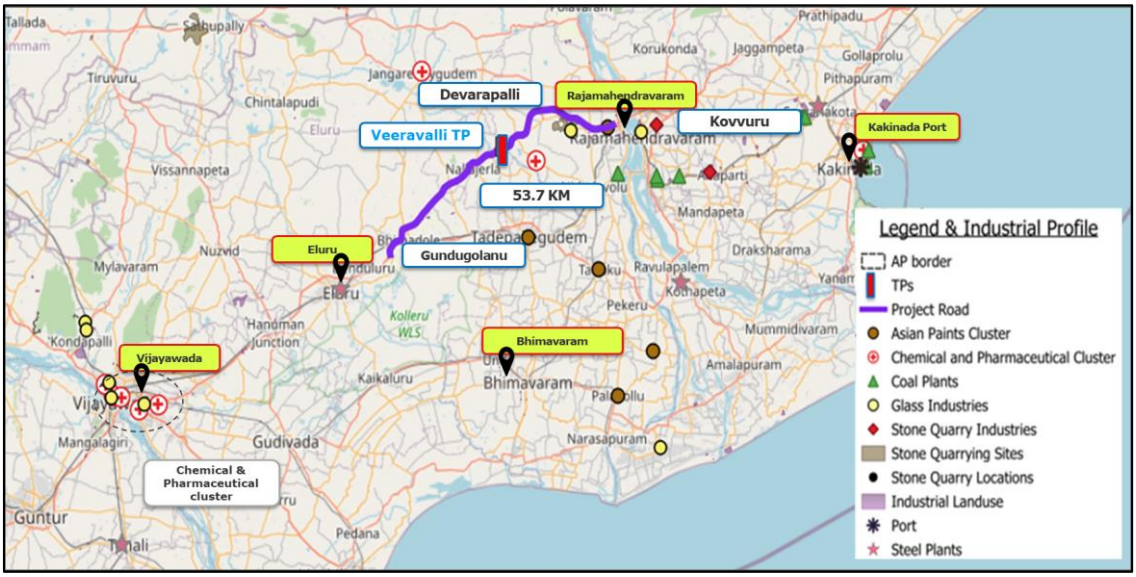


Figure 2-4: Industrial Profile of PR Section

2.3 Traffic Surveys

In order to understand the characteristics and the volume of traffic using the project road, data on road network, traffic and travel pattern of vehicles plying on the project road were collected through primary traffic surveys. Traffic volume video graphic survey for seven days and origin-destination (OD) survey as roadside interview for one day at toll plaza location was conducted on the project road. The schedule of the traffic surveys and location on the project road are given in **Table 2-1**.

Location	Chainage	Duration	Date(s)
Veeravalli TP	**Classified Traffic Volume Counts**		
	km 53.700	7 Days	22nd July 2024 – 28th July 2024
	Origin and Destination Survey		
	km 53.700	1 Day	23rd July 2024

Table 2-1: Traffic Survey Locations and Schedule

Trained enumerators were engaged for conducting traffic surveys under the supervision of experienced transport planner. The vehicle classification as generally used in the traffic surveys of NHAI studies along with their PCU values, as suggested in IRC: 64 – 1990, are presented in **Table 2-2**.

Vehicle Type	PCU Factor
Motorized Vehicles	
Car, Jeep, Van &Taxi	1.0
Two –Wheeler	0.5
Three-Wheeler (Auto-Rickshaw)	1.0
Mini-Bus/ School Bus	1.5
Govt. Bus/ Private Bus	3.0
Mini LCV/Max Pick Up	1.0
Light Commercial Vehicle (LCV)	1.5
2-Axle Truck	3.0
3-Axle Truck	3.0
Multi-Axle Vehicle (MAV 4-6 Axle)	4.5
HME	4.5
Agricultural Tractor	1.5
Agricultural Tractor with Trailer	4.5
Non – Motorised Vehicles	
Cycle	0.5
Cycle Rickshaw	2.0
Animal Drawn Cart	6.0

Table 2-2: Vehicle Classification and PCU Factors

2.4 Traffic Characteristics

The data collected from the traffic volume count survey was analysed in order to get the results with respect to existing traffic intensity, flow pattern, hourly variation, and composition of traffic on the study road network. The various traffic characteristics have been analysed under the following heads:

- Average Daily Traffic (ADT)
- Daily variation, Hourly variation, and Traffic composition
- Annual Average Daily Traffic (AADT)

2.4.1 Average Daily Traffic (ADT)

The traffic volume data collected at the toll plaza location during the seven days survey has been analysed. The summary of ADT in terms of vehicles and PCUs is presented in **Table 2-3**.

Mode	Veeravalli Toll Plaza
Tollable vehicles	
Car/Jeep/Van/Taxi	5,448
Minibus	68
Standard Bus	705
Mini LCV	875
LCV	1,168
2 Axle	689
3 Axle	1,151
MAV (4-6 Axle)	2,387
HMV/ MAV (=>7 Axle)	4
Non Tollable vehicles	
Two Wheeler	4,463
Auto Rickshaw	391
Agri. Tractors	130
Total Non-Motorised	28
Total Vehicles/PCUs	
Total Tollable Vehicles	12,494
Total Non Tollable Vehicles	5,012
Total Vehicles	17,506
Total PCU	29,763
Tollable PCU	26,567

Table 2-3: Average Daily Traffic at Veeravalli Toll Plaza

- Total vehicles of about 17,506 were observed on an average crossing Veeravalli Toll Plaza across the seven days.
- The share of passenger and freight vehicles in total traffic is 63.4 percent (11,103 vehicles) and 36.6 percent (6,403 vehicles), respectively.
- Considering the passenger vehicle categories, car traffic has a share of around 31.0 percent (5,448 vehicles) while buses have a share of around 4.0 percent (705 vehicles) of total traffic.
- In freight traffic, MAV traffic has a share of about 13.7 percent (2,387 vehicles), 3A trucks have a share of about 6.6 percent (1,151 vehicles) and 2A trucks account for 3.9 percent (689 vehicles) of total traffic.

2.4.2 Daily Variation, Hourly Variation and Traffic Composition

The day wise variation, hourly variation and the traffic composition at the toll plaza location is presented in **Figure 2-5**.

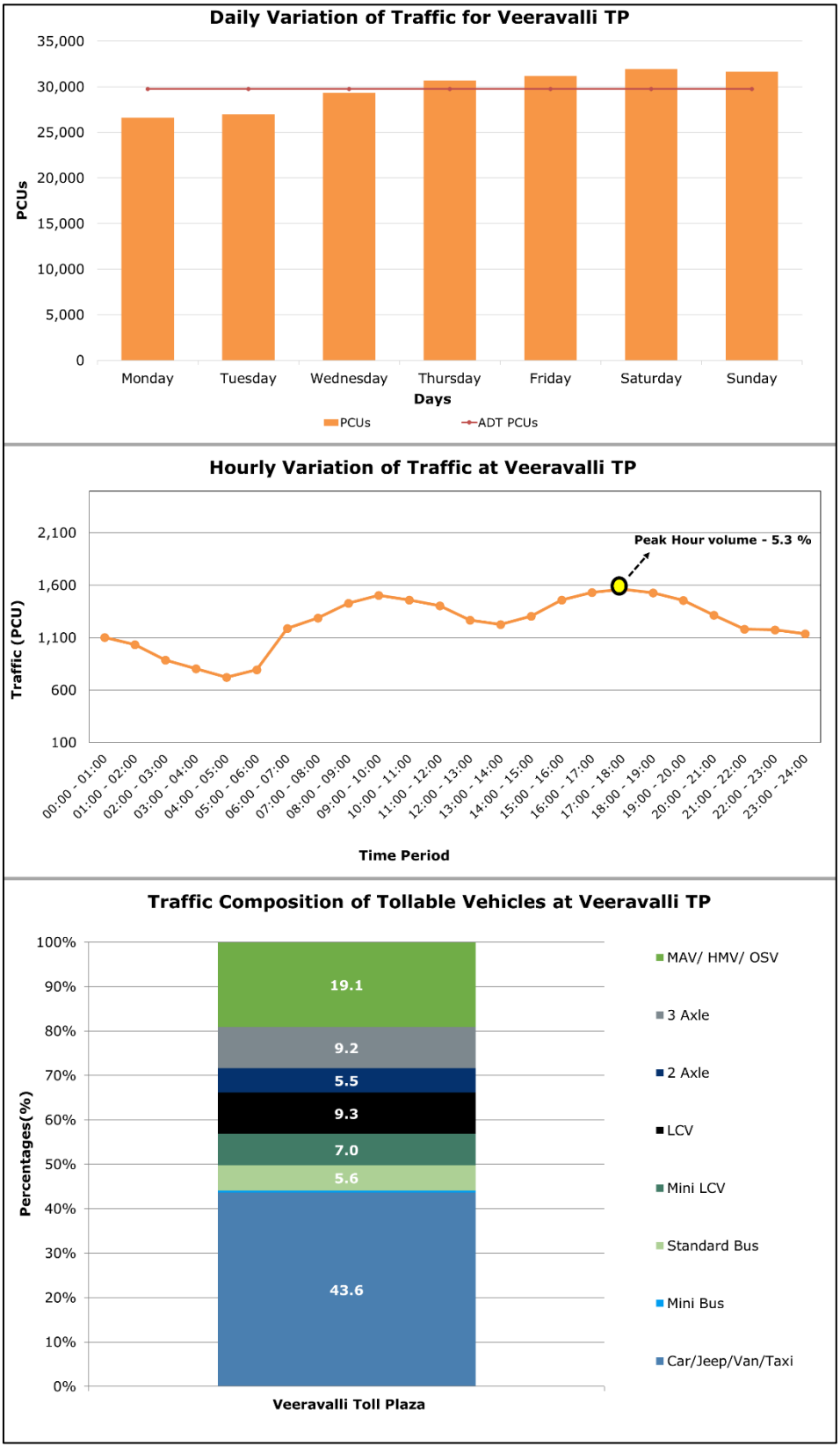


Figure 2-5: Daily Variation, Hourly Variation and Traffic Composition

- Traffic is usually lower on Mondays due to closure of markets/factories on Sundays in Vijayawada, Guntur, and nearby areas. With markets/factories opening up from Monday, traffic usually picks up from Tuesday onwards and remains consistent over the rest of the days.

- The directional distribution at the toll plaza location is almost equal with Kolkata - Chennai having a directional share of around 48.9 percent.

2.4.3 Comparison of Toll Data with TVC

ETC vs TVC Excluding Cash and Exemptions Traffic

The TVC survey was conducted from 22nd July 2024 to 28th July 2024. A comparison between TVC and ETC data (7-day average) for the days of survey is presented in **Table 2-4**.

Day/Date	CJV	LCV	2-Axle	3-Axle	MAV/ OSV	LCV/ 2A	Total	PCUs
Toll Data (ETC)	6,071	596	1,841	1,199	2,436	2,437	12,143	27,048
TVC	6,323	1,236	1,393	1,151	2,390	2,629	12,494	26,567
Variation (Toll data minus TVC)	-252	-640	447	48	46	-192	-351	481
Variation (%)	-4.0	-51.8	32.1	4.2	1.9	-7.3	-2.8	1.8

Table 2-4: Comparison Between TVC and ETC Data Excluding Cash & Exempted Traffic

The variation in total traffic is minimal (about 2.8 percent on an average per day) between the toll plaza count and videography; however, there are mode wise variations as ETC data does not include traffic under exemptions and violations. The variation between LCV and trucks could be attributed due to cross classifications between these categories of vehicles.

ETC vs TVC Including Cash and Exemptions Traffic

A comparison between TVC and ETC data (7-day average) including cash and exempted traffic for the days of survey is presented in **Table 2-5**.

Day/Date	CJV	LCV	2-Axle	3-Axle	MAV/ OSV	LCV/ 2A	Total	PCUs
Toll Data (ETC)	6,305	599	1,845	1,201	2,438	2,444	12,388	27,312
TVC	6,323	1,236	1,393	1,151	2,390	2,629	12,494	26,567
Variation (Toll data minus TVC)	-18	-637	451	49	48	-186	-107	745
Variation (%)	-0.3	-51.5	32.4	4.3	2.0	-7.1	-0.9	2.8

Table 2-5: Comparison Between TVC and ETC Data Including Cash & Exempted Traffic

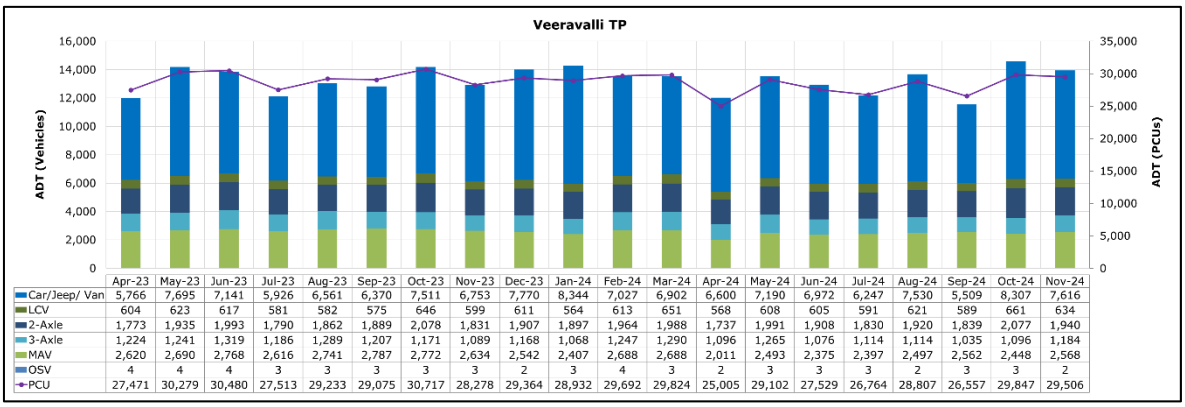
The variation in total traffic after adding cash and exempted traffic shows even lesser variation, which is about 0.9 percent on an average per day between the toll plaza count and videography.

2.4.4 Annual Average Daily Traffic (AADT)

The traffic plying on any road generally varies over different periods of the year depending on the cycle of different socio-economic activities in the regions through which it passes. Therefore, in order to have a more realistic picture of the traffic on the project road, it is required to assess its seasonal variation to estimate the annual average daily traffic (AADT).

The past toll traffic data for the toll plaza was made available by the client from December 2021 to November 2024 as presented in **Appendix 2.1**.

The month-on-month mode-wise traffic for the period from April 2023 to November 2024 is presented in **Figure 2-6**.



	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24
Car/Jeep/ Van	5,766	7,695	7,141	5,926	6,561	6,370	7,511	6,753	7,770	8,344	7,027	6,902	6,600	7,190	6,972	6,247	7,530	5,509	8,307	7,616
LCV	604	623	617	581	582	575	646	599	611	564	613	651	568	608	605	591	621	589	661	634
2-Axle	1,773	1,935	1,993	1,790	1,862	1,889	2,078	1,831	1,907	1,897	1,964	1,988	1,737	1,991	1,908	1,830	1,920	1,839	2,077	1,940
3-Axle	1,224	1,241	1,319	1,186	1,289	1,207	1,171	1,089	1,168	1,068	1,247	1,290	1,096	1,265	1,076	1,114	1,114	1,035	1,096	1,184
MAV	2,620	2,690	2,768	2,616	2,741	2,787	2,772	2,634	2,542	2,407	2,688	2,688	2,011	2,493	2,375	2,397	2,497	2,562	2,448	2,568
OSV	4	4	4	3	3	3	3	3	2	3	4	3	2	3	3	3	2	3	3	2
PCU	27,471	30,279	30,480	27,513	29,233	29,075	30,717	28,278	29,364	28,932	29,692	29,824	25,005	29,102	27,529	26,764	28,807	26,557	29,847	29,506

Figure 2-6: Month-on-Month Traffic Data for Veeravalli TP

Due to the maintenance work on the Kovvur bridge, heavy trucks were not allowed to use the bridge from 30th March 2024 to 8th May 2024. Therefore, data from May 9, 2024, to November 2024 has been considered for freight modes. For cars, complete data from April to November (including data for the months of April and May) has been considered.

The AADT for FY25 is estimated by annualizing the ETC data from April/May 2024 to November 2024. A seasonal correction factor (SCF), based on an average of 7/8–12-month factors derived for FY23 from the toll data of the adjacent toll plazas of Krishnavaram and Vempadu under Safeway Concessions, has been adopted. Additionally, cash and exempt traffic for FY25 (Apr to Nov) have been added to the estimated ETC ADT of Veeravalli toll plaza.

FY25 AADT along with ADT, 7/8–12-month SCF, cash and exempt traffic is presented in **Table 2-6**.

Particulars	CJV	LCV	2-Axle	3-Axle	MAV	OSV	PCUs
Veeravalli TP							
A. ETC (Apr/May-Nov)	6,996	615	1,929	1,126	2,477	3	28,244
B. SCF	1.02	1.00	1.00	1.00	1.02	1.02	
C. ETC AADT = A*B	7,164	614	1,925	1,126	2,526	3	28,619
D. Cash (Apr 24 - Nov 24)	70	2	3	2	2	2	106
E. Exempt (Apr 24 - Nov 24)	202	5		2	3	1	234
F. AADT FY25 (Estimated) = C+D+E	7,436	621	1,928	1,130	2,530	5	28,949

Table 2-6: AADT - FY25

2.5 Travel Characteristics

2.5.1 Survey Methodology

In order to understand the travel demand pattern in the region and tollable traffic streams, origin and destination (OD) surveys were carried out at the toll plaza locations. The OD survey was carried out for 24 hours, by roadside interview method as described in IRC: 102-1988. Both passenger and commercial vehicles plying on the project road were stopped on a random sampling basis and interviewed.

The travel characteristics obtained by OD survey facilitate the identification of:

1. Local and through traffic on the project road.
2. Potential divertible traffic to/from project road to various alternative routes.

Trained enumerators under the supervision of transport planners collected the trip characteristics using survey forms designed for this purpose. The OD survey elicited characteristics like origin, destination, frequency, purpose of trip for passenger vehicles and commodity being transported for goods vehicles. The information pertaining to origin and destination of trips collected during roadside interviews was analysed to obtain the trip distribution based on a zoning system suitably designed for the present study.

2.5.2 Traffic Zoning System

To understand the spatial dimensions of the trip characteristics of the vehicles interviewed during the O-D survey, a detailed zoning system was developed giving due consideration to the following factors:

- The road network catering to the traffic on the project road and its generating points
- Important towns, villages, factories, and industrial centres around the project road area
- Administrative boundaries of districts and states.
- Configuration of the project road in the regional road network with respect to other roads

Two major types of areas were identified for analysis purpose: -

Immediate Influence Area (IIA): It includes the cities/towns/villages and districts along the project road and adjacent to it, which generate/attract trips to the project road. In this study, it consists of districts of Eluru, East Godavari, West Godavari, Krishna, Visakhapatnam, Kakinada, and Guntur in the state of Andhra Pradesh.

Broad Influence Area (BIA): It includes the remaining districts of Andhra Pradesh and the remaining states of India.

Detailed zoning system is prepared for IIA, while more aggregate or broad zoning is developed for BIA. The zoning system adopted for data collection was based on 107 zones and is presented in **Appendix 2.2**.

The zoning system adopted for data collection is presented in **Figure 2-7**.

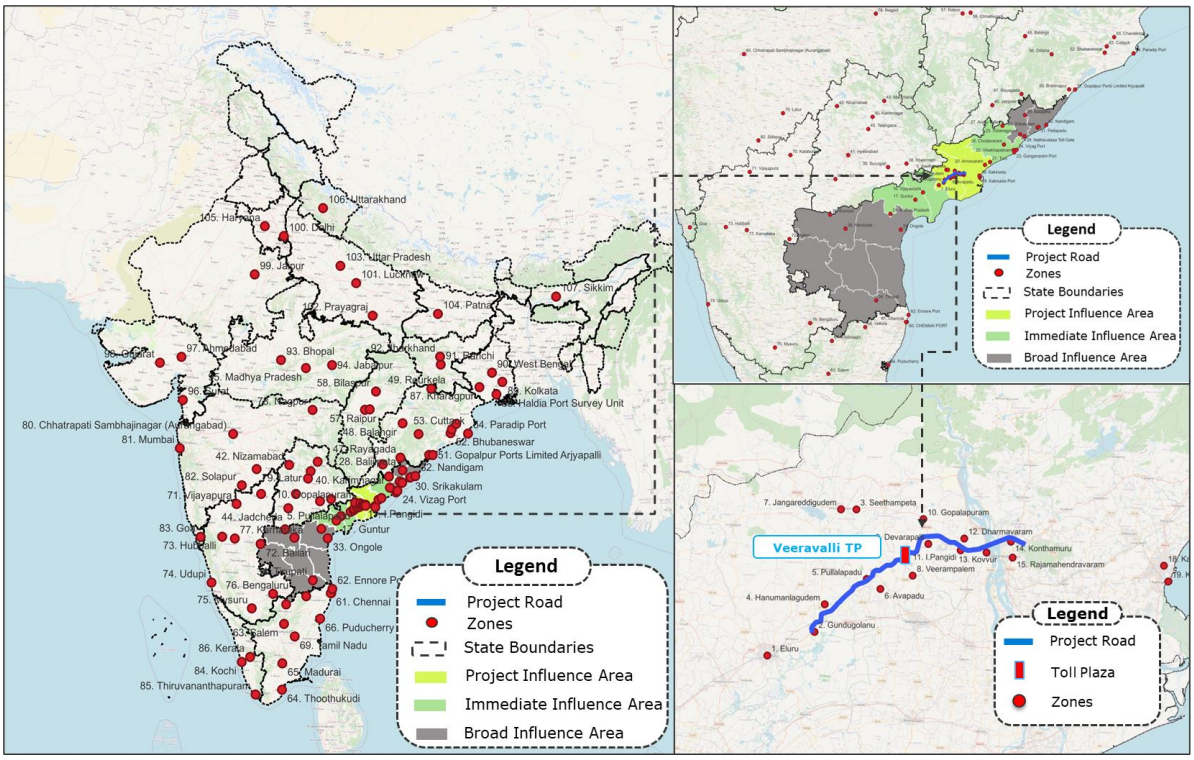


Figure 2-7: Zoning System Adopted for OD Surveys

2.5.3 Sample Size

The vehicles during the OD surveys were interviewed on a random sample basis. **Table 2-7** shows the AADT and the sample size (both in absolute numbers and in percentage terms) captured during the exercise. The individual traffic volume count of all categories of vehicles has been derived using split from seven-day traffic volume video count.

Modes	Car	Mini-Bus	Bus	MLCV	LCV	2-Axle	3-Axle	MAV
Sample	2,233	13	456	318	536	514	774	1,353
AADT	6,595	25	676	842	596	1,252	1,130	2,536
Percentage (%)	33.9	51.9	67.5	37.8	89.9	41.0	68.5	53.4

Table 2-7: Sample Size Collected in OD Survey at TP

Based on the sample size of different categories of vehicles interviewed during the OD survey, direction-wise expansion factors were calculated based on FY25 AADT. The OD matrices for all vehicle categories were generated and analysis was done in terms of regional distribution, travel pattern and commodity distribution.

2.5.4 Regional Distribution

Based on the OD matrices, the regional distribution of tollable vehicles at the toll plaza location has been calculated. **Table 2-8** gives the distribution indicating the attraction and generation zones for the traffic on the project road.

Region/Modes	Car	M Bus	Bus	MLCV	LCV	2A	3A	MAV
Andhra Pradesh	92.6	100.0	85.7	98.2	71.5	69.0	66.9	57.5
Telangana	5.2	0.0	13.5	1.3	3.8	2.4	2.6	2.8
Tamil Nadu	0.9	0.0	0.3	0.5	7.9	7.9	9.6	11.6
Karnataka	0.4	0.0	0.2	0.0	7.4	6.2	5.0	8.6
West Bengal	0.3	0.0	0.3	0.0	5.1	8.9	9.7	9.3
Odisha	0.3	0.0	0.0	0.0	2.4	2.0	3.1	4.7
Maharashtra	0.2	0.0	0.0	0.0	0.1	0.6	0.2	0.7
Rest of India	0.1	0.0	0.0	0.0	1.8	3.0	2.9	4.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 2-8: Regional Distribution of Tollable Traffic (in %) on Project Road

The traffic on the project corridor is generated primarily from the states of Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, West Bengal, Odisha, and Maharashtra. A brief description of the contribution of these states to passenger and freight traffic is presented below.

Passenger traffic:

- In case of passenger traffic, Andhra Pradesh is the major contributor on the project road. More than 93 percent of cars and about 86 percent of buses are being generated from Andhra Pradesh.
- Telangana contributes about 5-13 percent each in cars and buses while the remaining states contribute minimal in passenger traffic.

Freight Traffic

- In case of MLCVs, Andhra Pradesh is the dominant contributor, accounting for about 98.2 percent.
- For LCVs, Andhra Pradesh contributes significantly with 71.5 percent. Tamil Nadu follows with about 7.9 percent, and Karnataka contributes around 7.4 percent.
- For 2A Trucks, Andhra Pradesh contributes around 69.0 percent, West Bengal contributes about 8.9 percent, and Tamil Nadu follows with about 7.9 percent.
- In case of 3A Trucks, Andhra Pradesh has a share of about 66.9 percent, Tamil Nadu and West Bengal have a share of around 9-10 percent each.
- In case of MAVs, Andhra Pradesh leads with a contribution of about 57.5 percent followed by Tamil Nadu with about 11.6 percent, West Bengal accounts for about 9.3 percent and Karnataka contributes around 8.6 percent.

The mode wise top 20 OD pairs are given in **Appendix 2.3**.

2.5.5 Travel Pattern

In order to assess the travel pattern of vehicles, the important streams of traffic plying on the project road are estimated. The list of the popular movements found at the toll plaza location is presented in **Table 2-9**.

Sr. No.	Traffic Streams	Car	Mbus	Bus	MLCV	LCV	2A	3A	MAV
1	Eluru/Vijayawada & surroundings-Devarapalli/Rajamahendravaram & surroundings	58.2	94.4	46.9	59.3	28.1	26.7	23.3	13.4
2	Eluru/Vijayawada & surroundings-Kakinada & surroundings	8.7	5.6	5.9	9.7	5.0	5.9	4.8	4.1
3	Eluru/Vijayawada & surroundings-Visakhapatnam & surroundings	11.7	0.0	15.3	24.1	16.6	15.6	16.1	11.7
4	Eluru/Vijayawada & surroundings-Bhubaneswar / Cuttack & beyond	0.3	0.0	0.0	0.0	1.3	1.2	1.5	2.3
5	Eluru/Vijayawada & surroundings-Kolkata & surroundings	0.4	0.0	0.0	0.0	1.9	5.1	6.5	4.3
6	Eluru/Vijayawada & surroundings-Chhattisgarh / Jharkhand & beyond	0.0	0.0	0.0	0.0	0.8	1.4	1.4	2.5
7	Ongole/Nandyala & surrounding-Devarapalli & beyond	3.4	0.0	3.5	2.8	5.4	5.8	7.3	10.2
8	Chennai / Tirupati / Vellore & beyond-Devarapalli/Rajamahendravaram surroundings	3.5	0.0	0.3	1.2	4.5	4.6	5.3	3.9
9	Chennai / Tirupati / Vellore & beyond -Kakinada/Visakhapatnam surroundings	2.2	0.0	0.8	0.3	9.5	7.4	8.2	10.6
10	Chennai / Tirupati / Vellore & beyond-Beyond Visakhapatnam	0.3	0.0	0.0	0.0	4.9	8.0	10.4	13.7
11	Bengaluru & surrounding-Devarapalli & beyond	0.5	0.0	0.4	0.0	14.1	11.9	9.3	16.0
12	Suryapet/Hyderabad & beyond-Devarapalli & beyond	10.8	0.0	27.0	2.6	7.8	6.1	5.5	6.9
13	Western & Central India-Devarapalli & beyond	0.0	0.0	0.0	0.0	0.2	0.4	0.4	0.5
Total		**6,595**	**25**	**676**	**842**	**596**	**1,252**	**1,130**	**2,536**

Table 2-9: Traffic Streams (%) at Veeravalli Toll Plaza

Passenger Traffic:

- About 58.2 percent of cars and 46.9 percent of buses are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Devarapalli/Rajamahendravaram and surroundings (stream 1). The traffic in this region reflects the heavy commuter movement within these prominent towns, likely driven by daily business and social interactions.
- In addition, around 11.7 percent of cars and 15.3 percent of buses are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Vishakapatnam and surroundings (stream 3).
- Also, about 10.8 percent of cars and 27.0 percent of buses are found to be travelling from/to Suryapet/Hyderabad and beyond to/from Devarapalli and beyond (stream 12).

Freight Traffic:

- About 59.3 percent of MLCVs and 28.1 percent of LCVs are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Devarapalli/Rajamahendravaram and surroundings (stream 1).
- In addition, around 24.1 percent of MLCVs and 16.6 percent of LCVs are found to be travelling from/to Eluru/Vijayawada and surroundings from/to Vishakapatnam and surroundings (stream 3).
- In case of heavy freight vehicles, about 23-27 percent of 2A & 3A trucks and around 13.4 percent of MAVs are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Devarapalli/Rajamahendravaram and surroundings (stream 1).
- Additionally, around 16 percent of 2A & 3A trucks and around 11.7 percent of MAVs are found to be travelling from/to Eluru/Vijayawada and surroundings to/from Vishakapatnam and surroundings (stream 3).
- Around 6-7 percent each of 2A & 3A trucks and 10 percent of MAVs are found to be travelling from/to Ongole/Nandyala and surroundings to/from Devarapalli & beyond (stream 7).
- Moreover, about 9-12 percent of 2A & 3A trucks and around 16.0 percent of MAVs are found to be travelling from/to Bengaluru & surrounding to/from Devarapalli and beyond (stream 11).

2.5.6 Commodity Distribution

Analysis was also carried out to understand the different commercial vehicles being used to transport different commodities. The direction wise commodity distribution is presented in **Appendix 2.4**.

Figure 2-8 presents the commodity-wise share of the total commercial traffic at the toll plaza on the project road.

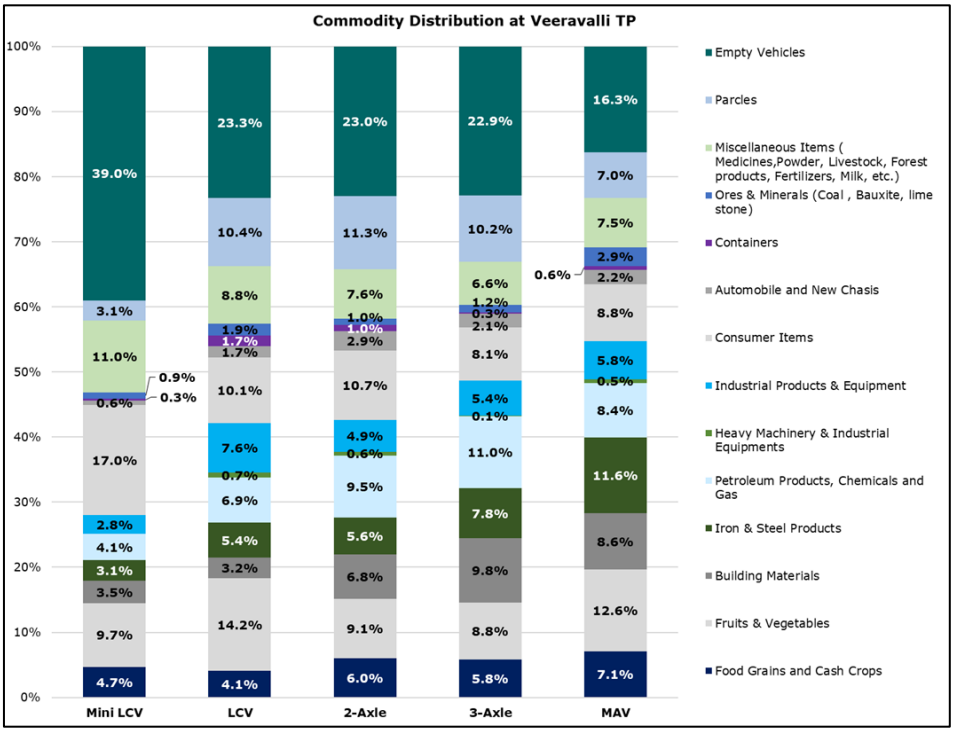


Figure 2-8: Commodity Distribution for Project Corridor

- All the freight modes are transporting fruits and vegetables, accounting for about 8 to 14 percent of the traffic. The major OD pairs are found to be between Bangalore & Kolkata/ Visakhapatnam.
- Heavy freight vehicles i.e. 2A/3A/MAVs are being widely used for transportation of petroleum products, chemical and gas, accounting for 10-12 percent of the traffic in Kolkata to Vijayawada direction whereas, in Vijayawada to Kolkata direction these trucks can be observed to account for about 7-10 percent of the traffic. The major OD pairs are found between Visakhapatnam/Kolkata/Kovvuru and Chennai/Vijayawada.
- Around 12 percent of MAVs are found to be transporting iron & steel products. The major OD pairs are between Vijayawada/Chennai and Visakhapatnam/Kolkata.
- Around 7-11 percent of 2A/3A/MAVs are transporting parcels and the major OD pairs are Vijayawada/Chennai/Bangalore to/from Visakhapatnam/Kolkata.
- In case of building materials, 3-Axle trucks and MAVs are being used to transport building materials with a share of around 9-10 percent each in both directions. The major OD pairs are Avapadu/Vijayawada to/from Devarapalli/Rajahmundry.
- About 30-60 percent of all freight modes transporting building materials, are carrying cement/fly ash between Vijayawada/Hyderabad/Southern AP and Rajahmundry/Vizag city/Northern AP. There are cement factories located in the southern part of the state between Guntur and Suryapet, and also near Kadapa.
- About 26-40 percent of 3A/MAVs carrying building materials are transporting tiles & bricks from Kolkata/Visakhapatnam to Eluru/Vijayawada.

3. TRAFFIC GROWTH RATE AND PROJECTIONS

3.1 General

The project road is a part of the NHAI InvIT Round 4 portfolio and the projections of traffic and revenue have been presented till FY55 in line with the maximum extendable concession period of 30 years. The estimation of the traffic using the tolled highway, and its future growth are important elements to assess the project's economics as these are generally the main/sole source of revenue for the project This chapter details various aspects of the current traffic of the project road and its growth potential as assessed by Ramboll.

3.2 Project Road Traffic

The traffic that is likely to use the project road was estimated on the basis of the traffic and travel characteristics gathered as part of the study. The traffic on the project road would normally consist of the following components:

- Normal Traffic
- Diverted Traffic
- Induced/Developmental Traffic

3.2.1 Normal Traffic

Normal traffic is the traffic which is already plying on the project road as assessed in section 2.4.4.

3.2.2 Diverted Traffic

Diverted traffic is generally dictated by the presence of an alternative route at a lower generalised cost, which is in-turn defined by the road configuration and its condition, the type of vehicle and its operating costs, the average riding speed, the route distance, and any tolling that may apply on a specific route. A detailed road network assessment along with site reconnaissance survey was conducted on the project road and vicinity to identify alternate routes.

The assessment of any likely traffic diversion from/to the Project Road (PR) has been done using the cost-ratio analysis as described below:

- Assessment of the potential divertible traffic sensitive to network improvements based on the observed travel pattern.
- Calculation of road user cost of travelling on the project road and the alternative route. The road user cost includes vehicle operating cost (VOC), travel time cost (TTC) and toll cost (TC), if any. VOC comprises of the cost of fuel, spare parts, maintenance labour, tyre, engine oil, grease, fixed cost, depreciation, and crew wages.

- The toll rates for expressway have been considered as 1.5 times the normal NHAI per km toll rates (accounting for 1.25 times for normal length of expressway and increase for the likely equivalent structure length).

The road user cost is estimated based on vehicle operating cost equations presented in IRC SP-30,2019 which is based on updation of Road User Cost Study (RUCS) carried out by Central Road Research Institute in 2019 for Ministry of Road Transport and Highways. Using the likely traffic stream speeds and lane configuration, the vehicle operating, and travel time costs are estimated for each of the routes. Road user cost on the identified routes is calculated and diversion percentages are estimated using diversion curve method mainly for trucks. In this method, traffic likely to be diverted from/to the project road, was estimated using Logit model, which computes expected diversion percentage based on the ratio of perceived cost on the existing and proposed facilities. The perceived cost is the financial vehicle operating cost and the time saving cost including toll charges (if any). According to the model, a vehicle will shift if the perceived cost on an alternative route is lower in comparison to existing route. The diversion equations for estimating diversion have been adopted from Indian National Expressway Network Report, MORTH (2009) as mentioned in IRC 108:2015. These equations are presented in **Table 3-1**.

Vehicle	Cost Ratio (CR) Interval	Equations
Truck	<= 0.750	% Div. = 100 - ((CR/0.75) * 5)
	0.750 <= CR <= 1.250	% Div. = 95 - ((CR-0.75)/0.5) * 90
	1.250 <= CR <= 2.0	% Div. = ((2-CR)/0.75) * 5

Source: IRC 108-2015

Table 3-1: Diversion Equations Used for Analysis

In the context of the project road section, there are two short distance alternative routes available in the vicinity of PR section, which could be used to bypass the Veeravalli toll plaza. The details of which is as follows:

I. Route via Gundugolanu-Tanuku-Rajahmundry-Diwancheruvu
II. Route via Nallajerla-Pongaturu-Yernagudem

The alignment of above-mentioned alternate routes is presented in **Figure 3-1**.

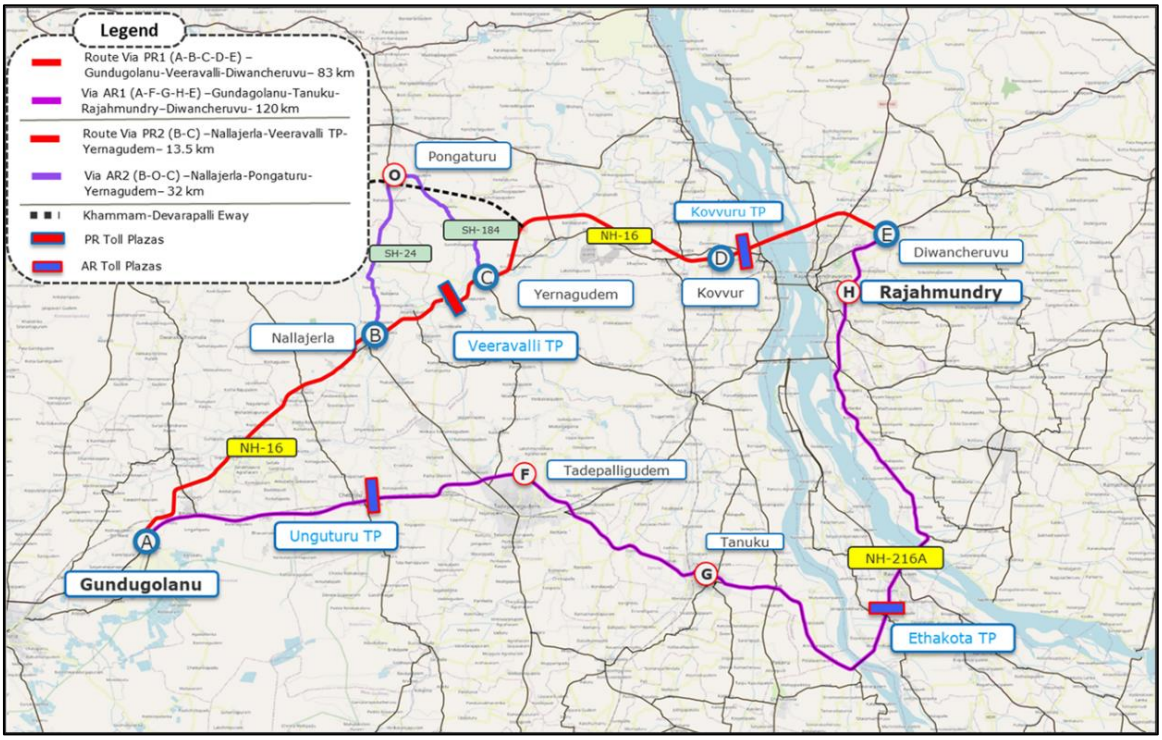


Figure 3-1: Alignment of Short Distance Alternate Route for PR Toll Plaza

I. Route via Gundugolanu-Rajahmundry-Diwancheruvu

The traffic destined to Rajahmundry and beyond has two route choice options between Gundugolanu to Rajahmundry. The first route option is to travel via project road section of NH-16 from Gundugolanu to Kovvuru i.e. route A-B-C-D-E. The alternate route choice for this stream of traffic is to use NH-216A route via Tanuku (A-F-G-H-E).

The route A-B-C-D-E is four laned around 83 km long which is about 37 km shorter than the alternate route A-F-G-H-E. The AR section A-F-G-H-E is also four laned and the user has to pay toll at the two toll plazas of Unguturu and Eethakota.

After the four laning upgradation of PR section, the traffic streams on alternate route are found to be using the shorter route via PR and the project road has observed an increase in traffic in the recent years.

The traffic playing on the alternate route has its own travel pattern with traffic and could be using this longer route due to the distributive nature and are continuing to pass through the towns of Unguturu, Tadepalligudem, Tanuku etc. to reach Rajahmundry. The route choice for cars is also dependent on factors such as stopovers in the small towns on the alternate route.

Based on the above, it is concluded that the travel pattern on these two routes has already been established and no further diversion of traffic from/to alternate route to/from the project road is envisaged.

II. Route via Nallajerla-Pongaturu-Yernagudem

This short distance alternate route is formed by two state highways i.e. SH-24 and SH-184, connecting Nallajerla to Yernagudem via Pongaturu (B-O-C). The alternate route B-

O-C is around 32 km long, whereas the route via PR (B-C) is about 13.5 km long. The route B-C is about 18.5 km shorter than the route B-O-C. As per site reconnaissance, the alternate route only caters to the traffic going towards nearby village areas, therefore it has not been considered for further analysis.

However, in wider context, there are some major developments in the project road network that could provide alternative route options for the traffic using the project road at present and may divert away to these routes once operational. These network level developments, have been studied in detail and analysed to work out the impact on the PR traffic. The details of which is given below:

Impact of Khammam-Devarapalli Expressway

The impact of Khammam-Devarapalli expressway has been done for the traffic streams travelling from/to Hyderabad/Suryapet & surroundings to/from Devarapalli & surroundings.

The tentative alignment of the alternate routes along with the route via project road is presented in **Figure 3-2**.

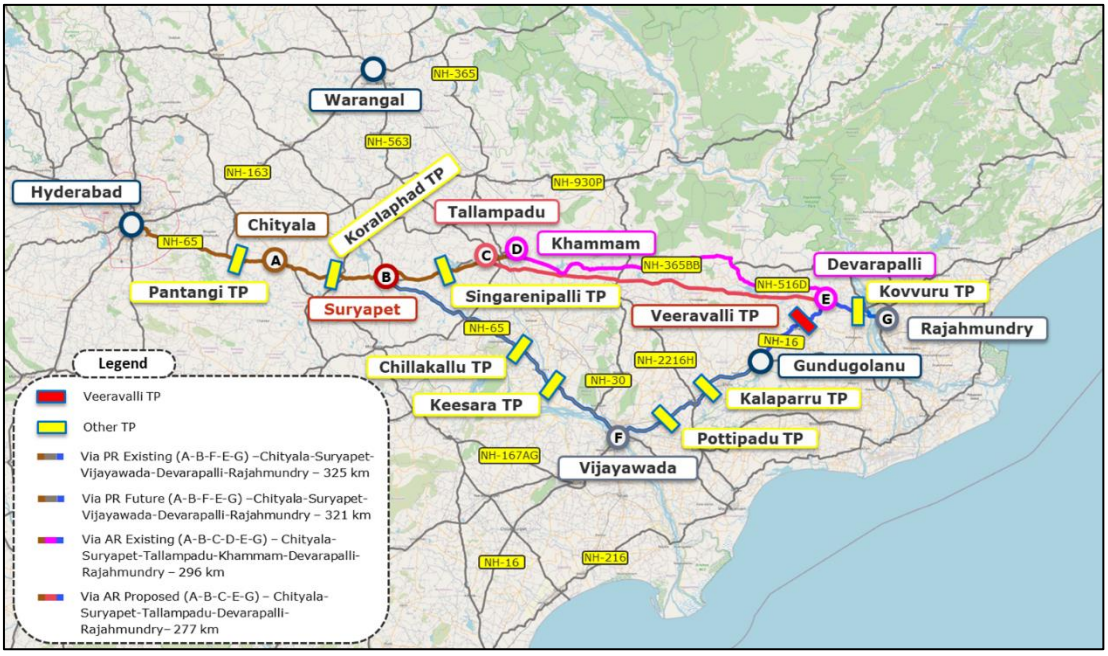


Figure 3-2: Alignment of Route Choices Between Suryapet and Devarapalli

Currently, traffic on the project road can travel via route A-B-F-E-G, which is a combination of NH-65 and NH-16 and has an existing length of about 325 km.

However, an alternative route via Suryapet Khammam (A-B-C-D-E-G), is available to which follows NH-365BB and NH-516D and is about 296 km long. The alternative route is around 29 km longer than the route via PR.

Under the Bharatmala Pariyojana project a six lane Vijayawada bypass is being developed. The bypass connects both NH-16 (Chennai-Kolkata) and NH-65 (Machilipatnam-Hyderabad) at Gollapudi and is divided into two stretches, the first between Chinna Avutapalli and Gollapudi (Western bypass) and the second is between

Gollapudi and China Kakani (Eastern bypass). The western bypass is expected to be completed in June 2025 and has been considered in the diversion analysis as it will be operational before the completion of Khammam-Devarapalli expressway. It is to be noted that on account of Western Vijayawada bypass the length of route via PR (A-B-F-E-G) will be 321 km making it 4 km shorter than the existing route via Vijayawada city.

Furthermore, there is a under construction greenfield expressway being developed, between Khammam and Devarapalli section i.e. route A-B-C-E-G which might impact the traffic from/to Hyderabad and beyond to/from Rajahmundry and beyond. The project is being developed under the Hybrid Annuity Model (HAM). The section from Suryapet to Khammam has been operational since October 2022 which has taken away some traffic plying to/from Hyderabad & beyond from/to Rajahmundry & beyond from the project road.

The stretch from Khammam to the Telangana border is expected to be completed in FY25. The section from the Telangana border to Devarapalli is anticipated to take an additional three years to be completed.

Once the expressway is operational, the remaining traffic plying to/from Hyderabad & beyond from/to Rajahmundry & beyond will also have a choice between PR and alternate route via Khammam-Devarapalli expressway. It is worth mentioning that the length of the expressway is about 162.1 km and after being operational the distance between Suryapet to Devarapalli will become around 277 km thus making route via PR longer by 44 km.

As per the information in public domain, the expressway will be operational by FY26; currently, the expressway construction is 65 percent complete.

This route is expected to become highly preferred due to an efficient and shorter route choice. The diversion results estimated for FY25 are presented in **Table 3-2**.

Alternate Routes / Modes	Car	LCV	2A	3A	MAV
Khammam - Devarapalli Expressway					
Potential Traffic	715	50	81	71	176
Potential Traffic as % of AADT	9.6	8.1	4.2	6.3	6.9
Diversion % based on Cost Ratio for PR existing	37.1	30.9	43.7	38.5	52.4
Diversion % based on Cost Ratio for PR future	37.0	28.3	21.1	15.2	21.3
Future AR Traffic Share (or % Loss of PR Traffic)	0.2	8.4	51.7	60.6	59.3
Diverted Traffic AR Future					
Total Diverted Traffic	0.0%	0.7%	2.2%	3.8%	4.1%
	1	4	42	43	104

Table 3-2: Impact of Khamam-Devarapalli Expressway – FY25

The completion of this expressways likely to take away approximately 0.7 percent of LCVs and around 2-4 percent of heavy freight vehicles, leading to an estimated traffic reduction of 731 PCUs. For the analysis going forward, only heavy freight vehicles have

been included. This traffic has been grown and considered appropriately in the respective years of impact.

To account for the gradual build-up of traffic on the alternate routes, the traffic shift is assumed to take place in phases with about 50 percent in FY27, 75 percent in FY28 and 100 percent from FY29 onwards.

3.2.3 Induced/ Development Traffic

Developmental /new generated traffic is the one which would be generated, over and above normal growth, because of lowering of transport costs or new developments in the immediate influence area of the project road. In case of the project road, there is no development envisaged in the vicinity of the project road.

This project section catering to the long-distance traffic of NH-16 will continue to remain an important highway for the movement along the east coast. Since, majority of the traffic is influenced by the cities of Vishakhapatnam and Vijayawada, upcoming development of Bharatmala projects providing better connectivity to cities like Pune, Hyderabad and Raipur will improve the traffic on this highway.

Vizag-Chennai Industrial Corridor (VCIC)

The East Coast Economic Corridor (ECEC) is India's first coastal corridor under the National Industrial Corridor Development Programme (NICDP). It includes four key corridors: Vizag-Chennai, Chennai-Kanyakumari, Odisha, and West Bengal.

The 800 km-long Vizag-Chennai Industrial Corridor (VCIC) is part of Phase I of the ECEC. It includes key port and industrial clusters and supports India's Act East Policy and Make in India Campaign. Based on the Conceptual Development Plan by ADB, four nodes are proposed for development: Vishakhapatnam, Kakinada, Gannavaram-Kankipadu, and Yerpedu-Srikalahasti.

The estimated investment for VCIC is $31.42 billion, including $14.73 billion for urban development, $15.08 billion for transport, and $1.61 billion for energy. As per the planned phase-wise estimated requirement for funds, urban infrastructure will need 69 percent of its planned investment between 2031-2045. For transport, 26 percent is needed in short term, 43 percent in medium term, and 31 percent in long term.

As per the information available in public domain, these developments are in the initial stages of conceptualisation and preparation of feasibility reports (preliminary engineering)/ master planning. After completion of master planning and preliminary engineering, projects are posed for consideration and approval from National Industrial Corridor Development and Implementation Trust (NICDIT) and Cabinet Committee on Economic Affairs (CCEA). No confirmed implementation plans or timelines are available yet. The future freight growth projections account for these developments.

3.3 Methodology for Traffic Growth Rate Estimation

Traffic growth for both passenger and freight vehicles has been estimated using the econometric approach as described in IRC-108, 2015. For freight traffic, due consideration has been given to the total tonnage transported and the shift in types of vehicles used for moving goods.

The econometric model applied, relates traffic growth to changes in state (or district) domestic product via an elasticity factor. According to IRC guidelines, elasticity based econometric model for highway projects should be derived in the following form:

$Log_e(P) = A0 + A1\ Log_e\ (EI)$, where:

P - Traffic Volume

EI - Economic Indicator

A0 - Regression Constant

A1 - Regression Co-efficient (Elasticity Index)

In order to estimate traffic on the project road, the methodology described below has been followed:

Identify the influence area - From the analysis of OD survey data, the project influencing states and districts, which are likely to impact the traffic growth on the project road, were identified.

Review Past traffic Data – Based on toll data available for the project, a review of past traffic and tonnage growth is carried out.

Analysis of economic growth of the Project Influencing Area (PIA) - For each PIA state, an economic profile describing past performance and future outlook was prepared. This also considers India's past economic performance and its future outlook.

Estimation of traffic elasticity to income – in order to translate economic growth into traffic growth, an elasticity factor was estimated.

Derivation of traffic growth rates – On the basis of the weighted (based on OD shares) PIA outlook and related traffic elasticity, traffic growth rates were estimated.

The methodology thus adopted incorporates, as basic data inputs, the perspective growth envisaged in the influence area and the changes in transport demand elasticities over a period of time. The traffic growth rates by vehicle type for the project road have been determined till FY55 in line with the maximum extendable concession period of 30 years.

3.4 Identification of PIA States

The regional distribution observed on the project road shows that Andhra Pradesh is the main contributor of traffic on the project road in case of passenger and freight vehicles,

however, states of Telangana, Odisha, Tamil Nadu, Karnataka, and West Bengal also contribute to the project road freight traffic.

The mode wise normalized regional distribution at the toll plaza is presented in **Figure 3-3**.

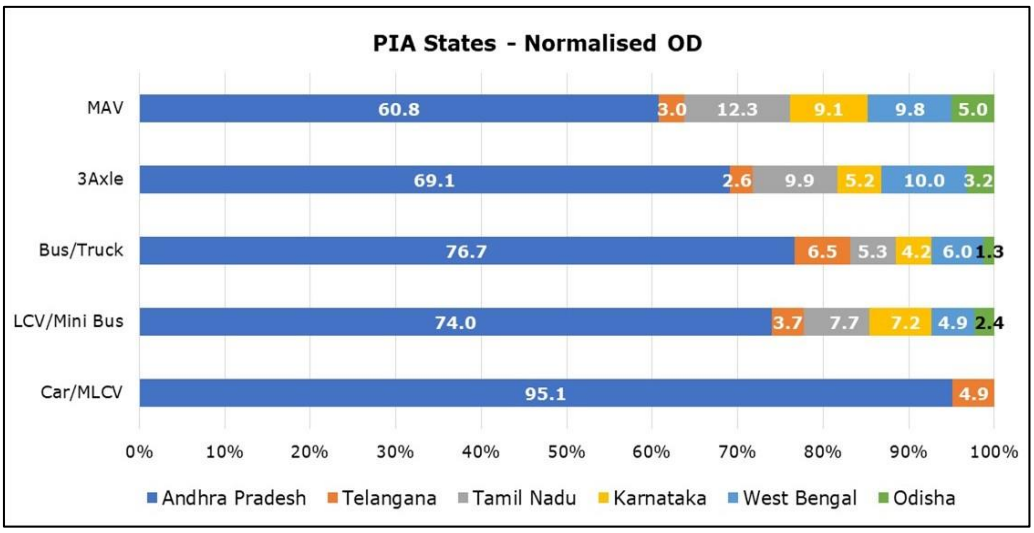


Figure 3-3: Normalised Regional Distribution (%) for the PR

The OD shares show that for passenger vehicles, around 95.1 percent of the car traffic is from the state of Andhra Pradesh and around 4.9 percent is from Telangana.

In case of LCVs, around 74 percent of traffic is being generated from the state of Andhra Pradesh and around 7-8 percent of traffic is from Tamil Nadu and Karnataka; about 2-5 percent traffic is contributed from Telangana, Odisha, and West Bengal.

The share of bus/truck traffic from Andhra Pradesh is around 76.7 percent; the states of Telangana and West Bengal contribute around 6-7 percent. In addition, the state of Odisha, Tamil Nadu and Karnataka has a share of around 1-5 percent.

In case of 3A truck category, Andhra Pradesh has a share of around 69.1 percent and around 10 percent each is from Tamil Nadu and West Bengal, followed by 3-5 percent traffic being generated from Telangana, Karnataka, and Odisha.

For MAVs, around 60.8 percent traffic is being generated from Andhra Pradesh whereas, around 9-12 percent traffic is coming from Tamil Nadu, Karnataka, and West Bengal and remaining 3-5 percent is from Telangana and Odisha.

Considering the predominance of Andhra Pradesh in the project road traffic, it has been considered as the primary PIA state for both passenger and freight traffic. In addition to Andhra Pradesh, the other PIA states which have been considered for freight traffic are Telangana, Tamil Nadu, Karnataka, West Bengal and Odisha.

3.5 Past Economic Growth of PIA

Growth of traffic on the project road depends on existing development and future growth prospects of the connecting regions. A number of economic indicators for the PIA states,

as published by Central Statistical Organisation (2011-12 prices), have been studied to assess their past performance.

PIA State - Andhra Pradesh

Past economic performance of the state has been as follows:

- Andhra Pradesh's Gross State Domestic Product (GSDP) stood at Rs 8,208.9 billion in FY24 and has been growing at a trendline growth rate of 7.0 percent since FY12.
- The tertiary sector is the largest contributor to GSDP of Andhra Pradesh, about 39.7 percent. Primary sector stood at 32.5 percent and secondary sector at 27.8 percent of the GSDP in FY24.

The change of sectoral composition of GSDP over the years is presented in **Figure 3-4**.

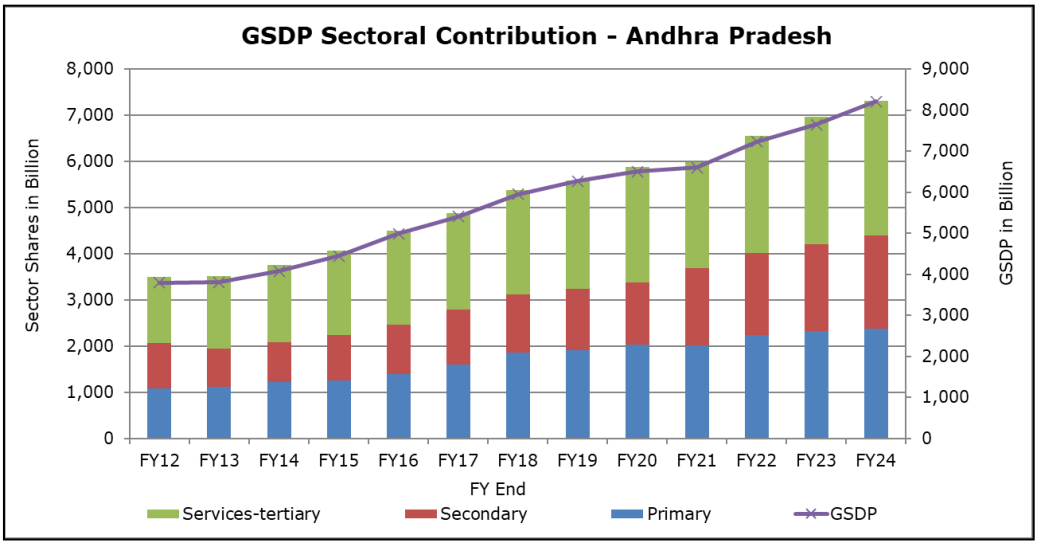


Figure 3-4: GSDP (in Rs Billion) and its Sectoral Composition for Andhra Pradesh

The performance of the state economy and its different sectors has been studied using time trend analysis. The average annual growth rates as obtained using regression analysis are presented in **Table 3-3**.

Particulars	FY12 to FY24	FY15 to FY24
GSDP	7.0	6.5
Agriculture and Allied	7.5	7.1
Industry	7.7	8.4
Services	5.6	4.5
Construction	4.5	5.1
Per Capita Income	6.3	5.7

Table 3-3 : Average Annual Growth Rates (%) of State Income for Andhra Pradesh

Andhra Pradesh is a predominant exporter of drugs, pharmaceuticals, allied chemicals, and plastics, agriculture and agro-based products, engineering products, mineral products, handicrafts and carpets, textiles, leather, animal, and marine products.

Currently, the state has 47 Special Economic Zones (SEZs). Moreover, 10 have been formally approved, 32 have been notified and five SEZs with in-principle approval. These

SEZs are dispersed over a manifold range of sectors, including textiles and apparel, food processing, footwear and leather products, multi-product, pharma, IT SEZs, etc.

Under the Andhra Pradesh Petroleum, Chemicals & Petrochemicals Investment Region (AP PCPIR), the construction of 40 kilometres of national highways, 42 kilometres of state highways, and approximately 75 kilometres of major district roads is planned. These infrastructure projects are projected to be completed within the next five years.

According to the Department for Promotion of Industry and Internal Trade (DPIIT), the state has enticed the Foreign Direct Investment (FDI) equity inflows worth US$ 888.13 million during the period October 2019 to March 2024.

The state houses many pharma manufacturing units belonging to eminent global and national players. Exports of pharmaceuticals from the state stood at US$ 863.72 million in FY22.

The state has the major share in the export of seafood products from India with export of worth US$ 7.38 billion in FY24. Andhra Pradesh contributes 32 percent of the total value of sea food exports from the country.

The per capita income of Andhra Pradesh is Rs. 154,121 in the year FY24. During FY12 to FY24, a growth of about 6.3 percent is seen in the state Andhra Pradesh. The growth in per capita income of Andhra Pradesh since FY12 is presented in **Figure 3-5**.

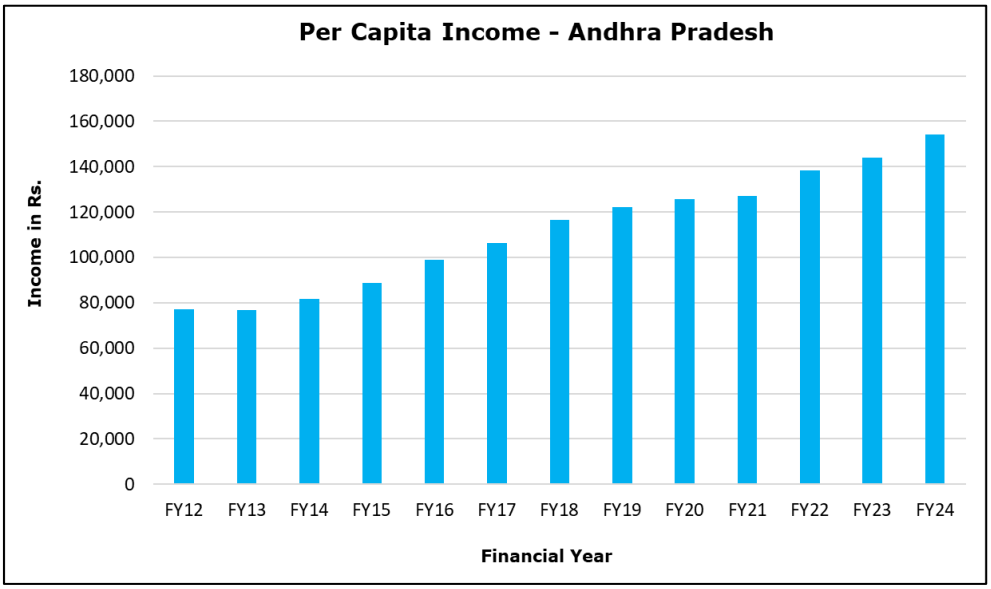


Figure 3-5: Per Capita Income of Andhra Pradesh from FY12 to FY24

Other PIA States

The other PIA states contributing to the traffic on the project road are Telangana, Tamil Nadu, Karnataka, West Bengal and Odisha. Economic indicators of PIA states are as follows.

- Telangana's Gross State Domestic Product (GSDP) stood at Rs 7,929.4 billion in FY24 and has been growing at a compounded annual growth rate of 6.9 percent since FY12.

- Tamil Nadu's Gross State Domestic Product (GSDP) stood at Rs 15,713.7 billion in FY24 and has been growing at a compounded annual growth rate of 6.2 percent since FY12.
- Karnataka's Gross State Domestic Product (GSDP) stood at Rs 14,232.3 billion in FY24 and has been growing at a compounded annual growth rate of 7.4 percent since FY12.
- Gross State Domestic Product (GSDP) of West Bengal stood at Rs 9,040.9 billion in FY24 and has been growing at a compounded annual growth rate of 4.5 percent since FY12.
- Gross State Domestic Product (GSDP) of Odisha stood at Rs 5,209.1 billion in FY24 and has been growing at a compounded annual growth rate of 7.0 percent since FY12.
- The service sector is the largest contributor to GSDP for the PIA states in FY24 – 63.1 percent in Telangana, 51.7 percent Tamil Nadu, 65.2 percent in Karnataka and 52.0 percent in West Bengal while in the state of Odisha secondary sector accounts for highest contribution (about 38.4 percent) in GSDP.

The average annual growth rates as obtained using regression analysis for the period FY12 to the latest available year are presented in **Table 3-4**.

Particular/States	Telangana	Tamil Nadu	Karnataka	West Bengal	Odisha
	FY12 to FY24				
GSDP	6.9	6.2	7.4	4.5	7.0
Primary	5.9	5.4	5.7	2.5	4.9
Secondary	4.8	6.2	5.8	6.8	9.1
Tertiary	7.6	5.7	8.1	4.8	5.1
Construction	5.3	5.0	3.7	4.9	4.9
Per Capita Income	6.4	5.6	6.6	3.9	6.1

Table 3-4: Average Annual Growth Rates (%) of State Income for Other PIA States

The GSDP over the years for the PIA states are presented in **Figure 3-6**.

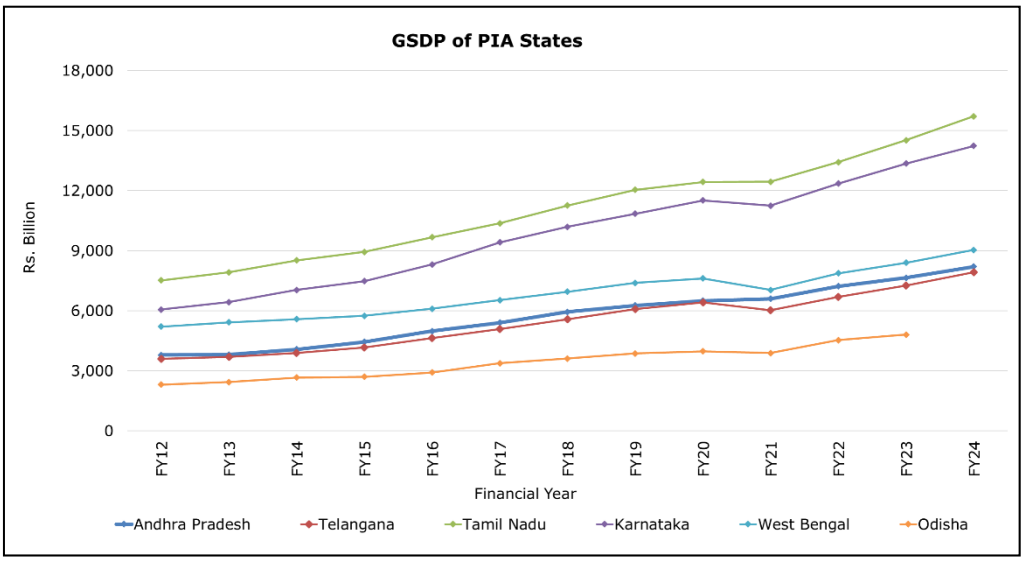


Figure 3-6: GSDP (in Rs billion) for PIA States

3.6 India and PIA Outlook

3.6.1 India's Past Performance and Outlook for Future

India's growth trend during the recent years has been presented in **Figure 3-7**.

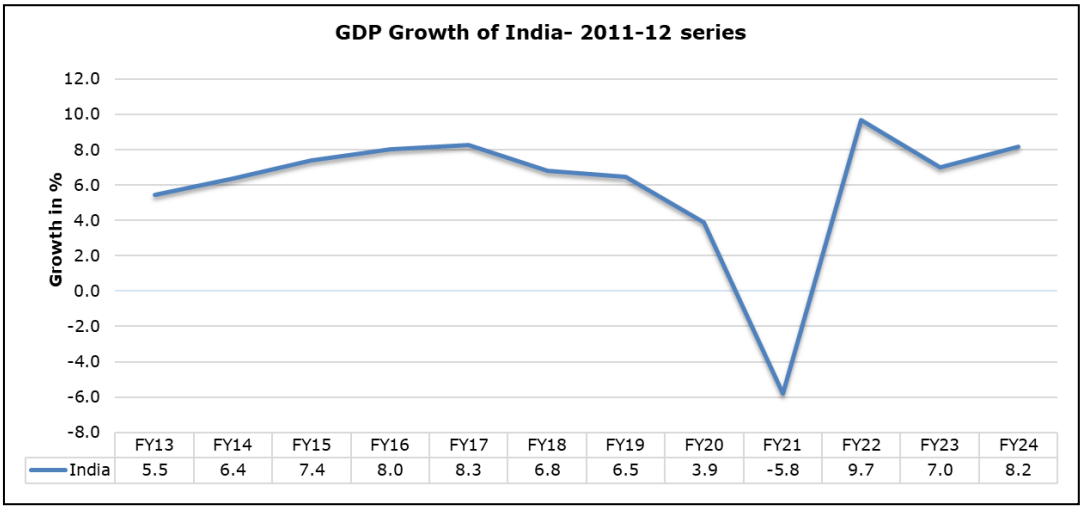


Figure 3-7: GDP Growth in India

India's economy has navigated through a series of fluctuations since FY12, from a slowdown to a sharp contraction due to the pandemic, followed by a strong recovery. Structural reforms and global dynamics continue to play crucial roles in shaping India's economic future.

India's economic growth has generally followed an accelerating trajectory until FY18, positioning it as one of the fastest-growing major economies in the world over the medium term. The real GDP growth rates were 8.3 percent in FY17, 6.8 percent in FY18, and 6.5 percent in FY19, reflecting a solid performance. Over the period from FY12 to FY19, the long-term average growth rate stood at 7.2 percent.

However, in FY20, the economy slowed down due to a combination of structural challenges and global economic headwinds, leading to a more modest growth rate of 3.9 percent. The outbreak of COVID-19 further exacerbated the situation, triggering a global recession and imposing significant economic disruptions. The Indian government's lockdown measures severely impacted the economy, contributing to a contraction of 5.8 percent in FY21.

India's GDP grew by 9.7 percent in FY22 and continued its recovery with a growth of 7.0 percent in FY23 and 8.2 percent in FY24. The recent forecast by Reserve Bank of India (RBI) indicates a growth rate of 6.4 percent for FY25.

In light of the outlook being predicted by various agencies for the current and future years, the year-on-year growth for Indian economy based on the forecast of Consensus Economics (October 2024 Publication), provided by the client for FY26 and beyond as used in the analysis are presented in **Figure 3-8**.

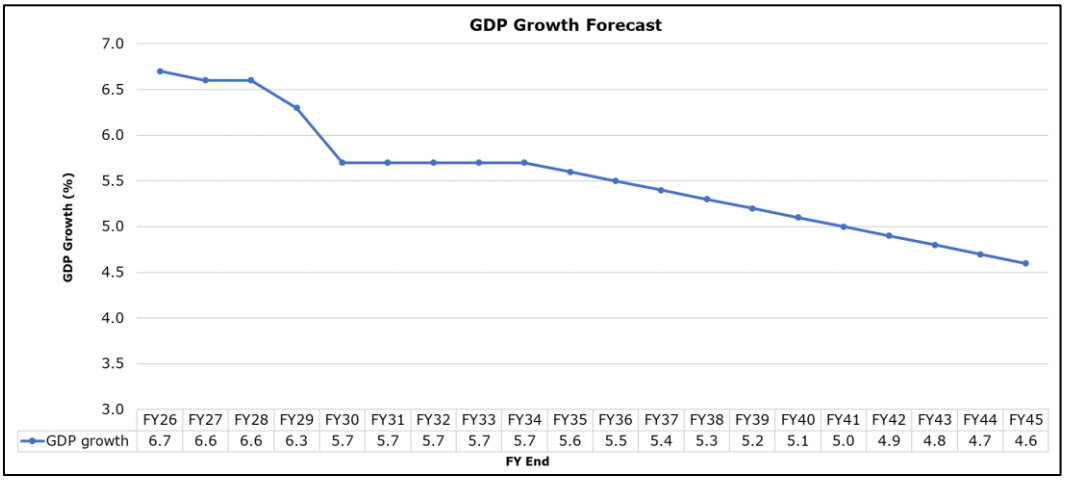


Figure 3-8: GDP Forecast of India

3.6.2 PIA States Outlook

A snapshot of the main economic indicators in the past years is based on data published by Central Statistical Organisation (CSO) for the PIA states and is presented in **Table 3-5**.

Indicators	Andhra Pradesh	Telangana	Tamil Nadu	Karnataka	West Bengal	Odisha
GSDP in Rs Billion (FY24)	8,208.9	7,929.4	15,713.7	14,232.3	9,040.9	5,209.1
GSDP growth (FY12 to FY24)	7.0%	6.9%	6.2%	7.4%	4.5%	7.0%
Per capita Income in Rs (FY24)	154,121	207,679	204,092	209,486	90,988	112,154
Sector Share (%) in FY24						
Agriculture and allied	32.5	17.1	11.2	10.8	18.6	26.3
Industry	27.8	19.8	37.2	24.0	29.3	38.4
Services	39.7	63.1	51.7	65.2	52.0	35.2

Table 3-5: Main Economic Indicators of PIA States

To forecast the PIA states' performance, the past growth of State GDPs relative to India's GDP has been analysed, and both short-term and long-term multipliers have been derived. In determining future multipliers, year-on-year variations and the size of the state's economy have been carefully considered.

The past and adopted multipliers for PIA states to Indian economy are presented in **Table 3-6**.

Period	India	Andhra Pradesh	Telangana	Tamil Nadu	Karnataka	West Bengal	Odisha
Past Growth (%)							
FY12 to FY24	5.7	7.0	6.9	6.2	7.4	4.5	7.0
FY15 to FY24	5.0	6.5	6.6	6.0	6.8	4.5	7.0
Past Multipliers - Average of Years							
FY13 to FY24		0.9	1.1	0.9	1.1	0.9	1.0
FY15 to FY24		1.0	1.2	0.9	1.1	0.9	1.0
Multipliers Adopted for Future							
States w.r.t. India		1.0	1.2	0.9	1.1	0.9	1.0

Table 3-6: Past and Future Multipliers of PIA States

3.7 Past Traffic Data on Project Road

Past ETC traffic data is provided by the client from December 2021 to November 2024 for the toll plaza location. A comparison of the ETC data of FY23 and FY24 has been carried out with estimated AADT for FY25 without considering cash and exempt. Mode wise traffic data along with the end point growth is presented in **Table 3-7**.

FY/Mode	CJV	LCV/MBus	Bus/2A	3A	MAV/OSV	PCU
Past traffic						
FY23	6,329	633	1,864	1,327	2,971	30,222
FY24	6,981	605	1,909	1,208	2,666	29,238
FY25	7,164	614	1,925	1,126	2,529	28,618
YoY Growth (%)						
FY24 vs FY23	10.3	-4.4	2.4	-9.0	-10.3	-3.3
FY25 vs FY24	2.6	1.4	0.9	-6.8	-5.2	-2.1
End Point Growth (%)						
FY25 vs FY23	6.4	-1.5	1.6	-7.9	-7.7	-2.7

Table 3-7: Past Traffic Trend Analysis of ETC Data

Car growth has been varying year on year at the toll plaza and has shown a growth of about 6.4 percent while comparing FY23 with FY25 and for bus/2A trucks, a growth of about 1.6 percent is observed during the same period. In case of freight modes, the decline in growth is to be attributed to opening of Suryapet - Khamam section on alternate route (operational since Oct 2022) which has taken away some of the traffic plying between Hyderabad and Vishakhapatnam from project road section.

However, the travel pattern analysis from the present study OD and other ODs in the area suggest that most of the traffic from/to Hyderabad to/from Rajahmundry and beyond which was amenable to shift to Suryapet-Khammam highway has already shifted and as mentioned in the diversion analysis only 176 MAVs are remaining on PR of that potential stream of traffic. The diversion analysis suggests that out of this 104 MAVs are further likely to shift once Suryapet-Khammam Expressway is fully operational. Therefore, it is envisaged that there would not be any further diversion to AR and this traffic will grow at normal economy growth rate. Past Toll Data from adjacent sections

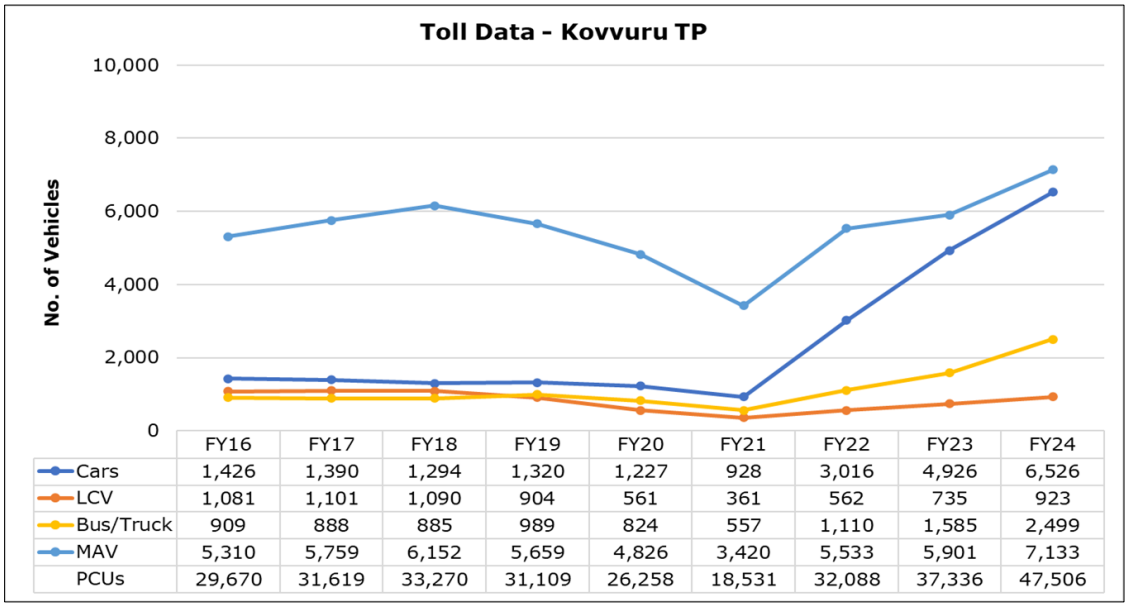
In addition to the project road traffic data, past traffic of adjacent road sections in proximity has also been analysed to understand the traffic growth trends on NH-16. The toll data of following road sections has been analysed:

I. Rajahmundry Bridge Across River Godavari (RGBL)

II. Gundugolanu to Rajahmundry section via Tanuku (TOT-1 assets of Andhra Pradesh)

3.7.1.1 Rajahmundry Bridge Across River Godavari (RGBL)

Past traffic data for the Kovvur toll plaza location as available with the consultant for the period from FY16 to FY24 is presented in **Figure 3-9**.



	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24
Cars	1,426	1,390	1,294	1,320	1,227	928	3,016	4,926	6,526
LCV	1,081	1,101	1,090	904	561	361	562	735	923
Bus/Truck	909	888	885	989	824	557	1,110	1,585	2,499
MAV	5,310	5,759	6,152	5,659	4,826	3,420	5,533	5,901	7,133
PCUs	29,670	31,619	33,270	31,109	26,258	18,531	32,088	37,336	47,506

Figure 3-9: Past Traffic at RGBL - Kovvur TP

A time series analysis of the past traffic data is presented in **Table 3-8**.

FY/Mode	CJV	LCV	Bus/Truck	MAV	PCU
Kovvur TP					
YOY Growth in %					
FY17 vs FY16	-2.5	1.8	-2.3	8.4	6.6
FY18 vs FY17	-6.9	-1.0	-0.3	6.8	5.2
FY19 vs FY18	2.0	-17.0	11.7	-8.0	-6.5
FY20 vs FY19	-7.0	-37.9	-16.7	-14.7	-15.6
FY21 vs FY20	-24.4	-35.7	-32.3	-29.1	-29.4
FY22 vs FY21	225.1	55.7	99.2	61.8	73.2
FY23 vs FY22	63.3	30.8	42.8	6.6	16.4
FY24 vs FY23	32.5	25.7	57.7	20.9	27.2
End Point Growth in %					
FY16 vs FY24	20.9	-1.9	13.5	3.8	6.1
FY19 vs FY24	37.7	0.4	20.4	4.7	8.8
FY16 vs FY23	19.4	-5.4	8.3	1.5	3.3
FY19 vs FY23	39.0	-5.1	12.5	1.0	4.7

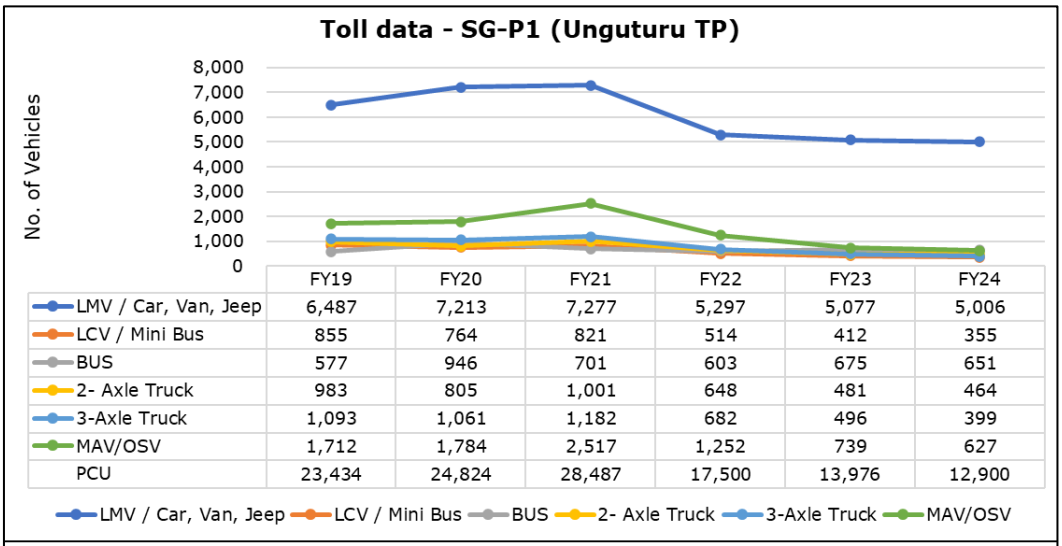
Table 3-8: Past Growth Analysis at RGBL - Kovvur TP

The section of RGBL has seen year-on-year variation in traffic which could be attributed to the freight traffic restrictions imposed in the year 2020 due to the construction activities on Gundugolanu to Kovvur section, which has been upgraded to a four-lane configuration in September 2021.RGBL section has seen a massive increase in traffic in

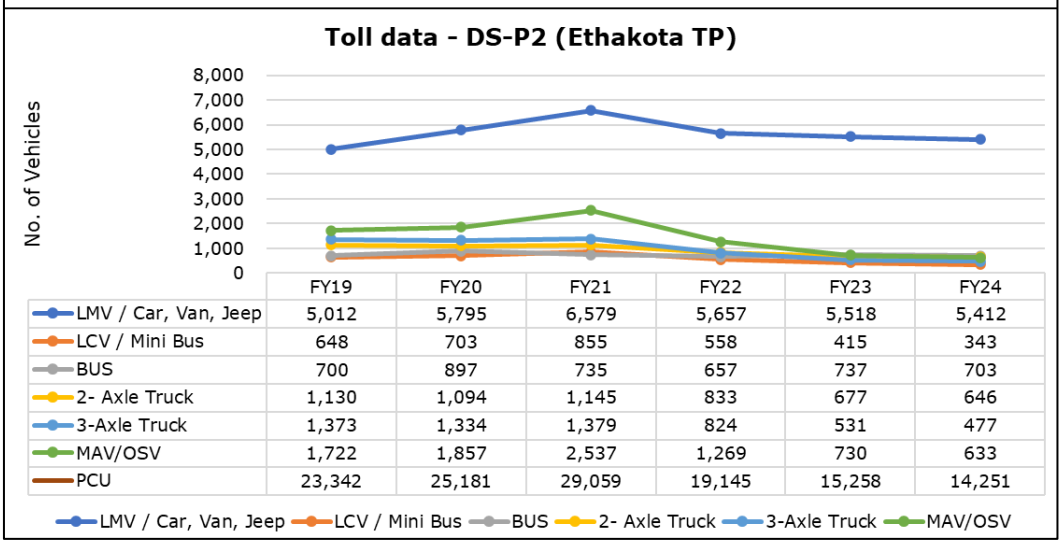
almost all the modes after opening of section from Gundugolanu to Veeravalli in September 2021 and completion of maintenance of Kovvuru Bridge in FY22. Also, opening of Suryapet-Khammam section in October 2022 has impacted the freight traffic on this section as the Hyderabad to Rajahmundry bound traffic started using the route via Khammam and as a result Kovvur Bridge witnessed an abnormal increase in traffic.

3.7.1.2 Gundugolanu to Rajahmundry section via Tanuku (TOT-1)

Past traffic data is available from FY16 to FY24 for Unguturu and Ethakota toll plazas with Ramboll from previous studies. The year-on-year traffic is presented in **Figure 3-10**.



	FY19	FY20	FY21	FY22	FY23	FY24
LMV / Car, Van, Jeep	6,487	7,213	7,277	5,297	5,077	5,006
LCV / Mini Bus	855	764	821	514	412	355
BUS	577	946	701	603	675	651
2- Axle Truck	983	805	1,001	648	481	464
3-Axle Truck	1,093	1,061	1,182	682	496	399
MAV/OSV	1,712	1,784	2,517	1,252	739	627
PCU	23,434	24,824	28,487	17,500	13,976	12,900



	FY19	FY20	FY21	FY22	FY23	FY24
LMV / Car, Van, Jeep	5,012	5,795	6,579	5,657	5,518	5,412
LCV / Mini Bus	648	703	855	558	415	343
BUS	700	897	735	657	737	703
2- Axle Truck	1,130	1,094	1,145	833	677	646
3-Axle Truck	1,373	1,334	1,379	824	531	477
MAV/OSV	1,722	1,857	2,537	1,269	730	633
PCU	23,342	25,181	29,059	19,145	15,258	14,251

Figure 3-10: Past Traffic on Alternate Section - Unguturu & Ethakota TP (TOT-1)

The year-on-year growth rates are presented in **Table 3-9**.

FY/Mode	CJV	LCV	Bus	Truck	3A	MAV	PCU
TP01- Unguturu TP							
YOY Growth (in %)							
FY20 vs FY19	11.2	-10.6	63.8	-18.1	-2.9	4.2	5.9
FY21 vs FY20	0.9	7.3	-25.9	24.4	11.4	41.1	14.8
FY22 vs FY21	-27.2	-37.4	-14.0	-35.2	-42.3	-50.3	-38.6
FY23 vs FY22	-4.2	-19.8	12.0	-25.8	-27.3	-40.9	-20.1
FY24 vs FY23	-1.4	-13.9	-3.6	-3.6	-19.6	-15.2	-7.7
TP02- Ethakota TP							
YOY Growth (in %)							
FY20 vs FY19	15.6	8.6	28.1	-3.2	-2.8	7.8	7.9
FY21 vs FY20	13.5	21.6	-18.0	4.6	3.4	36.6	15.4
FY22 vs FY21	-14.0	-34.8	-10.6	-27.3	-40.2	-50.0	-34.1
FY23 vs FY22	-2.4	-25.6	12.1	-18.7	-35.6	-42.5	-20.3
FY24 vs FY23	-1.9	-17.3	-4.6	-4.6	-10.1	-13.3	-6.6

Table 3-9: Past Traffic at TOT -1 Section

It is to be noted that the growth on this section was high during the widening of Gundugolanu to Veeravalli (PR) section in FY21, which had restricted the movement of freight vehicles on the Gundugolanu-Kovvur section, making this route a preferred choice. However, after the opening of section from Gundugolanu to Veeravalli in September 2021, the traffic on this route has declined till FY24.

3.8 Past and Future Transport Demand Elasticity

The econometric model applied for the project, relates traffic growth to changes in state domestic product via an elasticity factor according to IRC guidelines.

A regression between weighted GSDP (as independent variable) and weighted registered vehicles (as dependant variable) of PIA states was carried out. The registered vehicle elasticity in case of cars and all trucks is 0.7 for the state of Andhra Pradesh between FY12 and FY24.

Vehicle registration data is also used as a proxy wherein operational toll data is not available. Vehicle registration data represents all vehicles registered in the state, but does not indicate actual number of vehicles plying on the road as it does not account for factors such vehicles taken off the road due to lack road worthiness, those registered in a state but mostly used elsewhere, etc. Consequently, the elasticity values based on vehicle registration may not be representative of the traffic growth trends on the project road.

The point to point and trend line actual elasticity between weighted income (GSDP) and traffic for the project road section is presented in **Table 3-10**.

FY/Mode	CJV	LCV/M Bus	Bus/2A	3A	MAV/OSV
Veeravalli TP					
Point to Point Elasticity					
FY24 vs FY23	1.4	-0.6	0.3	-1.2	-1.4
FY25 vs FY24	0.3	0.2	0.1	-0.9	-0.7
Trend Line Elasticity					
FY25 vs FY23	0.8	-0.2	0.2	-1.1	-1.1

Table 3-10: Actual Past Traffic Elasticity on PR Based on Toll data

Cars

- The motorization rate for cars (per 1,000 population) in India has gone up from 6.6 in 2001 to 25 in 2019. Although India's car fleet has been growing at 10 percent for nearly 25 years, its motorization rate is low compared to other countries of similar wealth and much lower than developed countries with motorization rate of around 450. The low motorization rate suggests that there is room for continued growth for many years to come. With the continual increase in motorization rate and improved road network usage of cars for inter-urban travel is showing a growing trend.
- The past elasticity of 1.4 is observed for the period between FY23 and FY24 on the project road.
- It is likely that this growth would slow down over time as the market becomes more mature and saturated, therefore elasticity to GSDP can be expected to decline over time. With the anticipated growth momentum in the coming years, for the project road an elasticity value of 1.1 have been considered for the slab up to FY30 and further tapering to 1.0 has been done over different slabs in the remaining concession period.

LCV/Minibus

- Predominance of Mini LCV in the LCV category for short haul traffic is being witnessed across many national highways. The LCV segments are also witnessing a smart uptick in demand in the goods carrier segment, where the 2T mini-truck and 2-3.5T pickups dominate with 90 percent share of the total LCV goods segment.
- For project road, an elasticity of 0.5 has been adopted till the end of concession period.

Bus/Truck

- Over the years in India there has been a change in passenger's travel mode preferences with increasingly more people shifting from public transport systems towards personalised modes. This has resulted, in general, in elasticity of bus traffic/demand to GSDP lower than unity.
- The toll plaza data shows a past elasticity of 0.3 between FY23 and FY24 comparison in combined Bus/Truck category, whereas at the adjacent section of RGBL a higher

elasticity of 1.1 is observed for the period FY16 to FY23. For the project road, an elasticity of 0.5 has been considered for Bus/Truck category for the entire concession period.

3A Truck/MAV

- In India as a whole, the freight vehicle mix has been changing in the last decade favouring MAV to 2A/3A vehicles for long-distance traffic, given the operational efficiencies achievable with larger vehicles. Considering the ongoing technical advancements in automobile industry, some of the standard 2A/3A trucks would gradually be replaced by MAVs. Mature National Highways with tolling in operation for few years, have already witnessed the shift in 2A/3A trucks to MAV for long distance movement and the limited number of 2A/3A trucks are being used for local movements.
- For the project road, 0.4 has been considered for 3A trucks till FY35 and has been tapered to 0.3 till the end of concession period.
- In case of MAVs, an elasticity of 1.0 has been considered for MAVs till FY30 and has been tapered thereafter.

It has been assumed that transport demand elasticity, for both freight and passenger traffic, would gradually decline over time, despite growth in per capita income, as regions becomes more mature, self-sufficient and with alternative mode of transport available to users. Due consideration has been given to the tonnage shifts happening in the market with Mini LCV gaining importance for short distance movements over LCVs and MAVs being preferred over 2A/3A for long distance movements due to better operational efficiencies.

While assigning elasticities to different modes, freight travel pattern and over all elasticity of cargo tonnage with respect to weighted GSDP has been an important consideration. The recommended elasticity values adopted for all vehicle types in line with the traffic growth being observed on other national highways and changes in freight traffic pattern observed on the project road are presented in **Table 3-11**.

Period/Modes	Cars	LCV	Bus/2A	3A	MAV/OSV
Up to FY30	1.1	0.5	0.5	0.4	1.0
FY31- FY35	1.0	0.5	0.5	0.4	0.9
FY36- FY40	1.0	0.5	0.5	0.3	0.8
FY40 & beyond	1.0	0.5	0.5	0.3	0.7

Table 3-11: Recommended Elasticity for Project Road

3.9 Projected Traffic Growth Rates

Based on the moderated perspective elasticity values and the projected growth rates of the income for PIA states, the future average annual compound traffic growth rates by vehicle type have been estimated for the project road by using the following relationship:

T_{gr} = ($GSDP_{gr}$) x E;

where,

T_{gr} – Traffic growth rate for mode

$GSDP_{gr}$ – Growth rate of GSDP

E – Elasticity value for mode

Using the year-on-year mode wise weighted income for PIA and elasticity for different time periods, traffic growth rates have been estimated for each year till FY55 in line with the maximum extendable concession period of 30 years. The estimated traffic growth rates for the project road along with the implied growth rates after considering the impact of diversions have been presented in **Table 3-12**.

FY/Modes	Cars	LCV	Bus/ 2A	3A	MAV/ OSV	Cars	LCV	Bus/ 2A	3A	MAV/ OSV
	Normal Growth Rates					Implied Growth Rates				
FY26	7.4	3.3	3.4	2.7	6.7	7.4	3.3	3.4	2.7	6.7
FY27	7.3	3.3	3.3	2.7	6.6	7.3	3.3	2.2	0.7	4.4
FY28	7.3	3.3	3.3	2.7	6.6	7.3	3.3	2.8	1.7	5.5
FY29	7.0	3.1	3.2	2.5	6.3	7.0	3.1	2.6	1.5	5.2
FY30	6.3	2.8	2.9	2.3	5.7	6.3	2.8	2.9	2.3	5.7
FY31	5.8	2.8	2.9	2.3	5.1	5.8	2.8	2.9	2.3	5.1
FY32	5.8	2.8	2.9	2.3	5.1	5.8	2.8	2.9	2.3	5.1
FY33	5.8	2.8	2.9	2.3	5.1	5.8	2.8	2.9	2.3	5.1
FY34	5.8	2.8	2.9	2.3	5.1	5.8	2.8	2.9	2.3	5.1
FY35	5.7	2.8	2.8	2.3	5.0	5.7	2.8	2.8	2.3	5.0
FY36	5.6	2.7	2.8	1.7	4.4	5.6	2.7	2.8	1.7	4.4
FY37	5.5	2.7	2.7	1.6	4.3	5.5	2.7	2.7	1.6	4.3
FY38	5.4	2.6	2.7	1.6	4.2	5.4	2.6	2.7	1.6	4.2
FY39	5.2	2.6	2.6	1.6	4.2	5.2	2.6	2.6	1.6	4.2
FY40	5.1	2.5	2.6	1.5	4.1	5.1	2.5	2.6	1.5	4.1
FY41	5.0	2.5	2.5	1.5	3.5	5.0	2.5	2.5	1.5	3.5
FY42	4.9	2.4	2.5	1.5	3.4	4.9	2.4	2.5	1.5	3.4
FY43	4.8	2.4	2.4	1.5	3.4	4.8	2.4	2.4	1.5	3.4
FY44	4.7	2.3	2.4	1.4	3.3	4.7	2.3	2.4	1.4	3.3
FY45 and beyond	4.6	2.3	2.3	1.4	3.2	4.6	2.3	2.3	1.4	3.2

Table 3-12: Projected Traffic Growth Rates for Project Road (%)

In derivation of above growth rates, the likely shift of buses to cars in case of passenger vehicles and the replacement/ tonnage shift of 2A/3A trucks to MAV for long distance in case of freight vehicles has been duly considered.

The above growth rates relate to the most likely Base Case. In addition, two sets of traffic growth rates under low and high cases have also been considered and impact on toll revenue evaluated for both these cases. Based on the risk analysis of key parameters like economic growth and elasticity of travel demand impacting traffic growth, two additional growth scenarios have been presented. Low growth scenario considers a 20 percent reduction in growth rates relating to about 10 percent decline each in elasticity and economic growth. The high growth scenario considers a 20 percent increase in growth rates signifying about 10 percent increase each in elasticity and economic parameters.

3.10 Projections Mode-Wise Traffic

Table 3-13 presents the projections of the mode-wise vehicles under the base case till FY55 after considering diversion impacts.

FY End	CJV	LCV	Bus/2A	3A	MAV	OSV	Total PCU
2025	7,436	621	1,928	1,130	2,530	5	7,436
2026	7,989	642	1,993	1,161	2,699	5	7,989
2027	8,575	663	2,038	1,169	2,818	6	8,575
2028	9,203	685	2,094	1,188	2,973	6	9,203
2029	9,847	706	2,149	1,207	3,127	6	9,847
2030	10,470	726	2,211	1,234	3,305	7	10,470
2031	11,073	747	2,275	1,263	3,474	7	11,073
2032	11,710	768	2,341	1,292	3,653	8	11,710
2033	12,384	790	2,408	1,321	3,840	8	12,384
2034	13,096	813	2,478	1,352	4,037	8	13,096
2035	13,836	836	2,548	1,382	4,240	9	13,836
2036	14,605	859	2,619	1,405	4,427	9	14,605
2037	15,401	882	2,691	1,428	4,618	10	15,401
2038	16,225	905	2,763	1,451	4,814	10	16,225
2039	17,076	929	2,836	1,474	5,014	10	17,076
2040	17,955	952	2,909	1,497	5,219	11	17,955
2041	18,862	976	2,982	1,519	5,401	11	18,862
2042	19,795	1,000	3,056	1,542	5,586	12	19,795
2043	20,754	1,024	3,131	1,564	5,774	12	20,754
2044	21,739	1,048	3,205	1,587	5,964	12	21,739
2045	22,748	1,072	3,280	1,609	6,156	13	22,748
2046	23,804	1,097	3,356	1,631	6,354	13	23,804
2047	24,910	1,122	3,434	1,654	6,559	14	24,910
2048	26,066	1,148	3,514	1,677	6,770	14	26,066
2049	27,277	1,174	3,596	1,700	6,988	14	27,277
2050	28,543	1,201	3,680	1,724	7,213	15	28,543
2051	29,869	1,229	3,766	1,748	7,445	15	29,869
2052	31,256	1,257	3,853	1,772	7,685	16	31,256
2053	32,707	1,286	3,943	1,797	7,932	16	32,707
2054	34,226	1,315	4,035	1,822	8,188	17	34,226
2055	35,815	1,346	4,129	1,847	8,451	17	35,815
CAGR (%) (FY25 to FY45)	5.7	2.8	2.7	1.8	4.5	4.8	4.3

Table 3-13: Mode-Wise Projected Traffic for PR

3.11 Traffic Projections and Capacity Analysis

Table 3-14 presents the projections of the total vehicles based on the most likely growth rates till FY55 as assessed in this study.

FY	Total Traffic Before Diversion	Total Traffic After Diversion
2025	28,949	28,949
2026	30,585	30,585
2027	32,298	31,897
2028	34,118	33,483
2029	35,962	35,073
2030	37,730	36,799
2031	39,445	38,473
2032	41,244	40,230
2033	43,131	42,073
2034	45,111	44,007
2035	47,153	46,002
2036	49,122	47,927
2037	51,143	49,904
2038	53,216	51,931
2039	55,338	54,008
2040	57,510	56,133
2041	59,607	58,187
2042	61,744	60,281
2043	63,919	62,412
2044	66,131	64,579
2045	68,377	66,781
2046	70,707	69,064
2047	73,122	71,433
2048	75,628	73,889
2049	78,226	76,438
2050	80,922	79,081
2051	83,718	81,824
2052	86,620	84,671
2053	89,630	87,624
2054	92,753	90,690
2055	95,995	93,871
PCU CAGR – FY25 to FY45	4.4%	4.3%

Table 3-14: Projected Traffic in PCUs on the Project Road

With the considered diversion impacts, the project road traffic is likely to cross 60,000 PCUs in FY42.

As per the traffic projections estimated above, the six-laning of the PR section is anticipated to take place in FY35 and FY36.

It is to be noted, the majority of the distinct structures on the PR section are already six-laned, and the required land for the expansion to a six-lane carriageway is available. Thus, disruptions during the construction process are expected to be minimal. Cost ratio analysis suggests a minimal change in share of PR when compared in existing 4 lane configuration (during construction with a lower speed) with 6 lane configurations. Hence, no significant impact on traffic is expected during expansion of PR.

4. TOLL REVENUE PROJECTIONS

4.1 Tolling Strategy

The project road will continue to have an "Open System" of toll collection which enables the concessionaire to collect tolls from through traffic as well as from short distance one.

As mentioned earlier, there is one operational toll plaza on the project road, Veeravalli at km 53.700 with an effective tolling length of 108.2185 km.

4.2 Schedule of User Fee

As per Schedule of User Fee for the project, the per km toll rates applicable from 2007-08 for normal tolling length, bypasses and permanent structures, the revision basis and concessions are provided.

The concessions to traffic have been given in the form of rates as below:

Local traffic

Car / Jeep / Vans - includes local users owning a vehicle registered for non-commercial purposes, residing within a distance of 20 km from the toll plaza and crossing the same for commuting purposes.

Commercial vehicles - includes local users owning a commercial vehicle (excluding vehicles under National Permit), registered with address on the Registration Certificate of a particular district and uses such vehicle for commuting on a section of National Highway, permanent bridge, tunnel or bypass, as the case may be, which is located within that district, shall be levied user fee on all toll plazas which are located within that district at the rate of fifty per cent of the prescribed rate of fee (single journey rate). No such concession shall be provided, if a service road or alternative road is available for use by such commercial vehicles. Thus, local commercial traffic has to pay only 50 percent of the normal ticket.

Daily Pass

When the vehicle has to cross the tolled section more than once in a day, the user shall have the option to pay one and half times (1.5 times) of the fee for a single entry; this pass shall be valid for 2 entries within 24 hours of purchase.

Monthly Pass

A user, who makes use of the project road frequently during a month, may opt to purchase a monthly pass upon payment of a charge equal to two-thirds of the fee payable for 50 single journeys; this pass can be used for a maximum 50 one-way journeys over the month of validity.

Thus, the different categories of toll tickets are as follows:

(i) Traffic paying normal toll rates (single trip)

(ii) Traffic paying return journey rates

(iii) Traffic paying monthly pass rates

(iv) Traffic paying local personal rates

(v) Traffic paying local commercial rates

4.3 Tolling Segmentation

The tolling stream distribution has been estimated from the ETC data of April 2024 to November 2024 (excluding freight traffic from 30th March 2024 to 8th May 2024). The cash and exemption traffic data for FY25 (April–November) has been added into the ETC traffic distribution. The resultant ticket distribution is presented in **Table 4-1**.

Type	Car	LCV	Bus/2A Trucks	3A Trucks	MAV	OSV
Single	48.2	67.4	54.4	61.8	91.2	100.0
Return	45.5	30.1	36.9	23.0	8.2	0.0
Monthly	0.0	0.0	1.3	0.0	0.0	0.0
Local personal	3.0	0.0	0.0	0.0	0.0	0.0
Local commercial	0.5	1.8	7.4	15.0	0.4	0.0
Exemptions and Violations	2.9	0.7	0.0	0.2	0.1	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 4-1: Tolling Distribution

In case of cars, the normal toll paying traffic is likely to be about 48.2 percent at the toll plaza location. The share of return journey is around 45.5 percent due to the short lead of travel for cars on the project road. The exemptions for car traffic are about 2.9 percent.

In case of LCV and Bus/2A trucks, the level of normal paying traffic is likely to be around 67.4 percent and 54.4 percent respectively whereas, around 30-37 percent of traffic are opting for return journey. Additionally, around 7.4 percent of 2A trucks are falling under local commercial category.

For 3A trucks, the share of normal toll paying traffic is around 61.8 percent and the return journey category accounts for about 23 percent. Moreover, the share of local commercial traffic is high with about 15.0 percent as compared to other modes.

In case of MAVs, around 91.2 percent of traffic is opting for normal ticket due to their long lead of travel and around 8.2 percent of MAV falling under return journey category. As mentioned earlier, these trucks are making short distance trips from Eluru/Vijayawada/ Hyderabad to Rajahmundry/ Kakinada/ Vishakhapatnam. The MAV traffic falling under local commercial category is 0.4 percent.

Trip rate for local personal pass users for cars is 1.0 and for monthly pass it is considered as 1.67 across all the modes. For daily pass, trip rate of 2.0 has been considered for all the modes.

4.4 Toll Rates

This section presents details on the toll rates that are likely to be imposed on the users of the project road during the study period. The toll rates (Rs/km) for the base year 2007-08 for different vehicle categories as per toll fee rules are presented in **Table 4-2**.

Mode	Base rate per km (in Rs)
Car, Jeep, Van, LMV	0.65
LCV /M Bus	1.05
Bus/ 2 Axle Truck	2.20
3 Axle	2.40
MAV	3.45
Oversized	4.20
Local Passenger	150

Table 4-2: Toll Rates in Rs/km for Different Vehicle Categories

The toll notification states that the 2007 toll rates shall be increased without compounding by three per cent each year with effect from the 1st day of April 2008 and such increased rate shall be deemed to be the base rate for the subsequent years.

In addition to this, the rate of fee for use of bypass forming part of a section of a National Highway constructed with a cost of Rs 10 crore or more, for the base year 2007, shall be one and a half times of the per km base rates specified above and the length of such bypass shall be excluded from the length of such section of National Highway.

In addition to this, the fee levied and collected hereunder for permanent bridge/ structures, as the case may be, having a length of 60 m or more on the basis of the equivalent length for structure as specified shall be due and payable at the toll plaza.

The details of normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being charged at toll plaza as per the information in the Schedule M for the project are presented in **Table 4-3**.

Veeravalli TP at km 53.700	FY25 onwards
A. Normal	24.3590
B. Bypass	43.6930
C. Eq. structure	1.8320
Base Length	69.8840
Tolling Length = A+(B*1.5) + (C*10)	108.2185

Table 4-3: Tolling Length (in km) for the Project Road

The applicable base rates shall be revised annually with effect from April 1 each year to reflect the increase in wholesale price index for the month of December of the immediate preceding year in which such revision is undertaken but such revision shall be restricted for 40 per cent of the increase in wholesale price index.

Actual WPI information for December 2024 of 155.4 under 2011-12 series converted into 1999-00 series (155.4*1.873*1.641=477.636) has been used. WPI increase of 4.5 is

considered for FY27 & FY28, while WPI forecast for remaining years beyond December 2027 has been considered as 3.5 percent as provided by the client.

The stream of toll rates likely to be charged basis schedule -M lengths and adopted WPI assumptions at the toll plaza of the project road in cardinal years till FY55 is presented in **Table 4-4**. The toll fee has been rounded to nearest 5 Rupees as per toll fee rules.

FY	Car	LCV	Bus/ 2-axle Truck	3-axle Truck	MAV	O/size/ HME	Car Local
Veeravalli TP							
2025	160	255	535	585	840	1,025	340
2030	195	315	660	720	1,035	1,260	415
2035	240	385	805	880	1,265	1,540	510
2040	290	470	985	1,075	1,545	1,880	620
2045	355	575	1,205	1,310	1,885	2,295	760
2050	435	700	1,470	1,605	2,305	2,805	925
2055	530	855	1,795	1,960	2,815	3,430	1,130

Table 4-4: Toll Rates at Toll Plaza (in Rs)

The users purchasing return journey tickets will pay 1.5 times the above toll rates; the traffic opting for monthly pass will pay 33.3 times (two-thirds of 50 single journeys) the normal traffic toll rates.

4.5 Toll Revenue Estimates

Total Revenue collected at the toll plaza location during for FY23 and FY24 is Rs 1,664.4 million and Rs 1,702.3 million respectively. The mode wise past revenue for the project road toll plaza is presented in **Table 4-5**.

FY/TP	CJV	LCV	2-Axle	3-Axle	MAV	OSV	Total
FY23	290.6	49.6	288.7	222.0	812.9	0.6	1,664.4
FY24	336.5	50.5	316.2	218.6	779.9	0.7	1,702.3
FY25 (8 months)	231.3	34.5	214.3	137.5	481.6	0.3	1,099.6

Table 4-5: Mode-wise Past Revenue (In Millions)

The assured remittance amount for FY25 for the project road toll plaza is Rs. 1,648.0 whereas the estimated revenue from the model is 1,707.0 million which is 3.6 percent higher than the actual remittance amount.

As per the site findings, WIM is currently installed at the Veeravalli toll plaza lanes whereas no overloading is being charged currently.

In view of this, 7- day axle load survey data (as part of technical due diligence) has been provided by the technical consultants of the client which has been analysed to understand the extent of overloaded vehicles at Veeravalli toll plaza. The analysis shows similar overloading trends across the seven days. The findings of the overloading analysis are presented in **Table 4-6**.

Mode	Within Permissible Limit	Within Tolerance up to 5%	>5%-<10%	>10%-<20%	>20%	Total	Adopted %
LCV	100.0	0.0	0.0	0.0	0.0	100.0	
2A	99.1	0.4	0.3	0.1	0.04	100.0	
3A	66.1	6.9	5.4	12.4	9.2	100.0	7.08
MAV	41.1	8.5	8.3	14.3	27.8	100.0	7.18

Table 4-6: Overloaded Vehicles (%) on the PR

As observed from the seven-day axle load analysis, around 9 percent of 3A trucks and 28 percent of the MAVs are above 20 percent overloading limit at Veeravalli TP. However, the commodities such as fruits and vegetables, petroleum products, chemicals and gas, heavy machinery and industrial equipment as well as OD pairs with lead greater than 500 km are less likely to be overloaded. Hence, the revised overloading percentage after excluding these commodities in the category of above 20 percent overloading comes out to be around 7 percent in both 3A and MAV which has been adopted for the further analysis.

The overloading vehicles are liable to pay the overloading penalty as per the provisions of the concession agreement. The concession agreement of the latest TOT project states that overloading penalty should be charged as per the NHAI overloading circular. As per the amended National Highways Fee (Determination of Rates and Collection) Rules, 2018, "the driver or owner or person in charge of a mechanical vehicle shall be liable to pay fee, for entering the overloaded vehicle on the National Highway, to the user fee collecting agency, equal to fees as presented in **Table 4-7**.

Percentage of excess load over Maximum Permissible Gross Vehicular Weight	Multiplying factor to base rate fees	Fees
0% to 20%	Two	[(Fees applicable for such category of mechanical vehicle under sub-rule (2) of rule 4) X (Multiplying factor)]
>20% to 40%	Four	
>40% to 60%	Six	
>60% to 80%	Eight	
>80% and above	Ten	

Table 4-7: User Fee for Overloaded Vehicles

However, as per the operational overloading practices at the toll plazas where overloading penalty is being charged, it is either the next higher category toll or two times the normal fee which is usually being collected.

Continuing with the practice of two times toll, since MAVs are heavily overloaded, with WIM in place at Veeravalli, the practice of charging them for one-time extra payment can be put in place. Even if 20 percent of these 3A Trucks and MAVs pay one time extra, it will result in a substantial gain in revenue, but it might not be practically possible to stop each vehicle and collect extra toll.

Although the quantum of overloaded vehicles is high but after factoring in the practical number of vehicles from whom overloading can be charged, under a more pragmatic scenario, it is assumed that around 25 percent of this 7 percent overloaded category is

charged for one-time additional payment. This results in around 2 percent of 3A & MAV AADT of FY25 - paying one-time extra toll. However, with strict overloading compliance in place in the future years, this overloading percentage is likely to decline over the years of concession. At present, overloading is not being collected at Veeravalli TP and the proportion of the overloading revenue is not much, therefore, it has not been considered in the base case.

4.6 Toll Revenue Projections

Toll revenue streams have been calculated assuming that:

- Toll would be collected for all 365 days in a year and for 366 days in a leap year
- Toll revenues have been presented from FY25 to FY55 in line with the maximum extendable concession period of 30 years

The toll revenue for Veeravalli at the project road after considering the impacts of all diversions for the base case is presented in **Table 4-8**.

FY Ending March	Car	LCV	Bus/2A Truck	3A Truck	MAV	O/size /HME	Total
2025	359.4	52.6	326.6	209.1	757.4	1.9	1,707.0
2026	396.5	56.5	350.3	222.1	836.8	2.1	1,864.2
2027	443.9	61.4	374.4	234.2	914.0	2.3	2,030.2
2028	501.8	66.0	405.0	250.0	1,014.5	2.6	2,240.0
2029	552.4	71.3	431.0	263.3	1,108.3	2.8	2,429.2
2030	619.0	76.0	461.5	280.8	1,218.8	3.1	2,659.2
2031	683.4	81.6	493.3	299.2	1,336.7	3.4	2,897.5
2032	744.9	86.9	531.2	319.2	1,461.8	3.8	3,147.7
2033	823.0	93.2	566.7	338.4	1,600.4	4.1	3,425.9
2034	909.9	99.7	607.8	361.2	1,747.7	4.5	3,730.8
2035	997.4	106.5	649.2	384.3	1,911.0	4.9	4,053.3
2036	1,099.9	114.2	697.5	407.7	2,080.0	5.4	4,404.6
2037	1,203.2	121.5	743.8	430.6	2,254.2	5.8	4,759.0
2038	1,323.4	130.4	795.0	454.2	2,444.3	6.3	5,153.5
2039	1,444.4	138.6	848.0	479.9	2,652.7	6.8	5,570.4
2040	1,577.4	148.8	907.7	509.3	2,880.4	7.4	6,031.0
2041	1,733.9	158.6	967.3	537.3	3,088.9	7.9	6,493.9
2042	1,887.9	169.1	1,030.0	567.1	3,333.7	8.6	6,996.3
2043	2,060.4	179.9	1,098.8	598.0	3,579.7	9.2	7,525.9
2044	2,239.0	191.6	1,174.5	633.3	3,857.2	9.9	8,105.4
2045	2,444.5	204.2	1,248.9	666.1	4,134.8	10.6	8,709.0
2046	2,660.8	216.5	1,327.7	703.7	4,448.5	11.4	9,368.6
2047	2,891.9	230.9	1,416.3	741.8	4,778.6	12.3	10,071.9
2048	3,158.5	246.3	1,510.6	786.1	5,140.1	13.2	10,854.8
2049	3,425.5	262.6	1,603.4	827.1	5,514.6	14.2	11,647.3
2050	3,744.9	278.8	1,710.5	873.6	5,923.4	15.2	12,546.3
2051	4,072.9	297.4	1,821.8	922.0	6,366.4	16.4	13,496.9
2052	4,450.0	317.6	1,943.9	974.3	6,850.5	17.6	14,554.0
2053	4,841.6	336.8	2,068.4	1,027.0	7,348.2	18.9	15,640.8
2054	5,273.1	359.6	2,201.8	1,082.3	7,891.4	20.3	16,828.6
2055	5,734.4	381.7	2,344.5	1,143.7	8,476.7	21.8	18,102.8

Table 4-8: Toll Revenue (in Rs Million) for the Project Road by Mode

Around 74.4 percent of total revenue is likely to be generated from freight vehicles only. Majority of the revenue is expected to come from MAV/OSV with about 47.2 percent of the total revenue. Amongst other categories, cars represent a share of around 25.6 percent of total revenue followed by Bus/2A Trucks having a share of about 15.7 percent and around 9.0 percent share is contributed by 3A Trucks. LCV is likely to generate about 2.6 percent of total revenue.

Vehicles paying normal tolls are around 77.2 percent of total toll revenue for the project road section and around 20.9 percent of the traffic may fall in return pass category, while the remaining 1.9 percent is generated from monthly and local concession passes.

4.7 Scenario Analysis

For toll road projects, revenue streams are generally based on the assessment of the traffic volume (base and future) crossing the toll plazas and the applicable toll imposed on the user of the road. There is an inherent element of uncertainty in any forecast and whilst is not possible to measure risk in a strictly statistical sense (as many of the risks are largely or partly unknown), in this section an attempt is made at quantifying the main risks that could have an impact on this forecast.

The econometric approach used to derive traffic growth, is based on the estimation of GSDP growth rates for the influence area economies and traffic demand elasticity by mode; the estimation of both variables contains a certain degree of uncertainty which can be represented in the scenario analysis. Scenario analysis has been done in the following subheadings for the base case:

High Case

The high case is based on a more optimistic economic outlook for future years and higher elasticity values as compared to the base case. Therefore, traffic growth rates of 20 percent higher than the base case for every year and for all the mode are considered.

Low Case

A growth rate of 20 percent lower than base case for all types of vehicles has been considered in the present analysis to reflect uncertainty with regard to economic performance of PIA states and lower elasticity values.

The result of base case and scenario is presented in **Table 4-9**. A comparison versus base case has been presented for the Present Value of the project (at 12 percent discount rate) and the compounded annual growth rate (CAGR) from FY25 to FY45/FY55.

FY Ending March	Base Case	High Growth (+20%)	Low Growth (-20%)
2025	1,707.0	1,707.0	1,707.0
2026	1,864.2	1,884.1	1,844.4
2027	2,030.2	2,073.6	1,987.3
2028	2,240.0	2,312.5	2,169.1
2029	2,429.2	2,533.9	2,328.1
2030	2,659.2	2,800.4	2,524.2
2031	2,897.5	3,078.5	2,726.2
2032	3,147.7	3,374.0	2,935.6
2033	3,425.9	3,705.3	3,166.4
2034	3,730.8	4,071.6	3,417.4
2035	4,053.3	4,463.1	3,680.0
2036	4,404.6	4,889.9	3,966.3
2037	4,759.0	5,326.6	4,250.9
2038	5,153.5	5,814.8	4,566.5
2039	5,570.4	6,335.3	4,897.2
2040	6,031.0	6,912.8	5,261.4
2041	6,493.9	7,498.0	5,624.4
2042	6,996.3	8,136.1	6,016.7
2043	7,525.9	8,814.1	6,427.2
2044	8,105.4	9,558.3	6,875.2
2045	8,709.0	10,341.2	7,337.0
2046	9,368.6	11,201.4	7,839.1
2047	10,071.9	12,125.4	8,370.6
2048	10,854.8	13,159.1	8,959.7
2049	11,647.3	14,218.6	9,548.1
2050	12,546.3	15,424.7	10,213.8
2051	13,496.9	16,710.4	10,912.0
2052	14,554.0	18,147.9	11,684.7
2053	15,640.8	19,642.6	12,469.5
2054	16,828.6	21,286.4	13,322.3
2055	18,102.8	23,062.8	14,230.7
PV12 FY25 to FY45	24,441.3	26,585.8	22,525.5
PV12 vs base (till FY45)		8.8%	-7.8%
CAGR FY25 to FY45	8.5%	9.4%	7.6%
PV12 FY25 to FY55	30,946.1	34,595.3	27,815.2
PV12 vs base (till FY55)		8.8%	-7.8%
CAGR FY25 to FY55	8.2%	9.1%	7.3%

Table 4-9: Comparison of Annual Revenues Forecasts in Rs Million (Base) to Alternate Traffic Growth Assumptions

The project road revenues will have a CAGR of 8.5 percent for the period FY25 to FY45. The high growth scenario would generate about 8.8 percent higher PV than the base case while low growth scenario may result in 7.8 percent lower PV than the base case.

APPENDICES

APPENDIX 2.1
MONTH ON MONTH PAST TRAFFIC DATA

Traffic Study for Gundugolanu - Devarapalli - Kovvuru Section of NH-16 in the State of Andhra Pradesh

Month on Month Past Traffic Data

Veeravalli TP								
Month	**CJV**	**LCV**	**2-Axle**	**3-Axle**	**MAV**	**OSV**	**Total Traffic**	**PCUs**
Dec-21	6,519	633	1,822	1,405	2,862	3	13,245	30,044
Jan-22	6,079	548	1,662	1,307	2,683	4	12,283	27,901
Feb-22	6,640	643	1,808	1,583	3,034	3	13,711	31,444
Mar-22	5,709	677	1,859	1,541	3,114	3	12,904	30,955
Apr-22	6,016	657	1,836	1,507	3,035	3	13,054	30,699
May-22	6,649	655	1,866	1,465	2,947	2	13,583	30,893
Jun-22	6,732	671	1,931	1,446	3,077	2	13,859	31,727
Jul-22	5,591	708	1,875	1,300	3,373	3	12,849	31,368
Aug-22	6,885	720	2,063	1,471	3,264	3	14,407	33,273
Sep-22	5,387	677	1,921	1,407	3,166	4	12,562	30,651
Oct-22	6,519	611	1,888	1,240	2,834	4	13,097	29,592
Nov-22	5,956	611	1,800	1,195	3,015	3	12,581	29,442
Dec-22	6,878	611	1,849	1,219	2,776	4	13,337	29,507
Jan-23	7,046	516	1,742	1,139	2,569	3	13,015	28,036
Feb-23	6,426	572	1,813	1,293	2,785	4	12,894	29,154
Mar-23	5,862	593	1,781	1,243	2,774	3	12,255	28,318
Apr-23	5,766	604	1,773	1,224	2,620	4	11,991	27,471
May-23	7,695	623	1,935	1,241	2,690	4	14,188	30,279
Jun-23	7,141	617	1,993	1,319	2,768	4	13,844	30,480
Jul-23	5,926	581	1,790	1,186	2,616	3	12,102	27,513
Aug-23	6,561	582	1,862	1,289	2,741	3	13,038	29,233
Sep-23	6,370	575	1,889	1,207	2,787	3	12,831	29,075
Oct-23	7,511	646	2,078	1,171	2,772	3	14,181	30,717
Nov-23	6,753	599	1,831	1,089	2,634	3	12,909	28,278
Dec-23	7,770	611	1,907	1,168	2,542	2	14,002	29,364
Jan-24	8,344	564	1,897	1,068	2,407	3	14,283	28,932
Feb-24	7,027	613	1,964	1,247	2,688	4	13,543	29,692
Mar-24	6,902	651	1,988	1,290	2,688	3	13,523	29,824
Apr-24	6,600	568	1,737	1,096	2,011	2	12,013	25,005
May-24	7,190	608	1,991	1,265	2,493	3	13,550	29,102
Jun-24	6,972	605	1,908	1,076	2,375	3	12,938	27,529
Jul-24	6,247	591	1,830	1,114	2,397	3	12,182	26,764
Aug-24	7,530	621	1,920	1,114	2,497	2	13,684	28,807
Sep-24	5,509	589	1,839	1,035	2,562	3	11,536	26,557
Oct-24	8,307	661	2,077	1,096	2,448	3	14,592	29,847
Nov-24	7,616	634	1,940	1,184	2,568	2	13,945	29,506

APPENDIX 2.2
TRAFFIC ZONING SYSTEM

Traffic Study for Gundugolanu - Devarapalli - Kovvuru Section of NH-16 in the State of Andhra Pradesh
Traffic Zoning System

Zone	Place/Region	District/ State	State
1	Eluru/Hanuman Junction	PR Zones	Andhra Pradesh
2	Gundugolanu/Bhogapuram/Pathuru/Bhimadole/ Polasanapalli		
3	Seethampeta/Narasimhapuram/Gandivarigudem/Sriramvaram/Surappagudem		
4	Hanumanlagudem/M.Nagulapalli/Anjaneyanagar/Narayanpuram		
5	Pullalapadu/Dupacherla/Kothagudem/Jajulakunta/Anantapalli		
6	Avapadu/Marellamudi/Nallajerla/Gopalpuram/Chodavaram/Telikicherla		
7	Jangareddigudem/Kamavarapukota/Dwarka Tirumala		
8	Veerampalem/Bangarudem/Yernagudem/Tyajampudi		
9	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem		
10	Gopalapuram/Gollagudem/Vadalakunta/Chityala/Koyyalgudem		
11	I.Pangidi/Chagallu/Nidadavole		
12	Dharmavaram/Kapavaram/Dommeru/Vegeswarapuram		
13	Kovvur/SrinagarColony/Arikirevula		
14	Konthamuru		
15	Rajamahendravaram		
16	Vijayawada/Machlipatnam/Amaravathi	Krishna District	
17	Guntur	Guntur District	
18	Kakinada/Pithampuram	Kakinada District	
19	Kakinada Port	Kakinada District	
20	Annavaram/Pithapuram/Nellipudi	Kakinada District	
21	Tuni/Nasipatnam	Kakinada District	
22	Visakhapatnam city	Visakhapatnam District	
23	Gangavaram Port	Visakhapatnam District	
24	Vizag Port	Visakhapatnam District	
25	Vizianagaram/Nellmarla	Vizianagaram District	
26	Chodavaram/Narsipatnam/Madugula	Anakapalli District	
27	Araku Valley/Borra Caves/ Hukumpeta/Chintapalle	Visakhapatnam District	
28	Ballipeta/Pedamerangi/Vangara/Kotturu	Parvathipuran District	
29	Nathavalasa/Pusapatirega	Srikakulam District	
30	Srikakulam	Srikakulam District	
31	Pedapadu/Sanivada/Vanavanipeta	Eluru District	
32	Nandigam/Pundi/PalasaSompeta	Srikakulam District	
33	Ongole/Nellore/Kandukur	Prakasam District	
34	Tirupati/Puttur/SriCity/Chittoor	Tirupati District	
35	Kurnool/Raichur/Wanaparthy	Kurnool District	
36	Nandyala/Anantapur/Kadapa	Nandayal District	
37	Rest of Andhra Pradesh	Rest of Andhra Pradesh	
38	Khammam	Telangana	Telangana
39	Suryapet/Nalgonda/Kodad	Telangana	
40	Karimnagar/Warangal	Telangana	
41	Hyderabad	Telangana	
42	Nizamabad/Nirmal/Adilabad	Telangana	
43	Mancherial/Bellampalle/Ramagundam	Telangana	
44	Jadcherla/Mahbubnagar/nagarkurnool	Telangana	
45	Rest of Telangana	Telangana	
46	Jeypore/Koraput/Nowrangpur	Odisha	Odisha
47	Raygada/Bhawanipatna/Muniguda	Odisha	
48	Balangir/Sambalpur/Jharsuguda/Sundargarh	Odisha	
49	Rourkela/Deogarh	Odisha	
50	Brahmapur	Odisha	
51	Gopalpur Ports Limited Arjyapalli	Odisha	
52	Bhubaneswar/Puri	Odisha	
53	Cuttack	Odisha	
54	Paradeep Port	Odisha	
55	Chandikhol/Bhadrak/Balasore	Odisha	
56	Rest of Odisha	Odisha	
57	Raipur/Durg/Bhilai	Chhattisgarh	Chhattisgarh
58	Bilaspur/Korba/Ambikapur	Chhattisgarh	
59	Rest of Chhattisgarh	Chhattisgarh	
60	Chennai Port	Tamil Nadu	Tamil Nadu
61	Chennai	Tamil Nadu	
62	Ennore Port	Tamil Nadu	
63	Salem/Erode/Coimbatore	Tamil Nadu	
64	Thoothukudi Port	Tamil Nadu	
65	Madurai/Trichy/Thanjavur	Tamil Nadu	
66	Puducherry	Tamil Nadu	
67	Krishnagiri/Tirupathur/Rayakottai	Tamil Nadu	
68	Vellore	Tamil Nadu	
69	Rest of Tamil Nadu	Tamil Nadu	
70	Kalaburagi/Kodli/Kalgi	Karnataka	Karnataka
71	Vijayapura/Mangoli/Tikota	Karnataka	
72	Ballari/Davangere/Chitradurga	Karnataka	
73	Hubbli/Belgavi/Haveri	Karnataka	
74	Udupi/Mangalore	Karnataka	
75	Mysore/Mandya	Karnataka	
76	Bengaluru	Karnataka	
77	Rest of Karnataka	Karnataka	
78	Nagpur/Bhandara/Amravati/Wardha	Maharashtra	Maharashtra
79	Latur/Nanded	Maharashtra	
80	Aurangabad/Jalna/Ahmednagar	Maharashtra	
81	Mumbai/Pune/Nashik	Maharashtra	
82	Solapur/Kolhapur/Sangli/Satara	Maharashtra	
83	Rest of Maharashtra/Goa	Maharashtra	
84	Kochi/Allepy/Thrissur	Kerala	Kerala
85	Trivandum/Kollam	Kerala	
86	Rest of Kerala	Kerala	
87	Kharagpur/Durgapur/Bardhaman	West Bengal	West Bengal
88	Haldia Port	West Bengal	
89	Kolkata/Howrah	West Bengal	
90	Rest of West Bengal	West Bengal	
91	Ranchi/Jamshedpur/Dhanbad	Jharkhand	Jharkhand
92	Rest of Jharkhand	Jharkhand	
93	Bhopal/Indore/Ujjain	Madhya Pradesh	Madhya Pradesh
94	Jabalpur/Satna/Rewa	Madhya Pradesh	
95	Rest of Madhya Pradesh	Madhya Pradesh	
96	Surat	Gujarat	Gujarat
97	Ahmedabad/Vadodara/Bharuch	Gujarat	
98	Rest of Gujarat	Gujarat	
99	Jaipur/Jodhpur/Rest of Rajasthan	Rajasthan	Rajasthan
100	Delhi	Delhi	Delhi
101	Lucknow/Kanpur	Uttar Pradesh	Uttar Pradesh
102	Prayagraj/Varanasi	Uttar Pradesh	
103	Rest of Uttar Pradesh	Uttar Pradesh	
104	Patna/Gaya/Rest of Bihar	Bihar	Bihar
105	Haryana/Punjab	Haryana/Punjab	Haryana/Punjab
106	Uttarakhand/Himachal Pradesh/Jammu & Kashmir	Uttarakhand/Himachal Pradesh/Jammu & Kashmir	Uttarakhand/Himachal Pradesh/Jammu & Kashmir
107	Sikkim/Rest of North Eastern States	Sikkim/Rest of North Eastern States	Sikkim/Rest of North Eastern States

Confidential

APPENDIX 2.3
TOP 20 OD PAIRS

Traffic Study for Gundugolanu - Devarapalli - Kovvuru Section of NH-16 in the State of Andhra Pradesh-Veeravalli TP

TOP 20 Origin Destination Pairs

Car

S.No.	Origin	Destination	% of total
1	Rajamahendravaram	Vijayawada/Machlipatnam/Amaravathi	18%
2	Eluru/Hanuman Junction	Rajamahendravaram	11%
3	Vijayawada/Machlipatnam/Amaravathi	Visakhapatnam city	6%
4	Vijayawada/Machlipatnam/Amaravathi	Kakinada/Pithampuram	4%
5	Rajamahendravaram	Hyderabad	4%
6	Avapadu/Marellamudi/Nallajerla/Gopalpuram/Chodavaram/Telikicherla	Rajamahendravaram	4%
7	Eluru/Hanuman Junction	Kovvur/SrinagarColony/Arikirevula	3%
8	Eluru/Hanuman Junction	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	3%
9	Rajamahendravaram	Guntur	3%
10	Avapadu/Marellamudi/Nallajerla/Gopalpuram/Chodavaram/Telikicherla	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	2%
11	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	Vijayawada/Machlipatnam/Amaravathi	2%
12	Eluru/Hanuman Junction	Kakinada/Pithampuram	2%
13	Eluru/Hanuman Junction	Visakhapatnam city	2%
14	Rajamahendravaram	Tirupati/Puttur/SriCity/Chittoor	2%
15	Kovvur/SrinagarColony/Arikirevula	Vijayawada/Machlipatnam/Amaravathi	2%
16	Visakhapatnam city	Hyderabad	2%
17	Rajamahendravaram	Ongole/Nellore/Kandukur	1%
18	Kakinada/Pithampuram	Hyderabad	1%
19	Gundugolanu/Bhogapuram/Pathuru/Bhimadole/ Polasanapalli	Rajamahendravaram	1%
20	Guntur	Visakhapatnam city	1%
		Total	**75%**

MiniBus

S.No.	Origin	Destination	% of total
1	Eluru/Hanuman Junction	Rajamahendravaram	29%
2	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	Vijayawada/Machlipatnam/Amaravathi	18%
3	Rajamahendravaram	Vijayawada/Machlipatnam/Amaravathi	18%
4	Eluru/Hanuman Junction	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	13%
5	Eluru/Hanuman Junction	Kovvur/SrinagarColony/Arikirevula	6%
6	Gundugolanu/Bhogapuram/Pathuru/Bhimadole/ Polasanapalli	Rajamahendravaram	6%
7	Hanumanlagudem/M.Nagulapalli/Anjaneyanagar/Narayanpuram	Rajamahendravaram	6%
8	Avapadu/Marellamudi/Nallajerla/Gopalpuram/Chodavaram/Telikicherla	Kakinada/Pithampuram	6%
		Total	**100%**

Bus

S.No.	Origin	Destination	% of total
1	Eluru/Hanuman Junction	Rajamahendravaram	20%
2	Rajamahendravaram	Vijayawada/Machlipatnam/Amaravathi	15%
3	Visakhapatnam city	Hyderabad	11%
4	Vijayawada/Machlipatnam/Amaravathi	Visakhapatnam city	10%
5	Kakinada/Pithampuram	Hyderabad	7%
6	Rajamahendravaram	Hyderabad	6%
7	Avapadu/Marellamudi/Nallajerla/Gopalpuram/Chodavaram/Telikicherla	Rajamahendravaram	2%
8	Vijayawada/Machlipatnam/Amaravathi	Kakinada/Pithampuram	2%
9	Avapadu/Marellamudi/Nallajerla/Gopalpuram/Chodavaram/Telikicherla	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	2%
10	Guntur	Visakhapatnam city	2%
11	Rajamahendravaram	Guntur	2%
12	Vizianagaram/Nellmarla	Hyderabad	2%
13	Kovvur/SrinagarColony/Arikirevula	Vijayawada/Machlipatnam/Amaravathi	2%
14	Vijayawada/Machlipatnam/Amaravathi	Tuni/Nasipatnam	1%
15	Eluru/Hanuman Junction	Kovvur/SrinagarColony/Arikirevula	1%
16	Rajamahendravaram	Kurnool/Raichur/Wanaparthy	1%
17	Vijayawada/Machlipatnam/Amaravathi	Vizianagaram/Nellmarla	1%
18	Rajamahendravaram	Ongole/Nellore/Kandukur	1%
19	Vijayawada/Machlipatnam/Amaravathi	Nandigam/Pundi/PalasaSompeta	1%
20	Visakhapatnam city	Ongole/Nellore/Kandukur	1%
		Total	**89%**

Mini LCV

S.No.	Origin	Destination	% of total
1	Vijayawada/Machlipatnam/Amaravathi	Visakhapatnam city	14%
2	Rajamahendravaram	Vijayawada/Machlipatnam/Amaravathi	14%
3	Eluru/Hanuman Junction	Rajamahendravaram	10%
4	Eluru/Hanuman Junction	Visakhapatnam city	5%
5	Avapadu/Marellamudi/Nallajerla/Gopalpuram/Chodavaram/Telikicherla	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	5%
6	Vijayawada/Machlipatnam/Amaravathi	Kakinada/Pithampuram	5%
7	Eluru/Hanuman Junction	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	5%
8	Avapadu/Marellamudi/Nallajerla/Gopalpuram/Chodavaram/Telikicherla	Rajamahendravaram	4%
9	Eluru/Hanuman Junction	Kovvur/SrinagarColony/Arikirevula	4%
10	Eluru/Hanuman Junction	Kakinada/Pithampuram	3%
11	Rajamahendravaram	Guntur	3%
12	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	Vijayawada/Machlipatnam/Amaravathi	2%
13	Rajamahendravaram	Hyderabad	2%
14	Kovvur/SrinagarColony/Arikirevula	Vijayawada/Machlipatnam/Amaravathi	2%
15	Visakhapatnam city	Ongole/Nellore/Kandukur	2%
16	Gundugolanu/Bhogapuram/Pathuru/Bhimadole/ Polasanapalli	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	1%
17	Avapadu/Marellamudi/Nallajerla/Gopalpuram/Chodavaram/Telikicherla	Kovvur/SrinagarColony/Arikirevula	1%
18	Guntur	Visakhapatnam city	1%
19	Gundugolanu/Bhogapuram/Pathuru/Bhimadole/ Polasanapalli	Rajamahendravaram	1%
20	Vijayawada/Machlipatnam/Amaravathi	Chodavaram/Narsipatnam/Madugula	1%
		Total	**84%**

Traffic Study for Gundugolanu - Devarapalli - Kovvuru Section of NH-16 in the State of Andhra Pradesh-Veeravalli TP

TOP 20 Origin Destination Pairs

LCV

S.No.	Origin	Destination	% of total
1	Rajamahendravaram	Vijayawada/Machlipatnam/Amaravathi	8%
2	Vijayawada/Machlipatnam/Amaravathi	Visakhapatnam city	7%
3	Visakhapatnam city	Chennai	5%
4	Visakhapatnam city	Bengaluru	5%
5	Eluru/Hanuman Junction	Rajamahendravaram	4%
6	Bengaluru	Kolkata/Howrah	4%
7	Eluru/Hanuman Junction	Visakhapatnam city	4%
8	Visakhapatnam city	Hyderabad	4%
9	Vijayawada/Machlipatnam/Amaravathi	Kakinada/Pithampuram	3%
10	Eluru/Hanuman Junction	Kovvur/SrinagarColony/Arikirevula	3%
11	Kovvur/SrinagarColony/Arikirevula	Vijayawada/Machlipatnam/Amaravathi	2%
12	Kakinada/Pithampuram	Chennai	2%
13	Chennai	Kolkata/Howrah	2%
14	Rajamahendravaram	Chennai	2%
15	Avapadu/Marellamudi/Nallajerla/Gopalpuram/Chodavaram/Telikicherla	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	1%
16	Rajamahendravaram	Bengaluru	1%
17	Guntur	Visakhapatnam city	1%
18	Rajamahendravaram	Hyderabad	1%
19	Eluru/Hanuman Junction	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	1%
20	Eluru/Hanuman Junction	Kakinada/Pithampuram	1%
		Total	**63%**

2 Axle

S.No.	Origin	Destination	% of total
1	Vijayawada/Machlipatnam/Amaravathi	Visakhapatnam city	10%
2	Rajamahendravaram	Vijayawada/Machlipatnam/Amaravathi	9%
3	Bengaluru	Kolkata/Howrah	5%
4	Eluru/Hanuman Junction	Rajamahendravaram	4%
5	Chennai	Kolkata/Howrah	4%
6	Visakhapatnam city	Chennai	3%
7	Visakhapatnam city	Bengaluru	3%
8	Vijayawada/Machlipatnam/Amaravathi	Kakinada/Pithampuram	3%
9	Eluru/Hanuman Junction	Visakhapatnam city	3%
10	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	2%
11	Eluru/Hanuman Junction	Kovvur/SrinagarColony/Arikirevula	2%
12	Avapadu/Marellamudi/Nallajerla/Gopalpuram/Chodavaram/Telikicherla	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	2%
13	Eluru/Hanuman Junction	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	2%
14	Visakhapatnam city	Hyderabad	2%
15	Rajamahendravaram	Ongole/Nellore/Kandukur	2%
16	Eluru/Hanuman Junction	Kakinada/Pithampuram	2%
17	Guntur	Kakinada/Pithampuram	2%
18	Visakhapatnam city	Tirupati/Puttur/SriCity/Chittoor	1%
19	Guntur	Visakhapatnam city	1%
20	Eluru/Hanuman Junction	Kolkata/Howrah	1%
		Total	**63%**

3 Axle

S.No.	Origin	Destination	% of total
1	Vijayawada/Machlipatnam/Amaravathi	Visakhapatnam city	8%
2	Rajamahendravaram	Vijayawada/Machlipatnam/Amaravathi	5%
3	Visakhapatnam city	Chennai	4%
4	Bengaluru	Kolkata/Howrah	4%
5	Avapadu/Marellamudi/Nallajerla/Gopalpuram/Chodavaram/Telikicherla	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	4%
6	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	3%
7	Chennai	Kolkata/Howrah	3%
8	Vijayawada/Machlipatnam/Amaravathi	Kakinada/Pithampuram	3%
9	Eluru/Hanuman Junction	Rajamahendravaram	3%
10	Eluru/Hanuman Junction	Visakhapatnam city	2%
11	Eluru/Hanuman Junction	Kolkata/Howrah	2%
12	Visakhapatnam city	Bengaluru	2%
13	Guntur	Visakhapatnam city	2%
14	Rajamahendravaram	Guntur	2%
15	Eluru/Hanuman Junction	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	2%
16	Rajamahendravaram	Chennai	2%
17	Eluru/Hanuman Junction	Kovvur/SrinagarColony/Arikirevula	2%
18	Rajamahendravaram	Ongole/Nellore/Kandukur	2%
19	Rest of Tamil Nadu	Kolkata/Howrah	1%
20	Visakhapatnam city	Hyderabad	1%
		Total	**57%**

MAV

S.No.	Origin	Destination	% of total
1	Vijayawada/Machlipatnam/Amaravathi	Visakhapatnam city	6%
2	Visakhapatnam city	Chennai	5%
3	Chennai	Kolkata/Howrah	5%
4	Bengaluru	Kolkata/Howrah	4%
5	Visakhapatnam city	Bengaluru	4%
6	Rajamahendravaram	Vijayawada/Machlipatnam/Amaravathi	4%
7	Visakhapatnam city	Hyderabad	2%
8	Eluru/Hanuman Junction	Visakhapatnam city	2%
9	Eluru/Hanuman Junction	Rajamahendravaram	2%
10	Vijayawada/Machlipatnam/Amaravathi	Kakinada/Pithampuram	2%
11	Vijayawada/Machlipatnam/Amaravathi	Kolkata/Howrah	2%
12	Guntur	Visakhapatnam city	2%
13	Rajamahendravaram	Chennai	2%
14	Rajamahendravaram	Bengaluru	1%
15	Eluru/Hanuman Junction	Kolkata/Howrah	1%
16	Rajamahendravaram	Ongole/Nellore/Kandukur	1%
17	Rest of Odisha	Chennai	1%
18	Devarapalli/Krishnampalem/Dhumanthunigudem/Duddukuru/Konndagudem	Vijayawada/Machlipatnam/Amaravathi	1%
19	Kakinada/Pithampuram	Chennai	1%
20	Visakhapatnam city	Tirupati/Puttur/SriCity/Chittoor	1%
		Total	**50%**

APPENDIX 2.4
COMMODITY DISTRIBUTION AT TOLL PLAZA LOCATION

Traffic Study for Gundugolanu - Devarapalli - Kovvuru Section of NH-16 in the State of Andhra Pradesh
Commodity Distribution on Toll Plaza Location

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
	Veeravalli TP					
1	Food Grains and Cash Crops	4.7	4.1	6.0	5.8	7.1
2	Fruits & Vegetables	9.7	14.2	9.1	8.8	12.6
3	Building Materials	3.5	3.2	6.8	9.8	8.6
4	Iron & Steel Products	3.1	5.4	5.6	7.8	11.6
5	Petroleum Products, Chemicals and Gas	4.1	6.9	9.5	11.0	8.4
6	Heavy Machinery & Industrial Equipments	0.0	0.7	0.6	0.1	0.5
7	Industrial Products & Equipment	2.8	7.6	4.9	5.4	5.8
8	Consumer Items	17.0	10.1	10.7	8.1	8.8
9	Automobile and New Chasis	0.6	1.7	2.9	2.1	2.2
10	Containers	0.3	1.7	1.0	0.3	0.6
11	Ores & Minerals (Coal , Bauxite, lime stone)	0.9	1.9	1.0	1.2	2.9
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	11.0	8.8	7.6	6.6	7.5
13	Parcles	3.1	10.4	11.3	10.2	7.0
14	Empty Vehicles	39.0	23.3	23.0	22.9	16.3
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

	Vijawada-Kolkata					
Sr. No.	**Commodity Type**	**MLCV**	**LCV**	**2 Axle**	**3 Axle**	**MAV**
	Veeravalli TP					
1	Food Grains and Cash Crops	3.0	1.5	2.0	1.7	2.8
2	Fruits & Vegetables	15.0	24.2	15.1	18.4	24.0
3	Building Materials	4.5	2.3	4.8	9.2	8.8
4	Iron & Steel Products	2.3	2.3	2.4	2.3	3.5
5	Petroleum Products, Chemicals and Gas	4.5	4.2	8.4	9.5	7.1
6	Heavy Machinery & Industrial Equipments	0.0	1.1	0.4	0.0	0.2
7	Industrial Products	3.0	8.7	6.0	4.6	6.8
8	Consumer Items	20.3	11.0	13.5	10.4	10.4
9	Automobile and New Chasis	1.5	2.7	5.6	3.5	3.8
10	Containers	0.0	0.0	0.4	0.0	0.0
11	Ores & Minerals (Coal , Bauxite, lime stone)	0.8	0.8	0.0	0.3	1.5
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	7.5	8.0	4.0	8.1	7.8
13	Parcles	6.8	15.2	17.5	12.1	8.0
14	Empty Vehicles	30.8	18.2	19.9	19.9	15.3
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

	Kolkata-Vijayawada					
Sr. No.	**Commodity Type**	**MLCV**	**LCV**	**2 Axle**	**3 Axle**	**MAV**
	Veeravalli TP					
1	Food Grains and Cash Crops	5.9	6.6	9.9	9.1	10.5
2	Fruits & Vegetables	5.9	4.4	3.4	0.9	3.3
3	Building Materials	2.7	4.0	8.7	10.3	8.5
4	Iron & Steel Products	3.8	8.5	8.7	12.2	18.1
5	Petroleum Products, Chemicals and Gas	3.8	9.6	10.6	12.2	9.5
6	Heavy Machinery & Industrial Equipments	0.0	0.4	0.8	0.2	0.8
7	Industrial Products	2.7	6.6	3.8	6.1	5.1
8	Consumer Items	14.6	9.2	8.0	6.3	7.5
9	Automobile and New Chasis	0.0	0.7	0.4	0.9	0.9
10	Containers	0.5	3.3	1.5	0.5	1.1
11	Ores & Minerals (Coal , Bauxite, lime stone)	1.1	2.9	1.9	1.9	4.0
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	13.5	9.6	11.0	5.4	7.3
13	Parcles	0.5	5.9	5.3	8.7	6.3
14	Empty Vehicles	44.9	28.3	25.9	25.3	17.1
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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TOLL TRAFFIC AND REVENUE ASSESSMENT FOR MALLAVARAM-CHITTOOR AP/KA BORDER SECTION OF NH69/NH140 IN THE STATE OF ANDHRA PRADESH

FINAL TRAFFIC REPORT | February 2025



NHIT
National Highways Infra Trust

IBI

by IBI Group India Private Limited

Prepared for : National Highways Infra Investment Managers Pvt Ltd

Final Traffic Report

Toll traffic and revenue assessment for Mallavaram-Chittoor-AP/KA border section of NH69/NH140 in the state of Andhra Pradesh



Prepared for National Highways Infra Investment Managers Pvt Ltd,
By IBI Group India Private Limited

February 2025

Review History

Document: Traffic and Revenue Analysis for Mallavaram-Chittoor-AP/KA border section of NH69/NH140 in the state of Andhra Pradesh

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ABBREVIATION

AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
AR	Alternate Road
BIA	Broad Influence Area
BKV	Banglore- Kodikonda-Vijayawada Expressway
BC	Banglore-Chennai Expressway
CA	Concession Agreement
CAGR	Compound Annual Growth Rate
COD	Commercial Operation Date
Cr.	Crore
DES	Directorate of Economics and Statistics
FY	Financial Year
GC	Generalized Cost
GDP	Gross Domestic Product
GSDP	Gross State Domestic Product
GQ	Golden Quadrilateral
IIA	Immediate Influence Area
INR	Indian Rupee
IRC	Indian Roads Congress
Kms	Kilometers
LCV	Light Commercial Vehicle
MAV	Multi-axle Vehicle
Mn.	Millions
NHAI	National Highways Authority of India
MSME	Ministry of Micro, Small and Medium Enterprises
MoSPI	Ministry of Statistics and Programme Implementation
NH	National Highway
PWD	Public Works Department
O-D	Origin – Destination
OEA	Office of Economic Advisor
OSV	Over Sized Vehicle
PCI	Per Capita Income
PIA	Project Influence Area
PPP	Public Private Partnership
PR	Project Road
Rs.	Indian Rupees
SCF	Seasonal Correction Factor
SEZ	Special Economic Zone
SH	State Highway
SP	State Permit
TL	Trip Length
TLFD	Trip Length Frequency Distribution
TP	Toll Plaza
VOC	Vehicle Operating Cost
VOT	Value of Time
WPI	Wholesale Price Index
YOY	Year on Year
ZIF	Zonal Influence Factor

CHAPTER 1

Executive Summary

1. Executive Summary

IBI Group India Private Ltd (Consultant) was appointed by National Highways Infra Investment Managers Pvt Ltd to carry out the traffic due diligence study for the Mallavaram-Chittoor-AP/KA Border section of NH-69. This study "Toll Traffic and Revenue Assessment for Mallavaram-Chittoor-AP/KA Border section of NH-69/NH-140 in the state of Andhra Pradesh" summarizes IBI's evaluation of the future traffic and toll revenues considering Risk factors and Growth drivers expected during the project concession period.

1.1 Project Overview

The project road is part of the major National Highway 69/140 in which section1 is starting from AP/TN Border to Nalagampalli Village Section from Existing km 133.360 to km 171.590 (Design Chainage from km 134.890 to km 172.000) (Package-I) & from Nalagampalli Village to AP/Karnataka Border Section from km 172.000 (existing chainage km 171.590) to km 219.687(existing chainage km 216.912) (Package-II) & section 2 is starting from Chittoor (Design Chainage Km 0.00/Existing Chainage Km 158.00) to Mallavaram (Design Chainage Km 61.128/Existing Chainage Km 41.800), Providing connectivity between states like Andhra Pradesh, Karnataka, Tamil Nadu etc. The project road has two toll plazas (TPs), Gadanki Toll Plaza and Mahasamudram Toll Plaza.

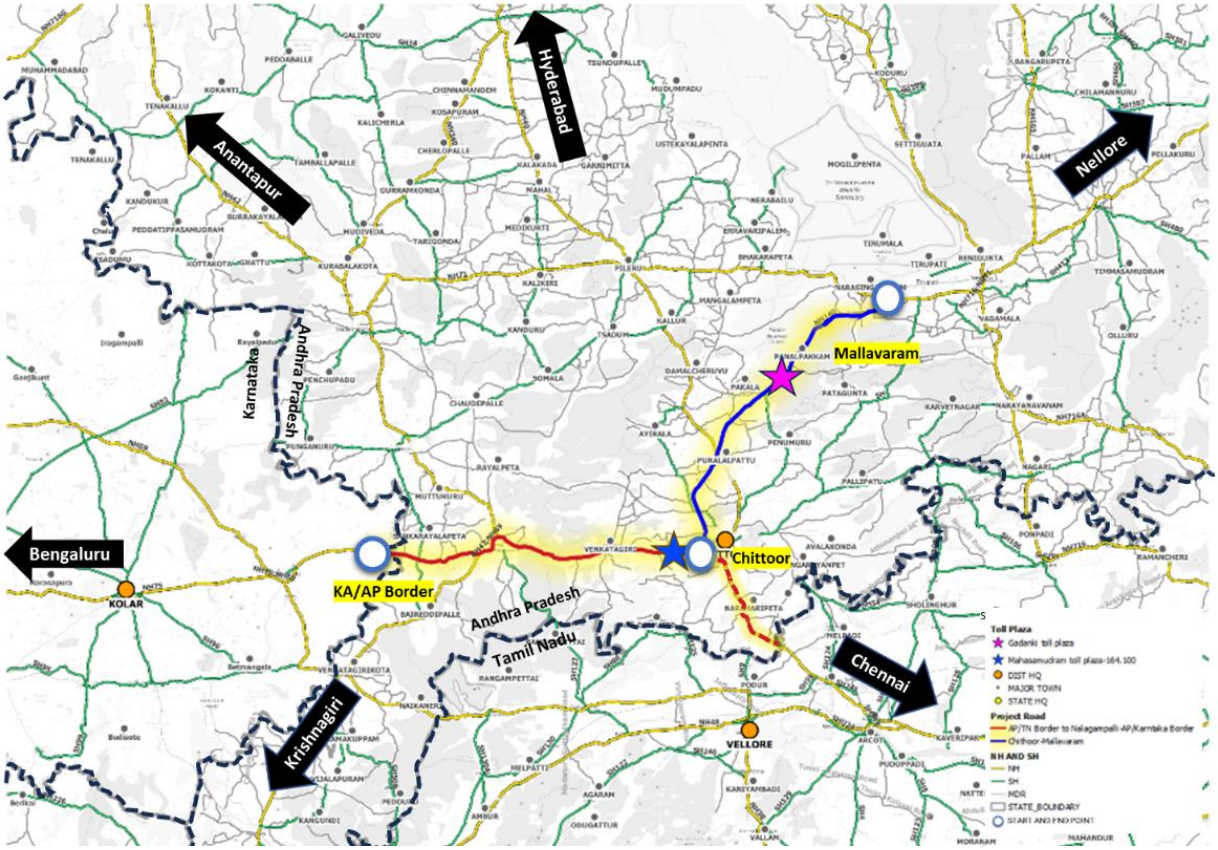


Figure 1-1: Corridor with existing toll plaza location

1.2 Salient growth features and traffic generators

The Chittoor-Mallavaram section is a vital economic corridor wherein Passenger traffic is mainly driven by tourism & Various temples and commercial traffic is influenced by multiple industries, playing a crucial role in regional and national logistics.

Tirumala is one of the most visited religious destinations in the world, attracting 60,000 to 80,000 pilgrims daily. In September 2023, the temple recorded an all-time high of 87,000 visitors in a single day, contributing to an annual footfall of approximately 30 to 40 million pilgrims. This massive influx of visitors plays a crucial role in driving regional economic activity, impacting tourism, transport, and local businesses.

Amara Raja Industries, a major player in the battery and power solutions sector, significantly contributes to regional industrial activity. Its large-scale manufacturing facility near Tirupati relies on an extensive logistics network for raw material procurement and finished product distribution. This industrial presence increases traffic at the Mahasamudram Toll Plaza, reinforcing its importance as a key growth driver in the region.

The Srikalahasti-Yerpedu node, located approximately 32 km from the project road, is part of the East Coast Industrial Corridor (ECIC), with Vizag-Chennai Industrial Corridor (VCIC) as its Phase 1. Key nodes along this corridor include Kopparthy Node, Visakhapatnam (Nakkapalli Cluster), and Chittoor Node in Andhra Pradesh. This corridor is expected to drive future industrial growth, enhancing economic connectivity across the state.

The Chennai-Bengaluru Industrial Corridor (CBIC) is designed to accelerate regional industrial development across Tamil Nadu, Karnataka, and Andhra Pradesh. A key component of this corridor is the Krishnapatnam Industrial Area in Andhra Pradesh, which is poised to become a major future growth driver by fostering industrial agglomeration and economic expansion.

This combination of religious tourism, industrial growth, and strategic corridor development makes Andhra Pradesh a crucial economic hub, contributing significantly to regional and national economic progress.

1.3 Traffic volume and composite of vehicles

Past data pertaining to the project corridor was sourced from the existing Concessionaire. This includes historic toll traffic and revenue data for the Gadanki, Mahasamudram toll plazas on the project road to study the past traffic and revenue trends, seasonal variations in traffic and other observations related to variations in the data. Past traffic trends in terms of year-on-year growth, month on month growth etc. were derived which will also help in understanding the travel pattern for both passenger and goods vehicles. The given traffic data includes the toll categories like single journey, local pass, and exempted traffic. Exempt category traffic falls under the list of vehicles where these types of vehicles are exempted from paying the user fee.

1.3.1 Historical traffic data

ETC daily-level data, segmented by ticket categories, was available for the following periods:

- Gadanki: Apr-2022 – Nov-2024
- Mahasamudram: Apr-2022 – Nov-2024

Gadanki Toll Plaza:

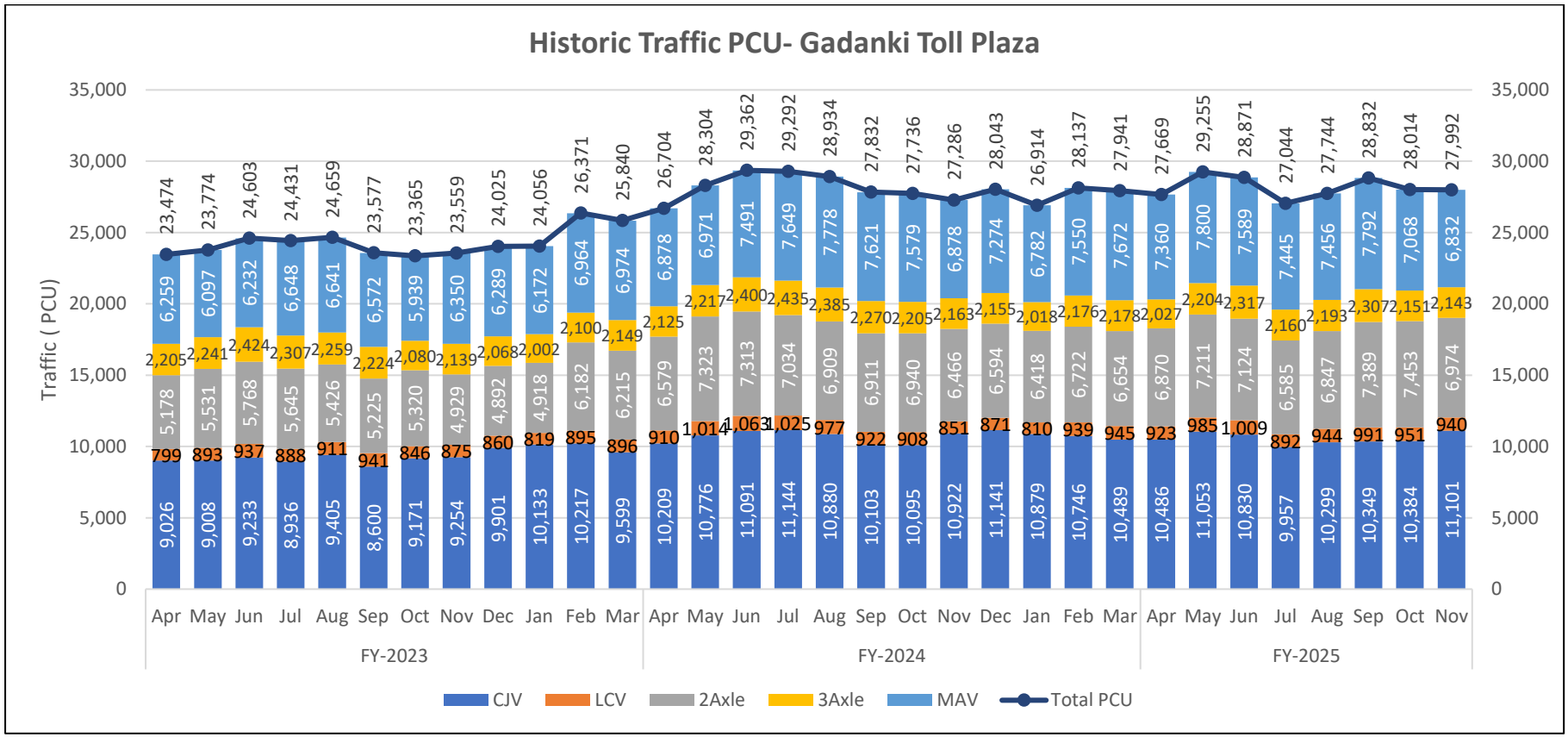


Figure 1-2: Historic Traffic PCU at Gadanki TP

The daily traffic volume remains fairly consistent throughout the year, with a range between 26,000 to 28,000 PCUs per day in FY24 and similarly 26,000 to 29000 PCUs in FY25, indicating steady traffic at the toll plaza.

Mahasamudram Toll Plaza:

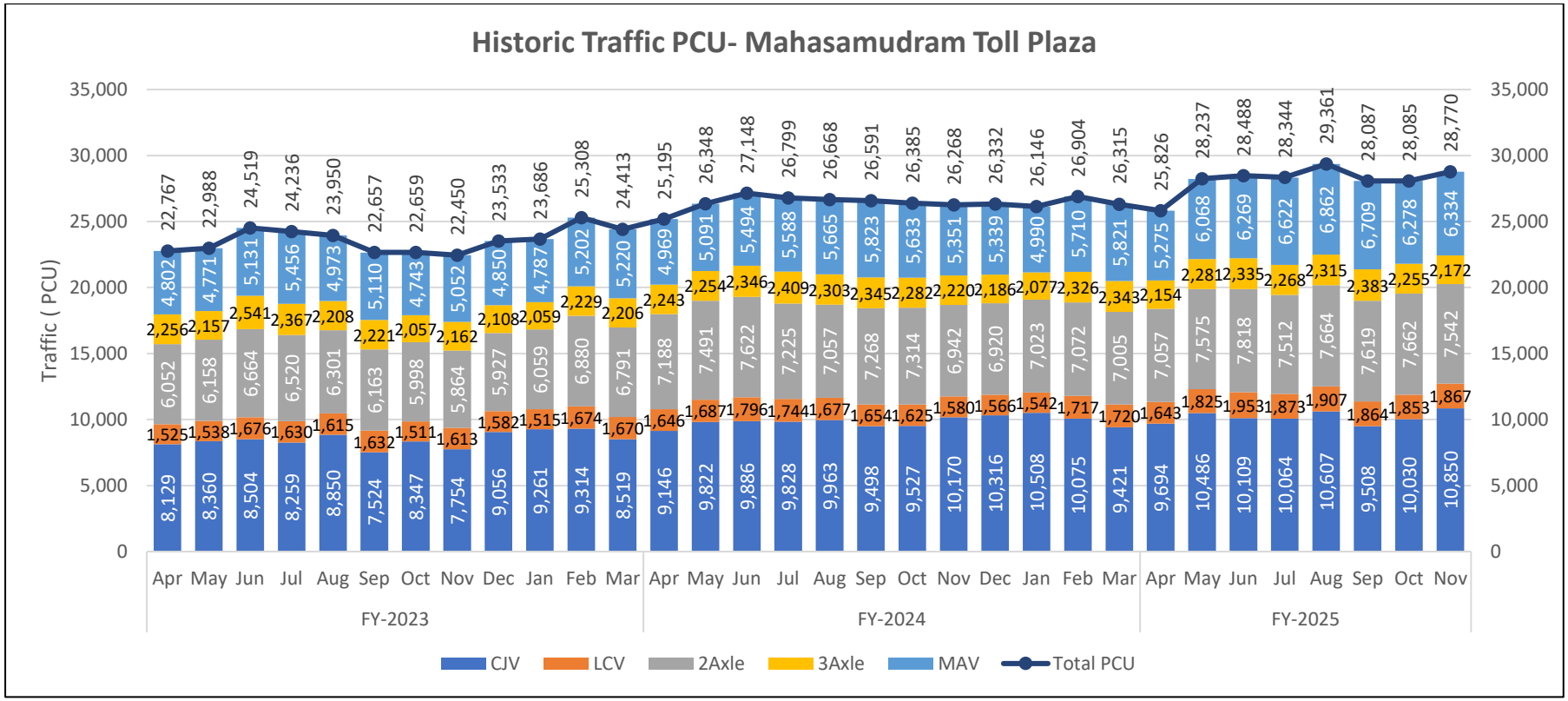


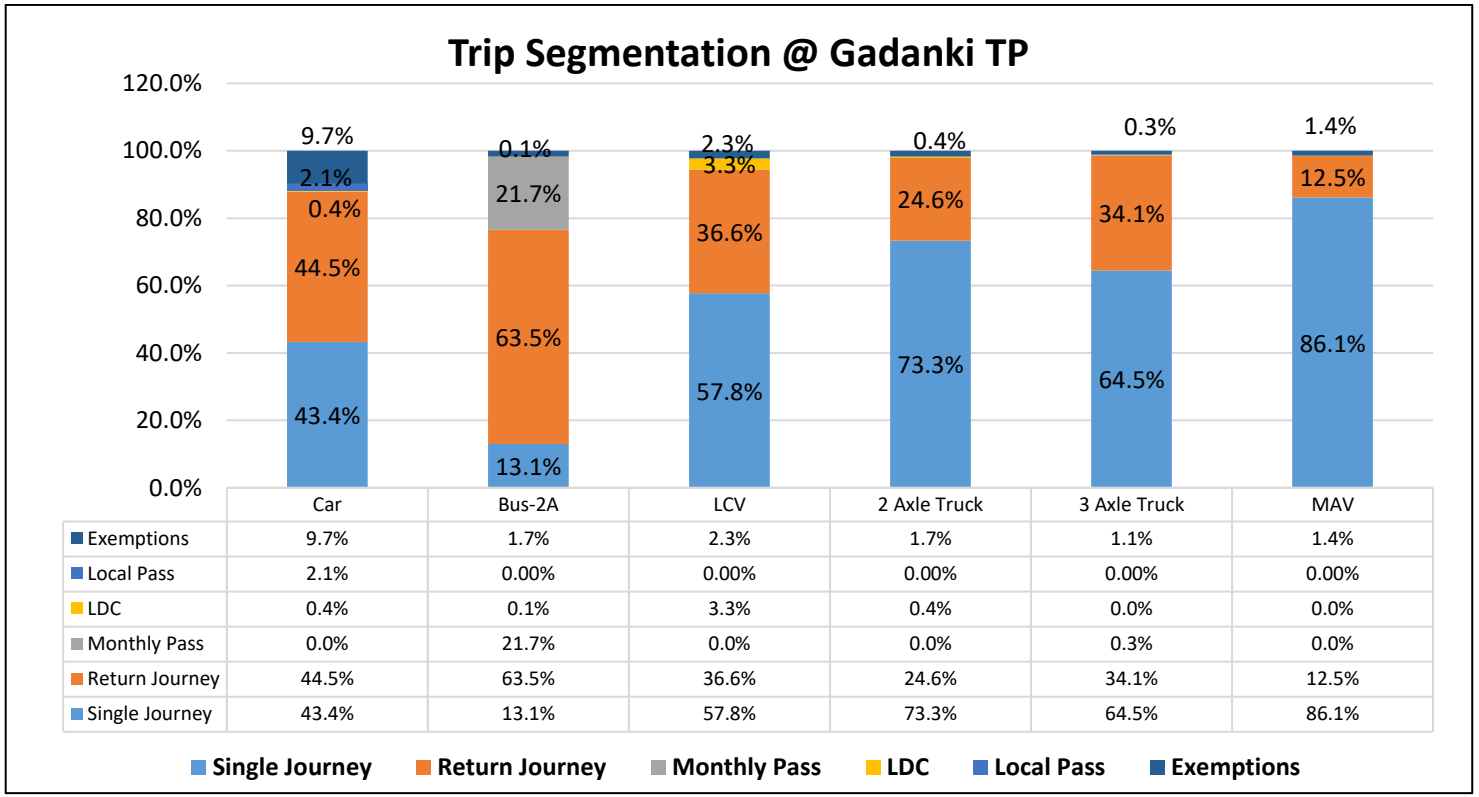
Figure 1-3: Historic Traffic PCU at Mahasamudram TP

The daily traffic volume remains fairly consistent throughout the year, with a range between 23,000 to 26,000 PCUs per day, indicating steady traffic at the toll plaza in FY24 similarly 25,000 PCUs to 29,000 PCUs in FY25.

1.3.2 Toll segmentation

Based on detailed review of historic trends of trip segmentation, Consultant has recommended FY 25 (Apr-Nov 24) Trip Segmentation for the base year and future traffic and revenue projections.

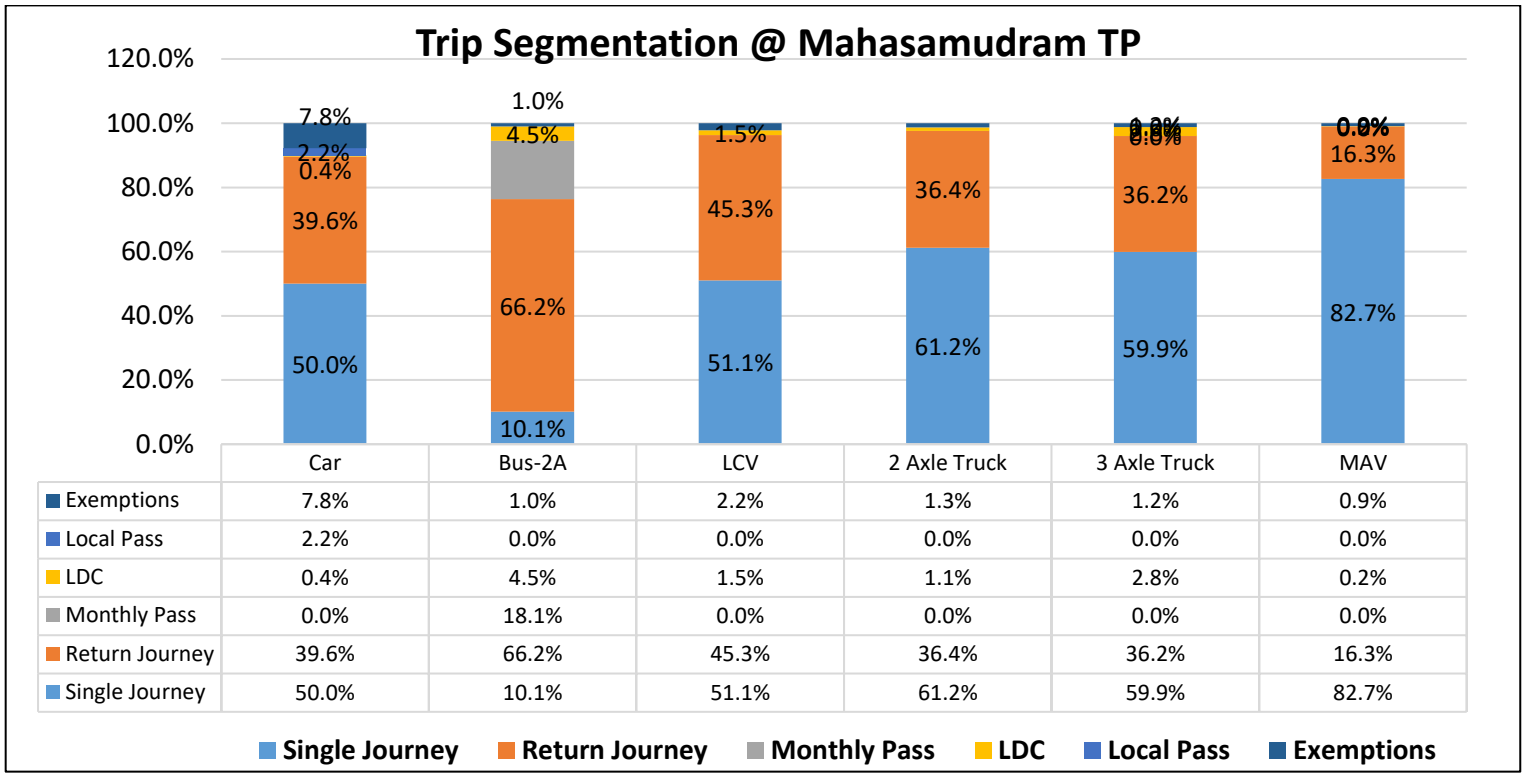
Gadanki Toll Plaza:



	Car	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
Exemptions	9.7%	1.7%	2.3%	1.7%	1.1%	1.4%
Local Pass	2.1%	0.00%	0.00%	0.00%	0.00%	0.00%
LDC	0.4%	0.1%	3.3%	0.4%	0.0%	0.0%
Monthly Pass	0.0%	21.7%	0.0%	0.0%	0.3%	0.0%
Return Journey	44.5%	63.5%	36.6%	24.6%	34.1%	12.5%
Single Journey	43.4%	13.1%	57.8%	73.3%	64.5%	86.1%

Figure 1-4: Trip Segmentation at Gadanki TP

Mahasamudram Toll Plaza:



	Car	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
Exemptions	7.8%	1.0%	2.2%	1.3%	1.2%	0.9%
Local Pass	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%
LDC	0.4%	4.5%	1.5%	1.1%	2.8%	0.2%
Monthly Pass	0.0%	18.1%	0.0%	0.0%	0.0%	0.0%
Return Journey	39.6%	66.2%	45.3%	36.4%	36.2%	16.3%
Single Journey	50.0%	10.1%	51.1%	61.2%	59.9%	82.7%

Figure 1-5: Trip Segmentation at Mahasamudram TP

1.3.3 Base year Traffic

- The Consultant recommends FY 25 (Apr to Nov 2024) ETC Toll plaza data for Base Year AADT, as it is based on the most recent data.
- ETC data of FY23 & FY24 are considered for SCF calculation. As it is presumed to be more suitable for SCF calculation for both the Toll Plaza's.
- Final AADT has arrived by adding adjusted ADT (with selected SCF) arrived from ETC data (April to Nov 2024, which excludes cash & exemption/violation traffic), cash & exempt traffic from non-ETC data (April to Nov 2024) and forced exemption/violation data obtained from traffic survey conducted on 26th July (for 24 hrs).
- Adopted AADT for both the toll plazas has been mentioned below.

Table 1-1: Base year (FY25) traffic at both the Toll Plazas

Mode	Gadanki Toll Plaza						Mahasamudram Toll Plaza					
	ADT(a)	SCF	AADT	Cash	Exempt	Final AADT	ADT(a)	SCF	AADT	Cash	Exempt	Final AADT
CJV	10,088	1.02	10,275	121	1,091	11,487	9,714	1.02	9,875	154	832	10,862
LCV	617	0.99	610	6	15	631	1,211	0.99	1,204	4	27	1,236
Bus	1,419	1.00	1,416	1	24	1,441	1,080	1.00	1,075	1	11	1,088
2Axle	891	1.00	889	1	15	905	1,410	1.00	1,403	1	15	1,420
3Axle	720	0.98	705	1	8	714	748	0.99	738	1	9	748
MAV	1,630	1.01	1,640	1	23	1,664	1,389	1.00	1,387	1	12	1,400
OSV	1	1.01	1	0	0	1	1	1.00	1	0	0	1
Total	**15,366**		**15,536**	**131**	**1,176**	**16,843**	**15,553**		**15,683**	**164**	**907**	**16,754**
PCU	**27,442**		**27,605**	**144**	**1,358**	**29,107**	**27,499**		**27,575**	**178**	**1,035**	**28,788**

1.3.4 Traffic Forecast

Traffic forecasting for project road traffic was done considering past trend in growth and analysing prospects of project influence area. Elasticity approach of growth rate estimation was used for long term traffic forecasting.

The network developments near the Asset's alignment, which are expected to impact traffic during the concession period, include the 4/8-lane access-controlled Bangalore–Chennai Expressway, the 4–6 lane partially access-controlled Bangalore–Vijayawada Expressway, and the 6-lane access-controlled Chittoor–Thatchur Expressway.

The Bangalore–Chennai Expressway is expected to have a negative impact on Mahasamudram TP, with a 50% impact in FY-27 and full impact by FY-28.

The Bangalore–Vijayawada Expressway is projected to negatively impact both TPs, with a 50% impact in FY-28 and full impact by FY-29.

The Chittoor–Thatchur Expressway is also expected to negatively affect Mahasamudram TP, with a 50% impact in FY-27 and full impact by FY-28.

All these network impacts are considered in the Traffic Projections.

The methodology used for the study included following steps:

- The influencing factors obtained from OD surveys are utilized in deriving the key socio-economic parameters of the Project Influence Area (PIA) for the historic trend.
- Through regression analysis for various combinations of dependent and independent parameters is conducted to evaluate the significance of the relation.
- Potential growth of various vehicle categories was separately assessed based on its probable market share in expected multi-modal development.
- The elasticity values for the selected relation are taken & used for the traffic growth rates estimation. However, there are several steps performed before obtaining the traffic growth rates which are explained in the chapter 6.

1.3.5 Traffic and Revenue Assumptions

Traffic Assumptions: -

- Future traffic forecasting was done using elasticity approach which considers the elasticity of transport demand and probable pattern of future growth of the economy.
- Elasticity values for each mode is estimated using the past vehicle registration data, past traffic trend and AADT-tonnage with the growth of PCI, GSDP and Moderated elasticity values chosen for the analysis based on previous trends in socioeconomic variables.
- For Car, Bus and truck traffic, the adopted elasticity values are as follows –
    - Gadanki TP – 1.05, 0.60, 0.85
    - Mahasamudram TP – 1.05, 0.60, 0.80
- Based on the projected elasticity values for TP 1, TP2 the growth of PIA, the future average annual compound traffic growth rates by vehicle type have been estimated by using the following relationship:

- For freight vehicle, the tonnages on the corridors are projected. The existing market share of different category of goods vehicles are then adjusted for the future years based on the past tonnage trend observed.
- Normal traffic projections have arrived by applying the traffic growth on the base year traffic.

- The future traffic projections are presented for Effective case traffic projections & the Effective case has arrived by considering the future adjustments in the form of diversions and developments detailed in the chapter 5.

Revenue Assumptions: -

- Toll revenue projections or forecasting will be calculated based on the projected traffic and projected toll rates.
- Toll rates by vehicle and toll category depends on the tolling length, wholesale price index (WPI) and the base rates which are applicable by vehicle category are according to the NH fee notification for the project.
- Toll fee shall be computed based on the base rate fixed by NHAI and is revised annually as per the formula provided by NHAI in Schedule R of the Concession agreement which is according to the National highway fee rules 2008.
- Fee applicable shall be the rate multiplied by the length of the highway section for which toll is to be collected.
- The amount of fee and the revision thereof effective from 1st April every year shall be calculated as follows:

$$\text{Applicable rate of fee} = \text{Base Rate} + \text{Base Rate X} \left\{\frac{\text{WPIA} - \text{WPI B}}{\text{WPI B}}\right\} * 0.40$$

Were
WPI-A means the Wholesale Price Index on December 31, 2023.
WPI-B means the Wholesale Price Index of week ending on 6th January 2007.i.e 208.7.
The actual fees to be charged shall be rounded off to the nearest Five rupees.

1.3.6 Traffic and Toll revenue projections

Gadanki Toll Plaza:

Table 1-2: Effective Future Traffic Projections at Gadanki TP

EFFECTIVE FUTURE TRAFFIC PROJECTIONS									
FINANCIAL YEAR	CAR	MINIBUS	BUS	LCV	2AT	3AT	MAV	TOTAL VEH	PCU
2025	11,487	168	1,441	462	905	714	1,665	16,843	29,107
2026	12,344	175	1,503	481	954	722	1,789	17,968	30,915
2027	13,264	183	1,566	500	1,006	729	1,918	19,167	32,824
2028	14,145	191	1,606	501	967	670	1,858	19,936	33,269
2029	15,034	198	1,643	499	918	608	1,773	20,672	33,563
2030	15,998	205	1,702	514	959	618	1,878	21,874	35,364
2035	21,521	242	2,010	594	1,185	700	2,483	28,735	45,632
2040	27,818	280	2,318	681	1,421	785	3,159	36,462	57,048
2045	34,962	316	2,621	758	1,654	855	3,890	45,056	69,468
2046	36,487	323	2,679	773	1,699	870	4,035	46,866	72,032
2056	54,025	393	3,260	912	2,155	988	5,600	67,333	1,00,390

Table 1-3: Effective Traffic Growth Rates at Gadanki TP

EFFECTIVE TRAFFIC GROWTH							
Year	CAR	MINIBUS	BUS	LCV	2AT	3AT	MAV
2026-26	7.50%	4.30%	4.30%	4.00%	5.50%	1.10%	7.40%
2027-27	7.50%	4.20%	4.20%	4.00%	5.40%	1.10%	7.20%
2028-28	6.60%	4.20%	2.50%	0.10%	-3.90%	-8.10%	-3.10%
2029-29	6.30%	4.00%	2.30%	-0.30%	-5.10%	-9.30%	-4.60%
2030-30	6.40%	3.60%	3.60%	3.10%	4.50%	1.60%	5.90%
2031-35	6.10%	3.40%	3.40%	2.90%	4.30%	2.50%	5.70%
2036-40	5.30%	2.90%	2.90%	2.80%	3.70%	2.30%	4.90%
2041-45	4.70%	2.50%	2.50%	2.20%	3.10%	1.70%	4.20%
2046-50	4.20%	2.10%	2.10%	1.90%	2.60%	1.50%	3.60%
2051-55	3.90%	1.90%	1.90%	1.60%	2.30%	1.20%	3.20%

Mahasamudram Toll Plaza:

Table 1-4: Effective Future Traffic Projections at Mahasamudram TP

EFFECTIVE FUTURE TRAFFIC PROJECTIONS									
FINANCIAL YEAR	CAR	MINIBUS	BUS	LCV	2AT	3AT	MAV	TOTAL VEH	PCU
2025	10,862	93	1,088	1,143	1,420	748	1,401	16,754	28,788
2026	11,680	97	1,135	1,183	1,487	753	1,515	17,849	30,541
2027	11,918	101	1,156	1,068	1,382	668	1,452	17,745	29,823
2028	12,026	104	1,141	902	1,131	498	1,244	17,046	27,443
2029	12,798	109	1,152	889	1,053	421	1,217	17,637	27,645
2030	13,630	113	1,194	912	1,093	426	1,293	18,661	29,124
2035	18,361	133	1,414	1,029	1,296	472	1,735	24,439	37,455
2040	23,630	154	1,625	1,152	1,503	519	2,225	30,808	46,542
2045	29,849	174	1,850	1,254	1,688	558	2,758	38,130	56,688
2046	31,150	178	1,892	1,273	1,726	564	2,863	39,646	58,755
2056	46,097	217	2,308	1,438	2,082	614	3,999	56,755	81,588

Table 1-5: Effective Traffic growth rates at Mahasamudram TP

EFFECTIVE TRAFFIC GROWTH							
Year	CAR	MINIBUS	BUS	LCV	2AT	3AT	MAV
2026-26	7.50%	4.40%	4.40%	3.50%	4.70%	0.60%	8.10%
2027-27	2.00%	3.50%	1.90%	-9.70%	-7.10%	-11.30%	-4.10%
2028-28	0.90%	3.50%	-1.30%	-15.50%	-18.10%	-25.40%	-14.30%
2029-29	6.40%	4.10%	0.90%	-1.40%	-7.00%	-15.50%	-2.20%
2030-30	6.50%	3.70%	3.70%	2.50%	3.80%	1.20%	6.30%
2031-35	6.10%	3.40%	3.40%	2.40%	3.50%	2.10%	6.10%
2036-40	5.20%	2.90%	2.80%	2.30%	3.00%	2.00%	5.10%
2041-45	4.80%	2.50%	2.60%	1.70%	2.30%	1.40%	4.40%
2046-46	4.10%	2.10%	2.10%	1.40%	2.10%	1.00%	3.60%
2047-55	3.90%	1.90%	1.90%	1.10%	1.80%	0.80%	3.30%

1.3.7 Toll rates

Table 1-6:Toll Fees for the year FY-2025 from June'24 to March'25 for TP1 – Gadanki

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	125	185	4,085	60	340
Light Commercial Vehicle or Minibus	200	295	6,600	100	-
Bus - 2 Axle	415	620	13,830	205	-
Truck - 2 Axle	415	620	13,830	205	-
3Axle	455	680	15,085	225	-
MAV (4-6) Axle	650	975	21,685	325	-
OSV	790	1,190	26,400	395	-

Table 1-7:Toll Fees for the year FY-2025 from June'24 to March'25 for TP2 – Mahasamudram

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	100	150	3,305	50	340
Light Commercial Vehicle or Minibus	160	240	5,335	80	-
Bus - 2 Axle	335	505	11,180	170	-
Truck - 2 Axle	335	505	11,180	170	-
3Axle	365	550	12,195	185	-
MAV (4-6) Axle	525	790	17,530	265	-
OSV	640	960	21,340	320	-

1.3.8 Traffic and Toll revenue projections

Toll revenue is projected based on the future traffic projections, toll fees by vehicle and toll category and trip rates. Traffic numbers are projected by fiscal year i.e., FY25, FY26 etc. and

toll rates are revised on 01st April every year. Toll revenues are projected by fiscal year till the end of concession period and considering maximum possible extension referring clauses related to Additional toll way, Capacity augmentation and modification of concession period.

(a) Toll would be collected for all the days in a year.
(b) Revenue projected from FY-2025 to FY-2056. (End of Concession period is 2046, How ever the same has been estimated till FY-2056 as long-term projections)

The toll revenue projections are done for the effective case which is basically the consideration of all network improvements and land developments as described in the chapter "Traffic Growth Rate Estimation". Like the effective traffic projections, the below table summarizes the projected annual toll revenue for all the toll plazas for Most Likely scenario.

Table 1-8:Estimated Annual Toll revenue (Effective case) in Rs. Crores – Most Likely

FY YEAR	Gadanki TP	Mahasamudram TP	Total Revenue
FY25	122	98	220
FY26	133	135	268
FY27	150	149	299
FY28	158	143	300
FY29	164	148	312
FY30	181	162	342
FY31	198	178	375
FY32	217	194	411
FY33	236	213	450
FY34	259	232	492
FY35	283	254	537
FY36	310	279	589
FY37	336	301	637
FY38	365	327	692
FY39	398	356	754
FY40	433	387	820
FY41	466	418	884
FY42	505	453	958
FY43	547	489	1,036
FY44	595	532	1,127
FY45	642	571	1,213
FY46	691	615	1,306
FY47	743	664	1,407
FY48	804	718	1,522
FY49	861	771	1,632
FY50	927	826	1,752
FY51	997	886	1,883
FY52	1,075	958	2,033
FY53	1,151	1,026	2,177
FY54	1,237	1,100	2,337
FY55	1,329	1,185	2,514
FY56	1,434	1,277	2,711
CAGR(FY25-46) (%)	**8.62%**	**9.15%**	**8.86%**
CAGR(FY25-56) (%)	**8.28%**	**8.64%**	**8.45%**

CHAPTER 2
Introduction

2. Introduction

2.1 General

IBI Group India Private Ltd (Consultant) was appointed by National Highways Infra Investment Managers Pvt Ltd to carry out the traffic due diligence study for the Mallavaram-Chittoor-AP/KA Border section of NH-69.

The project road is part of the major National Highway 69, providing connectivity between states like Andhra Pradesh, Karnataka. The project road has two toll plazas (TPs), Gadanki Toll Plaza and Mahasamudram Toll Plaza.

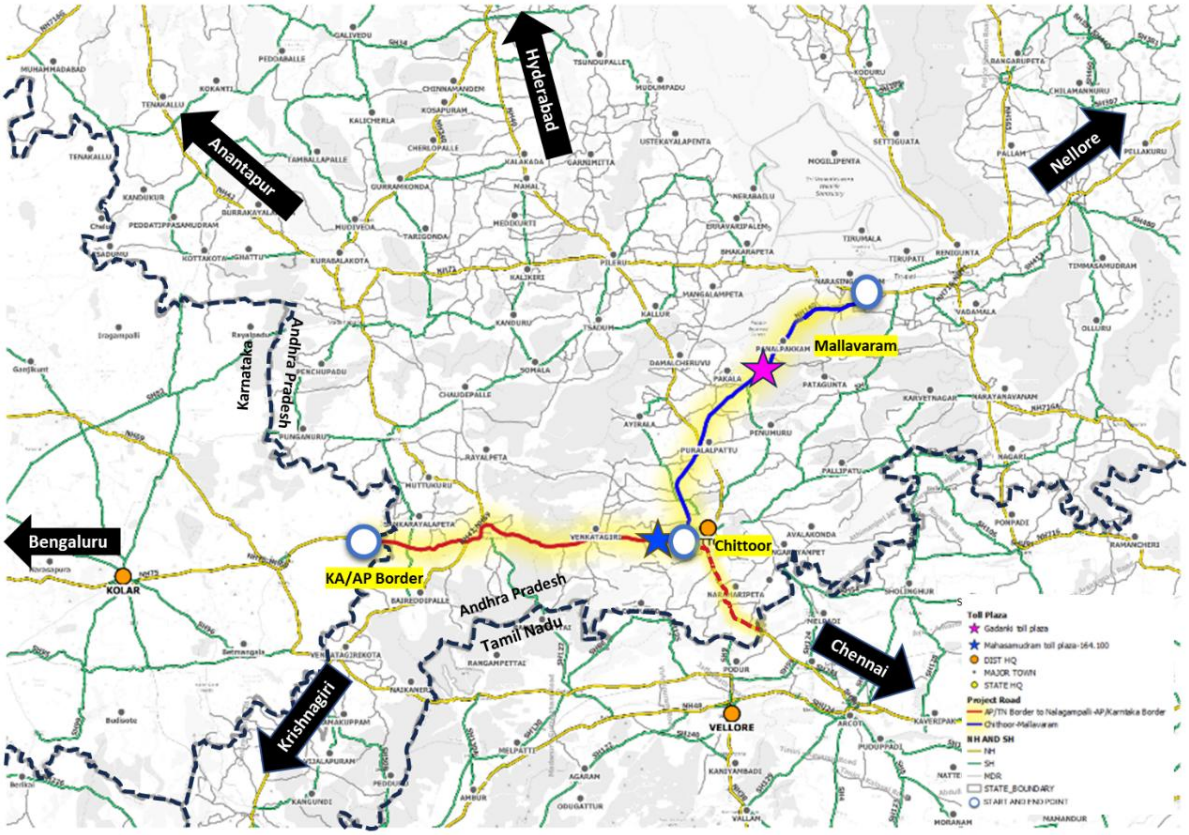


Figure 2-1: Project Corridor with existing toll plaza location

As part of this study, a systematic methodology has been followed to assess the characteristics of the existing traffic on the project road and traffic growth during the remaining period of the concession i.e., till (FY-2046), How ever the same has been estimated till FY-2056 as long-term projections considering the maximum extension in concession period. The details pertaining to the data collection, primary as well as secondary, and results from its analysis are presented in the subsequent chapters of this report.

The Traffic report presents the existing traffic characteristics, methodology used to derive traffic growth rates, details on adopted traffic growth rates, forecasted traffic, diverted, and generated traffic if any for the next Twenty (20) years. Based on these, future tollable traffic and toll revenues at the existing toll plaza locations are assessed and presented.

2.2 Objective and Scope of work

The main objective of the study is to carry out review of existing traffic & revenue data and forecasting the future traffic and revenues for the project road for the remaining concession period considering the potential risks and developments in view of the micro and macro characteristics related to demographics, economy, alternate routes, project road, regional network & peripheral development in the project influence area (PIA).

The scope of work is to assess the horizon year traffic & toll revenue at the toll plaza locations on the project road through:

- Review of Data and Documents:
    - Reviewing the Historical data on classified traffic volume & revenue data for the project highway's Toll Plazas.
    - Reviewing the Past traffic study reports.
    - Conducting gap analysis between actual and projected traffic & revenue for current/last year and ascertaining the reasons thereof.
    - ETC & Non ETC data for the historic period for the project road toll plazas.
    - Traffic volume/ revenue data collected from the concerned PIUs, and actual amount remitted by User Fee Collection Agencies to NHAI.
- Traffic Surveys:
    - 7 Days Traffic Volumes counts at both the toll plazas of project road using Videography method. The vehicle classification system as given in relevant IRC code may be followed.
    - All results shall be analyzed, and the annual average daily traffic (AADT) shall be worked out by applying seasonal correction / variation factors.
    - Triangulation of traffic forecasts shall be undertaken based on data from secondary sources and analysis of variations (if any), from the traffic as per TVC and as per data shared by NHIIMPL.
    - 1 Day Origin- Destination study at both the toll plazas of project road using roadside interview techniques.
    - The road-side interviews on random sample basis to cover all vehicles. The location of the O-D survey and commodity movement surveys shall normally be the same as for the classified traffic volume count.
    - Identification of Project Influence Area and traffic generators (industrial areas, towns, ports etc.) from analysis of travel pattern covering:
        a) Regional distribution of traffic – through/ bypassing traffic/ inter-state, intra-state/interdistrict, intra-district etc.
        b) Commodity composition- Goods type distribution.
        c) Top OD pairs by vehicle types.
        d) Travel frequency and trip purpose distribution leading to traffic segmentation by toll rate category.
    - Traffic diversion analysis, in case, there are existing routes, or new alternative routes are planned by relevant Authority.
    - Identification of and traffic analysis relating to Competing Routes ((including rail/DFC etc.), if any.
    - Assessment of impact of network improvements based on observed travel pattern.

- Traffic growth rate estimation based on the elasticity approach using econometric modelling

- Traffic & Revenue Estimates:
  - The values of elasticity of transport demand shall be based on the prevailing practices in the country. The Advisors shall give complete background including references for selecting the value of transport demand elasticity.
  - The demand estimates shall be done assuming three scenarios, namely, optimistic, pessimistic and most likely traffic growth. The growth factors shall be worked out for five- yearly intervals or as appropriate.
  - Above all will include formulation of future economic outlook based on recent economic performance, extent of impact of covid waves and expected economic recovery thereafter.
  - Key factors to be considered in forecasting traffic/ revenue:
    a) Seasonal Correction Factors
    b) Influence area of the project and its economic perspective
    c) Key traffic drivers of the project
    d) Present and future elasticity of transport demand by vehicle type
    e) Traffic growth rate trends observed
    f) Impact of upcoming developments and future development potential of the region
    g) Study of impact of competing routes in terms of diversion from/to the project road - Identification of competing routes and network condition, traffic characteristics & level of tolls charged, if any on the competing corridors
    h) Review of nearby toll plaza/past traffic & revenue data for accurate estimation of traffic growth and to study the past traffic growth trend.
    i) Scenario testing for toll revenue
    j) Any other competing transportation facility
    k) Distribution of traffic into different tolling streams (normal paying and concessions as applicable in line with CA)

2.3 Composition of the Report

This Report is further divided into seven chapters. Chapter 1 contains the executive summary of the report providing a brief outcome of the study. Chapter 2 provides a brief description of the project including the background and key objectives of the study. Chapter 3 contains details of the project road existing connectivity and its influence area. Chapter 4 contains details pertaining to various secondary and primary data and its analysis to understand the base year traffic and travel characteristics. Chapter 5 presents the traffic diversion analysis. This chapter details out the approach and methodology adopted for identification of the potential divertible traffic. It also, elaborately illustrates the approach and methodology adopted for the identification of alternate networks & routes and finally presents the Diverted traffic.

Chapter 6 illustrate the potential developments, growth drivers in the PIA and the potential developmental traffic generated out of the identified developments and, presents the estimation of the traffic growth rates used for traffic forecasting and Finally chapter 7 presents the traffic and revenue projections for the entire concession period.

CHAPTER 3

Characteristics of the Project Influence Region

3. Project Influence Area Characteristics

This chapter examines various areas which significantly influence the project road. Demographic, geographical, agricultural & industrial sector, and industrial profile of project influence area is discussed in this chapter.

3.1 Project Road

Key element of any traffic assessment is the understanding of the spread of regions around the project that influence the traffic on the highway and establish the relationship between them. This was achieved through extensive data collection from secondary sources/past reports.

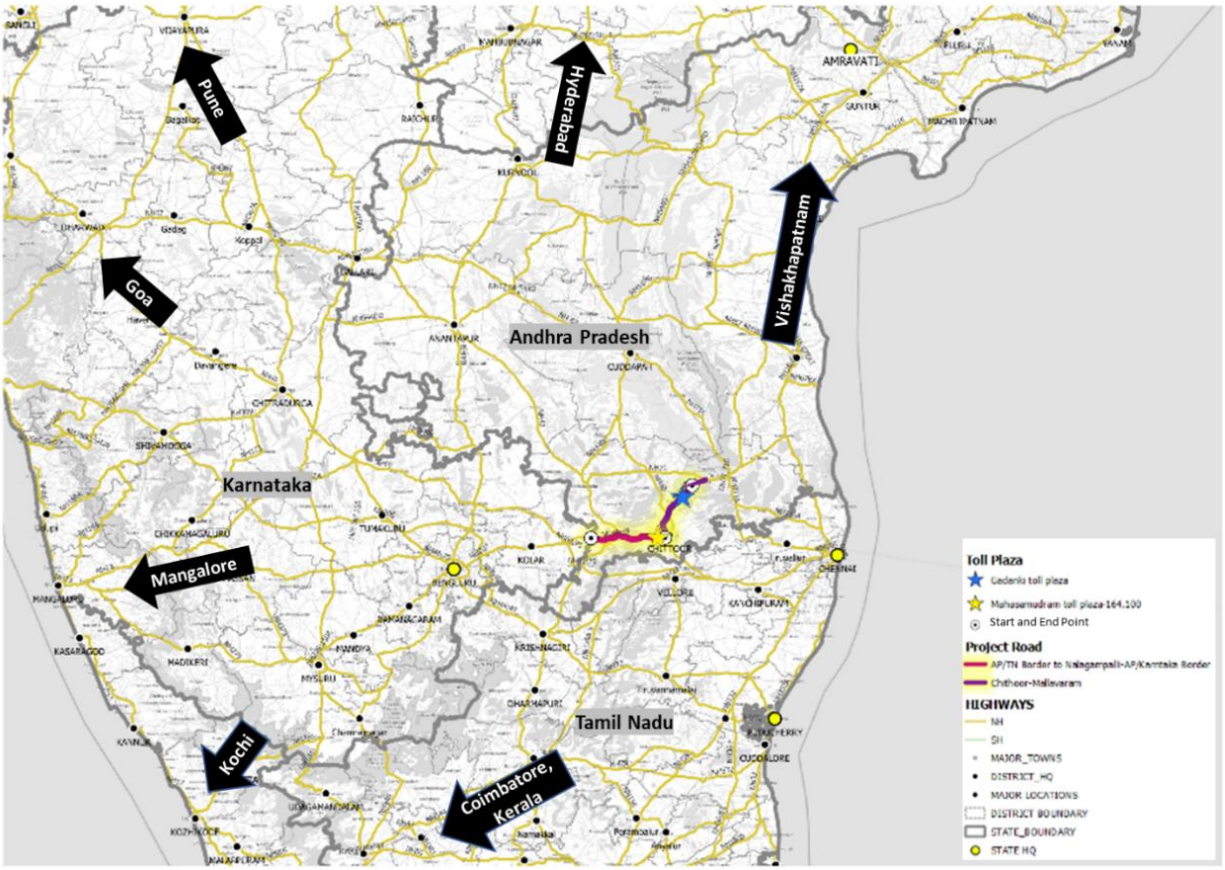


Figure 3-1: Project Road Network at Regional Level

Generally, the area which contributes to the total traffic plying on project road is called the project influence area (PIA). PIA is further classified into primary (immediate) and secondary (broad) influence area, depending on its distance from the project road. The immediate influence area of the project corridor comprises of region/districts of Andhra Pradesh, Karnataka which are in immediate proximity to the project road contributing above 80% of the project road traffic. Andhra Pradesh, Karnataka and Tamil Nadu are the other major contributors to the traffic on the project corridor.

Based on the study of the secondary information and past traffic data, the project influence area is divided into: Immediate Influence Area, which comprises of the traffic generators located along the project highway including the end points. Broad Influence Area, which comprises of long-distance destinations which are catered by project highway beyond immediate influence

area. The project road with its primary and secondary influence area is as presented in the table below.

Table 3-1: Major Traffic Generating Nodes for Project Road

SL. NO.	STATES	IMPORTANT CITIES
Immediate Influence Area		
A1	Andhra Pradesh	Tirupati, Chittoor, Vijayawada
A2	Karnataka	Bengaluru
Broad Influence Area		
B1	Tamil Nadu	
B2	West Bengal	
B3	Odisha	
B4	Kerala	

3.2 Andra Pradesh Profile

Andhra Pradesh (AP) is a southern coastal state in India, ranking 7th largest and 10th most populous. Its capital is Amaravati, and largest city is Visakhapatnam. AP borders Telangana, Orissa, Chhattisgarh, Karnataka, and Tamil Nadu, with a 974 km coastline along the Bay of Bengal.

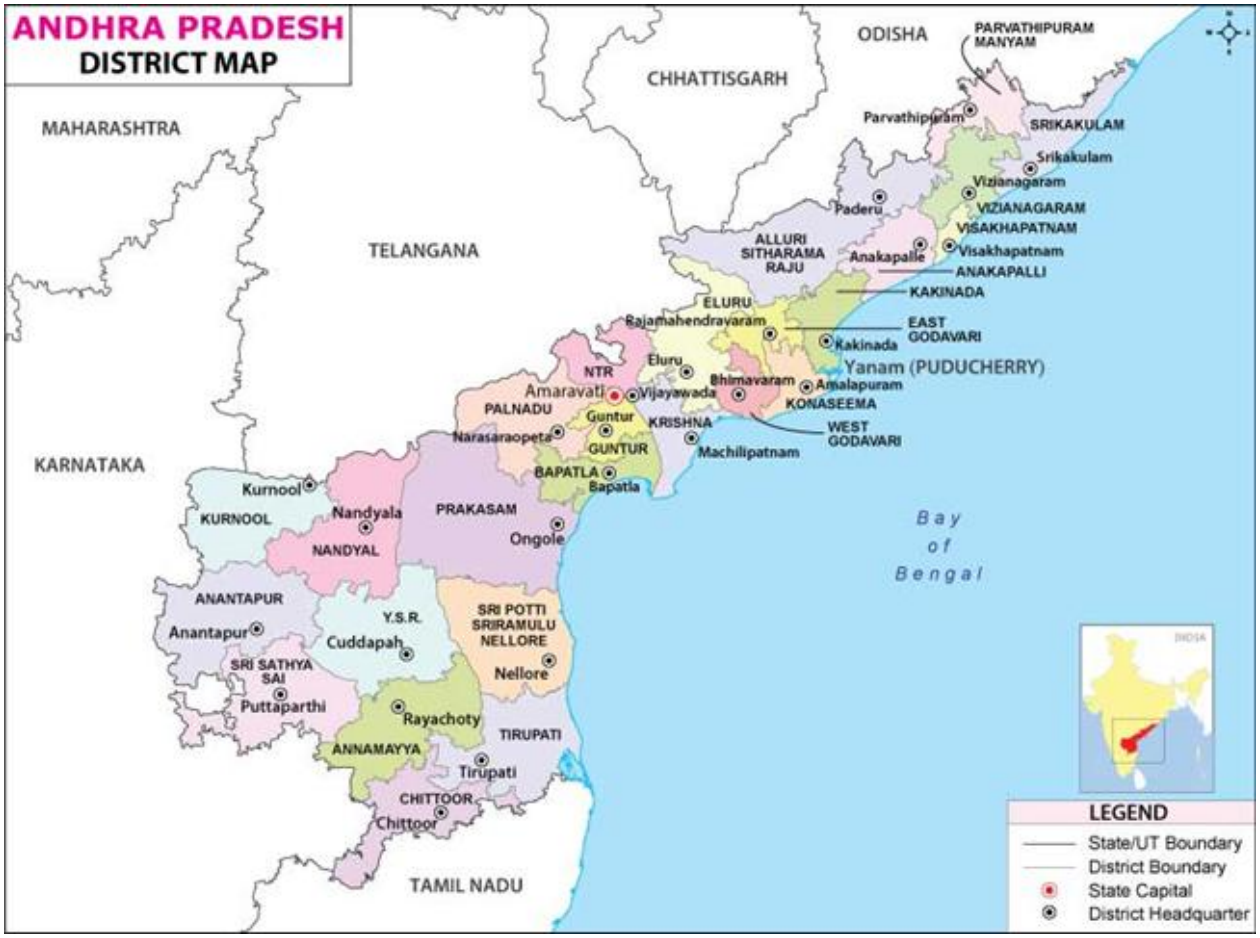


Figure 3-2: District Map of Andra Pradesh

The state has 26 districts across three regions: Coastal Andhra, Uttarandhra, and Rayalaseema, separated by the Eastern Ghats. Coastal plains are agriculturally productive,

while Rayalaseema's peneplains suit livestock grazing. 62% of the population depends on agriculture. Four cities - Amaravati, Kakinada, Tirupati, and Visakhapatnam - are designated as smart cities.

3.2.1 Economic & Industrial Profile

Andhra Pradesh is one of India's significant state economies, with a gross domestic product (GDP) of ₹11.50 lakh crore (approximately USD 140 billion) and a per capita GDP of ₹1,35,000 (around USD 1,600). The state's Gross State Domestic Product (GSDP) for the fiscal year 2023-24 is projected to be ₹17.5 lakh crore, reflecting a 12% increase from 2022-23. In 2021-22, the agriculture and allied sectors contributed 22.34% to Andhra Pradesh's Gross State Value Added (GSVA). The services sector is the largest contributor to the GSDP, accounting for about 50%, followed by industry at 28% and agriculture at 22%. Andhra Pradesh's top five export items include engineering goods, textiles, chemicals and pharmaceuticals, marine products, and agricultural products. In 2021-22, the state's total exports were ₹80,345 crore. Andhra Pradesh is a major producer of rice, and it also has a strong presence in the production of pharmaceuticals and electronics.

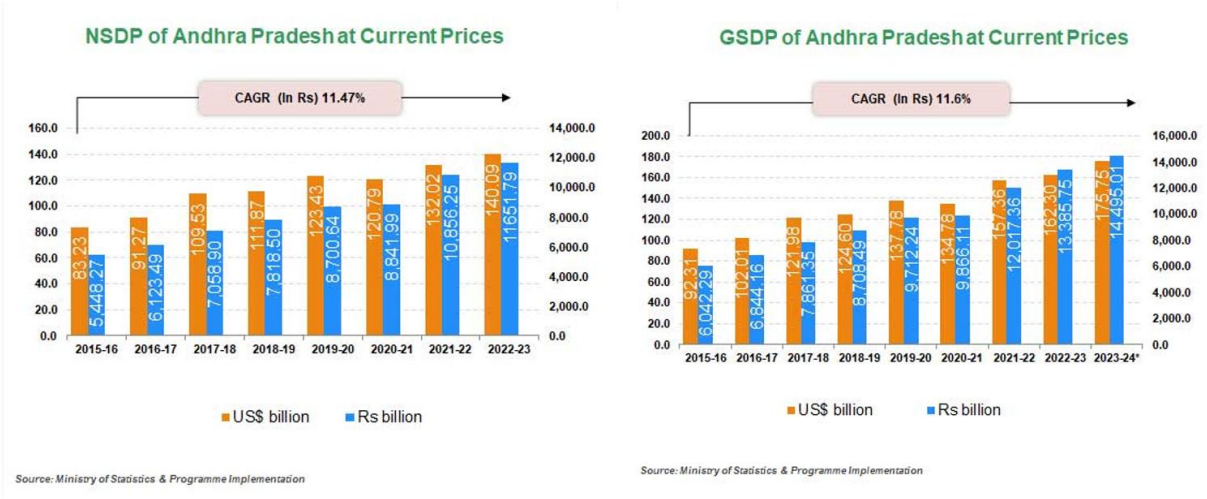


Figure 3-3: GSDP and NSDP of Andra Pradesh (Source: MoSPI)

Andhra Pradesh's foreign direct investment (FDI) inflows have averaged $320.145 million from December 2019 to September 2023. The data peaked at a record high of $1,245.678 million in December 2022, while it reached a record low of $58.227 million in March 2020.

Andhra Pradesh hosts a diverse industrial landscape with over 150 automotive and auto component manufacturing units. Key hubs in this sector include the cities of Visakhapatnam and Chittoor. Prominent companies operating in this sector include Hyundai, Kia, Ashok Leyland, and Mahindra & Mahindra.

3.2.2 Agriculture Profile

Andhra Pradesh, known as "the bejeweled rice bowl of India," plays a pivotal role in India's agriculture. About 63% of its population lives in villages and engages in agricultural practices, from which the state derives about 27% of its GDP. By and large, the cultivated area is about 12 million hectares, supplemented sufficiently by a vast irrigation network supplied with its water by rivers like Godavari, Krishna, Penna, and Tungabhadra.

Rice is the major crop, and Andhra Pradesh is one of the major producers of several crops like groundnuts, chilies, sugarcane, and cotton. The state also produces considerable quantities of

jowar, bajra, maize, minor millet, pulses, oilseeds, and tobacco. The agricultural economy of the state also encompasses livestock, poultry farming, and fisheries; its alone accounts for more than 70% of shrimp production in the country. The three main agricultural export zones in the state are: Chittoor, for mango pulp and vegetables; Krishna, for mangoes; and Guntur, for chillies. Interestingly, the Banaganapalle mango from the state got a geographical indication tag in 2017, showing its prominence in the agricultural scenario.

3.2.3 Infrastructure Profile

Andhra Pradesh has developed its infrastructure well, and it plays a vital role in its economic growth. The State is adequately connected with an excellent network of roads; major National Highways include NH-16. Further, the state has immense railway connectivity; it falls under the South Coast Railway zone with two major railway junctions in Vijayawada and Visakhapatnam. Its coastal line has major ports such as Visakhapatnam and Krishnapatnam.

Water infrastructures include large-scale irrigation projects like Polavaram, comprehensive water supply schemes for towns and villages. The state stands also very advanced in the sector of telecommunications, having wide coverage of mobile and broadband.

The smart city initiatives in cities like Vijayawada and Visakhapatnam support urban development, focusing on improved living standards and infrastructure. It has some of the finest educational institutions, such as IIT Tirupati and IIM Visakhapatnam. Similarly, it is supported by a network of healthcare facilities working on access and quality imperatives.

3.3 Karnataka Profile

Karnataka is the eighth-largest state by population, comprising 31 districts, the state capital Bangalore is the fourth-most populated city in India and is known as the Silicon Valley of India. It is bounded by Maharashtra, Goa and Andhra Pradesh on the northwest, north and east sides respectively. To its south are Kerala and Tamil Nadu. The state has a coastline along the Arabian Sea to its west. Karnataka spreads over an area of 191,791 sq km, making it the sixth largest Indian state in terms of geographical area. Bengaluru, Belagavi, Kalaburagi and Mysuru are four administrative divisions into which the state is divided into with thirty-one districts.



Figure 3-4: District Map of Karnataka

Karnataka has varied geography that includes Western Ghats aligned to the Arabian Sea as well as Deccan Plateau. This state is known for its landscapes which contain dense forests, fertile plains and dry areas. Krishna, Cauvery and Godavari rivers are major water resources for agriculture and drinking in this region.
Bengaluru is considered as a high-tech center among other technological cities such as Mysuru and Hubballi-Dharwad in India.

3.3.1 Economic & Industrial Profile

Karnataka is one of India's leading state economies, with a gross domestic product (GDP) of ₹22.40 lakh crore (approximately USD 273 billion) for 2022-23 (estimated). The state's Gross State Domestic Product (GSDP) for the fiscal year 2023-24 is projected to be ₹24.40 lakh crore, reflecting an 8.9% increase from 2022-23. Karnataka's economy has demonstrated strong growth, with a Compound Annual Growth Rate (CAGR) of 11.51% at current prices from 2015-16 to 2022-23. While sector-specific contributions aren't provided in the graphs, Karnataka is known for its robust services sector, particularly in IT and biotechnology, followed by industry and agriculture.
Karnataka's top export items include IT software, electronics, engineering goods, petroleum products, and ready-made garments. The state is a major IT hub of India, often referred to as the Silicon Valley of India, and it also has a strong presence in the production of aerospace components and biotechnology products.

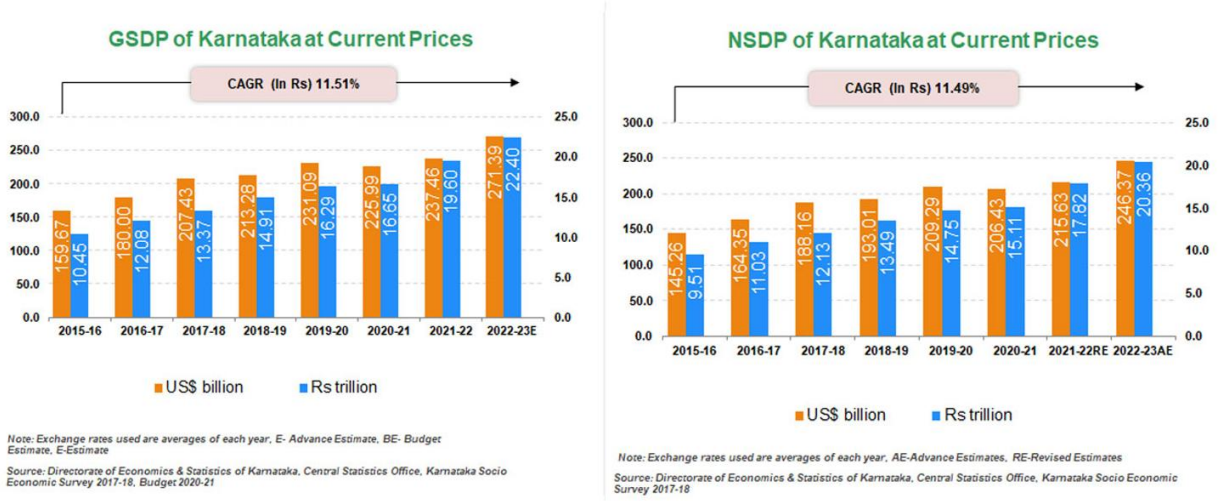


Figure 3-5: GSDP and NSDP of Karnataka (Source: DoES, Karnataka)

Karnataka's foreign direct investment (FDI) inflows have been significant, though specific figures are not provided in the graphs. The state has consistently been among the top recipients of FDI in India, attracting investments across various sectors.

Karnataka hosts a thriving industrial ecosystem, particularly in the IT and biotechnology sectors. Key hubs include Bengaluru, which is home to numerous global and Indian tech giants. Prominent companies operating in the state include Infosys, Wipro, and IBM in the IT sector, Biocon in biotechnology, and HAL (Hindustan Aeronautics Limited) in the aerospace industry. The state also has a growing presence in electric vehicle manufacturing and renewable energy sectors.

3.3.2 Agriculture Profile

Karnataka, often referred to as the "Silicon Valley of India," also boasts a rich agricultural heritage. Approximately 55% of its population resides in rural areas, with agriculture and allied sectors contributing about 13% to the state's GDP. The state has a cultivable area of around 12.3 million hectares, supported by major rivers like Cauvery, Krishna, and Tungabhadra.

Coffee is the state's signature crop, with Karnataka producing about 70% of India's coffee. The state is also a major producer of silk, accounting for nearly 65% of the country's raw silk production. Ragi (finger millet) is another key crop, with Karnataka being India's largest producer. Other significant crops include rice, jowar, maize, pulses, oilseeds, and various fruits and vegetables.

Karnataka's agricultural economy is diverse, encompassing horticulture, sericulture, animal husbandry, and fisheries. The state is India's second-largest milk producer and has a thriving poultry industry. In horticulture, Karnataka is a leading producer of pomegranates, grapes, and bananas.

The state has several agricultural export zones, including Bangalore Rural and Tumkur for roses and vegetables, Bijapur for grapes, and Malnad region for coffee. Notably, the Coorg Green Cardamom and Mysore Jasmine from Karnataka have received geographical indication tags, highlighting their unique qualities and regional significance.

Karnataka's agricultural sector is increasingly embracing technology, with the state being a hub for agri-tech startups and precision farming initiatives, blending its traditional agricultural strengths with its reputation for technological innovation.

3.3.3 Infrastructure Profile

Karnataka, as one of India's most progressive states, boasts a robust infrastructure network supporting its economic growth. The state's capital, Bengaluru, is a global tech hub, driving significant infrastructure development.

Transportation:

Karnataka has an extensive road network spanning about 2,37,000 km, including 13 National Highways. The state's rail network covers approximately 3,250 km, connecting major cities and industrial hubs. Karnataka is home to two major ports - New Mangalore Port and Karwar Port, facilitating international trade. The state has four operational airports, with Kempegowda International Airport in Bengaluru being one of India's busiest.

Power:

Karnataka has a total installed power generation capacity of around 30,000 MW, with a significant focus on renewable energy. The state is a leader in solar power generation, with Asia's largest solar park located in Pavagada.

Industrial Infrastructure:

The state has 185 industrial areas and 5 Special Economic Zones (SEZs). Major industrial corridors include the Chennai-Bengaluru Industrial Corridor and the Bengaluru-Mumbai Economic Corridor.

IT Infrastructure:

Bengaluru, known as India's Silicon Valley, hosts numerous IT parks and tech hubs. The city is home to over 4,000 active tech startups and hosts offices of global tech giants.

3.4 Tamil Nadu Profile

Tamil Nadu spans 130,058 sq km and is bordered by Kerala to the west, Karnataka to the northwest, Andhra Pradesh to the north, and the Indian Ocean to the east and south. The state capital, Chennai, is one of India's largest cities and a major economic and cultural hub, often referred to as the Detroit of India due to its extensive automotive industry. Tamil Nadu is divided into 38 districts, with major cities including Chennai, Coimbatore, Madurai, and Tiruchirappalli.

The state's geography is diverse, featuring the Eastern Ghats, fertile plains along the Kaveri River, and a long coastline with significant ports. Tamil Nadu's rivers, such as the Kaveri, Godavari, and Periyar, are crucial for agriculture and water supply. Known for its rich cultural heritage, Tamil Nadu boasts numerous temples, historic sites, and a vibrant arts scene.

Its economy is supported by sectors like manufacturing, information technology, and agriculture.



Figure 3-6: District Map of Tamil Nadu

3.4.1 Economic & Industrial Profile

Tamil Nadu is a leader in several industries, including engineering, automotive, pharmaceuticals, clothing, textiles, leather, chemicals, and plastics. The state's strong manufacturing environment is demonstrated by the fact that it has the most factories and industrial workers in all of India. The Gross State Domestic Product (GSDP) of Tamil Nadu increased at an impressive Compound Annual Growth Rate (CAGR) of 10.56% between 2015–16 and 2020–21, reaching roughly ₹19.43 trillion (US$ 265.49 billion). The Net State Domestic Product (NSDP) also experienced a CAGR of 10.60%, reaching ₹17.50 trillion (US$ 239.00 billion).

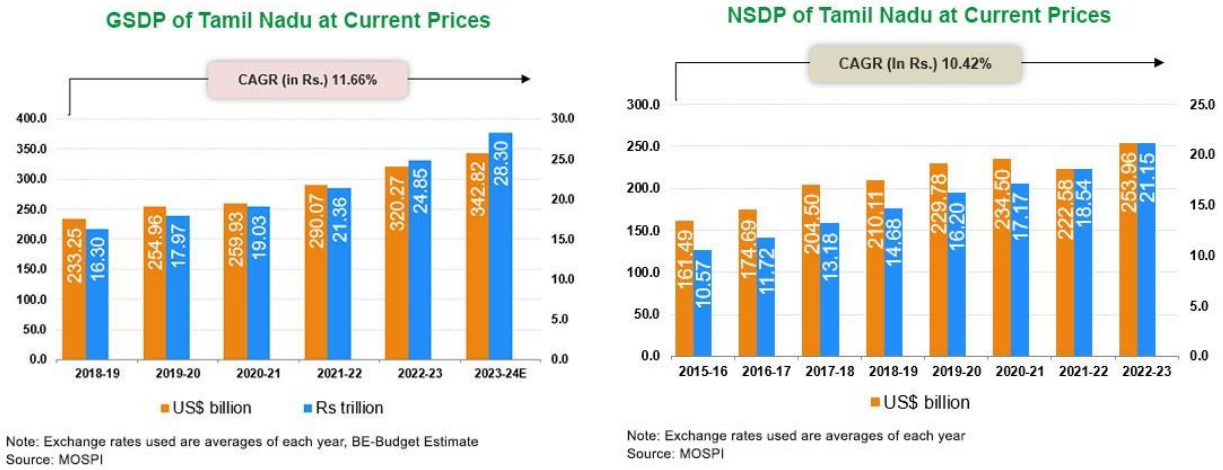


Figure 3-7: GSDP and NSDP of Tamil Nadu (Source: MOSPI)

Significantly driving the state's economic structure is the tertiary sector, which in 2020–21 accounted for 54.26% of the Gross State Value Added (GSVA), followed by the secondary sector at 32.39%. Tamil Nadu's considerable industrial operations are supported by its 33.71 GW installed power generation capacity as of May 2021. Additionally, the state has drawn a sizable amount of foreign direct investment (FDI); from November 2019 to March 2021, total inflows totaled US$ 3,329 million.

Because of the global economic issues, Tamil Nadu's overall merchandise exports dropped from US$ 30.02 billion in FY20 to US$ 26.16 billion in FY21. Additionally, the sector of IT and IT-enabled services has prospered, with exports reaching ₹1.39 lakh crore (US$ 19.9 billion)

The Tamil Nadu government has started several projects to improve its industrial framework and make the state a desirable place to invest. The "Industrial Policy 2021" seeks to create jobs for 2 million people by 2025, invest ₹10 lakh crore (US$137.8 billion), and increase the industrial sector at a rate of 15% per year. Proposals for significant investments totaling ₹52,257 crore (US$ 7.14 billion) have been authorized; these are anticipated to create over 93,000 employments in a variety of industries.

Furthermore, with significant financial support from organizations like the Asian Development Bank, Tamil Nadu is dedicated to infrastructure development through the Comprehensive Road Infrastructure Development Program (CRIDP) and the Tamil Nadu Urban Flagship Investment Program.

3.4.2 Agriculture Profile

Geographically, Tamil Nadu falls under the category of semi-dry sub-humid to dry humid tropics. It is the 11th largest state in India, covering an area of 130,058 sq km. The 2011 census showed that Tamil Nadu was the seventh most populous state, with a population of 72.1 million. The state occupies 4% of the total land area of India, holds 6% of its population, and is supplied by 3% of its total water resource base

3.4.3 Infrastructure Profile

A developed infrastructure network serves as the backbone for economic development in Tamil Nadu. It has a gigantic network of good roads, which include national highways and state highways in good condition. A strong railway system forms the link between major cities like Chennai, Coimbatore, and Madurai. Chennai International Airport serves domestic and

international flights. The state also has an extensive coastline with major ports like Chennai Port and Tuticorin Port through which a large volume of maritime trade is carried out.

In the case of energy, Tamil Nadu depends on thermal, hydro, and renewable sources; there have also been huge investments in wind and solar power. It has very well-developed water supply and sanitation systems that cover both urban and rural areas. Tamil Nadu is well covered in terms of telecommunications, with high-speed internet and mobile connectivity very common in its urban centers. The state is further developing its educational and healthcare facilities in line with its vision of playing a significant role as an economic and cultural leader for India

3.5 Tirupati District

Tirupati is a city and the administrative headquarters of the Tirupati district in Andhra Pradesh, India. It is located in the southeastern part of the state, approximately 150 kilometers northwest of Chennai.

3.5.1 Demographic & Geographical Profile

According to the 2011 census, Tirupati district has a population of 1,708,806, which constitutes about 1.8% of the state's population. The district experiences a tropical climate with three main seasons: summer, monsoon, and winter. It covers a geographical area of 15,310 square kilometers, representing 5.78% of Andhra Pradesh's total area. Tirupati has rich biodiversity and is surrounded by the Eastern Ghats, which contribute to its diverse landscape. The district is bordered by the Nellore district to the west, Chittoor district to the south, and Tamil Nadu to the east. Its population growth rate for the year 2011 was 12%. The district is renowned for the Tirumala Hills, which house the famous Tirumala Venkateswara Temple, a major pilgrimage site. The district's water resources include the Palar and Pennar rivers, which flow through its territory, and several reservoirs such as the Kandaleru Dam and the Srisailam Dam.

3.5.2 Economy

Andhra Pradesh is a significant commercial and Economic hub in the region, with a diversified economy based on agriculture, tourism, and small-scale industries. The district benefits from its strategic location and the influx of pilgrims, which supports various economic activities. Tirupati’s economy is also boosted by the presence of several industrial and service sectors. The district's textile and Agro-based industries contribute notably to its economic output.

Agricultural & Allied Sector

3.5.3 Agriculture & Allied Sector

Agriculture is a crucial component of Tirupati’s economy, supporting both income and employment for a significant portion of the population. The district benefits from its fertile soil and favourable climatic conditions, leading to a variety of crops being cultivated. The primary crops grown include rice, groundnut, sunflower, and various pulses. Here's a brief overview of the agriculture profile of Tirupati:

Main Crops:

- Kharif (monsoon) crops: Rice, groundnut, maize, and pulses (such as red gram and green gram).
- Rabi (winter) crops: Wheat, chickpea, sunflower, and oilseeds.
- Horticulture: The district also grows a range of fruits and vegetables, including bananas, mangoes, guavas, tomatoes, and chilies

3.5.4 Industrial Profile

Tirupati is an emerging industrial center with a growing focus on various sectors, including textiles, food processing, and small-scale industries.

- **Textiles**: The district has a developing textile industry, with several small and medium-sized units involved in the production of garments and fabrics. While not as prominent as other regions, the textile sector is gaining traction in Tirupati.
- **Argo-based Industries**: Tirupati has a substantial Agro-based industrial sector, including the processing of fruits and vegetables, and production of packaged foods. The district is known for its production of traditional sweets and snacks, which cater to both local and regional markets.
- **Tourism-Related Industries**: Given its status as a major pilgrimage destination, Tirupati has a range of industries related to tourism, including hospitality services, travel agencies, and souvenir shops. The influx of visitors supports a variety of small-scale enterprises.
- **Other Industries**: The district also hosts several small-scale manufacturing units involved in producing items such as pottery, handicrafts, and local cuisine specialties.

3.6 Chittoor District

Chittoor is a city and the administrative headquarters of the Chittoor district in Andhra Pradesh, India. Located in the southeastern part of the state, Chittoor lies approximately 200 kilometers northwest of Chennai.

3.6.1 Demographic & Geographical Profile

According to the 2011 census, Chittoor district has a population of 2,088,327, accounting for about 2.2% of Andhra Pradesh's population. The district experiences a tropical climate with three primary seasons: summer, monsoon, and winter. Chittoor spans an area of 15,359 square kilometers, making up 5.81% of the state's total area. It is geographically diverse, with parts of the Eastern Ghats running through the district, providing varied topography and rich biodiversity. The district is bordered by the Nallamala Hills to the west, the Tamil Nadu state to the south, the Anantapur district to the north, and the Nellore district to the east. The population density is 136 inhabitants per square kilometer. The population growth rate for the year 2011 was 16%. The labor force participation rate was 45.8% for the year 2017-2018. The district is well-watered by the Palar, Pennar, and Cheyyeru rivers, and is home to several important reservoirs, including the Chandragiri and Peddaganjam reservoirs.

3.6.2 Economy

Chittoor is a vibrant commercial and economic hub in Andhra Pradesh, characterized by a diverse economy encompassing agriculture, trade, and various industries. The district benefits from its agricultural productivity and its strategic location near major urban centers, fostering growth in multiple sectors.

3.6.3 Agricultural & Allied Sector

Agriculture is a key driver of Chittoor's economy, contributing significantly to both income and employment. The district's favorable climatic conditions and fertile soil support a wide range of crops. Major crops cultivated include rice, groundnut, and various fruits. Here's an overview of Chittoor's agriculture profile.

Main Crops:

- **Kharif (monsoon) crops**: Rice, groundnut, maize, and pulses (including red gram and green gram).
- **Rabi (winter) crops**: Wheat, chickpea, sunflower, and oilseeds.
- **Horticulture**: The district is renowned for its production of fruits such as mangoes, bananas, and guavas, as well as vegetables like tomatoes, onions, and chilies.

3.6.4 Industrial Profile

Chittoor is emerging as an industrial center with a focus on several sectors, including textiles, Agro-based industries, and manufacturing.

- **Textiles**: The district has a developing textile sector with numerous small and medium-sized units engaged in the production of garments and fabrics. The industry is growing and contributing to the local economy.
- **Agro-based Industries**: Chittoor hosts a range of Agro-based industries, including the processing of fruits and vegetables and the production of packaged foods. The district is particularly noted for its production of traditional sweets, snacks, and other food products.
- **Tourism-Related Industries**: The district, known for its historical and religious sites such as the Tirupati Temple and the Chandragiri Fort, has a well-established tourism sector. This includes hospitality services, travel agencies, and souvenir shops, driven by the influx of visitors.

CHAPTER 4

Primary & Secondary Data Collection & Analysis

4. Primary and Secondary Data Collection & Analysis

4.1 General

As part of the traffic study of Mallavaram-Chittoor-AP/KA border section of NH-69/ NH-140 spanning 120.295 km, in the state of Andhra Pradesh, extensive data collection & Analysis is conducted to develop base data. The main objective is to understand the present traffic situation based on primary traffic surveys and the historical toll operations data shared by the client, highlight the future threats (if any), and finally recommend a suitable growth rate for traffic forecast. The data collection included the primary surveys in the field and the secondary data collection from toll operations and the data available in public domain. This chapter presents the details of traffic surveys, the locations, schedule, and the findings of the primary surveys conducted.

4.2 Past Data from Secondary Sources and Primary Surveys

The findings from the data are summarized in the following subsequent sections.

4.2.1 Past traffic trend findings: Project Corridor

Past traffic trends were derived based on the past traffic data sourced from the Toll operations data. Past traffic AADT, (CAGR%) is presented in the following tables. Monthly traffic and Revenue numbers are mentioned in Annexures. Remittance collected at both the project road locations for FY24 is mentioned in below table.

Table 4-1: Remittance collected at both the Toll Plazas for FY24

Project Stretch	Plaza Name	Period	Contract Period	Total/Daily	Amount in) Rs.)
AP/TN Border to Nalagampalli, AP / Karnataka Border section	Mahasamudram	01.04.2023-31.03.2024	26.01.2023 - 26.01.2024	Total	74,54,88,999
Chittor - Mallavaram	Gadanki	01.04.2023-31.03.2024	12.10.2023 - 12.10.2024	Total	1,17,58,59,999

Table 4-2: Past Traffic Trend at Gadanki Toll Plaza (TP1)

Source	FY Year	CJV	LCV/Minibus	Bus/2Axle	3Axle	MAV	Total (Veh)	Total (PCU)	Growth
AVC	FY-2022	7,012	561	1,614	741	1,359	11,287	21,035	-
ETC	FY-2023	9,165	574	1,803	725	1,426	13,694	24,030	14.2%
ETC	FY-2024	10,153	591	2,208	730	1,605	15,288	27,077	12.7%
ETC	FY-2025*	10,275	610	2,305	705	1,641	15,536	27,605	1.9%
CAGR % (FY 23-25)		**5.9%**	**3.1%**	**13.1%**	**-1.4%**	**7.3%**	**6.5%**	**7.2%**	**-**
CAGR % (FY 22-25)		**13.6%**	**2.8%**	**12.6%**	**-1.6%**	**6.5%**	**11.2%**	**9.5%**	**-**

*FY-2025 * - Apr24-Nov24 Based AADT*

Toll Operational Data Outcomes: -

Between FY23 & FY25, the traffic in PCU terms has grown by 7.2%. In the same period, cars have witnessed growth at a rate of 5.9% whereas goods vehicles especially 3Axle have witnessed a negative growth of -1.4% respectively. In the same period MAVs have grown at 7.3% at Gadanki Toll Plaza.

Table 4-3: Past Traffic Trend at Mahasamudram Toll Plaza (TP2)

Source	FY Year	CJV	LCV/Minibus	Bus/2Axle	3Axle	MAV	Total (Veh)	Total (PCU)	Growth
AVC	FY-2021	6,259	1,041	1,904	699	982	10,886	20,051	-
AVC	FY-2022	6,044	967	1,852	600	1,047	10,512	19,567	-2.4%
ETC	FY-2023	8,166	1,047	2,058	729	1,099	13,098	23,042	14.9%
ETC	FY-2024	9,207	1,065	2,307	735	1,176	14,490	25,223	9.5%
ETC	FY-2025*	9,875	1,204	2,478	738	1,387	15,683	27,575	9.3%
CAGR % (FY 23-25)		**10.0%**	**7.3%**	**9.7%**	**0.6%**	**12.3%**	**9.4%**	**9.4%**	**-**
CAGR % (FY 21-25)		**12.1%**	**3.7%**	**6.8%**	**1.4%**	**9.0%**	**9.6%**	**8.3%**	**-**

*FY-2025 * - Apr24-Nov24 Based AADT*

Between FY23 & FY25, the traffic in PCU terms has grown by 9.4%. In the same period, cars have witnessed growth at a rate of 10.0% whereas goods vehicles 3Axle have witnessed least growth of 0.6% and Bus/2Axle have witnessed a growth at a rate of 9.7%. In the same period MAVs have grown at 12.3% at Mahasamudram Toll Plaza.

- Both the toll plaza locations have seen a consistent decline in 3Axle trucks and high growth in MAV traffic over the years. This is mostly due to preference of Higher axled trucks by the Transporters observed similarly across India.
- India general election & Andhra Pradesh legislative assembly elections were held in May-2024, which might have impacted the passenger traffic (recreational trips) in the current year FY25.

4.3 Traffic surveys

The traffic surveys are generally conducted to achieve the various project objectives. The Key outcomes of CTVC Survey are), to derive the average daily traffic by type of vehicle along the project corridor, Traffic composition and Vehicle composition.

Similarly, the key outcomes of the OD analysis include,

i) Origin zone & Destination zone of the vehicle type
ii) The frequency of travel i.e., daily, weekly, monthly, or occasionally and Toll Category.
iii) Trip purpose
iv) Commodity carried of goods vehicle.

For this Study, the Consultant has analyzed the survey data i.e., both the Classified Traffic Volume Count (Project Roads) and the Origin – Destination Survey (Project Roads) obtained through the Primary Surveys. Nevertheless, the Consultant before analyzing and utilizing the data for the project, has conducted a detailed and thorough review of the primary data and found the data to be accurate enough for achieving the objectives of the study. The subsequent sections would provide a more detailed analysis.

- Major traffic generators and routes
- Past traffic trend at each toll plaza location
- Travel pattern of the road users at the toll plaza locations
- Probable diversion routes

The various vehicle types having varied sizes and characteristics were converted into equivalent passenger car units (PCU). The Passenger Car Unit recommended by Indian Road Congress in “Guidelines for Capacity of Roads in Rural Areas” (IRC-64-1990) have been used for PCU conversion and are presented in below table.

Table 4-4 Vehicle Classification and PCU Factors

VEHICLE TYPE	PCU	VEHICLE TYPE	PCU
Car/Jeep/Taxi	1.0	Auto Rickshaw	1.0
Minibus/ LCV	1.5	Agricultural Tractor	1.5
Standard Bus	3.0	Agricultural Tractor & Trailer	4.5
2/3 Axle Truck	3.0	Animal Drawn Vehicle	6.0
MAV	4.5	Cycle	0.5
Two-Wheeler	0.5	Cycle Rickshaw	2.0

4.3.1 Average Daily Traffic

The traffic volume count data was collected for Seven days (24 Hrs) at the survey locations on the project route to arrive at the average daily traffic (ADT).

The summary of ADT in terms of vehicles and PCUs at each survey location along the Project routes are presented in below figure and table.

Table 4-5: ADT Summary from the surveys

	SECTION	NH-140	NH-69
S.NO	VEHICLE	GADANKI TP	MAHASAMUDRAM TP
1	Car	10,054	9,170
2	Mini LCV	899	1,414
3	Minibus	366	161
4	Bus	1,481	1,123
5	3-Ax Bus	110	120
6	LCV	516	1,206
7	Truck-2 Axle	994	1,467
8	Truck-3Axle	658	654
9	MAV	1,828	1,613
10	OSV	3	3
Traffic vehicles		**16,909**	**16,931**
Traffic PCU		**30,246**	**29,997**

The Consultant, for the purpose of the study has relied on the historic data for the computation of Base year Average Daily Traffic for Project Road locations. The Consultant considered toll operation data obtained from the months of April to November of Fiscal Year 2025 for the computation of the base year Average Daily Traffic. Final ADT arrived from ETC data (April to November 2024, which excludes cash & exemption/violation traffic). The table below illustrates the Recommended Average Daily Traffic adopted for the base year.

Table 4-6: Base Year Recommended ADT

S.NO	VEHICLE	GADANKI TP-1	MAHASAMUDRAM TP-2
1	CJV	10,088	9,714
2	LCV	617	1,211
3	Bus	1,419	1,080
4	2Axle	891	1,410
5	3Axle	720	748
6	MAV	1,630	1,389
7	OSV	1	1
Traffic vehicles		**15,366**	**15,553**
Traffic PCU		**27,442**	**27,499**

4.3.2 Vehicle Composition

Analysis was conducted to find the traffic composition by type of vehicles among the tollable traffic at Two Toll Plaza locations on the Project Road sections. Vehicular composition distribution in terms of cars, buses and trucks is summarized in below table and shown in below

figure and traffic composition by type of vehicle by location is shown in below figure. Salient findings from the analysis are presented below:

- It is observed that, car mode has highest share at both toll plaza locations. Approximately, 59% Car traffic observed at Gadanki TP, 54% at Mahasamudram TP.
- The 2nd highest traffic at both toll plaza locations is MAV traffic.

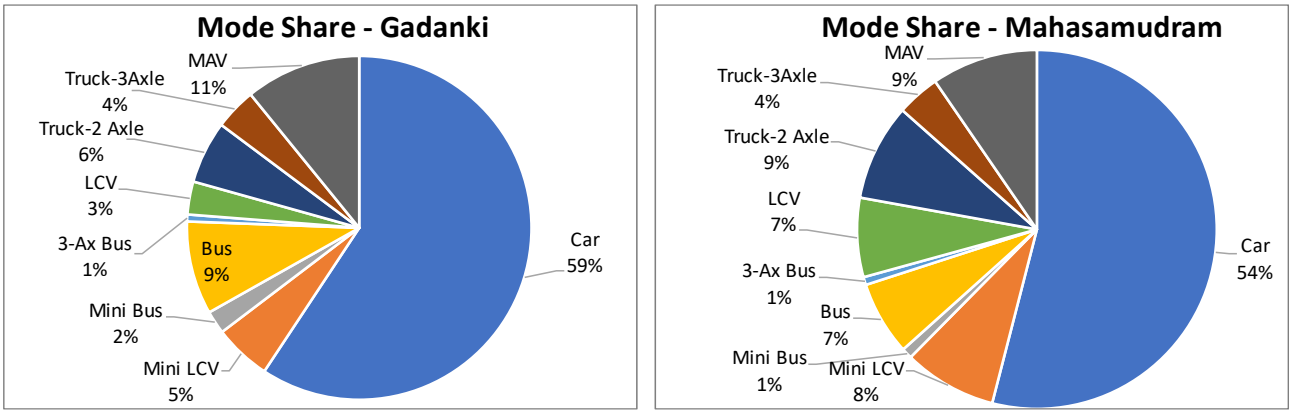


Figure 4-1: Traffic composition (Vehicles) for Gadanki & Mahasamudram Toll Plaza

4.3.3 Seasonal Correction Factors

Seasonal correction factors are used to normalize the Average Daily Traffic (ADT) which is measured for two-year period (FY-23 & FY-24). SCF values are used to normalize the ADT values to arrive at the Annual Average Daily Traffic (AADT). As the considered ADT values are based on 8 months traffic data from Apr-24 to Nov-24, seasonal correction factor is applied to arrive at Annual Average Daily Traffic (AADT). Hence the SCF is considered as average of FY-23 & FY-24 traffic data (from ETC Data) for all Modes of traffic.

4.3.4 Annual Average Daily Traffic (AADT)

- Annual Average Daily Traffic = Average Daily Traffic X Seasonal Correction Factor + Cash Traffic (Non ETC data) + Exemption/violation data obtained from traffic survey conducted on 26th July (for 24 hrs).
- As discussed in the earlier sections, owing to higher reliability, and based on the latest data, the consultant considered the toll operations data (ETC data) obtained for the months of April 2024 to November 2024 (FY-25) as base year ADT, cash traffic from Non ETC data (April 2024 to November 2024) and exemption/violation data obtained from traffic survey conducted on 26th July (for 24 hrs) and recommends the same for the computation of base year Average Annual Daily Traffic (AADT).

Table 4-7: Base Year Recommended AADT

S.NO	VEHICLE	GADANKI TP-1	MAHASAMUDRAM TP-2
1	Car	11,487	10,862
2	Minibus	168	93
3	Bus-2A	1,441	1,088

S.NO	VEHICLE	GADANKI TP-1	MAHASAMUDRAM TP-2
4	Bus 3A	0	0
5	LCV	462	1,143
6	Truck-2A	905	1,420
7	Truck-3A	714	748
8	MAV	1,665	1,401
9	OSV	1	1
Traffic vehicles		**16,843**	**16,754**
Traffic PCU		**29,107**	**28,788**

4.4 Travel Characteristics of the Road users

4.4.1 Survey Methodology

Origin Destination Survey helps in understanding the travel demand pattern of the traffic on the project road. The travel characteristics obtained by O-D survey facilitate the identification of:

- Local and through traffic on the project road.
- Major influence zones of both the passenger and commercial traffic.
- Major commodities carried by the truck traffic.

The O-D survey elicited characteristics like origin, destination, and frequency, purpose of trip for passenger vehicles and commodity type, the information pertaining to origin and destination of trips was analysed to obtain the trip distribution based on a zoning system provided.

4.4.2 Sample Size

The vehicles during the OD surveys were interviewed on a random sample basis and Table below shows the sample size distribution (in percentage terms) captured at the survey locations along the Project stretches.

Table 4-8 Sample Size Collected from Origin-Destination Survey

LOCATION	CAR/ MINI LCV	MINI BUS	Bus	LCV	2-AXLE TRUCK	3-AXLE TRUCK	MAV & ABOVE	GRAND TOTAL
Gadanki Toll Plaza	20%	61%	35%	56%	56%	76%	50%	**31%**
Mahasamudram Toll Plaza	29%	47%	38%	90%	56%	61%	63%	**41%**

4.4.3 Traffic Zoning System

To understand the spatial dimensions of the trip characteristics of the vehicles interviewed during the O-D survey, a detailed zoning system was developed considering the following factors:

- The road network catering to the traffic on the project road and its generating points.
- Important towns, villages, factories, and industrial centers around the project road area.
- Administrative boundaries of districts and states.

- Configuration of the project road in the regional road network with respect to other roads.

Two major types of areas were identified for analysis purposes.

Immediate Influence Area (IIA): Immediate Influence Area includes the cities/towns/villages and districts along the project road and adjacent to its which generates/attracts trips to the project road.

Broad Influence Area (BIA): Broad Influence Area includes other major traffic generating/attracting trips, but to a lesser degree when compared to IIA.

Detailed zoning system is prepared for IIA, while more aggregate or broad zoning is developed for BIA.

The zoning system adopted for data collection was based on 183 zones for better understanding the zonal influence by vehicle category at each toll plaza location. Detailed TAZ list is presented in Annexures.

4.4.4 Travel Pattern and Zone Influence Factors

From the origin & Destination survey data, location wise base year OD matrices were developed for each type of vehicle. Sample OD matrix is expanded to AADT by applying the expansion factors. The O-D matrices describing the travel pattern of both goods and passenger vehicles are used for identification of major OD pairs on the project corridor and for further analysis of movement pattern and estimation of through traffic. It is observed that the major influencing States for the project Sections are Andhra Pradesh, Karnataka, Tamil Nadu, West Bengal, Odisha, Kerala, Jharkhand, Assam, Puducherry, and Maharashtra.

Different vehicles interact in different degrees with the different zones depending on their purpose, commodity transported, frequency of travel etc. Vehicle category-wise zone-wise influence factors are established for interpretation of OD patterns.
Section wise influence factors were derived from the average of Influence factors by category at survey locations in the respective project sections. Section wise influence factors for cars, buses and trucks are summarized and shown in Below tables.

Regional Distribution of traffic at Gadanki Toll Plaza: -

Table 4-9 Regional Distribution of traffic at Gadanki Toll Plaza

GADANKI TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Andhra Pradesh	73.1%	76.9%	60.8%
Karnataka	17.5%	14.2%	19.3%
Tamil Nadu	8.6%	8.6%	10.4%
Telangana	0.1%	0.0%	0.2%
West Bengal	0.0%	0.1%	3.7%
Maharashtra	0.0%	0.0%	0.0%
Odisha	0.0%	0.0%	2.5%
Kerala	0.6%	0.1%	2.1%
Jharkhand	0.0%	0.0%	0.4%

GADANKI TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Assam	0.0%	0.0%	0.4%
Rajasthan	0.0%	0.0%	0.0%
Goa	0.0%	0.0%	0.0%
Puducherry	0.0%	0.0%	0.1%
Total	**100%**	**100%**	**100%**

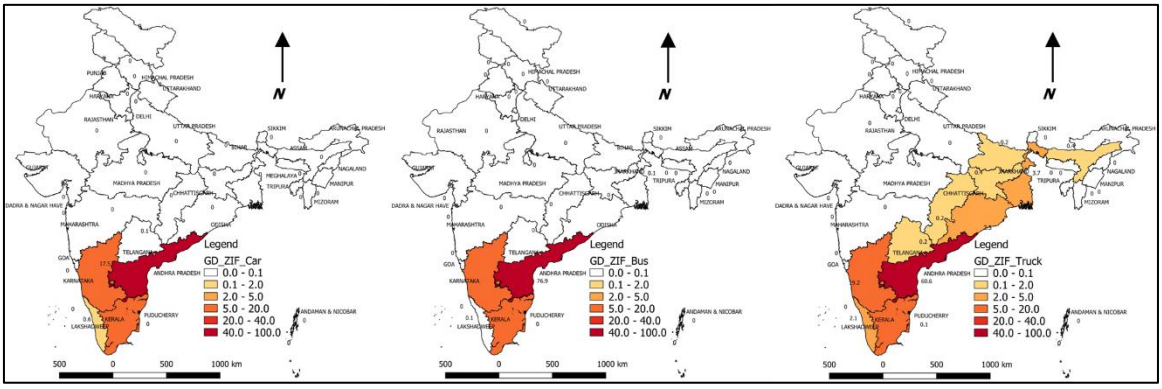


Figure 4-2: Regional distribution of Passenger & Goods traffic at Gadanki Toll Plaza

On detailed analysis of the Zonal influence factors, it was observed that,

- Approximately 73% of the Car passenger vehicle trips are happening within the state of Andhra Pradesh at Gadanki toll plaza, significant amount of the Car vehicle trips are origin-destined in Karnataka & Tamil Nadu.
- Approximately 61% of the truck traffic is plying within the state of Andhra Pradesh. Also, significant amount of truck traffic observed from Karnataka & Tamil Nadu states.

Regional Distribution of traffic at Mahasamudram Toll Plaza-

Table 4-10 Regional Distribution of traffic at Mahasamudram Toll Plaza

MAHASAMUDRAM TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Andhra Pradesh	54.9%	67.2%	37.7%
Karnataka	36.6%	29.5%	32.9%
Tamil Nadu	7.9%	3.1%	22.6%
Telangana	0.0%	0.0%	0.2%
West Bengal	0.0%	0.0%	2.4%
Maharashtra	0.1%	0.0%	1.8%
Odisha	0.1%	0.0%	1.2%
Kerala	0.2%	0.0%	0.2%
Jharkhand	0.0%	0.0%	0.4%
Assam	0.0%	0.0%	0.2%
Rajasthan	0.0%	0.0%	0.1%
Goa	0.0%	0.0%	0.1%

MAHASAMUDRAM TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Puducherry	0.0%	0.0%	0.1%
New Delhi	0.0%	0.2%	0.0%
Total	**100%**	**100%**	**100%**

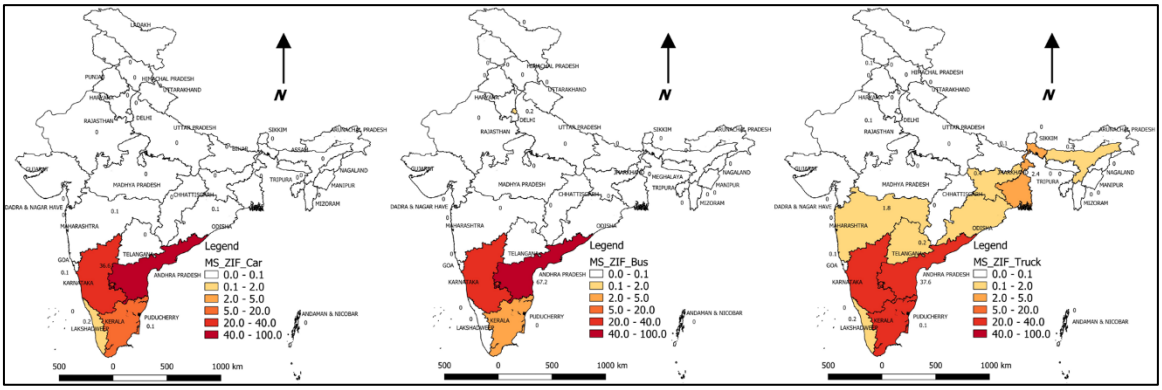


Figure 4-3: Regional distribution of Passenger & Goods traffic at Mahasamudram Toll Plaza

On detailed analysis of the Zonal influence factors, it was observed that,

- Approximately 55% of the Car passenger vehicle trips are happening within the state of Andhra Pradesh at Mahasamudram toll plaza, significant amount of the Car vehicle trips are origin-destined in Karnataka & Tamil Nadu.
- Approximately 38% of the truck traffic is plying in the state of Andhra Pradesh. Also, significant amount of truck traffic observed from Karnataka & Tamil Nadu states.

4.4.5 Commodity Distribution of Freight traffic

An analysis was also carried out to understand the different commercial vehicles being used to transport different commodities. Table below presents the toll plaza wise commodity distribution.

Commodity pattern at Gadanki Toll Plaza: -

- The overall share of empty vehicle is observed to be around 20% at Gadanki Toll Plaza.
- The Major Commodities observed at Gadanki Toll Plaza are Food Items, Fruit & Vegetables, Parcel, Steel, Parchoon are contributing to almost 70% of overall Commodities when Empty trucks are also included.
- Major commodities transported by LCV and 2-Axles are Food Items, Fruits & Vegetables, Parcel, Steel, Parchoon, Automobile, Plastics & Livestock.
- Major Commodities transported by HGVs are Food Items, Parcel, Steel, Fruits & Vegetables, Parchoon, Automobile & Plastics.

Table 4-11 Commodity Pattern at Gadanki Toll Plaza (TP1)

GADANKI TOLL PLAZA					
COMMODITY	**LCV**	**2-AXLE TRUCK**	**3-AXLE TRUCK**	**MAV**	**TOTAL**
Empty	20.5%	21.3%	20.4%	17.7%	19.6%

GADANKI TOLL PLAZA					
COMMODITY	LCV	2-AXLE TRUCK	3-AXLE TRUCK	MAV	TOTAL
Food Items	18.1%	15.6%	22.2%	17.5%	18.0%
Fruits & Vegetables	16.8%	7.1%	4.8%	7.4%	9.6%
Parcel	12.5%	8.6%	10.8%	6.8%	9.4%
Steel	3.5%	6.1%	6.6%	10.4%	7.0%
Parchoon	5.6%	7.5%	7.5%	6.2%	6.5%
Automobile	3.3%	8.1%	3.7%	5.5%	5.1%
Plastic	3.6%	3.9%	4.8%	4.0%	4.0%
Livestock	5.1%	4.8%	2.2%	2.3%	3.6%
Cement	0.7%	1.9%	0.7%	6.3%	3.0%
POL	1.7%	6.0%	3.9%	1.7%	2.9%
Wood	1.8%	2.5%	2.6%	2.7%	2.4%
Chemicals	1.3%	1.3%	0.9%	2.0%	1.5%
Other Construction	0.4%	0.6%	3.1%	2.1%	1.5%
Boulders/Marble/Granite	0.6%	0.4%	2.0%	1.9%	1.3%
Others	4.5%	4.5%	3.9%	5.4%	4.7%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Commodity pattern at Mahasamudram Toll Plaza: -

- The overall share of empty vehicle is observed to be around 31% at Mahasamudram toll plaza.
- The Major Commodities observed at Mahasamudram Toll Plaza are **Parcel, Fruits & Vegetables, Food Items & Automobiles** are contributing to almost **73%** of overall Commodities when Empty trucks are also included.
- The empty vehicles share observed at Mahasamudram Toll Plaza is more than 25% and it indicates the traffic at Mahasamudram Toll Plaza is more Local traffic.
- Major commodities transported by LCV and 2-Axles are Parcel, Fruits & Vegetables, Food Items, Automobile & Livestock.
- Major Commodities transported by HGVs are Parcel, Fruits & Vegetables, Food Items, Automobile, Parchoon, Steel & POL.

Table 4-12 Commodity Pattern at Mahasamudram toll plaza (TP2)

MAHASAMUDRAM TOLL PLAZA					
COMMODITY	LCV	2-AXLE TRUCK	3-AXLE TRUCK	MAV	TOTAL
Empty	33.3%	27.2%	27.5%	32.2%	31.1%
Parcel	12.4%	19.2%	17.2%	8.1%	13.5%
Fruits & Vegetables	18.6%	7.0%	5.5%	10.6%	12.9%
Food Items	7.0%	7.8%	12.0%	7.1%	7.8%
Automobile	4.1%	14.7%	11.8%	6.0%	7.7%
Livestock	8.8%	1.7%	0.9%	2.1%	4.9%
Wood	4.0%	4.9%	3.9%	2.3%	3.8%
Parchoon	2.4%	3.3%	5.4%	6.1%	3.8%
Steel	1.1%	3.0%	2.6%	8.0%	3.1%
POL	1.0%	3.0%	3.9%	5.3%	2.7%
Plastic	1.0%	1.9%	3.1%	1.8%	1.6%

MAHASAMUDRAM TOLL PLAZA					
COMMODITY	**LCV**	**2-AXLE TRUCK**	**3-AXLE TRUCK**	**MAV**	**TOTAL**
Electrical	1.6%	1.1%	0.4%	1.4%	1.3%
Chemicals	0.5%	0.8%	1.5%	1.6%	0.9%
Garments	1.0%	0.4%	1.5%	0.1%	0.7%
Heavy Industrial Goods	0.9%	0.6%	0.2%	0.7%	0.7%
Others	2.4%	3.3%	2.6%	6.5%	3.5%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

4.4.6 Trip length frequency Distribution

An analysis was carried out to understand the trip length frequency of the passenger and goods vehicles at all the toll plaza locations. Figures below presents the toll plaza wise trip length frequency distribution for goods and passenger vehicles.

Goods Vehicles

Trip length Frequency Distribution at Gadanki Toll Plaza

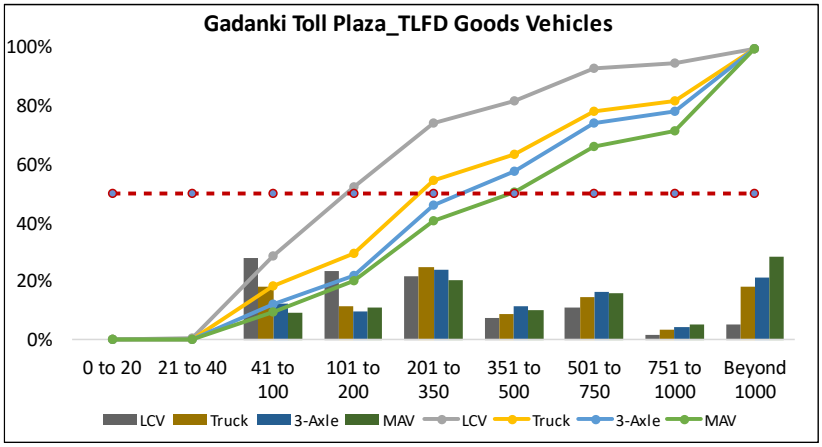


Figure 4-4: Trip length Frequency Distribution at Gadanki Toll Plaza – Goods

- Around 52.5% of LCVs, 29.8% of Trucks, 21.8% 3-Axle, 20.3% MAVs are having trip length less than 200 km.
- 40.6% of LCVs, 48.4% of 2-Axle trucks, 52.5% of 3-Axle trucks and 46.2% of MAV are having trip lengths more than 200 km and less than 750 km.
- Around 6.9% of LCVs, 21.8% of 2-Axle trucks, 25.7% of 3-Axle trucks and 33.5% of MAV are having trip lengths more than 750 km which refers there is significant medium and long-distance traffic through the Gadanki Toll plaza.
- Major OD pairs in goods traffic (3A & MAV) are Tirupati-Bengaluru, Tirupati-Chittoor, Vijayawada-Bengaluru & Bengaluru-Kolkata etc.

Trip length Frequency Distribution at Mahasamudram Toll Plaza

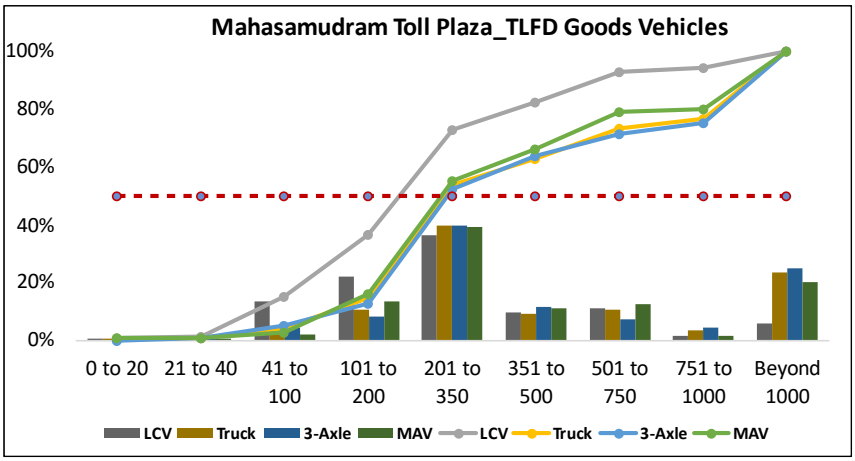


Figure 4-5: Trip length Frequency Distribution at Mahasamudram Toll Plaza – Goods

- Around 36.7% of LCVs, 14.4% of Trucks, 12.8% of 3-Axle, 16.2% MAVs are having trip lengths of less than 200 km.
- 56.3% of LCVs, 58.8% of 2-Axle trucks, 58.4% of 3-Axle trucks and 62.5% of MAV are having trip lengths more than 200 km and less than 750 km.
- Around 7.1% of LCVs, 26.9% of 2-Axle trucks, 28.8% of 3-Axle trucks and 21.2% of MAV are having trip lengths more than 750 km which refers there is significant medium and long-distance traffic through the Mahasamudram Toll plaza.
- Major OD pairs in goods traffic (3A & MAV) are Bengaluru-Chennai, Bengaluru-Kolkata, Chittoor-Bengaluru, Vijayawada-Bengaluru & Hindupuram-Chennai, etc.

Passenger Vehicles

Trip length Frequency Distribution at Gadanki Toll Plaza

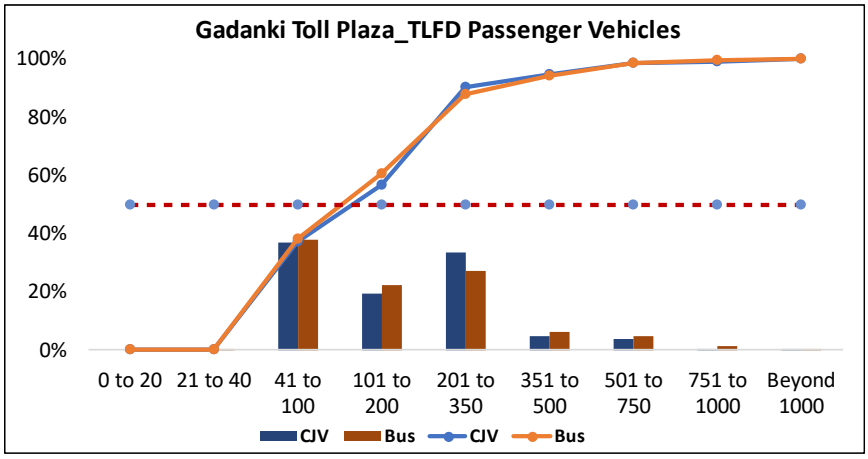


Figure 4-6: Trip length Frequency Distribution at Gadanki Toll Plaza - Passengers

- Around 37% of Cars and 38% Busses are having less than 100 km trip length.
- Approximately 57% of Cars and 61% of Busses are having less than 200 km trip length. 33.5% of Cars are observed to be having trip lengths more than 200 km and less than 350 km.
- 4.6% of cars trips are between 351 km to 500 km, 4.5% of the trips are between 500 km to 1000 km and 0.6% of the trips are beyond 1000 km.

- Tirupati-Bengaluru, Tirupati-Chittoor, Tirupati-Kanipakam & Tirupati-Vellore are the Major OD Pairs in passenger vehicles.

Trip length Frequency Distribution at Mahasamudram Toll Plaza

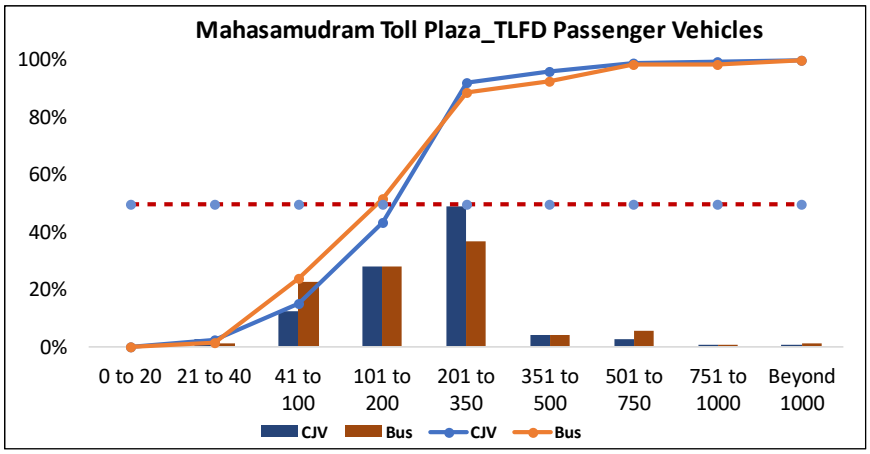


Figure 4-7: Trip length Frequency Distribution at Mahasamudram Toll Plaza-Passengers

- Around 15% of Cars and 24% of Busses are having less than 100 km trip length.
- Approximately 43% of Cars and 52% of Busses are having less than 200 km trip length. Around 49% of Cars are observed to be having trip lengths more than 200 km and less than 350 km.
- 4.3% of cars trips are between 351 km to 500 km, 3.1% of the trips are between 500 km to 1000 km and 0.6% of the trips are beyond 1000 km.
- Tirupati-Bengaluru, Chittoor-Bengaluru, Chittoor-Palamaner, & Bengaluru-Chennai are the Major OD Pairs in passenger vehicles.

4.4.7 Major Trip Generators

An analysis was carried out to identify the major trip generators. Table and figure below present the major trip generators of all passenger and goods vehicles at the toll plazas.

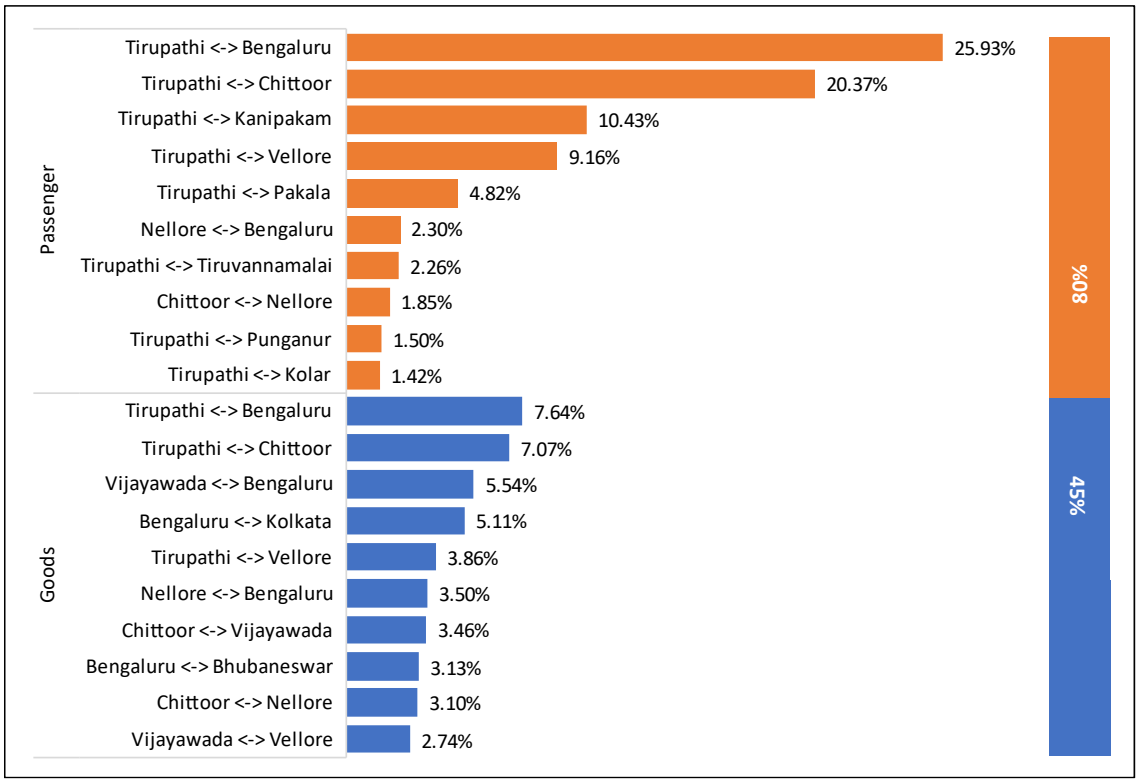


Figure 4-8: Major OD Pairs at Gadanki TP

From the Top Origin- Destination pair analysis of both passengers and Goods (3 Axle trucks & MAV), it is observed that the top ten OD Pairs comprises around 80% of total passenger traffic and 45% of goods traffic (3A & MAV only) at Gadanki Toll Plaza.

Passenger wise Major OD Pair at Toll Plaza:

- Top five OD Pair from passenger mode share is of around 71%. Major OD pairs are generated from Tirupati, Bengaluru, Chittoor, Kanipakam, Vellore and Pakala.

Goods wise Major OD Pair at Toll Plaza:

- Top five OD Pair from goods mode share is of 29.2%. Major OD pairs are generated from Tirupati, Bengaluru, Chittoor, Vijayawada, Vellore and Kolkata. Major Goods traffic on the project stretch is of short to medium distance traffic.

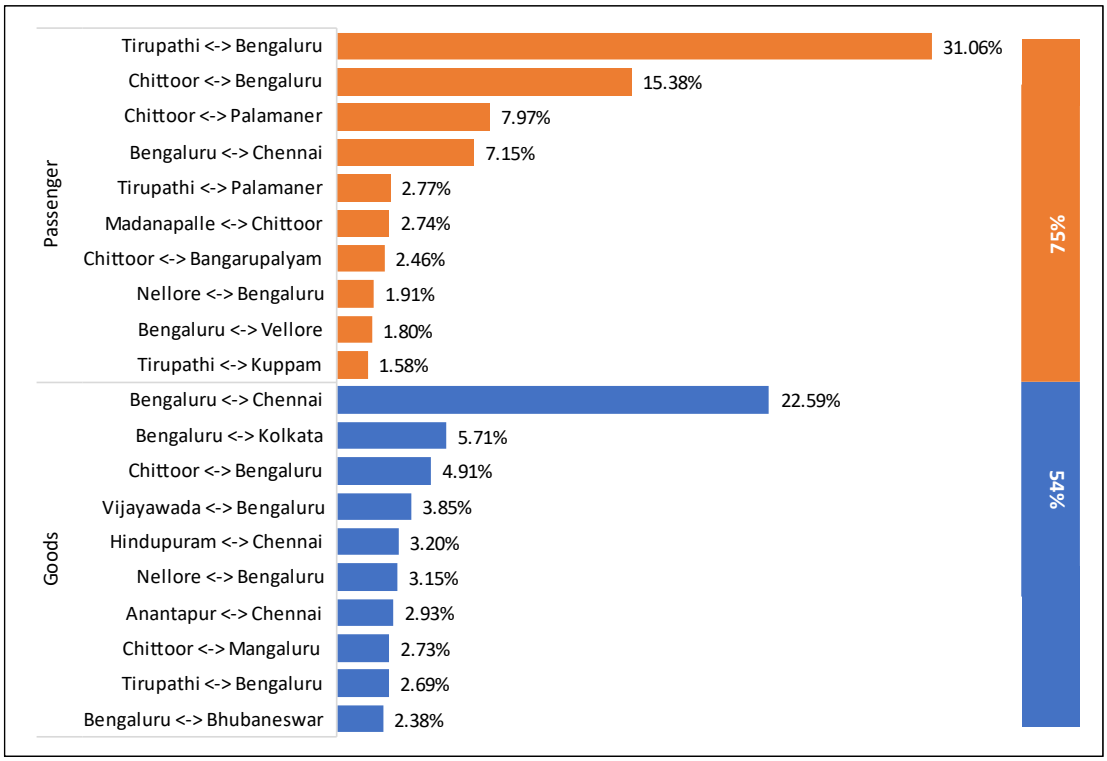


Figure 4-9: Major OD Pairs at Mahasamudram TP

From the Top Origin- Destination pair analysis of both passengers and Goods it is observed that the top ten OD Pairs comprises around 75% of total passenger traffic and 54% of total goods traffic at Mahasamudram Toll Plaza.

Passenger wise Major OD Pair at Toll Plaza:

- Top five OD Pair from passenger mode share is of 64.4%. Major OD pairs are generated from Tirupati, Bengaluru, Chittoor, Palamaner, and Chennai.

Goods wise Major OD Pair at Toll Plaza:

- Top five OD Pair from goods mode share is of 40.3%. Major OD pairs are generated from Bengaluru, Chennai, Kolkata, Chittoor, Vijayawada, and Hindupuram. Major Goods traffic on the project stretch is of short to medium distance traffic.

CHAPTER 5

Diversion & Development Traffic Impact Assessment

5. Diversion & Development Traffic Impact Assessment

5.1 Introduction

This chapter presents the details of road network in the project influence area and the potential impact on the project road traffic during concession period. The traffic diversion section covers the comparison of the potential alternate routes with the project road.

Road network assessment and alternate modes were identified, and risk assessment has been done to determine traffic likely to be diverted to / from various routes by mode-wise based on generalized costs including toll fees on project road and alternate routes.

This chapter also presents the details of land development in the project influence area and the potential impact on the project road traffic. Growth rates obtained from elasticity method needs to be adjusted for diversions as some of the upcoming development near project area can significantly affect the traffic estimates. The diversion and development section cover the potential land use development near project area and their effect on the future traffic estimates.

5.2 Diversion Traffic to Project Road/Alternate Routes

5.2.1 Road network assessment

Road network in the project influence area (PIA) was studied in detail from the past reports, latest news articles for all the potential impact roads on the project road traffic. Based on the site appreciation and desktop research it has been observed that there are viable alternate road that exists for the project road the & table below illustrates the list of alternate road development.

Table 5-1: Alternative Roads /Development Impacts on Project Road

S.NO	ALTERNATIVE ROAD/ NETWORK/ LAND /IMPROVEMENTS	IMPACT TYPE	YEAR OF IMPACT
1	4/8 Lane access-controlled Bangalore-Chennai Expressway	Negative impact on Mahasamudram TP	FY27: 50% FY28:100%
2	4-6 Lane Partially access-controlled Bangalore-Vijayawada Expressway	Negative Impact on Both the TP's	FY28: 50% FY29:100%
3	6 Lane access-controlled Chittoor-Thatchur Expressway	Negative impact on Mahasamudram TP	FY27: 50% FY28:100%

5.2.2 Approach & Methodology

The Diversion Analysis process starts with the identification of potential alternate routes which was described in the earlier section. Post identification of the alternate routes, the next step involves quantification of the potential divertible traffic on the project road and the identified alternate routes.

The potential divertible traffic is the traffic which could shift from one road to the other road considering all the factors such as Vehicle operating cost, Travel time and Tolls. Subsequently a diversion analysis (binomial model) is performed to identify the quantum of the traffic that shift to the project road (positive diversion) or shift to the alternate road (negative diversion). The positive or the negative diversion is based on the generalized costs obtained from the diversion analysis model.

In this case, as seen in the earlier section there are potential alternate routes which are combination of greenfield & brownfield upgradations. With respect to the potential divertible traffic for the project road it has been quantified based on the O-D analysis. The potential divertible traffic for the proposed alternate for the base year is not available as it is not operational at present (base year). In the absence of potential divertible traffic on the alternate route, the potential divertible traffic on project road is considered as total potential divertible traffic (PR+AR) for the diversion analysis.

The subsequent sections provide further elaboration on the potential divertible traffic, generalized costs and the divertible traffic and future divertible traffic on the project road till the end of the concession period.

The estimation of Traffic diversion away from project road for various diversions mentioned above are explained below.

Diversion 1:

- Negative diversion due to proposed Bangalore-Chennai Expressway for the traffic plying between Bangalore & West of Bangalore towards Chennai & nearby regions.

Diversion 2:

- Negative diversion due to proposed Bangalore-Kodikonda-Vijayawada Expressway for the traffic plying between Bangalore & nearby regions towards Vijayawada & further North of it.

Diversion 3:

- Negative diversion due to proposed Chittoor-Thatchur Expressway for the traffic plying between Bangalore & West of Bangalore towards Ennore port & nearby regions.

5.2.3 Bangalore-Chennai Expressway

262.100 km Bengaluru – Chennai Expressway by NHAI is a proposed 4/8 lane access-controlled highway with a route alignment connecting Bengaluru in Karnataka and Chennai in Tamil Nadu. This greenfield expressway under Bharatmala Pariyojna (BMP) program will run parallel to National Highway NH-75/69 and link at Sriperumbudur (in Chennai) on NH-4 in Tamil Nadu.

The project has been divided up into 4 phases and 11 sections – all to be executed in parallel. Current status of Bangalore- Chennai Expressway is mentioned in the below table with Length, Lane configuration & Construction status as on date.

Table 5-2: Bangalore-Chennai Expressway Status

Section	Phase	Pkg	Chainage	Length (km)	Start Date	Current Progress (%)	Expected Completion Date	Contractor	Source (State)
Hoskote to Malur	1	1	0 to 26.4	26.4	September 15, 2021	99% Complete		Dilip Buildcon	NHAI PIU Kengeri (Karnataka)
Malur to Bangarpet		2	26.4 to 53.5	27.1	September 20, 2021			Dilip Buildcon	
Bangarpet to Bethamangala		3	53.5 to 71	17.5	January 18, 2022			KCC Buildcon	
Bethamangala to Baireddypalli	2	1	71 to 96	25	10 Nov 2022	58.3%	31 Nov 2025	Montecarlo	NHAI PIU Chittoor (Andhra Pradesh)
Baireddypalli to Bangarupalyam		2	96 to 127	31	08 June 2023	35.02%	17 June 2026	APCO Infratech	
Bangarupalyam to Gudipala		3	127 to 156	29	4 Nov 2022	77.02%	3 Nov 2024	Dilip Buildcon	
Gudipala to Walajahpet	3	1	156 to 180	24	30/05/2022	62.75%	31/12/2024	Montecarlo	NHAI PIU Kanchipuram (Tamil Nadu) Tamil Nadu
Walajapet to Arakkonam		2	180 to 204.5	24.5	16/07/2022	80.07%	30/11/2024	KCC Buildcon	
Arakkonam to Kancheepuram		3	204.5 to 230	25.5	08/08/2022	50.73%	31/03/2025	DP Jain Infra	
Kanchipuram to Sriperumbudur		4	230 to 261.705	31.705	11/7/2022	61.78%	28/02/2025	RCC	
Trumpet connecting BCE & Old Bglr Chennai Hwy near			261.705 to 262.8	1.095	26/02/2024	0%	23/08/2025	RCC	
Sriperumbudur to Maduravoyal (Elevated Corridor)	4	-	13+800 to 35+800	23	DPR stage – VAX consultancy working on it from last 2-3 yrs				NHAI PIU Chennai (Tamil Nadu)

5.2.4 Diversion-1(a) (Long Distance Traffic on Bangalore Chennai Expressway)

Traffic coming from the Bangalore & West of Bangalore towards Chennai & nearby regions will have two route options available once the Bangalore-Chennai expressway is completely operational. The common point for both the Project Road and alternate route will be Hoskote and Sriperumbudur and the route comparison between Hoskote to Sriperumbudur via Project Road vis a-vis alternate route is described below.

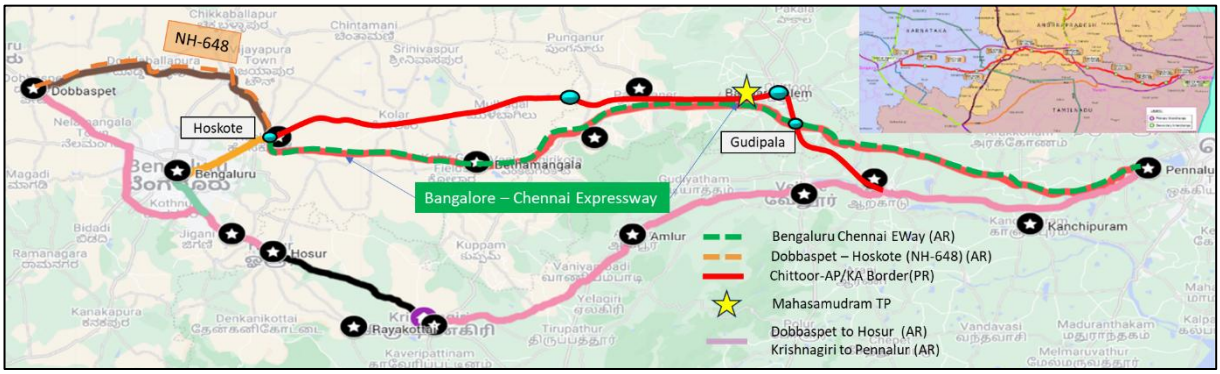


Figure 5-1: Bangalore-Chennai Route Comparison

Network Characteristics like Length, Road configuration etc. for both PR and AR are mentioned in the below table.

ROUTE COMPARISON					
YEAR	**ROAD (PR or AR)**	**SECTION**	**LENGTH (KM)**	**ROAD CONFIG**	**REMARKS**
FY25	PR	Hoskote to Chittoor (NH75, NH69, NH40)	147	4L	
	PR	Chittoor to AP/TN Border	24	4L	Current Status: Under Construction
	PR	AP/TN Border to Walajpet town	22	4L	Current Status: Under Construction
	PR	Walajpet town	5	2L	
	PR	Walajpet to Sriperumbudur	70	6L	
FY27	AR	Hoskote to Sriperumbudur	261.7	4L-E'Way	Current Status: Under Construction
Total Distance Via PR(Km)			**268**		
Total Distance Via AR(Km)			**261.7**		

Table 5-3: Hoskote-Sriperumbudur Route Comparison b/w PR & AR (Long Distance)

It is observed that Project Road is 6.3 kms longer than alternative route for Bangalore-Chennai route. Traffic zones which are considered for this part of diversion is shown below.

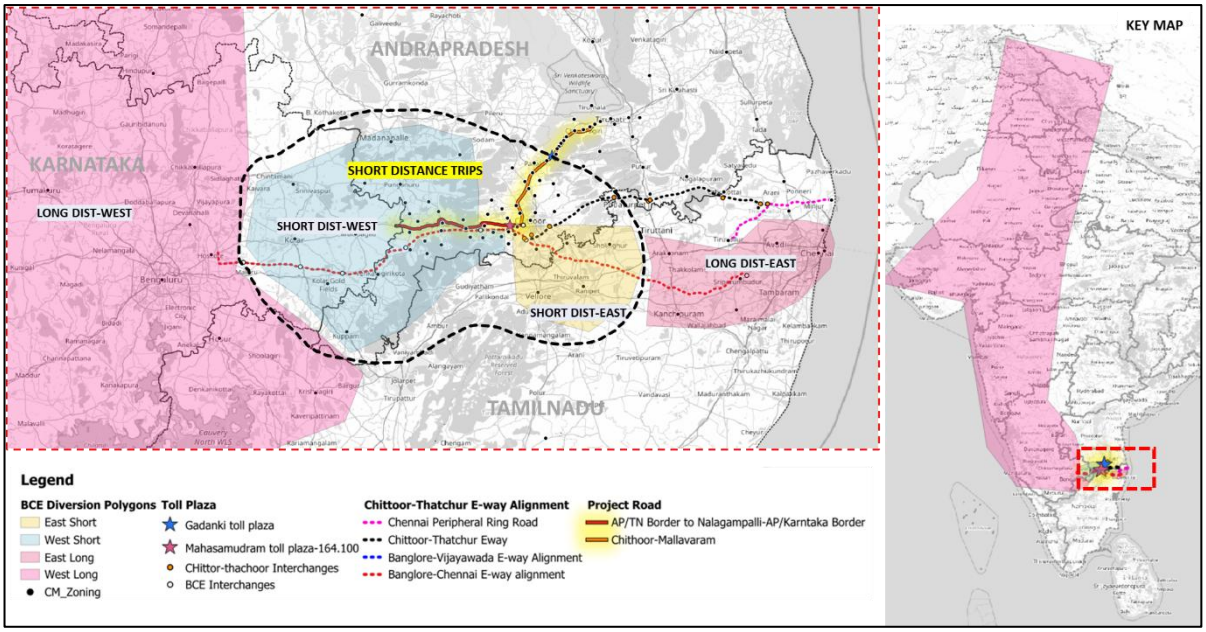


Figure 5-2: Bangalore-Chennai zoning Scheme

Zones that are considered by consultant on the West side are Western part of Mahasamudram in Hoskote, Bengaluru, regions to the North West of Bengaluru (like Tumkuru, Davanagare, Pune, Ahmedabad, Delhi, etc.) are highlighted on Figure 5-2 inside Pink polygon (Long-Dist-west). Similarly, zones considered on the eastern side are, Vellore, Ranipet, Kanchipuram, Chennai, Thiruvallur, etc. were considered for potential divertible traffic estimation. (Zones highlighted inside pink polygon (Long-Dist-East) in Figure 5-2).

Here for long distance traffic following combinations of PDT zones are considered:

1. Long-Dist-West & Short-Dist-West to Long-Dist-East.
2. Long-Dist-West to Short-Dist-East.

Both above mentioned combinations are considered for final long-distance PDT.

Table 5-4: Potential Divertible Traffic in Base year

Mode	Long Distance
Car	1,814
Minibus	2
Bus-2A	58
Bus-3A	0
LCV	552
2 Axle	675
3 Axle	341
MAV	592

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the project road is estimated. Generalized cost is calculated based on the value of time (VOT) and vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic

Evaluation of Highway Projects in India" and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion.

The consultant has considered that this diversion shall happen phase wise with 50% of the divertible traffic diverting in FY-27 and 100% of the divertible traffic diverting in FY-28. The table below illustrates the quantum of divertible traffic obtained, the diverted traffic considered and the percentage composition of the diverted traffic with respect to AADT.

Table 5-5: Traffic diversion from Mahasamudram toll plaza to BCE-Diversion1(a) in (FY25)

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	1,814	(989)	-9.1%
Bus	58	(41)	-3.8%
LCV	552	(278)	-24.3%
2 Axle	675	(323)	-22.7%
3 Axle	341	(181)	-24.2%
MAV	592	(312)	-22.3%

5.2.5 Diversion-1(b) (Short Distance Traffic on Bangalore Chennai Expressway)

The diversion impact assessment for short distance traffic at Mahasamudram toll plaza can be estimated for zones after Kolar on west and before Vellore in the east side as shown in the Figure 5-5 & 5-6.

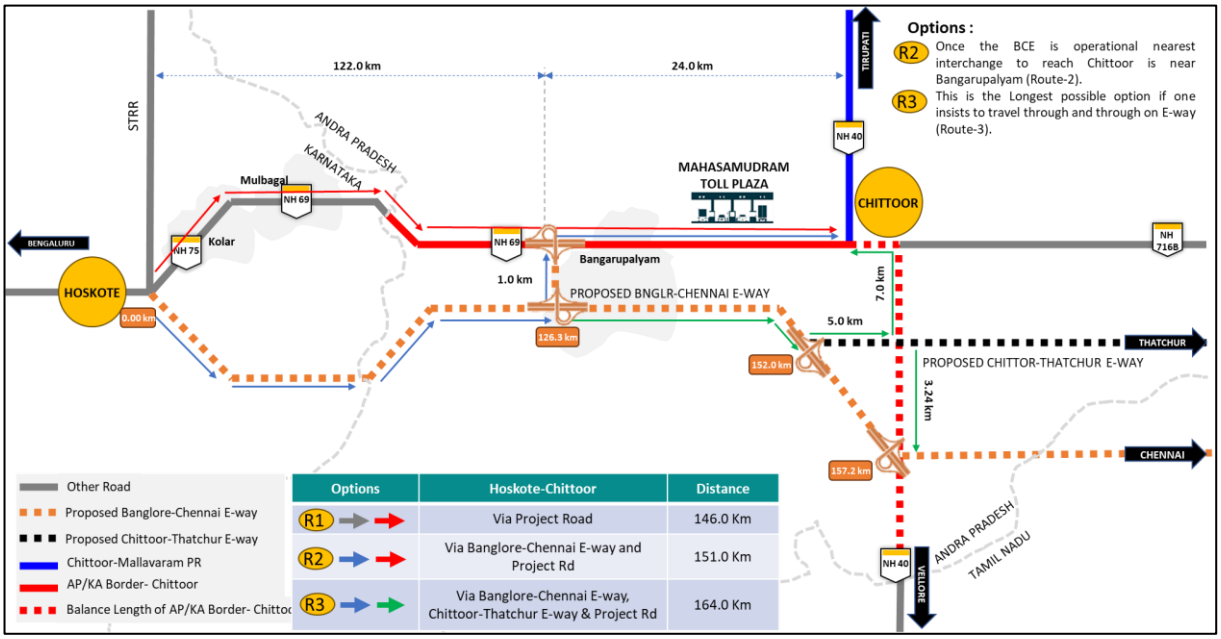


Figure 5-3 Line Diagram Showing Route Comparison for Short Distance Traffic on BCE

Network Characteristics like Length, Road configuration etc. for both PR and AR are mentioned in the below table.

Table 5-6 Hoskote-Sriperumbudur Route Comparison b/w PR & AR (Short Distance)

ROUTE COMPARISON						
YEAR	ROAD (PR or AR)	SECTION	LENGTH (KM)	Tollable Length (KM)	ROAD CONFIG	REMARKS
FY25	PR	Bangarupalyam Interchange to Chittoor to BCE/PR Interchange	34.2	84.8 (on Full Completion) Tolling length includes Normal, Bypass and Structures Actual length only	4L-Construction & 2L	
FY27	AR	Bangarupalyam (BCE) to BCE/PR Interchange	31.9	31.9	4L-E'Way	Current Status: Under Construction

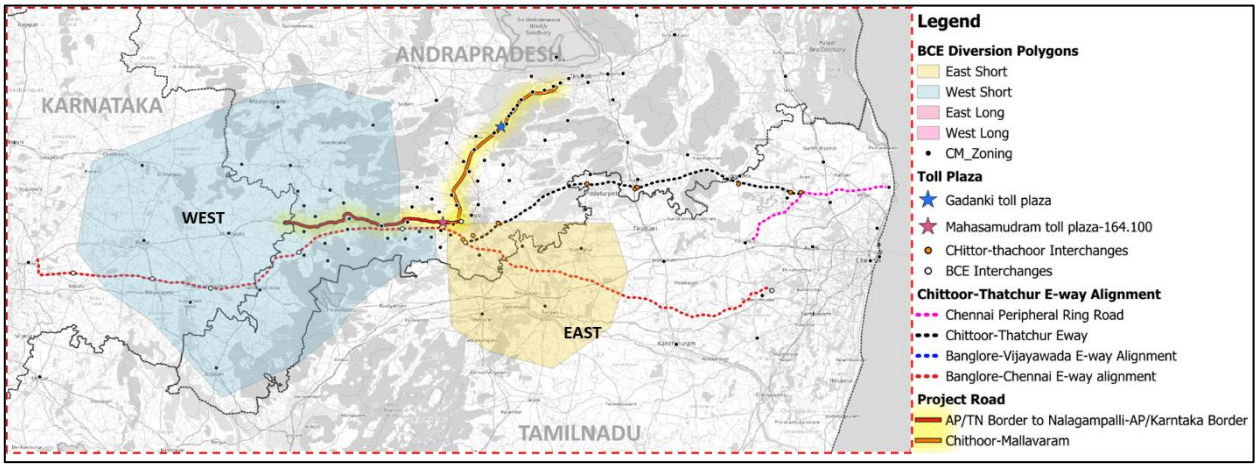


Figure 5-4 Bangalore Chennai Expressway Short Distance Traffic PDT Zones

All the Zones coming in the PIA of the proposed network development are considered and correspondingly travel demand is estimated from the potentially impacted zones. Potential Divertible traffic for the base year is mentioned below.

Table 5-7: Potential Divertible Traffic in Base year

Mode	Long Distance	Short Distance	Total
Car	1,814	151	1,965
Minibus	2	0	2
Bus-2A	58	3	60
Bus-3A	0	0	0
LCV	552	15	567
2 Axle	675	6	681
3 Axle	341	2	343
MAV	592	10	602

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the project road is estimated. Generalized cost is calculated based on the value of time (VOT) and vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic Evaluation of Highway Projects in India” and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion.

The consultant has considered that this diversion shall happen phase wise with 50% of the divertible traffic diverting in FY-27 and 100% of the divertible traffic diverting in FY-28. The table below illustrates the quantum of divertible traffic obtained, the diverted traffic considered and the percentage composition of the diverted traffic with respect to AADT.

Table 5-8: Traffic diversion from Mahasamudram toll plaza to BCE-Diversion1(b) in (FY25)

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	151	(107)	-1.0%
Bus	3	(3)	-0.2%
LCV	15	(11)	-0.9%
2 Axle	6	(5)	-0.3%
3 Axle	2	(1)	-0.2%
MAV	10	(9)	-0.6%

Table 5-9: Traffic diversion from Mahasamudram toll plaza to BCE-Diversion1(a&b) in (FY25)

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	1,965	1,096	10.1%
Bus	60	44	4.0%
LCV	567	288	25.2%
2 Axle	681	327	23.1%
3 Axle	343	183	24.4%
MAV	602	321	22.9%

5.2.6 Diversion-2(a) (Bangalore & nearby regions towards Vijayawada & further North of it)

Traffic coming from the Bangalore & nearby regions going towards Vijayawada & further North of it will have two route options available once the Bangalore-Kodikonda-Vijayawada Expressway is completely operational. The common point for both the Project Road and alternate route will be Hoskote & Addanki and the route comparison between Hoskote to Addanki via Project Road vis a-vis alternate route is described below.



Figure 5-5: Bangalore-Vijayawada Route Comparison

Network Characteristics like Length, Road configuration etc for both PR and AR are mentioned in the below table.

Table 5-10: Hoskote-Addanki Route Comparison b/w PR & AR

ROUTE COMPARISON					
YEAR	ROAD (PR or AR)	SECTION	LENGTH (KM)	ROAD CONFIG	REMARKS
FY25	PR	Hoskote to Chittoor (NH75, NH69)	146	4L	
	PR	Chittoor to Tirupati (NH140)	61	6L	
	PR	Tirupati to Renigunta (Tirupati Bypass)	16	4L	
	PR	Renigunta to Naidupeta (NH71)	59	6L	Current Status: Under Construction
	PR	Naidupeta to Addanki (NH16)	238	4L	
FY28	AR	Hoskote to Addanki (BKV)	441	6L-E'Way	Current Status: Under Construction
Total Distance Via PR(Km)			**520**		
Total Distance Via AR(Km)			**441**		

It is observed that Project Road is 79 kms longer than alternative route for Hoskote-Addanki route. Traffic zones which are considered for this part of diversion is shown below.

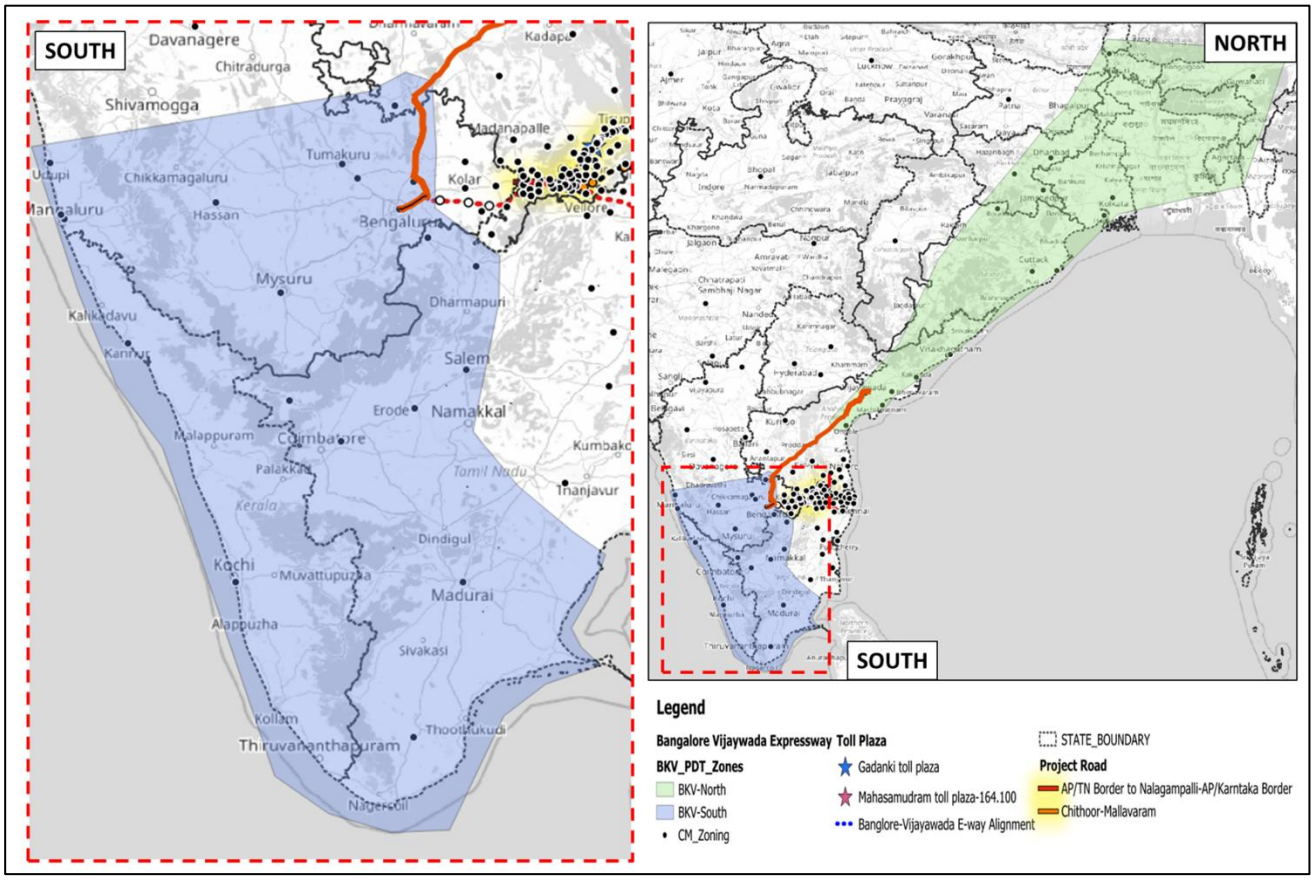


Figure 5-6: Bangalore Vijayawada zoning Scheme

Zones that are considered by consultant as North side are Ongole, Vijayawada, Visakhapatnam, Odisha, Jharkhand, West Bengal, etc., on the Figure 5-6 within pink polygon. Similarly on the southern side Hoskote, Bengaluru, Tumkuru, Mysuru, Mangalore, etc. were considered for potential divertible traffic estimation. (Zones highlighted within green polygon in Figure 5-6). All the Zones coming in the PIA of the proposed network development are considered and correspondingly travel demand is estimated from the potentially impacted zones. Potential Divertible traffic for the base year is mentioned below.

Table 5-11: Potential Divertible Traffic in Base Year (FY-25)

Mode	Gadanki TP	Mahasamudram TP
Car	253	254
Minibus	0	0
Bus-2A	48	67
Bus-3A	0	0
LCV	42	102
2 Axle	182	288
3 Axle	122	182
MAV	340	240

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the project road is estimated. Generalized cost is calculated based on the value of time (VOT) and vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic Evaluation of Highway Projects in India” and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion.

Table 5-12: Traffic Diversion from Gadanki TP to BKV (Diversion-2(a)) in FY 25

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	253	(170)	-1.5%
Bus	48	(46)	-3.2%
LCV	42	(31)	-6.7%
2 Axle	182	(146)	-16.2%
3 Axle	122	(110)	-15.4%
MAV	340	(281)	-16.9%

Table 5-13: Traffic Diversion from Mahasamudram TP to BKV (Diversion-2(a)) in FY 25

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	254	(170)	-1.6%
Bus	67	(46)	-5.8%
LCV	102	(31)	-6.6%
2 Axle	288	(146)	-16.3%
3 Axle	182	(110)	-22.0%
MAV	240	(281)	-14.1%

5.2.7 Diversion-2(b) (Bangalore Vijayawada Expressway- Kerala Bound Diversion)

Table 5-14: Potential Divertible Traffic in Base Year (FY-25)

Mode	Gadanki TP
Car	13
Minibus	0
Bus-2A	3
Bus-3A	0
LCV	8
2 Axle	28
3 Axle	41
MAV	80

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the project road is estimated. Generalized cost is calculated based on the value of time (VOT) and vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic Evaluation of Highway Projects in India” and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion.

Table 5-15: Traffic Diversion from Gadanki TP to BKV (Diversion-2(a)) in FY 25

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	13	(6.07)	-0.1%
Bus	3	(1.49)	-0.1%
LCV	8	(3.50)	-0.8%
2 Axle	28	(12.44)	-1.4%
3 Axle	41	(21.57)	-3.0%
MAV	80	(37.34)	-2.2%

The consultant has considered that this diversion shall happen phase wise with only 50% of the divertible traffic diverting in FY-28 and 100% of the divertible traffic diverting in FY-29. The table below illustrates the quantum of divertible traffic obtained, the diverted traffic considered and the percentage composition of the diverted traffic with respect to AADT.

5.2.8 Diversion-3 (Bangalore & West of Bangalore towards Thatchur & nearby regions)

Traffic coming from Bangalore & West of Bangalore towards Thatchur & nearby regions will have two route options available once the Chittoor-Thatchur expressway is completely operational. The common point for both the Project Road and alternate route will be Hoskote & Narigapalle and the route comparison between Hoskote to Narigapalle via Project Road vis a-vis alternate route is described below.

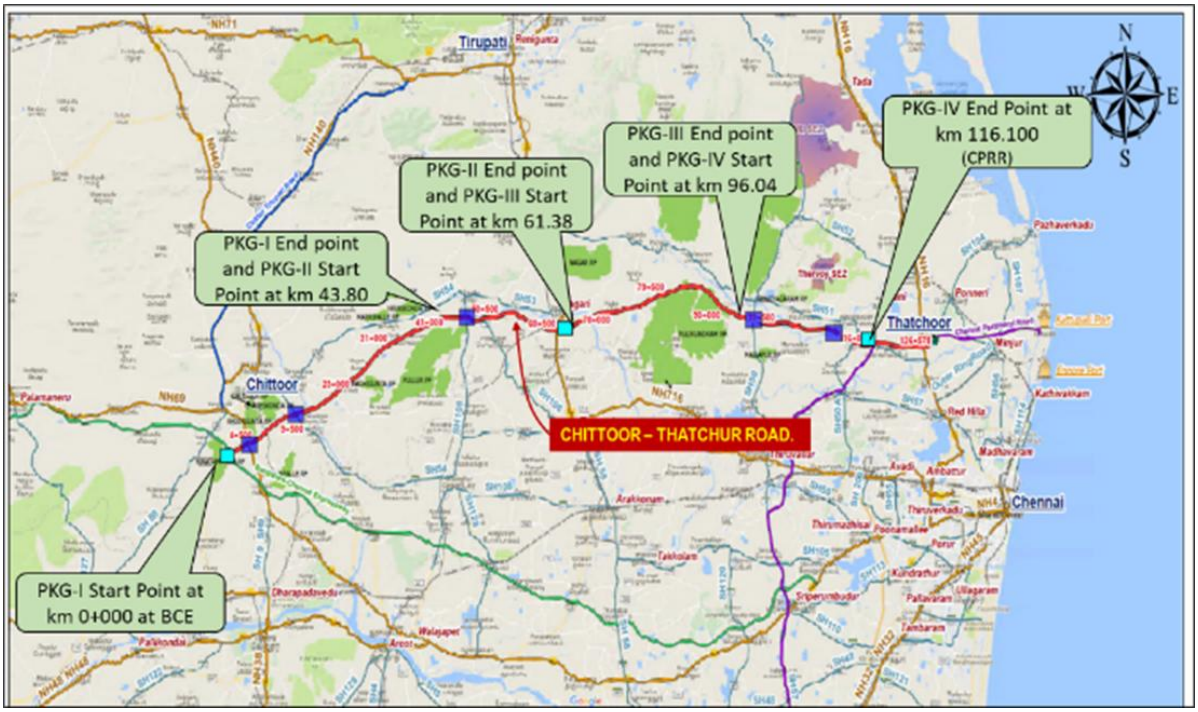


Figure 5-7: Bangalore-Thatchur Route Comparison

Network Characteristics like Length, Road configuration etc for both PR and AR are mentioned in the below table.

Table 5-16: Hoskote-Narigapalle Route Comparison b/w PR & AR

ROUTE COMPARISON					
YEAR	**ROAD (PR or AR)**	**SECTION**	**LENGTH (KM)**	**ROAD CONFIG**	**REMARKS**
FY25	PR	Hoskote to Narigapalle (NH75, NH69)	157	4L	
FY27	AR	Hoskote to CTE start point (BCE)	152	4L-E'Way	Current Status: Under Construction
	AR	CTE start point to Narigapalle (CTE)	5	6L-E'Way	
Total Distance Via PR (Km)			**157**		
Total Distance Via AR (Km)			**157**		

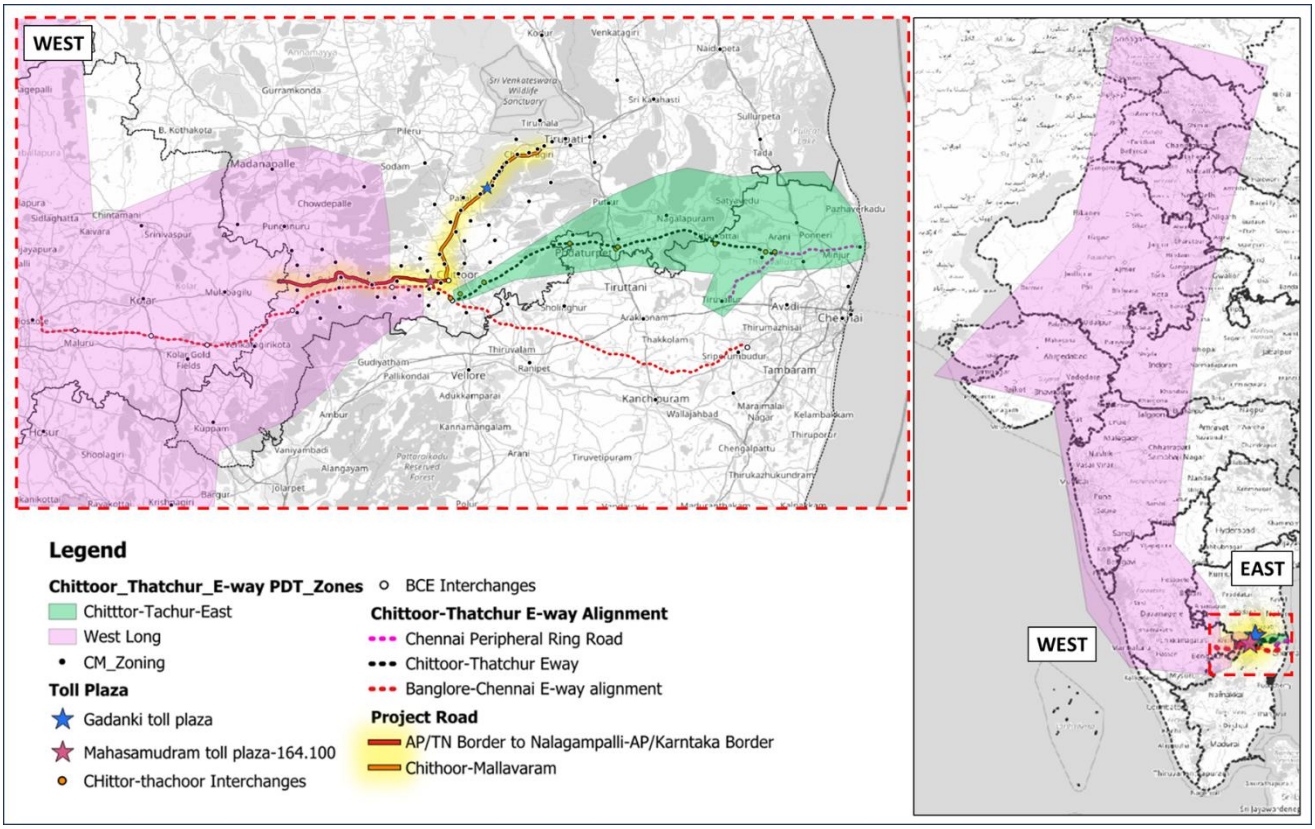


Figure 5-8: Bangalore-Thatchur zoning Scheme

It is observed that Project Road & alternative route for Bangalore to Thatchur route is almost same distance. Traffic zones which are considered for this part of diversion is shown below.

Zones that are considered by consultant on the West side are Western part of Mahasamudram in Chittoor, Kolar, Anantapur, Hindupuram, Hoskote, Bengaluru, regions to the North West of Bengaluru (like Tumkuru, Davanagare, Pune, Ahmedabad, Delhi, etc.,) are highlighted on Figure 5-7 inside green polygon. Similarly, zones considered on the eastern side are Puttur, Pichatur, Nagari, Ennore Port, Thiruvallur, etc., were considered for potential divertible traffic estimation. (Zones highlighted inside blue polygon in Figure 5-7).

Table 5-17: Potential Divertible Traffic in Base Year (FY-25)

Mode	Mahasamudram TP
Car	54
Minibus	0
Bus-2A	13
Bus-3A	0
LCV	7
2 Axle	0
3 Axle	0
MAV	6

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the project road is estimated. Generalized cost is calculated based on the value of time (VOT) and vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are

sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic Evaluation of Highway Projects in India” and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion.

The consultant has considered that this diversion shall happen phase wise with only 50% of the divertible traffic diverting in FY-27 and 100% of the divertible traffic diverting in FY-28. The table below illustrates the quantum of divertible traffic obtained, the diverted traffic considered and the percentage composition of the diverted traffic with respect to AADT.

Table 5-18: Traffic Diversion from Mahasamudram TP to CTE (Diversion-3) in FY 25

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	54	27	0.2%
Bus	13	8	0.8%
LCV	7	3	0.3%
2 Axle	0	0	0.0%
3 Axle	0	0	0.0%
MAV	6	3	0.2%

CHAPTER 6

Traffic Growth rate estimation

6. Traffic Growth Rate Estimation

6.1 Background

Demand for transport is derived demand. Derived demand is an economic term which refers demand for a good in one sector occurring because of demand from another sector. Transport users are accessing services not because of its direct benefits but because they wish to access product. Transport demand is basically movement of goods and passengers. Passengers travel to satisfy the need (work, school, college, recreation, etc.) and nobody travel just for the sake of travelling and we transport good as a part of overall economic activity. Derived demand for transportation is often difficult to estimate for future just by analysing the traffic growth in past years as it has derived from demand from some other sectors which may or may not vary in future in the same way. To consider trend in other sector and effect of the same on transport demand factors such as GDP, Primary GDP, secondary GDP, tertiary GDP, states GDP, Per Capita Income and vehicle registrations data is considered. These data are readily available as published by various organizations and more representative of growth in economy and related sectors.

The investment priorities are governed by the traffic demand, assessed benefits, and cost of the project. Demand plays the significant role, which governs the type of facility / infrastructure to be created. This in turn determines likely benefits and costs to develop the same. Prediction of traffic demand becomes an important task and must be conducted near accurately. The accurate estimation of traffic has direct bearing on the viability of project. Recognizing this, efforts were made to carefully assess all the parameters that help in predicting the traffic demand in future which necessitates realistic estimation of traffic growth rates. This chapter explains the methodology and estimation of traffic growth rates for the project for the horizon years. Traffic growth on a road facility is generally estimated based on the historical trends, in the present case traffic growth rates are estimated using Elasticity method as per IRC-108-2015 - *Guidelines for Traffic Forecast on Highways*.

6.2 Methodology

Traffic growth rate estimation follows systematic approach which is based on econometric modelling. The detailed methodology to arrive at growth rate is explained in the following sections.

6.2.1 Governing Factors for Traffic Growth

Traffic growth is governed by number of factors such as Gross National Product (GNP) or Gross Domestic Product (GDP), Agricultural output, Industrial Output which are mainly economic indicators and Population, Rural/Urban mix of population which are demographic factors. Since these indicators vary widely across the country, traffic growth rate varies from state to state, and within state from region to region. So, it is necessary to identify project influence zones and giving consideration while arriving at above indicators.

6.2.2 Determination of Past Trends

Past trend of traffic growth is key parameter in determination of future trend. Past trend of traffic can be analysed from variety of indicators such as traffic flow from census, vehicle registration and fuel sales. Vehicle registrations data is readily available as published by trusted organization is used for this study. For establishing reliable growth rates data should be taken

for considerable for number of years. The ideal way to arrive at rate of growth is through regression analysis. Once we have analysed growth in traffic, we can arrive at traffic growth in project influence area by finding out weight of different project influence areas using surveys.

6.2.3 Goods Vehicle Forecasting

Goods vehicle forecasting is done based on growth in tonnage and splits among distinct categories of vehicles. Growth in tonnage is obtained like procedure explained above. For vehicular splits base year splits were considered as benchmark and future year splits were projected based on experience and past growth trends in the same category of vehicles. Once we have tonnage and splits projections number of goods based on vehicle category and corresponding growth rate is calculated.

Traffic forecasting for project road traffic was done considering past trend in growth and analysing prospects of project influence area. Elasticity approach of growth rate estimation was used for long term traffic forecasting.

6.3 Determination of Growth Trends

Past data pertaining to the project corridor was sourced from the client. This includes traffic data for all the two toll plazas Gadanki & Mahasamudram. The findings from the data are summarized in the following subsequent sections.

6.3.1 Past Traffic Trend at All Toll Plazas

Past traffic trends were derived based on the historic traffic data provided by the client. Separate analysis was carried out for toll plaza 01 at Gadanki and toll plazas 02 at Mahasamudram, respectively. Traffic count summary, travel pattern for both passenger and goods traffic from the historic traffic data is presented below.

Table 6-1: Past Traffic Trend at Gadanki Toll Plaza (TP1)

Source	FY Year	CJV	LCV/Minibus	Bus/2Axle	3Axle	MAV	Total (Veh)	Total (PCU)	Growth
AVC	FY-2022	7,012	561	1,614	741	1,359	11,287	21,035	-
ETC	FY-2023	9,165	574	1,803	725	1,426	13,694	24,030	14.2%
ETC	FY-2024	10,153	591	2,208	730	1,605	15,288	27,077	12.7%
ETC	FY-2025*	10,275	610	2,305	705	1,641	15,536	27,605	1.9%
CAGR % (FY 23-25)		**5.9%**	**3.1%**	**13.1%**	**-1.4%**	**7.3%**	**6.5%**	**7.2%**	**-**
CAGR % (FY 22-25)		**13.6%**	**2.8%**	**12.6%**	**-1.6%**	**6.5%**	**11.2%**	**9.5%**	**-**

FY-2025 - Apr24-Nov24 Based AADT*

Table 6-2:Past Traffic Trend at Mahasamudram Toll Plaza (TP2)

Source	FY Year	CJV	LCV/Minibus	Bus/2Axle	3Axle	MAV	Total (Veh)	Total (PCU)	Growth
AVC	FY-2021	6,259	1,041	1,904	699	982	10,886	20,051	-
AVC	FY-2022	6,044	967	1,852	600	1,047	10,512	19,567	-2.4%
ETC	FY-2023	8,166	1,047	2,058	729	1,099	13,098	23,042	14.9%
ETC	FY-2024	9,207	1,065	2,307	735	1,176	14,490	25,223	9.5%
ETC	FY-2025*	9,875	1,204	2,478	738	1,387	15,683	27,575	9.3%
CAGR % (FY 23-25)		**10.0%**	**7.3%**	**9.7%**	**0.6%**	**12.3%**	**9.4%**	**9.4%**	**-**
CAGR % (FY 21-25)		**12.1%**	**3.7%**	**6.8%**	**1.4%**	**9.0%**	**9.6%**	**8.3%**	**-**

FY-2025 - Apr24-Nov24 Based AADT*

6.3.2 Project Influence Area

A study of the socio-economic profiles of the regions comprising the project influence area (PIA) provides an overview of the factors likely to influence the pattern of economic development and hence the flows and volumes of traffic on the proposed highway. The details include Population, Per-capita Income (PCI), GDP (India), GSDP (States), GDDP (Districts), Registered Vehicle population and targeted growth rates of the economy. The profiles help to generate basic inputs for the estimation of future growth in transport demand based on past scenarios, perspective changes in transport demand elasticity and economic growth rates.

The analysis of traffic pattern observed on the project road (at both the toll plaza locations) from traffic studies indicates that most of the traffic is generated from Andhra Pradesh, Karnataka, Tamil Nadu & West Bengal. Hence, the above-mentioned states have been considered as PIA zones in assessing traffic growth. Since drivers of growth for all the traffic streams would be different, these were analysed separately. In addition, truck traffic was analysed considering LCV, 2 Axle and 3 Axle, MAV separately to consider the expected changes in freight vehicle market share in future years.

Table 6-3:Project Influence Areas Impact on TP 01 – Gadanki

MODE	CAR	BUSES	TRUCKS
Andhra Pradesh	73.1%	76.9%	60.8%
Karnataka	17.5%	14.2%	19.3%
Tamil Nadu	8.6%	8.6%	10.4%
Telangana	0.1%	0.0%	0.2%
West Bengal	0.0%	0.1%	3.7%
Maharashtra	0.0%	0.0%	0.0%
Odisha	0.0%	0.0%	2.5%
Kerala	0.6%	0.1%	2.1%
Jharkhand	0.0%	0.0%	0.4%
Assam	0.0%	0.0%	0.4%
Rajasthan	0.0%	0.0%	0.0%
Goa	0.0%	0.0%	0.0%
Puducherry	0.0%	0.0%	0.1%
Delhi	0.0%	0.0%	0.0%

Table 6-4: Project Influence Areas Impact on TP 02 – Mahasamudram

MODE	CAR	BUSES	TRUCKS
Andhra Pradesh	54.9%	67.2%	37.7%
Karnataka	36.6%	29.5%	32.9%
Tamil Nadu	7.9%	3.1%	22.6%
Telangana	0.0%	0.0%	0.2%
West Bengal	0.0%	0.0%	2.4%
Maharashtra	0.1%	0.0%	1.8%
Odisha	0.1%	0.0%	1.2%
Kerala	0.2%	0.0%	0.2%
Jharkhand	0.0%	0.0%	0.4%
Assam	0.0%	0.0%	0.2%
Rajasthan	0.0%	0.0%	0.1%
Goa	0.0%	0.0%	0.1%

MODE	CAR	BUSES	TRUCKS
Puducherry	0.0%	0.0%	0.1%
Delhi	0.0%	0.2%	0.0%

6.3.3 Growth in Tonnage

To accommodate the dynamic change within the sale of goods vehicles of distinct categories in growth rate estimates, it is pragmatic to consider the overall growth of tonnage on project road at distinct locations. Once the growth of tonnage is established, tonnage share for distinct categories of trucks shall be assumed based on the past trend observed at the toll plaza locations and the potential market share of the individual truck categories with respect to the region (PIA). Using this growth in tonnage and assumed future tonnage share of distinct categories of goods vehicles the growth rate of each category will be back calculated.

To determine, growth of Historic traffic tonnage, PIA registered vehicles data was converted into total tonnage based on the historic vehicle split. The growth in payloads over the years is shown in the table below.

Table 6-5 Pay load for Different Categories

Mode	LCV	2A TRUCK	3 A TRUCK	MAV
FY-2018	5	9	16	25
FY-2019	5	11.1	17.1	28.5

6.3.4 Growth in Registered Vehicles

The growth in vehicle registrations in the project road influence region is generally a good indicator, as it is found to correlate reasonably well with traffic growth. Thus, it is possible to establish a definite trend and correlation between traffic growth and vehicle registration. To establish future traffic on the project corridor, the trend in vehicle registrations of the influencing areas, which are significantly contributing traffic to the corridor is also studied. Significant growth in registrations of car, buses and trucks has been observed in the project influence areas.

Growth in personal car is observed to be highest followed by Freight vehicles and Buses in the state of Andhra Pradesh. Compounded annual growth rate of cars, buses and trucks weighted for project area of Toll Plaza 1 at Gadanki is 9.28%, 6.08% & 5.47% respectively as shown in Table 8-4 in annexures. Similarly, for Mahasamudram TP 2 it is 9.11%, 6.43% & 4.82% respectively as shown in Table 8-5 in annexures.

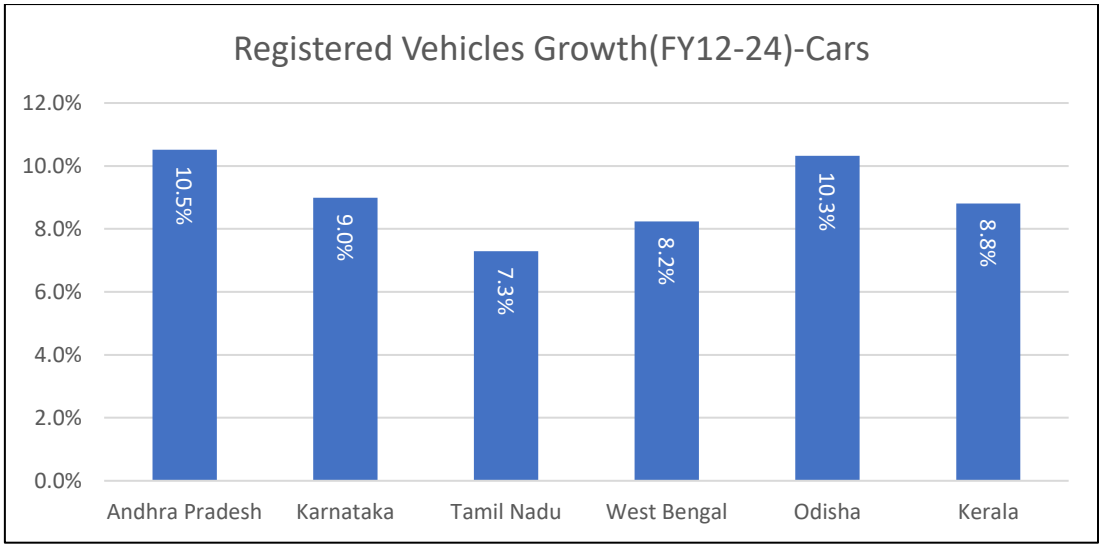


Figure 6-1: Long Term Growth Trends – Registered Cars in the PIA

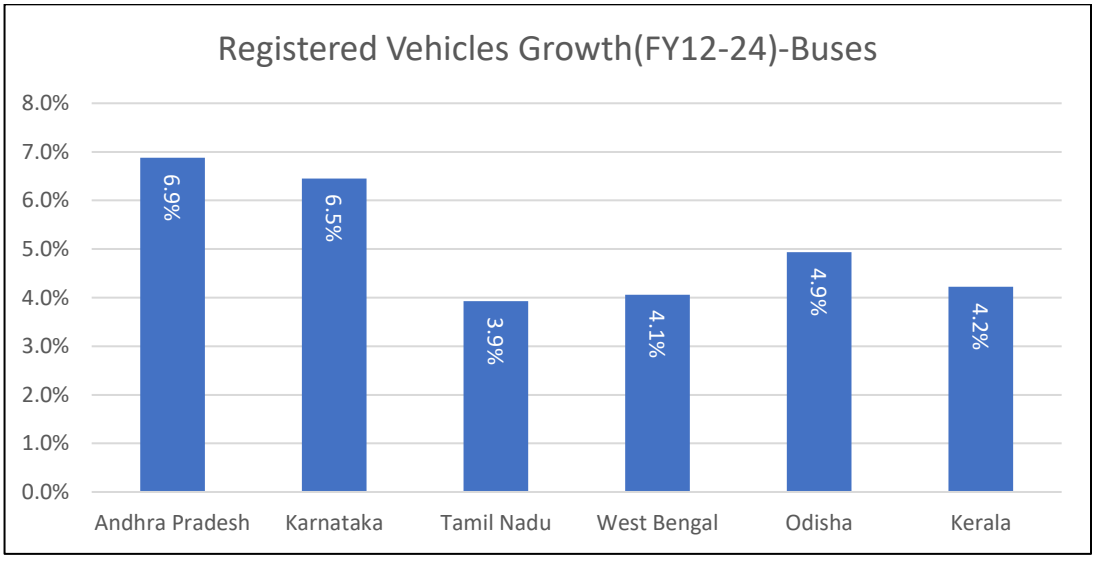


Figure 6-2: Long Term Growth Trends – Registered Buses in the PIA

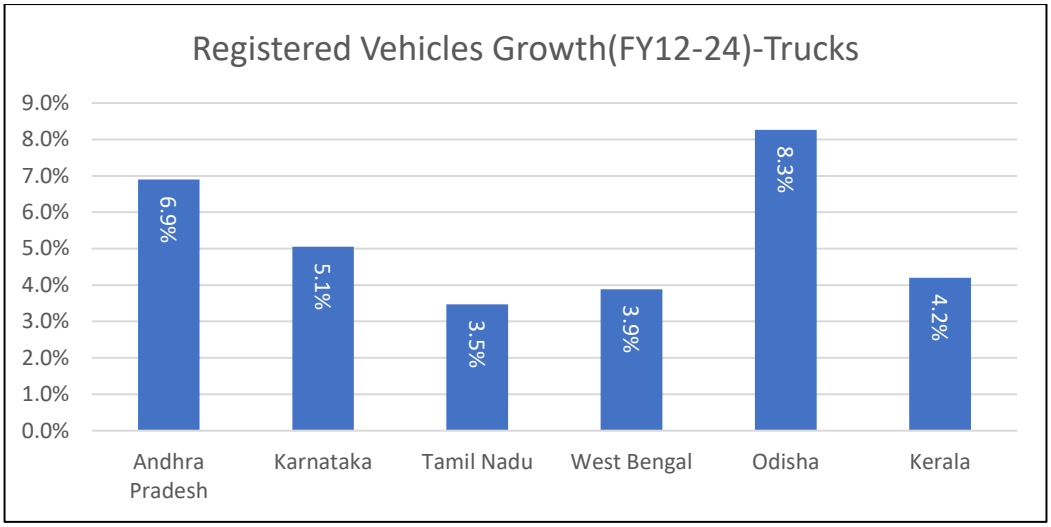


Figure 6-3 Long Term Growth Trends – Registered Trucks in the PIA

Source: MoRTH & VAHAN Database

6.3.5 Past Growth in Regional Economies

Growth of traffic on the project road depends on existing development and future growth prospects of the connecting regions. The time series data of economic indicators is one major economic variable followed in the econometric method of traffic forecasting through establishing a relationship between dependent (traffic / registered vehicles) and independent variable (GDP / GSDP / GDD) for project influence areas. Past economic growth for the PIA zones is sourced from the Central Statistical Organisation (CSO) and are presented below.

Table 6-6: GSDP for PIA zones

YEAR	Andhra Pradesh	Karnataka	Tamil Nadu	West Bengal	Odisha	Kerala
2012	3794	6060	7515	5205	2310	3640
2013	3806	6430	7918	5422	2434	3877
2014	4071	7045	8520	5585	2659	4028
2015	4446	7484	8939	5744	2707	4200
2016	4986	8313	9676	6095	2922	4512
2017	5402	9418	10368	6534	3373	4853
2018	5947	10197	11258	6950	3611	5162
2019	6266	10851	12047	7389	3867	5542
2020	6498	11514	12438	7618	3975	5592
2021	6597	11249	12447	7040	3891	5117
2022	7227	12354	13433	7874	4305	5781
2023	7647	13351	14533	8398	4646	6162
2024	8209	14232	15726	9041	5039	6464
CAGR (12-24)	**6.6%**	**7.4%**	**6.3%**	**4.7%**	**6.7%**	**4.9%**

6.3.6 Commercial Vehicles Sale Trend

Category wise commercial sales trend is presented in the below figure. From the figure it is observed that market share of 2 Axle truck and 3 Axle truck is declining from the previous Years whereas MAV market share is increasing. Due to improved road infrastructure and over

the years and due to technological advancements in commercial vehicle segments, there is a shift from 2 Axle /3 Axle trucks to MAVs.

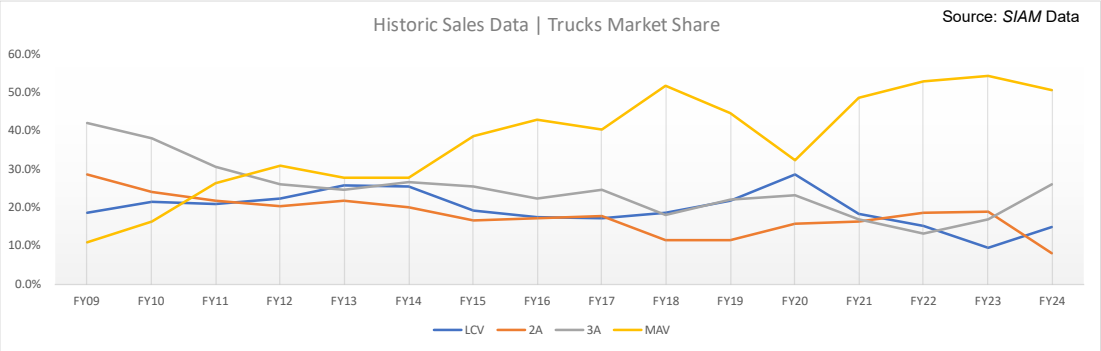


Figure 6-4: Market Share between Commercial Truck Categories

6.4 Traffic Growth Drivers

Before going to the traffic growth estimation through the established relation between economic variables and traffic variables, it is prudent to highlight the growth profile of the project corridor in terms of the geographic location and local economic growth potential. The table below summarises the major growth prospects for the traffic in the future on the project road.

Table 6-7: List of Developments in the PIA-Growth Driver

SL. NO	DEVELOPMENTS	DESCRIPTION	IMPACT TYPE
1	Tirumala - Tirupati	Tirumala typically receives more than **60,000** to **80,000** pilgrims per day. In September 2023, the temple saw a record number of over **87,000** pilgrims. The temple is one of the most visited religious sites in the world, with an annual footfall of around **30 to 40 million** visitors.	Growth Driver
2	Amara Raja Industries	Amara Raja Industries, particularly through its large-scale operations and facilities near Tirupati, plays a role in contributing to the traffic at the Mahasamudram Toll Plaza. The company's primary manufacturing plant in the region, focused on batteries and power solutions, relies on an extensive transportation network to bring in raw materials and distribute finished products.	Growth Driver
3	Vizag- Chennai Industrial Corridor (VCIC)	• Srikalahasti- Yerpedu node is situated at about 32km from project road • East Coast Industrial Corridor (ECIC) with Vizag- Chennai Industrial Corridor (VCIC) as Phase 1. a) Kopparthy Node in Andhra Pradesh	Future Growth Driver

SL. NO	DEVELOPMENTS	DESCRIPTION	IMPACT TYPE
		b) Visakhapatnam (Nakkapalli Cluster) in Andhra Pradesh c) **Chittoor Node in Andhra Pradesh**	
5	Chennai Bengaluru Industrial Corridor (CBIC)	Chennai Bengaluru Industrial Corridor (CBIC) is planned to achieve accelerated development and regional industry agglomeration in the states of Tamil Nadu, Karnataka and Andhra Pradesh. Krishnapatnam Industrial Area in Andhra Pradesh	Future Growth Driver

6.5 Transport Demand Elasticity

An Econometric method is proposed for forecasting future traffic trend based on elasticity which considers transport demand and most likely pattern of economic growth. The Elasticity Method relates traffic growth to changes in the related economic parameters. To calculate elasticity for various modes mode-wise impact of project influence area on project stretch is calculated which further useful in getting weighted GSDP values for project area. Based on individual state GDP and their mode-wise weight, weighted statistics for State GDP, registered number of vehicles, per capita income and other parameters were calculated for all the previous years. Elasticities were estimated based on regression analysis between registered vehicles & Historic AADT and all economic parameters. From the statistical significance and observations from major highways the elasticities are moderated for the base year. Base year elasticity serves as a base for moderating elasticities for the horizon years.

Plaza wise Elasticity values for each mode is estimated using the past vehicle registration data, past traffic trend with the GSDP, PCI, Population and tonnage are shown in below table.

Table 6-8: Elasticity values – Complete statistical analysis

VEHICLE TYPE	DEPENDENT VARIABLE	INDEPENDENT VARIABLE	ELASTICITY	
			TP1 – Gadanki	TP 2- Mahasamudram
Car	Registered Vehicles	PCI	1.48	1.33
Car	Registered Vehicles	GSDP	1.28	1.19
Car	Registered Vehicles	GSDP Tertiary sector	1.37	1.16
Bus	Registered Vehicles	PCI	0.93	1.03
Bus	Registered Vehicles	GSDP	0.84	0.94
Bus	Registered Vehicles	Population	9.85	10.70
Trucks	Registered Vehicles	GSDP	0.81	0.69
Trucks	Registered Vehicles	Secondary Sector GSDP	0.79	0.75
Car	AADT	PCI	1.45	1.17
Car	AADT	GSDP	1.27	1.05

VEHICLE TYPE	DEPENDENT VARIABLE	INDEPENDENT VARIABLE	ELASTICITY	
			TP1 – Gadanki	TP 2- Mahasamudram
Car	AADT	GSDP Tertiary sector	1.47	1.13
Bus	AADT	PCI	0.20	-0.16
Bus	AADT	GSDP	0.17	-0.15
Bus	AADT	Population	1.29	-2.84
Trucks	AADT	GSDP	0.65	0.54
Trucks	AADT	Secondary Sector GSDP	0.59	0.53
Trucks	Tonnage	GSDP	1.06	1.04

Elasticity values obtained from Reg vehicles are adopted for car & bus and trucks, average elasticity value obtained from the similar projects which is again moderated is considered for the traffic projections. Moderated elasticities are shown in below table.

Table 6-9: Moderated Elasticity Values for All TPs

VEHICLE TYPE	DEPENDENT VARIABLE	INDEPENDENT VARIABLE	TP1 - Gadanki	TP 2- Mahasamudram
Car	Registered Vehicles	PCI	1.05	1.05
Bus		GSDP	0.60	0.60
Trucks (Tonnage)		GSDP	0.85	0.80

Generally, the spread of economic development induces changes in the spatial distribution of activities and corresponding changes in transport demand elasticity. As regions become more self-sufficient, the need for long-distance transport diminishes. Accordingly, it was assumed that transport demand elasticity, for both freight and passenger traffic, would tend to decline over time, despite growth in per capita income.

Table 6-10: Moderated Future Elasticity Values for Car, Bus, and Trucks for All TPs

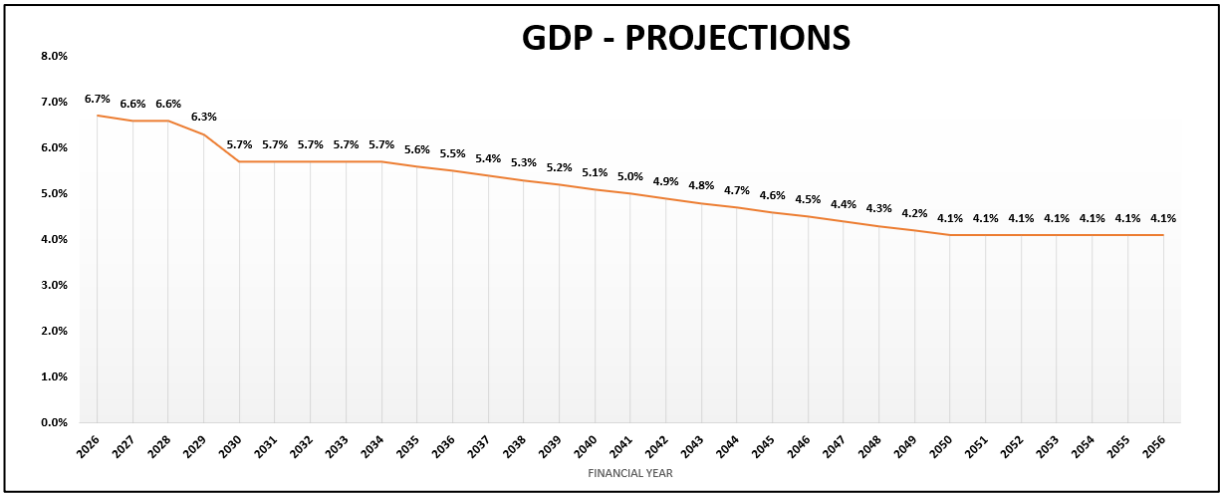
REGRESSION ANALYSIS - FUTURE ELASTICITIES			
VEHICLE TYPE	FY	Gadanki (TP 1)	Mahasamudram (TP 2)
Car	**FY 26 – FY 30**	1.05	1.05
	FY 31 – FY 35	1.00	1.00
	FY 36 – FY 40	1.00	1.00
	FY 41 – FY 45	1.00	1.00
	FY 46 – FY 50	1.00	1.00
	FY 51 – FY 55	1.00	1.00
Bus	**FY 26 – FY 30**	0.57	0.57
	FY 31 – FY 35	0.54	0.54
	FY 36 – FY 40	0.51	0.51
	FY 41 – FY 45	0.49	0.49
	FY 46 – FY 50	0.46	0.46
	FY 51 – FY 55	0.44	0.44
Trucks [GDP]	**FY 26 – FY 30**	0.85	0.80

REGRESSION ANALYSIS - FUTURE ELASTICITIES			
VEHICLE TYPE	FY	Gadanki (TP 1)	Mahasamudram (TP 2)
	FY 31 – FY 35	0.85	0.80
	FY 36 – FY 40	0.81	0.76
	FY 41 – FY 45	0.77	0.72
	FY 46 – FY 50	0.73	0.69
	FY 51 – FY 55	0.69	0.65

6.6 Future Growth of PIA

The economic impact of the 2020 coronavirus pandemic in India has been largely disruptive. The World Bank and other rating agencies had initially downgraded India's growth for fiscal year 2021 with the lowest figures India has seen in three decades since India's economic liberalization in the 1990s.

The consultant has adopted the consensus GDP provided by client for Future years. The Consultant has established a relationship between the GDP growth of India and the growth in GSDP of PIA. The same past relationship has moderated and applied to PIA states for the future GSDP Projections. The projected values of GDP of India and GSDP of PIA zones considered for the analysis is provided in the table below.



Source: Consensus GDP

Figure 6-5: GDP Projections of India – Scenario Wise

6.7 Projected Traffic Growth Rates – Normal

Based on the projected elasticity values for TP 01 and TP 02 the growth of PIA, the future average annual compound traffic growth rates by vehicle type have been estimated.

The traffic growth for the of most likely scenario is estimated and are presented in the following tables.

6.7.1 Traffic Growth Rates: TP 01 – Gadanki

The section illustrates the Normal traffic Growth rates for Gadanki Toll Plaza for Most Likely scenario.

Table 6-11: Normal Traffic Growth Rates for Toll Plaza 01 – Gadanki – Most Likely

YEAR	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV	Vehicles	PCU
FY2026	7.5%	4.3%	4.3%	4.0%	5.5%	1.1%	7.4%	6.7%	6.2%
FY2027	7.5%	4.2%	4.2%	4.0%	5.4%	1.1%	7.2%	6.7%	6.2%
FY2028	7.5%	4.2%	4.2%	4.0%	5.4%	1.2%	7.1%	6.7%	6.2%
FY2029	7.1%	4.0%	4.0%	3.7%	5.1%	1.0%	6.8%	6.4%	5.9%
FY2030	6.4%	3.6%	3.6%	3.1%	4.5%	1.6%	5.9%	5.8%	5.3%
FY2031	6.1%	3.4%	3.4%	3.0%	4.4%	2.6%	5.8%	5.6%	5.2%
FY2032	6.2%	3.4%	3.4%	3.0%	4.4%	2.6%	5.8%	5.6%	5.3%
FY2033	6.2%	3.4%	3.4%	3.0%	4.4%	2.6%	5.8%	5.6%	5.3%
FY2034	6.2%	3.4%	3.4%	3.0%	4.4%	2.6%	5.8%	5.7%	5.3%
FY2035	5.9%	3.2%	3.2%	2.8%	4.2%	2.4%	5.6%	5.4%	5.0%
FY2036	5.7%	3.0%	3.0%	2.9%	3.9%	2.5%	5.1%	5.2%	4.8%
FY2037	5.3%	2.9%	2.9%	2.9%	3.8%	2.4%	5.0%	4.9%	4.6%
FY2038	5.2%	2.9%	2.9%	2.8%	3.7%	2.3%	4.9%	4.8%	4.5%
FY2039	5.1%	2.8%	2.8%	2.7%	3.6%	2.3%	4.9%	4.7%	4.4%
FY2040	5.0%	2.8%	2.8%	2.6%	3.6%	2.2%	4.8%	4.6%	4.4%
FY2041	4.9%	2.6%	2.6%	2.3%	3.3%	1.9%	4.4%	4.5%	4.2%
FY2042	4.8%	2.5%	2.5%	2.2%	3.2%	1.8%	4.4%	4.4%	4.1%
FY2043	4.7%	2.5%	2.5%	2.2%	3.1%	1.7%	4.3%	4.3%	4.0%
FY2044	4.6%	2.4%	2.4%	2.1%	3.0%	1.7%	4.2%	4.2%	3.9%
FY2045	4.5%	2.4%	2.4%	2.0%	2.9%	1.6%	4.1%	4.1%	3.8%
FY2046	4.4%	2.2%	2.2%	2.0%	2.8%	1.6%	3.7%	4.0%	3.7%
FY2047	4.3%	2.2%	2.2%	1.9%	2.7%	1.6%	3.7%	3.9%	3.6%
FY2048	4.1%	2.1%	2.1%	1.9%	2.6%	1.5%	3.6%	3.8%	3.5%
FY2049	4.0%	2.1%	2.1%	1.8%	2.6%	1.4%	3.5%	3.7%	3.4%

YEAR	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV	Vehicles	PCU
FY2050	3.9%	2.0%	2.0%	1.7%	2.5%	1.3%	3.4%	3.6%	3.3%
FY2051	3.9%	1.9%	1.9%	1.6%	2.3%	1.2%	3.2%	3.6%	3.3%
FY2052	3.9%	1.9%	1.9%	1.6%	2.3%	1.2%	3.2%	3.6%	3.3%
FY2053	3.9%	1.9%	1.9%	1.6%	2.3%	1.2%	3.2%	3.6%	3.3%
FY2054	3.9%	1.9%	1.9%	1.6%	2.3%	1.2%	3.2%	3.6%	3.3%
FY2055	3.9%	1.9%	1.9%	1.6%	2.3%	1.2%	3.2%	3.6%	3.3%
FY2056	3.9%	1.8%	1.8%	1.5%	2.3%	1.2%	3.2%	3.6%	3.3%

6.7.2 Traffic Growth Rates: TP 02 – Mahasamudram

The section illustrates the Normal traffic Growth rates for Mahasamudram Toll Plaza for Most Likely scenario.

Table 6-12: Normal Traffic Growth Rates for Toll Plaza 02 – Mahasamudram – Most Likely

YEAR	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV	Vehicles	PCU
FY2026	7.5%	4.4%	4.4%	3.5%	4.7%	0.6%	8.1%	6.5%	6.1%
FY2027	7.5%	4.3%	4.3%	3.4%	4.7%	0.7%	7.8%	6.5%	6.0%
FY2028	7.5%	4.3%	4.3%	3.4%	4.7%	0.8%	7.6%	6.6%	6.1%
FY2029	7.2%	4.1%	4.1%	3.2%	4.4%	0.6%	7.2%	6.3%	5.8%
FY2030	6.5%	3.7%	3.7%	2.6%	3.9%	1.2%	6.3%	5.6%	5.2%
FY2031	6.1%	3.5%	3.5%	2.5%	3.5%	2.1%	6.2%	5.4%	5.0%
FY2032	6.2%	3.5%	3.5%	2.5%	3.5%	2.1%	6.1%	5.5%	5.1%
FY2033	6.2%	3.5%	3.5%	2.5%	3.5%	2.1%	6.1%	5.5%	5.1%
FY2034	6.2%	3.5%	3.5%	2.5%	3.5%	2.1%	6.1%	5.5%	5.1%
FY2035	5.9%	3.3%	3.3%	2.4%	3.4%	2.0%	5.9%	5.3%	4.9%
FY2036	5.7%	3.0%	3.0%	2.5%	3.2%	2.2%	5.3%	5.1%	4.7%
FY2037	5.3%	3.0%	3.0%	2.4%	3.1%	2.1%	5.2%	4.8%	4.5%
FY2038	5.2%	2.9%	2.9%	2.3%	3.0%	2.0%	5.1%	4.7%	4.4%
FY2039	5.1%	2.9%	2.9%	2.2%	3.0%	1.9%	5.0%	4.6%	4.3%

YEAR	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV	Vehicles	PCU
FY2040	5.0%	2.8%	2.8%	2.1%	2.9%	1.8%	4.9%	4.5%	4.2%
FY2041	4.9%	2.6%	2.6%	1.9%	2.6%	1.6%	4.6%	4.4%	4.0%
FY2042	4.8%	2.6%	2.6%	1.8%	2.5%	1.5%	4.5%	4.3%	4.0%
FY2043	4.7%	2.5%	2.5%	1.7%	2.4%	1.4%	4.4%	4.2%	3.9%
FY2044	4.6%	2.5%	2.5%	1.6%	2.4%	1.3%	4.3%	4.1%	3.8%
FY2045	4.5%	2.4%	2.4%	1.6%	2.3%	1.3%	4.2%	4.0%	3.7%
FY2046	4.3%	2.2%	2.2%	1.6%	2.3%	1.2%	3.8%	3.9%	3.6%
FY2047	4.2%	2.2%	2.2%	1.5%	2.2%	1.1%	3.7%	3.8%	3.5%
FY2048	4.1%	2.1%	2.1%	1.4%	2.1%	1.0%	3.7%	3.7%	3.4%
FY2049	4.0%	2.1%	2.1%	1.3%	2.1%	1.0%	3.6%	3.6%	3.3%
FY2050	3.9%	2.0%	2.0%	1.3%	2.0%	0.9%	3.5%	3.5%	3.2%
FY2051	3.9%	1.9%	1.9%	1.1%	1.8%	0.8%	3.3%	3.5%	3.2%
FY2052	3.9%	1.9%	1.9%	1.1%	1.8%	0.8%	3.3%	3.5%	3.2%
FY2053	3.9%	1.9%	1.9%	1.1%	1.8%	0.8%	3.3%	3.5%	3.2%
FY2054	3.9%	1.9%	1.9%	1.1%	1.8%	0.8%	3.3%	3.5%	3.2%
FY2055	3.9%	1.9%	1.9%	1.1%	1.8%	0.8%	3.3%	3.5%	3.2%
FY2056	3.9%	1.8%	1.8%	1.1%	1.8%	0.7%	3.2%	3.5%	3.2%

6.8 Projected Traffic Growth Rates – Effective

There are some developments in road and land use pattern surrounding project stretch which were detailed in the “diversion & Development Traffic Impact Assessment” chapter. Effective traffic growth rates include the normal traffic projections and the impacts of diversions and developments in the PIA which are detailed in the chapter “Diversion and Development Traffic Impact Assessment”. Considering the significance of the effective growth rates, the future traffic projections and associated toll revenue estimations are provided in the next chapter “Traffic and Toll Revenue Forecast.”

6.8.1 Traffic Growth Rates: TP 01 – Gadanki

The section illustrates the Effective traffic Growth rates for Gadanki Toll Plaza for Most Likely scenario.

Table 6-13: Effective Traffic Growth Rates for Toll Plaza 01 – Gadanki – Most Likely

YEAR	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV	Vehicles	PCU
FY2026	7.5%	4.3%	4.3%	0.0%	4.0%	5.5%	1.1%	6.7%	6.2%
FY2027	7.5%	4.2%	4.2%	0.0%	4.0%	5.4%	1.1%	6.7%	6.2%
FY2028	6.6%	4.2%	2.5%	0.0%	0.1%	-3.9%	-8.1%	6.7%	6.2%
FY2029	6.3%	4.0%	2.3%	0.0%	-0.3%	-5.1%	-9.3%	6.4%	5.9%
FY2030	6.4%	3.6%	3.6%	0.0%	3.1%	4.5%	1.6%	5.8%	5.3%
FY2031	6.1%	3.4%	3.4%	0.0%	3.0%	4.4%	2.6%	5.6%	5.2%
FY2032	6.2%	3.4%	3.4%	0.0%	3.0%	4.4%	2.6%	5.6%	5.3%
FY2033	6.2%	3.4%	3.4%	0.0%	3.0%	4.4%	2.6%	5.6%	5.3%
FY2034	6.2%	3.4%	3.4%	0.0%	3.0%	4.4%	2.6%	5.7%	5.3%
FY2035	5.9%	3.2%	3.2%	0.0%	2.8%	4.2%	2.4%	5.4%	5.0%
FY2036	5.7%	3.0%	3.0%	0.0%	2.9%	3.9%	2.5%	5.2%	4.8%
FY2037	5.3%	2.9%	2.9%	0.0%	2.9%	3.8%	2.4%	4.9%	4.6%
FY2038	5.2%	2.9%	2.9%	0.0%	2.8%	3.7%	2.3%	4.8%	4.5%
FY2039	5.1%	2.8%	2.8%	0.0%	2.7%	3.6%	2.3%	4.7%	4.4%
FY2040	5.0%	2.8%	2.8%	0.0%	2.6%	3.5%	2.2%	4.6%	4.4%
FY2041	4.9%	2.6%	2.6%	0.0%	2.3%	3.2%	1.9%	4.5%	4.2%
FY2042	4.8%	2.5%	2.5%	0.0%	2.2%	3.2%	1.8%	4.4%	4.1%
FY2043	4.7%	2.5%	2.5%	0.0%	2.2%	3.1%	1.7%	4.3%	4.0%
FY2044	4.6%	2.4%	2.4%	0.0%	2.1%	3.0%	1.6%	4.2%	3.9%
FY2045	4.5%	2.4%	2.4%	0.0%	2.0%	2.9%	1.6%	4.1%	3.8%
FY2046	4.4%	2.2%	2.2%	0.0%	2.0%	2.8%	1.6%	4.0%	3.7%
FY2047	4.3%	2.2%	2.2%	0.0%	1.9%	2.7%	1.6%	3.9%	3.6%
FY2048	4.2%	2.1%	2.1%	0.0%	1.9%	2.6%	1.5%	3.8%	3.5%
FY2049	4.0%	2.1%	2.1%	0.0%	1.8%	2.5%	1.4%	3.7%	3.4%
FY2050	3.9%	2.0%	2.0%	0.0%	1.7%	2.5%	1.3%	3.6%	3.3%
FY2051	3.9%	1.9%	1.9%	0.0%	1.6%	2.3%	1.2%	3.6%	3.3%
FY2052	3.9%	1.9%	1.9%	0.0%	1.6%	2.3%	1.2%	3.6%	3.3%
FY2053	3.9%	1.9%	1.9%	0.0%	1.6%	2.3%	1.2%	3.6%	3.3%

YEAR	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV	Vehicles	PCU
FY2054	3.9%	1.9%	1.9%	0.0%	1.6%	2.3%	1.2%	3.6%	3.3%
FY2055	3.9%	1.9%	1.9%	0.0%	1.6%	2.3%	1.2%	3.6%	3.3%
FY2056	3.9%	1.8%	1.8%	0.0%	1.5%	2.2%	1.2%	3.6%	3.3%

6.8.2 Traffic Growth Rates: TP 02 – Mahasamudram

The section illustrates the Effective traffic Growth rates for Mahasamudram Toll Plaza for Most Likely scenario.

Table 6-14: Effective Traffic Growth Rates for Toll Plaza 02 – Mahasamudram – Most Likely

YEAR	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV	Vehicles	PCU
FY2026	7.5%	4.4%	4.4%	0.0%	3.5%	4.7%	0.6%	6.5%	6.1%
FY2027	2.0%	3.5%	1.9%	0.0%	-9.7%	-7.1%	-11.3%	-0.6%	-2.4%
FY2028	0.9%	3.5%	-1.3%	0.0%	-15.5%	-18.1%	-25.4%	-3.9%	-8.0%
FY2029	6.4%	4.1%	0.9%	0.0%	-1.4%	-7.0%	-15.5%	3.5%	0.7%
FY2030	6.5%	3.7%	3.7%	0.0%	2.5%	3.8%	1.2%	5.8%	5.4%
FY2031	6.1%	3.5%	3.5%	0.0%	2.4%	3.5%	2.1%	5.5%	5.1%
FY2032	6.2%	3.5%	3.5%	0.0%	2.5%	3.5%	2.1%	5.6%	5.2%
FY2033	6.2%	3.5%	3.5%	0.0%	2.5%	3.5%	2.1%	5.6%	5.2%
FY2034	6.2%	3.5%	3.5%	0.0%	2.5%	3.5%	2.1%	5.6%	5.2%
FY2035	6.0%	3.3%	3.3%	0.0%	2.4%	3.4%	2.0%	5.4%	5.0%
FY2036	5.7%	3.0%	3.0%	0.0%	2.4%	3.2%	2.1%	5.2%	4.8%
FY2037	5.3%	3.0%	3.0%	0.0%	2.4%	3.1%	2.1%	4.9%	4.6%
FY2038	5.2%	2.9%	2.9%	0.0%	2.3%	3.0%	2.0%	4.8%	4.5%
FY2039	5.1%	2.9%	2.9%	0.0%	2.2%	2.9%	1.9%	4.7%	4.4%
FY2040	4.5%	2.7%	2.3%	0.0%	2.2%	2.9%	1.7%	4.2%	4.0%
FY2041	4.9%	2.6%	2.6%	0.0%	1.9%	2.5%	1.6%	4.5%	4.1%
FY2042	5.3%	2.7%	3.1%	0.0%	1.7%	2.3%	1.7%	4.8%	4.4%
FY2043	4.7%	2.5%	2.5%	0.0%	1.7%	2.4%	1.4%	4.3%	4.0%

YEAR	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV	Vehicles	PCU
FY2044	4.6%	2.5%	2.5%	0.0%	1.7%	2.3%	1.3%	4.2%	3.9%
FY2045	4.5%	2.4%	2.4%	0.0%	1.6%	2.2%	1.2%	4.1%	3.8%
FY2046	4.4%	2.2%	2.2%	0.0%	1.6%	2.2%	1.2%	4.0%	3.6%
FY2047	4.3%	2.2%	2.2%	0.0%	1.5%	2.2%	1.1%	3.9%	3.6%
FY2048	4.1%	2.1%	2.2%	0.0%	1.4%	2.1%	1.0%	3.8%	3.5%
FY2049	4.0%	2.1%	2.1%	0.0%	1.3%	2.0%	1.0%	3.7%	3.4%
FY2050	3.9%	2.0%	2.1%	0.0%	1.3%	2.0%	0.9%	3.6%	3.3%
FY2051	3.9%	1.9%	1.9%	0.0%	1.1%	1.8%	0.8%	3.6%	3.3%
FY2052	3.9%	1.9%	1.9%	0.0%	1.1%	1.8%	0.8%	3.6%	3.3%
FY2053	3.9%	1.9%	1.9%	0.0%	1.1%	1.8%	0.8%	3.6%	3.3%
FY2054	3.9%	1.9%	1.9%	0.0%	1.1%	1.8%	0.7%	3.6%	3.3%
FY2055	3.9%	1.9%	1.9%	0.0%	1.1%	1.8%	0.8%	3.6%	3.3%
FY2056	3.9%	1.8%	1.9%	0.0%	1.1%	1.8%	0.7%	3.6%	3.3%

CHAPTER 7

Traffic and Toll Revenue Forecast

7. Traffic & Toll Revenue Forecast

7.1 General

This chapter presents estimates of total traffic for all the two toll plazas of project corridor with Most likely scenario as explained in previous chapter. Normal traffic projections have arrived by applying the traffic growth rates on the base year traffic. Effective traffic projection has arrived by considering the future adjustments in the form of diversions and developments detailed in the Chapter “Diversion and Development Traffic Impact assessment” in overall traffic growth estimate.

7.2 Effective Traffic Projections at Gadanki (TP 1)

Effective traffic projections include the impact of road network improvement and land developments (if any). Traffic beyond year FY 2025 is summaries based on effective traffic growth rates and base year AADT. Mode wise traffic projection for Most likely Scenario for all the horizon years for Gadanki (TP 1) are estimated and effective future traffic is as shown in below table.

Table 7-1: Effective Future Traffic (AADT): Gadanki (TP 1) – Most Likely

YEAR	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	TOTAL VEH	TOTAL PCU
FY2025	11,487	168	1,441	0	462	905	714	1,665	16,843	29,107
FY2026	12,344	175	1,503	0	481	954	722	1,789	17,968	30,915
FY2027	13,264	183	1,566	0	500	1,006	729	1,918	19,167	32,824
FY2028	14,145	191	1,606	0	501	967	670	1,858	19,936	33,269
FY2029	15,034	198	1,643	0	499	918	608	1,773	20,672	33,563
FY2030	15,998	205	1,702	0	514	959	618	1,878	21,874	35,364
FY2031	16,973	212	1,760	0	530	1,001	633	1,987	23,097	37,212
FY2032	18,023	220	1,820	0	545	1,045	650	2,102	24,405	39,175
FY2033	19,139	227	1,882	0	562	1,091	666	2,224	25,790	41,247
FY2034	20,323	235	1,946	0	578	1,138	683	2,352	27,257	43,432
FY2035	21,521	242	2,010	0	594	1,185	700	2,483	28,735	45,632
FY2036	22,753	250	2,070	0	612	1,231	717	2,610	30,243	47,845
FY2037	23,962	257	2,131	0	629	1,278	735	2,742	31,733	50,058
FY2038	25,209	265	2,193	0	647	1,325	752	2,877	33,267	52,330
FY2039	26,494	272	2,255	0	664	1,373	769	3,016	34,843	54,660
FY2040	27,818	280	2,318	0	681	1,421	785	3,159	36,462	57,048
FY2041	29,177	287	2,378	0	697	1,467	800	3,299	38,106	59,435
FY2042	30,573	294	2,438	0	713	1,514	815	3,442	39,789	61,873
FY2043	32,003	301	2,499	0	728	1,560	829	3,589	41,509	64,359
FY2044	33,467	309	2,560	0	743	1,607	842	3,738	43,265	66,891
FY2045	34,962	316	2,621	0	758	1,654	855	3,890	45,056	69,468
FY2046	36,487	323	2,679	0	773	1,699	870	4,035	46,866	72,032
FY2047	38,040	330	2,737	0	788	1,745	883	4,182	48,705	74,631
FY2048	39,619	337	2,795	0	803	1,791	896	4,330	50,572	77,262
FY2049	41,221	344	2,853	0	818	1,836	909	4,481	52,462	79,922
FY2050	42,846	351	2,911	0	832	1,881	921	4,633	54,374	82,607
FY2051	44,533	358	2,967	0	845	1,924	932	4,783	56,341	85,328
FY2052	46,288	365	3,024	0	858	1,969	943	4,937	58,382	88,143
FY2053	48,111	372	3,082	0	871	2,014	954	5,096	60,500	91,056

YEAR	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	TOTAL VEH	TOTAL PCU
FY2054	50,007	379	3,141	0	885	2,060	965	5,260	62,697	94,071
FY2055	51,977	386	3,201	0	899	2,108	977	5,428	64,976	97,190
FY2056	54,025	393	3,260	0	912	2,155	988	5,600	67,333	1,00,390

7.3 Effective Traffic Projections at Mahasamudram (TP 2)

Effective traffic projections include the impact of road network improvement and land developments (if any). Traffic beyond year FY 2025 is summaries based on effective traffic growth rates and base year AADT. Scenario wise and Mode wise traffic projection for all the horizon years for Mahasamudram (TP 2) are estimated and effective future traffic is shown in below table.

Table 7-2: Effective Future Traffic (AADT): Mahasamudram (TP 2) – Most Likely

YEAR	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	TOTAL VEH	TOTAL PCU
FY2025	10,862	93	1,088	0	1,143	1,420	748	1,401	16,754	28,788
FY2026	11,680	97	1,135	0	1,183	1,487	753	1,515	17,849	30,541
FY2027	11,918	101	1,156	0	1,068	1,382	668	1,452	17,745	29,823
FY2028	12,026	104	1,141	0	902	1,131	498	1,244	17,046	27,443
FY2029	12,798	109	1,152	0	889	1,053	421	1,217	17,637	27,645
FY2030	13,630	113	1,194	0	912	1,093	426	1,293	18,661	29,124
FY2031	14,464	116	1,236	0	934	1,131	435	1,373	19,689	30,623
FY2032	15,361	120	1,279	0	957	1,171	444	1,457	20,789	32,212
FY2033	16,315	125	1,323	0	980	1,212	453	1,546	21,953	33,891
FY2034	17,329	129	1,368	0	1,005	1,254	462	1,639	23,187	35,660
FY2035	18,361	133	1,414	0	1,029	1,296	472	1,735	24,439	37,455
FY2036	19,413	137	1,457	0	1,053	1,337	482	1,827	25,706	39,247
FY2037	20,446	141	1,500	0	1,078	1,378	492	1,923	26,958	41,037
FY2038	21,514	145	1,544	0	1,103	1,419	501	2,021	28,248	42,874
FY2039	22,614	150	1,588	0	1,127	1,460	511	2,121	29,572	44,754
FY2040	23,630	154	1,625	0	1,152	1,503	519	2,225	30,808	46,542

YEAR	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	TOTAL VEH	TOTAL PCU
FY2041	24,790	158	1,667	0	1,173	1,541	528	2,327	32,184	48,465
FY2042	26,107	162	1,719	0	1,194	1,576	536	2,431	33,725	50,575
FY2043	27,327	166	1,763	0	1,214	1,614	544	2,538	35,165	52,577
FY2044	28,575	170	1,806	0	1,234	1,651	551	2,647	36,634	54,616
FY2045	29,849	174	1,850	0	1,254	1,688	558	2,758	38,130	56,688
FY2046	31,150	178	1,892	0	1,273	1,726	564	2,863	39,646	58,755
FY2047	32,474	182	1,933	0	1,292	1,763	570	2,970	41,185	60,849
FY2048	33,819	186	1,975	0	1,310	1,800	576	3,078	42,745	62,967
FY2049	35,184	190	2,016	0	1,328	1,836	582	3,187	44,323	65,105
FY2050	36,568	194	2,058	0	1,345	1,872	587	3,298	45,921	67,265
FY2051	38,007	197	2,098	0	1,360	1,906	592	3,407	47,567	69,459
FY2052	39,503	201	2,138	0	1,375	1,940	596	3,519	49,273	71,726
FY2053	41,059	205	2,180	0	1,391	1,974	601	3,634	51,044	74,073
FY2054	42,676	209	2,223	0	1,406	2,010	605	3,753	52,881	76,500
FY2055	44,354	213	2,266	0	1,422	2,046	610	3,876	54,785	79,010
FY2056	46,097	217	2,308	0	1,438	2,082	614	3,999	56,755	81,588

7.4 Traffic Comparison for All TPS

The table below illustrates the traffic comparison in terms of Vehicles and PCUs for each toll plaza for Most Likely scenario. The average of both toll plazas is also presented for the purpose of calculation of capacity of the project highway.

Table 7-3: Traffic comparison by Vehicles and PCU – Most Likely – TP 01

FY	VEHICLES		PCU	
	NORMAL TRAFFIC	EFFECTIVE TRAFFIC	NORMAL TRAFFIC	EFFECTIVE TRAFFIC
FY2025	16,843	16,843	29,107	29,107
FY2026	17,968	17,968	30,915	30,915
FY2027	19,167	19,167	32,824	32,824
FY2028	20,449	19,936	34,857	33,269
FY2029	21,755	20,672	36,917	33,563
FY2030	23,011	21,874	38,886	35,364
FY2031	24,291	23,097	40,913	37,212
FY2032	25,660	24,405	43,065	39,175
FY2033	27,108	25,790	45,335	41,247
FY2034	28,642	27,257	47,730	43,432
FY2035	30,187	28,735	50,140	45,632
FY2036	31,762	30,243	52,561	47,845
FY2037	33,319	31,733	54,985	50,058
FY2038	34,923	33,267	57,474	52,330
FY2039	36,571	34,843	60,028	54,660
FY2040	38,263	36,462	62,644	57,048
FY2041	39,978	38,106	65,253	59,435
FY2042	41,734	39,789	67,917	61,873
FY2043	43,528	41,509	70,634	64,359
FY2044	45,360	43,265	73,401	66,891
FY2045	47,227	45,056	76,214	69,468
FY2046	49,112	46,866	79,008	72,032
FY2047	51,027	48,705	81,839	74,631
FY2048	52,969	50,572	84,705	77,262
FY2049	54,937	52,462	87,601	79,922
FY2050	56,927	54,374	90,524	82,607
FY2051	58,971	56,341	93,479	85,328
FY2052	61,092	58,382	96,536	88,143
FY2053	63,291	60,500	99,697	91,056
FY2054	65,573	62,697	1,02,967	94,071
FY2055	67,940	64,976	1,06,350	97,190
FY2056	70,385	67,333	1,09,816	1,00,390
CAGR (25-46)	**5.23%**	**4.99%**	**4.87%**	**4.41%**
CAGR (25-56)	**4.72%**	**4.57%**	**4.38%**	**4.07%**

At Gadanki Toll Plaza, the Normal Traffic PCU Growth (CAGR) observed between FY-25 and FY-46 is 4.87%. Effective traffic growth for the same period is 4.41%. similarly, Normal Traffic (PCU) CAGR (FY 25-56) at GADANKI TP is estimated to be 4.38% and the effective Traffic (PCU) observed CAGR of 4.07% over the concession period.

Table 7-4: Traffic comparison by Vehicles and PCU – Most Likely – TP 02

FY	VEHICLES		PCU	
	NORMAL TRAFFIC	EFFECTIVE TRAFFIC	NORMAL TRAFFIC	EFFECTIVE TRAFFIC
FY2025	16,754	16,754	28,788	28,788
FY2026	17,849	17,849	30,541	30,541
FY2027	19,014	17,745	32,388	29,823
FY2028	20,260	17,046	34,352	27,443
FY2029	21,527	17,637	36,338	27,645
FY2030	22,741	18,661	38,231	29,124
FY2031	23,965	19,689	40,158	30,623
FY2032	25,272	20,789	42,200	32,212
FY2033	26,655	21,953	44,351	33,891
FY2034	28,116	23,187	46,617	35,660
FY2035	29,602	24,439	48,916	37,455
FY2036	31,103	25,706	51,206	39,247
FY2037	32,588	26,958	53,497	41,037
FY2038	34,114	28,248	55,847	42,874
FY2039	35,682	29,572	58,254	44,754
FY2040	37,290	30,808	60,716	46,542
FY2041	38,916	32,184	63,167	48,465
FY2042	40,579	33,725	65,666	50,575
FY2043	42,277	35,165	68,211	52,577
FY2044	44,008	36,634	70,799	54,616
FY2045	45,769	38,130	73,428	56,688
FY2046	47,549	39,646	76,040	58,755
FY2047	49,355	41,185	78,684	60,849
FY2048	51,184	42,745	81,356	62,967
FY2049	53,036	44,323	84,054	65,105
FY2050	54,906	45,921	86,772	67,265
FY2051	56,825	47,567	89,519	69,459
FY2052	58,815	49,273	92,358	71,726
FY2053	60,879	51,044	95,292	74,073
FY2054	63,018	52,881	98,325	76,500
FY2055	65,237	54,785	1,01,461	79,010
FY2056	67,531	56,755	1,04,677	81,588
CAGR (25-46)	**5.09%**	**4.19%**	**4.73%**	**3.46%**
CAGR (25-56)	**4.60%**	**4.01%**	**4.25%**	**3.42%**

At Mahasamudram Toll Plaza, the Normal Traffic PCU Growth (CAGR) observed between FY-25 and FY-46 is 4.73%. Effective traffic growth for the same period is 3.46%. similarly, Normal Traffic (PCU) CAGR (FY 25-56) at MAHASAMUDRAM TP is estimated to be 4.25% and the effective Traffic (PCU) observed CAGR of 3.42% over the concession period.

Table 7-5: Traffic comparison by Vehicles and PCU – Most Likely – Overall Project

FY	VEHICLES		PCU	
	NORMAL TRAFFIC	EFFECTIVE TRAFFIC	NORMAL TRAFFIC	EFFECTIVE TRAFFIC
FY2025	16,799	16,799	28,947	28,947
FY2026	17,909	17,909	30,728	30,728
FY2027	19,091	18,456	32,606	31,323
FY2028	20,355	18,491	34,604	30,356
FY2029	21,641	19,155	36,628	30,604
FY2030	22,876	20,267	38,559	32,244
FY2031	24,128	21,393	40,535	33,917
FY2032	25,466	22,597	42,633	35,694
FY2033	26,881	23,872	44,843	37,569
FY2034	28,379	25,222	47,173	39,546
FY2035	29,894	26,587	49,528	41,544
FY2036	31,432	27,974	51,883	43,546
FY2037	32,953	29,346	54,241	45,548
FY2038	34,518	30,757	56,660	47,602
FY2039	36,126	32,208	59,141	49,707
FY2040	37,776	33,635	61,680	51,795
FY2041	39,447	35,145	64,210	53,950
FY2042	41,156	36,757	66,792	56,224
FY2043	42,903	38,337	69,423	58,468
FY2044	44,684	39,950	72,100	60,754
FY2045	46,498	41,593	74,821	63,078
FY2046	48,330	43,256	77,524	65,393
FY2047	50,191	44,945	80,262	67,740
FY2048	52,077	46,658	83,031	70,115
FY2049	53,986	48,393	85,828	72,514
FY2050	55,916	50,147	88,648	74,936
FY2051	57,898	51,954	91,499	77,394
FY2052	59,954	53,828	94,447	79,934
FY2053	62,085	55,772	97,495	82,565
FY2054	64,296	57,789	1,00,646	85,285
FY2055	66,588	59,881	1,03,905	88,100
FY2056	68,958	62,044	1,07,246	90,989
CAGR (25-46)	**5.16%**	**4.61%**	**4.80%**	**3.96%**
CAGR (25-56)	**4.66%**	**4.30%**	**4.32%**	**3.76%**

Similarly, for the entire project the Normal Traffic PCU Growth (CAGR) observed between FY-25 and FY-46 is 4.80%. Effective traffic growth for the same period is 3.96%. The graph below illustrates the growth of effective traffic (PCU terms) for the project for Most Likely scenario.

Similarly, Normal Traffic (PCU) CAGR (FY 25-56) from AP/KA BORDER-CHITTOOR-MALLAVARAM is estimated to be 4.32% and the effective Traffic (PCU) observed CAGR of 3.76% over the concession period.

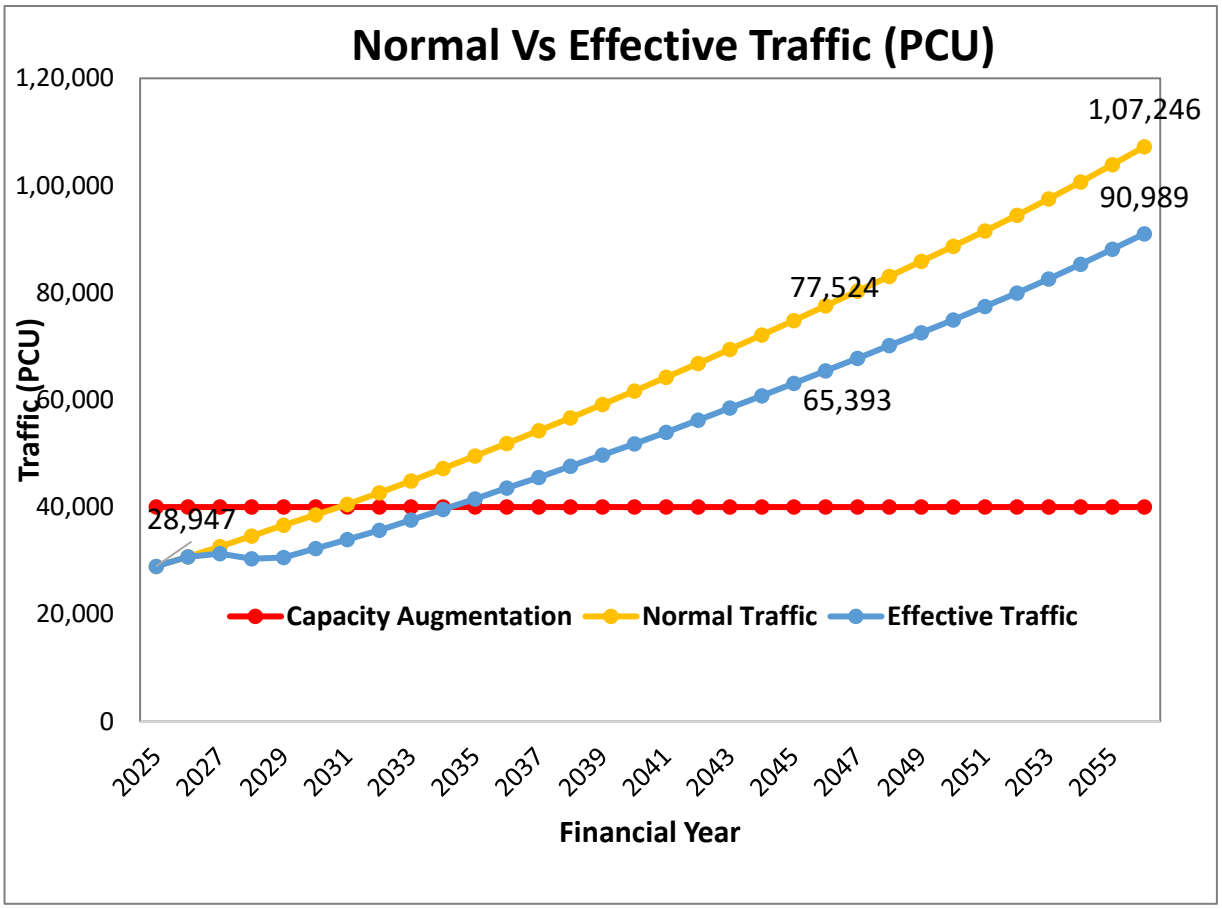


Figure 7-1: Future Traffic Projections in PCU

7.5 Toll Revenue Forecasting

Toll revenue projections or forecasting is calculated based on the projected traffic and projected toll rates. Toll rates by vehicle and toll category depends on the tolling length, wholesale price index (WPI) and the base rates which are applicable by vehicle category are according to the National Highway fee notification for the project.

7.5.1 Toll Plaza Control Length

Toll plaza control length for two plazas has been mentioned in the below table.

Table 7-6: Base rate fee by vehicle category for payable length for FY 25

TOLL PLAZA	Highway Length (Kms)	Net Bypass Length (Kms)	Structure Length (Kms)	Total Length (Kms)
Gadanki (TP1)	35.408	23.157	1.343	59.908
Mahasamudram (TP2)	47.227	13.09	0.07	60.387

7.5.2 Toll revenue estimation

Toll Fee Revision Methodology

Toll fee shall be computed based on the base rate fixed by NHAI and is revised annually as per the formula provided by NHAI in Schedule R of the Concession agreement which is according to the toll rules 2008.

a) Base Rate

As per the National Highway Fee Rules, 2008 and subsequent amendments till to date, the rate of fee for use of a section of national highway of four or more lanes for the base year 2007-08 are given as mentioned in below table. Fee applicable shall be the rate multiplied by the length of the highway section for which toll is to be collected.

Table 7-7: Base rate fee by vehicle category for payable length

TYPE OF VEHICLE	BASE RATE FEE PER KM (IN RUPEES)
Car	0.65
LCV	1.05
Bus or Truck	2.20
Truck 3A	2.40
HCM or EME or MAV (3-6 Axles)	3.45
Over Sized Vehicle (OSV)	4.20

b) Annual Revision of Rate of Fee

The amount of fee and the revision thereof effective from 1st April. The user fee shall be increased annually, without compounding by 3%. revision because of variation in WPI shall be restricted to 40%.

$$\text{Applicable rate of fee} = \text{Base Rate} + \text{Base Rate X} \left\{\frac{\text{WPIA} - \text{WPI B}}{\text{WPI B}}\right\} * 0.40$$

Were
WPI-A means the Wholesale Price Index on December 31, 2023.
WPI-B means the Wholesale Price Index of week ending on 6th January 2007.i.e 208.7.
The actual fees to be charged shall be rounded off to the nearest Five rupees.

WPI Forecasts

WPI Inflation values for the future years have been provided by client and are presented in the below Figure.

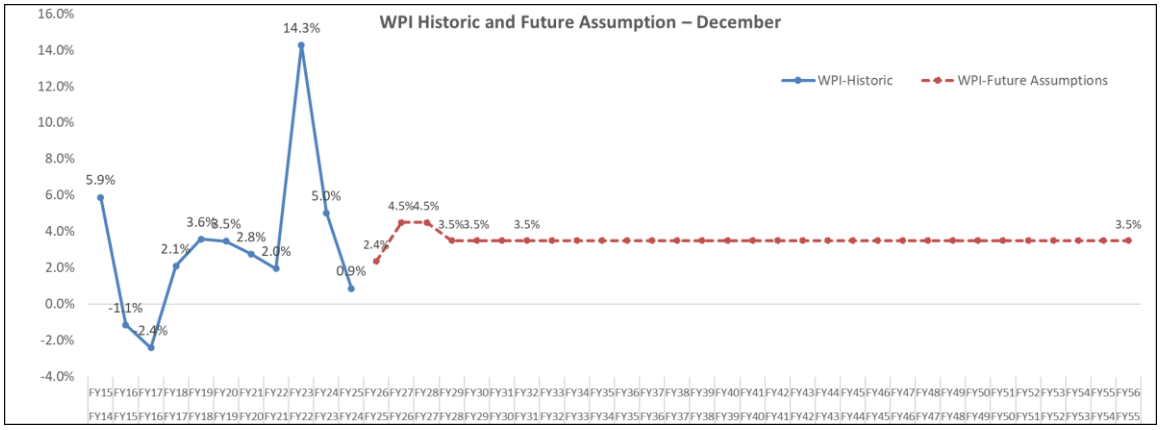


Figure 7-2: Past & Future Trend of Wholesale Price Index

The decrease in inflation in the recent years can be attributed to the lower commodity prices like oil, metals etc. along with the drop in the prices of the primary articles like food products etc.

Toll Fee Projections

a) Base Year (FY24)

As per the NH Fee rules 2007-08:

Toll fee for the fiscal year FY-2024 has been arrived by considering the toll plaza control length which were mentioned in the toll plaza control length table. From 01st April 2024 the toll fee rates for the Toll Plaza locations are presented in the Tables below.

Table 7-8: Toll Fees for the year FY-2025 from Apr'24 to March'25 for TP1 – Gadanki

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	125	185	4,085	60	340
Light Commercial Vehicle or Minibus	200	295	6,600	100	-
Bus - 2 Axle	415	620	13,830	205	-
Truck - 2 Axle	415	620	13,830	205	-
3Axle	455	680	15,085	225	-
MAV (4-6) Axle	650	975	21,685	325	-
OSV	790	1,190	26,400	395	-

Table 7-9: Toll Fees for the year FY-2024 from Apr'24 to March'25 for TP2 – Mahasamudram

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	100	150	3,305	50	340
Light Commercial Vehicle or Minibus	160	240	5,335	80	-
Bus - 2 Axle	335	505	11,180	170	-
Truck - 2 Axle	335	505	11,180	170	-

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
3Axle	365	550	12,195	185	-
MAV (4-6) Axle	525	790	17,530	265	-
OSV	640	960	21,340	320	-

7.5.3 Vehicle wise Trip Categories

Toll revenue is estimated by considering different concessions provided to the road users by vehicle category and eligible number of trips based on the toll category. The number of eligible trips in crossing toll plaza varies by the toll fee category i.e., Single (Full fare), Local passenger and Monthly Pass of both passenger and commercial vehicles are presented in the below tables. The estimation of the share of individual toll vehicle by type of toll ticket category is based on the recent toll traffic data of the period from Apr'2024 to Nov'2024.

Table 7-10: Vehicle wise Trip Categories at Gadanki (TP 1)

VEHICLE TYPE / TOLL CATEGORY	Single Journey	Return Journey	Monthly Pass	Local Comm	Local Pass	Exemptions	TOTAL (Excl. Penalties)
Car	43.35%	44.49%	0.00%	0.43%	2.06%	9.66%	100.00%
Minibus	57.76%	36.64%	0.00%	3.32%	0.00%	2.28%	100.00%
Bus-2A	13.05%	63.48%	21.73%	0.06%	0.00%	1.69%	100.00%
Bus-3A	64.48%	34.11%	0.28%	0.02%	0.00%	1.11%	100.00%
LCV	57.76%	36.64%	0.00%	3.32%	0.00%	2.28%	100.00%
2 Axle Truck	73.31%	24.61%	0.03%	0.40%	0.00%	1.66%	100.00%
3 Axle Truck	64.48%	34.11%	0.28%	0.02%	0.00%	1.11%	100.00%
MAV	86.15%	12.47%	0.00%	0.00%	0.00%	1.38%	100.00%

Table 7-11: Vehicle wise Trip Categories at Mahasamudram (TP 2)

VEHICLE TYPE / TOLL CATEGORY	Single Journey	Return Journey	Monthly Pass	Local Comm	Local Pass	Exemptions	TOTAL (Excl. Penalties)
Car	50.01%	39.58%	0.00%	0.43%	2.20%	7.78%	100.00%
Minibus	51.07%	45.26%	0.00%	1.48%	0.00%	2.19%	100.00%
Bus-2A	10.14%	66.18%	18.14%	4.49%	0.00%	1.05%	100.00%
Bus-3A	59.87%	36.16%	0.00%	2.79%	0.00%	1.17%	100.00%
LCV	51.07%	45.26%	0.00%	1.48%	0.00%	2.19%	100.00%
2 Axle Truck	61.21%	36.39%	0.02%	1.10%	0.00%	1.28%	100.00%
3 Axle Truck	59.87%	36.16%	0.00%	2.79%	0.00%	1.17%	100.00%
MAV	82.69%	16.27%	0.00%	0.17%	0.00%	0.88%	100.00%

7.5.4 Capacity Augmentation

As per the IRC recommendations, the designed Target Traffic is to be determined for LOS B as per IRC Code – IRC: SP:84-2019 which is 40,000 PCU's.

The Capacity Augmentation for any homogenous/tollable section(s) of the Project Highway in case the average daily traffic of PCUs for that homogenous/tollable section(s), in any Accounting Year shall exceed the designed capacity Target Traffic for Project Highway and shall continue to exceed the designed capacity for 1 (One) consecutive Accounting Years following thereafter ("Capacity Augmentation").

Currently, the project's road traffic comprises two homogeneous sections for each toll plaza. A third homogeneous section will be introduced upon the completion of the pending stretch between Chittoor and the Andhra Pradesh/Tamil Nadu border. The Average PCU in FY-2037 is 41,037 PCU at Mahasamudram Toll plaza which is crossing the design capacity of the project highway. Hence, capacity augmentation is required within the concession period for section from AP/KA Border to Chittoor & the details reg the same has been mentioned below.

Table 7-12: Capacity Augmentation Assumptions

Homogeneous Section	Toll Plaza's	Capacity Breaching 40000 PCU (Years) – 1 Years	Planning (2 Year)	Construction Period (2 Years)
AP/KA Border to Chittoor	Mahasamudram	FY 37	FY 38, 39	FY 40, 41
Chittoor to Mallavaram	Gadanki	Not exceeding capacity before the end of the concession period		

During the conversion from 4-lane to 6-lane road infrastructure, road users experience discomfort while traveling, prompting some to shift to alternative routes. This phenomenon was observed in the consultant's previous traffic studies. Based on these observations, the consultant has assumed a higher diversion during the construction period, with reduced speeds & Toll rates on the project corridor.

7.5.5 Toll revenue projections

Toll revenue is projected based on the future traffic projections, toll fees by vehicle and toll category and trip rates. Traffic numbers are projected by fiscal year i.e., FY25, FY26 etc. and toll rates are revised on 01st April every year. Toll revenues are projected by fiscal year till the end of concession period and considering maximum possible extension referring clauses related to Additional toll way, Capacity augmentation and modification of concession period.

(c) Toll would be collected for all the days in a year.

(d) Revenue projected from FY-2025 to FY-2056.

The toll revenue projections are done for the effective case which is basically the consideration of all network improvements and land developments as described in the chapter "Traffic Growth Estimation". The below table summarizes the projected annual toll revenue at both the toll plazas and Overall project.

Table 7-13: Estimated Annual Toll revenue (Effective case) in Rs. Crores – Most Likely

FY YEAR	Gadanki TP	Mahasamudram TP	Total Revenue
FY2025	122	98	220
FY2026	133	135	268
FY2027	150	149	299
FY2028	158	143	300
FY2029	164	148	312
FY2030	181	162	342
FY2031	198	178	375
FY2032	217	194	411
FY2033	236	213	450
FY2034	259	232	492
FY2035	283	254	537
FY2036	310	279	589
FY2037	336	301	637
FY2038	365	327	692
FY2039	398	356	754
FY2040	433	387	820
FY2041	466	418	884
FY2042	505	453	958
FY2043	547	489	1,036
FY2044	595	532	1,127
FY2045	642	571	1,213
FY2046	691	615	1,306
FY2047	743	664	1,407
FY2048	804	718	1,522
FY2049	861	771	1,632
FY2050	927	826	1,752
FY2051	997	886	1,883
FY2052	1,075	958	2,033
FY2053	1,151	1,026	2,177
FY2054	1,237	1,100	2,337
FY2055	1,329	1,185	2,514
FY2056	1,434	1,277	2,711
CAGR (25-46)	**8.62%**	**9.15%**	**8.86%**
CAGR (25-56)	**8.28%**	**8.64%**	**8.45%**

The Revenue Growth (CAGR) at Gadanki Toll Plaza is observed to be 8.28% % for FY25-FY56. Similaraly at Mahasamudram Toll Plaza it is observed to be 8.64% for FY25-FY56.

Also, It is estimated that the toll revenues are expected to grow (FY 25-56) at 8.45% CAGR on overall AP/KA-Chittoor-Mallavaram project Corridor.

Consultant doesn't recommend Cash penalty going forward after few years due to FasTAG penetration is likely to be close to 100%. Also, Concessionaire needs to deposit Cash penalty revenue with Authority.

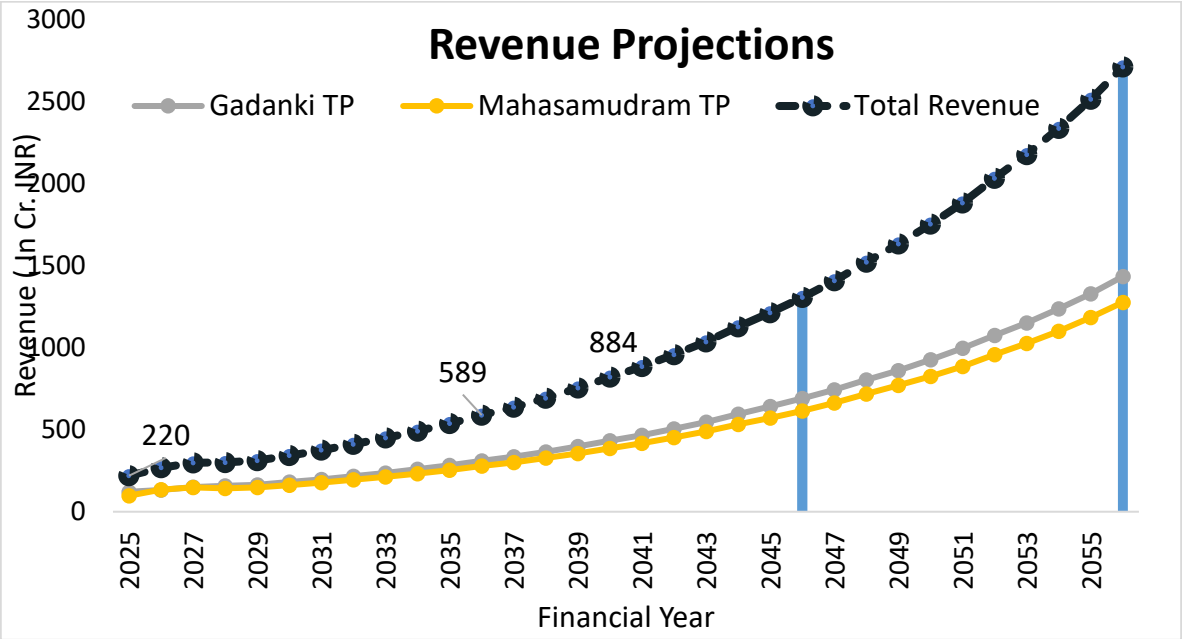


Figure 7-3 : Toll Revenue Projections

7.5.6 Overloading Analysis

7- day axle load survey data (as part of technical due diligence) has been provided by the technical consultant of the client which has been analysed to understand the extent of overloaded vehicles.

Table 7-14: Overloading Analysis for Project Road Toll Plazas

Mode	Sample-All Commodities (a)		Overloaded(>20%)-(b)		%ge Overloaded(>20%)-(b/a)		Final %ge Overloaded (>20%) after applying Factors	
	Gadanki	Mahasamudram	Gadanki	Mahasamudram	Gadanki	Mahasamudram	Gadanki	Mahasamudram
LCV	614	748	0	0	0.0%	0.0%	0.0%	0.0%
2AT	1379	1419	0	0	0.0%	0.0%	0.0%	0.0%
3AT	970	932	74	28	7.6%	3.0%	0.2%	0.1%
MAV	2998	2906	391	248	13.0%	8.5%	0.1%	0.1%

As observed from the seven-day axle load analysis, around 7.6% of 3A trucks and 13% of the MAVs are above 20% overloading limit at Gadanki TP. Similarly, around 3.0% of 3A trucks and 8.5% of the MAVs are above 20% overloading limit at Mahasamudram TP. However, after excluding the commodities such as fruits and vegetables, petroleum products, chemicals and gas, heavy machinery and industrial equipment since these are having stickiness to Project road as well as OD pairs with lead greater than 500 km & applying 25% factor to the final Overloading nos , the revised overloading percentage in the category of above 20% overloading comes out to be around 0.2% in 3A and 0.1% in MAV at Gadanki TP & 0.1% in 3A and 0.1% in MAV at Mahasamudram TP.

Based on the surveys done, potential for collecting overloading revenue found but presence of alternate routes necessitates no collection of overloading revenue.

Conclusion

Consultant recommended Net Traffic growth for the period FY-2025 to FY-2056 at 3.76% for the overall project after considering all the possible risks on the project and future growth opportunities which were detailed in previous chapters and in the Executive summary. The Toll revenue growth is projected at a CAGR% of 8.45% for the period between FY25 to FY56.

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8. Annexures

Monthly traffic and Revenue for both the Toll plazas are mentioned below. Monthly ADT traffic includes Cash & Exempt traffic as well for both the toll plazas. Monthly ADR also includes Cash revenue for both the toll plazas.

Table 8-1: Monthly ADT and ADR for Gadanki Toll plaza

FY	Month Name	CJV	LCV	2Axle	3Axle	MAV	OSV	Grand Total	PCU	Revenue (Lakhs per day)
FY-2023	April	9,026	533	1,726	735	1,391	1	13,412	23,474	21.73
	May	9,008	596	1,844	747	1,355	1	13,550	23,774	21.97
	June	9,233	625	1,923	808	1,385	2	13,975	24,603	22.75
	July	8,936	592	1,882	769	1,477	2	13,657	24,431	22.80
	August	9,405	608	1,809	753	1,476	4	14,054	24,659	22.91
	September	8,600	627	1,742	741	1,460	3	13,174	23,577	23.56
	October	9,171	564	1,773	693	1,320	2	13,523	23,365	25.93
	November	9,254	583	1,643	713	1,411	3	13,607	23,559	26.36
	December	9,901	573	1,631	689	1,398	3	14,195	24,025	26.80
	January	10,133	546	1,639	667	1,372	2	14,360	24,056	26.67
	February	10,217	597	2,061	700	1,548	3	15,125	26,371	27.88
	March	9,599	597	2,072	716	1,550	1	14,536	25,840	26.80
FY-2024	April	10,209	606	2,193	708	1,528	1	15,246	26,704	28.82
	May	10,776	676	2,441	739	1,549	1	16,182	28,304	30.26

	June	11,091	708	2,438	800	1,665	1	16,703	29,362	31.52
	July	11,144	683	2,345	812	1,700	1	16,684	29,292	32.12
	August	10,880	651	2,303	795	1,728	1	16,359	28,934	32.23
	September	10,103	615	2,304	757	1,694	1	15,473	27,832	31.96
	October	10,095	605	2,313	735	1,684	2	15,435	27,736	31.88
	November	10,922	567	2,155	721	1,528	2	15,895	27,286	31.01
	December	11,141	581	2,198	718	1,616	2	16,256	28,043	32.09
	January	10,879	540	2,139	673	1,507	1	15,740	26,914	30.80
	February	10,746	626	2,241	725	1,678	1	16,017	28,137	31.40
	March	10,489	630	2,218	726	1,705	1	15,769	27,941	31.22
FY-2025	April	10,486	616	2,290	676	1,636	1	15,704	27,669	31.45
	May	11,053	656	2,404	735	1,733	0	16,582	29,255	33.21
	June	10,830	672	2,375	772	1,686	1	16,336	28,871	34.19
	July	9,957	595	2,195	720	1,655	1	15,122	27,044	32.22
	August	10,299	629	2,282	731	1,657	1	15,600	27,744	33.29
	September	10,349	661	2,463	769	1,732	1	15,974	28,832	34.00
	October	10,384	634	2,484	717	1,571	1	15,792	28,014	33.06
	November	11,101	626	2,325	714	1,518	0	16,285	27,992	32.56

Table 8-2: Monthly ADT and ADR for Mahasamudram Toll plaza

FY	Month Name	CJV	LCV	2Axle	3Axle	MAV	OSV	Grand Total	PCU	Revenue (Lakhs per day)
FY-2023	April	8,129	1,017	2,017	752	1,067	1	12,983	22,767	19.96
	May	8,360	1,025	2,053	719	1,060	1	13,218	22,988	20.17
	June	8,504	1,118	2,221	847	1,140	1	13,831	24,519	21.56
	July	8,259	1,086	2,173	789	1,212	1	13,521	24,236	21.41
	August	8,850	1,076	2,100	736	1,105	1	13,869	23,950	21.08
	September	7,524	1,088	2,054	740	1,136	1	12,544	22,657	20.10
	October	8,347	1,007	1,999	686	1,054	1	13,094	22,659	20.00
	November	7,754	1,076	1,955	721	1,123	1	12,629	22,450	19.94
	December	9,056	1,055	1,976	703	1,078	2	13,869	23,533	20.67
	January	9,261	1,010	2,020	686	1,064	1	14,042	23,686	20.27
	February	9,314	1,116	2,293	743	1,156	2	14,624	25,308	20.34
	March	8,519	1,113	2,264	735	1,160	1	13,793	24,413	19.74
FY-2024	April	9,146	1,098	2,396	748	1,104	1	14,492	25,195	21.23
	May	9,822	1,125	2,497	751	1,131	1	15,327	26,348	22.18
	June	9,886	1,197	2,541	782	1,221	1	15,628	27,148	23.08
	July	9,828	1,163	2,408	803	1,242	1	15,445	26,799	23.34
	August	9,963	1,118	2,352	768	1,259	1	15,461	26,668	23.68

	September	9,498	1,103	2,423	782	1,294	1	15,100	26,591	23.70
	October	9,527	1,084	2,438	761	1,252	1	15,061	26,385	23.78
	November	10,170	1,053	2,314	740	1,189	1	15,468	26,268	23.57
	December	10,316	1,044	2,307	729	1,187	1	15,583	26,332	23.50
	January	10,508	1,028	2,341	692	1,109	1	15,680	26,146	23.21
	February	10,075	1,145	2,357	775	1,269	1	15,622	26,904	24.13
	March	9,421	1,147	2,335	781	1,294	1	14,979	26,315	23.52
FY-2025	April	9,694	1,095	2,352	718	1,172	1	15,032	25,826	23.59
	May	10,486	1,216	2,525	760	1,348	1	16,337	28,237	25.89
	June	10,109	1,302	2,606	778	1,393	1	16,190	28,488	26.83
	July	10,064	1,248	2,504	756	1,472	1	16,045	28,344	26.52
	August	10,607	1,271	2,555	772	1,525	1	16,730	29,361	27.58
	September	9,508	1,243	2,540	794	1,491	1	15,576	28,087	26.91
	October	10,030	1,235	2,554	752	1,395	2	15,968	28,085	26.83
	November	10,850	1,245	2,514	724	1,408	1	16,742	28,770	26.76

Table 8-3 Zoning List of Project corridor

Z. NO	Zone Name	Zone State
1	Tirupathi	Andhra Pradesh
2	Tirumala (Temple)	Andhra Pradesh
3	Tirupati International Airport	Andhra Pradesh
4	Tummalagunta	Andhra Pradesh
5	Cherlopalli	Andhra Pradesh
6	Chandragiri	Andhra Pradesh
7	Mallavaram	Andhra Pradesh
8	Renigunta	Andhra Pradesh
9	Panapakam	Andhra Pradesh
10	Ithepalli	Andhra Pradesh
11	Mungilipattu	Andhra Pradesh
12	Maravapalli	Andhra Pradesh
13	Kasipentla	Andhra Pradesh
14	Kothaindlu	Andhra Pradesh
15	Geddakinda Palli	Andhra Pradesh
16	Gadanki	Andhra Pradesh
17	Ragampet	Andhra Pradesh
18	Pakala	Andhra Pradesh
19	Puttur	Andhra Pradesh
20	Vadamalapet	Andhra Pradesh
21	Tiruchanur	Andhra Pradesh
22	Gudur	Andhra Pradesh
23	Naidupeta	Andhra Pradesh
24	Venkatagiri	Andhra Pradesh
25	Yerpadu	Andhra Pradesh
26	Srikalahasti	Andhra Pradesh
27	Sri City	Andhra Pradesh
28	Pichatur	Andhra Pradesh
29	Madanapalle	Andhra Pradesh
30	Koduru	Andhra Pradesh
31	Kothakota	Andhra Pradesh
32	Rayachoty	Andhra Pradesh
33	Penumuru	Andhra Pradesh
34	Kallur	Andhra Pradesh
35	Polakala	Andhra Pradesh
36	Pulikallu	Andhra Pradesh
37	Pathalapattu	Andhra Pradesh
38	Thenepalle	Andhra Pradesh
39	Kanipakam	Andhra Pradesh
40	Chittoor	Andhra Pradesh
41	Murukambattu	Andhra Pradesh

Z. NO	Zone Name	Zone State
42	Patnam	Andhra Pradesh
43	Aragonda	Andhra Pradesh
44	Kaligiri	Andhra Pradesh
45	Goduguchinta	Andhra Pradesh
46	Vedurukuppam	Andhra Pradesh
47	Chittathur Kale Palle	Andhra Pradesh
48	Veerakanellore	Andhra Pradesh
49	Nagari	Andhra Pradesh
50	Bangarupalyam	Andhra Pradesh
51	Mutharapalli	Andhra Pradesh
52	Yadamari	Andhra Pradesh
53	Kasiralla	Andhra Pradesh
54	Mahasamudram	Andhra Pradesh
55	Madireddipalle	Andhra Pradesh
56	Bodabandla	Andhra Pradesh
57	Ragimanupenta	Andhra Pradesh
58	Tekumanda	Andhra Pradesh
59	Megili	Andhra Pradesh
60	Mogilpalle	Andhra Pradesh
61	Mathyam	Andhra Pradesh
62	Thavanampalle Palli	Andhra Pradesh
63	Thavanam Palli	Andhra Pradesh
64	Punganur	Andhra Pradesh
65	Pedda Panjani	Andhra Pradesh
66	Palamaner	Andhra Pradesh
67	Baireddipalle	Andhra Pradesh
68	Thathireddipalli	Andhra Pradesh
69	Mandipet Kotur	Andhra Pradesh
70	Kogileru	Andhra Pradesh
71	Kolamasana Palle	Andhra Pradesh
72	Karidimadugu	Andhra Pradesh
73	Veerlabanda	Andhra Pradesh
74	Pathikonda	Andhra Pradesh
75	Karasanapalle	Andhra Pradesh
76	Appinapalle	Andhra Pradesh
77	Ramasamudram	Andhra Pradesh
78	Somala	Andhra Pradesh
79	Venkatagirikota	Andhra Pradesh
80	Kuppam	Andhra Pradesh
81	Kadapa	Andhra Pradesh
82	Nellore	Andhra Pradesh
83	Ongole	Andhra Pradesh
84	Vijayawada	Andhra Pradesh

Z. NO	Zone Name	Zone State
85	Machilipatnam port	Andhra Pradesh
86	Kakinada	Andhra Pradesh
87	Visakhapatnam	Andhra Pradesh
88	Vizag Port	Andhra Pradesh
89	Anantapur	Andhra Pradesh
90	Hindupuram	Andhra Pradesh
91	Nandyala	Andhra Pradesh
92	Rajamahendravaram	Andhra Pradesh
93	Gudipala	Andhra Pradesh
94	Krishnapatnam Port	Andhra Pradesh
95	Kolar Gold Fields	Karnataka
96	Kolar	Karnataka
97	Mulbagal	Karnataka
98	Hoskote	Karnataka
99	Tumakuru	Karnataka
100	Dobbaspet	Karnataka
101	Bengaluru	Karnataka
102	Kempegowda International Airport Bengaluru	Karnataka
103	Ballari	Karnataka
104	Davanagere	Karnataka
105	Chikkaballapur	Karnataka
106	Chintamani	Karnataka
107	Hubballi	Karnataka
108	Vijayapura	Karnataka
109	Kalaburagi	Karnataka
110	Mysuru	Karnataka
111	Mangaluru	Karnataka
112	Mangalore Port	Karnataka
113	Udupi	Karnataka
114	Hassan	Karnataka
115	Krishnagiri	Tamil Nadu
116	Hosur	Tamil Nadu
117	Salem	Tamil Nadu
118	Erode	Tamil Nadu
119	Coimbatore	Tamil Nadu
120	Vellore	Tamil Nadu
121	Ranipet	Tamil Nadu
122	Kanchipuram	Tamil Nadu
123	Ennore Port	Tamil Nadu
124	Viluppuram	Tamil Nadu
125	Tindivanam	Tamil Nadu
126	Tiruvannamalai	Tamil Nadu
127	Virudhachalam	Tamil Nadu

Z. NO	Zone Name	Zone State
128	Tiruchirappalli	Tamil Nadu
129	Mayiladuthurai	Tamil Nadu
130	Ooty	Tamil Nadu
131	Madurai	Tamil Nadu
132	Thoothukudi	Tamil Nadu
133	Sriperumbuddur	Tamil Nadu
134	Oragadam Industrial Corridor	Tamil Nadu
135	Chennai	Tamil Nadu
136	Ponnai	Tamil Nadu
137	Arakkonam	Tamil Nadu
138	Sholinghur	Tamil Nadu
139	Thiruvallur	Tamil Nadu
140	Avadi	Tamil Nadu
141	Tiruvottiyur	Tamil Nadu
142	Uthukkotai	Tamil Nadu
143	Periyapalayam	Tamil Nadu
144	Kavaraipettai	Tamil Nadu
145	Chennai Port	Tamil Nadu
146	Panietty	Tamil Nadu
147	Pallipattu	Tamil Nadu
148	Puducherry	Puducherry
149	Kochi	Kerala
150	Kannur	Kerala
151	Goa	Goa
152	Bhubaneswar	Odisha
153	Rourkela	Odisha
154	Paradip Port	Odisha
155	Nalgonda	Telangana
156	Warangal	Telangana
157	Hyderabad	Telangana
158	Raipur	Chhattisgarh
159	Ranchi	Jharkhand
160	Patna	Bihar
161	Kolkata	West Bengal
162	Haldia International Port	West Bengal
163	Surat	Gujarat
164	Ahmedabad	Gujarat
165	Kandla Port	Gujarat
166	Rajkot	Gujarat
167	Mundra port	Gujarat
168	Pune	Maharashtra
169	Solapur	Maharashtra
170	Ahmednagar	Maharashtra

Z. NO	Zone Name	Zone State
171	Mumbai	Maharashtra
172	Nashik	Maharashtra
173	Nagpur	Maharashtra
174	Bhopal	Madhya Pradesh
175	Sikkim	Sikkim
176	Lucknow	Uttar Pradesh
177	Dhanbad	Jharkhand
178	Jamshedpur	Jharkhand
179	Udaipur	Rajasthan
180	Delhi	New Delhi
181	Top North states	Punjab
182	Srinagar	Jammu and Kashmir
183	Northeast States	Assam

Table 8-4: Weighted Vehicle Registration Data for Project Influence Area of TP1 – Gadanki

CATEGORY	CARS	BUSES	TRUCKS
2012	684,423	46,013	177,508
2013	777,083	53,245	192,387
2014	858,806	56,510	200,502
2015	947,952	59,697	210,625
2016	1,038,312	63,388	221,706
2017	1,134,197	68,497	233,071
2018	1,260,207	74,320	255,120
2019	1,377,736	78,804	274,317
2020	1,483,041	84,770	289,810
2021	1,583,443	85,308	295,496
2022	1,701,323	86,101	305,957
2023	1,839,492	89,294	321,323
2024	1,985,865	93,388	336,300
CAGR (FY12-FY24)	**9.28%**	**6.08%**	**5.47%**

Table 8-5: Weighted Vehicle Registration Data for Project Influence Area of TP2 – Mahasamudram

CATEGORY	CARS	BUSES	TRUCKS
2012	885,714	44,503	242,724
2013	998,982	51,510	259,553
2014	1,103,346	54,966	270,328
2015	1,218,759	58,383	283,170
2016	1,340,268	62,237	297,595

CATEGORY	CARS	BUSES	TRUCKS
2017	1,472,440	67,563	311,857
2018	1,621,706	73,690	332,518
2019	1,765,896	78,268	354,053
2020	1,896,315	84,412	371,256
2021	2,017,952	84,933	377,930
2022	2,157,687	85,799	390,390
2023	2,332,518	89,250	408,740
2024	2,520,601	94,040	426,844
CAGR (FY12-FY24)	**9.11%**	**6.43%**	**4.82%**

Table 8-6: PIA GSDP by Vehicle Category at Toll Plaza 01 - Gadanki

YEAR	GSDP IN RS. BILLIONS		
	CARS	BUSES	TRUCKS
2012	4,508	4,439	4,607
2013	4,618	4,536	4,745
2014	4,972	4,880	5,103
2015	5,360	5,267	5,471
2016	5,966	5,865	6,063
2017	6,526	6,402	6,638
2018	7,140	7,010	7,243
2019	7,558	7,418	7,678
2020	7,878	7,724	8,001
2021	7,901	7,762	7,976
2022	8,645	8,491	8,734
2023	9,224	9,052	9,335
2024	9,895	9,713	10,013
CAGR(FY12-24)	**6.77%**	**6.74%**	**6.68%**

Table 8-7: PIA GSDP by Vehicle Category at TP2 - Mahasamudram

YEAR	GSDP IN RS. BILLIONS		
	CARS	BUSES	TRUCKS
2012	4,921	4,576	5,540
2013	5,097	4,706	5,780
2014	5,516	5,085	6,243
2015	5,918	5,480	6,647
2016	6,578	6,111	7,323
2017	7,269	6,738	8,047
2018	7,926	7,363	8,741
2019	8,405	7,795	9,284
2020	8,807	8,159	9,695
2021	8,762	8,146	9,603
2022	9,594	8,927	10,488

YEAR	GSDP IN RS. BILLIONS		
	CARS	BUSES	TRUCKS
2023	10,279	9,538	11,261
2024	11,007	10,213	12,074
CAGR(FY12-24)	**6.94%**	**6.92%**	**6.71%**

Table 8-8: Economic Forecast for Comparison with PIA states – Most Likely Scenario

YEAR	India	Andhra Pradesh	Karnataka	Tamil Nadu	Telangana	West Bengal	Maharashtra	Odisha	Kerala
2026	6.7%	7.4%	8.0%	7.4%	7.4%	5.4%	5.7%	7.8%	5.7%
2027	6.6%	7.3%	7.9%	7.3%	7.3%	5.3%	5.6%	7.7%	5.6%
2028	6.6%	7.3%	7.9%	7.3%	7.3%	5.3%	5.6%	7.7%	5.6%
2029	6.3%	6.9%	7.6%	6.9%	6.9%	5.0%	5.4%	7.3%	5.4%
2030	5.7%	6.3%	6.8%	6.3%	6.3%	4.6%	4.8%	6.6%	4.8%
2031	5.7%	6.3%	6.6%	6.0%	6.0%	4.6%	4.8%	6.6%	4.8%
2032	5.7%	6.3%	6.6%	6.0%	6.0%	4.6%	4.8%	6.6%	4.8%
2033	5.7%	6.3%	6.6%	6.0%	6.0%	4.6%	4.8%	6.6%	4.8%
2034	5.7%	6.3%	6.6%	6.0%	6.0%	4.6%	4.8%	6.6%	4.8%
2035	5.6%	5.9%	6.4%	5.9%	5.9%	4.5%	4.8%	6.5%	4.8%
2036	5.5%	5.8%	6.1%	5.8%	5.8%	4.4%	4.4%	6.4%	4.7%
2037	5.4%	5.7%	5.9%	5.7%	5.7%	4.3%	4.3%	6.3%	4.6%
2038	5.3%	5.6%	5.8%	5.6%	5.6%	4.2%	4.2%	6.2%	4.5%
2039	5.2%	5.5%	5.7%	5.5%	5.5%	4.2%	4.2%	6.1%	4.4%
2040	5.1%	5.4%	5.6%	5.4%	5.4%	4.1%	4.1%	5.9%	4.3%
2041	5.0%	5.3%	5.5%	5.3%	5.3%	4.0%	4.0%	5.8%	4.2%
2042	4.9%	5.1%	5.4%	5.1%	5.1%	3.9%	3.9%	5.7%	4.2%
2043	4.8%	5.0%	5.3%	5.0%	5.0%	3.8%	3.8%	5.6%	4.1%
2044	4.7%	4.9%	5.2%	4.9%	4.9%	3.8%	3.8%	5.5%	4.0%
2045	4.6%	4.8%	5.1%	4.8%	4.8%	3.7%	3.7%	5.4%	3.9%
2046	4.5%	4.7%	5.0%	4.7%	4.7%	3.6%	3.6%	5.2%	3.8%
2047	4.4%	4.6%	4.8%	4.6%	4.6%	3.5%	3.5%	5.1%	3.7%
2048	4.3%	4.5%	4.7%	4.5%	4.5%	3.4%	3.4%	5.0%	3.7%
2049	4.2%	4.4%	4.6%	4.4%	4.4%	3.4%	3.4%	4.9%	3.6%
2050	4.1%	4.3%	4.5%	4.3%	4.3%	3.3%	3.3%	4.8%	3.5%
2051	4.1%	4.3%	4.5%	4.3%	4.3%	3.3%	3.3%	4.8%	3.5%
2052	4.1%	4.3%	4.5%	4.3%	4.3%	3.3%	3.3%	4.8%	3.5%
2053	4.1%	4.3%	4.5%	4.3%	4.3%	3.3%	3.3%	4.8%	3.5%
2054	4.1%	4.3%	4.5%	4.3%	4.3%	3.3%	3.3%	4.8%	3.5%
2055	4.1%	4.3%	4.5%	4.3%	4.3%	3.3%	3.3%	4.8%	3.5%
2056	4.1%	4.3%	4.5%	4.3%	4.3%	3.3%	3.3%	4.8%	3.5%

Table 8-9: Weighted Economic Forecast for Passenger & Commercial Vehicles for both TP's – Most Likely Scenario

YEAR	TP1 - Gadanki			TP2 – Mahasamudram		
	CARS	BUSES	TRUCKS	CARS	BUSES	TRUCKS
FY2026	7.5%	7.5%	7.5%	7.7%	7.6%	7.5%
FY2027	7.4%	7.4%	7.4%	7.6%	7.5%	7.4%
FY2028	7.4%	7.4%	7.4%	7.6%	7.5%	7.4%
FY2029	7.1%	7.1%	7.0%	7.2%	7.2%	7.1%
FY2030	6.4%	6.4%	6.4%	6.5%	6.5%	6.4%
FY2031	6.3%	6.3%	6.2%	6.4%	6.4%	6.2%
FY2032	6.3%	6.3%	6.2%	6.4%	6.4%	6.2%
FY2033	6.3%	6.3%	6.2%	6.4%	6.4%	6.2%
FY2034	6.3%	6.3%	6.2%	6.4%	6.4%	6.2%
FY2035	6.0%	6.0%	6.0%	6.1%	6.1%	6.1%
FY2036	5.8%	5.8%	5.8%	5.9%	5.9%	5.8%
FY2037	5.7%	5.7%	5.7%	5.8%	5.8%	5.7%
FY2038	5.6%	5.6%	5.6%	5.7%	5.7%	5.6%
FY2039	5.5%	5.5%	5.5%	5.6%	5.6%	5.5%
FY2040	5.4%	5.4%	5.4%	5.5%	5.5%	5.4%
FY2041	5.3%	5.3%	5.3%	5.4%	5.4%	5.3%
FY2042	5.2%	5.2%	5.2%	5.3%	5.2%	5.2%
FY2043	5.1%	5.1%	5.1%	5.2%	5.1%	5.1%
FY2044	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
FY2045	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%
FY2046	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%
FY2047	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%
FY2048	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%
FY2049	4.5%	4.5%	4.4%	4.5%	4.5%	4.5%
FY2050	4.4%	4.3%	4.3%	4.4%	4.4%	4.4%
FY2051	4.4%	4.3%	4.3%	4.4%	4.4%	4.4%
FY2052	4.4%	4.3%	4.3%	4.4%	4.4%	4.4%
FY2053	4.4%	4.3%	4.3%	4.4%	4.4%	4.4%
FY2054	4.4%	4.4%	4.3%	4.4%	4.4%	4.4%
FY2055	4.4%	4.4%	4.3%	4.4%	4.4%	4.4%
FY2056	4.4%	4.4%	4.3%	4.4%	4.4%	4.4%

TOLL TRAFFIC AND REVENUE ASSESSMENT FOR BAREILLY TO SITAPUR SECTION OF NH30 IN THE STATE OF UTTAR PRADESH

FINAL TRAFFIC REPORT | February 2025



National Highways Infra Trust

IBI

Prepared for : National Highways Infra Investment Managers Pvt Ltd

Final Traffic Report

Toll traffic and revenue assessment for Bareilly to Sitapur section of NH30 in the state of Uttar Pradesh

Prepared for National Highways Infra Investment Managers Pvt Ltd,

By IBI Group India Private Limited

Review History

Document: Traffic and Revenue Analysis for the Bareilly to Sitapur section of NH30 in the state of Uttar Pradesh.

Date: February 22, 2025

Prepared by: Sharmistha Roy

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Disclaimer

IBI Group India Private Limited while preparing the report relied on the data and information provided by the Vendor Traffic data. The information has not been independently verified by IBI Group and which IBI Group has assumed to be accurate and complete. The results of this study constitute the opinion of IBI Group. This opinion is based on normal professional effort with respect to future traffic and revenue for the tolled highway asset and subject to the time and budget constraints of the study's scope of work and based on the information available to IBI at the time of execution of this study. IBI cannot guarantee or assure future events in connection to this traffic and revenue forecast.

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ABBREVIATION

AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
AR	Alternate Road
BIA	Broad Influence Area
CA	Concession Agreement
CAGR	Compound Annual Growth Rate
COD	Commercial Operation Date
Cr.	Crore
DES	Directorate of Economics and Statistics
E-Way	Expressway
FY	Financial Year
GC	Generalized Cost
GDP	Gross Domestic Product
GSDP	Gross State Domestic Product
GQ	Golden Quadrilateral
IIA	Immediate Influence Area
INR	Indian Rupee
IRC	Indian Roads Congress
Kms	Kilometers
LCV	Light Commercial Vehicle
MAV	Multi-axle Vehicle
Mn.	Millions
NHAI	National Highways Authority of India
MSME	Ministry of Micro, Small and Medium Enterprises
NH	National Highway
NHAI	National Highways Authority of India
PWD	Public Works Department
O-D	Origin – Destination
OEA	Office of Economic Advisor
OSV	Over Sized Vehicle
PCI	Per Capita Income
PIA	Project Influence Area
PPP	Public Private Partnership
PR	Project Road
Rs.	Indian Rupees
SCF	Seasonal Correction Factor

SEZ	Special Economic Zone
SH	State Highway
SP	State Permit
TL	Trip Length
TLFD	Trip Length Frequency Distribution
TP	Toll Plaza
VOC	Vehicle Operating Cost
VOT	Value of Time
WPI	Wholesale Price Index
YOY	Year on Year
ZIF	Zonal Influence Factor

CHAPTER 1

Executive Summary

1. Executive Summary

IBI Group India Private Ltd (Consultant) was appointed by National Highways Infra Investment Managers Pvt Ltd to carry out the traffic due diligence study for the Bareilly Sitapur stretch of NH30 in the state of Uttar Pradesh. This study "Toll Traffic and Revenue Assessment for Bareilly Sitapur stretch of NH30 in the state of Uttar Pradesh" summarizes IBI's evaluation of the future traffic and toll revenues considering Risk factors and Growth drivers expected during the project concession period.

1.1 Project Overview

The project road is part of the major National Highway 30 where the section starts at design kilometer 262.000 and ends at kilometer 419.590 (existing km 262.000 to km 413.200 of National Highway number 24 in the State of Uttar Pradesh). Two toll plazas are existing on this section where Faridpur toll plaza is located at Km 266.900 and Maigalganj toll plaza at Km 372.168.

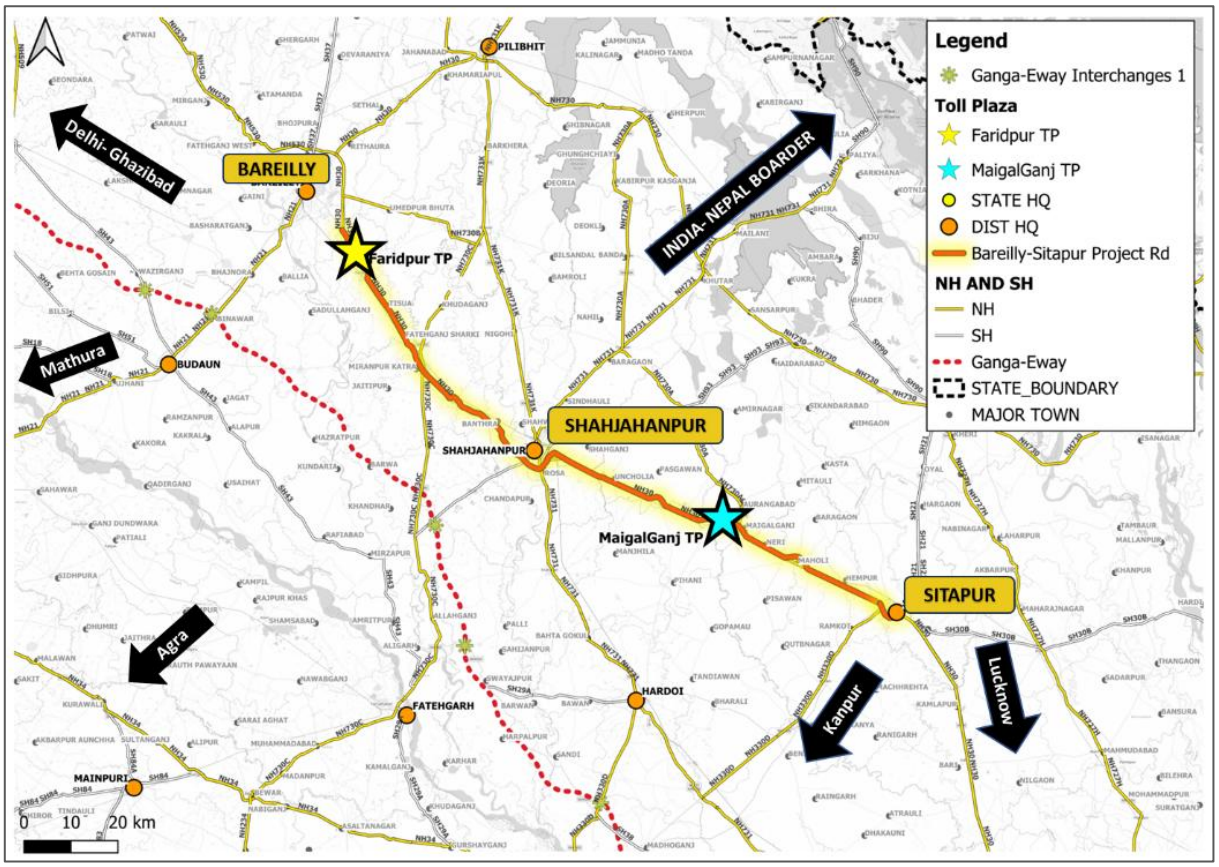


Figure 1-1: Corridor with existing toll plaza location

1.2 Salient growth features and traffic generators

Table 1-1: Growth Features and Traffic Generators

Sl. No	Developments	Description	Impact Type
1	Tourism – Agra, Vrindhavan,	The number of tourists visiting Uttar Pradesh has surged, growing from 16 crore in 2016 to over 48 crores	Current Growth Driver

Sl. No	Developments	Description	Impact Type
	Ayodhya, Varanasi	currently, with more than 32 crore tourists recorded between January and June 2024 alone[1]. The state experiences an annual footfall of 540 million across its four major religious cities—Varanasi, Ayodhya, Prayagraj, and Mathura-Vrindavan. The upcoming inauguration of the Ram Mandir in Ayodhya is expected to draw an additional 50 to 100 million tourists each year. Moreover, Prayagraj experiences a significant surge in visitors during the Kumbh Mela, which occurs once every six years. In 2017, the city saw a staggering 250 million visitors in less than two months. The Maha-Kumbh in Prayagraj, set to begin on January 13, 2025, is expected to attract an even greater crowd, with projections of 500 million visitors.	
2	Industries	The Bareilly-Sitapur stretch serves as a key industrial corridor, with sugar factories being the dominant industry, accounting for 62% of the region's industrial activity. Other notable sectors include food products (10%), flour mills (8%), chemicals, fertilizers, plywood, and agro products, among others. Major companies like Bajaj Hindustan Ltd., WIMCO, IFFCO, Reliance, Bharat Petroleum, Dalmia Bharat Limited and Ramaa Shyama play a significant role in driving economic growth in the area. This corridor stands out as a critical hub for agro-processing, logistics, and diverse industries, supporting regional development.	Current Growth Driver
3	State upcoming developments	The UP Global Investor Summit 2023 marked a significant milestone with 18,643 MoU's signed, amounting to a total investment of Rs 33.50 lakh crore. Key sectors driving these investments include renewable energy (12.41%), higher education (9%), industrial parks (11.35%), manufacturing, logistics, and warehousing. The real estate industry and IT-enabled services also contributed significantly to this growth.	Future Growth Driver
4	Mega Food Park in Baheri	A major project, the Mega Food Park in Baheri, is under development, featuring a Dairy Craft Cheesemaking plant across 12 acres with an investment of Rs 250 crore, expected to create 600 direct jobs and benefit local farmers.	Future Growth Driver
5	Industrial township	• A new industrial township near **Jhumka** intersection is underway, further bolstering	Future Growth Driver

[1] https://timesofindia.indiatimes.com/city/kanpur/tourism-boom-in-uttar-pradesh-visitor-numbers-triple-in-eight-years/articleshow/113748352.cms

Sl. No	Developments	Description	Impact Type
		economic and employment opportunities in the region. • The **Moradabad Special Economic Zone** (SEZ) spans 464.28 acres, offering robust infrastructure and sector-specific facilities for handicraft trade, textile, IT/ITES, and hardware manufacturing, making it a multi-product hub. Out of 137 allotted plots, 45 industrial units are already operational, with 377 plots still available for new investments. • The **Greater Bareilly Township**, which focuses on planned urban growth and housing solutions. Additionally, 35 villages have been integrated into the Bareilly Development Authority (BDA) jurisdiction, facilitating easier land acquisition and MSME township development. These initiatives mark significant progress in infrastructure, industrial growth, and urban expansion in Bareilly, Moradabad, and surrounding regions, paving the way for economic advancement and employment opportunities. • The development of "**Medi city**", a designated area focusing on health businesses and activities. This project aims to create a hub for healthcare-related infrastructure and services, with the proposed Medi City land included in the Master Plan 2021.	

1.3 Traffic volume and composite of vehicles

1.3.1 Historical traffic data

ETC daily-level data, segmented by ticket categories, was available for the following periods:

- Faridpur: Apr 2023– Nov-2024
- Maigalganj: Oct-2023 – Nov-2024

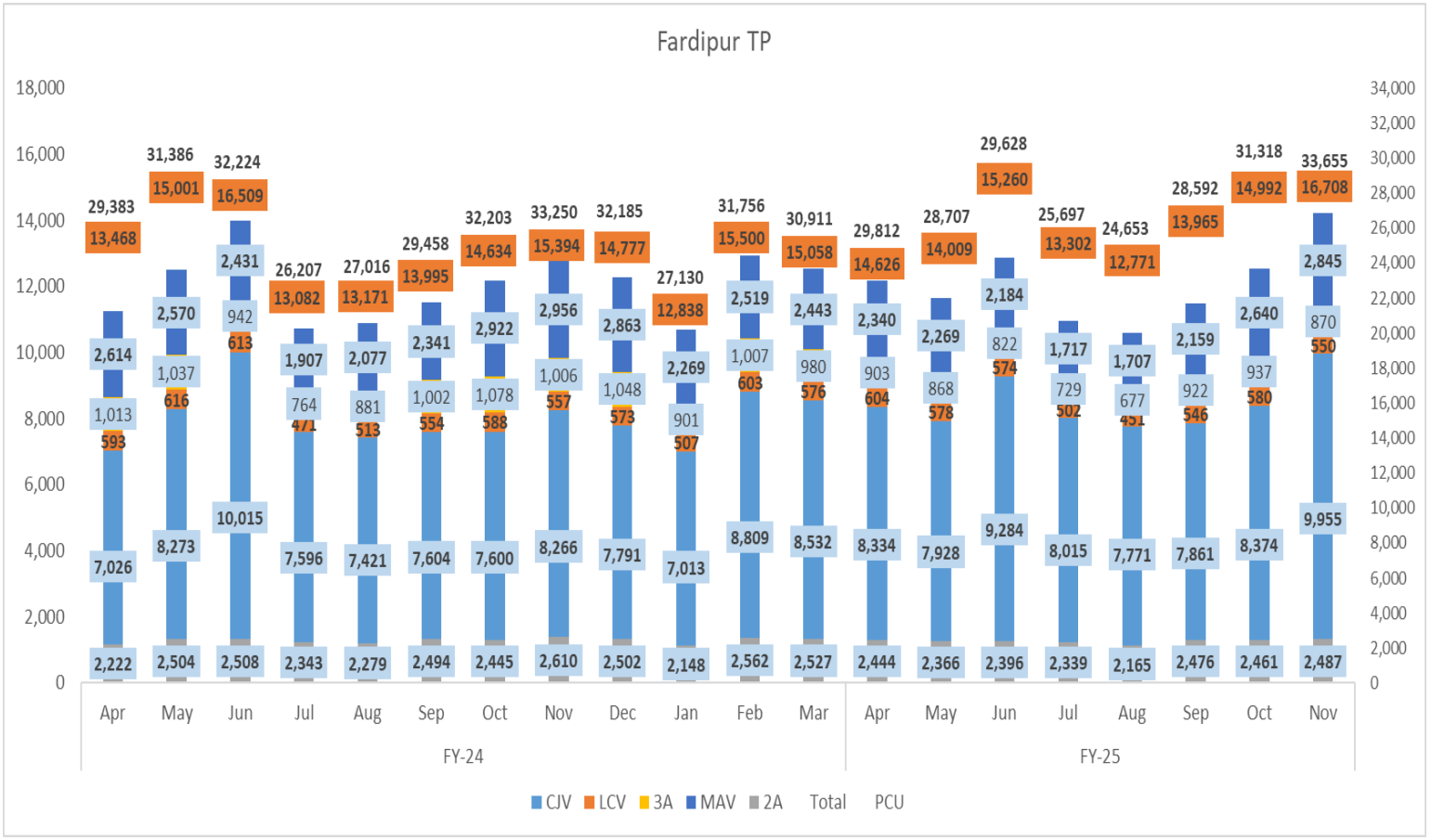


Figure 1-2: Historic Traffic Trend Mode Wise (Faridpur TP)

It was observed from historic data that FY24 (Apr-Nov) vs FY25 (Apr-Nov) shows an 4.1% growth in CJV, but a 9.4% decline in MAV. Overall traffic experienced a 3.8% drop in terms of PCUs.

Lower traffic was observed in July and August due to the monsoon season and restrictions during the Kanwar Yatra

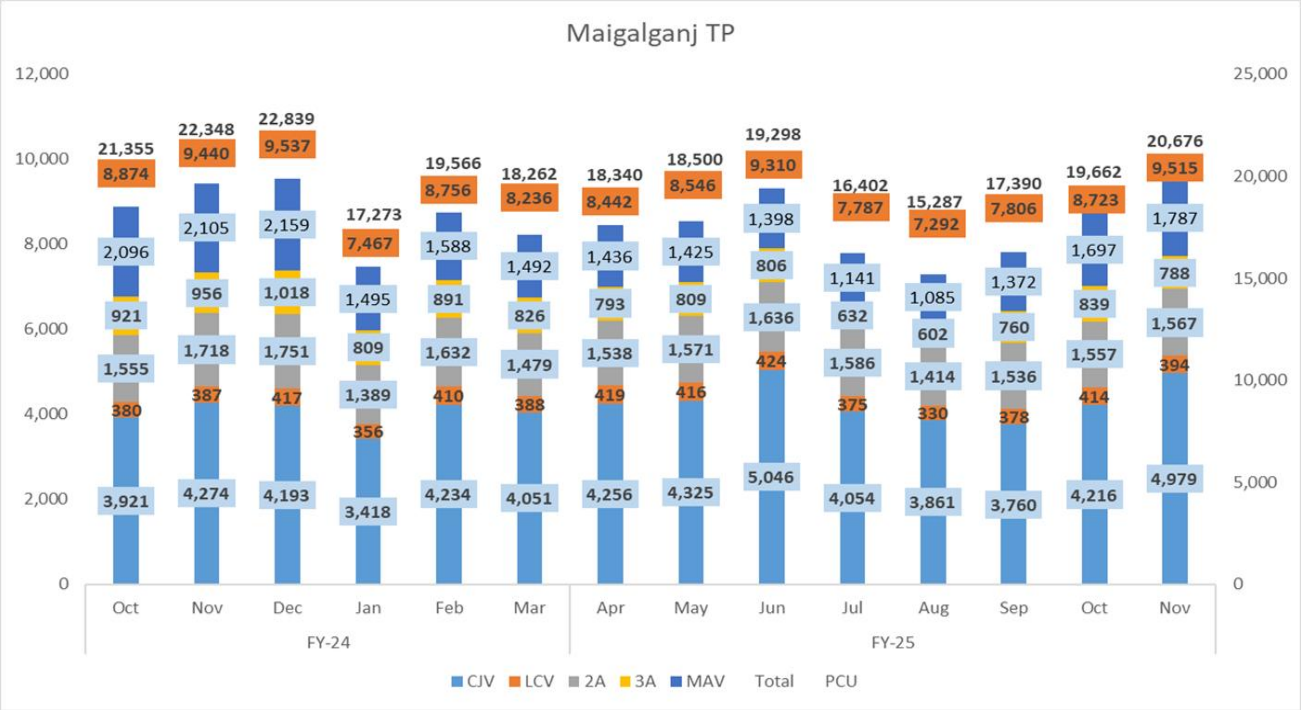


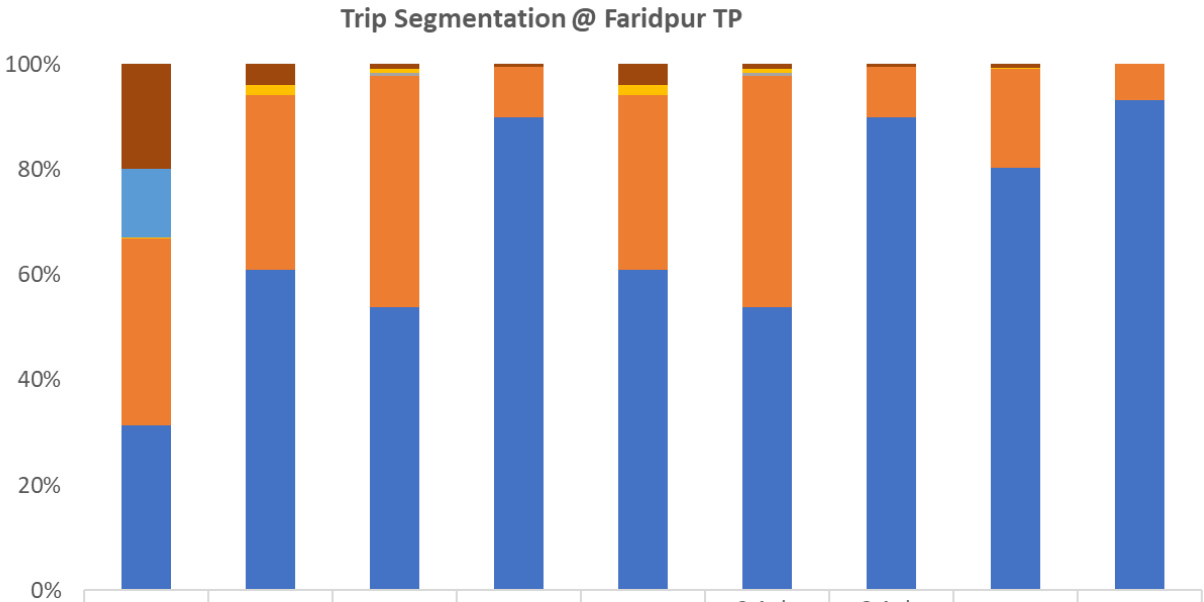
Figure 1-3: Historic Traffic Trend Mode Wise (Maigalganj TP)

Lower traffic was observed in July and August due to the monsoon season and restrictions during the Kanwar Yatra. The overall traffic decline in traffic from Jan to Sep and slight growth observed in Nov and Oct months.

1.3.2 Toll segmentation

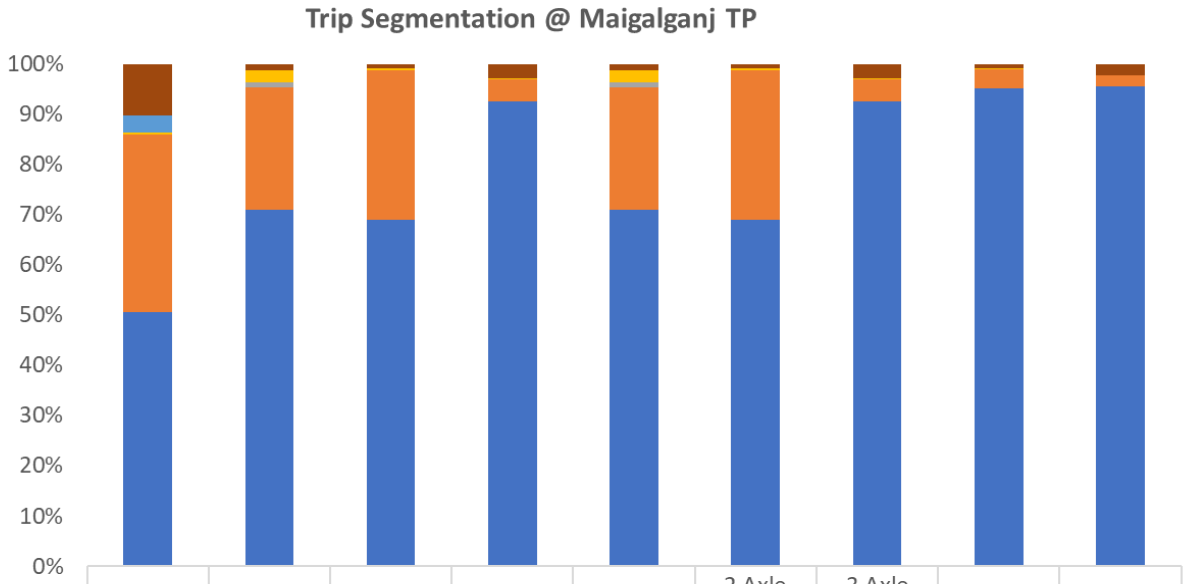
Based on detailed review of historic trends of trip segmentation, Consultant has recommended FY 25(Apr-Nov) Trip Segmentation for the base year and future traffic and revenue projections.

Trip categories and trip rates arrived based on the historic data of project road.



	Car	Mini Bus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	Over Size
Exemptions	19.9%	4.0%	0.9%	0.4%	4.0%	0.9%	0.4%	0.6%	0.0%
Local Pass	13.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Local Comm	0.1%	1.9%	0.7%	0.1%	1.9%	0.7%	0.1%	0.2%	0.0%
Monthly Pass	0.0%	0.0%	0.7%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%
Return Journey	35.5%	33.2%	43.8%	9.5%	33.2%	43.8%	9.5%	18.9%	6.8%
Single Journey	31.4%	60.9%	53.9%	90.0%	60.9%	53.9%	90.0%	80.3%	93.2%

Figure 1-4: Trip Segmentation Mode Vs Trip Wise (Faridpur TP)



	Car	Mini Bus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	Over Size
Exemptions	10.16%	1.16%	0.87%	2.89%	1.16%	0.87%	2.89%	0.89%	2.22%
Local Pass	3.39%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Local Comm	0.39%	2.42%	0.29%	0.19%	2.42%	0.29%	0.19%	0.06%	0.00%
Monthly Pass	0.02%	1.00%	0.00%	0.00%	1.00%	0.00%	0.00%	0.00%	0.00%
Return Journey	35.52%	24.38%	29.85%	4.29%	24.38%	29.85%	4.29%	3.87%	2.22%
Single Journey	50.53%	71.03%	69.00%	92.63%	71.03%	69.00%	92.63%	95.18%	95.56%

Figure 1-5: Trip Segmentation Mode Vs Trip Wise (Maigalganj TP)

1.3.3 Base Year Traffic

Table 1-2: Base Year AADT (Faridpur TP)

Mode	FasTAG	Cash	Exempt	Missing Trips	SCF	AADT
Car	7,580	13	841	1,038	1.00	**9,464**
LCV/Minibus	526	0	22	0	1.00	**545**
2Axle Truck	2,369	0	22	0	1.00	**2,380**
3 Axle	837	0	4	0	1.01	**850**
MAV	2,215	0	14	0	1.01	**2,251**
OSV	1	0	0	0	1.01	**1**
Total	**13,527**	**13**	**903**	**1,038**		**15,491**
PCU	**27,957**	**13**	**1,014**	**1,038**		**30,104**

Table 1-3: Base Year AADT (Maigalganj TP)

Mode	FasTAG	Cash	Exempt	Missing Trips	SCF	AADT
Car	3,799	73	437	0	1.02	**4,369**
LCV/Minibus	387	2	5	0	1.01	**399**
2Axle Truck	1,536	1	13	0	1.00	**1,552**
3 Axle	731	1	22	0	1.01	**760**
MAV	1,402	1	13	0	1.03	**1,454**
OSV	0	0	0	0	1.02	**0**
Total	**7,856**	**77**	**489**	**0**		**8,534**
PCU	**17,492**	**85**	**606**	**0**		**18,446**

AADT Based on FY 25 (Apr-Nov) Toll Operational data.

Arrived AADT by adopting this formula (ETC X SCF + Cash + Exempt + Missing Trips)

1.3.4 Traffic Forecast

Traffic forecasting for project road traffic was done considering past trend in growth and analysing prospects of project influence area. Elasticity approach of growth rate estimation was used for long term traffic forecasting.

Table 1-4: Alternative Roads /Development Impacts on Project Road

S.NO	Alternative Road/ Network/ Land /Improvements	Impact Type	Year Of Impact
1	6 lane greenfield access-controlled highway with a route alignment connecting NH-334 Ganga Expressway	Negative impact on Both Faridpur & Maigalganj TP	FY27: 50% FY28:100%
2	Widening of Shahjahanpur-Hardoi-Lucknow to 4L	Negative Impact on Maigalganj TP	FY27: 50% FY28:100%
3	Ganga E-Way Phase-II (From Haridwar)	Negative Impact on Maigalganj TP	FY36: 50% FY37: 100%

All these network impacts are considered in the Traffic Projections.

The methodology used for the study included following steps:

- The influencing factors obtained from OD surveys are utilized in deriving the key socio-economic parameters of the Project Influence Area (PIA) for the historic trend.
- Through regression analysis for various combinations of dependent and independent parameters is conducted to evaluate the significance of the relation.
- Potential growth of various vehicle categories was separately assessed based on its probable market share in expected multi-modal development.
- The elasticity values for the selected relation are taken & used for the traffic growth rates estimation. However, there are several steps performed before obtaining the traffic growth rates which are explained in the chapter 6.

1.3.5 Traffic and Revenue Forecast

Traffic forecasting for project road traffic was done considering past trend in growth and analyzing prospects of project influence area. Elasticity approach of growth rate estimation was used for long term traffic forecasting.

The methodology used for the study included following steps:

- The influencing factors obtained from OD surveys are utilized in deriving the key socio-economic parameters of the Project Influence Area (PIA) for the historic trend.
- Through regression analysis for various combinations of dependent and independent parameters is conducted to evaluate the significance of the relation.
- Potential growth of various vehicle categories was separately assessed based on its probable market share in expected multi-modal development.
- The elasticity values for the selected relation are taken & used for the traffic growth rates estimation. However, there are several steps performed before obtaining the traffic growth rates which are explained in the chapter 6.

1.3.6 Traffic and Revenue Assumptions

Traffic Assumptions: -

- Future traffic forecasting was done using elasticity approach which considers the elasticity of transport demand and probable pattern of future growth of the economy.
- Elasticity values for each mode is estimated using the past vehicle registration data, past traffic trend and AADT-tonnage with the growth of PCI, GSDP and Moderated elasticity values chosen for the analysis based on previous trends in socioeconomic variables.
- For Car, Bus and truck traffic, the adopted elasticity values are as follows –
    - Faridpur TP – 1.35, 0.50, 0.80
    - Maigalganj TP – 1.30, 0.50, 0.80
- Based on the projected elasticity values for TP 1 and TP2 the growth of PIA, the future average annual compound traffic growth rates by vehicle type have been estimated by using the following relationship:
    - For freight vehicle, the tonnages on the corridors are projected. The existing market share of different category of goods vehicles are then adjusted for the future years based on the past tonnage trend observed.
    - Normal traffic projections have arrived by applying the traffic growth on the base year traffic.
- The future traffic projections are presented for Effective case traffic projections & the Effective case has arrived by considering the future adjustments in the form of diversions and developments detailed in the chapter 5.

Revenue Assumptions: -

- Toll revenue projections or forecasting will be calculated based on the projected traffic and projected toll rates.
- Toll rates by vehicle and toll category depends on the tolling length, wholesale price index (WPI) and the base rates which are applicable by vehicle category are according to the NH fee notification for the project.
- Toll fee shall be computed based on the base rate fixed by NHAI and is revised annually as per the formula provided by NHAI in Schedule R of the Concession agreement which is according to the National highway fee rules 2008.
- Fee applicable shall be the rate multiplied by the length of the highway section for which toll is to be collected.
- The amount of fee and the revision thereof effective from 1st April every year shall be calculated as follows:

$$\text{Applicable rate of fee} = \text{Base Rate} + \text{Base Rate X} \left\{\frac{\text{WPIA} - \text{WPI B}}{\text{WPI B}}\right\} * 0.40$$

Were
WPI-A means the Wholesale Price Index on December 31, 2023.
WPI-B means the Wholesale Price Index of week ending on 6th January 2007.i.e 208.7.
The actual fees to be charged shall be rounded off to the nearest Five rupees.

1.3.7 Traffic and Toll revenue projections

Faridpur Toll Plaza:

Table 1-5: Effective Future Traffic (AADT): Faridpur (TP 1) – Most Likely

YEAR	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	TOTAL PCU
FY 2025	9,464	52	1,000	0	494	1,380	850	2,252	30,104
FY 2026	10,242	54	1,037	0	512	1,451	854	2,402	31,925
FY 2027	10,693	53	954	0	481	1,333	759	2,212	30,583
FY 2028	11,146	52	861	0	446	1,195	660	1,975	28,930
FY 2029	12,020	54	890	0	460	1,248	660	2,085	30,567
FY 2030	12,861	56	916	0	472	1,296	667	2,184	32,119
FY 2035	18,139	65	1,059	0	541	1,554	733	2,767	41,538
FY 2045	29,540	82	1,296	0	655	2,004	815	3,941	60,723
FY 2046	30,688	83	1,319	0	661	2,042	816	4,066	62,632
FY 2056	42,845	99	1,556	0	706	2,394	811	5,367	82,487

Table 1-6: Effective traffic growth rates for toll plaza 01 – Faridpur (%) – Most Likely

Year	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	OSV
FY 2025	8.2%	3.7%	3.7%	0.0%	3.7%	5.1%	0.5%	6.7%	6.7%
FY 2026	4.4%	-1.2%	-8.0%	0.0%	-6.1%	-8.1%	-11.1%	-7.9%	-7.9%
FY 2027	4.2%	-1.5%	-9.7%	0.0%	-7.3%	-10.3%	-13.0%	-10.7%	-10.7%
FY 2028	7.8%	3.4%	3.3%	0.0%	3.1%	4.4%	0.1%	5.6%	5.6%
FY 2029	7.0%	3.1%	3.0%	0.0%	2.7%	3.9%	1.0%	4.7%	4.7%
FY 2030	7.0%	3.0%	2.9%	0.0%	2.8%	3.7%	1.9%	4.9%	4.9%
FY 2035	5.8%	2.7%	0.4%	0.0%	1.7%	1.1%	-0.1%	2.3%	2.3%
FY 2040	4.7%	2.2%	2.1%	0.0%	1.8%	2.6%	1.0%	3.6%	3.6%
FY 2045	3.9%	1.9%	1.8%	0.0%	1.0%	1.9%	0.2%	3.2%	3.2%
FY 2046	3.8%	1.8%	1.8%	0.0%	0.9%	1.8%	0.1%	3.1%	3.1%
FY 2055	3.1%	1.7%	1.6%	0.0%	0.6%	1.5%	-0.1%	2.6%	2.6%

Maigalganj Toll Plaza:

Table 1-7: Effective Future Traffic (AADT): Maigalganj (TP 2) – Most Likely

YEAR	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	TOTAL PCU
FY 2025	4,369	24	493	0	374	1,059	760	1,454	18,446
FY 2026	4,713	25	511	0	390	1,114	763	1,562	19,529
FY 2027	4,525	24	445	0	354	990	668	1,430	17,833
FY 2028	4,275	22	372	0	314	849	571	1,265	15,849
FY 2029	4,594	23	384	0	326	888	573	1,345	16,709
FY 2030	4,900	24	396	0	337	924	581	1,418	17,524
FY 2040	8,843	31	516	0	448	1,323	716	2,234	27,279
FY 2041	9,240	32	527	0	457	1,359	726	2,318	28,239
FY 2042	9,642	33	538	0	466	1,396	735	2,403	29,210
FY 2043	10,050	33	549	0	475	1,432	745	2,490	30,193
FY 2044	10,464	34	560	0	483	1,469	754	2,578	31,188
FY 2045	10,884	35	571	0	492	1,505	763	2,667	32,191
FY 2046	11,288	35	581	0	499	1,536	771	2,754	33,146
FY 2056	15,549	42	685	0	558	1,832	835	3,664	42,994

Table 1-8: Effective traffic growth rates for toll plaza 02 – Maigalganj (%) – Most Likely

Year	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	OSV
FY 2025	7.9%	3.6%	3.6%	0.0%	4.2%	5.2%	0.4%	7.4%	7.4%
FY 2026	-4.0%	-5.7%	-13.0%	0.0%	-9.3%	-11.1%	-12.5%	-8.5%	-8.5%
FY 2027	-5.5%	-6.7%	-16.3%	0.0%	-11.3%	-14.3%	-14.4%	-11.5%	-11.5%
FY 2028	7.5%	3.4%	3.3%	0.0%	3.8%	4.6%	0.4%	6.4%	6.4%
FY 2029	6.7%	3.1%	2.9%	0.0%	3.3%	4.1%	1.3%	5.4%	5.4%
FY 2030	6.7%	3.0%	2.9%	0.0%	3.2%	4.0%	2.2%	4.9%	4.9%
FY 2035	6.0%	2.7%	2.6%	0.0%	2.7%	3.4%	2.1%	4.5%	4.5%
FY 2040	4.5%	2.2%	2.1%	0.0%	2.0%	2.7%	1.4%	3.8%	3.8%
FY 2045	3.7%	1.9%	1.8%	0.0%	1.4%	2.1%	1.1%	3.2%	3.2%
FY 2046	3.6%	1.8%	1.8%	0.0%	1.4%	2.0%	1.0%	3.2%	3.2%
FY 2055	3.1%	1.7%	1.6%	0.0%	1.0%	1.7%	0.7%	2.6%	2.6%

1.3.8 Toll rates

Table 1-9: Toll Fees for the year FY-2025 from Apr'24 to March'25 for TP1 – Faridpur

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
s	130	195	4,315	65	340
Light Commercial Vehicle or Minibus	210	315	6,970	105	-
Bus - 2 Axle	440	655	14,605	220	-
Truck - 2 Axle	440	655	14,605	220	-
3Axle	480	715	15,935	240	-
MAV (4-6) Axle	685	1,030	22,905	345	-
OSV	835	1,255	27,885	420	-

Table 1-10: Toll Fees for the year FY-2025 from June'24 to March'25 for TP2 – Maigalganj

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	130	195	4,385	65	340
Light Commercial Vehicle or Minibus	210	320	7,080	105	-
Bus - 2 Axle	445	670	14,835	225	-
Truck - 2 Axle	445	670	14,835	225	-
3Axle	485	730	16,185	245	-
MAV (4-6) Axle	700	1,045	23,265	350	-
OSV	850	1,275	28,325	425	-

1.3.9 Toll revenue projections

Toll revenue is projected based on the future traffic projections, toll fees by vehicle and toll category and trip rates. Traffic numbers are projected by fiscal year i.e., FY25, FY26 etc. and toll rates are revised on 01st April every year. Toll revenues are projected by fiscal year till the end of concession period and considering maximum possible extension referring clauses related to Additional toll way, Capacity augmentation and modification of concession period.

(a) Toll would be collected for all the days in a year.

(b) Revenue projected from FY-2025 to FY-2056.

The toll revenue projections are done for the effective case which is basically the consideration of all network improvements and land developments as described in the chapter "Traffic Growth Rate Estimation". Like the effective traffic projections, the below table summarizes the projected annual toll revenue for all the toll plazas for Most Likely scenario.

Table 1-11: Estimated Annual Toll revenue (Effective case) in Rs. Crores – Most Likely

FY YEAR	Faridpur TP	Maigalganj TP	Total Revenue
FY25	131	91	223
FY26	145	102	246
FY27	145	97	242

FY YEAR	Faridpur TP	Maigalganj TP	Total Revenue
FY28	141	90	231
FY29	153	99	252
FY30	167	107	274
FY31	183	117	299
FY32	200	128	328
FY33	218	139	357
FY34	237	152	389
FY35	259	165	424
FY36	278	180	458
FY37	300	194	495
FY38	323	209	532
FY39	349	226	575
FY40	383	247	629
FY41	411	265	675
FY42	442	285	726
FY43	477	306	783
FY44	513	330	843
FY45	550	353	903
FY46	589	378	967
FY47	631	405	1,035
FY48	678	434	1,112
FY49	721	463	1,183
FY50	770	494	1,264
FY51	823	527	1,350
FY52	880	563	1,443
FY53	936	601	1,537
FY54	1,001	640	1,642
FY55	1,068	683	1,752
FY56	1,144	730	1,874
CAGR (25-46)	**7.41%**	**6.99%**	**7.24%**
CAGR (25-56)	**7.23%**	**6.94%**	**7.11%**

The Revenue Growth (CAGR) at Faridpur Toll Plaza is observed to be 7.23% for FY25-FY56. Similarly, at Maigalganj Toll Plaza it is observed to be 6.94% for FY25-FY56.

CHAPTER 2

Introduction

2. Introduction

2.1 General

IBI Group India Private Ltd (Consultant) was appointed by National Highways Infra Investment Managers Pvt Ltd to carry out the traffic due diligence study for the Bareilly to Sitapur section of NH-30.

The project road is part of the major National Highway 30. The road stretch starts from Bareilly to Sitapur in Uttar Pradesh, spanning 157.7 km passing through key towns and cities along the way. The project road has two toll plazas (TPs), Faridpur Toll Plaza and Maigalganj Toll plaza. The project road starts from Bareilly, the highway travels through Shahjahanpur and Hardoi, serving as a vital link between these hubs. The stretch is providing connectivity between states like Madhya Pradesh, Delhi, Haryana, Uttarakhand and Bihar.

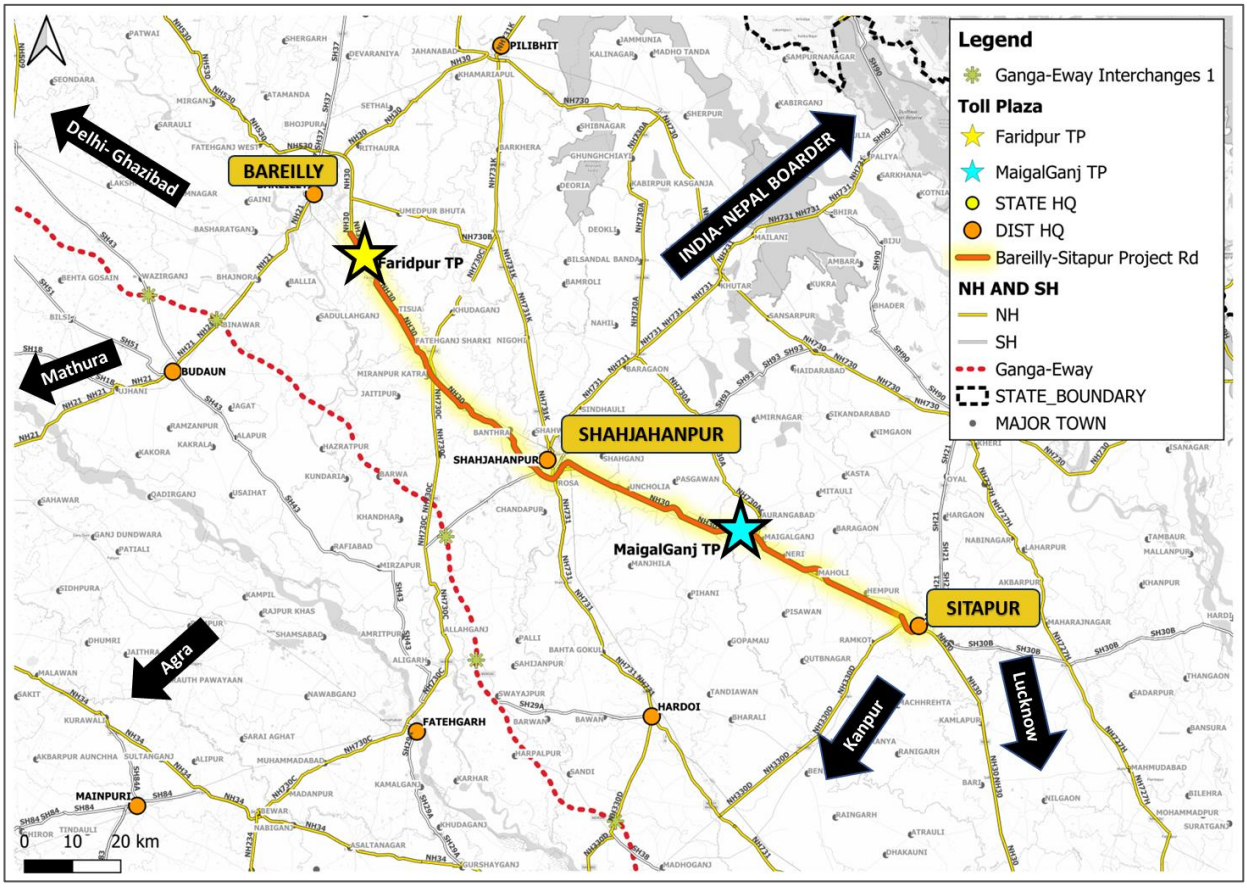


Figure 2-1 Project Corridor with existing toll plazas location

As part of this study, a systematic methodology has been followed to assess the characteristics of the existing traffic on the project road and traffic growth during the remaining period of the concession i.e., till (20 Years). How ever the same has been estimated till FY-2056 as long-term projections. The details pertaining to the data collection, primary as well as secondary, and results from its analysis are presented in the subsequent chapters of this report.

The Traffic report presents the existing traffic characteristics, methodology used to derive traffic growth rates, details on adopted traffic growth rates, forecasted traffic, diverted, and generated traffic if any for the next twenty (20) years. Based on these, future toll able traffic and toll revenues at the existing toll plaza locations are assessed and presented.

2.2 Objective and Scope of work

The main objective of the study is to carry out review of existing traffic & revenue data and forecasting the future traffic and revenues for the project road for the remaining concession period considering the potential risks and developments in view of the micro and macro characteristics related to demographics, economy, alternate routes, project road, regional network & peripheral development in the project influence area (PIA).

The scope of work is to assess the horizon year traffic & toll revenue at the toll plaza locations on the project road through:

- **Review of Data and Documents:**
    - Reviewing the Historical data on classified traffic volume & revenue data for the project highway's Toll Plazas.
    - Reviewing the Past traffic study reports.
    - Conducting gap analysis between actual and projected traffic & revenue for current/last year and ascertaining the reasons thereof.
    - Traffic volume/ revenue data collected from the concerned PIUs, and actual amount remitted by User Fee Collection Agencies to NHAI.

- **Traffic Surveys:**
    - 7 Days Traffic Volumes counts at both the toll plazas of project road using Videography method. The vehicle classification system as given in relevant IRC code may be followed.
    - All results shall be analyzed, and the annual average daily traffic (AADT) shall be worked out by applying seasonal correction / variation factors.
    - Triangulation of traffic forecasts shall be undertaken based on data from secondary sources and analysis of variations (if any), from the traffic as per TVC and as per data shared by NHIIMPL.
    - 1 Day Origin- Destination study at both the toll plazas of project road using roadside interview techniques.
    - The road-side interviews on random sample basis to cover all vehicles. The location of the O-D survey and commodity movement surveys shall normally be the same as for the classified traffic volume count.
    - Identification of Project Influence Area and traffic generators (industrial areas, towns, ports etc.) from analysis of travel pattern covering:
        a) Regional distribution of traffic – through/ bypassing traffic/ inter-state, intra-state/interdistrict, intra-district etc.
        b) Commodity composition- Goods type distribution.
        c) Top OD pairs by vehicle types.
        d) Travel frequency and trip purpose distribution leading to traffic segmentation by toll rate category.

- Traffic diversion analysis, in case, there are existing routes, or new alternative routes are planned by relevant Authority.
- Identification of and traffic analysis relating to Competing Routes ((including rail/DFC etc.), if any.
- Assessment of impact of network improvements based on observed travel pattern.
- Traffic growth rate estimation based on the elasticity approach using econometric modelling

- **Traffic & Revenue Estimates:**
  - The values of elasticity of transport demand shall be based on the prevailing practices in the country. The Advisors shall give complete background including references for selecting the value of transport demand elasticity.
  - The demand estimates shall be done assuming three scenarios, namely, optimistic, pessimistic and most likely traffic growth. The growth factors shall be worked out for five- yearly intervals or as appropriate.
  - Above all will include formulation of future economic outlook based on recent economic performance, extent of impact of covid waves and expected economic recovery thereafter.
  - Key factors to be considered in forecasting traffic/ revenue:
    a) Seasonal Correction Factors
    b) Influence area of the project and its economic perspective
    c) Key traffic drivers of the project
    d) Present and future elasticity of transport demand by vehicle type
    e) Traffic growth rate trends observed
    f) Impact of upcoming developments and future development potential of the region
    g) Study of impact of competing routes in terms of diversion from/to the project road - Identification of competing routes and network condition, traffic characteristics & level of tolls charged, if any on the competing corridors
    h) Review of nearby toll plaza/past traffic & revenue data for accurate estimation of traffic growth and to study the past traffic growth trend.
    i) Scenario testing for toll revenue
    j) Any other competing transportation facility
    k) Distribution of traffic into different tolling streams (normal paying and concessions as applicable in line with CA)

2.3 Composition of the Report

This Report is further divided into seven chapters. Chapter 1 contains the executive summary of the report providing a brief outcome of the study. Chapter 2 provides a brief description of the project including the background and key objectives of the study. Chapter 3 contains details of the project road existing connectivity and its influence area. Chapter 4 contains details pertaining to various secondary and primary data and its analysis to understand the base year traffic and travel characteristics. Chapter 5 presents the traffic diversion analysis. This chapter

details out the approach and methodology adopted for identification of the potential divertible traffic. It also, elaborately illustrates the approach and methodology adopted for the identification of alternate networks & routes presents the Diverted traffic.

Chapter 6 illustrate the potential developments, growth drivers in the PIA and the potential developmental traffic generated out of the identified developments and, presents the estimation of the traffic growth rates used for traffic forecasting and chapter 7 presents the traffic and revenue projections for the entire concession period.

CHAPTER 3

Characteristics of the Project Influence Region

3. Project Influence Area Characteristics

This chapter examines various areas which significantly influence the project road. Demographic, geographical, agricultural & industrial sector, and industrial profile of project influence area is discussed in this chapter.

3.1 Project Road

Key element of any traffic assessment is the understanding of the spread of regions around the project that influence the traffic on the highway and establish the relationship between them. This was achieved through extensive data collection from secondary sources/past reports.

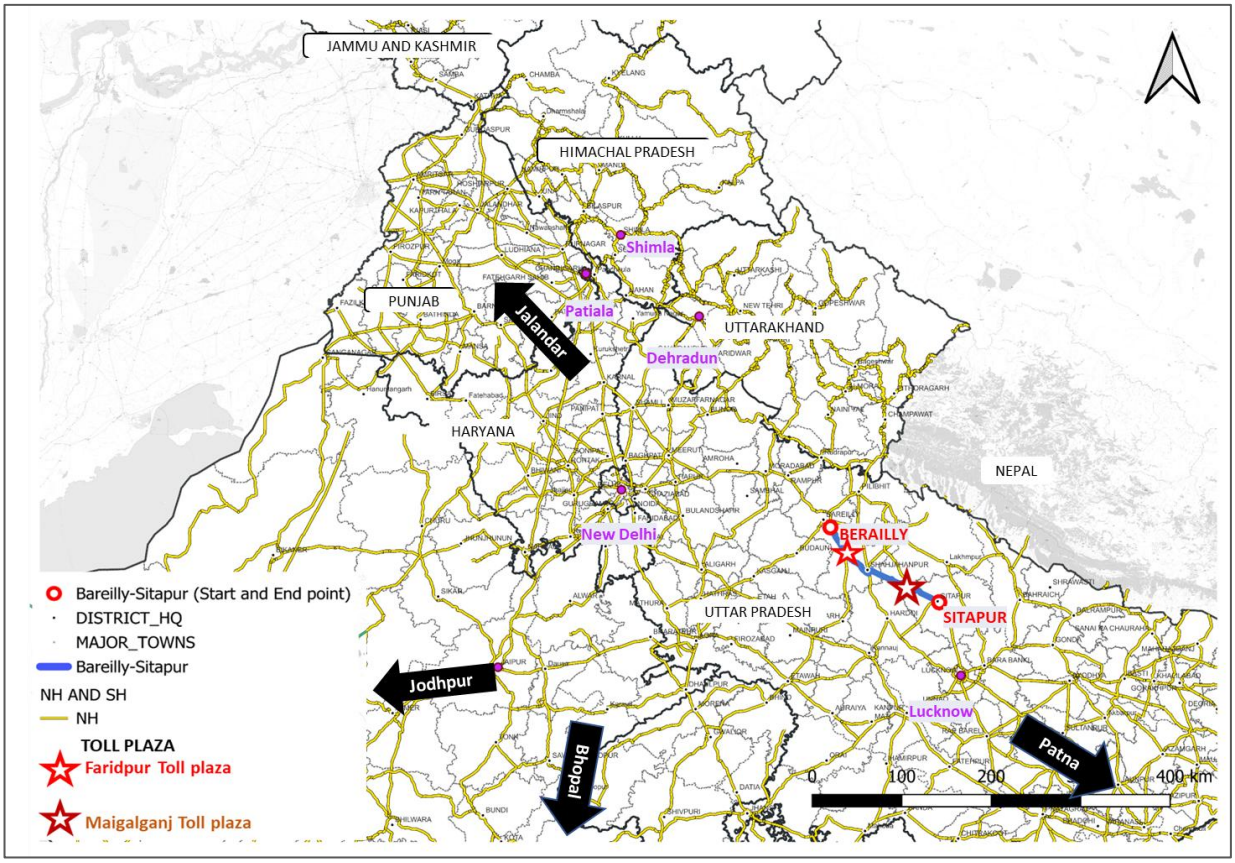


Figure 3-1 Project Road Network at Regional Level

Generally, the area which contributes to the total traffic plying on project road is called the project influence area (PIA). PIA is further classified into primary (immediate) and secondary (broad) influence area, depending on its distance from the project road. The immediate influence area of the project corridor comprises of region/districts of Uttar Pradesh, Bareilly, Shahjahanpur & Sitapur which are in immediate proximity to the project road contributing above 81% of the project road traffic. Uttar Pradesh, Haryana, Uttarakhand and Bihar are the other major contributors to the traffic on the project corridor.

Based on the study of the secondary information and past traffic data, the project influence area is divided into: Immediate Influence Area, which comprises of the traffic generators located along the project highway including the end points. Broad Influence Area, which comprises of long-distance destinations which are catered by project highway beyond immediate influence

area. The project road with its primary and secondary influence area is as presented in the table below.

Table 3-1 Major Traffic Generating Nodes for Project Road

SL. NO.	STATES	IMPORTANT CITIES
Immediate Influence Area		
A1	Uttar Pradesh	Bareilly, Shahjahanpur, Lucknow, Sitapur
A2	Uttarakhand	Rudrapur, Haldwani, Dehradun
Broad Influence Area		
B1	Punjab	
B2	Haryana	
B3	Bihar	
B4	West Bengal	

3.2 Uttar Pradesh Profile

Uttar Pradesh (UP) is a state in northern India, ranking 4th largest and 1st most populous. Its capital is Lucknow, and largest city is Lucknow. The state is bordered by Rajasthan to the west, Haryana, Himachal Pradesh and Delhi to the northwest, Uttarakhand and Nepal to the north, Bihar to the east, Madhya Pradesh, Chhattisgarh and Jharkhand to the south.



Figure 3-2 District Map of Uttar Pradesh

The state has 75 districts across four regions: Paschim Pradesh, Bundelkhand, Avadh Pradesh and Purvanchal. The state also has three distinct physical regions: the Shiwalik in the north, the Gangetic plains in the center, and the Vindhyan hills in the south. 65% of the population depends on agriculture. Central smart cities: Agra, Aligarh, Bareilly, Jhansi, Kanpur, Lucknow, Moradabad, Prayagraj, Saharanpur, and Varanasi and State smart cities: Ayodhya, Firozabad, Ghaziabad, Gorakhpur, Mathura, Meerut, and Shahjahanpur.

3.2.1 Economic & Industrial Profile

Uttar Pradesh is one of India's significant state economies, with a gross domestic product (GDP) of ₹20.48 lakh crore and per capita GDP of ₹84,125.775. The state's Gross State Domestic Product (GSDP) for the fiscal year 2023-24 is projected to be ₹24.39 lakh crore, reflecting a 19% increase from 2022-23. In 2022-23, the agriculture and allied sectors contributed 18.2% to Uttar Pradesh's Gross State Value Added (GSVA). The services sector is the largest contributor to the GSDP, accounting for about 54.3%, followed by industry at 23% and agriculture at 25.7%. Uttar Pradesh's top five export items include Telecom Products, Buffalo Meat, Cotton and Manmade Fibers, Footwear products. In 2021-22, the state's total exports were ₹1.74 Lakh Crore. Uttar Pradesh is a major producer of Sugarcane, and it also has It accounts for about 17.8% of the country's total food grain output.

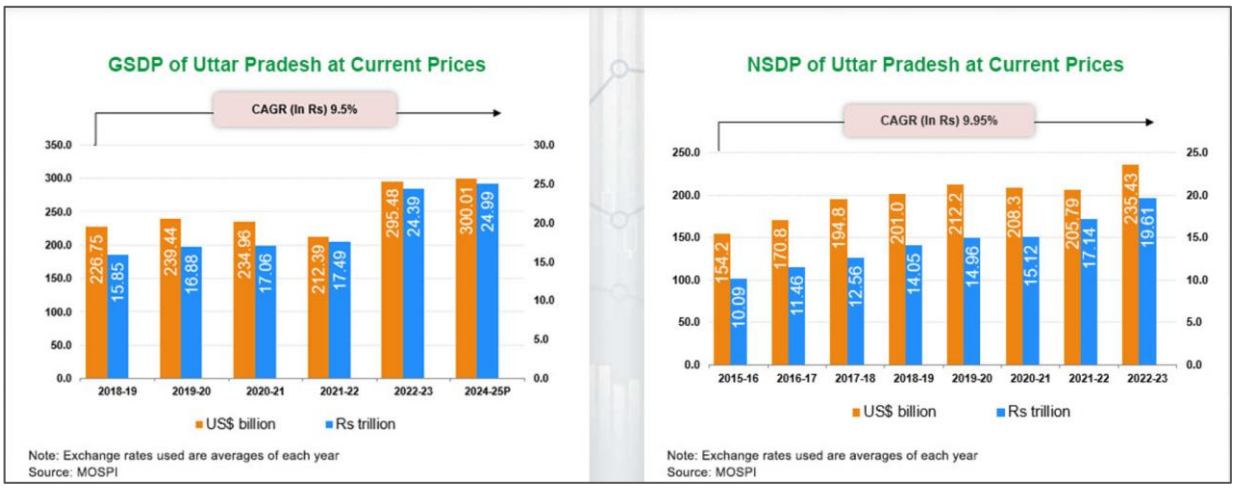


Figure 3-3 GSDP and NSDP of Uttar Pradesh (Source: MoSPI)

Uttar Pradesh's foreign direct investment (FDI) inflows have averaged $82.92 Billion from December 2019 to September 2023. The data peaked at a record high of $21.68 Billion in December 2022, while it reached a record low of $942 million in March 2020.

Uttar Pradesh hosts a diverse industrial landscape with over 1,000 automotive and auto component manufacturing units. Key hubs in this sector include the cities of Lucknow, Kanpur, Shahjahanpur, Aligarh, Prayagraj, Saharanpur, and Etawah. Prominent companies operating in this sector include Tata Motors, Honda, and Yamaha.

3.2.2 Agriculture Profile

Uttar Pradesh, known as "the Sugar bowl of India," plays a pivotal role in India's agriculture. About 78% of its population lives in villages and engages in agricultural practices, from which the state derives about 24.5% of its GDP. By and large, the cultivated area is about 26 million hectares, supplemented sufficiently by a vast irrigation network supplied with its water by rivers like Ganga, Yamuna, Saryu, Gomti, Rapti, Betwa and Chambal.

Sugarcane is the major crop, and Uttar Pradesh is one of the major producers of several crops like Wheat, Rice and Maize. The state also produces considerable quantities of Pulses, Oilseeds, Millets, Vegetables and Fruits. The three main agricultural export zones in the state are: Shahjahanpur, Pilibhit, Rampur, for Basmati Rice; Hardoi and Sitapur, for mangoes and Vegetables, showing its prominence in the agricultural scenario.

3.2.3 Infrastructure Profile

Uttar Pradesh has developed its infrastructure well, and it plays a vital role in its economic growth. The State is adequately connected with largest network of national highways in India, facilitating efficient road transport. Major expressways include the Yamuna Expressway, connecting Delhi to Agra, and the Agra-Lucknow Expressway, which significantly reduces travel time. The state is also developing the Ganga Expressway, a 594 km long greenfield project aimed at improving connectivity and promoting industrial growth along its route. extensive railway network that connects major cities and rural areas. The state is also set to benefit from dedicated freight corridors aimed at enhancing logistics and transportation efficiency.

The Lucknow Metro and Kanpur Metro have been operationalized, improving urban transportation and reducing congestion in these cities.

The establishment of the Inland Waterways Authority aims to enhance connectivity through rivers. A multi-modal terminal has been completed in Varanasi to facilitate cargo movement via waterways.

The government is focused on improving urban infrastructure through various initiatives, including the construction of roads, bridges, and public facilities to support growing urban populations. Significant investments are being made in developing smart cities and enhancing public welfare facilities ahead of major events like the Maha Kumbh in Prayagraj.

3.3 Uttarakhand Profile

Uttarakhand is the ranks 20th place in population wise, comprising 13 districts, the state capital Dehradun is part of a larger metropolitan area that includes surrounding towns and regions, which further influences its population dynamics. It is bounded by Himachal Pradesh to the northwest, Tibet to the north, Nepal to east, Uttar Pradesh to the south and southeast and Haryana on the west respectively. Uttarakhand spreads over an area of 53,483 sq km, making

it the 19th Indian state in terms of geographical area. Garhwal and Kumaon are two administrative divisions into which the state is divided into with 13 districts.

Uttarakhand features a highly varied geography characterized by its mountainous terrain, rich forests, and significant water bodies. The state is predominantly part of the Himalayas, including major peaks such as Nanda Devi, which is the highest point in Uttarakhand at 7,816 meters (25,643 feet). Other notable peaks include Kedarnath, Trishul, and Kamet. Major rivers originating from Uttarakhand include the Ganges and Yamuna, both of which are crucial to India's river system. These rivers are fed by numerous glacial melts and streams.



Figure 3-4 District Map of Uttarakhand

3.3.1 Economic & Industrial Profile

The Uttarakhand state is the second fastest growing state in India.[5] Its gross state domestic product (GSDP) (at constant prices) increased more than 13 times from ₹24,786 crore in FY 2005 to ₹3.33 lakh crore in FY23-24. The real GSDP grew at 13.7% (CAGR) during the FY 2005–FY2012 period. The contribution of the service sector to the GSDP of Uttarakhand was just over 50% during FY 2012. Per capita income in Uttarakhand is ₹2,61,173 (FY 2023) which is higher than the national average of ₹2.12 lakh (FY 2023).

Like most of India, agriculture is one of the most significant sectors of the economy of Uttarakhand. Basmati rice, wheat, soybeans, groundnuts, coarse cereals, pulses, and oil seeds are the most widely grown crops. Fruits like apples, oranges, pears, peaches, litchis, and plums

are widely grown and important to the large food processing industry. Agricultural export zones have been set up in the state for litchi, horticulture, herbs, medicinal plants, and basmati rice. During 2010, wheat production was 831 thousand tons and rice production was 610 thousand tons, while the main cash crop of the state, sugarcane, had a production of 5058 thousand tons. there key industries include tourism and hydropower, and there is prospective development in IT, ITES, biotechnology, pharmaceuticals and automobile industries.

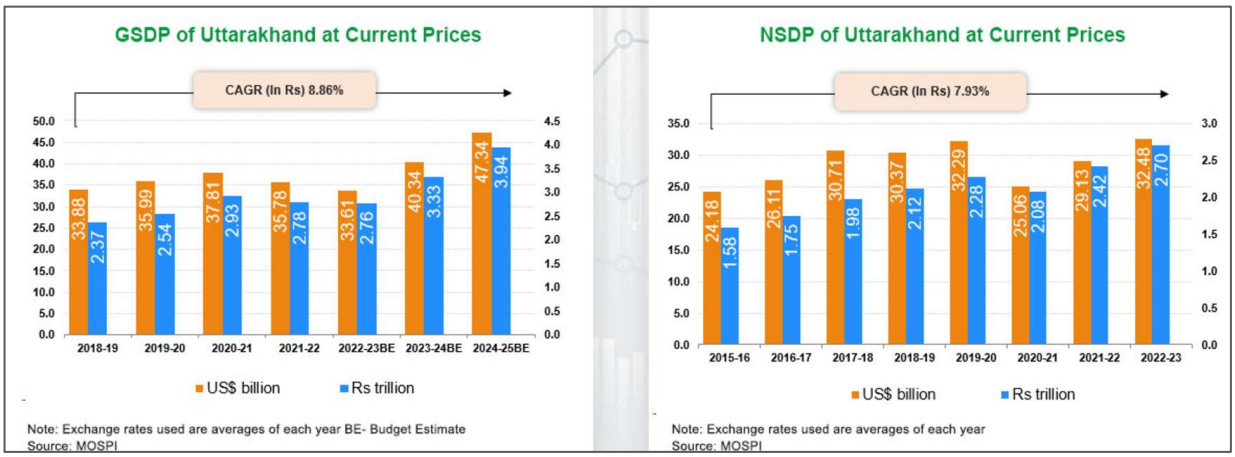


Figure 3-4 GSDP and NSDP of Uttarakhand (Source: MOSPI)

Uttarakhand's strategic location, combined with government support and a focus on key sectors like tourism, pharmaceuticals, and IT, makes it an attractive destination for foreign direct investment. The recent agreements and ongoing initiatives indicate a positive trend in investment inflows, which are crucial for the state's economic growth.

3.3.2 Agriculture Profile

Agriculture in Uttarakhand is highly dependent on the diverse climatic zones, making it suitable for a range of crops, especially fruits, vegetables, and medicinal plants. Despite its challenges, such as the rugged terrain and vulnerability to natural disasters, Uttarakhand has considerable agricultural potential. The government's focus on organic farming, irrigation, and infrastructure development aims to improve productivity and ensure sustainable agricultural growth in the region.

Uttarakhand's agriculture profile is characterized by its diverse climatic conditions, varied topography, and a mix of traditional and modern agricultural practices. Here's a detailed overview of the agricultural landscape in the state:

Area Under Cultivation: Approximately 7.23 lakh hectares (about 13% of the total reported area) is under cultivation, with a cropping intensity of 161.75%, indicating multiple cropping cycles in a year.

Irrigation: The net irrigated area stands at about 3.36 lakh hectares, with most irrigation facilities concentrated in the plains and valleys, as the hilly terrain limits irrigation options.

Food Crops:

- Cereals: Major food crops include:
- Wheat: A staple crop with significant production; wheat productivity has improved from 18.84 quintals per hectare in 2000-01 to 23.76 quintals per hectare in 2011-12.
- Rice: Another important crop, with production figures around 610 thousand tonnes.
- Maize and Pulses: Grown primarily in the hilly regions and contribute to food security.

Cash Crops:

- Sugarcane: The main cash crop, with production reaching around 5,058 thousand tonnes.
- Basmati Rice: Known for its aroma and quality, particularly grown in Udham Singh Nagar.

Horticulture: Uttarakhand is recognized for its fruit production, including apples, pears, peaches, litchis, and plums. The state has established agricultural export zones for various fruits and herbs.

Spices and Medicinal Plants: The state produces spices like ginger, turmeric, and garlic, which thrive due to favourable climatic conditions. Uttarakhand is home to approximately 175 species of medicinal herbs, supporting both local health practices and potential export markets.

Livestock and Dairy: The livestock sector is vital for rural livelihoods, with initiatives aimed at improving goat and sheep farming. Dairy farming is also significant, contributing to the state's economy and providing employment opportunities.

3.3.3 Infrastructure Profile

Uttarakhand’s infrastructure has seen significant improvements in recent years, with major developments in transport, energy, water supply, telecommunications, and health. However, challenges remain in remote and hilly regions, where accessibility and connectivity can still be difficult. Continued investment in infrastructure will be critical to sustaining economic growth, improving the quality of life for residents, and boosting tourism and industrial growth.

Tourism Infrastructure:

Uttarakhand's tourism industry is supported by a wide range of infrastructure, from hotels, resorts, and guesthouses to better transportation systems for pilgrims and tourists. The state is known for its pilgrimage sites, including the Char Dham (Yamunotri, Gangotri, Kedarnath, and Badrinath), and attracts eco-tourism and adventure tourism. The Uttarakhand Tourism Development Board (UTDB) promotes tourism, and efforts are underway to improve the tourism infrastructure, particularly in remote and high-altitude areas.

Industrial and Commercial Infrastructure: Industrial Zones: Uttarakhand has established industrial zones, particularly in Haridwar, Pantnagar, and Saharanpur, to promote industrialization, especially in sectors like pharmaceuticals, manufacturing, and food

processing. The Uttarakhand Industrial Investment Policy aims to attract investment in various sectors by providing incentives and developing necessary infrastructure for businesses.

Information Technology: Uttarakhand has promoted the development of IT parks, particularly in Dehradun and Haridwar, to foster IT-related services and industries. The state has also launched the Uttarakhand IT Policy to attract investments in the sector, encouraging software development and BPO industries.

3.4 Bareilly District

Bareilly is a city and the administrative headquarters of the Bareilly district in Uttar Pradesh, India. Bareilly lies in the Indo-Gangetic Plains, approximately 252 kilometers northwest of Lucknow and 265 kilometers east of New Delhi.

3.4.1 Demographic & Geographical Profile

According to the 2011 census, Bareilly district has a population of 4,448,359, which constitutes about 2.12% of the state's population. The district experiences a tropical climate with three main seasons: summer, monsoon, and winter. It covers a geographical area of 4,034 square kilometers, representing 1.5% of Uttar Pradesh's total area. Bareilly It is located on the bank of Ramganga River and is the site of the Ramganga Barrage built for canal irrigation. The district is bordered by the Udham Singh Nagar district to the north, Pilibhit district to the east, and Shahjahanpur to the South-East, Badaun to the South and Rampur to the west and Its population growth rate for the year 2011 was 23.4%. This district is a home to the archaeological site of Ahichhatra, which was the capital of Northern Panchala. The district's water resources include the Ramganga, Siddha, Dojora, Bahgul, Sankha, Deoranian, and Nakatia rivers, which flow through its territory, and several reservoirs such as the Nanak Sagar Dam and Sharda Canal.

3.4.2 Economy

Bareilly is a significant commercial and Economic hub in the region, with a diversified economy based on agriculture, tourism, and small-scale industries. The district benefits from its strategic location and which supports various economic activities. Bareilly economy is also boosted by the presence of several industrial and service sectors. The district's agricultural produce and handicrafts industries contribute notably to its economic output. Major companies like Hindustan Unilever have established operations in Bareilly, enhancing local economic activity.

3.4.3 Agriculture & Allied Sector

Agriculture is a crucial component of Bareilly economy, supporting both income and employment for a significant portion of the population. The district benefits from its fertile soil and favourable climatic conditions, leading to a variety of crops being cultivated. The primary crops grown

include rice, wheat, Sugarcane, Mustard, Pulses, Potato and Mint. Here's a brief overview of the agriculture profile of Bareilly:

Main Crops:

- Kharif (monsoon) crops: Rice, Maize, Millet, Sugarcane, Brinjal, Bottle Gourd and Bitter Gourd.
- Rabi (winter) crops: Wheat, Barley, Gram, Lentils, Potato, Onion.
- Horticulture: The district also grows a range of fruits and vegetables, including mangoes, guavas, tomatoes, and Cauliflower

3.4.4 Industrial Profile

Bareilly is an emerging industrial center with a growing focus on various sectors, including textiles, food processing, and small-scale industries.

- **Textiles**: The textile sector is significant, with local production of garments and accessories
- **Argo-based Industries**: Tirupati has a substantial Agro-based industrial sector, including the processing of fruits and vegetables, and production of packaged foods. This sector includes food processing industries such as fruit preservation, pickles, and snacks (namkeen).
- **Automobiles:** The district is developing a base for automobile manufacturing and related services.
- **Chemicals:** There is an increasing presence of chemical manufacturing, including pesticides and insecticides.
- **Leather and Leather Products:** Bareilly has a notable leather industry, producing various leather goods.
- **Metals and Mining:** The district has potential in metals processing and mining activities.

3.5 Shahjahanpur District

Shahjahanpur is a city and the administrative headquarters of the Shahjahanpur district in Uttar Pradesh, India. Shahjahanpur district is in the northern part of India lies approximately 175 kilometers northwest of Lucknow.

3.5.1 Demographic & Geographical Profile

According to the 2011 census, Shahjahanpur district has a population of 3,006,538, accounting for about 1.5% Uttar Pradesh population. The district experiences a tropical climate with three primary seasons: summer, monsoon, and winter. Shahjahanpur spans an area of 4,575 square kilometers, making up 1.88% of the state's total area. The district features predominantly flat terrain with fertile plains, which are conducive to agricultural activities. The soil is primarily Loamy Soil, enriched by the river systems that flow through the area. The district is bordered by the Bareilly and Rampur to the west, the Hardoi state to the south, the Lakhimpur Kheri district

to the north, and the Pilibhit district to the east. The population density is 673 inhabitants per square kilometer. The population growth rate for the year 2011 was 17.84%. The labor force participation rate was 49.8% for the year 2023-2024. The district is well-watered by the Ramganga, Garrah, Gomti, Khannaut and Suketa and Kai rivers, and important reservoirs, including the Kalagarh and Dabri reservoirs.

3.5.2 Economy

Shahjahanpur district characterized by a diverse economy encompassing agriculture, trade, and various small-scale industries. The district benefits from its agricultural productivity and its strategic location near major urban centers, fostering growth in multiple sectors.

3.5.3 Agricultural & Allied Sector

Agriculture is a key driver of Shahjahanpur economy, contributing significantly to both income and employment. The district's favorable climatic conditions and fertile soil support a wide range of crops. Major crops cultivated include rice, groundnut, Sugarcane, Pulses and paddy. Here's an overview of Shahjahanpur agriculture profile.

Main Crops:

- **Kharif (monsoon) crops**: maize, Maize, Millets, Jowar and Groundnuts
- **Rabi (winter) crops**: Wheat, Gram, Barley, Pulses and Oilseeds.
- **Horticulture**: The district is renowned for its production of fruits such as mangoes and guavas, as well as vegetables like tomatoes, onions, and chilies.

3.5.4 Industrial Profile

Shahjahanpur is emerging as an industrial center with a focus on several sectors, including textiles, agro-based industries, and manufacturing.

- **Agro-based Industries**: Agriculture remains the backbone of the district's economy, with about 80% of the area under agricultural use. Numerous food processing units exist, focusing on products like rice, sugar, and oilseeds. The district is recognized for its potential in developing an Agri Export Zone for basmati rice.
- **Handicrafts and Cottage Industries:** The district is known for its handicrafts, particularly carpets and durries, which are significant export items. Local artisans engage in various crafts, contributing to the cultural heritage and economy.
- **Chemical and Petrochemical Industries:** Several small-scale chemical manufacturing units produce fertilizers, pesticides, and other chemical products that support agriculture.
- **Service Sector:** Emerging areas within the service sector include organic farming, handicrafts, art and artisan products, and automotive repair services.
- **Manufacturing Sector:** The manufacturing sector plays a vital role in the local economy, encompassing various industries.

3.6 Sitapur District

Sitapur is a city and the administrative headquarters of the Sitapur district in Uttar Pradesh, India. Located in the Northern part of the state, Sitapur lies approximately 90 kilometers north of Lucknow.

3.6.1 Demographic & Geographical Profile

According to the 2011 census, Sitapur district has a population of 4,483,992, accounting for about 2.24% Uttar Pradesh population. The district experiences a tropical climate with three primary seasons: summer, monsoon, and winter. Shahjahanpur spans an area of 5,743 square kilometers, making up 2.36% of the state's total area. The district features predominantly flat terrain with fertile plains, which are conducive to agricultural activities. The soil is primarily Loamy Soil, enriched by the river systems that flow through the area. The district is bordered by the Hardoi to the west, the Barabanki state to the south, the Kheri district to the north, and the Bahraich district to the east. The population density is 781 inhabitants per square kilometer. The population growth rate for the year 2011 was 18%. The labor force participation rate was 78.8% for the year 2023-2024. The district is well-watered by the Kathana, Sarayan, Gomti, Ghaghra and Pirai rivers, and important reservoirs, including the iddhauliya, Ramgarh, Bakhira, Karela Jheel reservoirs.

3.6.2 Economy

Sitapur district characterized by a diverse economy encompassing agriculture, trade, and various small-scale industries. The district benefits from its agricultural productivity and its strategic location near major urban centers, fostering growth in multiple sectors.

3.6.3 Agricultural & Allied Sector

Agriculture is a key driver of Shahjahanpur economy, contributing significantly to both income and employment. The district's favorable climatic conditions and fertile soil support a wide range of crops. Major crops cultivated include rice, groundnut, Sugarcane, Pulses and paddy. Here's an overview of Sitapur agriculture profile.

Main Crops:

- **Kharif (monsoon) crops**: Paddy, Maize, Sesame, Pigeon Pea, Groundnut, Moong Bean etc.
- **Rabi (winter) crops**: Wheat, Sugarcane, Barley, Gram, Barley, Mustard, Lentil, Potato etc.
- **Horticulture**: The district is renowned for its production of fruits such as mangoes, Banana, Papaya and guavas, as well as vegetables like tomatoes, onions, and chilies.

3.6.4 Industrial Profile

The industrial profile of Sitapur district in Uttar Pradesh is characterized by a mix of traditional and agro-based industries, primarily driven by the region's agricultural output.

- **Sugar Industry:** Sitapur is home to several sugar mills, which are among the most significant industrial establishments in the district.
- **Agro-based Industries:** The district has various agro-based industries that process local agricultural products.
- **Textiles and Handicrafts:** Historically, Sitapur was known for its textile industry, particularly in the production of traditional fabrics and potteries. While the textile sector has diminished, there remains some production of cotton and woolen mats (Durries), especially in Laharpur and Khairabad.
- **Dairy Industry:** The dairy sector plays a crucial role in the local economy, providing livelihoods to many residents. There are initiatives aimed at enhancing dairy development through area development schemes.

3.7 Lucknow District

Lucknow is a city and the administrative headquarters of the Bareilly district in Uttar Pradesh, India. Bareilly lies in the Indo-Gangetic Plains, approximately 252 kilometers northwest of Lucknow and 265 kilometers east of New Delhi.

3.7.1 Demographic & Geographical Profile

According to the 2011 census, Bareilly district has a population of 4,448,359, which constitutes about 2.3% of the state's population. The district experiences a tropical climate with three main seasons: summer, monsoon, and winter. It covers a geographical area of 2,528 square kilometers, representing 1.0% of Uttar Pradesh's total area. Lucknow It is located on the bank of Gomati River. This district is bordered by Barabanki to the east, Unnao to the west, Raebareli to the south, and Sitapur and Hardoi to the north and Its population growth rate for the year 2011 was 25.79%. The district is known for its historical landmarks, educational institutions, and vibrant markets. The district's water resources include the Kukrail, Loni, and Beta are tributaries of Gomti river, and Sai rivers which flow through its territory, and several reservoirs such as the Chinhat Lake.

3.7.2 Economy

Lucknow Gross District Domestic Product: As of 2019-20, Lucknow's GDDP was approximately ₹60,364 crores, with a per capita GDP of around ₹111,373. This positions Lucknow as one of the key economic centers in Uttar Pradesh and northern India. The district hosts several large-scale industries, including Hindustan Aeronautics Limited, Tata Motors, and Scooters India Limited. The manufacturing sector includes textiles (notably Chikan embroidery), machine tools, chemicals, and furniture production. The service sector is robust, with significant contributions

from education, healthcare, IT, and finance. Major companies like Tata Consultancy Services and HCL Technologies operate in the area. Lucknow serves as a major wholesale market (mandi) for agricultural products like mangoes and food grains from surrounding areas. This sector plays a crucial role in the local economy. The handicrafts industry is significant, with products like Chikan embroidery and other traditional crafts contributing to exports and foreign exchange earnings. The real estate sector is booming, with numerous malls, residential complexes, and commercial spaces being developed by major players like Omaxe and Unitech.

3.7.3 Agriculture & Allied Sector

Cultivable Area: Approximately 56% of the total land area in Lucknow is under active cultivation, with a net sown area of about 2,156.45 square kilometres.

Soil Types: The predominant soil types include Bhur, Matiyaar, and Dumat, which support diverse agricultural practices.

Main Crops:

- Kharif (monsoon) crops: Paddy, Maize, Jowar, Bajra and groundnuts.
- Rabi (winter) crops: Wheat, Barley, Gram, Peas, Mustard and Lentils.
- Horticulture: The district also grows a range of melons, Dasheri mango, and Vegetables.
- The livestock sector includes dairy farming, poultry, and goat rearing, contributing to rural livelihoods.
- Aquaculture is practiced in some areas, although it is less prominent compared to other agricultural activities.

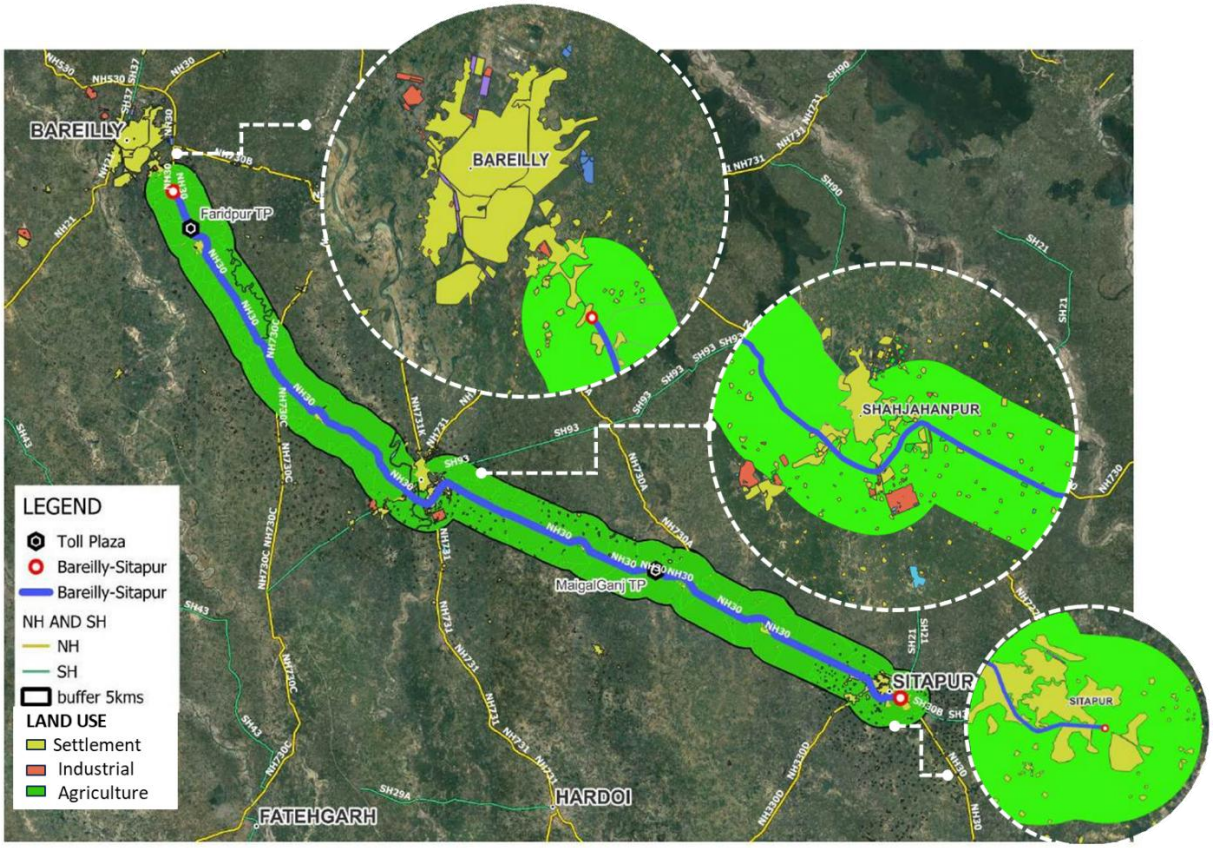
3.7.4 Industrial Profile

Lucknow district has a diverse industrial profile that reflects its evolving economic landscape. The city is transitioning from its historical roots in culture and handicrafts to a more modern industrial and technological hub. Here's an overview of the industrial profile of Lucknow district:

- Automotive: The automotive sector is significant, with Tata Motors operating a major plant for light commercial vehicles, producing around 640 vehicles per day. Other notable companies include Hindustan Aeronautics Limited, Scooter India Ltd., and Tata Marcopolo.
- **Food Processing:** Companies like PepsiCo, Nestlé, and Coca-Cola contribute to the food processing industry, capitalizing on the agricultural produce of the region.
- **Textiles and Handicrafts:** Lucknow is renowned for its traditional Chikan embroidery and other handicrafts, which account for a substantial portion of exports from Uttar Pradesh.
- **Information Technology (IT):** The IT sector is growing, with companies such as Tata Consultancy Services and HCL Technologies establishing operations in the city. Lucknow is becoming a hub for emerging startups and tech companies, particularly in the Gomti Nagar area.

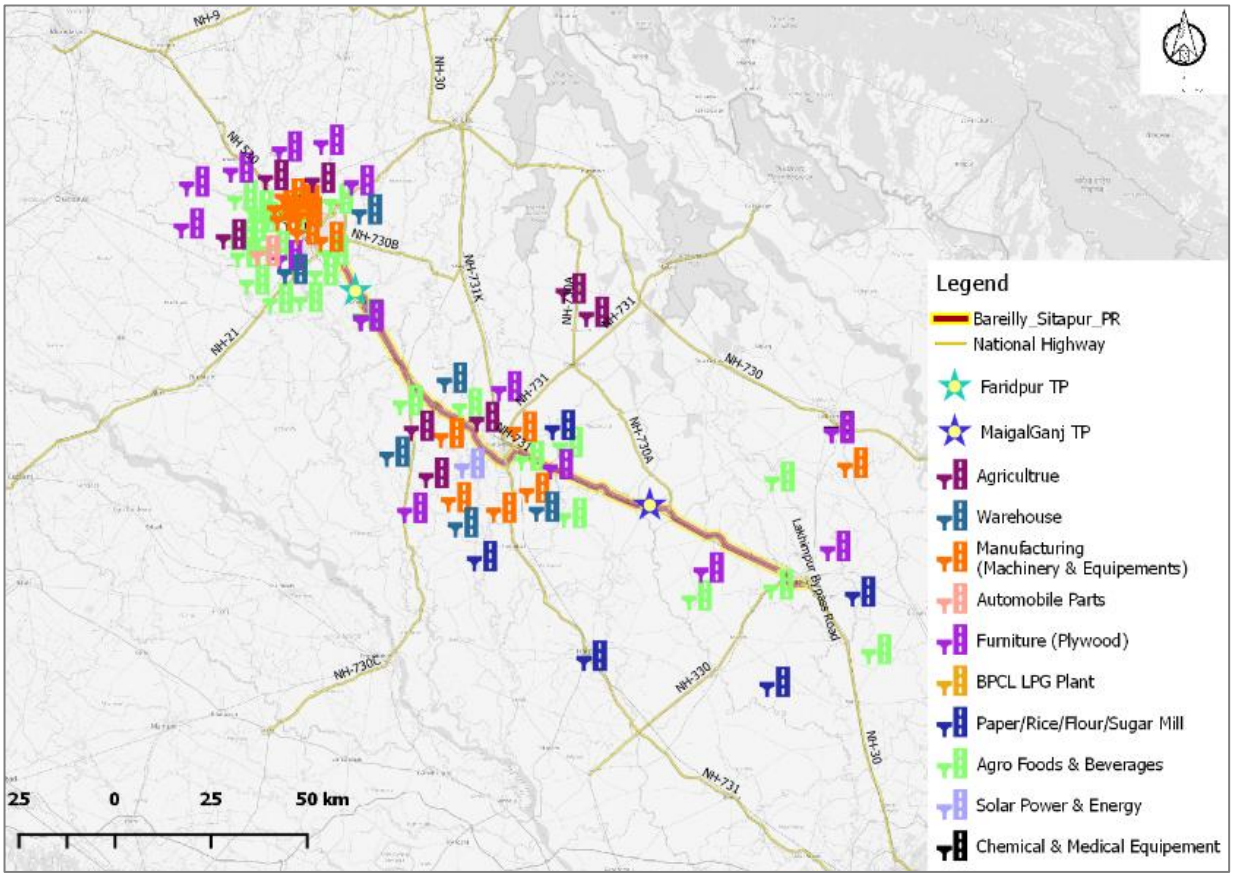
- **Chemicals and Pharmaceuticals:** The district hosts various chemical manufacturing units, contributing to both local needs and exports.
- **Aerospace and Defense:** With the establishment of a defense industrial corridor, Lucknow aims to enhance its capabilities in aerospace and defense manufacturing.
- **Small Scale Industries (SSIs):** A significant number of small-scale industries operate in sectors like furniture production, metal fabrication, and various artisan crafts. These industries are crucial for local employment and economic stability.
- **Prospects:** Lucknow is increasingly becoming a hub for Information Technology (IT) and IT-enabled services (ITeS), with plans for establishing an IT Special Economic Zone (SEZ) to attract foreign direct investment (FDI). The government has also earmarked funds for developing textile business clusters in the region, indicating growth potential in this sector

3.8 Land-use profile of the project road



The stretch from Bareilly to Sitapur via Shahjahanpur is part of National Highway 30. The route passes through five districts in Uttar Pradesh: Bareilly, Shahjahanpur, Lakhimpur, Hardoi, and Sitapur. Within a 5 km buffer of the Bareilly to Sitapur road, 95.2% of the land is used for agriculture followed by Residential land comprises 4.1% of the land use in this buffer zone. Faridpur TP falls under Bareilly District and Maigalganj TP falls under Kheri district.

3.9 Current industry profile



The industrial profile between Bareilly and Sitapur is primarily characterized by small to medium-scale industries that are closely tied to the region's agricultural base. Here's an overview-

Agro-Based Industries:

- **Food Processing:** The region's rich agricultural output has led to the development of various food processing industries, particularly in areas like Bareilly and Shahjahanpur. These industries focus on processing crops such as wheat, rice, pulses, and sugarcane into consumable products.
- **Dairy Production:** Dairy farming is prominent, with several small-scale milk processing units scattered across the region. These units process milk into products like butter, cheese, and ghee, catering to local and regional markets.

Small-Scale Manufacturing:

- **Engineering and Auto Parts:** In Bareilly and Shahjahanpur, there are small industries focused on manufacturing auto parts, machinery, and engineering goods. These industries cater to both local demands and supply parts to larger industrial hubs.

Chemical and Fertilizer Industries:

- **Fertilizer Production:** Some areas along the route, particularly near Shahjahanpur and Hardoi, have small-scale chemical and fertilizer plants that support the agricultural sector. These industries produce fertilizers, pesticides, and other agricultural inputs.

- **Sugar Mills:** The fertile land in this region supports sugarcane cultivation, leading to the establishment of sugar mills, especially in Shahjahanpur. These mills are vital to the local economy, providing employment and contributing to the region's economic output.

CHAPTER 4

Primary and Secondary Data Collection & Analysis

4. Primary and Secondary Data Collection & Analysis

4.1 General

As part of the traffic study of Bareilly Sitapur section of NH-30 spanning 157.7 km, in the state of Uttar Pradesh, extensive data collection & analysis is conducted to develop base data. The main objective is to understand the present traffic situation based on primary traffic surveys and the historical toll operations data shared by the client, highlight the future threats (if any), and recommend a suitable growth rate for traffic forecast. The data collection included the primary surveys in the field and the secondary data collection from toll operations and the data available in public domain. This chapter presents the details of traffic surveys, the locations, schedule, and the findings of the primary surveys conducted.

4.2 Past Data from Secondary Sources and Primary Surveys

The findings from the data are summarized in the following subsequent sections.

4.2.1 Past traffic trend findings: Project Corridor

Past traffic trends were derived based on the past traffic data sourced from the Toll operations data. Past traffic AADT, (CAGR%) is presented in the following tables.

Table 4-1: Remittance collected at both the Toll Plazas for FY24

Project Stretch	Plaza Name	Period	Contract Period	Total/Daily	Amount in) Rs.)
Bareilly Sitapur Section	Faridpur	01.04.2023-31.03.2024	03.05.2023 - 03.08.2023	Daily	27,38,999
			03.08.2023 - 03.08.2024	Total	1,08,88,17,101
	Maigalganj	01.04.2023-31.03.2024	20.01.2024 - 20.01.2025	Total	1,18,35,99,999
			20.10.2023 - 20.01.2024	Daily	27,44,777

Table 4-2 Past Traffic Trend at Faridpur (TP1) and Maigalganj Toll Plazas (TP2) AADT based on ETC data

Toll Plaza	Source	FY Year	CJV	LCV/Minibus	Bus/2Axle	3Axle	MAV	Total (Veh)	Total (PCU)
Faridpur TP	ETC	FY-2024	7,088	539	2,415	966	2,474	13,481	29,175
	ETC	FY-2025*	7,580	526	2,369	837	2,216	13,527	27,957
	CAGR % (FY 24-25)		**6.94%**	**-2.41%**	**-1.90%**	**-13.35%**	**-10.43%**	**0.34%**	
Maigalganj TP	ETC	FY-2024	3,564	385	1,568	898	1,787	8,203	19,583
	ETC	FY-2025*	3,799	387	1,536	731	1,402	7,856	17,492
	CAGR % (FY 24-25*)		**6.59%**	**0.52%**	**-2.04%**	**-18.60%**	**-21.54%**	**-4.23%**	

*FY-2025 * - Apr24-Nov24 Toll operational data*

Between FY24 and FY25, vehicle traffic at Faridpur toll plaza (TP1) grew by 0.34%. During this period, car traffic grew by 6.9%, while goods vehicles, particularly 3-axle trucks, saw a decline of -13.4%. MAVs at TP1 also experienced a negative growth of -10.4%. Similarly, from FY24 to FY25, vehicle traffic at Maigalganj Toll Plaza (TP2) declined by -4.23%. While cars grew by 6.59%, goods vehicles, especially 3-axle trucks, experienced a significant drop of -18.6%. MAVs at TP2 saw a substantial negative growth of -21.54%.

Table 4-3 Past Traffic Trend at Faridpur (TP1) and Maigalganj Toll Plazas (TP2) AADT (Including Exempt and Cash from TMS Data)

Toll Plaza	Source	FY Year	CJV	LCV/Minibus	Bus/2Axle	3Axle	MAV	Total (Veh)	Total (PCU)
Faridpur TP	ETC	FY-2024	9,006	562	2,434	970	2,487	15,460	31,256
	ETC	FY-2025*	9,464	545	2,380	850	2,251	15,489	30,102
	CAGR % (FY 24-25)		**5.10%**	**-3.02%**	**-2.22%**	**-12.37%**	**-9.45%**	**0.2%0%**	
Maigalganj TP	ETC	FY-2024	4,038	390	1,571	843	1,648	8,491	19,286
	ETC	FY-2025*	4,369	399	1,552	760	1,454	8,534	18,446
	CAGR % (FY 24-25)		**8.20%**	**2.31%**	**-1.21%**	**-9.85%**	**-11.77%**	**0.51%**	

*FY-2025 * - Apr24- Nov24 Toll operational data*

According to TMS data, including exempt and cash traffic, between FY24 and FY25, vehicle traffic at Faridpur Toll Plaza (TP1) saw a growth of 0.2%. Similarly, at Maigalganj Toll Plaza (TP2), vehicle traffic increased by 0.51%. While car traffic showed positive growth at both plazas, goods v

ehicles, including 3-axle trucks and MAVs, experienced a significant decline at both locations. Both the toll plaza locations have seen a consistent decline in 3Axle trucks and in MAV traffic over the years. Both toll plazas were affected by the commissioning of a newly built flyover that was 3.5 km long and a two-lane to four-lane widening from Aligarh to Kanpur.

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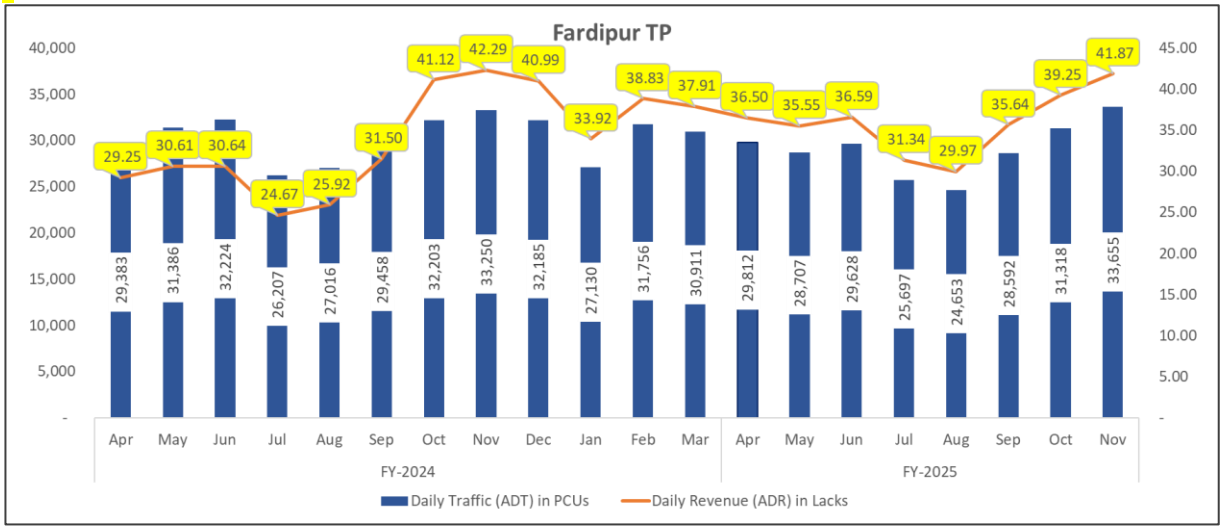


Figure 4-1 Historic traffic and revenue trend – Faridpur toll plaza (ETC+CASH+EXEMPT)

- It was observed from historic data that FY24 (Apr-Nov) vs FY25 (Apr-Nov) shows an 4.1% growth in CJV, but a 9.4% decline in MAV. Overall traffic experienced a 3.8% drop in terms of PCUs.
- Lower traffic was observed in July and August due to the monsoon season and restrictions during the Kanwar Yatra.

  The overall traffic decline in traffic from Jan to Sep and slight growth observed in Nov and Oct months.

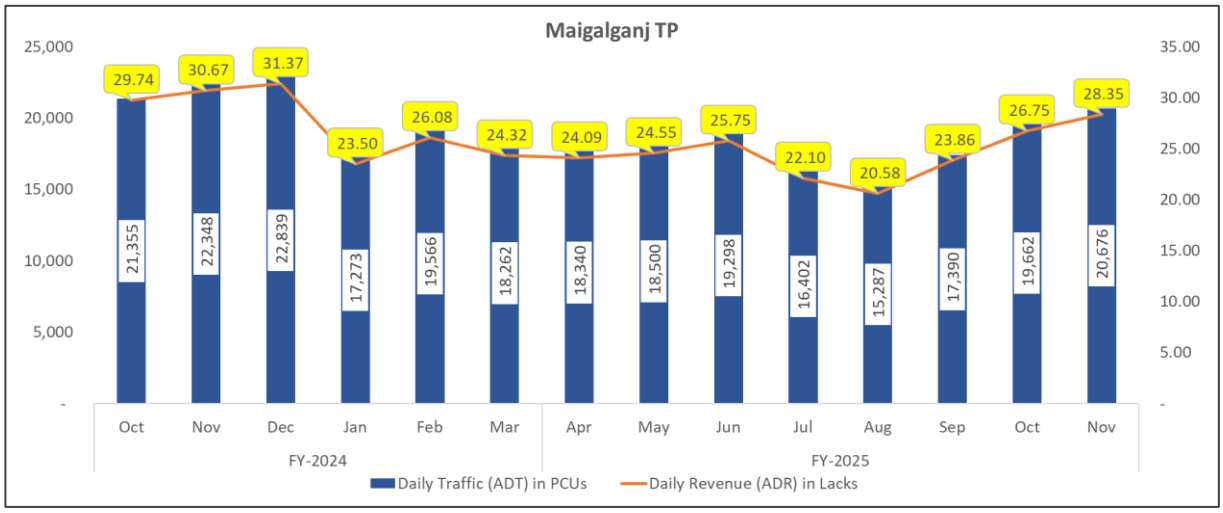


Figure 4-2 Historic traffic and revenue trend – Maigalganj toll plaza (ETC+CASH+EXEMPT)

- **Faridpur TP** handles significantly higher traffic volumes. Its total daily traffic is 65% higher than **Maigalganj TP**. This indicates Faridpur is a much busier toll plaza, likely situated on a more heavily traveled route.
- Both TPs show a similar pattern in vehicle types, with CJVs (Car, Jeep, Van) being most common, followed by 2-axle vehicles (2A) and Multi-Axle Vehicles (MAV). However, Faridpur consistently has higher numbers across all categories.

4.3 Traffic surveys

The traffic surveys are generally conducted to achieve the various project objectives. The Key outcomes of CTVC Survey are, to derive the average daily traffic by type of vehicles along the project corridor, traffic composition and vehicle composition. Similarly, the key outcomes of the OD analysis include,

i) Origin zone & Destination zone of the vehicle type

ii) The frequency of travel i.e., daily, weekly, monthly, or occasionally and Toll Category.

iii) Trip purpose

iv) Commodity carried of goods vehicle.

For this Study, the Consultant has analyzed the survey data i.e., both the Classified Traffic Volume Count (Project Roads) and the Origin – Destination Survey (Project Roads) obtained through the Primary Surveys. Nevertheless, the Consultant before analyzing and utilizing the data for the project, has conducted a detailed and thorough review of the primary data and found the data to be accurate enough for achieving the objectives of the study. The subsequent sections would provide a more detailed analysis.

- Major traffic generators and routes
- Past traffic trend at each toll plaza location
- Travel pattern of the road users at the toll plaza locations
- Probable diversion routes

The various vehicle types having varied sizes and characteristics were converted into equivalent passenger car units (PCU). The Passenger Car Unit recommended by Indian Road Congress in “Guidelines for Capacity of Roads in Rural Areas” (IRC-64-1990) have been used for PCU conversion and are presented in below table.

Table 4-4 Vehicle Classification and PCU Factors

VEHICLE TYPE	PCU	VEHICLE TYPE	PCU
Car/Jeep/Taxi	1.0	Auto Rickshaw	1.0
Minibus/ LCV	1.5	Agricultural Tractor	1.5
Standard Bus	3.0	Agricultural Tractor & Trailer	4.5

VEHICLE TYPE	PCU	VEHICLE TYPE	PCU
2/3 Axle Truck	3.0	Animal Drawn Vehicle	6.0
MAV	4.5	Cycle	0.5
Two-Wheeler	0.5	Cycle Rickshaw	2.0

4.3.1 Traffic survey locations and schedule

The primary data collection for the project involved a 7-day Traffic Volume Count (TVC) study conducted at two toll plaza (TP) locations, as well as a 3-day study on an alternate road. Additionally, an Origin-Destination (OD) and Local District Commercial (LDC) study was carried out at two TP locations over a 24-hour period, with a one-day OD survey also conducted on the alternate road. A network inventory survey was performed on key roads surrounding the project area to assess the condition and importance of these routes. Furthermore, valuable secondary information was gathered through interactions with stakeholders, residents, and truck drivers, providing further insight into the area's transportation dynamics.

A summary of traffic survey locations and schedule has been provided in the Table 4-5.

Table 4-5 Traffic survey locations and schedule

Type of survey	Location	Survey dates	Duration
Traffic Volume Counts (TVC)	Faridpur TP	21/08/2024 To 27/08/2024	7 Days
	Maigalganj TP	21/08/2024 To 27/08/2024	7 Days
	Alternate Road (Bisalpur)	24/08/2024 To 26/08/2024	3 Days
Origin – Destination (OD) & Local District Commercial (LDC) study	Faridpur TP	22/08/2024	24 Hrs.
	Maigalganj TP	22/08/2024	24 Hrs.
	Alternate Road (Bisalpur)	27/08/2024	24 Hrs.

4.3.2 Average Daily Traffic

The traffic volume count data was collected for One day (24 Hrs.) at the survey locations on the project road to arrive at the average daily traffic (ADT). The summary of ADT in terms of vehicles and PCUs at each survey location along the project road are presented in below Table 4-6.

Table 4-6 ADT summary from the traffic surveys

Mode	FARIDPUR TP	MAIGALGANJ TP	Alternate location
Car	7,845	3,256	2,834
Mini LCV	1,185	579	522
Minibus	52	23	17
Bus	1,105	553	211
3-Ax Bus	2	0	0
LCV	540	360	156
Truck-2 Axle	1,455	1,186	56
Truck-3Axle	776	693	47
MAV	1,879	1,236	236
OSV	9	4	4
Traffic Vehicles	**14,847**	**7,891**	**4,083**

Mode	FARIDPUR TP	MAIGALGANJ TP	Alternate location
Traffic PCUs	**28,424**	**17,286**	**5,639**

The daily traffic at Faridpur TP, Maigalganj TP, and an alternate road at Bisalpur location reveals significant differences in vehicle volumes across the three areas. Faridpur TP has the highest traffic volume, with 14,847 vehicles and 28,424 PCUs, indicating it is a major traffic point. In comparison, Maigalganj TP has 7,891 vehicles (17,286 PCUs), reflecting a lower traffic load. The alternate road, with 4,083 vehicles (5,639 PCUs), shows significantly lower traffic than both Faridpur and Maigalganj.

The vehicle distribution shows that cars are the most prevalent in all three locations, with Faridpur TP having 7,845 cars, Maigalganj TP having 3,256, and the alternate location having 2,834. Faridpur TP also leads in freight traffic, with 1,455 two-axle trucks and 776 three-axle trucks, whereas Maigalganj TP and the alternate location have significantly fewer trucks. The alternate location sees lower vehicle counts across all categories, including mini-LCVs, buses, and trucks, indicating it may be a less important route or serves a more localized function.

The Consultant, for the purpose of the study has relied on the historic data for the computation of base year annual average daily traffic for project road locations. The Consultant considered toll operation data obtained from the months of April to November of Fiscal Year 2025 for the computation of the base year Annual Average Daily Traffic. Final AADT arrived from ETC data (April to November 2024, which includes cash & exemption/violation traffic). The Table 4-7 below illustrates the recommended average daily traffic adopted for the base year.

Table 4-7 Base Year Recommended AADT (Including cash & exemption/violation traffic)

S.NO	Mode	FARIDPUR TP	MAIGALGANJ TP
1	CJV	9,464	4,369
2	LCV/Minibus	545	399
3	2 Axle	2,380	1,552
4	3 Axle	850	760
5	MAV	2,251	1,454
6	OSV	1	0
Traffic vehicles		**15,491**	**8,534**
Traffic PCU		**30,104**	**18,446**

4.3.3 Vehicle Composition

Analysis was conducted to find the traffic composition by type of vehicles among the toll-able traffic at two toll plaza locations on the project road sections. Vehicular traffic composition by type of vehicle by location are shown in below figure. Salient findings from the analysis are presented below.

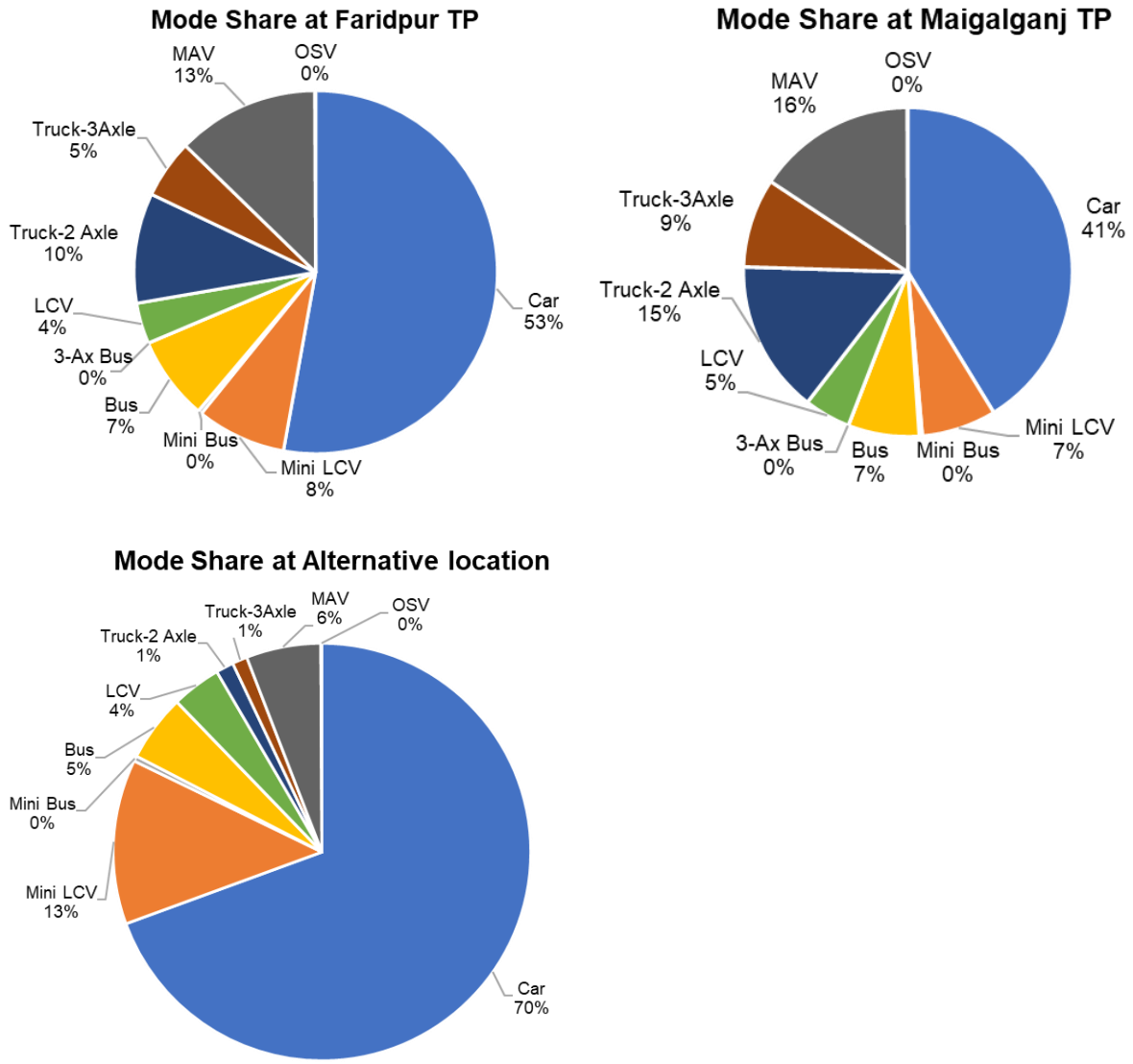


Figure 4-3 Traffic composition (Vehicles) by locations

- It is observed that, car mode has highest share at three locations. The 2nd highest traffic at three locations is freight traffic.
- **Faridpur TP** has the highest overall traffic volume, with a strong presence of both passenger vehicles (cars) and freight traffic (trucks, MAVs). **Maigalganj TP** shows a mix of passenger and freight vehicles, though the overall traffic is lower than Faridpur TP. Approximately, 53% Car traffic observed at Faridpur TP, 41% at Maigalganj TP.
- The **Alternate Location** has a predominant focus on passenger vehicles, particularly cars (70% car traffic observed), and shows a much lower overall traffic volume, indicating that it may be less critical for freight and more geared towards local or commuter traffic.

4.3.4 Seasonal Correction Factors

Seasonal correction factors are used to normalize the Average Daily Traffic (ADT).

Table 4-8: Mode Wise Recommended Years for Seasonal Correction Factors

Considered Data	CJV	LCV	BUS/2-Axle	3-Axle	MAV
Faridpur TP					
May-2023 to Apr-2024 (Project Corridor)	Yes	Yes	Yes	Yes	Yes
Adjacent Corridor					
FY 23 (Adjacent Corridor)	Yes	Yes	Yes	Yes	Yes
FY 24 (Adjacent Corridor)	Yes	Yes	Yes	Yes	Yes

COD started from mid of April FY 24, so consultant has considered from May (Faridpur Toll Plaza). COD Started from mid of October FY 24, so consultant Considered (Adjacent Corridor) FY 23, FY 24 and Faridpur data Average for Maigalganj Toll Plaza.

4.3.5 Annual Average Daily Traffic (AADT)

- Annual Average Daily Traffic = Average Daily Traffic X Seasonal Correction Factor + Cash Traffic + Exemption/violation data obtained from traffic survey conducted on 22nd August (for 24 hrs.)
- As discussed in the earlier sections, owing to higher reliability, and based on the latest data, the consultant considered the toll operations data (ETC data) obtained for the months of April 2024 to November 2024 (FY-25) as base year ADT, cash traffic from Schedule-M (April 2024 to November 2024) and exemption/violation data obtained from traffic survey conducted on 22nd August (for 24 hrs.) and recommends the same for the computation of base year Average Annual Daily Traffic (AADT), shown in below Table 4-9.

Table 4-9 Base Year Recommended AADT

S.NO	VEHICLE	Faridpur TP	Maigalganj TP
1	Car	9,464	4,369
2	LCV/Minibus	545	399
3	Truck-2A	2,380	1,552
4	Truck-3A	850	760
5	MAV	2,251	1,454
6	OSV	1	0
Total Traffic vehicles		**15,491**	**8,534**
Traffic PCU		**30,104**	**18,466**

4.4 Travel Characteristics of the Road users

4.4.1 Survey Methodology

Origin Destination Survey helps in understanding the travel demand pattern of the traffic on the project road. The travel characteristics obtained by O-D survey facilitate the identification of:

- Local and through traffic on the project road.
- Major influence zones of both the passenger and commercial traffic.
- Major commodities carried by the truck traffic.

The O-D survey elicited characteristics like origin, destination, and frequency, purpose of trip for passenger vehicles and commodity type, the information pertaining to origin and destination of trips was analyzed to obtain the trip distribution based on a zoning system provided.

4.4.2 Sample Size

The vehicles during the OD surveys were interviewed on a random sample basis and Table below shows the sample size distribution (in percentage terms) captured at the survey locations along the Project stretches shown in below Table 4-10.

Table 4-10 Sample Size Collected from Origin-Destination Survey

S.NO	VEHICLE	Faridpur TP	Maigalganj TP
1	Car	51.7%	48.5%
2	Minibus	85.4%	64.0%
3	Bus	42.9%	57.0%
4	LCV	41.5%	81.2%
5	2Axle Truck	58.6%	58.5%
6	3Axle Truck	65.3%	65.5%
7	MAV & above	52.2%	63.9%
Grand Total		**52.3%**	**54.8%**

4.4.3 Traffic Zoning System

To understand the spatial dimensions of the trip characteristics of the vehicles interviewed during the O-D survey, a detailed zoning system was developed considering the following factors:

- The road network catering to the traffic on the project road and its generating points.
- Important towns, villages, factories, and industrial centers around the project road area.
- Administrative boundaries of districts and states.
- Configuration of the project road in the regional road network with respect to other roads.

Two major types of areas were identified for analysis purposes.

Immediate Influence Area (IIA): Immediate Influence Area includes the cities/towns/villages and districts along the project road and adjacent to its which generates/attracts trips to the project road.

Broad Influence Area (BIA): Broad Influence Area includes other major traffic generating/attracting trips, but to a lesser degree when compared to IIA.

Detailed zoning system is prepared for IIA, while more aggregate or broad zoning is developed for BIA.

The zoning system adopted for data collection was based on 183 zones for better understanding the zonal influence by vehicle category at each toll plaza location.

4.4.4 Travel Pattern and Zone Influence Factors

From the origin & Destination survey data, location wise base year OD matrices were developed for each type of vehicle. Sample OD matrix is expanded to AADT by applying the expansion factors. The O-D matrices describing the travel pattern of both goods and passenger vehicles are used for identification of major OD pairs on the project corridor and for further analysis of movement pattern and estimation of through traffic. It is observed that the major influencing States for the project Sections are Uttar Pradesh, Bihar, Delhi, Haryana, Uttarakhand, Punjab, Odisha, Jharkhand, West Bengal, Jammu & Kashmir, Himachal Pradesh, Union Territory of Chandigarh and Northeast India.

Different vehicles interact in different degrees with the different zones depending on their purpose, commodity transported, frequency of travel etc.
Section wise influence factors were derived from the average of Influence factors by category at survey locations in the respective project sections. Section wise influence factors for cars, buses and trucks are summarized and shown in below Table 4-11.

Regional Distribution of traffic at Faridpur Toll Plaza: -

Table 4-11 Regional distribution of traffic at Faridpur Toll Plaza

FARIDPUR TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Uttar Pradesh	92.6%	85.4%	66.6%
Uttarakhand	2.9%	4.0%	12.4%
Delhi	2.8%	8.6%	3.6%
Bihar	0.4%	0.3%	3.4%
Haryana	0.5%	0.9%	3.0%
Punjab	0.4%	0.3%	2.6%
West Bengal	0.1%	0.1%	3.0%
North - East India	0.0%	0.1%	1.4%
Odisha	0.1%	0.1%	1.1%
Jharkhand	0.0%	0.1%	0.9%
Jammu & Kashmir	0.0%	0.1%	0.7%
Himachal Pradesh	0.1%	0.0%	0.7%
Union Territory of Chandigarh	0.0%	0.0%	0.5%
Total	**100%**	**100%**	**100%**

Regional distribution of passenger & goods traffic at Faridpur Toll Plaza is depicted in Figure 4-4. On detailed analysis of the zonal influence factors, it was observed that,

- Approximately 93% of the car passenger vehicle trips are happening within the state of Uttar Pradesh at Faridpur toll plaza, significant amount of the car vehicle trips is origin-destined in Bihar, Uttarakhand and Delhi.
- The state of Uttar Pradesh accounts for almost 68% of all freight traffic. Also, significant amount of truck traffic observed from Uttarakhand, Delhi, Bihar & West Bengal states.

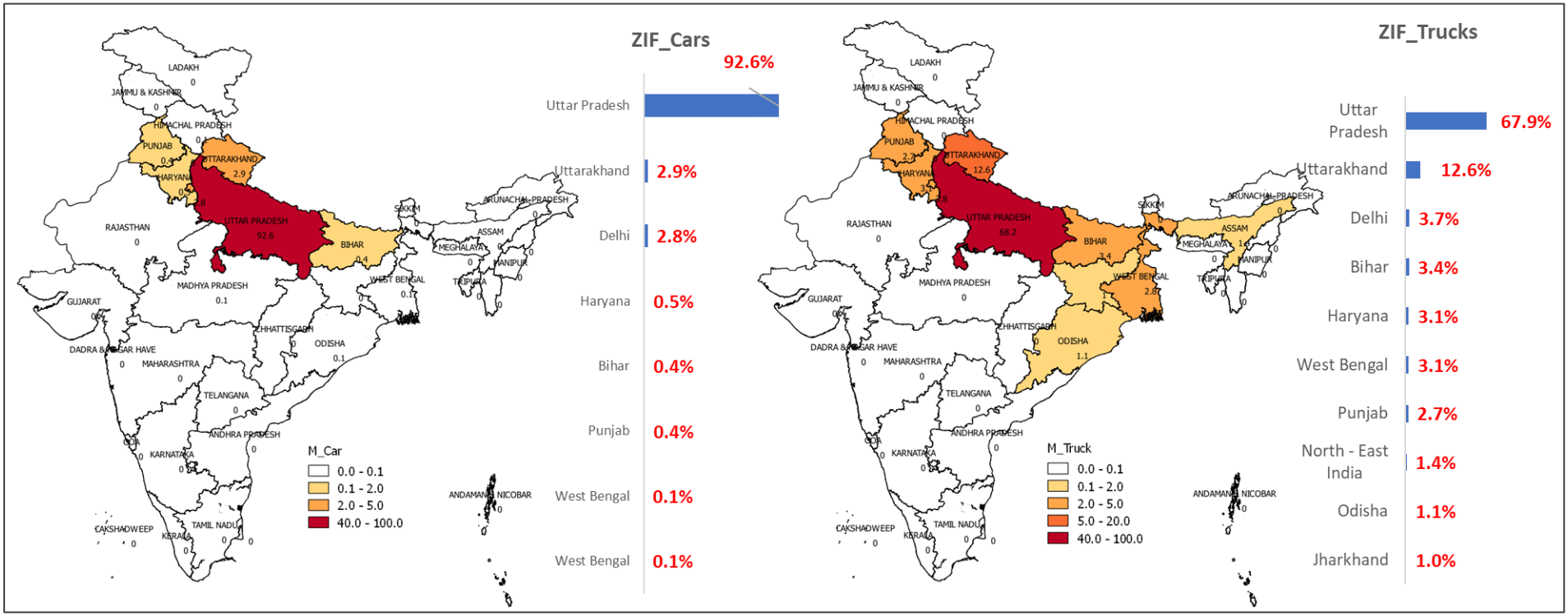


Figure 4-4 Regional distribution of passenger & goods traffic at Faridpur Toll Plaza

Regional Distribution of traffic at Maigalganj Toll Plaza-

Table 4-12 Regional distribution of traffic at Maigalganj Toll Plaza

MAIGALGANJ TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Uttar Pradesh	90.9%	77.3%	63.7%
Uttarakhand	3.7%	2.7%	7.1%
Delhi	3.1%	15.0%	5.2%
Bihar	0.5%	1.3%	5.4%
Haryana	0.8%	2.4%	3.5%
Punjab	0.5%	0.4%	3.7%
West Bengal	0.2%	0.7%	3.7%
North - East India	0.1%	0.0%	2.8%
Odisha	0.0%	0.0%	0.7%
Jharkhand	0.0%	0.0%	1.2%
Jammu & Kashmir	0.0%	0.0%	1.1%
Himachal Pradesh	0.1%	0.0%	0.8%
Union Territory of Chandigarh	0.1%	0.2%	0.9%
Total	**100%**	**100%**	**100%**

Regional distribution of passenger & goods traffic at Maigalganj Toll Plaza is depicted in Figure 4-5. On detailed analysis of the Zonal influence factors, it was observed that,

- Approximately 91% of the Car passenger vehicle trips are happening within the state of Uttar Pradesh at Maigalganj toll plaza, significant amount of the Car vehicle trips is origin-destined in Uttarakhand and Delhi.
- The state of Uttar Pradesh accounts for almost 65% of all freight traffic. Also, significant amount of truck traffic observed from Uttarakhand, Delhi, Bihar, Haryana & Punjab states.

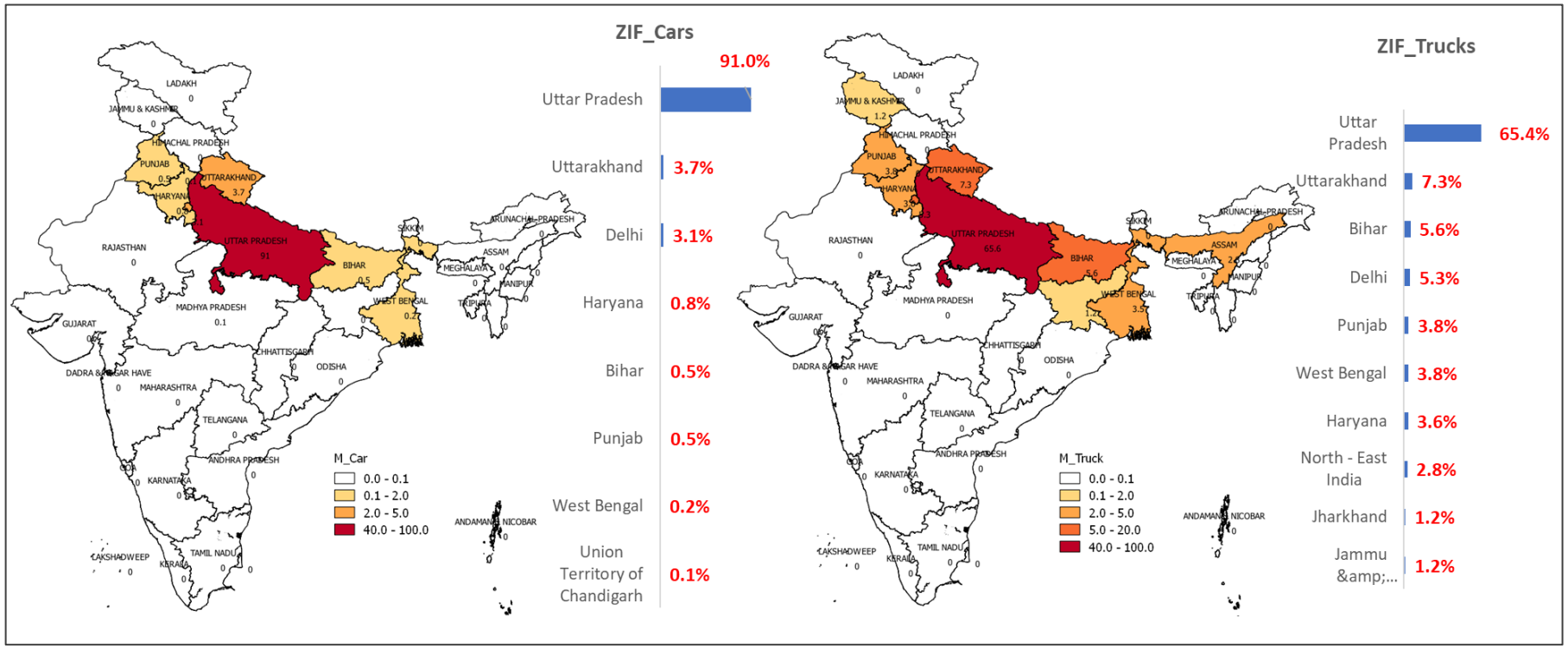


Figure 4-5 Regional distribution of passenger & goods traffic at Maigalganj Toll Plaza

Regional Distribution of traffic at Alternate Road-

Table 4-13 Regional distribution of traffic at Alternate Road

MAIGALGANJ TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Uttar Pradesh	97.8%	95.3%	93.0%
Uttarakhand	0.5%	0.0%	2.6%
Delhi	0.8%	3.5%	0.4%
Bihar	0.1%	0.0%	0.6%
Haryana	0.4%	1.1%	2.0%
Punjab	0.2%	0.0%	0.2%
West Bengal	0.0%	0.0%	0.2%
North - East India	0.0%	0.0%	0.5%
Odisha	0.0%	0.0%	0.0%
Jharkhand	0.0%	0.0%	0.1%
Jammu & Kashmir	0.0%	0.0%	0.0%
Himachal Pradesh	0.1%	0.0%	0.3%
Union Territory of Chandigarh	0.1%	0.2%	0.0%
Total	**100%**	**100%**	**100%**

Regional distribution of passenger & goods traffic at Alternate Road is depicted in Figure 4-5. On detailed analysis of the Zonal influence factors, it was observed that,
Approximately 97.8% of the Car passenger vehicle trips are happening within the state of Uttar Pradesh at Alternate Road (NH-730B), significant amount of the Car vehicle trips is origin-destined in Uttarakhand, Delhi.

Approximately 93% of the truck traffic is plying in the state of Uttar Pradesh. Also, significant amount of truck traffic observed from Uttarakhand, Haryana, North-East India, Bihar, Delhi, etc.

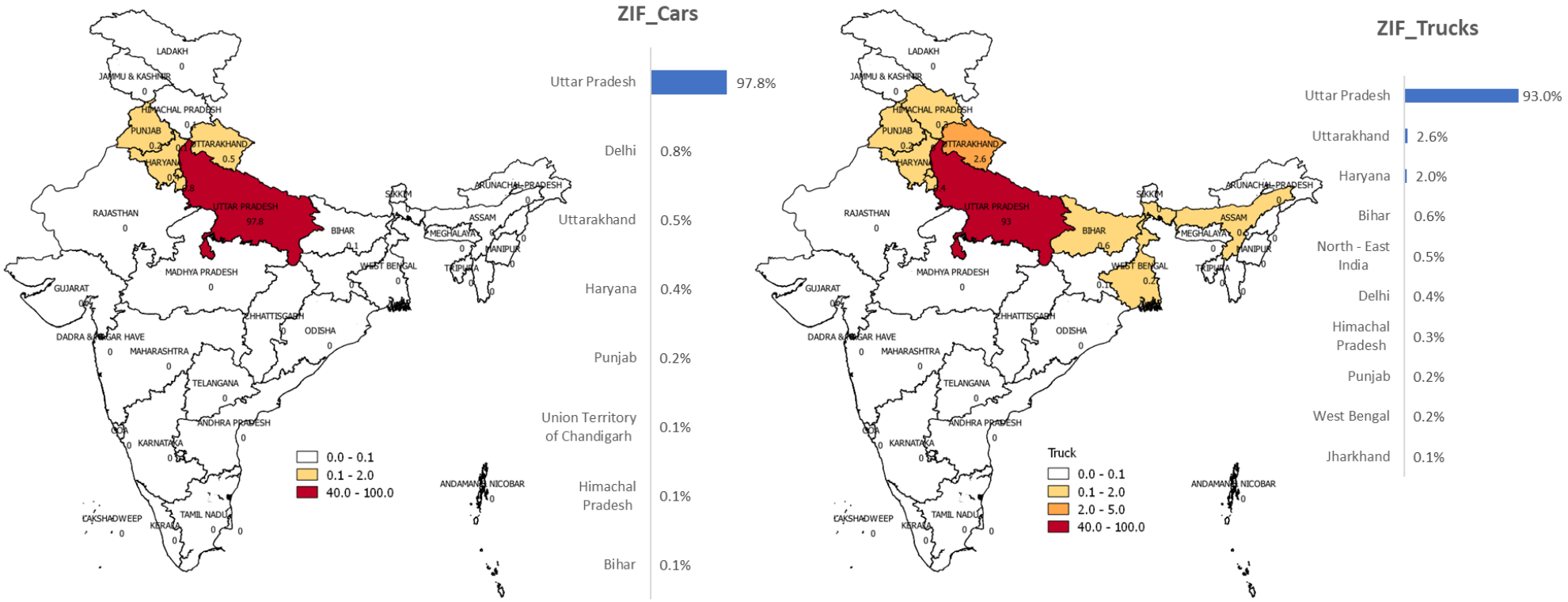


Figure 4-6: Regional distribution of passenger & goods traffic at Alternate Road

Regional Distribution of traffic at Faridpur Toll Plaza (2nd OD Survey)-

Table 4-14 Regional distribution of traffic at Faridpur Toll Plaza (2nd OD Survey)

MAIGALGANJ TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Uttar Pradesh	91.4%	87.2%	67.3%
Uttarakhand	3.3%	4.2%	10.9%
Delhi	3.5%	5.5%	4.4%
Bihar	0.6%	1.0%	5.0%
Haryana	0.3%	1.2%	3.0%
Punjab	0.1%	0.3%	3.9%
West Bengal	0.3%	0.2%	2.2%
North - East India	0.1%	0.0%	1.1%
Odisha	0.2%	0.1%	0.5%
Jharkhand	0.0%	0.0%	0.4%
Jammu & Kashmir	0.0%	0.1%	0.6%
Himachal Pradesh	0.1%	0.1%	0.1%
Union Territory of Chandigarh	0.0%	0.2%	0.3%
Uttar Pradesh	91.4%	87.2%	67.3%
Total	**100%**	**100%**	**100%**

Regional distribution of passenger & goods traffic at Alternate Road is depicted in Figure 4-5. On detailed analysis of the Zonal influence factors, it was observed that,

Approximately 91.5% of the Car passenger vehicle trips are happening within the state of Uttar Pradesh at Faridpur Toll Plaza, significant amount of the Car vehicle trips is origin-destined in Uttarakhand, Delhi.

Approximately 69.7% of the truck traffic is plying in the state of Uttar Pradesh. Also, significant amount of truck traffic observed from Uttarakhand, Haryana, North-East India, Bihar, Delhi, etc.

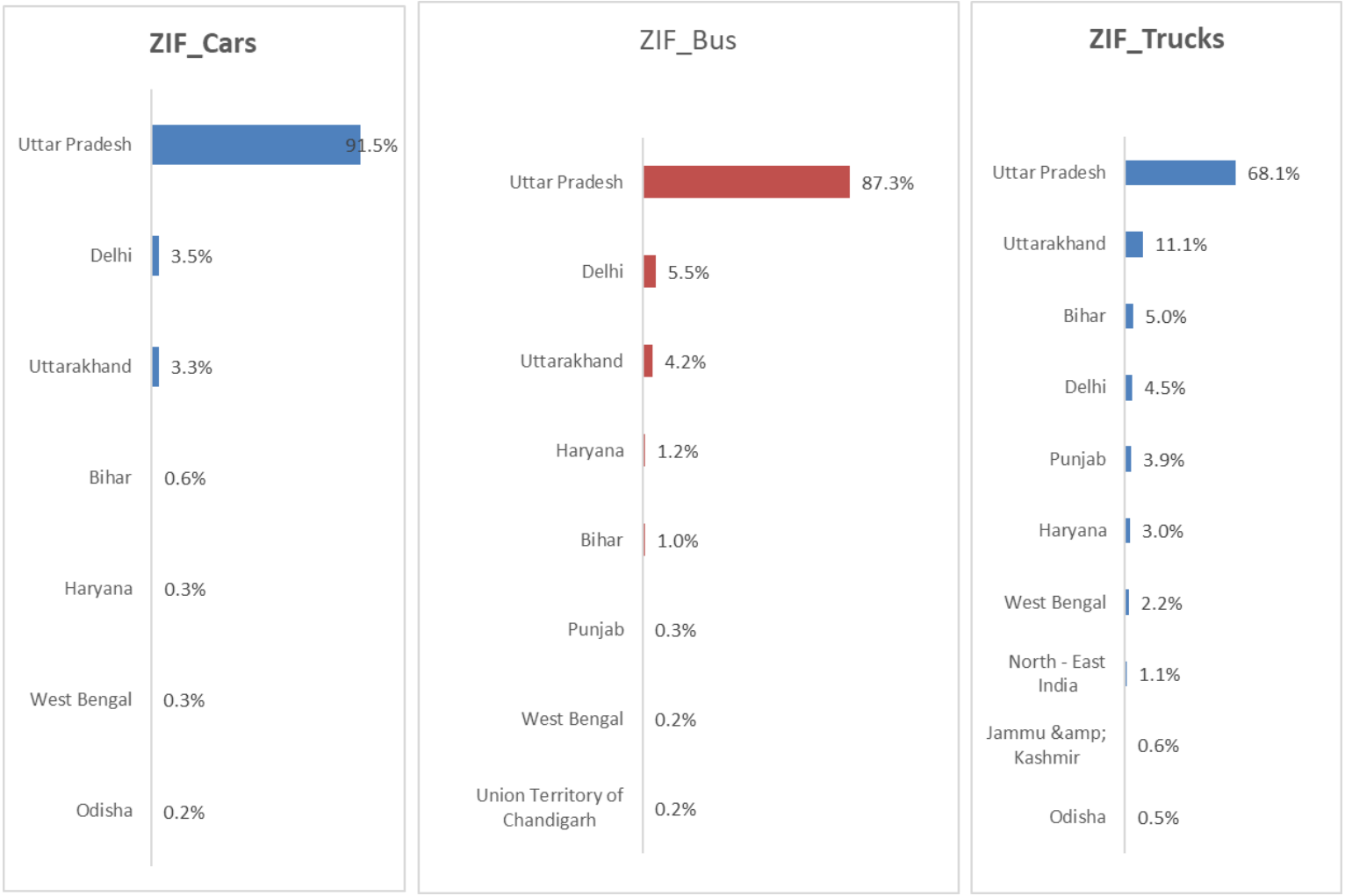


Figure 4-7: Regional distribution of passenger & goods traffic at Faridpur Toll Plaza (2nd OD Survey)

4.4.5 Commodity Distribution of Freight traffic

An analysis was also carried out to understand the different commercial vehicles being used to transport different commodities. Table below presents the toll plaza wise commodity distribution.

Commodity pattern at Faridpur Toll Plaza: -

- The overall share of empty vehicle is observed to be around 34% at Faridpur Toll Plaza.
- The Major Commodities observed at Faridpur Toll Plaza are Parchoon, Fruit & Vegetables, Food Items, Wood are contributing to almost 66% of overall Commodities when Empty trucks are also included.
- The overall share of Parchoon observed to be around 10.5% at Toll Plaza. 8.7% of LCV, 14.7% of 2-Axle trucks, 14.4% of 3-Axle trucks and 8.7% of MAV trucks are observed to be carrying parchoon.
- Major commodities transported by LCV and 2-Axles are Fruits & Vegetables, Parchoon, Parcel, Medicine, Automobile.
- Major Commodities transported by HGVs are Food Items, Parcel, Steel, Fruits & Vegetables, Parchoon, Automobile & POL.

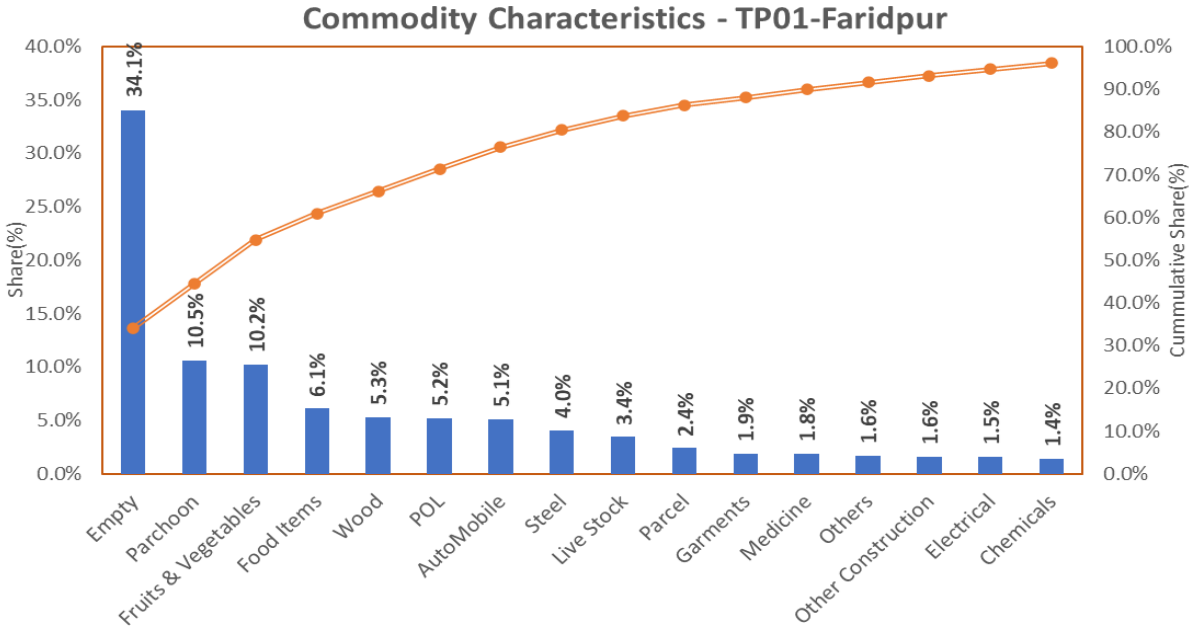


Figure 4-8 Commodity Characteristics at Faridpur Toll Plaza (TP1)

Table 4-15 Commodity Pattern at Faridpur Toll Plaza (TP1)

FARIDPUR TOLL PLAZA					
COMMODITY	LCV	2-AXLE TRUCK	3-AXLE TRUCK	MAV	TOTAL
Empty	43.7%	29.0%	26.9%	28.4%	34.1%
Parchoon (wholesale)	8.7%	14.7%	14.4%	8.7%	10.5%
Fruits & Vegetables	12.4%	10.4%	9.4%	7.7%	10.2%
Food Items	4.1%	6.1%	7.7%	7.9%	6.1%
Wood	2.8%	3.1%	7.8%	8.4%	5.3%
POL	5.0%	7.5%	4.4%	4.3%	5.2%
Automobiles	2.4%	10.2%	6.0%	5.1%	5.1%

FARIDPUR TOLL PLAZA					
COMMODITY	LCV	2-AXLE TRUCK	3-AXLE TRUCK	MAV	TOTAL
Steel	2.0%	2.1%	4.2%	7.5%	4.0%
Livestock	6.3%	2.3%	1.6%	1.4%	3.4%
Parcel	2.8%	3.0%	3.0%	1.3%	2.4%
Garments	1.9%	1.8%	2.3%	1.7%	1.9%
Medicine	1.8%	3.1%	1.0%	1.5%	1.8%
Others	1.6%	2.3%	2.0%	1.2%	1.6%
Other Construction	0.5%	0.2%	1.5%	3.7%	1.6%
Electrical	1.0%	1.6%	2.7%	1.7%	1.5%
Chemicals	0.9%	0.8%	1.6%	2.3%	1.4%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Commodity pattern at Maigalganj Toll Plaza: -

- The overall share of empty vehicle is observed to be around 17.5% at Maigalganj toll plaza. The overall share of parcels observed to be around 16.8% at Toll Plaza. 18.4% of LCV, 21.1% of 2-Axle trucks, 12.5% of 3-Axle trucks and 15.1% of MAV trucks are observed to be carrying parcels.
- The Major Commodities observed at Maigalganj TP are **Parcel, Parchoon, Fruits & Vegetables, Food Items, Steel & Automobiles** are contributing to almost **62%** of overall Commodities when Empty trucks are also included.
- Major commodities transported by LCV and 2-Axles are Parcel, Fruits & Vegetables, Food Items, Automobile, POL & Steel & major Commodities transported by HGVs are Parcel, Fruits & Vegetables, Food Items, Automobile, Parchoon, Steel & POL.

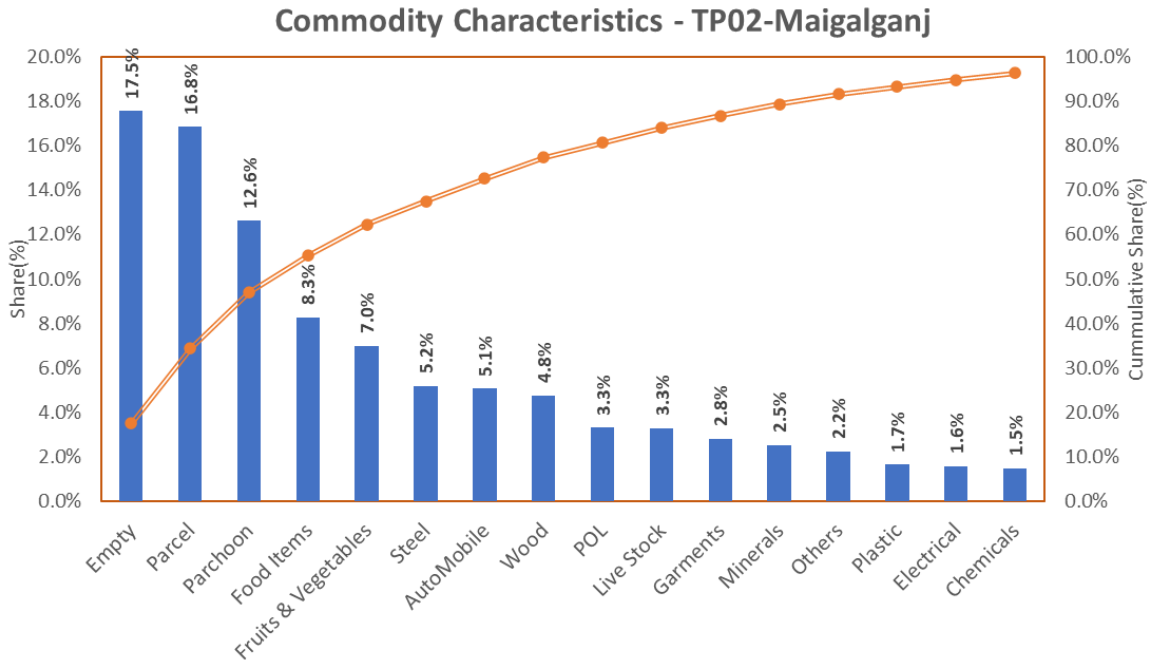


Figure 4-9 Commodity Characteristics at Maigalganj Toll Plaza (TP2)

Table 4-16 Commodity Pattern at Maigalganj toll plaza (TP2)

MAIGALGANJ TOLL PLAZA					
COMMODITY	LCV	2-AXLE TRUCK	3-AXLE TRUCK	MAV	TOTAL
Empty	28.7%	18.6%	13.2%	9.5%	17.5%
Parcel	18.4%	21.1%	12.5%	15.1%	16.8%
Parchoon (wholesale)	10.4%	12.8%	14.0%	13.7%	12.6%
Food Items	5.2%	7.3%	10.0%	10.6%	8.3%
Fruits & Vegetables	7.8%	9.1%	7.4%	4.7%	7.0%
Steel	3.8%	4.0%	5.4%	7.1%	5.2%
Automobile	3.8%	4.7%	8.9%	4.3%	5.1%
Wood	2.7%	5.1%	5.9%	5.8%	4.8%
POL	1.1%	3.1%	3.2%	5.5%	3.3%
Livestock	6.3%	2.6%	2.0%	1.8%	3.3%
Garments	2.0%	3.1%	3.0%	3.2%	2.8%
Minerals	0.7%	0.9%	2.1%	5.4%	2.5%
Others	3.1%	1.2%	3.2%	1.7%	2.2%
Plastic	1.7%	2.2%	1.8%	1.3%	1.7%
Electrical	1.6%	0.6%	0.8%	2.7%	1.6%
Chemicals	1.0%	0.6%	1.4%	2.5%	1.5%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Commodity pattern at Alternate Road: -

- The overall share of Parchoon observed to be around 10.32% at Alternate Road (NH-730B). 7.87% of LCV, 22.47% of 2-Axle trucks, 25.96% of 3-Axle trucks and 12.92% of MAV trucks are observed to be carrying parcels.
- The Major Commodities observed Alternate Road (NH-730B) are Parchoon, Fruit & Vegetables, POL, Food Items are contributing to almost 73.37% of overall Commodities when Empty trucks are also included.

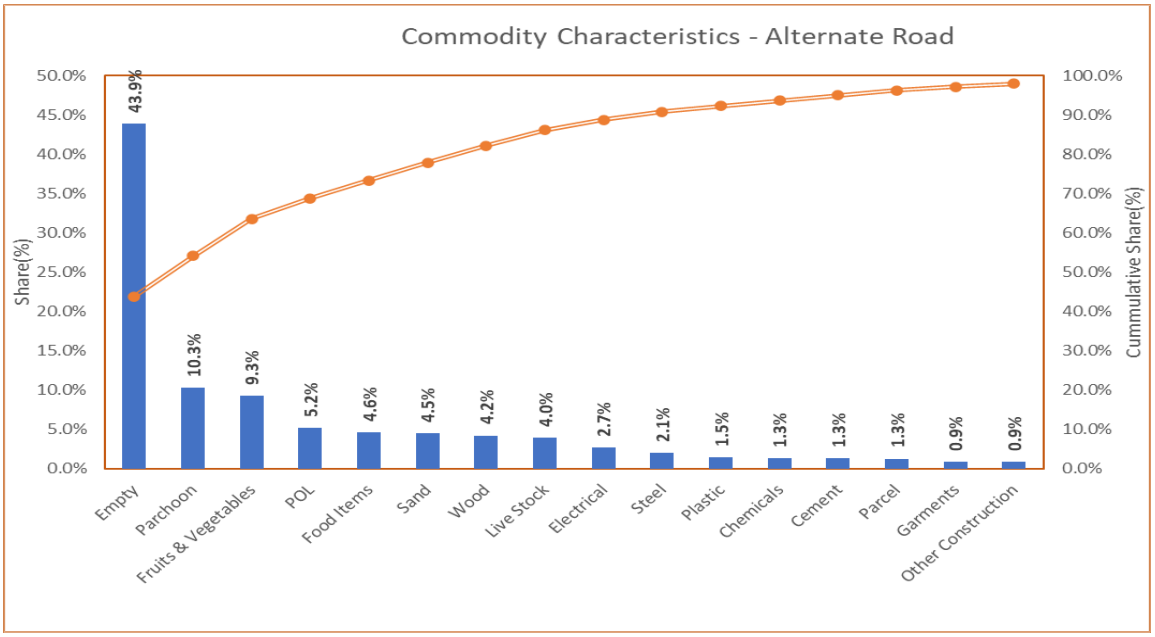


Figure 4-10: Commodity Characteristics at Alternate Road

Table 4-17: Commodity Pattern at Alternate Road

MAIGALGANJ TOLL PLAZA					
COMMODITY	**LCV**	**2-AXLE TRUCK**	**3-AXLE TRUCK**	**MAV**	**TOTAL**
Empty	49.43%	33.73%	35.49%	28.58%	43.88%
Parchoon (wholesale)	7.87%	22.47%	25.96%	12.92%	10.32%
Fruits & Vegetables	11.48%	3.10%	7.26%	3.66%	9.32%
POL	5.07%	11.63%	2.10%	4.95%	5.24%
Food Items	4.32%	1.55%	12.41%	4.81%	4.62%
Sand	1.17%	8.13%	2.10%	15.90%	4.54%
Wood	3.30%	8.92%	2.10%	6.82%	4.24%
Live-Stock	4.72%	7.36%	2.10%	1.01%	3.98%
Electrical	3.35%	1.55%	0.00%	1.15%	2.68%
Steel	1.87%	0.00%	0.00%	3.57%	2.05%
Plastic	1.76%	0.00%	0.00%	1.01%	1.45%
Chemicals	0.87%	0.00%	8.39%	1.92%	1.35%
Cement	0.54%	0.00%	0.00%	4.72%	1.34%
Parcel	1.81%	0.00%	0.00%	0.00%	1.29%
Garments	0.80%	0.00%	0.00%	1.51%	0.87%
Other Construction	0.18%	0.00%	2.10%	3.16%	0.85%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Commodity pattern at Faridpur Toll Plaza (2nd OD Survey) for micro diversion check: -

- The overall share of empty vehicle is observed to be around 24.3% at Faridpur Toll Plaza.
- The Major Commodities observed at Faridpur Toll Plaza are Parchoon, Fruit & Vegetables, Food Items, Steel are contributing to almost 67.2% of overall Commodities when Empty trucks are also included.
- The overall share of Parchoon observed to be around 12.8% at Toll Plaza. 16.63% of LCV, 13.55% of 2-Axle trucks, 13.02% of 3-Axle trucks and 9.95% of MAV trucks are observed to be carrying parchoon.
- Major commodities transported by LCV and 2-Axles are Fruits & Vegetables, Parchoon, Parcel, Medicine, Automobile.
- Major Commodities transported by HGVs are Food Items, Parcel, Steel, Fruits & Vegetables, Parchoon, Automobile & POL.

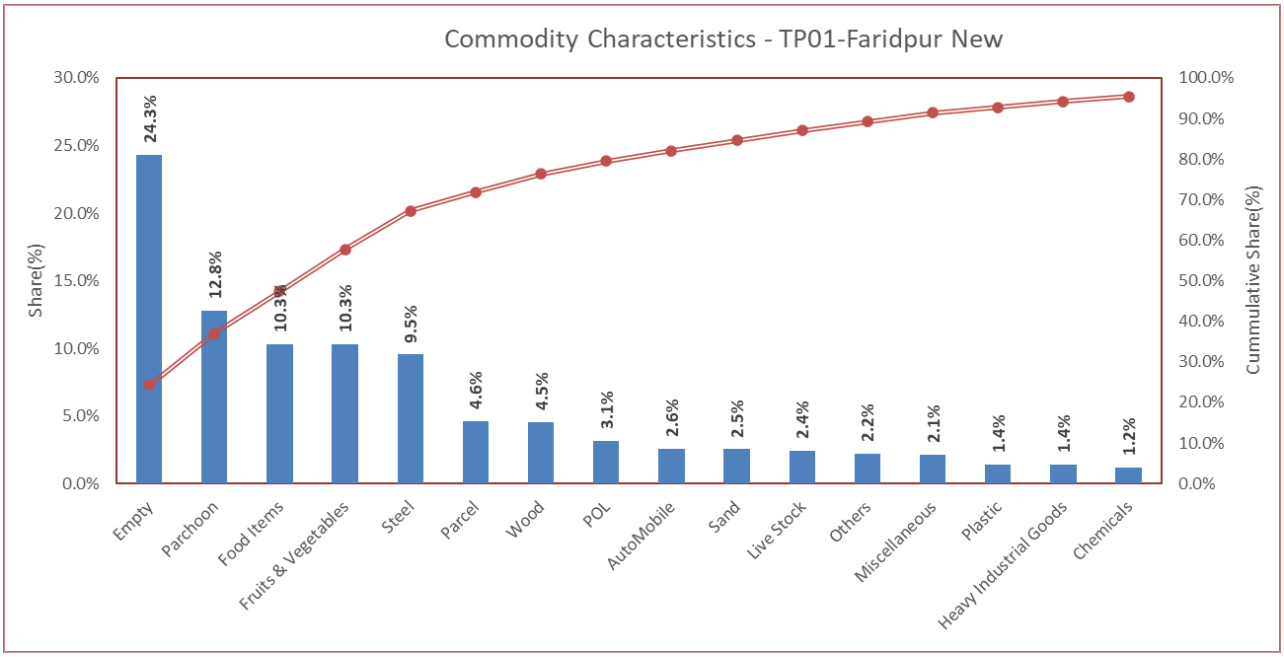


Figure 4-11: Commodity Characteristics at Faridpur Toll Plaza (2nd OD Survey)

Table 4-18: Commodity Pattern at Faridpur Toll Plaza (2nd OD Survey)

MAIGALGANJ TOLL PLAZA					
COMMODITY	**LCV**	**2-AXLE TRUCK**	**3-AXLE TRUCK**	**MAV**	**TOTAL**
Empty	32.4%	21.1%	20.0%	22.7%	24.3%
Parchoon (wholesale)	16.6%	13.6%	13.0%	9.9%	12.8%
Food Items	6.0%	7.4%	14.2%	13.2%	10.3%
Fruits & Vegetables	12.6%	9.6%	11.1%	9.0%	10.3%
Steel	4.7%	8.9%	10.1%	12.7%	9.5%
Parcel	6.3%	7.0%	4.2%	2.4%	4.6%
Wood	3.1%	4.0%	4.8%	5.5%	4.5%
POL	2.5%	4.1%	3.1%	3.0%	3.1%
AutoMobile	0.6%	5.2%	5.6%	1.3%	2.6%
Sand	0.0%	1.1%	1.7%	5.1%	2.5%
Live Stock	5.0%	2.0%	1.0%	1.6%	2.4%
Others	2.3%	4.1%	1.8%	1.3%	2.2%
Miscellaneous	2.5%	3.2%	1.7%	1.4%	2.1%
Plastic	0.9%	2.3%	1.8%	1.0%	1.4%
Heavy Industrial Goods	1.1%	1.6%	1.1%	1.6%	1.4%
Chemicals	0.1%	1.1%	0.7%	2.1%	1.2%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

4.4.6 Trip length frequency Distribution

An analysis was carried out to understand the trip length frequency of the passenger and goods vehicles at all the toll plaza locations. Figures below presents the toll plaza wise trip length frequency distribution for goods and passenger vehicles.

4.4.6.1 Goods Vehicles

Trip length Frequency Distribution at Faridpur Toll Plaza

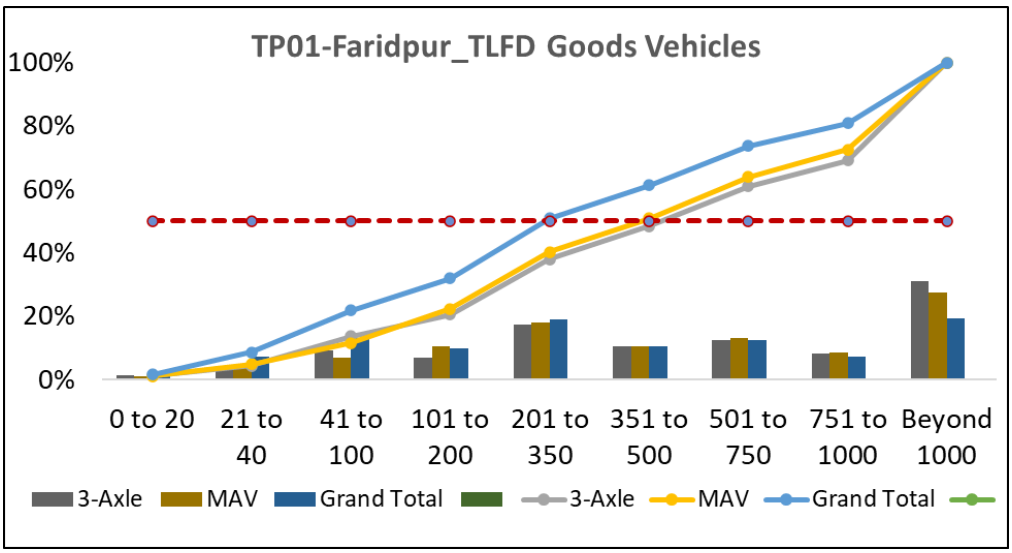


Figure 4-12 Trip length Frequency Distribution at Faridpur Toll Plaza – Goods

- Around 49.7% of LCVs, 22.2% of Trucks, 20.5% 3-Axle, 22.2% MAVs are having trip length less than 200 km.
- 39.4% of LCVs, 47.3% of 2-Axle trucks, 40.3% of 3-Axle trucks and 41.6% of MAV are having trip lengths more than 200 km and less than 750 km.
- Around 10.8% of LCVs, 30.5% of 2-Axle trucks, 39.1% of 3-Axle trucks and 36.2% of MAV are having trip lengths more than 750 km which refers there is significant medium and long-distance traffic through the Faridpur Toll plaza.
- Major OD pairs of (3A & MAV) are Bareilly-Lucknow, Bareilly-Faridpur, Lucknow-Delhi, Bareilly-Shahjahanpur etc.

Trip length Frequency Distribution at Maigalganj Toll Plaza

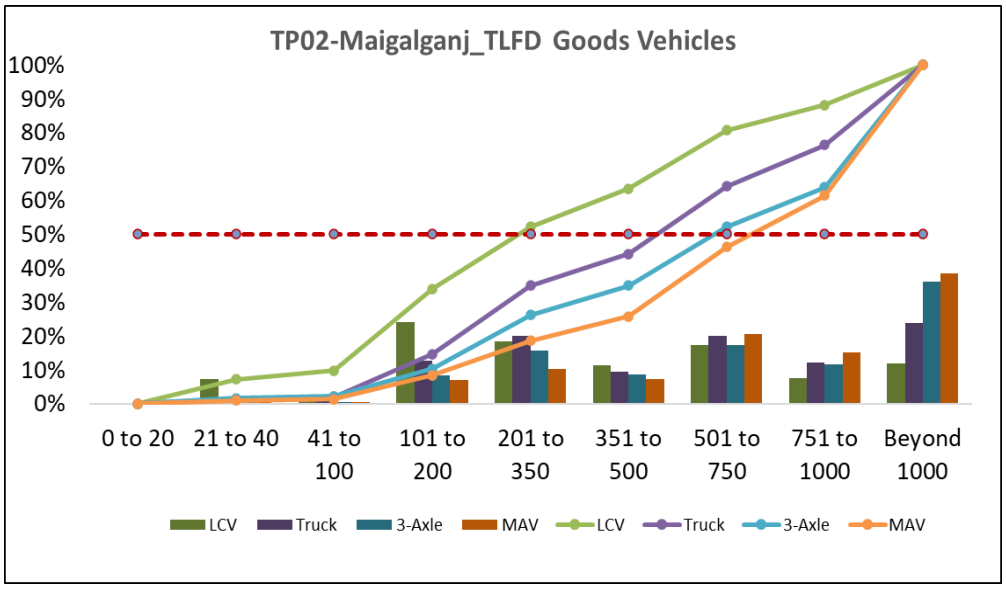


Figure 4-13 Trip length Frequency Distribution at Maigalganj Toll Plaza – Goods

- Around 33.9% of LCVs, 14.7% of Trucks, 10.4% 3-Axle, 8.4% MAVs are having trip length less than 200 km.
- 46.8% of LCVs, 49.4% of 2-Axle trucks, 41.8% of 3-Axle trucks and 37.9% of MAV are having trip lengths more than 200 km and less than 750 km.

- Around 19.3% of LCVs, 35.9% of 2-Axle trucks, 47.8% of 3-Axle trucks and 53.7% of MAV are having trip lengths more than 750 km which refers there is significant medium and long-distance traffic through the Maigalganj Toll plaza.
- Major OD pairs are Bareilly-Lucknow, Shahjahanpur-Sitapur, Shahjahanpur-Lucknow, Bareilly-Sitapur, Lucknow-Delhi etc.

Trip length Frequency Distribution at Alternate Road

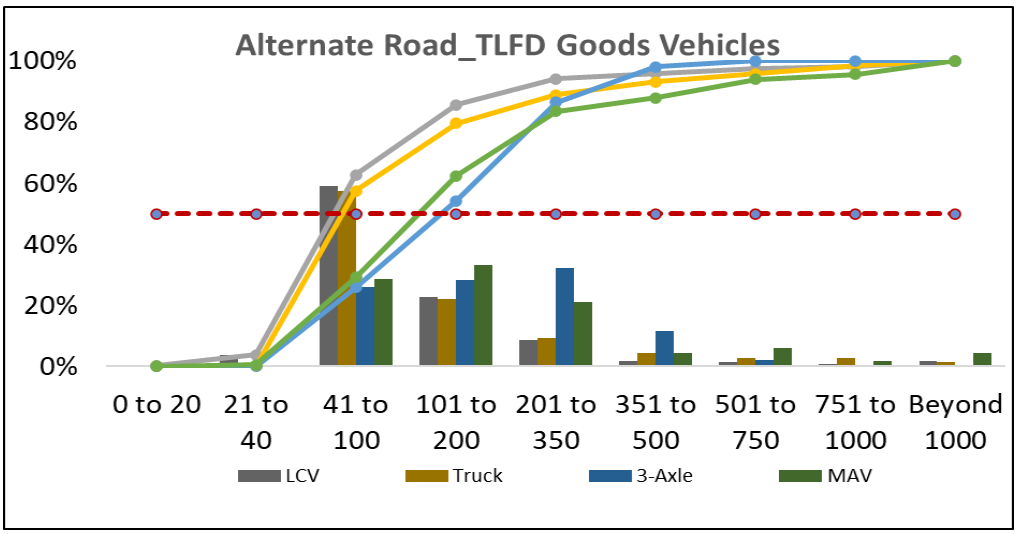


Figure 4-14: Trip length Frequency Distribution at Alternate Road – Goods

- Around 85.5% of LCVs, 81.0% of Trucks, 75.0% 3-Axle, 71% MAVs are having trip length less than 200 km.
- 12.0% of LCVs, 15.0% of 2-Axle trucks, 25.4% of 3-Axle trucks and 22.0% of MAV are having trip lengths more than 200 km and less than 750 km.
- Around 2.6% of LCVs, % of 2-Axle trucks, 0.0% of 3-Axle trucks and 6.7% of MAV are having trip lengths more than 750 km which refers there is significant medium traffic at alternate Survey location.
- Major OD pairs are Bareilly-Nigohi, Faridpur-Bisalpur, Bareilly-Shahjahanpur etc.

Trip length Frequency Distribution at Faridpur Toll Plaza (2nd OD Survey)

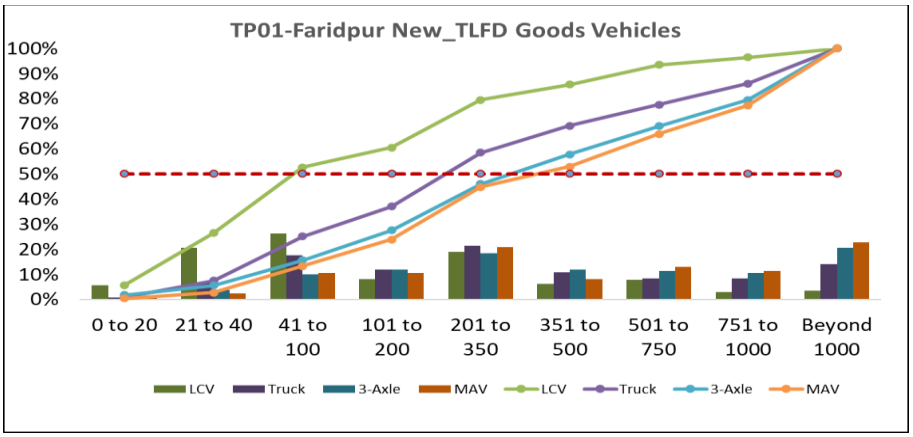


Figure 4-15 Trip length Frequency Distribution at Faridpur Toll Plaza (2nd OD Survey)– Goods

- Around 60.5% of LCVs, 37.1% of Trucks, 27.5% 3-Axle, 23.9% MAVs are having trip length less than 200 km.

- 32.9% of LCVs, 40.5% of 2-Axle trucks, 41.5% of 3-Axle trucks and 42.1% of MAV are having trip lengths more than 200 km and less than 750 km.
- Around 6.5% of LCVs, 22.4% of 2-Axle trucks, 31.0% of 3-Axle trucks and 34.0% of MAV are having trip lengths more than 750 km which refers there is significant medium and long-distance traffic through the Faridpur Toll plaza.
- Major OD pairs of (3A & MAV) are Bareilly-Lucknow, Bareilly-Faridpur, Lucknow-Delhi, Bareilly-Shahjahanpur etc.

4.4.6.2 Passenger Vehicles

Trip length Frequency Distribution at Faridpur Toll Plaza

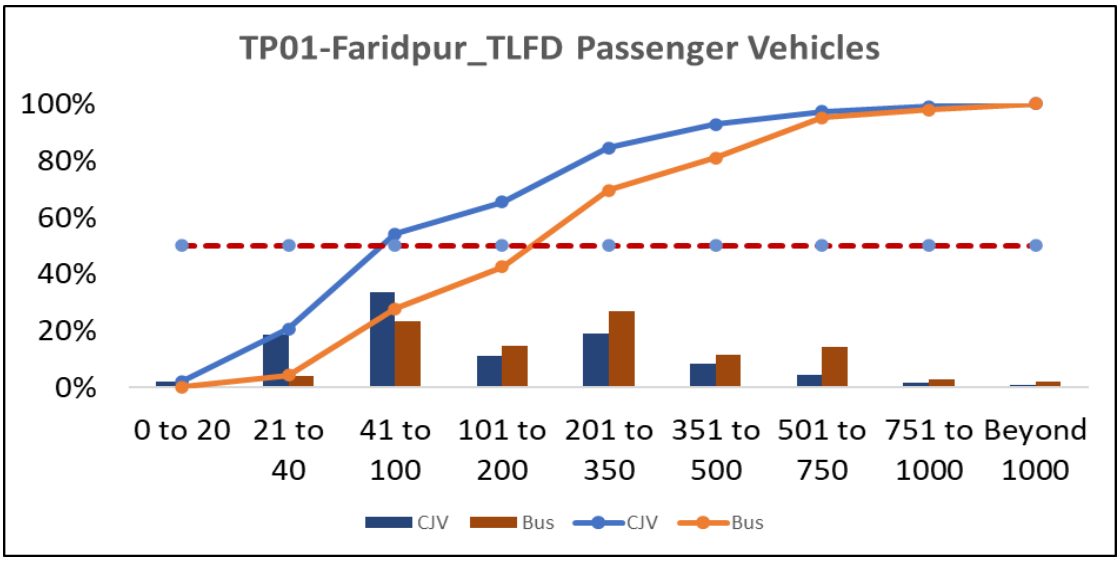


Figure 4-16 Trip length Frequency Distribution at Faridpur Toll Plaza - Passengers

- Around 54.2% of Cars and 27.5% Busses are having less than 100 km trip length.
- Approximately 11.3% of Cars and 14.9% of Busses are having less than 200 km trip length. 18.9% of Cars and 26.9% of Busses are observed to be having trip lengths more than 200 km and less than 350 km.
- 14.6% of cars and 28.5% of Busses trips are between 351 km to 1000 km, and 1.0% of Cars and 2.1% of Busses trips are beyond 1000 km.
- Major OD pairs are Bareilly-Shahjahanpur, Bareilly-Faridpur, Bareilly-Lucknow, Bareilly-Lucknow, Lucknow-Delhi, Shahjahanpur-Delhi etc.

Trip length Frequency Distribution at Maigalganj Toll Plaza

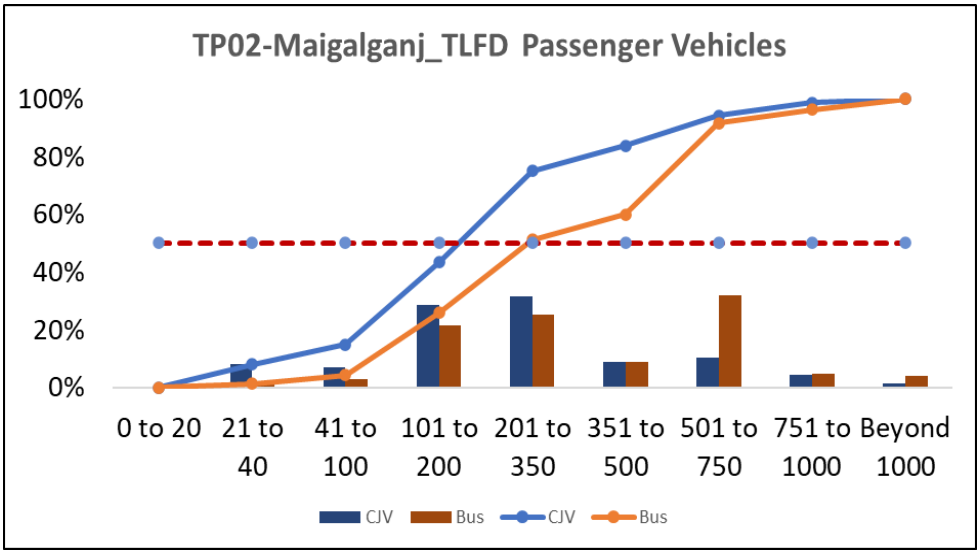


Figure 4-17 Trip length Frequency Distribution at Maigalganj Toll Plaza-Passengers

- Around 14.8% of Cars and 4.2% Busses are having less than 100 km trip length.
- Approximately 28.6% of Cars and 21.6% of Busses are having less than 200 km trip length. 31.6% of Cars and 25.3% of Busses are observed to be having trip lengths more than 200 km and less than 350 km.
- 8.9% of cars and 8.8% of Busses trips are between 351 km to 500 km, 14.8% of Car and 36.3% of Busses trips are between 500 km to 1000 km and 1.3% of Car and 3.7% of Busses trips are beyond 1000 km.
- Major OD pairs are Bareilly-Lucknow, Shahjahanpur-Lucknow, Shahjahanpur-Sitapur, Bareilly-Sitapur etc.

Trip length Frequency Distribution at Alternate Road

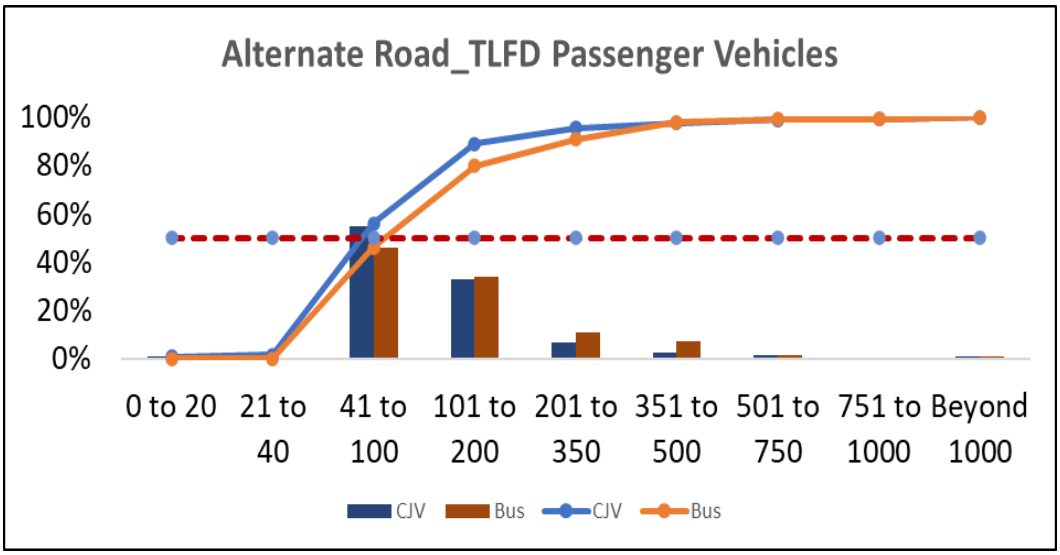


Figure 4-18: Trip length Frequency Distribution at Alternate Road -Passengers

- Around 56.0% of Cars and 45.9% Busses are having less than 100 km trip length.

- Approximately 33.0% of Cars and 33.7% of Busses are having less than 200 km trip length. 6.4% of Cars and 11.0% of Busses are observed to be having trip lengths more than 200 km and less than 350 km.
- 2.3% of cars and 7.2% of Busses trips are between 351 km to 500 km, 1.5% of Car and 1.3% of Busses trips are between 500 km to 1000 km and 1.0% of Car and 1.0% of Busses trips are beyond 1000 km.
- Major OD pairs are Bareilly-Bisalpur, Bareilly-Shahjahanpur, Bareilly-Hardoi Bareilly-Nigohi etc.

Trip length Frequency Distribution at Faridpur Toll Plaza (2nd OD Survey)

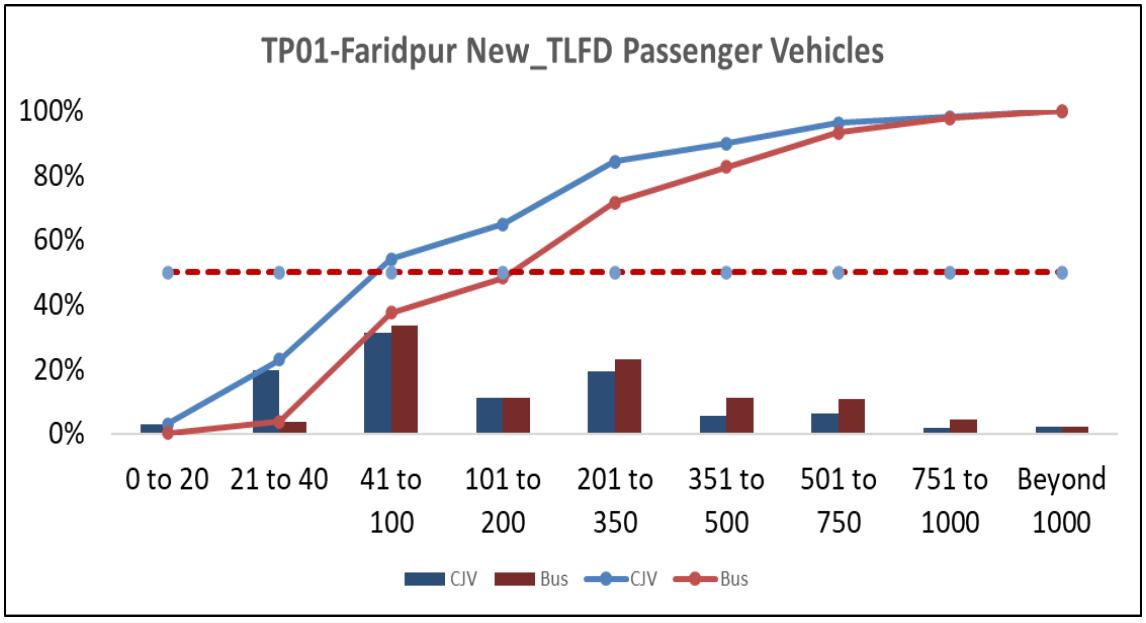


Figure 4-19: Trip length Frequency Distribution at Faridpur Toll Plaza (2nd OD Survey) – Passengers

- Around 54.1.0% of Cars and 37.4% Busses are having less than 100 km trip length.
- Approximately 10.9% of Cars and 10.97% of Busses are having less than 200 km trip length. 19.23% of Cars and 23.2% of Busses are observed to be having trip lengths more than 200 km and less than 350 km.
- 5.7% of cars and 11.1% of Busses trips are between 351 km to 500 km, 8.2% of Car and 15.1% of Busses trips are between 500 km to 1000 km and 2.0% of Car and 2.2% of Busses trips are beyond 1000 km.
- Major OD pairs are Bareilly-Bisalpur, Bareilly-Shahjahanpur, Bareilly-Hardoi Bareilly-Nigohi etc.

4.4.7 Major Trip Generators

An analysis was carried out to identify the major trip generators. Table and figure below present the major trip generators of all passenger and goods vehicles at the toll plazas.

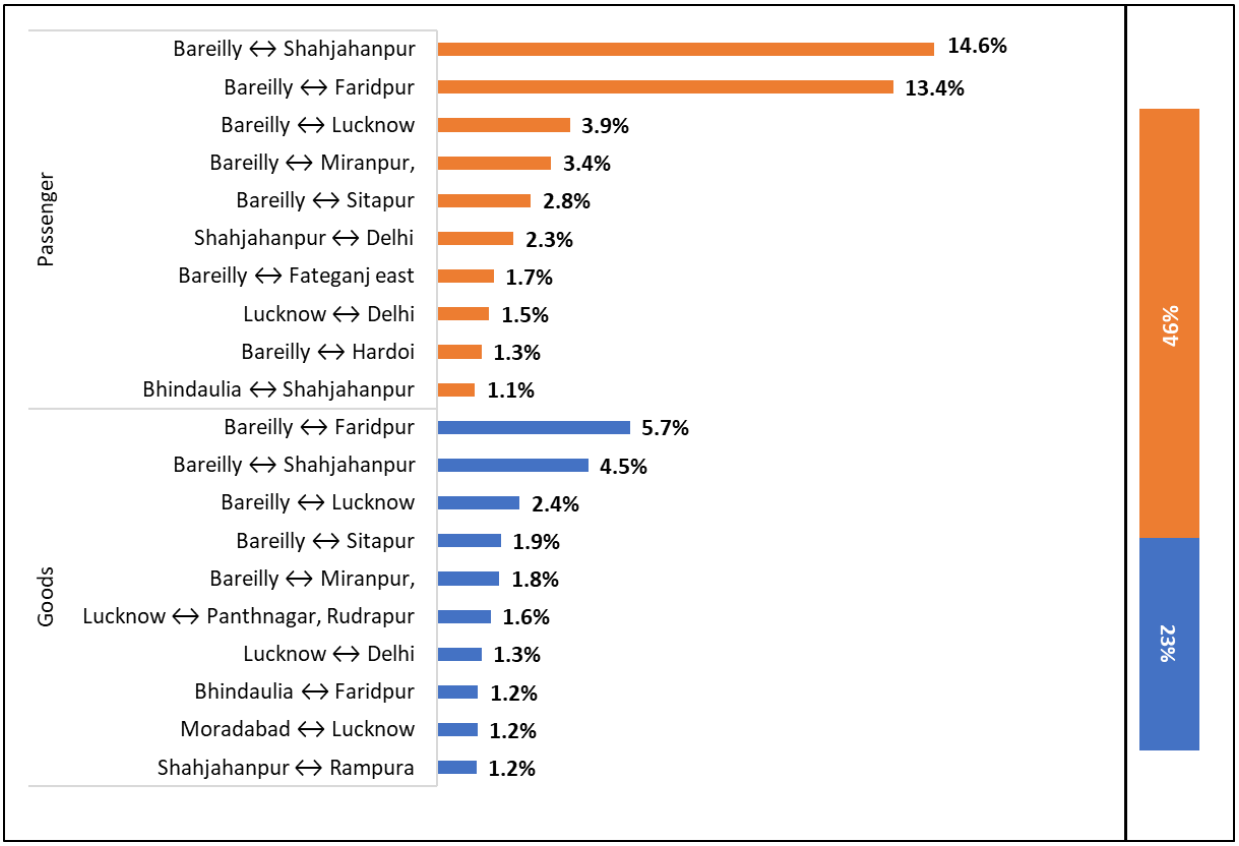


Figure 4-20 Major OD Pairs at Faridpur TP

Top ten OD Pairs comprises around 46% of total passenger traffic and 23% of total goods traffic at Faridpur Toll Plaza.

Passenger wise Major OD Pair at Toll Plaza:

- Top five OD Pair from passenger mode share is of 38.1%. Major OD pairs are generated from, Bareilly Core City, Shahjahanpur, Faridpur, Lucknow, Delhi, Miranpur etc.

Goods wise Major OD Pair at Toll Plaza:

- Top five OD Pair from goods mode share is of 16.1%. Major OD pairs are generated from Bareilly, Lucknow, Sitapur, Delhi, Rampura, Faridpur etc.

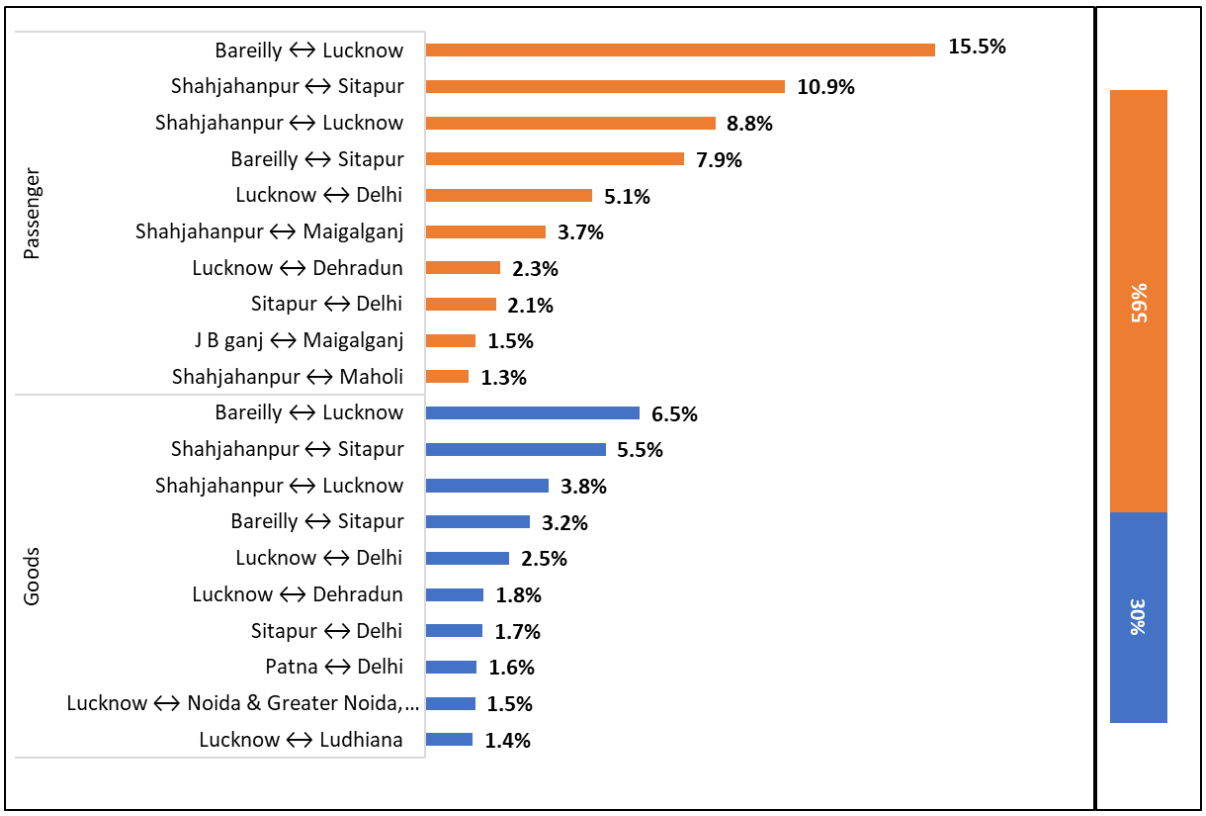


Figure 4-21 Major OD Pairs at Maigalganj TP

Top ten OD Pairs comprises around 59% of total passenger traffic and 30% of total goods traffic at Maigalganj Toll Plaza.

Passenger wise Major OD Pair at Toll Plaza:

- Top five OD Pair from passenger mode share is of 48.2%. Major OD pairs are generated from Lucknow, Sitapur, Delhi, Shahjahanpur, Bareilly etc.

Goods wise Major OD Pair at Toll Plaza:

- Top five OD Pair from goods mode share is of 21.5%. Major OD pairs are generated from Lucknow, Sitapur, Delhi, Shahjahanpur, Bareilly etc.

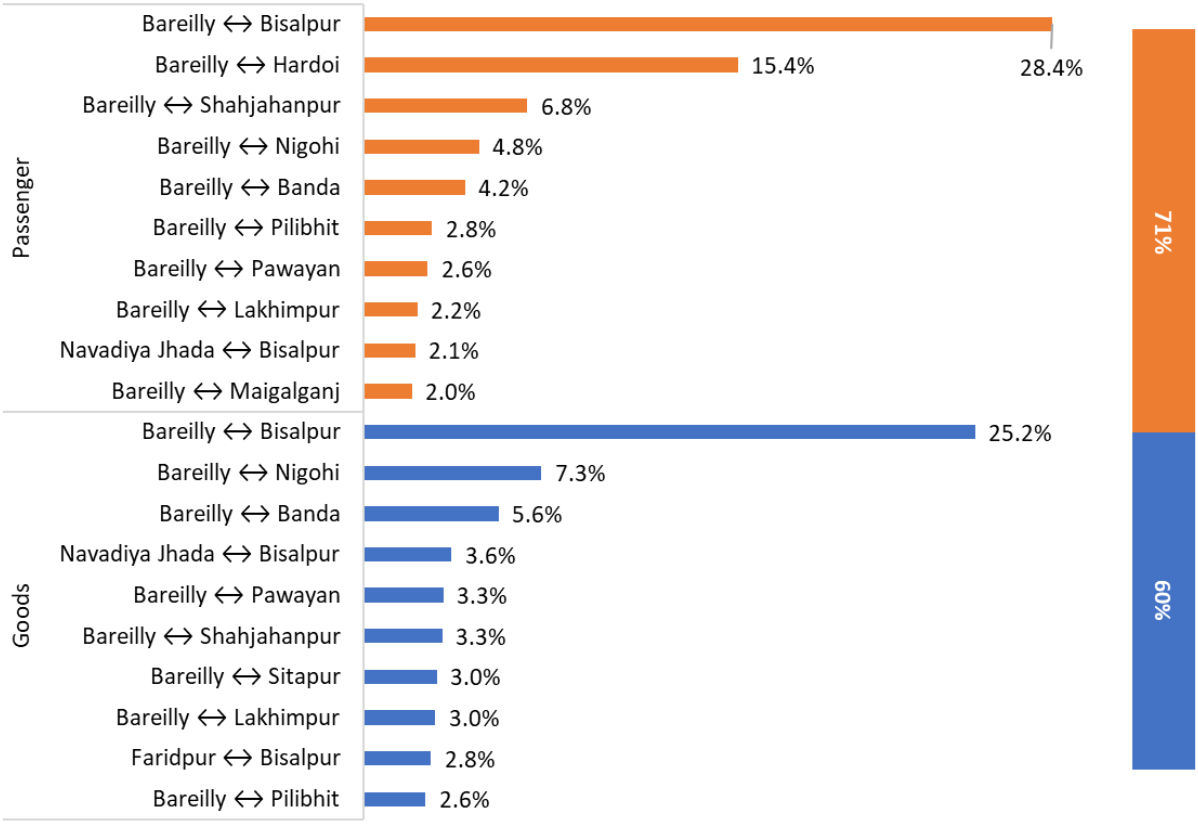


Figure 4-22: Major OD Pairs at Alternate Road

Top ten OD Pairs comprises around 71% of total passenger traffic and 60% of total goods traffic at Maigalganj Toll Plaza.

Passenger wise Major OD Pair at all Toll Plaza's:

Top five OD Pair from passenger mode share is of 60%. Major OD pairs are generated from Bareilly, Bisalpur, Hardoi, Shahjahanpur, Nigohi, Banda etc.

Goods wise Major OD Pair at all Toll Plaza's:

Top five OD Pair from goods mode share is of 50%.

Major OD pairs are generated from Bisalpur, Nigohi, Banda, Navadiya Jhada (Bhuta Town), Faridpur etc.

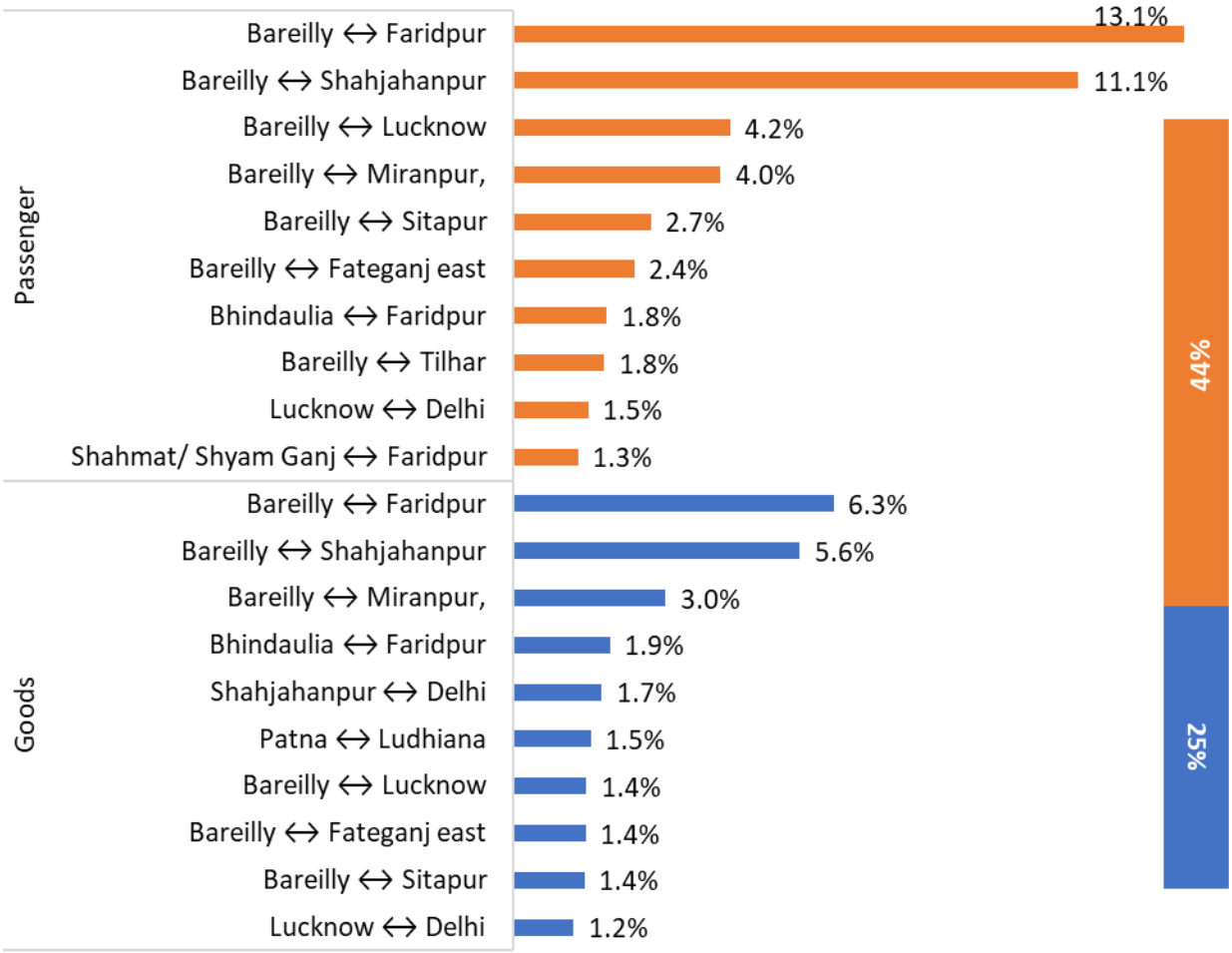


Figure 4-23 Major OD Pairs at Faridpur TP (2nd OD Survey)

Top ten OD Pairs comprises around 44% of total passenger traffic and 25% of total goods traffic at Faridpur Toll Plaza.

Passenger wise Major OD Pair at Toll Plaza:

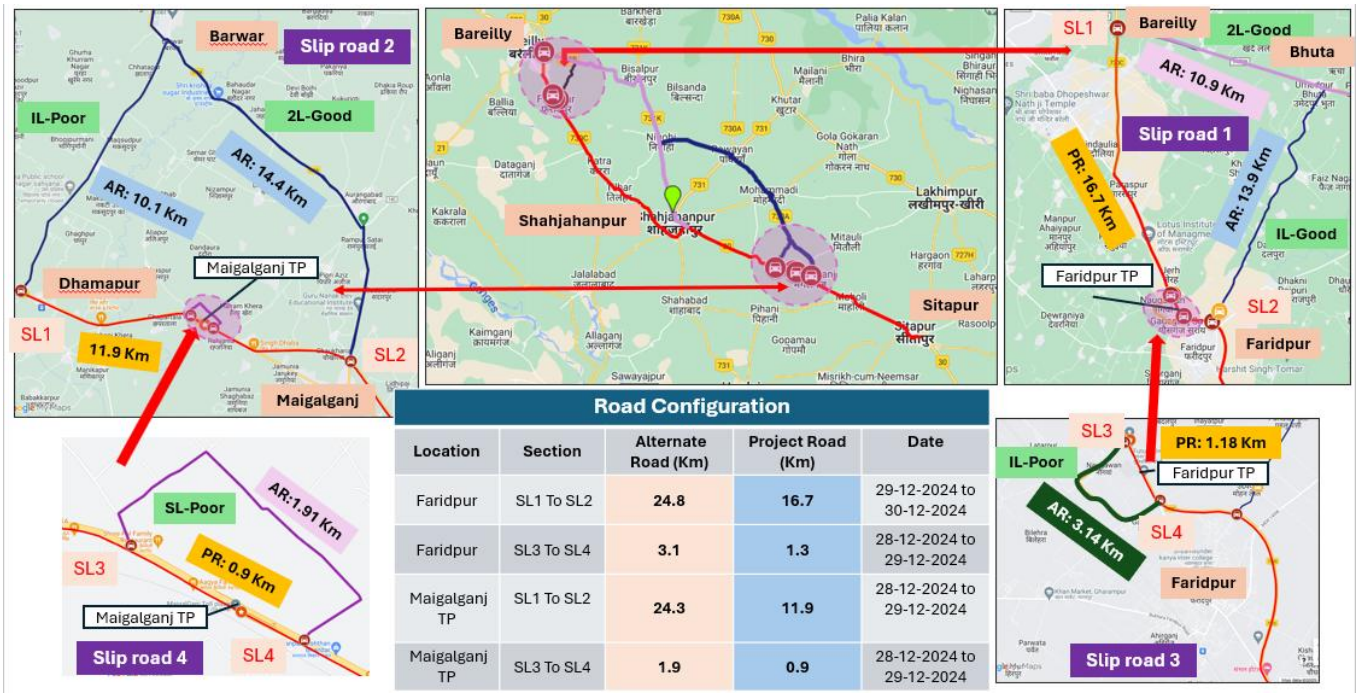
- Top five OD Pair from passenger mode share is of 35.1%. Major OD pairs are generated from, Bareilly Core City, Shahjahanpur, Faridpur, Lucknow, Delhi, Miranpur etc.

Goods wise Major OD Pair at Toll Plaza:

- Top five OD Pair from goods mode share is of 18.5%. Major OD pairs are generated from Bareilly, Lucknow, Sitapur, Delhi, Rampura, Faridpur etc.

4.4.8 RP Survey

RP Survey was conducted at 4 Locations 2 at Faridpur toll plaza and other 2 at Maigalganj toll plaza.



Road Configuration

Location	Section	Alternate Road (Km)	Project Road (Km)	Date
Faridpur	SL1 To SL2	24.8	16.7	29-12-2024 to 30-12-2024
Faridpur	SL3 To SL4	3.1	1.3	28-12-2024 to 29-12-2024
Maigalganj TP	SL1 To SL2	24.3	11.9	28-12-2024 to 29-12-2024
Maigalganj TP	SL3 To SL4	1.9	0.9	28-12-2024 to 29-12-2024

Figure 4-24: RP Survey Location & Network Map

From the Registration plate survey, it is observed that:

Around 150 vehicles per day are using slip roads at Faridpur Toll plaza. And 78% of vehicles falls in “Car” category.

Around 70 vehicles per day are using slip roads at Maigalganj Toll plaza. And 80% of vehicles falls in “Car” category.

Table 4-19: RP Survey Results Mode Wise

Toll Plaza	Faridpur TP						Maigalganj TP					
Slip Road Location	SL 1	SL 2	Leakage /RP Matched Vehicles	SL 3	SL 4	Leakage /RP Matched Vehicles	SL 3	SL 4	Leakage /RP Matched Vehicles	SL 1	SL 2	Leakage /RP Matched Vehicles
Total Vehicles (Both Direction)	5698	667	**78**	776	340	**69**	153	325	**29**	887	1948	**40**
Car/Taxi/Mini LCV/LMV	4628	387	**78**	642	323	**38**	140	289	**28**	466	1343	**29**
Mini-Bus & Bus	211	7	**0**	9	2	**1**	0	2	**0**	23	84	**1**
LCV	273	37	**0**	43	9	**8**	9	14	**1**	102	202	**3**
2 Axle	75	55	**0**	8	2	**4**	1	6	**0**	14	31	**1**
3 Axle	147	54	**0**	35	0	**2**	3	7	**0**	150	65	**3**
MAV	364	127	**0**	34	4	**15**	0	7	**0**	132	223	**2**

CHAPTER 5

Diversion & Development Traffic Impact Assessment

5. Diversion & Development Traffic Impact Assessment

5.1 Introduction

This chapter presents the details of road network in the project influence area and the potential impact on the project road traffic during concession period. The traffic diversion section covers the comparison of the potential alternate routes with the project road.

Road network assessment and alternate modes were identified, and risk assessment has been done to determine traffic likely to be diverted to / from various routes by mode-wise based on generalized costs including toll fees on project road and alternate routes.

This chapter also presents the details of land development in the project influence area and the potential impact on the project road traffic. Growth rates obtained from elasticity method needs to be adjusted for diversions as some of the upcoming development near project area can significantly affect the traffic estimates. The diversion and development section cover the potential land use development near project area and their effect on the future traffic estimates.

5.2 Diversion Traffic to Project Road/Alternate Routes

5.2.1 Road network assessment

Road network in the project influence area (PIA) was studied in detail from the past reports, latest news articles for all the potential impact roads on the project road traffic. Based on the site appreciation and desktop research it has been observed that there is viable alternate road that exists for the project road the & table below illustrates the list of alternate road development.

Table 5-1 Alternative Roads /Development Impacts on Project Road

S.NO	Alternative Road/ Network/ Land /Improvements	Impact Type	Year Of Impact
1	6 lane greenfield access-controlled highway with a route alignment connecting NH-334 Ganga Expressway	Negative impact on Both Faridpur & Maigalganj TP	FY27: 50% FY28:100%
2	Widening of Shahjahanpur-Hardoi-Lucknow to 4L	Negative Impact on Maigalganj TP	FY27: 50% FY28:100%
3	Ganga E-Way Phase-II (From Haridwar)	Negative Impact on Maigalganj TP	FY36: 50% FY37: 100%
4	4L E-Way from Ghaziabad-Hapur to Kanpur-Unnao Greenfield alignment via Farrukhabad (tentative length 380 Km)	The OD pairs impacted by this expressway are part of the Ganga Expressway diversion	

5.2.2 Approach & Methodology

The Diversion Analysis process starts with the identification of potential alternate routes which was described in the earlier section. Post identification of the alternate routes, the next step involves quantification of the potential divertible traffic on the project road and the identified alternate routes.

The potential divertible traffic is the traffic which could shift from one road to the other road considering all the factors such as Vehicle operating cost, Travel time and Tolls. Subsequently a diversion analysis (binomial model) is performed to identify the quantum of the traffic that shift to the project road (positive diversion) or shift to the alternate road (negative diversion). The positive or the negative diversion is based on the generalized costs obtained from the diversion analysis model.

In this case, as seen in the earlier section there are potential alternate routes which are combination of greenfield & brownfield upgradations. With respect to the potential divertible traffic for the project road it has been quantified based on the O-D analysis. The potential divertible traffic for the proposed alternate for the base year is not available as it is not operational at present (base year). In the absence of potential divertible traffic on the alternate route, the potential divertible traffic on project road is considered as total potential divertible traffic (PR+AR) for the diversion analysis.

5.2.2.1 Diversion 1 Ganga Expressway Impact

Pair 1: Hapur to Lucknow (Ganga E-Way)

- Negative Impact on both toll Plaza's due to proposed Ganga Expressway for the traffic plying between Hapur, Meerut, Ghaziabad Delhi & Greater Noida towards Lucknow, Bihar & beyond.

Pair 2: Hapur to Kanpur (Ganga E-Way)

- Negative Impact on Faridpur toll Plaza's due to proposed Ganga Expressway for the traffic plying between Hapur, Meerut, Ghaziabad Delhi & Greater Noida towards Kanpur, Varanasi & beyond.

Pair 3: Bareilly to Kanpur (Ganga E-Way)

- Negative Impact on Faridpur toll Plaza's due to proposed Ganga Expressway for the traffic plying between Bareilly, Rampur, Pilbhit & Uttarakhand towards Kanpur, Varanasi & beyond.

Pair 4: Hapur to Shahjahanpur (Ganga E-Way)

- Negative Impact on Faridpur toll Plaza's due to proposed Ganga Expressway for the traffic plying between Uttarakhand, Bareilly, Moradabad & Beyond towards Shahjahanpur, Lakhimpur & Local zones.

5.2.2.2 Diversion 2 Shahjahanpur to lucknow (NH-731 Improvement)

Negative Impact at Maigalganj toll Plaza's due to proposed Ganga Expressway for the traffic plying between Shahjahanpur, Bareilly, Rampur, Moradabad towards Lucknow, Bihar & beyond.

5.2.3 Ganga Expressway

594 km Ganga Expressway project by UPEIDA is an under construction 6 lane greenfield access-controlled highway with a route alignment connecting NH-334 in Meerut District with NH-2 at Prayagraj (Allahabad) Bypass in Prayagraj District.

This greenfield project was first announced in 2008 connect Noida with Ballia. Since then, the project in Phase 1 has been revised to connect Meerut with Prayagraj. In Phase 2, the expressway will be extended by 110 km to Tigri on the Uttar Pradesh / Uttarakhand Border and by 314 km to Ballia near Varanasi.

- **Status:** Under Construction
- **Developers:** Adani Enterprises and IRB Infrastructure Developers
- **Owner:** Uttar Pradesh Expressways Industrial Development Authority (UPEIDA)
- **Project Model:** DBFOT under PPP.

UP Expressways Industrial Development Authority

गंगा एक्सप्रेस–वे निर्माण की प्रगति

दिनांक–02.12.2024

Earth Work in Main Carriageway	C&G in Main Carriageway	GSB in Main Carriageway	WMM in Main Carriageway	DBM in Main Carriageway	Total Structures = 1489 Completed	Over all Progress
87%	100%	68%	64%	62%	1361	65

5.2.4 Diversion-1 (Ganga Expressway Impact)

Traffic coming from Delhi and North Delhi will have two alignments passing on north side of UP state once the Ganga expressway is completely operational. Consultant has considered the impact of ganga expressway in Pair wise as mentioned in the Table 5-2 below.

Table 5-2 Pair wise Route Comparison b/w PR & AR

Pair	From	To	Route Via PR	Route Via Ganga E-way (AR)	Impacted Toll Plaza's
1	Hapur	Lucknow	A-B-C-D-E	A-K-J-I-F-E	Both Toll Plaza's
2	Hapur	Kanpur	A-B-C-I-H	A-K-J-I-F-G-H	Faridpur Toll Plaza
3	Bareilly	Kanpur	B-C-I-H	B-K-J-I-F-G-H	Faridpur Toll Plaza
4	Hapur	Shahjahanpur	A-B-C	A-K-J-C	Faridpur Toll Plaza

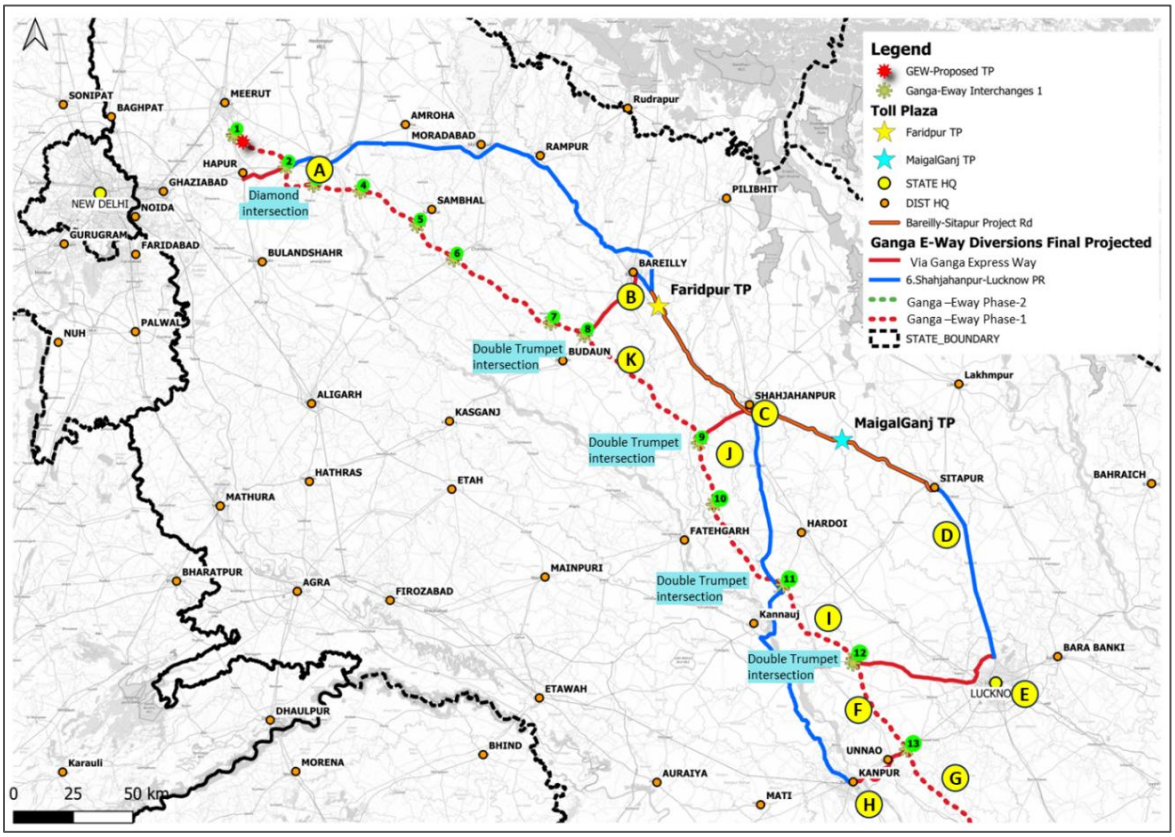


Figure 5-1 Ganga Expressway Route Comparison

Pair 1: Hapur to Lucknow (Ganga E-Way Impact)

Traffic coming from the Hapur, Meerut, Delhi, beyond west part & North of it will have two route options available once the Ganga Expressway is completely operational. The common point for both the Project Road and alternate route will be Hapur and the route comparison between Hapur to Lucknow via Project Road vis a-vis alternate route is described below.

Table 5-3 Hapur Lucknow Route Comparison b/w PR & AR

ROUTE COMPARISON					
YEAR	**ROAD (PR or AR)**	**SECTION**	**LENGTH (KM)**	**ROAD CONFIG**	**REMARKS**
FY25	PR	Hapur (NH334) - Brijghat Toll plaza	19	6L	
	PR	Brijghat Toll plaza - Rajabpur (NH9)	27	6L	
	PR	Rajabpur (NH9) - Moradabad	29	6L	
	PR	Moradabad - Bareilly	82	4L	
	PR	Bareilly - Shahjahanpur	96	4L	
	PR	Shahjahanpur - Lucknow	175	4L	
	PR	South City Extension - Saraikaiyan	5	4L	
	PR	Rampur Bypass	8	2L	2Lane to 4L Upgradation works Going on for 8 Km's length
FY27	AR	Node 2 To Node 11	343	6L-EWAY	

	AR	Node 11 To Lucknow	63	6L-EWAY	Greenfield Expressway under Construction
Total Distance Via PR(Km)			**441**		
Total Distance Via AR(Km)			**406**		

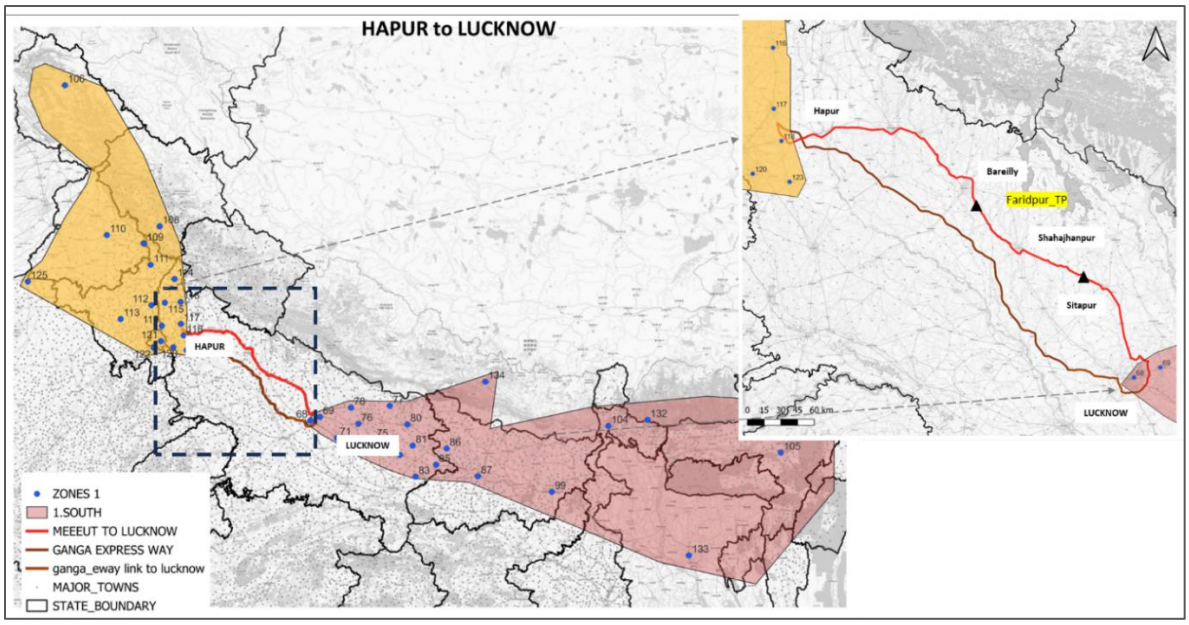


Figure 5-2 Hapur Lucknow (Ganga E-Way) zoning Scheme

It is observed that Project Road is 35 kms longer than alternative route for Hapur to Lucknow route. Traffic zones which are considered for this part of diversion is shown above Figure 5-2.

Zones that are considered by consultant on the North side are Hapur, Delhi, North Rajasthan, Punjab, Himachal Pradesh, Haryana and Jammu & Kashmir (Zones highlighted inside yellow polygon in Figure 5-2). Similarly, zones considered on the South side are Lucknow, Bihar, Northeast India & Northeast Uttar Pradesh were considered for potential divertible traffic estimation. (Zones highlighted inside Brown polygon in Figure 5-2). All the Zones coming in the PIA of the proposed network development are considered and correspondingly travel demand is estimated from the potentially impacted zones. Potential Divertible traffic for the base year is mentioned below.

Table 5-4 Potential Divertible Traffic in Base year (Pair 1)

Mode	Faridpur TP	Maigalganj TP
Car	340	340
Minibus	108	108
Bus-2A	61	61
Bus-3A	221	221
LCV	152	152
2 Axle	379	379
3 Axle	340	340
MAV	108	108

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the

project road is estimated. Generalized cost is calculated based on the value of time (VOT) and vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic Evaluation of Highway Projects in India” and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion.

The consultant has considered that this diversion shall happen phase wise with 50% of the divertible traffic diverting in FY-27 and 100% of the divertible traffic diverting in FY-28. The table below illustrates the quantum of divertible traffic obtained, the diverted traffic considered and the percentage composition of the diverted traffic with respect to AADT.

Table 5-5 Traffic diversion from Faridpur toll plaza to Hapur Lucknow – Diversion1 in FY25

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	340	-185	-2.0%
Bus	108	-82	-8.2%
LCV	61	-36	-7.2%
2 Axle	221	-135	-9.8%
3 Axle	152	-73	-8.6%
MAV	379	-226	-10.1%

Table 5-6 Traffic diversion from Maigalganj toll plaza to Hapur Lucknow – Diversion1 in FY25

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	340	-185	-4.2%
Bus	108	-82	-16.7%
LCV	61	-36	-9.5%
2 Axle	221	-135	-12.7%
3 Axle	152	-73	-9.6%
MAV	379	-226	-15.6%

The tables below illustrate the divertible traffic onto the project road at Faridpur toll plazas from FY-25 up to FY-46. The sudden jump in traffic from FY27 to FY28 is due to the consideration of phase wise diversion as described earlier.

Pair 2: Hapur to Kanpur (Ganga E-Way Impact)

Traffic coming from the Hapur, Meerut, Delhi, beyond west part & North of it will have two route options available once the Ganga Expressway is completely operational. The common point for both the Project Road and alternate route will be Hapur and the route comparison between Hapur to Kanpur via Project Road vis a-vis alternate route is described below in Table 5-7.

Table 5-7 Hapur Kanpur Route Comparison b/w PR & AR

ROUTE COMPARISON					
Year	Road (PR or AR)	SECTION	LENGTH (KM)	ROAD CONFIG	REMARKS
FY25	PR	Hapur (NH334) - Brijghat Toll plaza	19	6L	

ROUTE COMPARISON					
Year	**Road (PR or AR)**	**SECTION**	**LENGTH (KM)**	**ROAD CONFIG**	**REMARKS**
		Brijghat Toll plaza - Rajabpur (NH9)	27	6L	
		Rajabpur (NH9) - Moradabad	29	6L	
		Moradabad – Bareilly	82	4L	
		Bareilly – Shahjahanpur	96	4L	
		Shahjahanpur – Shahabad	22	4L	
		Shahabad (NH731) – Bilgram	56	2L	
		South City Extension – Saraikaiyan	5	4L	
		Rampur Bypass	8	2L	2Lane to 4L Upgradation works Going on for 8 Km's length
FY28	AR	Node 2 To Node 11	297	6L-EWAY	Greenfield Expressway under Construction
Total Distance Via PR(Km)			**344**		
Total Distance Via AR(Km)			**297**		

It is observed that Project Road is 47 kms longer than alternative route for Hapur to Kanpur route. Traffic zones which are considered for this part of diversion is shown below.

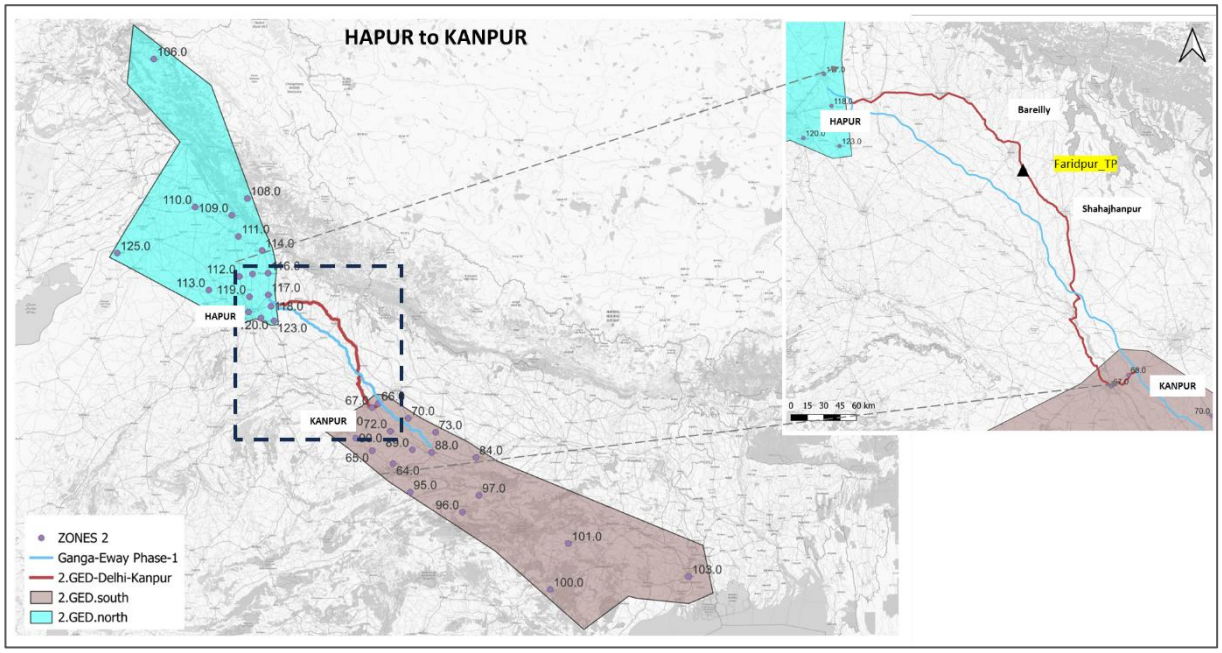


Figure 5-3 Hapur Kanpur (Ganga E-Way) zoning Scheme

Zones that are considered by consultant on the North side are Hapur, Delhi, North Rajasthan, Punjab, Himachal Pradesh, Haryana and Jammu & Kashmir (Zones highlighted inside yellow polygon in Figure 5-3). Similarly, zones considered on the South side are Kanpur, Odisha, Varanasi & Kolkata were considered for potential divertible traffic estimation. (Zones

highlighted inside Brown polygon in Figure 5-3). All the Zones coming in the PIA of the proposed network development are considered and correspondingly travel demand is estimated from the potentially impacted zones. Potential Divertible traffic for the base year is mentioned below in Table 5-8.

Table 5-8 Potential Divertible Traffic in Base year (Pair 2)

Mode	Faridpur TP
Car	46
Minibus	0
Bus-2A	8
Bus-3A	0
LCV	21
2 Axle Truck	74
3 Axle Truck	53
MAV	121

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the project road is estimated. Generalized cost is calculated based on the value of time (VOT) and vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic Evaluation of Highway Projects in India” and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion.

The consultant has considered that this diversion shall happen phase wise with 50% of the divertible traffic diverting in FY-27 and 100% of the divertible traffic diverting in FY-28. The table below illustrates the quantum of divertible traffic obtained, the diverted traffic considered and the percentage composition of the diverted traffic with respect to AADT.

Table 5-9 Traffic diversion from Faridpur toll plaza to Hapur Kanpur -Diversion1 in FY25

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	46	-31	-0.3%
Bus	8	-8	-0.8%
LCV	21	-15	-2.9%
2 Axle	74	-66	-4.8%
3 Axle	53	-37	-4.4%
MAV	121	-104	-4.6%

The tables below illustrate the divertible traffic onto the project road at Faridpur toll plazas from FY-25 up to FY-46. The sudden jump in traffic from FY27 to FY28 is due to the consideration of phase wise diversion as described earlier.

Pair 3: Bareilly to Kanpur (Ganga E-Way Impact)

Traffic coming from the Bareilly, Moradabad, Pilibhit, & Uttarakhand will have two route options available once the Ganga Expressway is completely operational. The common point for both the Project Road and alternate route will be Bareilly and the route comparison between Bareilly to Kanpur via Project Road vis a-vis alternate route is described below.

Table 5-10 Bareilly Kanpur Route Comparison b/w PR & AR

ROUTE COMPARISON					
Year	**Road (PR or AR)**	**SECTION**	**LENGTH (KM)**	**ROAD CONFIG**	**REMARKS**
FY25	PR	Bareilly - Shahjahanpur	96	4L	
		Shahjahanpur - Shahabad	22	4L	
		Shahabad (NH731) - Bilgram	56	2L	
		South City Extension - Saraikaiyan	5	4L	
FY27	AR	Node 8 - Node 9	66	6L-EWAY	Greenfield Expressway under Construction
		Node 9 - Node 10	28	6L-EWAY	
		Node 10 - Node 11	47	6L-EWAY	
		Bareilly - Node 8	48	4L	
		11th-Bilgram	2	2L	
Total Distance Via PR(Km)			**179**		
Total Distance Via AR(Km)			**191**		

It is observed that Project Road is 12 kms shorter than alternative route for Bareilly to Kanpur route. Traffic zones which are considered for this part of diversion is shown below.

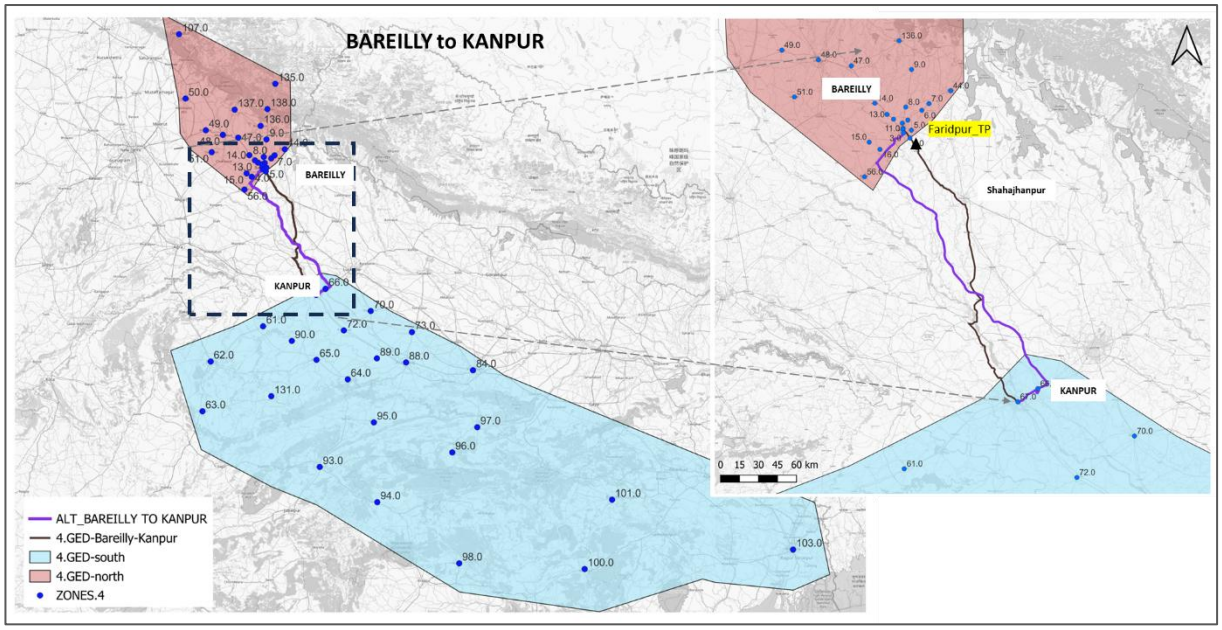


Figure 5-4 Bareilly Kanpur (Ganga E-Way) zoning Scheme

Zones that are considered by consultant on the North side are Bareilly, Moradabad, Pilibhit, & Uttarakhand (Zones highlighted inside brown polygon in Figure 5-4). Similarly, zones considered on the South side are Kanpur, Odisha, Varanasi & Kolkata were considered for potential divertible traffic estimation. (Zones highlighted inside blue polygon in Figure 5-4). All the Zones coming in the PIA of the proposed network development are considered and correspondingly travel demand is estimated from the potentially impacted zones. Potential Divertible traffic for the base year is mentioned below.

Table 5-11: Potential Divertible Traffic in Base year (Pair 3)

Mode	Faridpur TP
Car	300
Minibus	2
Bus-2A	54
Bus-3A	0
LCV	38
2 Axle Truck	194
3 Axle Truck	125
MAV	333

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the project road is estimated. Generalized cost is calculated based on the value of time (VOT) and vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic Evaluation of Highway Projects in India” and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion.

The consultant has considered that this diversion shall happen phase wise with 50% of the divertible traffic diverting in FY-27 and 100% of the divertible traffic diverting in FY-28. The table below illustrates the quantum of divertible traffic obtained, the diverted traffic considered and the percentage composition of the diverted traffic with respect to AADT.

Table 5-12: Traffic diversion from Faridpur toll plaza to Bareilly Kanpur-Diversion1 in FY25

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	300	-126	-1.3%
Bus	54	-27	-2.7%
LCV	38	-13	-2.5%
2 Axle	194	-77	-5.6%
3 Axle	125	-42	-4.9%
MAV	333	-145	-6.5%

The tables below illustrate the divertible traffic onto the project road at Faridpur toll plazas from FY-25 up to FY-46. The sudden jump in traffic from FY27 to FY28 is due to the consideration of phase wise diversion as described earlier.

Pair 4: Hapur to Shahjahanpur (Ganga E-Way Impact)

Traffic coming from the Hapur, Delhi, North Rajasthan, Punjab, Himachal Pradesh, Haryana and Jammu & Kashmir will have two route options available once the Ganga Expressway is completely operational. The common point for both the Project Road and alternate route will be Hapur and the route comparison between Hapur to Shahjahanpur via Project Road vis a-vis alternate route is described below.

Table 5-13 Hapur Shahjahanpur Route Comparison b/w PR & AR

ROUTE COMPARISON					
Year	**Road (PR or AR)**	**SECTION**	**LENGTH (KM)**	**ROAD CONFIG**	**REMARKS**
FY25	PR	Hapur (NH334) - Brijghat Toll plaza	19	6L	
		Brijghat Toll plaza - Rajabpur (NH9)	27	6L	
		Rajabpur (NH9) - Moradabad	29	6L	
		Moradabad - Bareilly	82	4L	
		Bareilly - Shahjahanpur	96	4L	
		Rampur Bypass	8	2L	2Lane to 4L Upgradation works Going on for 8 Km's length
FY27	AR	Node 2 To Node 9	220	6L-EWAY	Greenfield Expressway under Construction
		Node 9-shahjanpur	23	2L	
Total Distance Via PR(Km)			**261**		
Total Distance Via AR(Km)			**243**		

It is observed that Project Road is 18 kms longer than alternative route for Hapur to Shahjahanpur route. Traffic zones which are considered for this part of diversion is shown below in Figure 5-5.

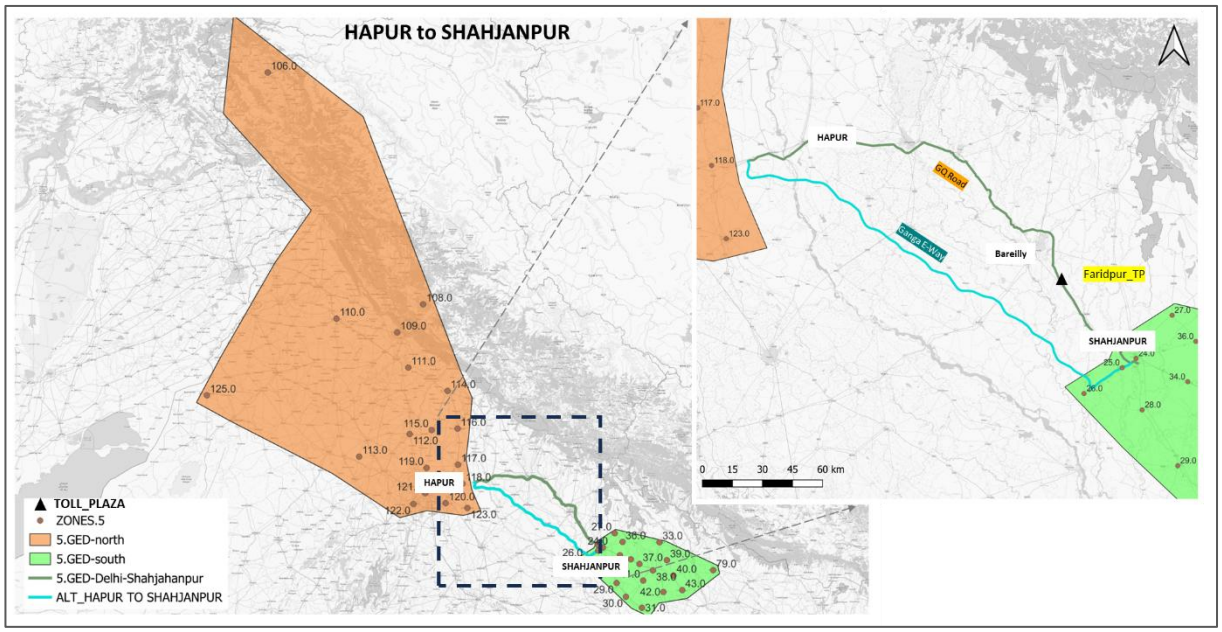


Figure 5-5 Hapur Shahjahanpur (Ganga E-Way) zoning Scheme

Zones that are considered by consultant on the North side are Hapur, Delhi, North Rajasthan, Punjab, Himachal Pradesh, Haryana and Jammu & Kashmir (Zones highlighted inside brown

polygon in Figure 5-5). Similarly, zones considered on the South side are Shahjahanpur, Hardoi, Shahabad, Lakhimpur & Local zones were considered for potential divertible traffic estimation. (Zones highlighted inside green polygon in Figure 5-5). All the Zones coming in the PIA of the proposed network development are considered and correspondingly travel demand is estimated from the potentially impacted zones. Potential Divertible traffic for the base year is mentioned below in Table 5-14 .

Table 5-14 Potential Divertible Traffic in Base year (Pair 4)

Mode	Faridpur TP
Car	590
Minibus	1
Bus-2A	101
Bus-3A	0
LCV	48
2 Axle	200
3 Axle	108
MAV	321

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the project road is estimated. Generalized cost is calculated based on the value of time (VOT) and vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic Evaluation of Highway Projects in India” and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion

The consultant has considered that this diversion shall happen phase wise with 50% of the divertible traffic diverting in FY-27 and 100% of the divertible traffic diverting in FY-28. The table below illustrates the quantum of divertible traffic obtained, the diverted traffic considered and the percentage composition of the diverted traffic with respect to AADT.

Table 5-15: Traffic diversion from Faridpur toll plaza to Hapur Shahjahanpur-Diversion1 in FY25

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	601	-329	-3.5%
Bus	142	-105	-10.5%
LCV	50	-28	-5.7%
2 Axle	98	-59	-4.3%
3 Axle	72	-37	-4.4%
MAV	189	-117	-5.2%

The tables below illustrate the divertible traffic onto the project road at Faridpur toll plazas from FY-25 up to FY-46. The sudden jump in traffic from FY27 to FY28 is due to the consideration of phase wise diversion as described earlier.

5.2.5 Diversion-2 (Shahjahanpur-Hardoi-Lucknow)

Traffic coming from the Shahjahanpur, Pilbith, Moradabad and Uttarakhand will have two route options available once Shahjahanpur- Via Hardoi-Lucknow is completely operational. The common point for both the Project Road and alternate route will be Shahjahanpur and Lucknow the route comparison between Shahjahanpur-Lucknow via Project Road vis a-vis alternate route is described below in Figure 5-6.

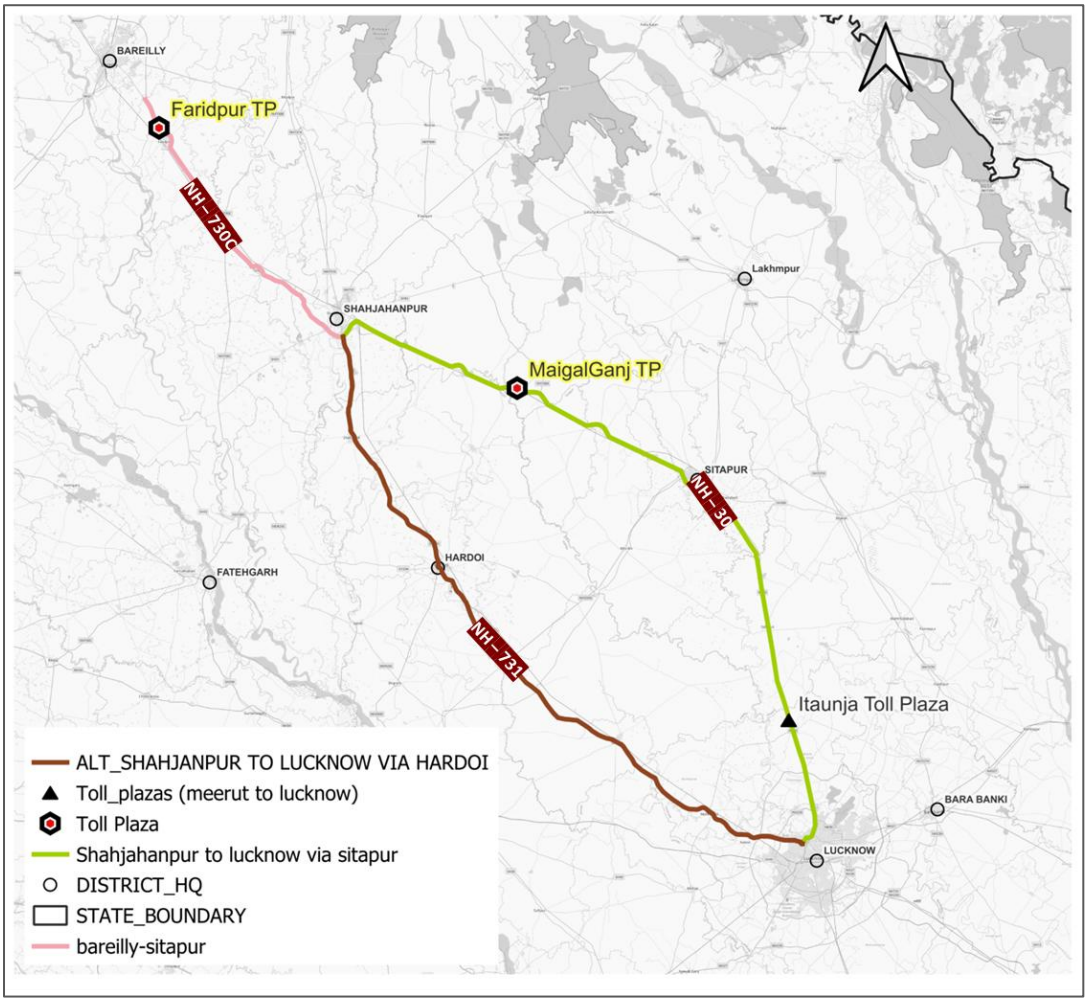


Figure 5-6 Shahjahanpur to Lucknow Route Comparison

Network Characteristics like Length, Road configuration etc. for both PR and AR are mentioned in the below.

Table 5-16 Shahjahanpur Lucknow Route Comparison b/w PR & AR

ROUTE COMPARISON					
Year	**Road (PR or AR)**	**SECTION**	**LENGTH (KM)**	**ROAD CONFIG**	**REMARKS**
FY25	PR	Shahjahanpur-Lucknow	175	4L	
FY27	AR	Shahjahanpur-Shahabad	22	4L	
	AR	Shahabad (NH731)-Lucknow	145	4L	Under Construction

ROUTE COMPARISON					
Year	Road (PR or AR)	SECTION	LENGTH (KM)	ROAD CONFIG	REMARKS
		Total Distance Via PR(Km)	175		
		Total Distance Via AR(Km)	167		

It is observed that Project Road is 8 kms longer than alternative route for Shahjahanpur to Lucknow route. Traffic zones which are considered for this part of diversion is shown below.

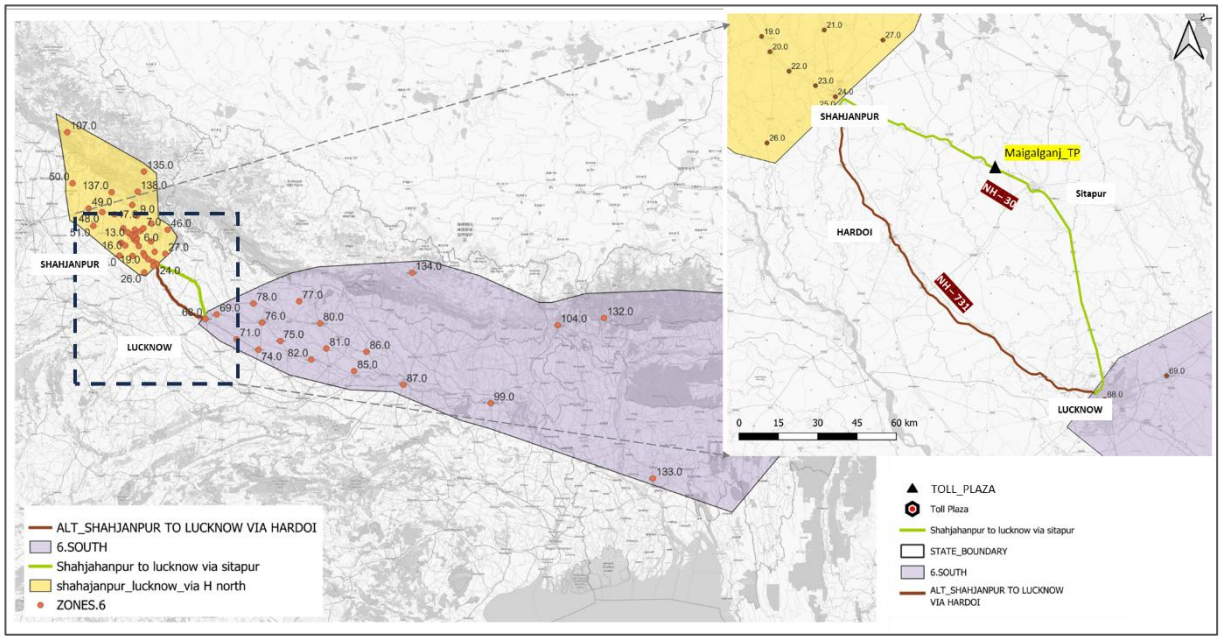


Figure 5-7 Shahjahanpur to Lucknow zoning Scheme

Zones that are considered by consultant as North side are Shahjahanpur, Pilibhit, Moradabad and Uttarakhand etc., on the Figure 5-7 within yellow polygon. Similarly on the southern side Lucknow, Nepal, Northwest Bengal, Sikkim, Ayodhya, Gorakhpur, etc. were considered for potential divertible traffic estimation. (Zones highlighted within pink polygon in Figure 5-7). All the Zones coming in the PIA of the proposed network development are considered and correspondingly travel demand is estimated from the potentially impacted zones. Potential Divertible traffic for the base year is mentioned below in Table 5-17.

Table 5-17 Potential Divertible Traffic in Base Year Diversion 2 (FY-25)

Mode	Maigalganj TP
Car	1543
Minibus	5
Bus-2A	134
Bus-3A	0
LCV	108
2 Axle	347
3 Axle	209
MAV	353

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the

project road is estimated. Generalized cost is calculated based on the value of time (VOT) and vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic Evaluation of Highway Projects in India” and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion.

The consultant has considered that this diversion shall happen phase wise with 50% of the divertible traffic diverting in FY-28 and 100% of the divertible traffic diverting in FY-29. The Table 5-18 below illustrates the quantum of divertible traffic obtained, the diverted traffic considered and the percentage composition of the diverted traffic with respect to AADT.

Table 5-18 Traffic Diversion from Maigalganj TP to Shahjahanpur-Hardoi-Lucknow (Diversion-2) in FY 25

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	1,557	-775	-17.7%
Bus	133	-75	-15.2%
LCV	107	-60	-16.1%
2 Axle	345	-188	-17.7%
3 Axle	205	-118	-15.6%
MAV	354	-194	-13.3%

The **Error! Reference source not found.** below illustrate the divertible traffic onto the project road at both the toll plazas from FY-25 up to FY-46. The sudden jump in traffic from FY28 to FY29 is due to the consideration of phase wise diversion as described earlier.

5.2.6 Diversion-3 (Ganga Expressway Phase II Impact)

Traffic coming from Delhi and North Delhi will have two alignments passing on north side of UP state once the Ganga expressway Phase II is completely operational. Consultant has considered the impact of ganga expressway in Pair wise as mentioned in the Table 5-2 below.

Table 5-1 Pair wise Route Comparison b/w PR & AR

Pair	From	To	Route Via PR	Route Via Ganga E-way (AR)	Impacted Toll Plaza’s
1	Haridwar	Lucknow	Haridwar Lucknow (Via Rudrapur)	Haridwar Lucknow (Via Bijnor)	Faridpur
2	Haridwar	Kanpur	Haridwar Lucknow (Via Rudrapur	Haridwar Kanpur (Via Bijnor)	Faridpur

Pair 1: Haridwar to Lucknow (Ganga E-Way Phase II Impact)

Traffic coming from the Haridwar only & Lucknow, Bihar & Northeast India of it will have two route options available once the Ganga Expressway Phase II is completely operational. The common point for both the Project Road and alternate route will be Haridwar and the route

comparison between Haridwar to Lucknow via Project Road vis a-vis alternate route is described below.

Table 5-19 Shahjahanpur Lucknow Route Comparison b/w PR & AR

ROUTE COMPARISON					
YEAR	ROAD (PR or AR)	SECTION	LENGTH (KM)	ROAD CONFIG	REMARKS
FY36	PR	Sahanpur To Najibabad	10.8	4L	
	PR	Najibabad To Bareilly	224.1	4L	
	PR	Bareilly To Shahjahanpur	92.6	4L	
	PR	Shahjahanpur To Lucknow (Via Hardoi)	166	4L	
FY36	AR	Sahanpur To Hasanpur	112	6L E-Ways	
	AR	Hasanpur To Nawabad Garant	303.6	6L E-Ways	
	AR	Nawabad Garant To Lucknow	62.3	6L E-Ways	
Total Distance Via PR(Km)			**493**		
Total Distance Via AR(Km)			**478**		

It is observed that Project Road is 15 kms longer than alternative route for Haridwar to Lucknow route. Traffic zones which are considered for this part of diversion is shown below.

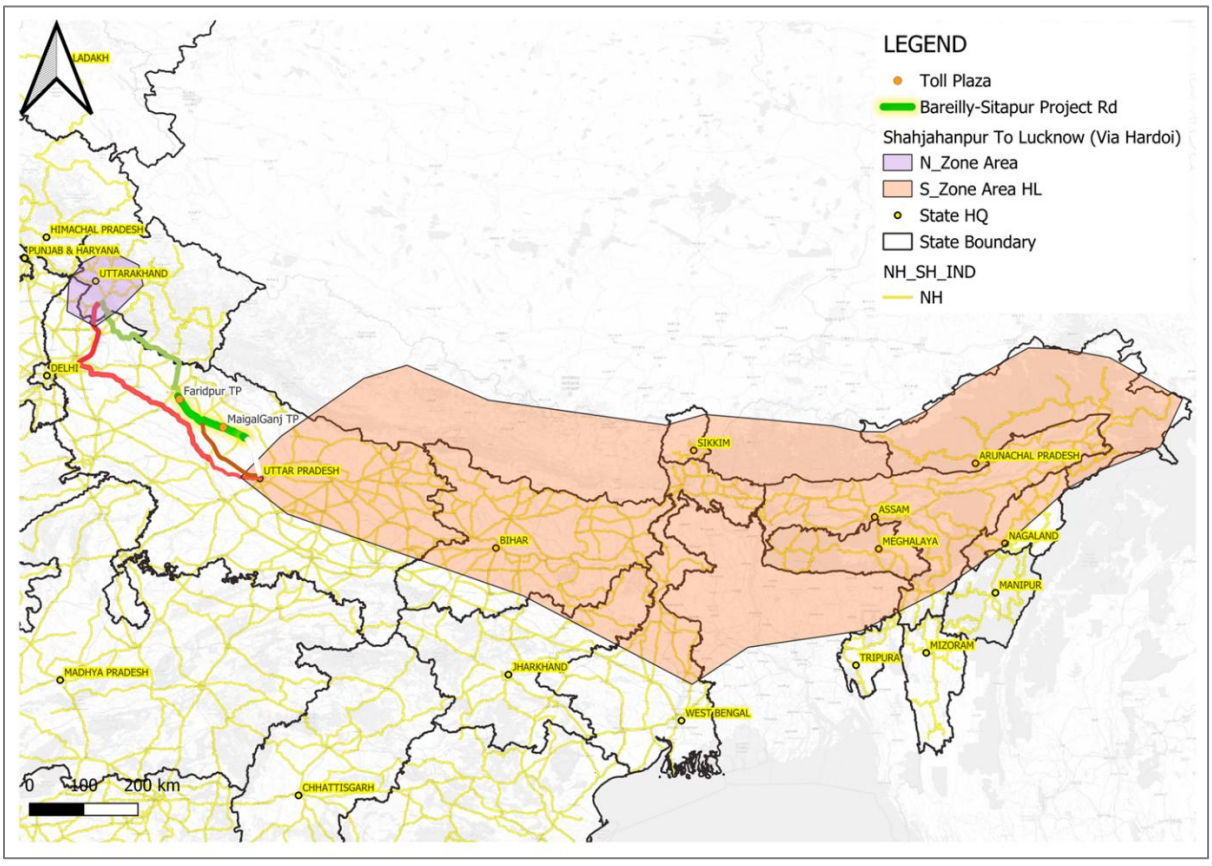


Figure 5-8 Haridwar to Lucknow zoning Scheme

Zones that are considered by consultant on the North side are Haridwar (Zones highlighted inside pink polygon in Figure 5-2). Similarly, zones considered on the South side are Lucknow,

Bihar, Northeast India & Northeast Uttar Pradesh were considered for potential divertible traffic estimation. (Zones highlighted inside Brown polygon in Figure 5-2). All the Zones coming in the PIA of the proposed network development are considered and correspondingly travel demand is estimated from the potentially impacted zones. Potential Divertible traffic for the base year is mentioned below.

Table 5-20 Potential Divertible Traffic in Base year (Pair 1)

Mode	Faridpur TP
Car	84
Minibus	0
Bus-2A	24
Bus-3A	0
LCV	3
2 Axle	37
3 Axle	22
MAV	50

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the project road is estimated. Generalized cost is calculated based on the value of time (VOT) and vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic Evaluation of Highway Projects in India” and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion.

The consultant has considered that this diversion shall happen phase wise with 50% of the divertible traffic diverting in FY-27 and 100% of the divertible traffic diverting in FY-28. The table below illustrates the quantum of divertible traffic obtained, the diverted traffic considered and the percentage composition of the diverted traffic with respect to AADT.

Table 5-21 Traffic diversion from Faridpur toll plaza to Haridwar Lucknow – Diversion3 in FY25

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	84	-40	-0.4%
Bus	24	-15	-1.5%
LCV	3	-1	-0.3%
2 Axle	37	-16	-1.2%
3 Axle	22	-8	-0.9%
MAV	50	-23	-1.0%

The tables below illustrate the divertible traffic onto the project road at Faridpur toll plazas from FY-25 up to FY-46. The sudden jump in traffic from FY27 to FY28 is due to the consideration of phase wise diversion as described earlier.

Pair 2: Haridwar to Kanpur (Ganga E-Way Phase II Impact)

Traffic coming from the Haridwar only & Kanpur, South Bihar & West Bengal India of it will have two route options available once the Ganga Expressway Phase II is completely operational. The common point for both the Project Road and alternate route will be Haridwar and the route

comparison between Haridwar to Lucknow via Project Road vis a-vis alternate route is described below.

Table 5-22 Hapur Lucknow Route Comparison b/w PR & AR

ROUTE COMPARISON					
YEAR	ROAD (PR or AR)	SECTION	LENGTH (KM)	ROAD CONFIG	REMARKS
FY36	PR	Sahanpur To Najibabad	10.8	4L	
	PR	Najibabad To Bareilly	224.1	4L	
	PR	Bareilly To Shahjahanpur	92.6	4L	
	PR	Shahjahanpur To Shahabad	22	4L	
	PR	Shahabad To Bilgram	55.5	2L	
FY36	AR	Sahanpur To Hasanpur	112	6L E-Ways	
	AR	Hasanpur To Bilgram	257.6	6L E-Way's	
	AR	Bilgram Bypass to Bilgram Junction	2	2L	
Total Distance Via PR(Km)			**405**		
Total Distance Via AR(Km)			**372**		

It is observed that Project Road is 33 kms longer than alternative route for Haridwar to Kanpur route. Traffic zones which are considered for this part of diversion is shown below.

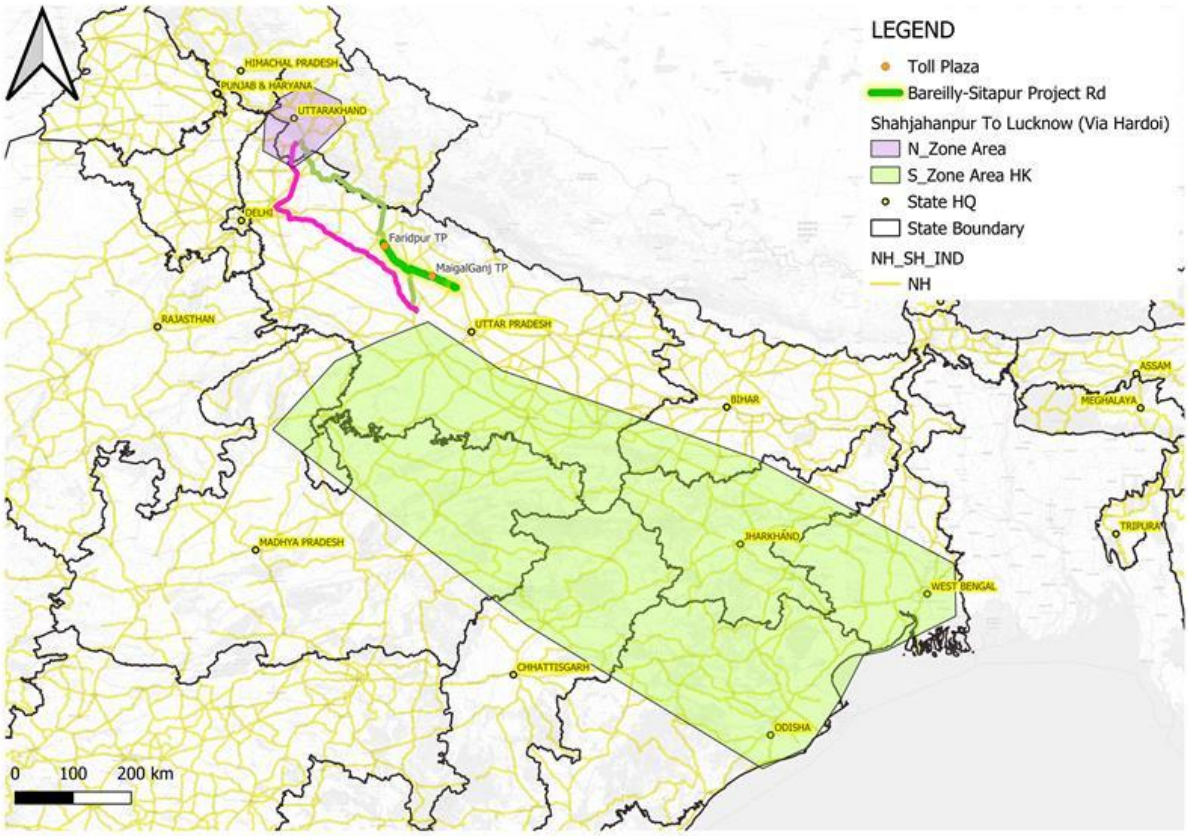


Figure 5-9 Haridwar to Kanpur zoning Scheme

Zones that are considered by consultant on the North side are Haridwar (Zones highlighted inside pink polygon in Figure 5-2). Similarly, zones considered on the South side are Lucknow, Bihar, Northeast India & Northeast Uttar Pradesh were considered for potential divertible traffic estimation. (Zones highlighted inside Brown polygon in Figure 5-2). All the Zones coming in the PIA of the proposed network development are considered and correspondingly travel demand is estimated from the potentially impacted zones. Potential Divertible traffic for the base year is mentioned below.

Table 5-23 Potential Divertible Traffic in Base year (Pair 2)

Mode	Faridpur TP
Car	20
Minibus	0
Bus-2A	6
Bus-3A	0
LCV	8
2 Axle	33
3 Axle	28
MAV	58

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the project road is estimated. Generalized cost is calculated based on the value of time (VOT) and

vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic Evaluation of Highway Projects in India” and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion.

The consultant has considered that this diversion shall happen phase wise with 50% of the divertible traffic diverting in FY-27 and 100% of the divertible traffic diverting in FY-28. The table below illustrates the quantum of divertible traffic obtained, the diverted traffic considered and the percentage composition of the diverted traffic with respect to AADT.

Table 5-24 Traffic diversion from Faridpur toll plaza to Haridwar Kanpur – Diversion 3 in FY25

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	20	-11	-0.1%
Bus	6	-5	-0.5%
LCV	8	-4	-0.9%
2 Axle	33	-18	-1.3%
3 Axle	28	-13	-1.5%
MAV	58	-33	-1.5%

The tables below illustrate the divertible traffic onto the project road at Faridpur toll plazas from FY-25 up to FY-46. The sudden jump in traffic from FY27 to FY28 is due to the consideration of phase wise diversion as described earlier.

CHAPTER 6

Traffic Growth rate estimation

6. Traffic Growth Rate Estimation

6.1 Background

Demand for transport is derived demand. Derived demand is an economic term which refers demand for a good in one sector occurring because of demand from another sector. Transport users are accessing services not because of its direct benefits but because they wish to access product. Transport demand is basically movement of goods and passengers. Passengers travel to satisfy the need (work, school, college, recreation, etc.) and nobody travel just for the sake of travelling and we transport good as a part of overall economic activity. Derived demand for transportation is often difficult to estimate for future just by analysing the traffic growth in past years as it has derived from demand from some other sectors which may or may not vary in future in the same way. To consider trend in other sector and effect of the same on transport demand factors such as GDP, Primary GDP, secondary GDP, tertiary GDP, states GDP, Per Capita Income and vehicle registrations data is considered. These data are readily available as published by various organizations and more representative of growth in economy and related sectors.

The investment priorities are governed by the traffic demand, assessed benefits, and cost of the project. Demand plays the significant role, which governs the type of facility / infrastructure to be created. This in turn determines likely benefits and costs to develop the same. Prediction of traffic demand becomes an important task and must be conducted near accurately. The accurate estimation of traffic has direct bearing on the viability of project. Recognizing this, efforts were made to carefully assess all the parameters that help in predicting the traffic demand in future which necessitates realistic estimation of traffic growth rates. This chapter explains the methodology and estimation of traffic growth rates for the project for the horizon years. Traffic growth on a road facility is generally estimated based on the historical trends, in the present case traffic growth rates are estimated using Elasticity method as per IRC-108-2015 - *Guidelines for Traffic Forecast on Highways*.

6.2 Methodology

Traffic growth rate estimation follows systematic approach which is based on econometric modelling. The detailed methodology to arrive at growth rate is explained in the following sections.

6.2.1 Governing Factors for Traffic Growth

Traffic growth is governed by number of factors such as Gross National Product (GNP) or Gross Domestic Product (GDP), Agricultural output, Industrial Output which are mainly economic indicators and population, rural/urban mix of population which are demographic factors. Since these indicators vary widely across the country, traffic growth rate varies from state to state, and within state from region to region. So, it is necessary to identify project influence zones and giving consideration while arriving at above indicators.

6.2.2 Determination of Past Trends

Past trend of traffic growth is key parameter in determination of future trend. Past trend of traffic can be analysed from variety of indicators such as traffic flow from census, vehicle registration and fuel sales. Vehicle registrations data is readily available as published by trusted organization is used for this study. For establishing reliable growth rates data should be taken for considerable for number of years. The ideal way to arrive at rate of growth is through regression analysis. Once we have analysed growth in traffic, we can arrive at traffic growth in project influence area by finding out weight of different project influence areas using surveys.

6.2.3 Goods Vehicle Forecasting

Goods vehicle forecasting is done based on growth in tonnage and splits among distinct categories of vehicles. Growth in tonnage is obtained like procedure explained above. For vehicular splits base year splits were considered as benchmark and future year splits were projected based on experience and past growth trends in the same category of vehicles. Once we have tonnage and splits projections number of goods based on vehicle category and corresponding growth rate is calculated.

Traffic forecasting for project road traffic was done considering past trend in growth and analyzing prospects of project influence area. Elasticity approach of growth rate estimation was used for long term traffic forecasting.

6.3 Determination of Growth Trends

Past data pertaining to the project corridor was sourced from the client. This includes traffic data for all the two toll plazas Faridpur & Maigalganj. The findings from the data are summarized in the following subsequent sections.

6.3.1 Past traffic trend at all toll plazas

Past traffic trends were derived based on the historic traffic data provided by the client. Separate analysis was carried out for toll plaza 01 at Faridpur and toll plazas 02 at Maigalganj, respectively. Traffic count summary, travel pattern for both passenger and goods traffic from the historic traffic data is presented below in Table 6-1.

Table 6-1 Past Traffic Trend at Faridpur (TP1) and Maigalganj Toll Plazas (TP2) based on ETC data

Toll Plaza	Source	FY Year	CJV	LCV/Minibus	Bus/2Axle	3Axle	MAV	Total (Veh)	Total (PCU)
Faridpur TP	ETC	FY-2024	7,088	539	2,415	966	2,474	13,481	29,175
	ETC	FY-2025*	7,580	526	2,369	837	2,216	13,527	27,957
	CAGR % (FY 24-25)		**6.94%**	**-2.41%**	**-1.90%**	**-13.35%**	**-10.43%**	**0.34%**	
Maigalganj TP	ETC	FY-2024	3,564	385	1,568	898	1,787	8,203	
	ETC	FY-2025*	3,799	387	1,536	731	1,402	7,856	
	CAGR % (FY 24-25*)		**6.59%**	**0.52%**	**-2.04%**	**-18.60%**	**-21.54%**	**-4.23%**	

*FY-2025 * - Apr24-Nov24 Based AADT*

6.3.2 Project Influence Area

A study of the socio-economic profiles of the regions comprising the project influence area (PIA) provides an overview of the factors likely to influence the pattern of economic development and hence the flows and volumes of traffic on the proposed highway. The details include population, per-capita income (PCI), GDP (India), GSDP (States), GDDP (Districts), registered vehicle population and targeted growth rates of the economy. The profiles help to generate basic inputs for the estimation of future growth in transport demand based on past scenarios, perspective changes in transport demand elasticity and economic growth rates.

The analysis of traffic pattern observed on the project road (at both the toll plaza locations) from traffic studies indicates that most of the traffic is generated from Uttar Pradesh, Uttarakhand, Delhi, Bihar, Haryana, Punjab & West Bengal. Hence, the above-mentioned states have been considered as PIA zones in assessing traffic growth. Since drivers of growth for all the traffic streams would be different, these were analyzed separately. In addition, truck traffic was analyzed considering LCV, 2 Axle and 3 Axle, MAV separately to consider the expected changes in freight vehicle market share in future years.

Table 6-2 Project influence areas impact on both toll plazas

States	FARIDPUR TP			MAIGALGANJ TP		
	Cars	Buses	Trucks	Cars	Buses	Trucks
Uttar Pradesh	92.6%	85.4%	66.6%	90.9%	77.3%	63.8%
Uttarakhand	2.9%	4.0%	12.3%	3.7%	2.7%	7.1%
Delhi	2.8%	8.6%	3.7%	3.1%	15.0%	5.2%
Bihar	0.4%	0.3%	3.4%	0.5%	1.3%	5.4%
Haryana	0.5%	0.9%	3.0%	0.8%	2.4%	3.5%
Punjab	0.4%	0.3%	2.6%	0.5%	0.4%	3.7%
West Bengal	0.1%	0.1%	3.0%	0.2%	0.7%	3.7%
North - East India	0.0%	0.1%	1.4%	0.1%	0.0%	2.8%
Himachal Pradesh	0.1%	0.0%	0.7%	0.1%	0.0%	1.2%
Union Territory of Chandigarh	0.0%	0.0%	0.5%	0.1%	0.2%	0.9%
Odisha	0.1%	0.1%	1.1%	0.0%	0.0%	0.7%
Jammu & Kashmir	0.0%	0.1%	0.7%	0.0%	0.0%	1.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

6.3.3 Growth in Tonnage

To accommodate the dynamic change within the sale of goods vehicles of distinct categories in growth rate estimates, it is pragmatic to consider the overall growth of tonnage on project road at distinct locations. Once the growth of tonnage is established, tonnage share for distinct categories of trucks shall be assumed based on the past trend observed at the toll plaza locations and the potential market share of the individual truck categories with respect to the

region (PIA). Using this growth in tonnage and assumed future tonnage share of distinct categories of goods vehicles the growth rate of each category will be back calculated.

To determine, growth of Historic traffic tonnage, PIA registered vehicles data was converted into total tonnage based on the historic vehicle split. The growth in payloads over the years is shown in the table below.

Table 6-3 Pay load for Different Categories

Mode	LCV	2A TRUCK	3 A TRUCK	MAV
FY-2018	5	9	16	25
FY-2019	5	11.1	17.1	28.5

6.3.4 Growth in Registered Vehicles

The growth in vehicle registrations in the project road influence region is generally a good indicator, as it is found to correlate reasonably well with traffic growth. Thus, it is possible to establish a definite trend and correlation between traffic growth and vehicle registration. To establish future traffic on the project corridor, the trend in vehicle registrations of the influencing areas, which are significantly contributing traffic to the corridor is also studied. Significant growth in registrations of car, buses and trucks has been observed in the project influence areas.

Growth in personal car is observed to be highest followed by freight vehicles and buses in the state of Uttar Pradesh. Compounded annual growth rate of cars, buses and trucks weighted for project area of Toll Plaza 1 at Faridpur is 10.53%, 9.99% & 8.31% respectively as shown in Table 8-4 Weighted vehicle registration data for Project Influence Area of TP1 – Faridpur Table 8-4in Annexures. Similarly, for Maigalganj TP 2 it is 10.50%, 9.42% & 8.13% respectively as shown in Table 8-5 in Annexures.

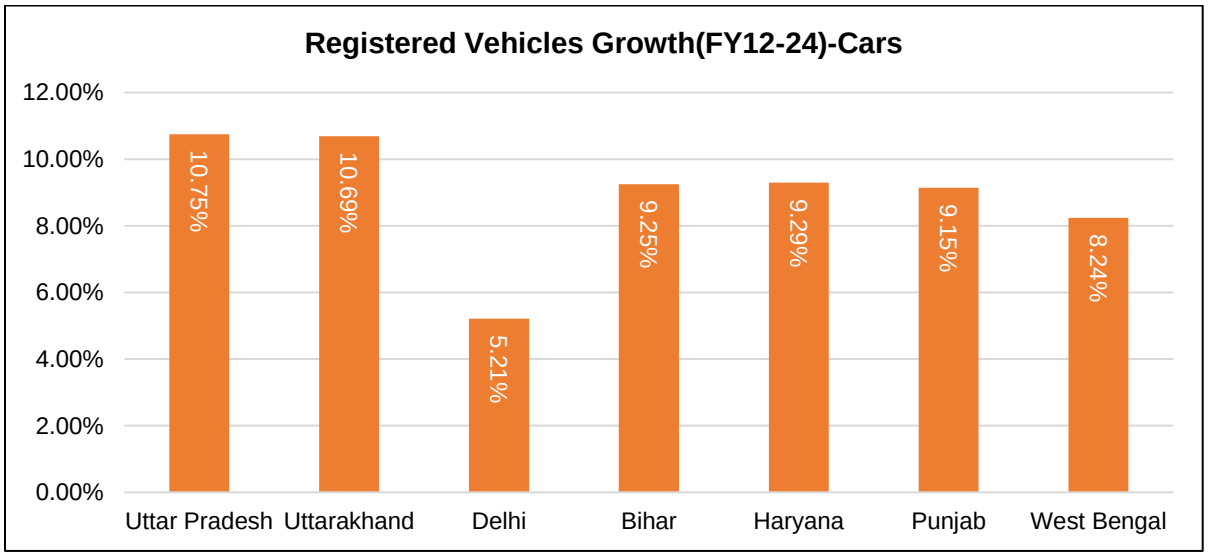


Figure 6-1 Long term growth trends – Registered Cars in the PIA

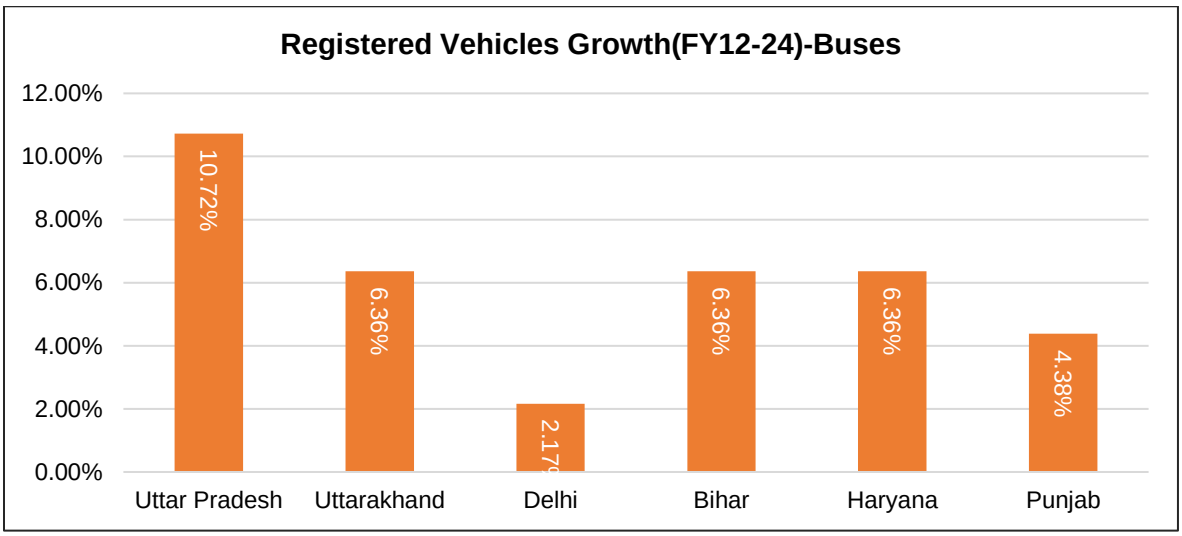


Figure 6-2 Long term growth trends – Registered Buses in the PIA

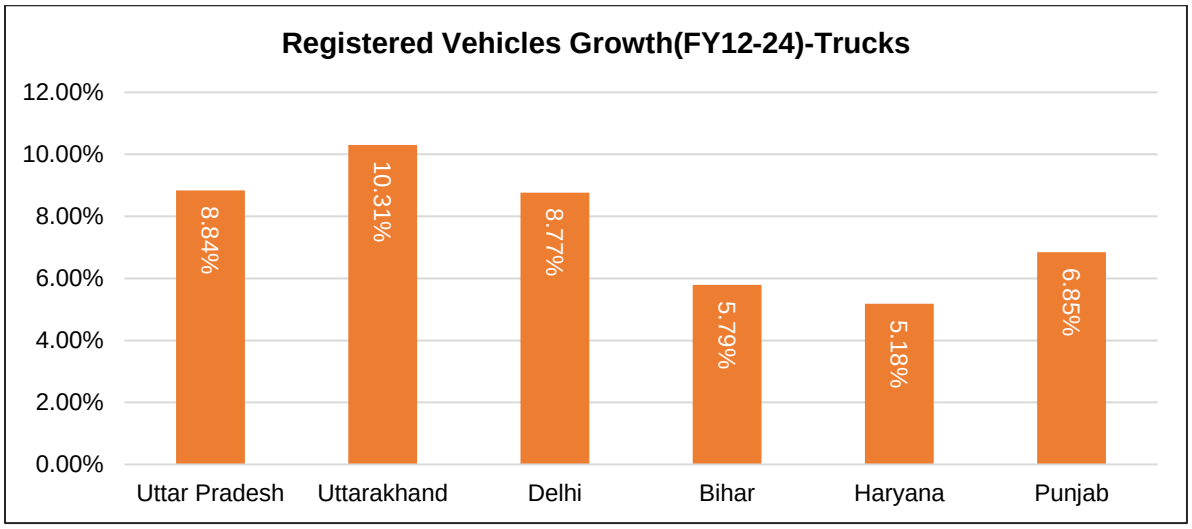


Figure 6-3 Long term growth trends – Registered Trucks in the PIA

Source: ***From MoRTH and VAHAN Data base***

6.3.5 Past Growth in Regional Economies

Growth of traffic on the project road depends on existing development and future growth prospects of the connecting regions. The time series data of economic indicators is one major economic variable followed in the econometric method of traffic forecasting through establishing a relationship between dependent (traffic / registered vehicles) and independent variable (GDP / GSDP / GDD) for project influence areas. Past economic growth for the PIA zones is sourced from the Central Statistical Organisation (CSO) and are presented in Table 6-4.

Table 6-4 GSDP (in Rs. Millions) for PIA zones

Year	Uttar Pradesh	Uttarakhand	Delhi	Bihar	Haryana	Punjab
2012	72.4	11.5	34.4	24.7	29.8	26.7
2013	75.8	12.4	36.7	25.7	32.1	28.1
2014	80.2	13.4	39.3	27.0	34.8	29.9
2015	83.4	14.1	42.8	27.9	37.1	31.2
2016	90.8	15.3	47.6	29.6	41.3	33.0
2017	101.2	16.8	51.2	31.9	45.7	35.3
2018	105.6	18.1	54.2	34.4	48.2	37.5
2019	109.7	18.6	56.5	38.1	53.3	39.7
2020	114.2	19.0	58.6	39.8	54.5	41.3
2021	109.0	16.7	53.4	36.9	49.6	40.7
2022	121.5	18.4	58.0	40.0	54.4	43.4
2023	132.4	19.8	62.6	44.2	58.7	46.2
2024	142.3	21.3	67.2	46.7	63.4	49.3
CAGR (FY12 - 24)	**5.8%**	**5.3%**	**5.7%**	**5.4%**	**6.5%**	**5.3%**

6.3.6 Commercial Vehicles Sale Trend

Category wise commercial sales trend is presented in the below Figure 6-4. From the figure it is observed that market share of 2 Axle truck and 3 Axle truck is declining from the previous Years whereas MAV market share is increasing. Due to improved road infrastructure and over the years and due to technological advancements in commercial vehicle segments, there is a shift from 2 Axle /3 Axle trucks to MAVs.

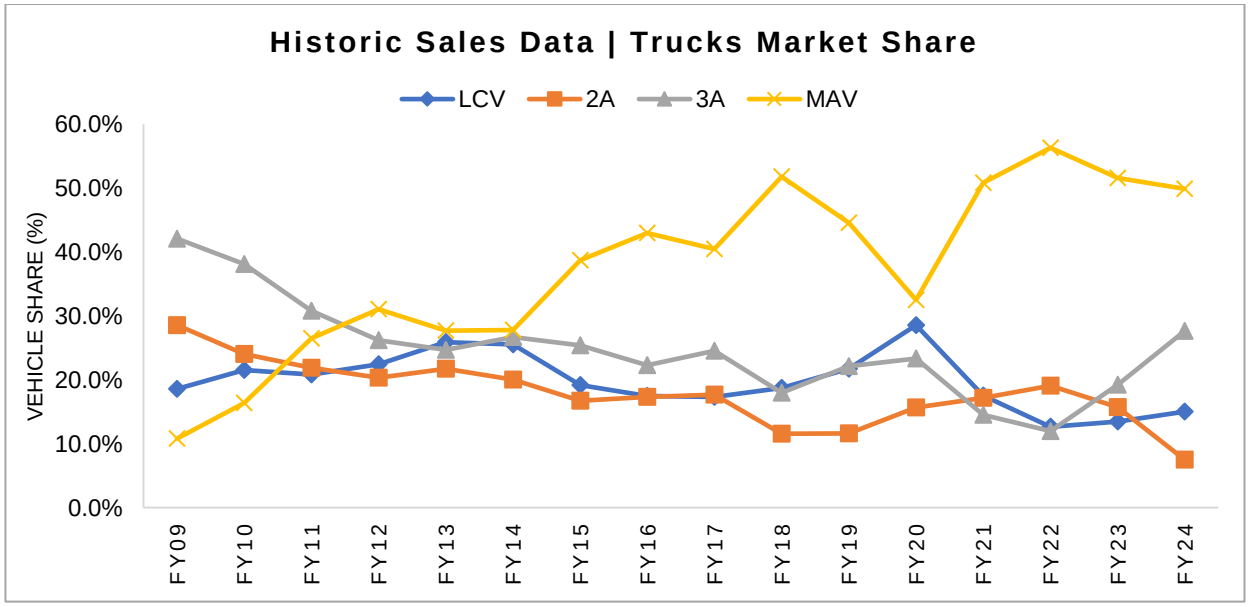


Figure 6-4 Market share between commercial truck categories

6.4 Traffic Growth Drivers

Before going to the traffic growth estimation through the established relation between economic variables and traffic variables, it is prudent to highlight the growth profile of the project corridor in terms of the geographic location and local economic growth potential. The Table 6-5 below summarises the major growth prospects for the traffic in the future on the project road.

Table 6-5 List of developments in the PIA-Growth Driver

Sl. No	Developments	Description	Impact Type
1	Tourism – Agra, Vrindhavan, Ayodhya, Varanasi	The number of tourists visiting Uttar Pradesh has surged, growing from 16 crore in 2016 to over 48 crores currently, with more than 32 crore tourists recorded between January and June 2024 alone[2]. The state experiences an annual footfall of 540 million across its four major religious cities—Varanasi, Ayodhya, Prayagraj, and Mathura-Vrindavan. The upcoming inauguration of the Ram Mandir in Ayodhya is expected to draw an additional 50 to 100 million tourists each year. Moreover, Prayagraj experiences a significant surge in visitors during the Kumbh Mela, which occurs once every six years. In 2017, the city saw a staggering 250 million visitors in less than two months. The Maha-Kumbh in Prayagraj, set to begin on January 13, 2025, is expected to attract an even greater crowd, with projections of 500 million visitors.	Current Growth Driver
2	Industries	The Bareilly-Sitapur stretch serves as a key industrial corridor, with sugar factories being the dominant industry, accounting for 62% of the region's industrial activity. Other notable sectors include food products (10%), flour mills (8%), chemicals, fertilizers, plywood, and agro products, among others. Major companies like Bajaj Hindustan Ltd., WIMCO, IFFCO, Reliance, Bharat Petroleum, Dalmia Bharat Limited and Ramaa Shyama play a significant role in driving economic growth in the area. This corridor stands out as a critical hub for agro-processing, logistics, and diverse industries, supporting regional development.	Current Growth Driver
3	State upcoming developments	The UP Global Investor Summit 2023 marked a significant milestone with 18,643 MoU's signed, amounting to a total investment of Rs 33.50 lakh crore. Key sectors driving these investments include renewable energy (12.41%), higher education (9%),	Future Growth Driver

[2] https://timesofindia.indiatimes.com/city/kanpur/tourism-boom-in-uttar-pradesh-visitor-numbers-triple-in-eight-years/articleshow/113748352.cms

Sl. No	Developments	Description	Impact Type
		industrial parks (11.35%), manufacturing, logistics, and warehousing. The real estate industry and IT-enabled services also contributed significantly to this growth.	
4	Mega Food Park in Baheri	A major project, the Mega Food Park in Baheri, is under development, featuring a Dairy Craft Cheesemaking plant across 12 acres with an investment of Rs 250 crore, expected to create 600 direct jobs and benefit local farmers.	Future Growth Driver
5	Industrial township	• A new industrial township near **Jhumka** intersection is underway, further bolstering economic and employment opportunities in the region. • The **Moradabad Special Economic Zone** (SEZ) spans 464.28 acres, offering robust infrastructure and sector-specific facilities for handicraft trade, textile, IT/ITES, and hardware manufacturing, making it a multi-product hub. Out of 137 allotted plots, 45 industrial units are already operational, with 377 plots still available for new investments. • The **Greater Bareilly Township**, which focuses on planned urban growth and housing solutions. Additionally, 35 villages have been integrated into the Bareilly Development Authority (BDA) jurisdiction, facilitating easier land acquisition and MSME township development. These initiatives mark significant progress in infrastructure, industrial growth, and urban expansion in Bareilly, Moradabad, and surrounding regions, paving the way for economic advancement and employment opportunities. • The development of "**Medi city**", a designated area focusing on health businesses and activities. This project aims to create a hub for healthcare-related infrastructure and services, with the proposed Medi City land included in the Master Plan 2021.	Future Growth Driver
6	Road network improvements	• **Bareilly Southern Bypass and its connectivity** improvements. Two major road sections are proposed: Ramganga Bridge to Binaur (26 km) and Bareilly South Bypass from Parsakhera to Tilhar Mod (31 km). These road projects are crucial for linking Bareilly to the Ganga Expressway, enhancing regional connectivity and supporting economic growth. However, these projects are currently in the proposal stage, with no reports available yet.	Future Growth Driver

Sl. No	Developments	Description	Impact Type
		• **Ganga Expressway** - 594 km Ganga Expressway project by UPEIDA is an approved 6 lane greenfield access-controlled highway with a route alignment connecting NH-334 in Meerut District with NH-2 at Prayagraj (Allahabad) Bypass in Prayagraj District. Currently under construction stage. • **Widening of Shahjahanpur-Hardoi-Lucknow to 4L** - Currently the Shahjahanpur-Hardoi-Lucknow (NH-731) road is under upgradation from 2 lane to 4 lane.	

6.5 Transport Demand Elasticity

An Econometric method is proposed for forecasting future traffic trend based on elasticity which considers transport demand and most likely pattern of economic growth. The Elasticity Method relates traffic growth to changes in the related economic parameters. To calculate elasticity for various modes mode-wise impact of project influence area on project stretch is calculated which further useful in getting weighted GSDP values for project area. Based on individual state GDP and their mode-wise weight, weighted statistics for State GDP, registered number of vehicles, per capita income and other parameters were calculated for all the previous years. Elasticities were estimated based on regression analysis between registered vehicles & historic AADT and all economic parameters. From the statistical significance and observations from major highways, the elasticities are moderated for the base year. Base year elasticity serves as a base for moderating elasticities for the horizon years.

Plaza wise elasticity values for each mode is estimated using the past vehicle registration data, past traffic trend with the GSDP, PCI, Population and tonnage are shown in below Table 6-6.

Table 6-6 Elasticity values – Complete statistical analysis

Vehicle Type	Dependent Variable	Independent Variable	Elasticity	
			TP1 – Faridpur	TP 2- Maigalganj
Car	Registered Vehicles	PCI	2.39	2.42
Car	Registered Vehicles	GSDP	1.78	1.78
Bus	Registered Vehicles	PCI	2.37	2.33
Bus	Registered Vehicles	GSDP	1.72	1.63
Bus	Registered Vehicles	Population	7.23	6.81
Trucks	Registered Vehicles	GSDP	1.51	1.47
Car	AADT	PCI	1.65	1.66
Car	AADT	GSDP	1.23	1.24
Bus	AADT	PCI	0.82	0.86
Bus	AADT	GSDP	0.59	0.60
Bus	AADT	Population	2.77	2.75
Trucks	AADT	GSDP	0.54	0.54

Vehicle Type	Dependent Variable	Independent Variable	Elasticity	
			TP1 – Faridpur	TP 2- Maigalganj
Trucks	Tonnage	GSDP	0.91	0.92

Elasticity values obtained from Registered vehicles are adopted for car & bus and trucks, average elasticity value obtained from the similar projects which is again moderated is considered for the traffic projections. Moderated elasticities are shown in below Table 6-7.

Table 6-7 Moderated Elasticity Values for All TPs

Vehicle Type	Dependent Variable	Independent Variable	TP1 – Faridpur	TP 2- Maigalganj
Car	Registered Vehicles	PCI	1.35	1.30
Bus		GSDP	0.50	0.50
Trucks (Tonnage)		GSDP	0.80	0.80

Generally, the spread of economic development induces changes in the spatial distribution of activities and corresponding changes in transport demand elasticity. As regions become more self-sufficient, the need for long-distance transport diminishes. Accordingly, it was assumed that transport demand elasticity, for both freight and passenger traffic, would tend to decline over time, despite growth in per capita income.

Table 6-8 Moderated Future Elasticity Values for Car, Bus, and Trucks for All TPs

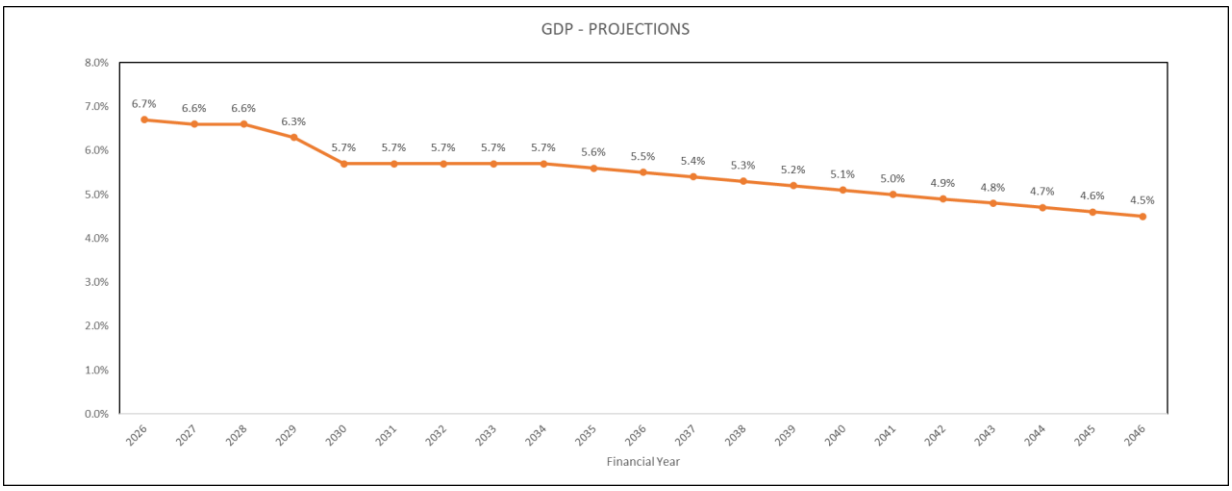
Regression Analysis - Future Elasticities			
Vehicle Type	Year	Faridpur (TP 1)	Maigalganj (TP 2)
Car	FY 26 – FY 30	1.35	1.30
	FY 31 – FY 35	1.28	1.24
	FY 36 – FY 40	1.22	1.17
	FY 41 – FY 45	1.16	1.11
Bus	FY 26 – FY 30	0.50	0.50
	FY 31 – FY 35	0.48	0.48
	FY 36 – FY 40	0.45	0.45
	FY 41 – FY 45	0.43	0.43
Trucks [GDP]	FY 26 – FY 30	0.80	0.80
	FY 31 – FY 35	0.76	0.76
	FY 36 – FY 40	0.72	0.72
	FY 41 – FY 45	0.69	0.69

Reg Veh means Registered vehicles of the PIA States and AADT means Historic traffic data on the Project Road or Adjacent roads.

For Historic AADT No's, roads in the PIA have been referred from adjacent section for the regression analysis

6.6 Future Growth of PIA

The economic impact of the 2020 coronavirus pandemic in India has been largely disruptive. The World Bank and other rating agencies had initially downgraded India's growth for fiscal year 2021 with the lowest figures India has seen in three decades since India's economic liberalization in the 1990s.



Source: Consensus GDP.

Figure 6-5 GDP Projections of India – Scenario Wise

Table 6-9 Economic Forecast for Comparison with PIA states – Most Likely Scenario

FY	India	Uttar Pradesh	Uttarakhand	Delhi	Bihar	Haryana	Punjab	West Bengal	Assam	Jharkhand	Odisha	Jammu & Kashmir	Himachal Pradesh
2026	6.7%	7.4%	6.0%	6.7%	6.4%	7.7%	6.0%	5.4%	8.4%	6.0%	7.7%	5.4%	6.7%
2027	6.6%	7.3%	5.9%	6.6%	6.3%	7.6%	5.9%	5.3%	8.3%	5.9%	7.6%	5.3%	6.6%
2028	6.6%	7.3%	5.9%	6.6%	6.3%	7.6%	5.9%	5.3%	8.3%	5.9%	7.6%	5.3%	6.6%
2029	6.3%	6.9%	5.7%	6.3%	6.0%	7.2%	5.7%	5.0%	7.9%	5.7%	7.2%	5.0%	6.3%
2030	5.7%	6.3%	5.1%	5.7%	5.4%	6.6%	5.1%	4.6%	7.1%	5.1%	6.6%	4.6%	5.7%
2031	5.7%	6.6%	5.1%	5.7%	5.4%	6.6%	5.1%	4.6%	7.1%	5.1%	6.6%	4.6%	5.7%
2032	5.7%	6.6%	5.1%	5.7%	5.4%	6.6%	5.1%	4.6%	7.1%	5.1%	6.6%	4.6%	5.7%
2033	5.7%	6.6%	5.1%	5.7%	5.4%	6.6%	5.1%	4.6%	7.1%	5.1%	6.6%	4.6%	5.7%
2034	5.7%	6.6%	5.1%	5.7%	5.4%	6.6%	5.1%	4.6%	7.1%	5.1%	6.6%	4.6%	5.7%
2035	5.6%	6.4%	5.0%	5.6%	5.3%	6.4%	5.0%	4.5%	7.0%	5.0%	6.4%	4.5%	5.6%
2036	5.5%	6.1%	5.0%	5.5%	5.2%	6.3%	5.0%	4.4%	6.9%	5.0%	6.3%	4.4%	5.5%
2037	5.4%	5.9%	4.9%	5.4%	5.1%	6.2%	4.9%	4.3%	6.8%	4.9%	6.2%	4.3%	5.4%
2038	5.3%	5.8%	4.8%	5.3%	5.0%	6.1%	4.8%	4.2%	6.6%	4.8%	6.1%	4.2%	5.3%

FY	India	Uttar Pradesh	Uttarakhand	Delhi	Bihar	Haryana	Punjab	West Bengal	Assam	Jharkhand	Odisha	Jammu & Kashmir	Himachal Pradesh
2039	5.2%	5.7%	4.7%	5.2%	4.9%	6.0%	4.7%	4.2%	6.5%	4.7%	6.0%	4.2%	5.2%
2040	5.1%	5.6%	4.6%	5.1%	4.8%	5.9%	4.6%	4.1%	6.4%	4.6%	5.9%	4.1%	5.1%
2041	5.0%	5.2%	4.5%	5.0%	4.8%	5.8%	4.5%	4.0%	6.3%	4.5%	5.8%	4.0%	5.0%
2042	4.9%	5.1%	4.4%	4.9%	4.7%	5.6%	4.4%	3.9%	6.1%	4.4%	5.6%	3.9%	4.9%
2043	4.8%	5.0%	4.3%	4.8%	4.6%	5.5%	4.3%	3.8%	6.0%	4.3%	5.5%	3.8%	4.8%
2044	4.7%	4.9%	4.2%	4.7%	4.5%	5.4%	4.2%	3.8%	5.9%	4.2%	5.4%	3.8%	4.7%
2045	4.6%	4.8%	4.1%	4.6%	4.4%	5.3%	4.1%	3.7%	5.8%	4.1%	5.3%	3.7%	4.6%
2046	4.5%	4.7%	4.1%	4.5%	4.3%	5.2%	4.1%	3.6%	5.6%	4.1%	5.2%	3.6%	4.5%
2047	4.4%	4.6%	4.0%	4.4%	4.2%	5.1%	4.0%	3.5%	5.5%	4.0%	5.1%	3.5%	4.4%
2048	4.3%	4.5%	3.9%	4.3%	4.1%	4.9%	3.9%	3.4%	5.4%	3.9%	4.9%	3.4%	4.3%
2049	4.2%	4.4%	3.8%	4.2%	4.0%	4.8%	3.8%	3.4%	5.3%	3.8%	4.8%	3.4%	4.2%
2050	4.1%	4.3%	3.7%	4.1%	3.9%	4.7%	3.7%	3.3%	5.1%	3.7%	4.7%	3.3%	4.1%
2051	4.1%	4.3%	3.7%	4.1%	3.9%	4.7%	3.7%	3.3%	5.1%	3.7%	4.7%	3.3%	4.1%
2052	4.1%	4.3%	3.7%	4.1%	3.9%	4.7%	3.7%	3.3%	5.1%	3.7%	4.7%	3.3%	4.1%
2053	4.1%	4.3%	3.7%	4.1%	3.9%	4.7%	3.7%	3.3%	5.1%	3.7%	4.7%	3.3%	4.1%
2054	4.1%	4.3%	3.7%	4.1%	3.9%	4.7%	3.7%	3.3%	5.1%	3.7%	4.7%	3.3%	4.1%
2055	4.1%	4.3%	3.7%	4.1%	3.9%	4.7%	3.7%	3.3%	5.1%	3.7%	4.7%	3.3%	4.1%
2056	4.1%	4.3%	3.7%	4.1%	3.9%	4.7%	3.7%	3.3%	5.1%	3.7%	4.7%	3.3%	4.1%

Table 6-10: Weighted Economic Forecast for Passenger & Commercial Vehicles for both TP's – Most Likely Scenario

Year	TP1 – Faridpur Toll Plaza			TP2 – Maigalganj Toll Plaza		
	Car	Bus	Truck	Car	Bus	Truck
FY 2026	7.4%	7.3%	7.3%	7.3%	7.3%	7.2%

Year	TP1 – Faridpur Toll Plaza			TP2 – Maigalganj Toll Plaza		
	Car	Bus	Truck	Car	Bus	Truck
FY 2027	7.2%	7.2%	7.1%	7.2%	7.2%	7.1%
FY 2028	7.2%	7.2%	7.1%	7.2%	7.2%	7.1%
FY 2029	6.9%	6.9%	6.8%	6.9%	6.9%	6.8%
FY 2030	6.3%	6.2%	6.2%	6.3%	6.2%	6.2%
FY 2031	6.5%	6.5%	6.4%	6.5%	6.5%	6.4%
FY 2032	6.5%	6.5%	6.4%	6.5%	6.5%	6.4%
FY 2033	6.5%	6.5%	6.4%	6.5%	6.5%	6.4%
FY 2034	6.5%	6.5%	6.4%	6.5%	6.5%	6.4%
FY 2035	6.4%	6.4%	6.3%	6.4%	6.4%	6.3%
FY 2036	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
FY 2037	5.9%	5.9%	5.9%	5.9%	5.9%	5.8%
FY 2038	5.8%	5.8%	5.8%	5.8%	5.8%	5.7%
FY 2039	5.7%	5.7%	5.6%	5.7%	5.7%	5.6%
FY 2040	5.6%	5.6%	5.5%	5.6%	5.6%	5.5%
FY 2041	5.2%	5.2%	5.2%	5.2%	5.2%	5.2%
FY 2042	5.1%	5.1%	5.1%	5.1%	5.1%	5.1%
FY 2043	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
FY 2044	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%
FY 2045	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%
FY 2046	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%
FY 2047	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%
FY 2048	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
FY 2049	4.4%	4.4%	4.4%	4.4%	4.4%	4.4%
FY 2050	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%
FY 2051	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%
FY 2052	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%
FY 2053	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%
FY 2054	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%
FY 2055	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%
FY 2056	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%

6.7 Projected Traffic Growth Rates – Normal

Based on the projected elasticity values for TP 01 and TP 02 the growth of PIA, the future average annual compound traffic growth rates by vehicle type have been estimated.

The traffic growth for the of most likely scenario is estimated and are presented in the following tables.

6.7.1 Traffic Growth Rates: TP 01 – Faridpur Toll Plaza

The section illustrates the normal traffic growth rates for Faridpur Toll Plaza for Most Likely scenario.

Table 6-11 Normal traffic growth rates for toll plaza 01 – Faridpur – Most Likely

Year	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV
FY 2025	8.2%	3.7%	3.7%	3.7%	3.7%	5.1%	0.5%	6.7%
FY 2026	8.3%	3.6%	3.6%	3.6%	3.6%	5.1%	0.6%	6.5%
FY 2027	8.3%	3.6%	3.6%	3.6%	3.6%	5.1%	0.7%	6.4%
FY 2028	7.9%	3.4%	3.4%	3.4%	3.4%	4.8%	0.6%	6.1%
FY 2029	7.0%	3.1%	3.1%	3.1%	2.8%	4.3%	1.6%	5.2%
FY 2030	7.1%	3.1%	3.1%	3.1%	2.9%	4.1%	2.5%	5.3%
FY 2031	7.2%	3.1%	3.1%	3.1%	3.0%	4.1%	2.5%	5.3%
FY 2032	7.2%	3.1%	3.1%	3.1%	3.0%	4.1%	2.5%	5.3%
FY 2033	7.2%	3.1%	3.1%	3.1%	3.0%	4.1%	2.5%	5.3%
FY 2034	7.1%	3.0%	3.0%	3.0%	2.9%	4.0%	2.4%	5.2%
FY 2035	6.4%	2.7%	2.7%	2.7%	2.6%	3.6%	2.3%	4.7%
FY 2036	5.7%	2.7%	2.7%	2.7%	2.6%	3.5%	2.2%	4.6%
FY 2037	5.6%	2.6%	2.6%	2.6%	2.5%	3.4%	2.1%	4.5%
FY 2038	5.5%	2.6%	2.6%	2.6%	2.4%	3.4%	2.0%	4.4%
FY 2039	5.3%	2.5%	2.5%	2.5%	2.3%	3.3%	2.0%	4.3%
FY 2040	4.7%	2.2%	2.2%	2.2%	1.9%	2.8%	1.5%	3.9%
FY 2041	4.6%	2.2%	2.2%	2.2%	1.8%	2.8%	1.5%	3.8%
FY 2042	4.5%	2.1%	2.1%	2.1%	1.8%	2.7%	1.4%	3.7%
FY 2043	4.4%	2.1%	2.1%	2.1%	1.7%	2.6%	1.3%	3.7%
FY 2044	4.2%	2.1%	2.1%	2.1%	1.6%	2.6%	1.2%	3.6%
FY 2045	3.9%	1.9%	1.9%	1.9%	1.1%	2.1%	0.7%	3.4%
FY 2046	3.8%	1.9%	1.9%	1.9%	1.0%	2.1%	0.6%	3.4%
FY 2047	3.7%	1.8%	1.8%	1.8%	1.0%	2.0%	0.5%	3.3%
FY 2048	3.6%	1.8%	1.8%	1.8%	0.9%	1.9%	0.5%	3.2%
FY 2049	3.5%	1.7%	1.7%	1.7%	0.8%	1.9%	0.4%	3.1%
FY 2050	3.3%	1.7%	1.7%	1.7%	0.7%	1.7%	0.3%	3.0%
FY 2051	3.3%	1.7%	1.7%	1.7%	0.7%	1.7%	0.3%	3.0%
FY 2052	3.3%	1.7%	1.7%	1.7%	0.7%	1.7%	0.3%	3.0%
FY 2053	3.3%	1.7%	1.7%	1.7%	0.7%	1.7%	0.3%	2.9%
FY 2054	3.3%	1.7%	1.7%	1.7%	0.7%	1.7%	0.3%	2.9%
FY 2055	3.2%	1.7%	1.7%	1.7%	0.7%	1.7%	0.3%	2.8%

6.7.2 Traffic Growth Rates: TP 02 – Maigalganj Toll Plaza

The section illustrates the normal traffic growth rates for Maigalganj Toll Plaza for Most Likely scenario.

Table 6-12 Normal traffic growth rates for toll plaza 02 – Maigalganj – Most Likely

Year	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV
FY 2025	7.9%	3.6%	3.6%	3.6%	4.2%	5.2%	0.4%	7.4%
FY 2026	7.9%	3.6%	3.6%	3.6%	4.2%	5.1%	0.4%	7.2%
FY 2027	7.9%	3.6%	3.6%	3.6%	4.2%	5.1%	0.6%	7.0%
FY 2028	7.5%	3.4%	3.4%	3.4%	3.9%	4.8%	0.7%	6.6%
FY 2029	6.7%	3.1%	3.1%	3.1%	3.4%	4.3%	1.5%	5.7%
FY 2030	6.7%	3.1%	3.1%	3.1%	3.3%	4.2%	2.5%	5.2%
FY 2031	6.9%	3.1%	3.1%	3.1%	3.3%	4.3%	2.5%	5.2%
FY 2032	6.9%	3.1%	3.1%	3.1%	3.3%	4.3%	2.5%	5.2%
FY 2033	6.9%	3.1%	3.1%	3.1%	3.3%	4.3%	2.5%	5.2%
FY 2034	6.8%	3.0%	3.0%	3.0%	3.2%	4.2%	2.5%	5.1%
FY 2035	6.1%	2.7%	2.7%	2.7%	2.8%	3.7%	2.4%	4.8%
FY 2036	5.5%	2.7%	2.7%	2.7%	2.7%	3.6%	2.3%	4.7%
FY 2037	5.4%	2.6%	2.6%	2.6%	2.6%	3.5%	2.2%	4.6%
FY 2038	5.2%	2.6%	2.6%	2.6%	2.6%	3.4%	2.1%	4.5%
FY 2039	5.1%	2.5%	2.5%	2.5%	2.5%	3.3%	2.1%	4.4%
FY 2040	4.5%	2.2%	2.2%	2.2%	2.0%	2.9%	1.6%	4.0%
FY 2041	4.4%	2.2%	2.2%	2.2%	2.0%	2.8%	1.6%	3.9%
FY 2042	4.3%	2.1%	2.1%	2.1%	1.9%	2.8%	1.5%	3.8%
FY 2043	4.2%	2.1%	2.1%	2.1%	1.8%	2.7%	1.4%	3.7%
FY 2044	4.1%	2.1%	2.1%	2.1%	1.8%	2.6%	1.4%	3.7%
FY 2045	3.8%	1.9%	1.9%	1.9%	1.5%	2.2%	1.2%	3.4%
FY 2046	3.6%	1.9%	1.9%	1.9%	1.4%	2.2%	1.2%	3.4%
FY 2047	3.5%	1.8%	1.8%	1.8%	1.3%	2.1%	1.1%	3.3%
FY 2048	3.4%	1.8%	1.8%	1.8%	1.3%	2.0%	1.0%	3.2%
FY 2049	3.3%	1.7%	1.7%	1.7%	1.2%	2.0%	1.0%	3.1%
FY 2050	3.2%	1.7%	1.7%	1.7%	1.1%	1.8%	0.8%	3.0%
FY 2051	3.2%	1.7%	1.7%	1.7%	1.1%	1.8%	0.8%	3.0%
FY 2052	3.2%	1.7%	1.7%	1.7%	1.1%	1.8%	0.8%	3.0%
FY 2053	3.2%	1.7%	1.7%	1.7%	1.1%	1.8%	0.8%	3.0%
FY 2054	3.2%	1.7%	1.7%	1.7%	1.1%	1.8%	0.8%	3.0%
FY 2055	3.1%	1.7%	1.7%	1.7%	1.1%	1.8%	0.8%	2.8%

6.8 Projected Traffic Growth Rates – Effective

There are some developments in road and land use pattern surrounding project stretch which were detailed in the "diversion & Development Traffic Impact Assessment" chapter. Effective traffic growth rates include the normal traffic projections and the impacts of diversions and developments in the PIA which are detailed in the chapter "Diversion and Development Traffic Impact Assessment". Considering the significance of the effective growth rates, the future traffic projections and associated toll revenue estimations are provided in the next chapter "Traffic and Toll Revenue Forecast."

6.8.1 Traffic Growth Rates: TP 01 – Faridpur Toll Plaza

The section illustrates the effective traffic growth rates for Faridpur Toll Plaza for Most Likely scenario.

Table 6-13 Effective traffic growth rates for toll plaza 01 – Faridpur – Most Likely

Year	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	OSV
FY 2025	8.2%	3.7%	3.7%	0.0%	3.7%	5.1%	0.5%	6.7%	6.7%
FY 2026	4.4%	-1.2%	-8.0%	0.0%	-6.1%	-8.1%	-11.1%	-7.9%	-7.9%
FY 2027	4.2%	-1.5%	-9.7%	0.0%	-7.3%	-10.3%	-13.0%	-10.7%	-10.7%
FY 2028	7.8%	3.4%	3.3%	0.0%	3.1%	4.4%	0.1%	5.6%	5.6%
FY 2029	7.0%	3.1%	3.0%	0.0%	2.7%	3.9%	1.0%	4.7%	4.7%
FY 2030	7.0%	3.0%	2.9%	0.0%	2.8%	3.7%	1.9%	4.9%	4.9%
FY 2031	7.2%	3.1%	2.9%	0.0%	2.8%	3.7%	1.9%	4.9%	4.9%
FY 2032	7.2%	3.1%	2.9%	0.0%	2.8%	3.7%	1.9%	4.9%	4.9%
FY 2033	7.2%	3.1%	3.0%	0.0%	2.8%	3.7%	1.9%	4.9%	4.9%
FY 2034	7.1%	3.0%	2.9%	0.0%	2.7%	3.7%	1.8%	4.8%	4.8%
FY 2035	5.8%	2.7%	0.4%	0.0%	1.7%	1.1%	-0.1%	2.3%	2.3%
FY 2036	5.7%	2.6%	2.5%	0.0%	2.4%	3.2%	1.7%	4.2%	4.2%
FY 2037	4.7%	1.0%	-3.0%	0.0%	2.1%	2.8%	0.4%	3.6%	3.6%
FY 2038	5.4%	2.5%	2.4%	0.0%	2.3%	3.1%	1.5%	4.1%	4.1%
FY 2039	6.2%	4.1%	8.2%	0.0%	2.5%	3.4%	2.6%	4.7%	4.7%
FY 2040	4.7%	2.2%	2.1%	0.0%	1.8%	2.6%	1.0%	3.6%	3.6%
FY 2041	4.6%	2.2%	2.1%	0.0%	1.7%	2.5%	1.0%	3.5%	3.5%
FY 2042	4.4%	2.1%	2.0%	0.0%	1.6%	2.5%	0.9%	3.4%	3.4%
FY 2043	4.3%	2.1%	2.0%	0.0%	1.6%	2.4%	0.8%	3.4%	3.4%
FY 2044	4.2%	2.0%	2.0%	0.0%	1.5%	2.3%	0.8%	3.3%	3.3%
FY 2045	3.9%	1.9%	1.8%	0.0%	1.0%	1.9%	0.2%	3.2%	3.2%
FY 2046	3.8%	1.8%	1.8%	0.0%	0.9%	1.8%	0.1%	3.1%	3.1%
FY 2047	3.7%	1.8%	1.7%	0.0%	0.8%	1.8%	0.1%	3.0%	3.0%

Year	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	OSV
FY 2048	3.6%	1.8%	1.7%	0.0%	0.8%	1.7%	0.0%	3.0%	3.0%
FY 2049	3.4%	1.7%	1.7%	0.0%	0.7%	1.6%	-0.1%	2.9%	2.9%
FY 2050	3.3%	1.7%	1.6%	0.0%	0.6%	1.5%	-0.2%	2.7%	2.7%
FY 2051	3.3%	1.7%	1.6%	0.0%	0.6%	1.5%	-0.2%	2.7%	2.7%
FY 2052	3.3%	1.7%	1.6%	0.0%	0.6%	1.5%	-0.1%	2.7%	2.7%
FY 2053	3.3%	1.7%	1.6%	0.0%	0.6%	1.5%	-0.1%	2.7%	2.7%
FY 2054	3.3%	1.7%	1.6%	0.0%	0.6%	1.5%	-0.1%	2.7%	2.7%
FY 2055	3.1%	1.7%	1.6%	0.0%	0.6%	1.5%	-0.1%	2.6%	2.6%

6.8.2 Traffic Growth Rates: TP 02 – Maigalganj Toll Plaza

The section illustrates the effective traffic growth rates for Maigalganj Toll Plaza for Most Likely scenario.

Table 6-14 Effective traffic growth rates for toll plaza 02 – Maigalganj – Most Likely

Year	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	OSV
FY 2025	7.9%	3.6%	3.6%	0.0%	4.2%	5.2%	0.4%	7.4%	7.4%
FY 2026	-4.0%	-5.7%	-13.0%	0.0%	-9.3%	-11.1%	-12.5%	-8.5%	-8.5%
FY 2027	-5.5%	-6.7%	-16.3%	0.0%	-11.3%	-14.3%	-14.4%	-11.5%	-11.5%
FY 2028	7.5%	3.4%	3.3%	0.0%	3.8%	4.6%	0.4%	6.4%	6.4%
FY 2029	6.7%	3.1%	2.9%	0.0%	3.3%	4.1%	1.3%	5.4%	5.4%
FY 2030	6.7%	3.0%	2.9%	0.0%	3.2%	4.0%	2.2%	4.9%	4.9%
FY 2031	6.8%	3.0%	2.9%	0.0%	3.2%	4.1%	2.2%	4.9%	4.9%
FY 2032	6.9%	3.0%	2.9%	0.0%	3.2%	4.0%	2.3%	4.9%	4.9%
FY 2033	6.8%	3.0%	2.9%	0.0%	3.2%	4.0%	2.3%	5.0%	5.0%
FY 2034	6.7%	3.0%	2.9%	0.0%	3.2%	4.0%	2.2%	4.8%	4.8%
FY 2035	6.0%	2.7%	2.6%	0.0%	2.7%	3.4%	2.1%	4.5%	4.5%
FY 2036	5.4%	2.6%	2.5%	0.0%	2.6%	3.3%	2.1%	4.4%	4.4%
FY 2037	4.9%	1.8%	-0.5%	0.0%	2.5%	3.2%	1.6%	4.1%	4.1%
FY 2038	5.2%	2.5%	2.4%	0.0%	2.5%	3.2%	1.9%	4.3%	4.3%
FY 2039	5.4%	3.2%	5.5%	0.0%	2.5%	3.3%	2.2%	4.5%	4.5%
FY 2040	4.5%	2.2%	2.1%	0.0%	2.0%	2.7%	1.4%	3.8%	3.8%
FY 2041	4.3%	2.2%	2.1%	0.0%	1.9%	2.7%	1.4%	3.7%	3.7%
FY 2042	4.2%	2.1%	2.0%	0.0%	1.9%	2.6%	1.3%	3.6%	3.6%
FY 2043	4.1%	2.1%	2.0%	0.0%	1.8%	2.6%	1.2%	3.5%	3.5%
FY 2044	4.0%	2.0%	1.9%	0.0%	1.7%	2.5%	1.2%	3.5%	3.5%
FY 2045	3.7%	1.9%	1.8%	0.0%	1.4%	2.1%	1.1%	3.2%	3.2%
FY 2046	3.6%	1.8%	1.8%	0.0%	1.4%	2.0%	1.0%	3.2%	3.2%

Year	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	OSV
FY 2047	3.5%	1.8%	1.7%	0.0%	1.3%	1.9%	1.0%	3.1%	3.1%
FY 2048	3.4%	1.8%	1.7%	0.0%	1.2%	1.9%	0.9%	3.0%	3.0%
FY 2049	3.3%	1.7%	1.7%	0.0%	1.2%	1.8%	0.8%	3.0%	3.0%
FY 2050	3.1%	1.7%	1.6%	0.0%	1.0%	1.7%	0.7%	2.8%	2.8%
FY 2051	3.1%	1.7%	1.6%	0.0%	1.0%	1.7%	0.7%	2.8%	2.8%
FY 2052	3.1%	1.7%	1.6%	0.0%	1.1%	1.7%	0.7%	2.8%	2.8%
FY 2053	3.1%	1.7%	1.6%	0.0%	1.0%	1.7%	0.7%	2.8%	2.8%
FY 2054	3.1%	1.7%	1.6%	0.0%	1.0%	1.7%	0.7%	2.8%	2.8%
FY 2055	3.1%	1.7%	1.6%	0.0%	1.0%	1.7%	0.7%	2.6%	2.6%

CHAPTER 7

Traffic and Toll Revenue Forecast

7. Traffic & Toll Revenue Forecast

7.1 General

This chapter presents estimates of total traffic for all the two toll plazas of project corridor with Most likely scenario as explained in previous chapter. Normal traffic projections have arrived by applying the traffic growth rates on the base year traffic. Effective traffic projection has arrived by considering the future adjustments in the form of diversions and developments detailed in the Chapter "Diversion and Development Traffic Impact assessment" in overall traffic growth estimate.

7.2 Effective Traffic Projections at Faridpur (TP 1)

Effective traffic projections include the impact of road network improvement and land developments (if any). Traffic beyond year FY 2025 is summaries based on effective traffic growth rates and base year AADT. Mode wise traffic projection for Most likely Scenario for all the horizon years for Faridpur (TP 1) are estimated and effective future traffic is as shown in below Table 7-1.

Table 7-1 Effective Future Traffic (AADT): Faridpur (TP 1) – Most Likely

YEAR	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	TOTAL PCU
FY 2025	9,464	52	1,000	0	494	1,380	850	2,252	30,104
FY 2026	10,242	54	1,037	0	512	1,451	854	2,402	31,925
FY 2027	10,693	53	954	0	481	1,333	759	2,212	30,583
FY 2028	11,146	52	861	0	446	1,195	660	1,975	28,930
FY 2029	12,020	54	890	0	460	1,248	660	2,085	30,567
FY 2030	12,861	56	916	0	472	1,296	667	2,184	32,119
FY 2031	13,764	58	943	0	485	1,344	680	2,290	33,784
FY 2032	14,749	59	971	0	499	1,394	693	2,402	35,565
FY 2033	15,807	61	999	0	512	1,445	706	2,518	37,453
FY 2034	16,943	63	1,029	0	527	1,499	720	2,641	39,455
FY 2035	18,139	65	1,059	0	541	1,554	733	2,767	41,538
FY 2036	19,192	67	1,063	0	551	1,571	732	2,830	42,952
FY 2037	20,283	68	1,090	0	564	1,621	745	2,949	44,871
FY 2038	21,239	69	1,057	0	576	1,667	748	3,054	46,363
FY 2039	22,393	71	1,083	0	589	1,718	759	3,179	48,366
FY 2040	23,776	74	1,172	0	603	1,775	779	3,328	50,944

YEAR	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	TOTAL PCU
FY 2041	24,885	75	1,196	0	614	1,821	787	3,447	52,844
FY 2042	26,018	77	1,221	0	625	1,867	794	3,568	54,774
FY 2043	27,172	79	1,246	0	635	1,912	802	3,691	56,732
FY 2044	28,347	80	1,271	0	645	1,958	808	3,815	58,717
FY 2045	29,540	82	1,296	0	655	2,004	815	3,941	60,723
FY 2046	30,688	83	1,319	0	661	2,042	816	4,066	62,632
FY 2047	31,846	85	1,343	0	667	2,079	817	4,191	64,552
FY 2048	33,014	86	1,366	0	672	2,116	818	4,318	66,481
FY 2049	34,187	88	1,389	0	678	2,152	818	4,445	68,415
FY 2050	35,364	89	1,412	0	683	2,187	817	4,573	70,351
FY 2051	36,520	91	1,435	0	686	2,220	816	4,699	72,242
FY 2052	37,715	92	1,458	0	690	2,254	815	4,827	74,190
FY 2053	38,948	94	1,482	0	694	2,288	814	4,959	76,196
FY 2054	40,224	96	1,506	0	698	2,323	813	5,094	78,264
FY 2055	41,542	97	1,531	0	703	2,358	812	5,233	80,392
FY 2056	42,845	99	1,556	0	706	2,394	811	5,367	82,487

7.3 Effective Traffic Projections at Maigalganj (TP 2)

Effective traffic projections include the impact of road network improvement and land developments (if any). Traffic beyond year FY 2025 is summaries based on effective traffic growth rates and base year AADT. Scenario wise and Mode wise traffic projection for all the horizon years for Maigalganj (TP 2) are estimated and effective future traffic is shown in below Table 7-2.

Table 7-2 Effective Future Traffic (AADT): Maigalganj (TP 2) – Most Likely

YEAR	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	TOTAL PCU
FY 2025	4,369	24	493	0	374	1,059	760	1,454	18,446
FY 2026	4,713	25	511	0	390	1,114	763	1,562	19,529
FY 2027	4,525	24	445	0	354	990	668	1,430	17,833
FY 2028	4,275	22	372	0	314	849	571	1,265	15,849
FY 2029	4,594	23	384	0	326	888	573	1,345	16,709
FY 2030	4,900	24	396	0	337	924	581	1,418	17,524
FY 2031	5,226	24	407	0	348	961	593	1,488	18,368

YEAR	Car	Minibus	Bus-2A	Bus-3A	LCV	2 Axle Truck	3 Axle Truck	MAV	TOTAL PCU
FY 2032	5,582	25	419	0	359	1,000	607	1,562	19,265
FY 2033	5,965	26	431	0	371	1,040	621	1,639	20,213
FY 2034	6,373	27	444	0	383	1,082	635	1,720	21,210
FY 2035	6,800	27	457	0	395	1,125	649	1,803	22,242
FY 2036	7,209	28	468	0	406	1,164	663	1,885	23,228
FY 2037	7,600	29	480	0	417	1,203	676	1,969	24,205
FY 2038	7,974	29	478	0	427	1,241	687	2,050	25,101
FY 2039	8,387	30	489	0	437	1,281	700	2,139	26,122
FY 2040	8,843	31	516	0	448	1,323	716	2,234	27,279
FY 2041	9,240	32	527	0	457	1,359	726	2,318	28,239
FY 2042	9,642	33	538	0	466	1,396	735	2,403	29,210
FY 2043	10,050	33	549	0	475	1,432	745	2,490	30,193
FY 2044	10,464	34	560	0	483	1,469	754	2,578	31,188
FY 2045	10,884	35	571	0	492	1,505	763	2,667	32,191
FY 2046	11,288	35	581	0	499	1,536	771	2,754	33,146
FY 2047	11,695	36	592	0	505	1,567	779	2,841	34,104
FY 2048	12,106	37	602	0	512	1,597	786	2,930	35,067
FY 2049	12,517	37	612	0	518	1,627	793	3,018	36,029
FY 2050	12,928	38	622	0	524	1,656	800	3,108	36,991
FY 2051	13,331	38	632	0	530	1,684	806	3,195	37,928
FY 2052	13,747	39	642	0	535	1,713	812	3,285	38,893
FY 2053	14,179	40	653	0	541	1,742	818	3,377	39,885
FY 2054	14,622	40	663	0	546	1,771	824	3,472	40,904
FY 2055	15,079	41	674	0	552	1,802	830	3,570	41,950
FY 2056	15,549	42	685	0	558	1,832	835	3,664	42,994

7.4 Traffic comparison for all toll plazas

The Table 7-3 below illustrates the traffic comparison in terms of Vehicles and PCUs for each toll plaza for Most Likely scenario. The average of both toll plazas is also presented for the purpose of calculation of capacity of the project highway.

Table 7-3 Traffic comparison by vehicles and PCU – Most Likely – TP 01 (Faridpur)

FY	VEHICLES		PCU	
	NORMAL TRAFFIC	EFFECTIVE TRAFFIC	NORMAL TRAFFIC	EFFECTIVE TRAFFIC
FY 2025	15,491	15,491	30,104	30,104
FY 2026	16,552	16,552	31,925	31,925
FY 2027	17,693	16,484	33,854	30,583
FY 2028	18,920	16,335	35,911	28,930
FY 2029	20,174	17,417	37,994	30,567
FY 2030	21,378	18,453	39,980	32,119
FY 2031	22,667	19,563	42,102	33,784
FY 2032	24,059	20,765	44,365	35,565
FY 2033	25,544	22,050	46,761	37,453
FY 2034	27,129	23,421	49,299	39,455
FY 2035	28,787	24,858	51,935	41,538
FY 2036	30,373	26,006	54,450	42,952
FY 2037	31,914	27,321	56,940	44,871
FY 2038	33,501	28,409	59,496	46,363
FY 2039	35,133	29,791	62,116	48,366
FY 2040	36,809	31,506	64,797	50,944
FY 2041	38,356	32,826	67,269	52,844
FY 2042	39,932	34,170	69,781	54,774
FY 2043	41,534	35,537	72,330	56,732
FY 2044	43,160	36,925	74,912	58,717
FY 2045	44,809	38,332	77,525	60,723
FY 2046	46,383	39,675	80,018	62,632
FY 2047	47,969	41,028	82,527	64,552
FY 2048	49,565	42,390	85,049	66,481
FY 2049	51,168	43,757	87,580	68,415
FY 2050	52,775	45,125	90,116	70,351
FY 2051	54,349	46,467	92,597	72,242
FY 2052	55,974	47,851	95,149	74,190
FY 2053	57,649	49,279	97,775	76,196
FY 2054	59,377	50,754	1,00,477	78,264

FY	VEHICLES		PCU	
	NORMAL TRAFFIC	EFFECTIVE TRAFFIC	NORMAL TRAFFIC	EFFECTIVE TRAFFIC
FY 2055	61,159	52,275	1,03,258	80,392
FY 2056	62,918	53,778	1,05,992	82,487
CAGR (25-46) (%)	**5.36%**	**4.58%**	**4.77%**	**3.55%**
CAGR (25-56) (%)	**4.63%**	**4.10%**	**4.14%**	**3.31%**

At Faridpur Toll Plaza, the Normal Traffic PCU Growth (CAGR) observed between FY-25 and FY-56 is 4.14%. Effective traffic growth for the same period is 3.31%.

Table 7-4 Traffic comparison by vehicles and PCU – Most Likely – TP 02 (Maigalganj)

FY	VEHICLES		PCU	
	NORMAL TRAFFIC	EFFECTIVE TRAFFIC	NORMAL TRAFFIC	EFFECTIVE TRAFFIC
FY 2025	8,534	8,534	18,446	18,446
FY 2026	9,078	9,078	19,529	19,529
FY 2027	9,659	8,435	20,669	17,833
FY 2028	10,282	7,668	21,879	15,849
FY 2029	10,915	8,134	23,103	16,709
FY 2030	11,522	8,579	24,267	17,524
FY 2031	12,164	9,049	25,478	18,368
FY 2032	12,852	9,554	26,761	19,265
FY 2033	13,583	10,093	28,114	20,213
FY 2034	14,359	10,663	29,541	21,210
FY 2035	15,167	11,257	31,017	22,242
FY 2036	15,940	11,823	32,434	23,228
FY 2037	16,694	12,373	33,846	24,205
FY 2038	17,469	12,886	35,292	25,101
FY 2039	18,263	13,463	36,771	26,122
FY 2040	19,076	14,112	38,282	27,279
FY 2041	19,826	14,659	39,674	28,239
FY 2042	20,587	15,212	41,086	29,210
FY 2043	21,359	15,773	42,517	30,193
FY 2044	22,142	16,342	43,964	31,188
FY 2045	22,933	16,916	45,426	32,191
FY 2046	23,687	17,464	46,820	33,146
FY 2047	24,446	18,014	48,221	34,104
FY 2048	25,209	18,569	49,627	35,067
FY 2049	25,973	19,123	51,038	36,029

FY	VEHICLES		PCU	
	NORMAL TRAFFIC	EFFECTIVE TRAFFIC	NORMAL TRAFFIC	EFFECTIVE TRAFFIC
FY 2050	26,737	19,676	52,449	36,991
FY 2051	27,485	20,216	53,827	37,928
FY 2052	28,254	20,773	55,243	38,893
FY 2053	29,047	21,349	56,697	39,885
FY 2054	29,862	21,940	58,191	40,904
FY 2055	30,702	22,548	59,726	41,950
FY 2056	31,552	23,165	61,254	42,994
CAGR (25-46) (%)	**4.98%**	**3.47%**	**4.54%**	**2.83%**
CAGR (25-56)	**4.31%**	**3.27%**	**3.95%**	**2.77%**

At Maigalganj Toll Plaza, the Normal Traffic PCU Growth (CAGR) observed between FY-25 and FY-56 is 3.95%. Effective traffic growth for the same period is 2.77%.

Table 7-5 Traffic comparison by Vehicles and PCU – Most Likely – Overall Project

FY	VEHICLES		PCU	
	NORMAL TRAFFIC	EFFECTIVE TRAFFIC	NORMAL TRAFFIC	EFFECTIVE TRAFFIC
FY 2025	12,012	12,012	24,275	24,275
FY 2026	12,815	12,815	25,727	25,727
FY 2027	13,676	12,459	27,261	24,208
FY 2028	14,601	12,002	28,895	22,389
FY 2029	15,545	12,775	30,549	23,638
FY 2030	16,450	13,516	32,124	24,822
FY 2031	17,415	14,306	33,790	26,076
FY 2032	18,456	15,160	35,563	27,415
FY 2033	19,563	16,071	37,438	28,833
FY 2034	20,744	17,042	39,420	30,333
FY 2035	21,977	18,058	41,476	31,890
FY 2036	23,157	18,914	43,442	33,090
FY 2037	24,304	19,847	45,393	34,538
FY 2038	25,485	20,647	47,394	35,732
FY 2039	26,698	21,627	49,443	37,244
FY 2040	27,943	22,809	51,539	39,112
FY 2041	29,091	23,742	53,471	40,542
FY 2042	30,260	24,691	55,433	41,992
FY 2043	31,447	25,655	57,423	43,463
FY 2044	32,651	26,633	59,438	44,953
FY 2045	33,871	27,624	61,475	46,457

FY	VEHICLES		PCU	
	NORMAL TRAFFIC	EFFECTIVE TRAFFIC	NORMAL TRAFFIC	EFFECTIVE TRAFFIC
FY 2046	35,035	28,570	63,419	47,889
FY 2047	36,208	29,521	65,374	49,328
FY 2048	37,387	30,480	67,338	50,774
FY 2049	38,570	31,440	69,309	52,222
FY 2050	39,756	32,401	71,282	53,671
FY 2051	40,917	33,342	73,212	55,085
FY 2052	42,114	34,312	75,196	56,541
FY 2053	43,348	35,314	77,236	58,041
FY 2054	44,619	36,347	79,334	59,584
FY 2055	45,930	37,412	81,492	61,171
FY 2056	47,235	38,472	83,623	62,740
CAGR(FY25-46) (%)	**5.23%**	**4.21%**	**4.68%**	**3.29%**
CAGR(FY25-56) (%)	**4.52%**	**3.83%**	**4.07%**	**3.11%**

Similarly, for the entire project the Normal Traffic PCU Growth (CAGR) observed between FY-25 and FY-56 is 4.07%. Effective traffic growth for the same period is 3.11%. The graph Figure 7-1 below illustrates the growth of effective traffic (PCU terms) for the project for Most Likely scenario.

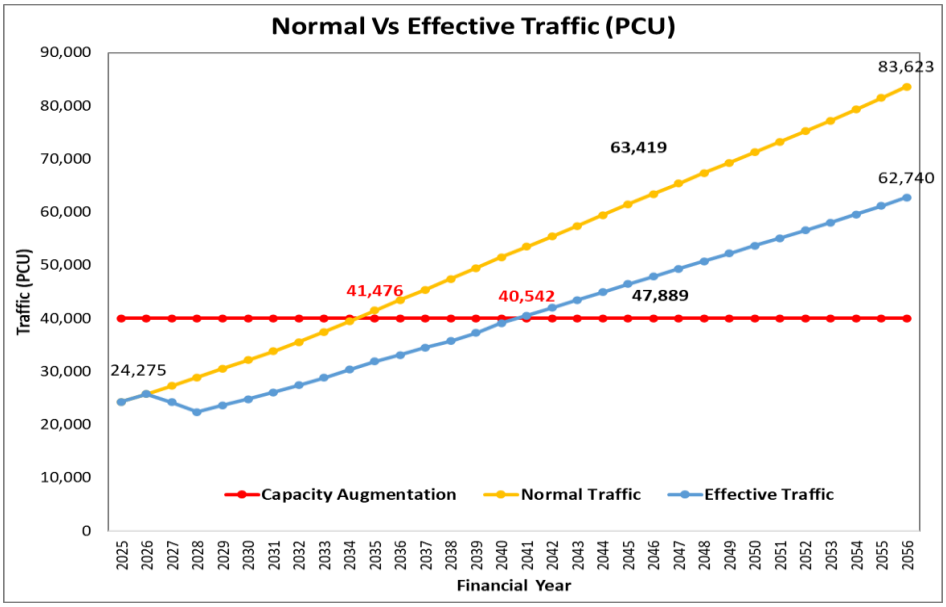


Figure 7-1 Future Traffic Projections in PCU

7.5 Toll Revenue Forecasting

Toll revenue projections or forecasting is calculated based on the projected traffic and projected toll rates. Toll rates by vehicle and toll category depends on the tolling length, wholesale price

index (WPI) and the base rates which are applicable by vehicle category are according to the National Highway fee notification for the project.

7.5.1 Toll Plaza Control Length

Toll plaza control length for two plazas has been mentioned in the below Table 7-6.

Table 7-6 Base rate fee by vehicle category for payable length for FY 25

FY	Toll Plazas	Highway Length (Kms)	Net Bypass Length (Kms)	Structure Length (Kms)	Total Length (Kms)
FY25	Faridpur (TP1)	66.913	11.272	0.445	78.630
	Maigalganj (TP2)	58.806	17.905	0.400	77.111
Schedule M Future Years	Faridpur (TP1)	66.913	11.272	0.615	78.800
	Maigalganj (TP2)	60.589	17.801	0.400	78.790

7.5.2 Toll revenue estimation

7.5.2.1 Toll Fee Revision Methodology

Toll fee shall be computed based on the base rate fixed by NHAI and is revised annually as per the formula provided by NHAI in Schedule R of the Concession agreement which is according to the toll rules 2008.

A) Base Rate

As per the National Highway Fee Rules, 2008 and subsequent amendments till to date, the rate of fee for use of a section of national highway of four or more lanes for the base year 2007-08 are given as mentioned in below Table 7-7. Fee applicable shall be the rate multiplied by the length of the highway section for which toll is to be collected.

Table 7-7 Base rate fee by vehicle category for payable length

Type of vehicle	Base Rate Fee Per Km (in rupees)
Car	0.65
LCV	1.05
Bus or Truck	2.20
Truck 3A	2.40
HCM or EME or MAV (3-6 Axles)	3.45
Over Sized Vehicle (OSV)	4.20

B) Annual Revision of Rate of Fee

The amount of fee and the revision thereof effective from 1st April. The user fee shall be increased annually, without compounding by 3%. revision because of variation in WPI shall be restricted to 40%.

$$\text{Applicable rate of fee } = \text{Base Rate} + \text{Base Rate X} \left\{\frac{\text{WPIA} - \text{WPI B}}{\text{WPI B}}\right\} * 0.40$$

Were,

WPI-A means the Wholesale Price Index on December 31, 2023.
WPI-B means the Wholesale Price Index of week ending on 6th January 2007.i.e 208.7.
The actual fees to be charged shall be rounded off to the nearest Five rupees.

7.5.2.2 WPI Forecasts

A) Wholesale Price Index

Wholesale price index (WPI) tracks the price movement of key commodities of national relevance grouped under three main categories Primary Articles, Fuel & Power and Manufactured Products. Based on this individual movement, the WPI is determined through the averaging principle.

Till the year 2010 the index was computed with base year 1993-94 for about 435 commodities grouped as above. The index published by the Office of Economic Advisor, Prime Minister's Office on weekly basis.

B) Past trends of the Wholesale Price Index

Past data of WPI for the month of December from FY-2015 to FY-2024 was collected and analyzed for its trends. WPI Trends for all the Commodities for the past and the assumed WPI Inflation values for the future years are presented in the below Figure 7-2.

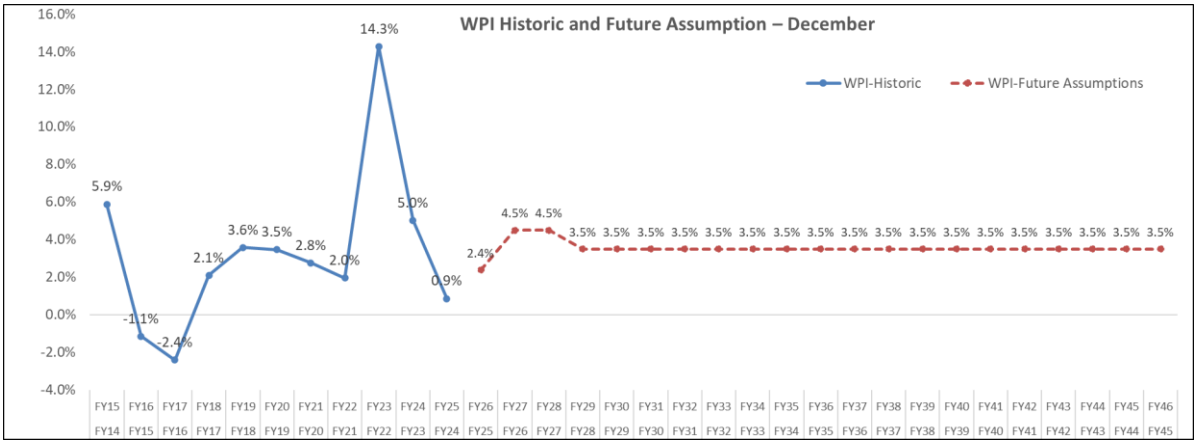


Figure 7-2 Past & future trend of Wholesale Price Index (WPI)

The decrease in inflation in the recent years can be attributed to the lower commodity prices like oil, metals etc. along with the drop in the prices of the primary articles like food products etc.

7.5.2.3 Toll Fee Projections

A) Base Year (FY24)

As per the NH Fee rules 2007-08:

Toll fee for the fiscal year FY-2024 has been arrived by considering the toll plaza control length which were mentioned in the toll plaza control length table. From 01st April 2024 the toll fee rates for the Toll Plaza locations are presented in the tables below.

Table 7-8 Toll Fees for the year FY-2025 from Apr'24 to March'25 for TP1 – Faridpur

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	130	195	4,315	65	340
Light Commercial Vehicle or Minibus	210	315	6,970	105	-
Bus - 2 Axle	440	655	14,605	220	-
Truck - 2 Axle	440	655	14,605	220	-
3Axle	480	715	15,935	240	-
MAV (4-6) Axle	685	1,030	22,905	345	-
OSV	835	1,255	27,885	420	-

Table 7-9 Toll Fees for the year FY-2024 from Apr'24 to March'25 for TP2 – Maigalganj

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	130	195	4,385	65	340
Light Commercial Vehicle or Minibus	210	320	7,080	105	-
Bus - 2 Axle	445	670	14,835	225	-
Truck - 2 Axle	445	670	14,835	225	-
3Axle	485	730	16,185	245	-
MAV (4-6) Axle	700	1,045	23,265	350	-
OSV	850	1,275	28,325	425	-

7.5.3 Vehicle wise Trip Categories

Toll revenue is estimated by considering different concessions provided to the road users by vehicle category and eligible number of trips based on the toll category. The number of eligible trips in crossing toll plaza varies by the toll fee category i.e., Single (Full fare), Local passenger and Monthly Pass of both passenger and commercial vehicles are presented in the below Table

7-10 and Table 7-11. The estimation of the share of individual toll vehicle by type of toll ticket category is based on the recent toll traffic data of the period from Apr'2024 to July'2024.

Table 7-10 Vehicle wise Trip Categories at Faridpur (TP 1)

Vehicle Type / Toll Category	Single Journey	Return Journey	Monthly Pass	Local Comm	Local Pass	Exemptions	TOTAL (Excl. Penalties)
Car	31.36%	35.55%	0.02%	0.06%	13.16%	19.85%	100.00%
Minibus	60.91%	33.17%	0.03%	1.90%	0.00%	3.99%	100.00%
Bus-2A	53.87%	43.83%	0.74%	0.65%	0.00%	0.90%	100.00%
Bus-3A	90.01%	9.45%	0.00%	0.11%	0.00%	0.43%	100.00%
LCV	60.91%	33.17%	0.03%	1.90%	0.00%	3.99%	100.00%
2 Axle Truck	53.87%	43.83%	0.74%	0.65%	0.00%	0.90%	100.00%
3 Axle Truck	90.01%	9.45%	0.00%	0.11%	0.00%	0.43%	100.00%
MAV	80.33%	18.86%	0.00%	0.17%	0.00%	0.64%	100.00%
OSV	93.18%	6.82%	0.00%	0.00%	0.00%	0.00%	100.00%

Table 7-11 Vehicle wise Trip Categories at Maigalganj (TP 2)

Vehicle Type / Toll Category	Single Journey	Return Journey	Monthly Pass	Local Comm	Local Pass	Exemptions	TOTAL (Excl. Penalties)
Car	50.53%	35.52%	0.02%	0.39%	3.39%	10.16%	100.00%
Minibus	71.03%	24.38%	1.00%	2.42%	0.00%	1.16%	100.00%
Bus-2A	69.00%	29.85%	0.00%	0.29%	0.00%	0.87%	100.00%
Bus-3A	92.63%	4.29%	0.00%	0.19%	0.00%	2.89%	100.00%
LCV	71.03%	24.38%	1.00%	2.42%	0.00%	1.16%	100.00%
2 Axle Truck	69.00%	29.85%	0.00%	0.29%	0.00%	0.87%	100.00%
3 Axle Truck	92.63%	4.29%	0.00%	0.19%	0.00%	2.89%	100.00%
MAV	95.18%	3.87%	0.00%	0.06%	0.00%	0.89%	100.00%
OSV	95.56%	2.22%	0.00%	0.00%	0.00%	2.22%	100.00%

7.5.4 Capacity Augmentation

As per the IRC recommendations, the designed Target Traffic is to be determined for LOS B as per IRC Code – IRC: SP:84-2019 which is 40,000 PCU's.

The Capacity Augmentation for any homogenous/toll-able section(s) of the Project Highway in case the average daily traffic of PCUs for that homogenous/toll-able section(s), in any Accounting Year shall exceed the designed capacity Target Traffic for Project Highway and shall continue to exceed the designed capacity for 1 (One) consecutive Accounting Years following thereafter ("Capacity Augmentation").

Currently, the project road traffic comprises two homogeneous sections for each toll plaza. The Average PCU in FY-2046 is 47,886 PCU at Overall project corridor which is not crossing the design capacity of the project highway. Hence, capacity augmentation is required within the concession period for section from Bareilly-Sitapur & the details reg the same has been mentioned below.

Table 7-12:Capacity Augmentation Assumptions

Homogeneous Section	Toll Plaza's	Capacity Breaching 40000 PCU (Years) – 1 Years	Planning (2 Year)	Construction Period (2 Years)
Bareilly-Shahjahanpur	Faridpur	FY 35	FY 36 & 37	FY 38 & 39
Shahjahanpur-Sitapur	Maigalganj	Not exceeding capacity before the end of the concession period		

During the conversion from 4-lane to 6-lane road infrastructure, road users experience discomfort while traveling, prompting some to shift to alternative routes. This phenomenon was observed in the consultant's previous traffic studies. Based on these observations, the consultant has assumed a higher diversion during the construction period, with reduced speeds on the project corridor. Also toll rates for this period (during construction) is 75% of actual toll rates.

7.5.5 Toll revenue projections

Toll revenue is projected based on the future traffic projections, toll fees by vehicle and toll category and trip rates. Traffic numbers are projected by fiscal year i.e., FY25, FY26 etc. and toll rates are revised on 01st April every year. Toll revenues are projected by fiscal year till the end of concession period and considering maximum possible extension referring clauses related to additional toll way, capacity augmentation and modification of concession period.

(a) Toll would be collected for all the days in a year.

(b) Revenue projected from FY-2025 to FY-2056.

The toll revenue projections are done for the effective case which is basically the consideration of all network improvements and land developments as described in the chapter "Traffic Growth Estimation". The below Table 7-13 summarizes the projected annual toll revenue at both the toll plazas and Overall project.

Table 7-13 Estimated Annual Toll revenue (Effective case) in Rs. Crores – Most Likely

FY	Faridpur TP	Maigalganj TP	Total Revenue
FY25	131	91	223
FY26	145	102	246
FY27	145	97	242
FY28	141	90	231
FY29	153	99	252
FY30	167	107	274
FY31	183	117	299
FY32	200	128	328
FY33	218	139	357
FY34	237	152	389
FY35	259	165	424
FY36	278	180	458
FY37	300	194	495
FY38	323	209	532
FY39	349	226	575
FY40	383	247	629
FY41	411	265	675
FY42	442	285	726
FY43	477	306	783
FY44	513	330	843
FY45	550	353	903
FY46	589	378	967
FY47	631	405	1,035
FY48	678	434	1,112
FY49	721	463	1,183
FY50	770	494	1,264
FY51	823	527	1,350
FY52	880	563	1,443
FY53	936	601	1,537
FY54	1,001	640	1,642
FY55	1,068	683	1,752
FY56	1,144	730	1,874
CAGR (FY 25-46) (%)	**7.41%**	**6.99%**	**7.24%**
CAGR (FY 25-56) (%)	**7.23%**	**6.94%**	**7.11%**

The Revenue Growth (CAGR) at Faridpur Toll Plaza is observed to be 7.23% for FY25-FY56. Similaraly at Maigalganj Toll Plaza it is observed to be 6.94% for FY25-FY56.

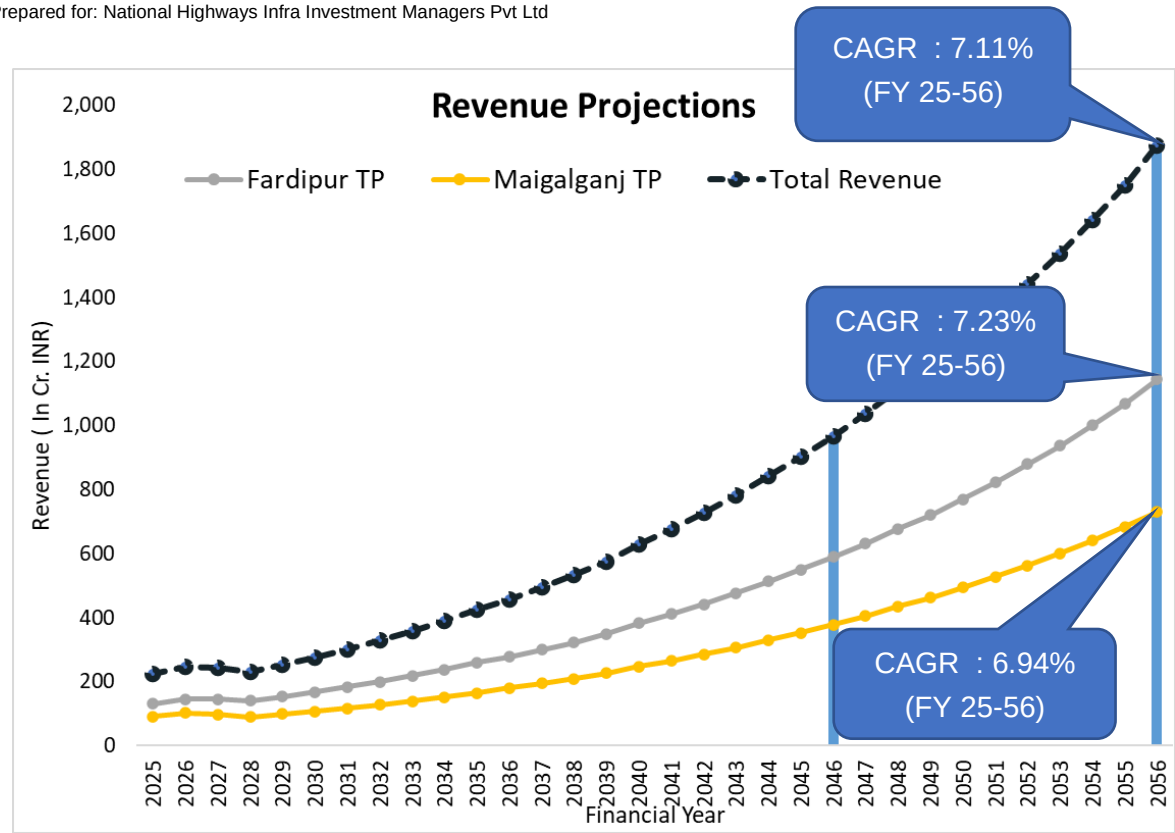


Figure 7-3 Toll Revenue Projections

7.5.6 Overloading Analysis

7- day axle load survey data (as part of technical due diligence) has been provided by the technical consultant of the client which has been analysed to understand the extent of overloaded vehicles.

Table 7-14: Overloading Analysis for Project Road Toll Plazas

Mode	Sample-All Commodities (a)		Overloaded(>20%)-(b)		%ge Overloaded(>20%)-(b/a)		Final %ge Overloaded (>20%) after applying Factors	
	Faridpur	Maigalganj	Faridpur	Maigalganj	Faridpur	Maigalganj	Faridpur	Maigalganj
LCV	1,369	1,655	0	0	0.0%	0.0%	0.0%	0.0%
2AT	1,649	1,352	3	5	0.2%	0.4%	0.0%	0.0%
3AT	1,462	1,533	30	83	2.1%	5.4%	0.0%	0.3%
MAV	3,507	2,946	267	506	7.6%	17.2%	0.4%	0.3%

As observed from the seven-day axle load analysis, around 2.1% of 3A trucks and 7.6% of the MAVs are above 20% overloading limit at Faridpur TP. Similarly, around 5.4% of 3A trucks and 17.2% of the MAVs are above 20% overloading limit at Maigalganj TP. However, after excluding the commodities such as fruits and vegetables, petroleum products, chemicals and gas, heavy machinery and industrial equipment since these are having stickiness to Project road as well as OD pairs with lead greater than 500 km & applying 25% factor to the final Overloading no's , the revised overloading percentage in the category of above 20% overloading comes out to be around 0.0% in 3A and 0.4% in MAV at Faridpur TP & 0.3% in 3A and 0.3% in MAV at Maigalganj TP.

Based on the surveys done, potential for collecting overloading revenue found but presence of alternate routes necessitates no collection of overloading revenue.

Conclusion

the toll revenues are expected to grow while implementing with Schedule M (FY 25-56) at 7.11% CAGR on overall Bareilly Sitapur project Corridor. Consultant doesn't recommend Cash penalty going forward after few years due to FasTAG penetration is likely to be close to 100%. Also, Concessionaire needs to deposit Cash penalty revenue with Authority.

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8. Annexures

Monthly traffic and Revenue for both the Toll plazas are mentioned below. Monthly ADT traffic includes Cash & Exempt traffic as well for both the toll plazas. Monthly ADR also includes Cash revenue for both the toll plazas.

Table 8-1: Monthly ADT & ADR for Faridpur Toll plaza

FY	Month Name	CJV	LCV	2A	3A	MAV	OSV	Total	PCU	Revenue (Lakhs Per Day)
FY-24	Apr	7,026	593	2,222	1,013	2,611	2	13,468	29,383	29.25
	May	8,273	616	2,504	1,037	2,568	2	15,001	31,386	30.61
	Jun	10,015	613	2,508	942	2,430	2	16,509	32,224	30.64
	Jul	7,596	471	2,343	764	1,906	1	13,082	26,207	24.67
	Aug	7,421	513	2,279	881	2,076	1	13,171	27,016	25.92
	Sep	7,604	554	2,494	1,002	2,339	2	13,995	29,458	31.50
	Oct	7,600	588	2,445	1,078	2,920	2	14,634	32,203	41.12
	Nov	8,266	557	2,610	1,006	2,955	1	15,394	33,250	42.29
	Dec	7,791	573	2,502	1,048	2,862	1	14,777	32,185	40.99
	Jan	7,013	507	2,148	901	2,268	1	12,838	27,130	33.92
	Feb	8,809	603	2,562	1,007	2,518	1	15,500	31,756	38.83
	Mar	8,532	576	2,527	980	2,442	1	15,058	30,911	37.91
FY-25	Apr	8,334	604	2,444	903	2,340	1	14,626	29,812	36.50
	May	7,928	578	2,366	868	2,268	1	14,009	28,707	35.55
	Jun	9,284	574	2,396	822	2,184	1	15,260	29,628	36.59
	Jul	8,015	502	2,339	729	1,716	1	13,302	25,697	31.34
	Aug	7,771	451	2,165	677	1,706	1	12,771	24,653	29.97
	Sep	7,861	546	2,476	922	2,159	1	13,965	28,592	35.64
	Oct	8,374	580	2,461	937	2,639	1	14,992	31,318	39.25
	Nov	9,955	550	2,487	870	2,844	1	16,708	33,655	41.87

Table 8-2: Monthly ADT & ADR for Maigalganj Toll plaza

FY	Month Name	CJV	LCV	2A	3A	MAV	OSV	Total	PCU	Revenue (Lakhs Per Day)
FY-24	Oct	3,921	380	1,555	921	2,096	0	8,874	21,355	29.74
	Nov	4,274	387	1,718	956	2,104	1	9,440	22,348	30.67
	Dec	4,193	417	1,751	1,018	2,158	1	9,537	22,839	31.37
	Jan	3,418	356	1,389	809	1,494	0	7,467	17,273	23.50
	Feb	4,234	410	1,632	891	1,588	0	8,756	19,566	26.08
	Mar	4,051	388	1,479	826	1,492	0	8,236	18,262	24.32
FY-25	Apr	4,256	419	1,538	793	1,436	0	8,442	18,340	24.09
	May	4,325	416	1,571	809	1,424	0	8,546	18,500	24.55
	Jun	5,046	424	1,636	806	1,397	0	9,310	19,298	25.75
	Jul	4,054	375	1,586	632	1,141	0	7,787	16,402	22.10
	Aug	3,861	330	1,414	602	1,084	0	7,292	15,287	20.58
	Sep	3,760	378	1,536	760	1,372	0	7,806	17,390	23.86
	Oct	4,216	414	1,557	839	1,696	1	8,723	19,662	26.75
	Nov	4,979	394	1,567	788	1,786	0	9,515	20,676	28.35

Table 8-3 Zoning List of Project corridor

Z. NO	Zone Name	Zone State
1	Bareilly	Uttar Pradesh
2	Shahmat/ Shyam Ganj	Uttar Pradesh
3	Bareilly Cantonment Area	Uttar Pradesh
4	Bhindaulia	Uttar Pradesh
5	Navadiya Jhada	Uttar Pradesh
6	Hafizganj	Uttar Pradesh
7	Nawabganj	Uttar Pradesh
8	Bhojipura	Uttar Pradesh
9	Baheri	Uttar Pradesh
10	Bareilly Airport	Uttar Pradesh
11	Izatnagar Railway Workshop	Uttar Pradesh
12	Parakhera Industrial Area	Uttar Pradesh
13	Fatehganj west	Uttar Pradesh
14	Mirganj	Uttar Pradesh
15	Aonla	Uttar Pradesh
16	Iffco Township	Uttar Pradesh
17	Faridpur	Uttar Pradesh
18	Dataganj	Uttar Pradesh
19	Fateganj east	Uttar Pradesh
20	Miranpur,	Uttar Pradesh
21	Nigohi	Uttar Pradesh
22	Tilhar	Uttar Pradesh
23	Nagaria Taluqua Gopalpura	Uttar Pradesh
24	Shahjahanpur	Uttar Pradesh
25	Jamaur	Uttar Pradesh
26	Jalalbad	Uttar Pradesh
27	Pawayan	Uttar Pradesh
28	Shahbad	Uttar Pradesh
29	Hardoi	Uttar Pradesh
30	Rao Bahadur	Uttar Pradesh
31	Sandila	Uttar Pradesh
32	Lakhimpur	Uttar Pradesh
33	J B ganj	Uttar Pradesh
34	Maigalganj	Uttar Pradesh
35	Mohammadi	Uttar Pradesh
36	Maholi	Uttar Pradesh
37	Sitapur	Uttar Pradesh
38	Laharpur	Uttar Pradesh
39	Biswan	Uttar Pradesh
40	Misriksh	Uttar Pradesh

Z. NO	Zone Name	Zone State
41	Sidhauli	Uttar Pradesh
42	Mahmudabad	Uttar Pradesh
43	Pilibhit	Uttar Pradesh
44	Bisalpur	Uttar Pradesh
45	Puranpur	Uttar Pradesh
46	Rampura	Uttar Pradesh
47	Moradabad	Uttar Pradesh
48	Amroha	Uttar Pradesh
49	Bijnor	Uttar Pradesh
50	Shambal	Uttar Pradesh
51	Aligarh	Uttar Pradesh
52	Etah	Uttar Pradesh
53	Agra	Uttar Pradesh
54	Mainpuri	Uttar Pradesh
55	Budaun	Uttar Pradesh
56	Farrukhabad	Uttar Pradesh
57	Kannauj	Uttar Pradesh
58	Etawah	Uttar Pradesh
59	Pata	Uttar Pradesh
60	Orai, Jalaun	Uttar Pradesh
61	Jhansi	Uttar Pradesh
62	Lalitpur	Uttar Pradesh
63	Chitrakoot	Uttar Pradesh
64	Banda	Uttar Pradesh
65	Bilgram	Uttar Pradesh
66	Unnao	Uttar Pradesh
67	Kanpur	Uttar Pradesh
68	Lucknow	Uttar Pradesh
69	Bara Banki	Uttar Pradesh
70	Rae Bareli	Uttar Pradesh
71	Jagdishpur	Uttar Pradesh
72	Fatehpur	Uttar Pradesh
73	Pratapgarh	Uttar Pradesh
74	Sultanapur	Uttar Pradesh
75	Akbarpur	Uttar Pradesh
76	Faizabad	Uttar Pradesh
77	Bansi	Uttar Pradesh
78	Gonda	Uttar Pradesh
79	Bahraich	Uttar Pradesh
80	Gorakhpur	Uttar Pradesh
81	Barhalganj	Uttar Pradesh
82	Azamgarh	Uttar Pradesh
83	Ghazipur	Uttar Pradesh

Z. NO	Zone Name	Zone State
84	Varanasi City	Uttar Pradesh
85	Ballia	Uttar Pradesh
86	North-West Bihar	Bihar
87	Patna	Bihar
88	Prayagraj City	Uttar Pradesh
89	Kaushambi	Uttar Pradesh
90	Bewar	Uttar Pradesh
91	Madya Pradesh	Madhya Pradesh
92	North-West Madhya Pradesh	Madhya Pradesh
93	Katni	Madhya Pradesh
94	Eastern Madhya Pradesh	Madhya Pradesh
95	North-East Madhya Pradesh	Madhya Pradesh
96	Waidhan	Madhya Pradesh
97	Vilemar Kundi	Uttar Pradesh
98	Chhattishgarh	Chhattishgarh
99	Eastern-Bihar	Bihar
100	Rourkela	Odisha
101	Ranchi	Jharkhand
102	Bhubaneswar	Odisha
103	Kolkata	West Bengal
104	Northwest Bengal	West Bengal
105	North - East India	North - East India
106	Jammu & Kashmir	Jammu & Kashmir
107	Dehradun	Uttarakhand
108	Shimla	Himachal Pradesh
109	Chandigarh	Union Territory of Chandigarh
110	Ludhiana	Punjab
111	Northern-Haryana	Haryana
112	Panipat	Haryana
113	Western-Haryana	Haryana
114	Saharanpur	Uttar Pradesh
115	Shamli	Uttar Pradesh
116	Muzaffarnagar	Uttar Pradesh
117	Meerut	Uttar Pradesh
118	Hapur	Uttar Pradesh
119	Bagpat	Uttar Pradesh
120	Noida & Greater Noida, Ghaziabad	Uttar Pradesh
121	Delhi	Delhi
122	Gurugram, Faridabad	Haryana
123	Bulandshahr	Uttar Pradesh
124	Jaipur	Rajasthan
125	Northern Rajasthan	Rajasthan
126	South & East - Rajasthan	Rajasthan

Z. NO	Zone Name	Zone State
127	Gujarat	Gujarat
128	Kandla/Mundra Port/Gandhidham	Gujarat
129	Maharashtra	Maharashtra & Goa
130	Southern India	Southern India
131	Chhatarpur	Madhya Pradesh
132	Bhutan	Bhutan
133	Bangladesh	Bangladesh
134	Nepal	Nepal
135	Almora	Uttarakhand
136	Panthnagar, Rudrapur	Uttarakhand
137	Kashipur	Uttarakhand
138	Halwadni	Uttarakhand

Table 8-4 Weighted vehicle registration data for Project Influence Area of TP1 – Faridpur

Year	Cars	Buses	Trucks
2012	13,98,991	37,884	1,54,781
2013	15,96,418	43,532	1,72,607
2014	17,85,016	49,330	1,84,881
2015	19,87,893	55,061	1,99,065
2016	22,03,277	61,747	2,18,142
2017	24,05,410	71,276	2,39,613
2018	26,87,799	78,368	2,70,237
2019	29,97,059	87,439	3,07,733
2020	33,30,396	98,265	3,36,326
2021	35,80,570	99,894	3,44,249
2022	38,79,466	1,01,815	3,59,009
2023	42,38,051	1,08,874	3,81,624
2024	46,51,914	1,18,815	4,03,626
CAGR (FY12 - 24)	**10.53%**	**9.99%**	**8.31%**

Table 8-5 Weighted vehicle registration data for project influence area of TP2 – Maigalganj

Year	Cars	Buses	Trucks
2012	13,89,337	38,695	1,58,855
2013	15,84,924	43,990	1,76,770
2014	17,71,741	49,394	1,89,284
2015	19,72,592	54,757	2,03,614
2016	21,85,678	60,953	2,22,682
2017	23,85,921	69,784	2,44,067
2018	26,65,070	76,329	2,74,120
2019	29,70,566	84,686	3,10,843

Year	Cars	Buses	Trucks
2020	32,99,601	94,716	3,39,028
2021	35,46,706	96,230	3,46,868
2022	38,41,825	98,039	3,61,574
2023	41,96,048	1,04,623	3,83,978
2024	46,04,804	1,13,927	4,05,736
CAGR (FY12 - 24)	**10.50%**	**9.42%**	**8.13%**

Table 8-6 PIA GSDP by vehicle category at toll plaza 01 – Faridpur

Year	GSDP (in Rs. Millions)		
	Cars	Buses	Trucks
2012	68.8	65.8	55.7
2013	72.1	69.0	58.4
2014	76.3	73.1	61.9
2015	79.4	76.2	64.4
2016	86.4	83.0	70.1
2017	96.2	92.3	77.8
2018	100.5	96.5	81.5
2019	104.5	100.2	84.9
2020	108.6	104.3	88.2
2021	103.6	99.3	83.8
2022	115.4	110.5	93.2
2023	125.8	120.3	101.5
2024	135.2	129.3	109.0
CAGR FY12 - 24 (%)	**5.79%**	**5.79%**	**5.76%**

Table 8-7 PIA GSDP by vehicle category at toll plaza 02 – Maigalganj

Year	GSDP (in Rs. Millions)		
	Cars	Buses	Trucks
2012	67.9	63.0	55.0
2013	71.2	66.1	57.7
2014	75.4	70.0	61.2
2015	78.5	73.1	63.6
2016	85.4	79.7	69.2
2017	95.0	88.5	76.7
2018	99.3	92.6	80.4
2019	103.2	96.3	83.9
2020	107.3	100.1	87.2
2021	102.4	95.1	82.9
2022	114.0	105.7	92.1
2023	124.2	115.1	100.2
2024	133.5	123.7	107.7
CAGR FY12 - 24 (%)	**5.79%**	**5.79%**	**5.76%**

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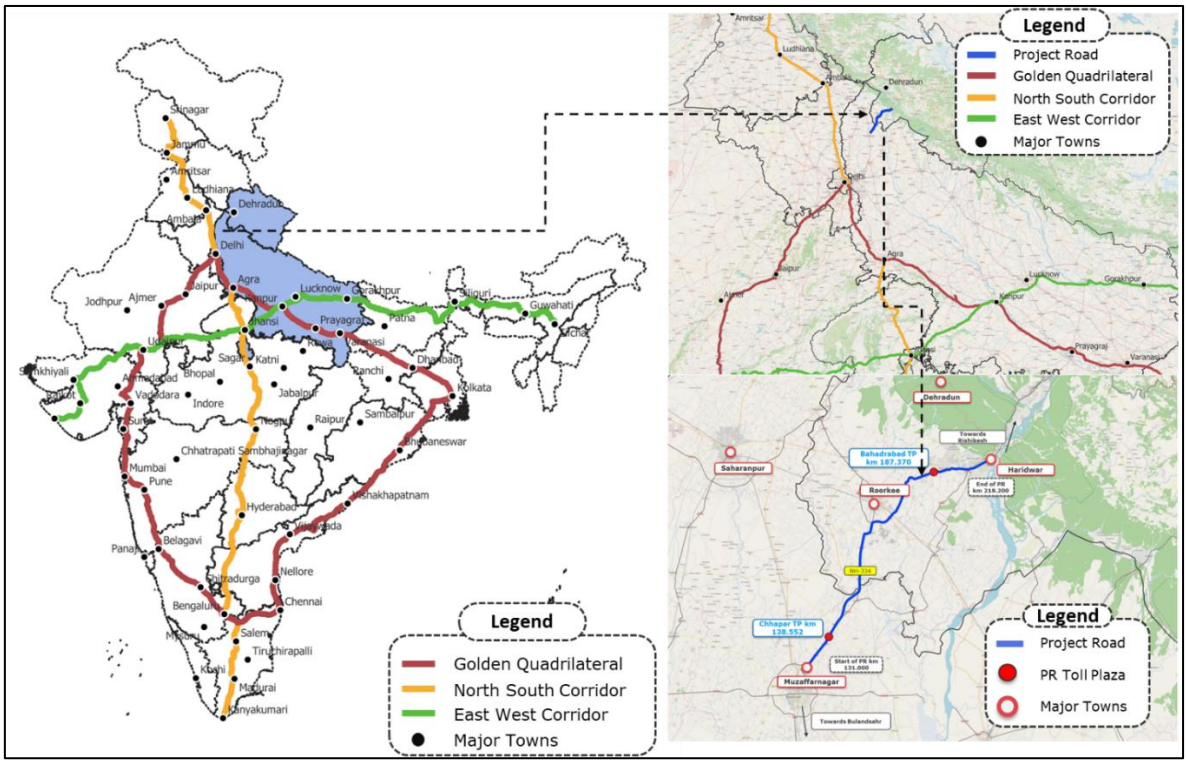
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TRAFFIC STUDY FOR MUZAFFARNAGAR - HARIDWAR SECTION OF NH-334 (OLD NH-58) IN THE STATES OF UTTAR PRADESH AND UTTARAKHAND



RAMBOLL

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ABBREVIATIONS

%	Percentage
2A	2 Axle truck
3A	3 Axle truck
AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
AR	Alternate Route
BIA	Broad Influence Area
CAGR	Compounded Annual Growth Rate
FY	Financial Year
GDP	Gross Domestic Product
GSDP	Gross State Domestic Product
IIA	Immediate Influence Area
IRC	Indian Road Congress
Km	Kilometre
LCV	Light Commercial Vehicle
M Bus	Minibus
MAV	Multi Axle Vehicle
MLCV	Mini LCV
NH	National Highway
NHAI	National Highway Authority of India
NHDP	National Highway Development Program
NHIPPL	National Highways Infra Projects Private Limited
NPV	Net Present Value
OD	Origin-Destination survey
PCU	Passenger Car Unit
PIA	Project Influence Area
PR	Project Road
PV	Present Value
Rs/₹	Rupees
SEZ	Special Economic Zone
Sq.km	Square Kilometre
TP	Toll Plaza
TP01	Toll Plaza 01/ Chhapar
TP02	Toll Plaza 02/ Bahadrabad
WPI	Wholesale Price Index
YOY	Year on Year

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Appendix 2.1 Month on Month Past Traffic Data

Appendix 2.2 Traffic Zoning System

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Appendix 2.4 Regional Distribution and Traffic Streams from OD surveys of Round II

Appendix 2.5 Commodity Distribution at Toll Plaza Location

EXECUTIVE SUMMARY

Project Overview

The Project Road, NH-334 (old NH-58), connects major industrial, agricultural, and cultural centres in India, serving as a primary conduit for freight and passenger traffic in the states of Uttarakhand and Uttar Pradesh and connects important cities and towns like Meerut, Muzaffarnagar, Roorkee and Haridwar etc.

The project road section, Muzaffarnagar-Haridwar, a part of NH-334 (old NH-58) in the state of Uttar Pradesh and Uttarakhand, starts at 131.00 km near Muzaffarnagar and ends at 218.00 near Haridwar with a length of 79 km. There are two operational toll plazas on the project road, Chhapar TP (km 138.552) and Bahadrabad TP (km 187.370). Both toll plazas have 14 tolling lanes (staggered 7 lanes in each direction). This project has been offered by NHAI to National Highways Infra Investment Managers Private Limited (NHIIMPL) for transfer to InvIT in the fourth round for a concession period of 20 years with maximum extension till 30 years.

Figure 0-1 shows the context and alignment of project road with major places along the highway.

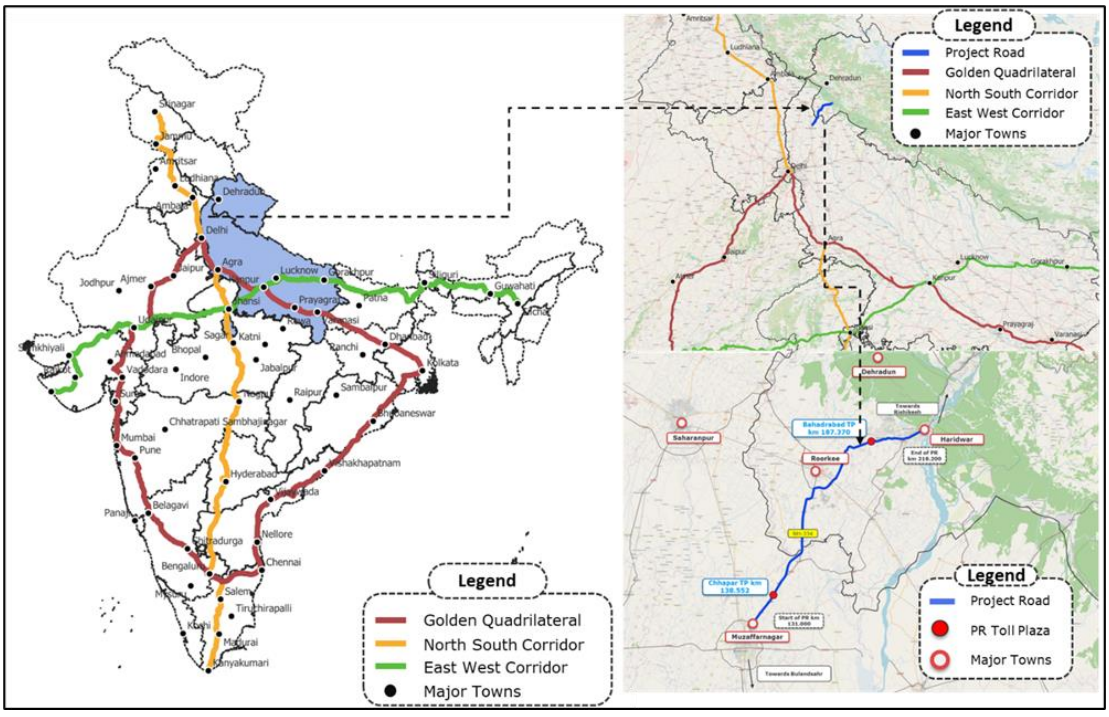


Figure 0-1: Project Road and Location of Toll Plazas

Salient Growth Feature and Traffic Generators

The project road serves the short distance traffic for both passenger and freight which is mainly generated from/to Delhi NCR to/from Roorkee/Haridwar/Dehradun/Rishikesh.

In wider context, PR also serves the traffic for the freight vehicles, which is plying from/to Haridwar/Roorkee and surroundings to/from Ahmedabad/Surat/Vadodara and surroundings.

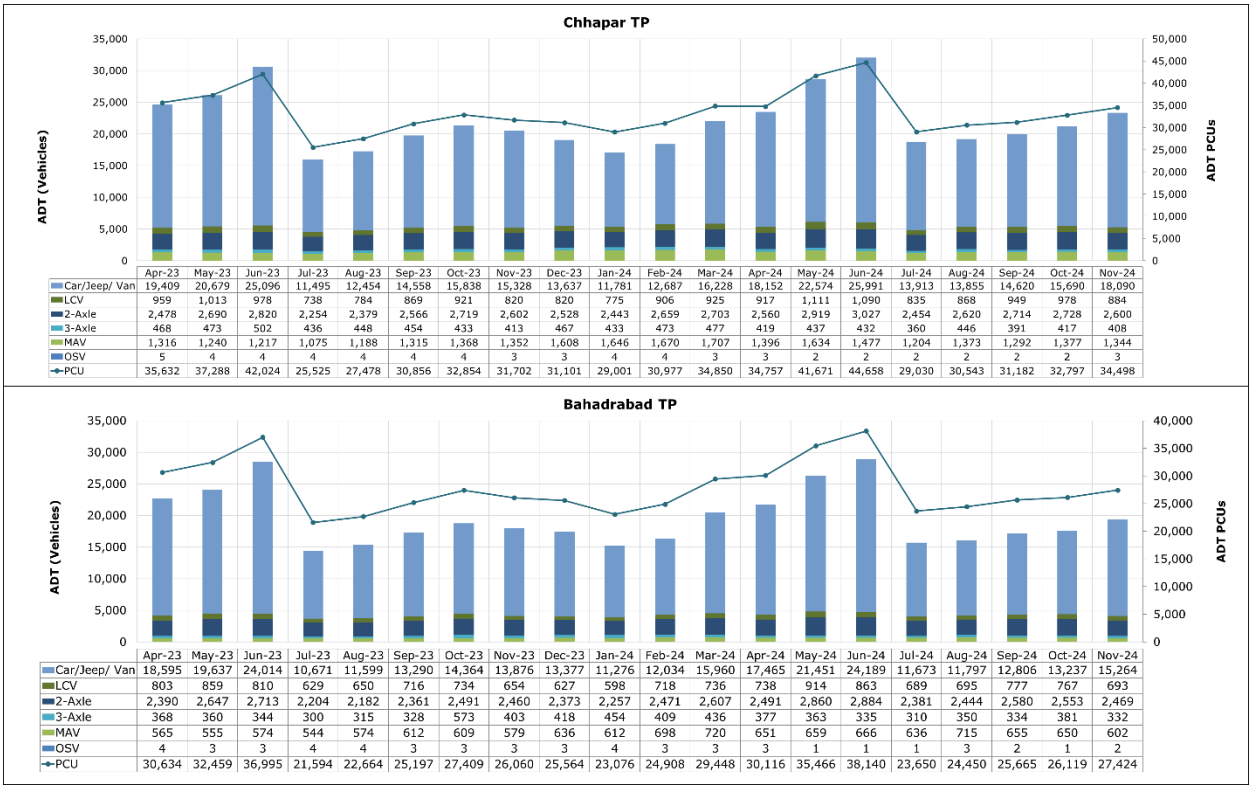
The project road section is located in the districts of Muzaffarnagar and Haridwar.

Muzaffarnagar district in Uttar Pradesh, is strategically located to connect economic hubs due to its extensive road network. The district's diverse agronomic activities, including sugarcane, wheat, mangoes, and rice, contribute to the country's sugar industry. The district has seen significant industrial growth, particularly in sugar and jaggery production units, steel, paper, and chemical industries.

Haridwar district located in western part of Uttarakhand and is renowned for its extensive Ayurvedic practice and production of herbal medicines. Sugarcane, rice, wheat, legumes, and oil seeds are among its principal crops. With the founding of two PSUs, Hindustan Antibiotics Ltd. and Bharat Heavy Electricals Ltd., industrialization began since 1960s. A new "Industrial Development Zone" is to be established close to Haridwar by the Uttarakhand State Industrial Development Corporation (SIDCUL). Haridwar also hosts the Ardh Kumbh every six years and the Kumbh Mela every twelve years adding a boom to its tourism.

Traffic Volume and Vehicle Composition - AADT for FY25

The toll data for both the toll plazas was made available by the client from August 2022 to November 2024. The month-on-month mode wise traffic for this period April 2023 to November 2024 for both the toll plazas is presented in **Figure 0-2**.



Chhapar TP	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24
Car/Jeep/ Van	19,409	20,679	25,096	11,495	12,454	14,558	15,838	15,328	13,637	11,781	12,687	16,228	18,152	22,574	25,991	13,913	13,855	14,620	15,690	18,090
LCV	959	1,013	978	738	784	869	921	820	820	775	906	925	917	1,111	1,090	835	868	949	978	884
2-Axle	2,478	2,690	2,820	2,254	2,379	2,566	2,719	2,602	2,528	2,443	2,659	2,703	2,560	2,919	3,027	2,454	2,620	2,714	2,728	2,600
3-Axle	468	473	502	436	448	454	433	413	467	433	473	477	419	437	432	360	446	391	417	408
MAV	1,316	1,240	1,217	1,075	1,188	1,315	1,368	1,352	1,608	1,646	1,670	1,707	1,396	1,634	1,477	1,204	1,373	1,292	1,377	1,344
OSV	5	4	4	4	4	4	4	3	3	4	4	3	3	2	2	2	2	2	2	3
PCU	35,632	37,288	42,024	25,525	27,478	30,856	32,854	31,702	31,101	29,001	30,977	34,850	34,757	41,671	44,658	29,030	30,543	31,182	32,797	34,498

Bahadrabad TP	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24
Car/Jeep/ Van	18,595	19,637	24,014	10,671	11,599	13,290	14,364	13,876	13,377	11,276	12,034	15,960	17,465	21,451	24,189	11,673	11,797	12,806	13,237	15,264
LCV	803	859	810	629	650	716	734	654	627	598	718	736	738	914	863	689	695	777	767	693
2-Axle	2,390	2,647	2,713	2,204	2,182	2,361	2,491	2,460	2,373	2,257	2,471	2,607	2,491	2,860	2,884	2,381	2,444	2,580	2,553	2,469
3-Axle	368	360	344	300	315	328	573	403	418	454	409	436	377	363	335	310	350	334	381	332
MAV	565	555	574	544	574	612	609	579	636	612	698	720	651	659	666	636	715	655	650	602
OSV	4	3	3	4	4	3	3	3	3	4	3	3	3	1	1	1	3	2	1	2
PCU	30,634	32,459	36,995	21,594	22,664	25,197	27,409	26,060	25,564	23,076	24,908	29,448	30,116	35,466	38,140	23,650	24,450	25,665	26,119	27,424

Figure 0-2: Month on Month Traffic Data for TP01 and TP02

The AADT for FY25 is estimated by annualizing the ETC data from April 2024 to November 2024. For TP01-Chhapar, a SCF based on 8–12-month factor derived from the average of FY23 and FY24 ETC traffic data of Siwaya TP, has been adopted.

In case of TP02-Bahadrabad, an 8–12-month SCF has been derived based on the average of FY23 and FY24 ETC traffic data. Additionally, cash and exempted traffic for FY25 (Apr

to Oct) have been added to the estimated ETC traffic of Chhapar and Bahadrabad toll plazas.

The AADT of FY25 along with the Seasonal Correction Factor (SCF), Average Daily Traffic (ADT), cash traffic and exempt traffic for respective months of FY25 is presented in **Table 0-1**.

Particulars		CJV	LCV	2-Axle	3-Axle	MAV	OSV	PCUs
TP01 – Chhapar								
A.	ADT FY25 (April - Nov)-ETC	17,861	954	2,703	414	1,387	2	34,894
B.	SCF (8-12 Month Factor)-Siwaya TP - Avg. of FY23 & FY24	0.97	0.98	1.00	1.05	1.05	1.05	
C.	ETC*SCF = A*B	17,333	931	2,706	433	1,452	2	34,690
D.	Cash (April 24 - Oct 24)	19	2	2	1	1	1	40
E.	Exempt (April 24 - Oct 24)	5,273	90	175	3	7	1	5,978
F.	AADT FY25 (Estimated) = C+D+E	22,624	1,023	2,883	437	1,460	5	40,711
TP02 - Bahadrabad								
A.	ADT FY25 (April - Nov)-ETC	15,985	767	2,583	348	654	2	28,881
B.	SCF (8-12 Month Factor)-Bahadrabad TP - Avg. of FY23 & FY24	0.94	0.96	1.00	1.03	1.05	1.05	
C.	ETC*SCF = A*B	15,020	735	2,580	356	685	2	28,022
D.	Cash (April 24 - Oct 24)	173	8	3	1	1	1	206
E.	Exempt (April 24 - Oct 24)	6,980	81	68	10	10	1	7,385
F.	AADT FY25 (Estimated) = C+D+E	22,173	823	2,651	368	697	4	35,619

Table 0-1: AADT for FY25

Travel Pattern

- The car traffic from/to Delhi/Ghaziabad/Noida and Surroundings to/from SIDCUL/Haridwar/Rishikesh and Surroundings is about 19-22 percent at TP01 & TP02.
- About 28-33 percent of Bus traffic at TP01 & TP02 was found to be travelling from/to Delhi/Ghaziabad/Noida and Surroundings to/from SIDCUL/Haridwar/Rishikesh and Surroundings.
- 3A trucks from/to Rajasthan/Central/South India to/from SIDCUL/Haridwar/Rishikesh and Surroundings is about 10-17 percent at TP01 & TP02.
- In case of MAVs, around 8 and 20 percent at TP01 & TP02 respectively, were found to be plying between Delhi/Ghaziabad/Noida and Surroundings to/from SIDCUL/Haridwar/Rishikesh and Surroundings.
- The MAV traffic is observed to be having Roorkee-Delhi and Roorkee-Haridwar as top OD pair at both toll plazas.

Network Impacts

In context of the project road, three road network developments which may impact the traffic on the project road are:

1. Impact of Delhi-Dehradun Expressway (with spur to Haridwar)

The assessment for the route between Delhi NCR & beyond and Dehradun/Haridwar & beyond has been done for the two traffic streams:

- Traffic plying between Delhi NCR & beyond and Dehradun & beyond
- Traffic from/to Delhi NCR & beyond to/from Haridwar/Rishikesh & beyond

The proposed expressway will be a mix of brownfield upgradation/greenfield alignment. The negative impact of traffic at the toll plazas has been considered as 40 percent in FY26 and 100 percent from FY27 onwards.

During the six laning of the project road section DDE may take away higher traffic due to construction activities on PR. For estimating this impact, six laning toll rates at 75 percent and reduced speeds on PR due to construction activity have been considered. It is to be noted that higher diversion percentages have been considered for diversion to DDE during construction period for six laning in FY35 and FY36 and lower percentage of diversion is applicable once the six laning is complete from FY37 onwards.

The total diverted traffic estimated for FY25 after the operation of Delhi-Dehradun Expressway at the two toll plazas is presented in **Table 0-2** before and after six laning of the project road section.

Potential Streams	Modes				
	Car	LCV	2A	3A	MAV
Diverted Traffic Before Six Laning of PR					
Chhapar TP	22.9	9.2	21.8	27.1	21.2
Bahadrabad TP	19.2	11.4	22.3	34.9	34.6
Diverted Traffic During Construction Period for Six Laning of PR					
Chhapar TP	28.8	10.2	24.5	30.7	24.4
Bahadrabad TP	24.3	12.6	25.8	39.7	39.8

Table 0-2: Diverted Traffic to Delhi-Dehradun Expressway - FY25

2. Impact of Ganga Expressway Phase II

The assessment for the route between East UP/Meerut & beyond and Haridwar & beyond has been done for the two traffic streams:

- Traffic plying between East UP & beyond and Haridwar & beyond
- Traffic from/to Meerut & beyond to/from Haridwar & beyond

The total diverted traffic after the operation of Ganga Expressway Phase II at the two toll plazas estimated for FY25 is presented in **Table 0-3**.

Potential Streams	Modes				
	Car	LCV	2A	3A	MAV
Diverted Traffic (East UP & beyond)					
Chhapar TP	1.3	0.7	1.4	1.4	1.7
Bahadrabad TP	1.3	0.8	1.6	1.7	3.6
Diverted Traffic (Meerut & beyond)					
Chhapar TP	0.4	0.2	0.2	0.3	0.2
Bahadrabad TP	0.4	0.2	0.2	0.3	0.4

Table 0-3: Diverted Traffic to Ganga Expressway Phase II – FY25

In total Ganga Expressway Phase II may take away around 692 PCUs from both the toll plazas. The negative impact of traffic at all the toll plazas has been considered as 50 percent in FY35 and 100 percent from FY36 onwards.

3. Impact of Upper Ganga Canal Road

The assessment is done for the stream to/from Purquazi & beyond for Chhapar toll plaza. The total diverted traffic estimated for FY25after the operation Upper Ganga Canal Road at the Chhapar toll plazas is presented in **Table 0-4**.

Potential Streams	Modes		
	Car	LCV	PCU
Diverted Traffic			
Chhapar TP	15.4	11.6	9.0

Table 0-4: Diverted Traffic to the Upper Ganga Canal Road – FY25

The proposed expressway may take away around 15 percent in cars and 12 percent in LCVs. Because of the two-way movement on this two-lane road abutting farmlands, presence of height restriction barriers and difficulty in manoeuvring higher axle vehicles, only car & LCV traffic have been considered for further analysis and freight traffic is not considered. The negative impact of traffic at all the toll plazas has been considered as 50 percent in FY28 and 100 percent from FY29 onwards.

Traffic Growth Rates

The estimated traffic growth rates for the project road based on the elasticity approach have been presented till FY55 in line with the maximum extendable concession period of 30 years in **Table 0-5**.

FY/Modes	Cars	LCV	2A	3A	MAV/ OSV
TP01-Chhapar					
FY26	6.3	1.3	5.7	1.3	6.3
FY27	6.2	1.3	5.6	1.2	6.2
FY28	6.2	1.3	5.6	1.2	6.2
FY29	5.9	1.2	5.3	1.2	5.9
FY30	5.3	1.1	4.8	1.1	5.3
FY31	5.3	1.1	4.3	1.1	4.8
FY32	5.3	1.1	4.3	1.1	4.8
FY33	5.3	1.1	4.3	1.1	4.8
FY34	5.3	1.1	4.3	1.1	4.8
FY35	5.2	1.1	4.2	1.1	4.7
FY36	5.1	1.0	3.6	1.0	4.1
FY37	5.1	1.0	3.5	1.0	4.1
FY38	5.0	1.0	3.5	1.0	4.0
FY39	4.9	1.0	3.4	1.0	3.9
FY40	4.8	1.0	3.3	1.0	3.8
FY41	4.7	0.9	3.3	0.9	3.8
FY42	4.6	0.9	3.2	0.9	3.7
FY43	4.5	0.9	3.2	0.9	3.6
FY44	4.4	0.9	3.1	0.9	3.5
FY45 and beyond	4.3	0.9	3.0	0.9	3.5
TP02-Bahadrabad					
FY26	6.5	1.3	5.8	1.3	6.4
FY27	6.4	1.3	5.7	1.3	6.3
FY28	6.4	1.3	5.7	1.3	6.3
FY29	6.1	1.2	5.4	1.2	6.1
FY30	5.5	1.1	4.9	1.1	5.5
FY31	5.5	1.1	4.4	1.1	4.9
FY32	5.5	1.1	4.4	1.1	4.9
FY33	5.5	1.1	4.4	1.1	4.9
FY34	5.5	1.1	4.4	1.1	4.9
FY35	5.4	1.1	4.3	1.1	4.8
FY36	5.3	1.1	3.7	1.1	4.2
FY37	5.2	1.0	3.6	1.0	4.2
FY38	5.1	1.0	3.6	1.0	4.1
FY39	5.0	1.0	3.5	1.0	4.0
FY40	4.9	1.0	3.4	1.0	3.9
FY41	4.8	1.0	3.4	1.0	3.8
FY42	4.7	0.9	3.3	0.9	3.8
FY43	4.6	0.9	3.2	0.9	3.7
FY44	4.5	0.9	3.2	0.9	3.6
FY45 and beyond	4.4	0.9	3.1	0.9	3.5

Table 0-5: Projected Traffic Growth Rates for Project Road (%)

The implied traffic growth rates for the project road after considering the impact of diversion under the base case have been presented in **Table 0-6**.

FY/Modes	Cars	LCV	2A	3A	MAV/ OSV
TP01-Chhapar					
2026	-3.5	-2.4	-3.6	-9.7	-2.7
2027	-9.9	-4.5	-9.6	-17.3	-8.6
2028	-4.4	-5.2	5.6	1.2	6.2
2029	-5.8	-5.7	5.3	1.2	5.9
2030	5.3	1.1	4.8	1.1	5.3
2031	5.3	1.1	4.3	1.1	4.8
2032	5.3	1.1	4.3	1.1	4.8
2033	5.3	1.1	4.3	1.1	4.8
2034	5.3	1.1	4.3	1.1	4.8
2035	-6.3	-0.8	-0.5	-5.1	-0.9
2036	3.5	0.5	2.5	-0.2	2.8
2037	16.6	2.3	7.3	6.4	8.6
2038	5.0	1.0	3.5	1.0	4.0
2039	4.9	1.0	3.4	1.0	3.9
2040	4.8	1.0	3.3	1.0	3.8
2041	4.7	0.9	3.3	0.9	3.8
2042	4.6	0.9	3.2	0.9	3.7
2043	4.5	0.9	3.2	0.9	3.6
2044	4.4	0.9	3.1	0.9	3.5
2045 & beyond	4.3	0.9	3.0	0.9	3.5
TP02-Bahadrabad					
2026	-1.7	-3.3	-3.6	-12.9	-8.3
2027	-6.9	-6.0	-9.8	-23.4	-19.3
2028	6.4	1.3	5.7	1.3	6.3
2029	6.1	1.2	5.4	1.2	6.1
2030	5.5	1.1	4.9	1.1	5.5
2031	5.5	1.1	4.4	1.1	4.9
2032	5.5	1.1	4.4	1.1	4.9
2033	5.5	1.1	4.4	1.1	4.9
2034	5.5	1.1	4.4	1.1	4.9
2035	-2.5	-0.9	-1.6	-7.9	-6.6
2036	4.1	0.4	2.4	-0.7	0.7
2037	12.5	2.4	8.6	9.3	13.7
2038	5.1	1.0	3.6	1.0	4.1
2039	5.0	1.0	3.5	1.0	4.0
2040	4.9	1.0	3.4	1.0	3.9
2041	4.8	1.0	3.4	1.0	3.8
2042	4.7	0.9	3.3	0.9	3.8
2043	4.6	0.9	3.2	0.9	3.7
2044	4.5	0.9	3.2	0.9	3.6
2045 & beyond	4.4	0.9	3.1	0.9	3.5

Table 0-6: Implied Traffic Growth Rates for Project Road (%)

Traffic Projections

Table 0-7 presents the projections of the mode-wise vehicles under Base Case after diversion till FY55.

TP01 - Chhapar							
FY End	CJV	LCV	Bus/2A	3A	MAV	OSV	Total PCU
2025	22,624	1,023	2,883	437	1,460	5	40,711
2026	21,842	998	2,781	394	1,420	5	39,279
2027	19,687	953	2,515	326	1,299	6	35,510
2028	18,818	903	2,655	330	1,379	6	35,361
2029	17,718	852	2,796	334	1,461	6	34,989
2030	18,663	861	2,931	338	1,539	7	36,715
2031	19,658	870	3,056	342	1,613	7	38,445
2032	20,706	880	3,187	345	1,690	7	40,261
2033	21,811	889	3,323	349	1,771	8	42,167
2034	22,973	899	3,465	353	1,857	8	44,167
2035	21,521	892	3,449	335	1,841	8	42,531
2036	22,273	896	3,535	334	1,892	9	43,777
2037	25,960	917	3,793	355	2,056	9	49,073
2038	27,247	927	3,925	359	2,137	10	51,150
2039	28,572	936	4,059	362	2,221	10	53,279
2040	29,935	945	4,195	366	2,306	10	55,458
2041	31,336	954	4,333	369	2,392	11	57,686
2042	32,772	963	4,473	372	2,480	11	59,962
2043	34,243	971	4,614	376	2,570	11	62,283
2044	35,749	980	4,756	379	2,660	12	64,648
2045	37,287	988	4,900	382	2,752	12	67,055
2046	38,892	997	5,048	386	2,847	13	69,556
2047	40,565	1,006	5,200	389	2,945	13	72,154
2048	42,311	1,015	5,357	392	3,047	14	74,853
2049	44,132	1,023	5,519	396	3,152	14	77,658
2050	46,031	1,032	5,686	399	3,261	15	80,572
2051	48,011	1,041	5,858	403	3,373	15	83,601
2052	50,077	1,050	6,035	406	3,490	16	86,748
2053	52,232	1,060	6,217	410	3,610	16	90,018
2054	54,480	1,069	6,405	413	3,735	17	93,417
2055	56,824	1,078	6,598	417	3,863	17	96,949
TP02 – Bahadrabad							
FY End	CJV	LCV	Bus/2A	3A	MAV	OSV	Total PCU
2025	22,173	823	2,651	368	697	4	35,619
2026	21,795	796	2,554	321	639	4	34,509
2027	20,293	748	2,303	246	516	5	31,404
2028	21,585	757	2,435	249	549	5	33,262
2029	22,896	766	2,567	252	582	5	35,145
2030	24,155	775	2,694	255	614	5	36,948
2031	25,483	783	2,812	257	644	6	38,788
2032	26,883	792	2,935	260	676	6	40,724
2033	28,361	801	3,063	263	709	6	42,760
2034	29,920	809	3,197	266	744	7	44,902
2035	29,184	802	3,146	245	695	7	43,718
2036	30,370	806	3,223	243	699	7	45,157
2037	34,177	825	3,501	266	795	7	50,330
2038	35,924	834	3,626	269	828	8	52,619
2039	37,726	842	3,753	271	861	8	54,971
2040	39,581	850	3,881	274	895	8	57,386
2041	41,490	859	4,012	277	929	9	59,863
2042	43,451	867	4,144	279	964	9	62,399
2043	45,462	875	4,277	282	1,000	9	64,992
2044	47,523	883	4,412	284	1,036	10	67,642
2045	49,631	890	4,549	287	1,073	10	70,345
2046	51,833	898	4,689	289	1,110	10	73,160
2047	54,132	906	4,834	292	1,150	11	76,093
2048	56,534	914	4,984	295	1,190	11	79,147
2049	59,042	922	5,138	297	1,233	12	82,329
2050	61,661	930	5,297	300	1,276	12	85,642
2051	64,397	939	5,460	302	1,321	12	89,094
2052	67,253	947	5,629	305	1,368	13	92,690
2053	70,237	955	5,803	308	1,417	13	96,436
2054	73,353	964	5,982	310	1,467	14	100,339
2055	76,607	972	6,167	313	1,519	14	104,405

Table 0-7: Mode-Wise Projected Traffic for PR

Total traffic in PCUs at the project road under the base case scenario before and after considering diversion impacts is presented in **Table 0-8**.

FY	Total Traffic Before Diversion			Total Traffic After Diversion		
	TP01	TP02	Average	TP01	TP02	Average
2025	40,711	35,619	38,165	40,711	35,619	38,165
2026	43,068	37,745	40,407	39,279	34,509	36,894
2027	45,532	39,971	42,751	35,510	31,404	33,457
2028	48,142	42,333	45,237	35,361	33,262	34,312
2029	50,783	44,727	47,755	34,989	35,145	35,067
2030	53,309	47,020	50,164	36,715	36,948	36,831
2031	55,858	49,355	52,606	38,445	38,788	38,617
2032	58,535	51,810	55,173	40,261	40,724	40,492
2033	61,345	54,393	57,869	42,167	42,760	42,463
2034	64,296	57,110	60,703	44,167	44,902	44,534
2035	67,340	59,918	63,629	42,531	43,718	43,124
2036	70,348	62,719	66,534	43,777	45,157	44,467
2037	73,440	65,605	69,522	49,073	50,330	49,702
2038	76,614	68,574	72,594	51,150	52,619	51,885
2039	79,869	71,624	75,747	53,279	54,971	54,125
2040	83,204	74,755	78,979	55,458	57,386	56,422
2041	86,616	77,964	82,290	57,686	59,863	58,774
2042	90,103	81,251	85,677	59,962	62,399	61,180
2043	93,663	84,611	89,137	62,283	64,992	63,638
2044	97,292	88,043	92,668	64,648	67,642	66,145
2045	100,987	91,544	96,266	67,055	70,345	68,700
2046	104,828	95,190	100,009	69,556	73,160	71,358
2047	108,822	98,986	103,904	72,154	76,093	74,123
2048	112,973	102,940	107,957	74,853	79,147	77,000
2049	117,290	107,058	112,174	77,658	82,329	79,993
2050	121,777	111,346	116,562	80,572	85,642	83,107
2051	126,443	115,813	121,128	83,601	89,094	86,348
2052	131,294	120,464	125,879	86,748	92,690	89,719
2053	136,338	125,310	130,824	90,018	96,436	93,227
2054	141,583	130,356	135,970	93,417	100,339	96,878
2055	147,036	135,613	141,325	96,949	104,405	100,677
CAGR (FY25-FY45)	4.6%	4.8%	4.7%	2.5%	3.5%	3.0%

Table 0-8: Projected Traffic at PR in PCUs (Before and After Diversion)

Tolling Segmentation

The tolling stream distribution under the present study has been derived from the toll data taking an average of FY25 and the same is presented in **Table 0-9**.

Type	Car	LCV	Bus/2A Trucks	3A Trucks	MAV	OSV
TP01 - Chhapar						
Single	42.2	42.8	31.7	67.3	56.0	100.0
Return	34.7	48.3	62.0	31.7	43.5	0.0
Monthly	0.0	0.0	0.0	0.0	0.0	0.0
Local personal	0.2	0.0	0.0	0.0	0.0	0.0
Local commercial	0.0	0.1	0.2	0.0	0.0	0.0
Exemptions	22.8	8.8	6.1	1.0	0.5	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
TP02 - Bahadrabad						
Single	38.6	40.7	27.4	48.5	62.8	100.0
Return	28.6	45.9	63.2	35.7	34.2	0.0
Monthly	0.0	0.0	0.0	0.0	0.0	0.0
Local personal	1.8	0.0	0.0	0.0	0.0	0.0
Local commercial	0.9	3.8	6.8	12.8	1.4	0.0
Exemptions	30.2	9.6	2.6	3.0	1.5	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 0-9: Tolling Distribution

Tollable Length and Toll rates

The normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being charged at toll plazas along with the length which will be charged post augmentation to six lane configurations are presented in **Table 0-10**.

Particulars	Gaz. Notification Length	Schedule M Length	
		Before Completion of Improvement (till 31st May FY28)	After Completion of Improvement (From 1st June FY28)
TP01-Chhapar at km 138.552			
A. Normal	27.595	27.595	26.545
B. Bypass	7.709	7.709	7.709
C. Equivalent structure	0.136	0.136	1.186
Base Length	35.440	35.440	35.440
Tolling Length = A+(B*1.5) + (C*10)	40.519	40.519	49.969
TP02-Bahadrabad at km 187.370			
A1. Normal - 2 lane (to be charged at 60%)		0.397	0.397
A2. Normal - 4/6 lane	24.471	22.621	22.531
B. Bypass	16.224	16.224	16.224
C1. Equivalent structure - 2 lane (to be charged at 60%)	0.525	0.653	0.653
C2. Equivalent structure - 4/6 lane	1.900	3.750	3.840
Base Length	43.120	43.645	43.645
Tolling Length = A+(B*1.5) + (C*10)	85.957	88.613	89.423

Table 0-10: Tolling Lengths (in km) for Project Road

The stream of toll rates likely to be charged basis schedule -M lengths and adopted WPI assumptions at the toll plaza of the project road in cardinal years till FY55 is presented in **Table 0-11**. The toll fee has been rounded to nearest 5 Rupees as per toll fee rules.

FY End	Car	LCV/ M Bus	Bus/ 2A Truck	3-axle Truck	MAV	OSV	Car Local
TP01 - Chappar							
2025 (Existing)	60	95	200	220	315	385	340
With Schedule-M Lengths							
2025	60	95	200	220	315	385	340
2030	90	145	305	335	480	580	415
2035	110	180	370	405	585	710	510
2040	135	215	455	495	715	870	620
2045	165	265	555	605	870	1,060	760
2050	200	325	680	740	1,065	1,295	925
2055	245	395	830	905	1,300	1,585	1,130
TP02 - Bahadrabad							
2025 (Existing)	125	205	425	465	670	815	340
With Schedule-M Lengths							
2025	130	210	440	480	690	840	340
2030	160	260	545	595	855	1,040	415
2035	195	320	665	725	1,045	1,275	510
2040	240	390	815	890	1,275	1,555	620
2045	295	475	995	1,085	1,560	1,895	760
2050	360	580	1,215	1,325	1,905	2,320	925
2055	440	710	1,485	1,620	2,330	2,835	1,130

Table 0-11: Toll Rates at Toll Plazas (in Rs)

Project Road Revenue

The project road revenue under the base case scenario considering the impacts of all diversions is presented in **Table 0-12**.

FY Ending	TP01 - Chhapar	TP02 - Bahadrabad	Total
2025	703.6	1,213.0	1,916.6
2026	691.3	1,203.5	1,894.8
2027	661.8	1,128.8	1,790.6
2028	835.3	1,284.1	2,119.5
2029	889.6	1,402.7	2,292.3
2030	973.5	1,530.8	2,504.3
2031	1,062.5	1,682.2	2,744.6
2032	1,164.3	1,831.9	2,996.2
2033	1,250.2	1,994.3	3,244.5
2034	1,369.0	2,185.2	3,554.1
2035	1,379.0	2,191.2	3,570.2
2036	1,480.9	2,366.6	3,847.6
2037	1,718.8	2,752.0	4,470.8
2038	1,857.7	2,967.3	4,825.0
2039	2,013.6	3,220.7	5,234.4
2040	2,178.4	3,509.1	5,687.5
2041	2,350.9	3,794.7	6,145.5
2042	2,540.7	4,107.2	6,647.9
2043	2,731.8	4,442.0	7,173.9
2044	2,976.5	4,819.2	7,795.7
2045	3,194.5	5,216.3	8,410.8
2046	3,434.2	5,629.3	9,063.5
2047	3,721.0	6,095.9	9,816.8
2048	4,022.7	6,584.9	10,607.6
2049	4,339.7	7,114.0	11,453.7
2050	4,660.3	7,714.3	12,374.6
2051	5,047.3	8,338.6	13,385.9
2052	5,427.3	9,050.9	14,478.2
2053	5,854.0	9,738.8	15,592.8
2054	6,326.4	10,519.5	16,845.9
2055	6,834.0	11,427.2	18,261.2

Table 0-12: Base Case Revenue

The project road will have a CAGR of 7.7 percent for the period between FY25 to FY45.

1. INTRODUCTION

1.1 General

National Highways Authority of India (NHAI) has setup NHAI InvIT to monetize its completed and operational National Highway projects with the objective of mobilizing additional resources through capital markets. One continuous road section with a length of 79 kilometers viz., Muzaffarnagar-Haridwar of NH-334 (old NH-58) in the state of Uttar Pradesh and Uttarakhand referred to as Project Road (PR), has been offered by NHAI to National Highways Infra Investment Managers Private Limited (NHIIMPL) for transfer to InvIT in the fourth round for a concession period of 20 years with maximum extension till 30 years.

The project highway, NH-334 (old NH-58), is connecting many of the major industrial, agricultural and cultural centres of India. The total length of NH-334 (old NH-58) is roughly 207 km starting from Haridwar Chandi Chowk in the state of Uttarakhand and ending at Bulandshahar in the state of Uttar Pradesh. NH-334 (old NH-58) acts as a primary conduit for transportation of freight as well as passenger traffic in these states as well as connects important cities and towns like Meerut, Muzaffarnagar, Roorkee and Haridwar etc.

Figure 1-1 shows the alignment of NH-334 (old NH-58) with major places along the highway.

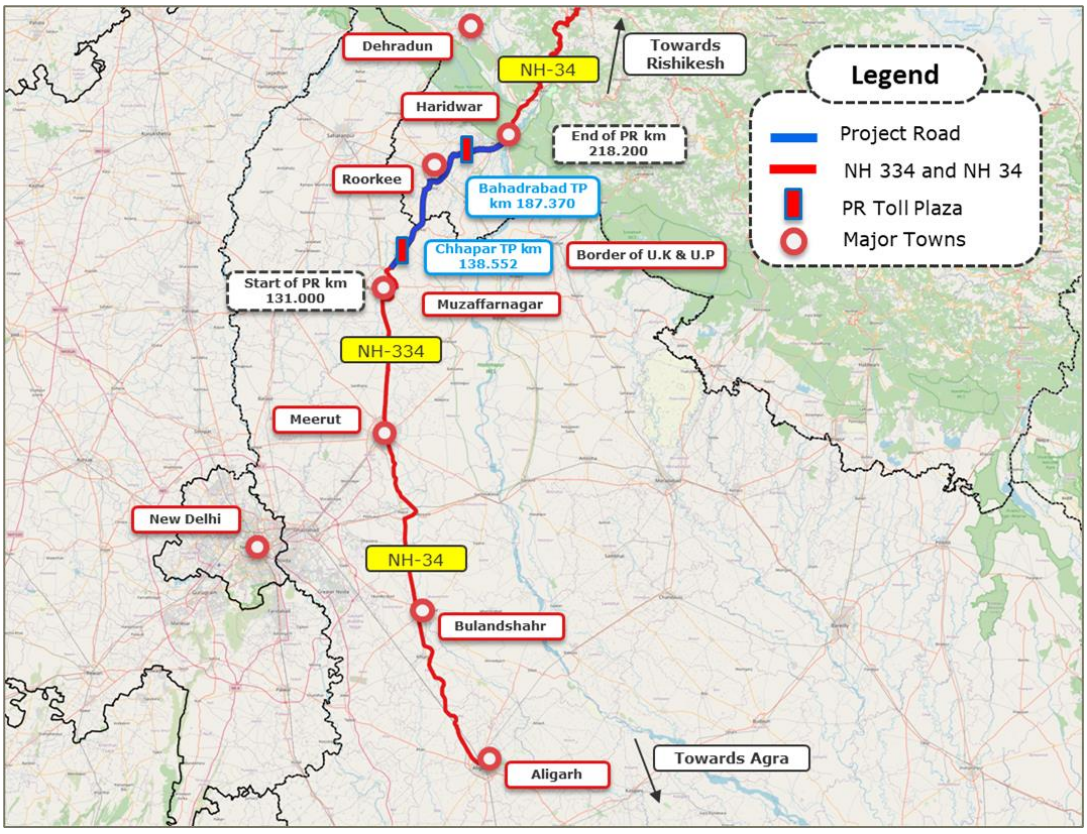


Figure 1-1: Alignment of NH-334 (Old NH-58) with Major Places

National Highways Infra Investment Managers Private Limited, the Investment Manager to InvIT has appointed Ramboll India Private Ltd as the Traffic Consultant to carry out a

study for assessing the present traffic levels, travel pattern and future traffic & revenue estimation till year FY55 duly considering the network characteristics, future economic perspective in the influence area of the project.

1.2 Scope of Services

The scope of the study includes the following:

- Undertake Traffic Survey on the highway section as per the following:
  - Seven days 24 hours Videography Traffic Counts at or near the existing toll plaza locations on the project road to derive the Average Daily Traffic (ADT)
  - One day Origin-Destination survey at or near the existing toll plaza locations to assess the existing travel pattern of vehicles plying on the project road – origin and destination.
- Estimation of the base year AADT FY25
- Analysis of OD data to cover:
  - Regional distribution of traffic and influence factors for different zones contributing traffic on the corridor
  - Identification of Project Influence Area from analysis of travel pattern - regional distribution of traffic,
  - Main traffic generators (industrial areas, towns, ports etc.)
  - Commodity composition- Goods type distribution
  - Top OD pairs by vehicle types
- Review of past traffic studies, traffic/toll data and other relevant reports as may be available to determine category wise volume of traffic for past years as well as for current year
- To identify competing route and analyse the network conditions, traffic characteristics & level of toll charged and the advantage/ disadvantage of the competing road and their impact on the project traffic
- Carry out a study of past economic performance of influence area
- Diversion analysis, wherever needed – cost ratio-based diversion analysis using spreadsheets to be carried out for respective potential OD pairs.
- Preparation of traffic projections till year FY55 in three scenarios – low, most likely and high
- Capacity analysis of the road or any other requirements for potential capacity augmentation
- Estimation of tollable traffic streams by toll category and estimation of toll

revenue as per categories of traffic streams stipulated in the tolling schedule for the study period

- Review future road and transportation network developments in the area of influence of the project and identify those schemes that may impact positively or negatively traffic on the toll road
- Identify factors which may have a positive and / or negative impact on the traffic - all major developments like DFC, industrial corridors, economic corridors, ports, Bharatmala, Sagarmala
- Scenario Analysis of toll revenue – Critical parameters of diversion (if applicable) and three scenarios of traffic growth (most likely, low and high).

1.3 Report Structure

This report is divided into four chapters, including this introduction chapter. Chapter 2 details upon the project road characteristics and socio – economic profile of the districts in the project influence area including the estimation of AADT and travel characteristics in the Project Influence Area (PIA). Chapter 3 contains the details on the derivation of traffic growth rates used for traffic forecasting and presents traffic projections for the study period. Chapter 4 presents the details regarding tolling strategy, toll rates and the revenue projections for the duration of the concession.

2. TRAFFIC SURVEY AND ANALYSIS

2.1 General

To understand the traffic characteristics, the volume of traffic and travel pattern of vehicles plying on the project road were collected through primary surveys. This chapter presents the details of the project road characteristics, traffic surveys carried out, their analysis and the salient findings. The results of the analysis will be utilized in assessing the traffic growth and estimation of traffic and revenue forecast on the project road for the concession period.

2.2 Project Road Characteristics

The project road section, Muzaffarnagar-Haridwar, a part of the NH-334 (old NH-58) in the state of Uttar Pradesh/Uttarakhand, starts at km 131.560 near Muzaffarnagar and ends at km 209.120 near Haridwar with a length of about 79 km. The project road falls under the jurisdiction of Muzaffarnagar district of Uttar Pradesh and Haridwar district of Uttarakhand passing through settlements of Muzaffarnagar, Chhapar, Roorkee, Bahadrabad and Haridwar. There are two operational toll plazas on the project road, one near Muzaffarnagar (Chhapar TP at km 138.55) and other near Haridwar (Bahadrabad TP at km 187.37). Both Chhapar and Bahadrabad toll plazas have 14 tolling lanes (staggered 7 lanes in each direction).

The alignment of project road and toll plaza locations is shown in **Figure 2-1**.

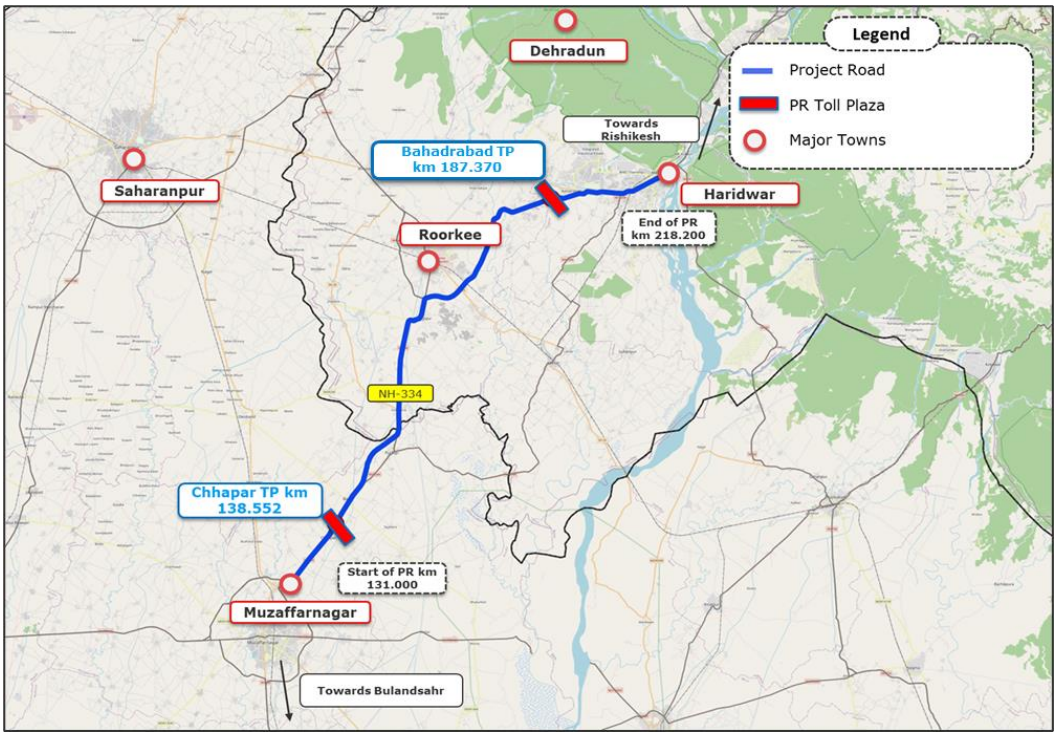


Figure 2-1: Project Road and Location of Toll Plazas

The project road serves the short distance traffic for both passenger and freight which is mainly generated from/to Delhi NCR to/from Roorkee/Haridwar/Dehradun/Rishikesh.

In wider context, PR also serves the traffic for the freight vehicles, which is plying from/to Haridwar/Roorkee and surroundings to/from Ahmedabad/Surat/Vadodara and surroundings.

2.2.1 Profile of Project Influence Area District

Muzaffarnagar District

Muzaffarnagar district, situated in the northern part of Uttar Pradesh, has an area of approximately 4,000 sq. km and as per the 2011 census, Muzaffarnagar has a population of approximately 28.4 lakh.

Muzaffarnagar district's strategic location plays a crucial role in connecting various economic hubs due to its extensive road network. It is intersected by some of the major highways, including the NH-334 that links Delhi to Dehradun and the National Highway 119, ensuring seamless connectivity to Uttarakhand.

Given its location between the Ganges and Yamuna rivers, the district has diverse agronomic activities. The predominant crops include sugarcane, yielding one of the highest productions in the country, and contributing significantly to the country's sugar industry. Other major crops include wheat, mangoes, and rice, which are supported by the favourable climatic conditions and abundant water resources from canal systems.

Muzaffarnagar has also seen considerable industrial growth with the establishment of various agro-based industries, primarily sugar and jaggery production units. Other industries include steel, paper, and chemical industries, which have proliferated due to the advantageous location close to the National Capital Region (NCR), providing easy access to markets and raw materials. Jaggery is recognized under One District One Product in PMFME (Pradhan Mantri Formalisation of Micro Food Processing Enterprises) Scheme for Muzaffarnagar district.

Haridwar District

Haridwar district lies in the western part of Uttarakhand with an area of 2,360 sq. km. and as per the 2011 census, the population of the district is 18.90 lakhs. Due to Haridwar's location on the bank of river Ganga, the land of Haridwar district is highly fertile.

Haridwar is known for its rich ayurvedic tradition and the presence of herbal medicine manufacturing. The major agricultural crops of the district are sugarcane (with three sugar mills in the district), rice, wheat, pulses, oil seeds, etc. Mushroom is recognized under One District One Product in PMFME Scheme for Haridwar district.

Two centrally owned public sector enterprises (PSUs) of Hindustan Antibiotics Ltd and Bharat Heavy Electricals Ltd are located near Haridwar. Uttarakhand's State Industrial Development Corporation (SIDCUL) will now set up a new "Industrial Development Zone" in the area adjacent to Shivalik Nagar near Haridwar, to encourage industrialization.

The industrial profile of SIDCUL is presented in **Figure 2-2.**

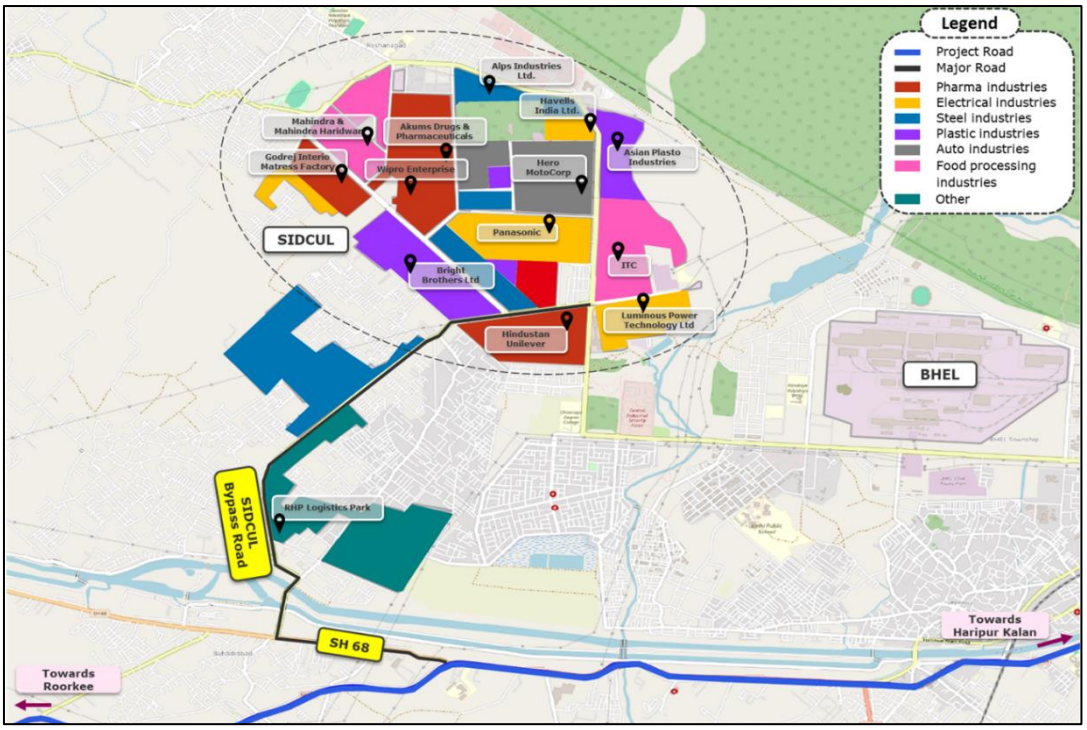


Figure 2-2: Industrial Profile of SIDCUL

Haridwar is one of the four holy cities in India that host the Kumbh Mela, a gathering of millions of devotees, every 12 years. The Ardh Kumbh is held in the district every six years. Kanwar Mela is also held in Haridwar district every year during the monsoon season. Haridwar also serves as the gateway to Char Dham of Uttarakhand.

The industrial profile surrounding the PR toll plazas is presented in **Figure 2-3**.

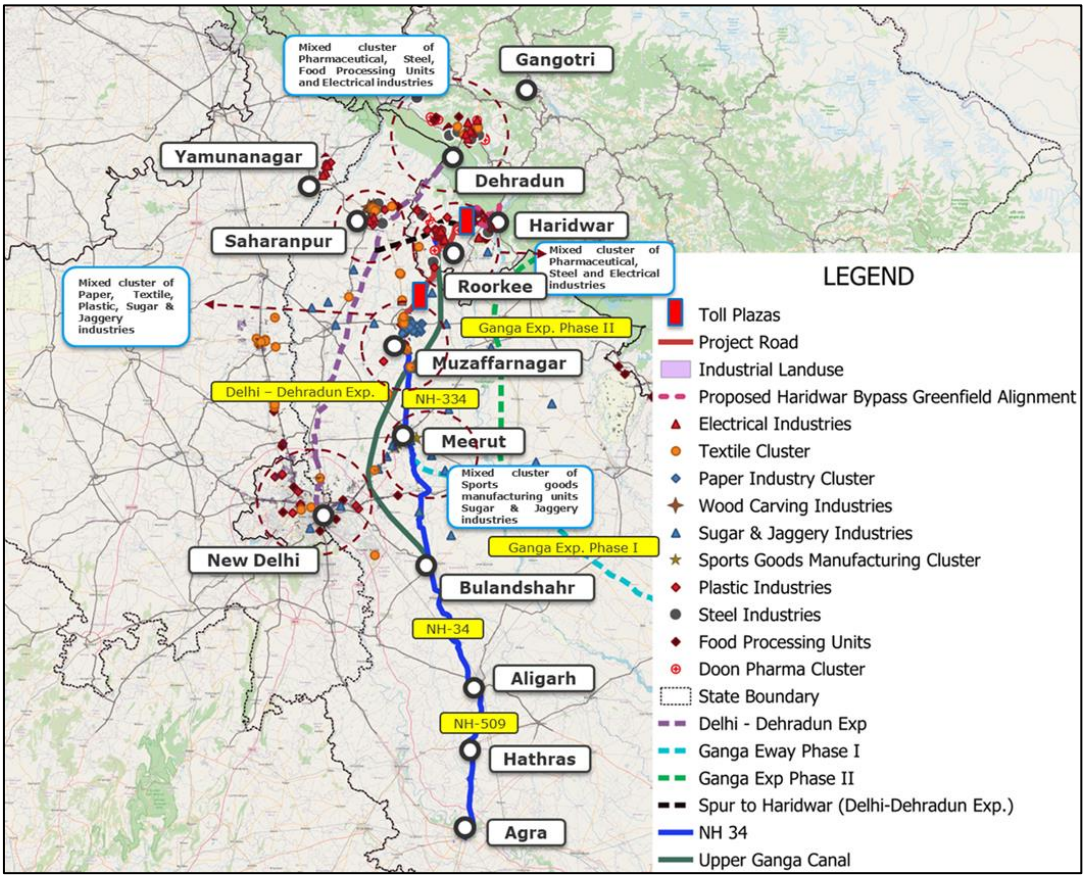


Figure 2-3: Industrial Profile of the Project Road

Upon studying the industrial profile of PR, it was observed that Muzaffarnagar district consists of mixed clusters of paper, textile, plastic, sugar and jaggery industries while Haridwar district consists of mixed clusters of pharmaceutical, steel and electrical industries.

2.3 Traffic Surveys

To understand the characteristics and the volume of traffic using the project road, data on road network, traffic and travel pattern of vehicles plying on the project road were collected through primary traffic surveys. Traffic volume video graphic survey for seven days and origin-destination (OD) survey as roadside interview for one day at toll plaza locations were initially conducted on the project road in August 2024. In addition, OD surveys were carried out at both the toll plazas in January 2025 to revalidate the travel pattern. The schedule of the traffic surveys and locations on the project road are given in **Table 2-1**.

Location	Chainage	Duration	Date(s)
Classified Traffic Volume Counts			
TP01 – Chhapar	km 138.55	7 Days	20th Aug–26th Aug 2024
TP02 – Bahadrabad	km 187.37		
Origin and Destination Survey - August 2024			
TP01 – Chhapar	km 138.55	1 Day	22nd Aug 2024
TP02 – Bahadrabad	km 187.37		
Additional Origin and Destination Survey - January 2025			
TP01 – Chhapar	km 138.55	1 Day	17th Jan 2025
TP02 – Bahadrabad	km 187.37		

Table 2-1: Traffic Survey Locations and Schedule

Trained enumerators were engaged for conducting traffic surveys under the supervision of experienced transport planner. The vehicle classification as generally used in the traffic surveys of NHAI studies along with their PCU values, as suggested in IRC: 64 – 1990, are presented in **Table 2-2**.

Vehicle Type	PCU Factor
Motorized Vehicles	
Car, Jeep, Van &Taxi	1.0
Two –Wheeler	0.5
Three-Wheeler (Auto-Rickshaw)	1.0
Mini-Bus/ School Bus	1.5
Govt. Bus/ Private Bus	3.0
Mini LCV/Max Pick Up	1.0
Light Commercial Vehicle (LCV)	1.5
2-Axle Truck	3.0
3-Axle Truck	3.0
Multi-Axle Vehicle (MAV 4-6 Axle)	4.5
HME	4.5
Agricultural Tractor	1.5
Agricultural Tractor with Trailer	4.5
Non – Motorised Vehicles	
Cycle	0.5
Cycle Rickshaw	2.0
Animal Drawn Cart	6.0

Table 2-2: Vehicle classification and PCU factors

2.4 Traffic Characteristics

The data collected from the traffic volume count survey was analysed in order to get the results with respect to existing traffic intensity, flow pattern, hourly variation, and composition of traffic on the study road network. The various traffic characteristics have been analysed under the following heads:

- Average Daily Traffic (ADT)
- Daily variation, Hourly variation, and Traffic composition
- Annual Average Daily Traffic (AADT)

2.4.1 Average Daily Traffic (ADT)

The traffic volume data collected at the toll plaza locations during the seven days survey has been analysed. The summary of ADT in terms of vehicles and PCUs is presented in **Table 2-3**.

Mode	TP01- Chhapar	TP02- Bahadrabad
Tollable vehicles		
Car/Jeep/Van/Taxi	17,534	19,904
Minibus	123	212
Standard Bus	1,310	1,471
Mini LCV	917	726
LCV	1,900	1,205
2 Axle	442	611
3 Axle	391	341
MAV (4-6 Axle)	1,205	622
HMV/ MAV (=>7 Axle)	4	10
Non Tollable vehicles		
Two-Wheeler	13,099	24,361
Auto Rickshaw	566	1,524
Agri. Tractors	228	286
Total Non-Motorised	152	233
Total Vehicles/PCUs		
Total Tollable Vehicles	23,827	25,103
Total Non Tollable Vehicles	14,045	26,405
Total Vehicles	37,873	51,508
Total PCU	42,685	53,452
Tollable PCU	33,359	32,871

Table 2-3: Average Daily Traffic at TP01 & TP02

- The observed total vehicles are around 37,873 and 51,508 at TP01 and TP02 respectively.
- Car traffic has a share of around 46.3 percent (17,534 vehicles) and 38.6 percent (19,904 vehicles) at TP01 and TP02 respectively.
- Total freight vehicles account for a share of 13.4 percent at TP01 and 7.4 percent at TP02. Within the freight traffic, MAV accounts for about 3.2 percent (1,205 vehicles) and 1.2 percent (622 vehicles) at TP01 and TP02 respectively.
- The tollable traffic recorded at TP01 and TP02 is about 63 percent and 49 percent respectively.
- Other motorised non-tollable vehicles (two-wheeler, auto rickshaw and tractor) account for about 37.1 percent at Chhapar toll plaza and 51.3 percent at Bahadrabad toll plaza.

2.4.2 Daily Variation, Hourly Variation, and Traffic Composition

The day wise variation, hourly variation and the traffic composition at the toll plaza locations is presented in **Figure 2-4**.

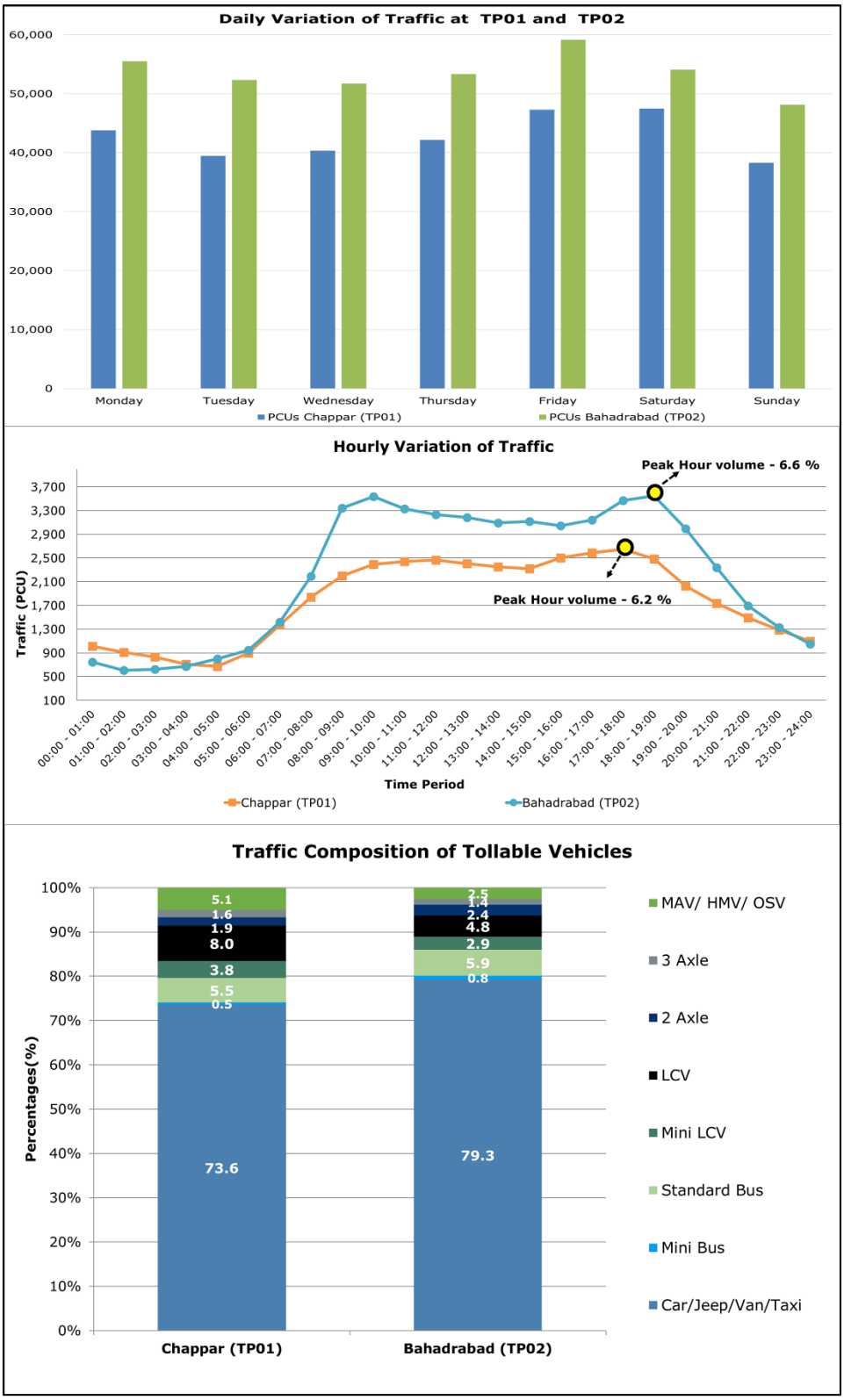


Figure 2-4: Daily Variation, Hourly Variation and Traffic Composition at TP01 & TP02

- The directional distribution at the toll plaza locations is almost equal with Muzaffarnagar-Haridwar having a directional distribution of 51.1 percent at TP01 and 48.9 percent at TP02.
- The peak hour at both the toll plazas was observed to be in the evening with TP01 and TP02 to be observed between 17:00-18:00 and 18:00-19:00 respectively.

- In case of passenger traffic, car traffic has a share of about 73.6 percent at TP01 and 79.3 percent at TP02. While bus traffic has a share of about 5.5 and 5.9 percent at TP01 and TP2 respectively.
- In case of freight traffic, MAVs have a share of about 5.1 percent at TP01 and 2.5 percent at TP02.

2.4.3 Comparison of Toll Data with TVC

ETC vs TVC Excluding Cash and Exemptions Traffic

The TVC survey was conducted from 20th August 2024 to 26th August 2024. A comparison of the average of 7 days between TVC and Toll Data of the survey dates is presented in **Table 2-4**.

Day/Date	CJV	LCV/ Minibus	2A/Bus	3A	MAV/ OSV	Total	PCU
TP01- Chhapar							
Toll Data (ETC)	13,978	797	2,486	388	1,245	18,895	29,401
TVC	18,451	2,023	1,752	391	1,209	23,827	33,359
Variation (Toll data minus TVC)	-4,473	-1,226	734	-4	36	-4,932	-3,958
Variation (%)	-24.2	-60.6	41.9	-0.9	3.0	-20.7	-11.9
TP02- Bahadrabad							
Toll Data (ETC)	11,737	640	2,314	323	644	15,658	23,506
TVC	20,630	1,418	2,081	341	633	25,103	32,871
Variation (Toll data minus TVC)	-8,893	-778	233	-18	11	-9,445	-9,366
Variation (%)	-43.1	-54.8	11.2	-5.3	1.7	-37.6	-28.5

Table 2-4: Comparison Between TVC and ETC Data Excluding Cash & Exempted Traffic

The variation in total traffic is about 21 percent (at TP01) and 38 percent (at TP02) on an average per day between the toll plaza count and videography. The comparison shows TVC is higher than ETC in almost all the modes except 2A/ Bus category. The ETC data does not include traffic under exemptions and violations. The variation between LCV and trucks could be attributed to cross classifications between these categories of vehicles.

ETC vs TVC Including Cash and Exemptions Traffic

A comparison between TVC and ETC data (7-day average) including cash and exempted traffic for the days of survey is presented in **Table 2-5**.

Day/Date	CJV	LCV/ Minibus	2A/ Bus	3A	MAV/ OSV	Total	PCU
TP01- Chhapar							
Toll Data (ETC)	18,552	890	2,540	390	1,253	23,624	34,314
TVC	18,451	2,023	1,752	391	1,209	23,827	33,359
Variation (Toll data minus TVC)	101	-1,133	787	-1	44	-203	956
Variation (%)	0.5	-56.0	44.9	-0.4	3.6	-0.9	2.9
TP02- Bahadrabad							
Toll Data (ETC)	18,279	703	2,396	331	650	22,359	30,440
TVC	20,630	1,418	2,081	341	633	25,103	32,871
Variation (Toll data minus TVC)	-2,351	-715	315	-10	17	-2,744	-2,431
Variation (%)	-11.4	-50.4	15.1	-3.1	2.7	-10.9	-7.4

Table 2-5: Comparison Between TVC and ETC Data Including Cash & Exempted Traffic

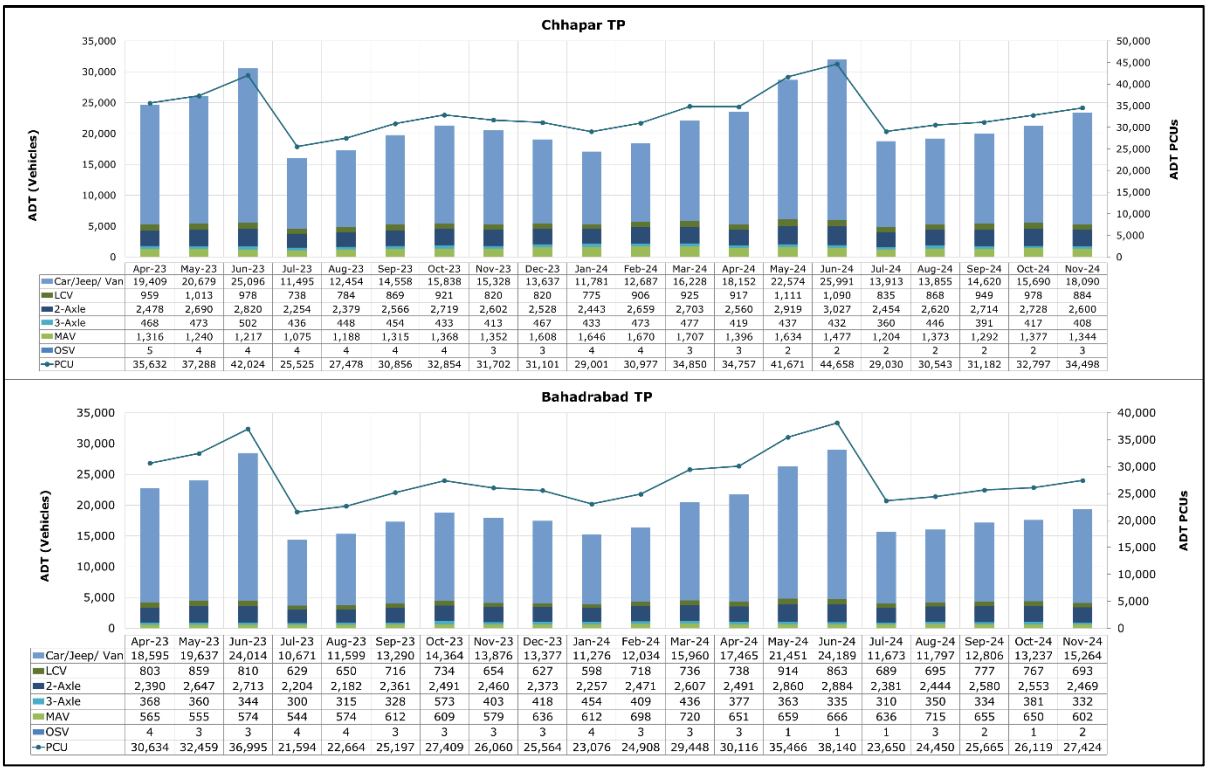
The comparison of TVC vs ETC in total traffic after adding cash and exempted traffic shows lesser variation than earlier comparison at TP01, whereas TP02 still shows a gap of about 10.9 percent on an average per day between the ETC data and TVC count.

2.4.4 Annual Average Daily Traffic (AADT)

The traffic plying on any road generally varies over different periods of the year depending on the cycle of different socio-economic activities in the regions through which it passes. Therefore, in order to have a more realistic picture of the traffic on the project road, it is required to assess its seasonal variation to estimate the annual average daily traffic (AADT).

The past toll traffic data for the toll plaza was made available by the client from August 2022 to November 2024 as presented in **Appendix 2.1**.

The month-on-month mode-wise traffic for the period from April 2023 to November 2024 is presented in **Figure 2-5**.



	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24
Car/Jeep/ Van	19,409	20,679	25,096	11,495	12,454	14,558	15,838	15,328	13,637	11,781	12,687	16,228	18,152	22,574	25,991	13,913	13,855	14,620	15,690	18,090
LCV	959	1,013	978	738	784	869	921	820	820	775	906	925	917	1,111	1,090	835	868	949	978	884
2-Axle	2,478	2,690	2,820	2,254	2,379	2,566	2,719	2,602	2,528	2,443	2,659	2,703	2,560	2,919	3,027	2,454	2,620	2,714	2,728	2,600
3-Axle	468	473	502	436	448	454	433	413	467	433	473	477	419	437	432	360	446	391	417	408
MAV	1,316	1,240	1,217	1,075	1,188	1,315	1,368	1,352	1,608	1,646	1,670	1,707	1,396	1,634	1,477	1,204	1,373	1,292	1,377	1,344
OSV	5	4	4	4	4	4	4	3	3	4	4	3	3	2	2	2	2	2	2	3
PCU	35,632	37,288	42,024	25,525	27,478	30,856	32,854	31,702	31,101	29,001	30,977	34,850	34,757	41,671	44,658	29,030	30,543	31,182	32,797	34,498

	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24
Car/Jeep/ Van	18,595	19,637	24,014	10,671	11,599	13,290	14,364	13,876	13,377	11,276	12,034	15,960	17,465	21,451	24,189	11,673	11,797	12,806	13,237	15,264
LCV	803	859	810	629	650	716	734	654	627	598	718	736	738	914	863	689	695	777	767	693
2-Axle	2,390	2,647	2,713	2,204	2,182	2,361	2,491	2,460	2,373	2,257	2,471	2,607	2,491	2,860	2,884	2,381	2,444	2,580	2,553	2,469
3-Axle	368	360	344	300	315	328	573	403	418	454	409	436	377	363	335	310	350	334	381	332
MAV	565	555	574	544	574	612	609	579	636	612	698	720	651	659	666	636	715	655	650	602
OSV	4	3	3	4	4	3	3	3	3	4	3	3	3	1	1	1	3	2	1	2
PCU	30,634	32,459	36,995	21,594	22,664	25,197	27,409	26,060	25,564	23,076	24,908	29,448	30,116	35,466	38,140	23,650	24,450	25,665	26,119	27,424

Figure 2-5: Month on Month Traffic Data for TP01 and TP02

The AADT for FY25 is estimated by annualizing the ETC data from April 2024 to November 2024. It is to be noted that due to the Kawar Yatra in the month of July/August, both toll plazas are closed for tolling for around 5-8 days and thus, in estimation of AADT, those days have not been considered.

The past ETC traffic data of adjacent section of Siwaya TP as available with Ramboll, has also been studied and the traffic profile was found to be similar with relation to Chhapar TP. For TP01-Chhapar, a SCF based on 8–12-month factor derived from the average of FY23 and FY24 ETC traffic data of Siwaya TP, has been adopted.

In case of TP02-Bahadrabad, an 8–12-month SCF has been derived based on the average of FY23 and FY24 ETC traffic data.

Additionally, cash and exempt traffic for FY25 (Apr to Oct) has been added to the estimated AADT of ETC traffic of Chhapar and Bahadrabad toll plazas.

The AADT of FY25 along with the Seasonal Correction Factor (SCF), Average Daily Traffic (ADT), cash traffic and exempt traffic for respective months of FY25 is presented in **Table 2-6**.

Particulars		CJV	LCV	2-Axle	3-Axle	MAV	OSV	PCUs
TP01 – Chhapar								
A.	ADT FY25 (April - Nov)-ETC	17,861	954	2,703	414	1,387	2	34,894
B.	SCF (8-12 Month Factor)-Siwaya TP - Avg. of FY23 & FY24	0.97	0.98	1.00	1.05	1.05	1.05	
C.	ETC*SCF = A*B	17,333	931	2,706	433	1,452	2	34,690
D.	Cash (April 24 - Oct 24)	19	2	2	1	1	1	40
E.	Exempt (April 24 - Oct 24)	5,273	90	175	3	7	1	5,978
F.	AADT FY25 (Estimated) = C+D+E	22,624	1,023	2,883	437	1,460	5	40,711
TP02 - Bahadrabad								
A.	ADT FY25 (April - Nov)-ETC	15,985	767	2,583	348	654	2	28,881
B.	SCF (8-12 Month Factor)-Bahadrabad TP - Avg. of FY23 & FY24	0.94	0.96	1.00	1.03	1.05	1.05	
C.	ETC*SCF = A*B	15,020	735	2,580	356	685	2	28,022
D.	Cash (April 24 - Oct 24)	173	8	3	1	1	1	206
E.	Exempt (April 24 - Oct 24)	6,980	81	68	10	10	1	7,385
F.	AADT FY25 (Estimated) = C+D+E	22,173	823	2,651	368	697	4	35,619

Table 2-6: AADT for FY25

2.5 Travel Characteristics

2.5.1 Survey Methodology

To understand the travel demand pattern in the region and tollable traffic streams, Origin and destination (OD) surveys were carried out at the toll plaza locations. The OD survey was carried out for 24 hours, by roadside interview method as described in IRC: 102-1988. Both passenger and commercial vehicles plying on the project road were stopped on a random sampling basis and interviewed.

The travel characteristics obtained by OD survey facilitate the identification of:

1. Local and through traffic on the project road.
2. Potential divertible traffic to/from project road to various alternative routes.

Trained enumerators under the supervision of transport planners collected the trip characteristics using survey forms designed for this purpose. The OD survey elicited characteristics like origin, destination, frequency, purpose of trip for passenger vehicles and commodity being transported for goods vehicles. The information pertaining to origin and destination of trips collected during roadside interviews was analysed to obtain the trip distribution based on a zoning system suitably designed for the present study.

2.5.2 Traffic Zoning System

To understand the spatial dimensions of the trip characteristics of the vehicles interviewed during the O-D survey, a detailed zoning system was developed giving due consideration to the following factors:

- The road network catering to the traffic on the project road and its generating points
- Important towns, villages, factories, and industrial centres around the project road area
- Administrative boundaries of districts and states.
- Configuration of the project road in the regional road network with respect to other roads

Two major types of areas were identified for analysis purpose: -

Immediate Influence Area (IIA): It includes the cities/towns/villages and districts along the project road and adjacent to it, which generate/attract trips to the project road. In this study, it consists of districts Muzaffarnagar, Haridwar, Baghpat, Bijnor, Meerut, Saharanpur and Dehradun in the state of Uttar Pradesh and Uttarakhand.

Broad Influence Area (BIA): It includes the remaining districts of Uttar Pradesh Uttarakhand and remaining states of India.

Detailed zoning system is prepared for IIA, while more aggregate or broad zoning is developed for BIA. The zoning system adopted for data collection was based on 94 zones and is presented in **Appendix 2.2**. The zoning map is presented as **Figure 2-6**.

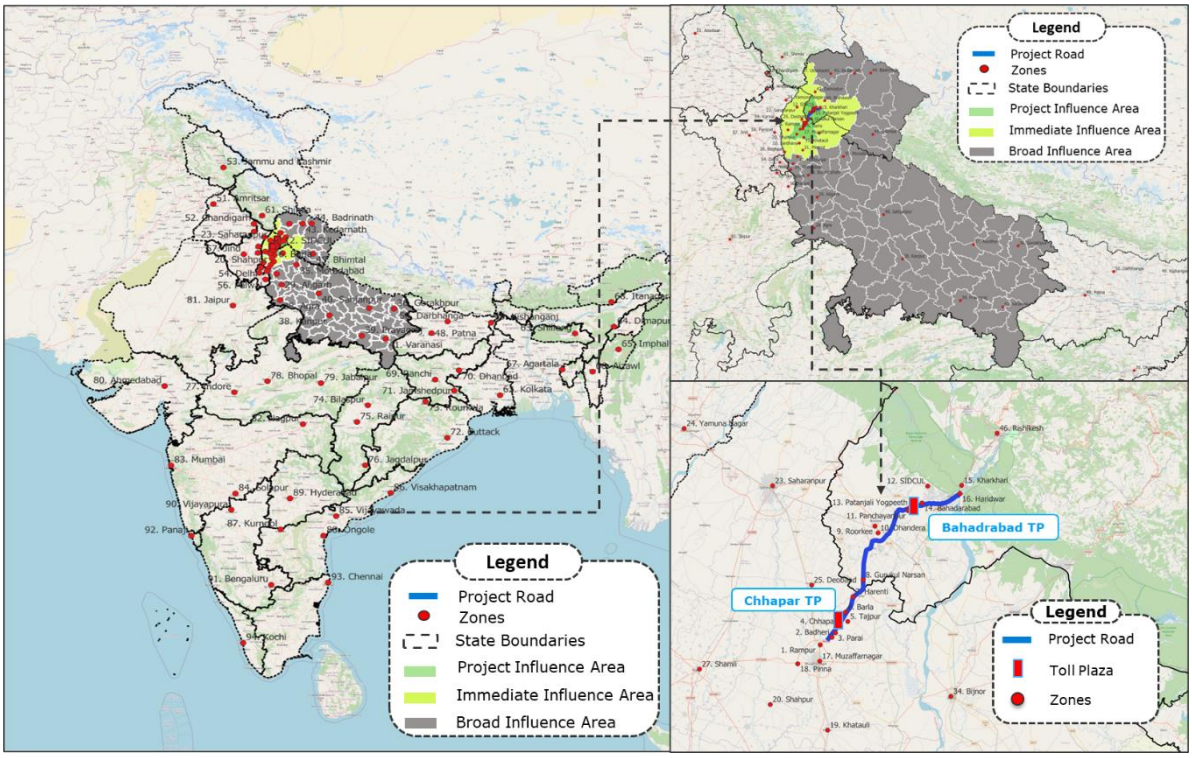


Figure 2-6: Zoning Map

2.5.3 Sample Size

The toll traffic data does not provide the individual traffic volume count of all categories of vehicles. The seven-day traffic volume video count at the existing toll plazas was analysed to get the individual volume count of all categories of vehicles along with the direction split.

The vehicles during the OD surveys were interviewed on a random sample basis. **Table 2-7** shows the AADT and the sample size (both in absolute numbers and in percentage terms) captured during the exercise.

Modes	Car	M Bus	Bus	MLCV	LCV	2A	3A	MAV/ OSV	Total
TP01- Chhapar									
Sample	3,656	454	217	692	449	1,165	388	923	7,944
AADT	21,091	514	233	1,533	509	2,649	437	1,465	28,432
Percentage	17.3	88.3	92.9	45.1	88.2	44.0	88.8	63.0	27.9
TP02- Bahadrabad									
Sample	4,052	329	210	761	219	962	273	463	7,269
AADT	20,338	449	365	1,835	374	2,286	368	701	26,715
Percentage	19.9	73.2	57.6	41.5	58.6	42.1	74.2	66.1	27.2

Table 2-7: Sample Size Collected in OD Survey at TP01 & TP02

Based on the sample size of different categories of vehicles interviewed during the OD survey, direction-wise expansion factors were calculated based on FY25 AADT. The OD matrices for all vehicle categories were generated and analysis was done in terms of regional distribution, travel pattern and commodity distribution.

2.5.4 Regional Distribution

Based on the OD matrices, the regional distribution of tollable vehicles at the toll plaza locations has been calculated. **Table 2-8** gives the distribution indicating the attraction and generation zones for the traffic on the project road.

Region/Modes	Car	M Bus	Bus	MLCV	LCV	2A	3A	MAV
TP01- Chhapar								
Uttarakhand	45.7	48.2	48.0	45.4	49.2	48.3	48.2	48.4
Uttar Pradesh	32.8	19.3	23.4	37.0	27.6	30.6	29.0	26.5
Delhi	15.5	24.8	21.0	10.4	12.8	11.3	9.7	9.7
Haryana	3.9	4.1	3.3	4.1	5.6	5.4	6.4	5.3
Rajasthan	0.8	2.7	3.1	1.4	1.5	1.7	3.4	5.2
Maharashtra	0.2	0.2	0.4	0.0	1.2	0.8	0.8	1.5
Gujarat	0.2	0.0	0.2	0.4	0.4	0.6	0.5	1.3
Rest of India	0.8	0.7	0.6	1.3	1.7	1.3	2.0	2.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
TP02- Bahadrabad								
Uttarakhand	68.1	61.8	60.7	72.7	64.6	70.2	65.9	63.6
Uttar Pradesh	12.3	17.6	17.4	14.3	14.3	12.7	12.8	11.0
Delhi	10.1	11.9	13.9	6.2	9.0	5.9	5.3	7.5
Haryana	5.3	6.2	5.6	3.1	8.6	4.5	6.6	4.8
Rajasthan	1.0	0.4	0.3	0.4	1.5	1.3	3.2	3.2
Maharashtra	0.2	0.0	0.4	0.3	0.7	1.1	1.7	2.3
Gujarat	0.2	0.0	0.0	0.7	0.0	1.4	3.3	2.7
Rest of India	2.8	2.1	1.7	2.3	1.3	3.0	1.3	5.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Combined (Avg. TP01 & TP02)								
Uttarakhand	56.7	54.6	55.7	60.3	55.7	58.5	56.3	53.3
Uttar Pradesh	22.8	18.5	19.7	24.6	22.0	22.3	21.6	21.5
Delhi	12.9	18.8	16.7	8.1	11.2	8.8	7.7	9.0
Haryana	4.6	5.1	4.7	3.6	6.9	5.0	6.5	5.1
Rajasthan	0.9	1.7	1.4	0.8	1.5	1.5	3.3	4.6
Maharashtra	0.2	0.1	0.4	0.2	1.0	0.9	1.2	1.7
Gujarat	0.2	0.0	0.1	0.5	0.2	1.0	1.8	1.8
Rest of India	1.8	1.3	1.3	1.9	1.5	2.1	1.7	3.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 2-8: Regional Distribution of Tollable Traffic (in %) On Project Road

Passenger traffic:

- Car traffic at both the toll plaza locations is majorly from Uttarakhand (45.7 percent at TP01 and 68.1 percent at TP02) followed by Uttar Pradesh (32.8 percent at TP01 and 12.3 percent at TP02).
- In case of Bus traffic, Uttarakhand contributes about 48.0 percent at TP01 and 60.7 at TP02 respectively, followed by Uttar Pradesh with around 17-23 percent at Chhapar and Bahadrabad TP.

Freight Traffic

- Around 45.4 percent of MLCV at TP01 and 72.7 percent at TP02 are from Uttarakhand followed by Uttar Pradesh accounting for around 37.0 and 14.3 at TP01 and TP02 respectively.
- In case of 2A/3A trucks, Uttarakhand contributes around 48 percent followed by Uttar Pradesh with 30-31 percent at Chhapar TP and at Bahadrabad TP, Uttarakhand contributes to about 66-70 percent followed by Uttar Pradesh contributing about 13 percent.
- In case of MAVs, Uttarakhand accounts for about 48.4 percent at TP01 and 63.6 percent at TP02. The state of Uttar Pradesh contributes around 26.5 percent at TP01 and 11 percent at TP02, followed by Delhi accounting to about 8-10 percent at TP01 and TP02.

- MAVs are observed to be having Muzaffarnagar/Delhi/Ghaziabad/Noida- Roorkee as top OD pair at Chhapar toll plaza and Delhi/Ghaziabad/Noida/Roorkee-SIDCUL/Haridwar as top OD pair at Bahadrabad toll plaza.

The mode wise top 20 OD pairs are given in **Appendix 2.3**.

2.5.5 Travel Pattern

To assess the travel pattern of vehicles, the important streams of traffic plying on the project road are estimated. The list of the popular movements found at the toll plaza locations is presented in **Table 2-9**.

Sr. No.	Traffic Streams	Car	MBus	Bus	MLCV	LCV	2A	3A	MAV
TP01-Chhapar									
1	Meerut/Muzaffarnagar/Panipat and surroundings to Roorkee and surroundings	32.7	8.3	10.6	29.4	18.7	29.3	18.2	23.7
2	Meerut/Muzaffarnagar/Panipat and surroundings to SIDCUL/Haridwar/Rishikesh and Beyond	14.8	23.2	24.8	26.1	22.4	15.9	28.1	11.6
3	Meerut/Muzaffarnagar/Panipat and surroundings to West UP & Beyond	0.3	0.0	0.3	0.1	0.0	0.1	0.2	0.0
4	Meerut/Muzaffarnagar/Panipat and surroundings to Dehradun & surroundings	4.5	4.6	3.5	3.2	3.6	4.3	3.1	6.2
5	Delhi/Ghaziabad/Noida and surroundings to Roorkee and surroundings	16.0	4.2	6.2	20.2	23.1	25.7	22.0	21.0
6	Delhi/Ghaziabad/Noida and surroundings to SIDCUL/Haridwar/Rishikesh and Beyond	19.0	30.4	33.2	8.8	15.0	10.0	11.7	7.5
7	Delhi/Ghaziabad/Noida and surroundings to West UP & Beyond	0.1	0.7	0.0	0.0	0.0	0.4	0.0	0.2
8	Delhi/Ghaziabad/Noida and surroundings to Dehradun & Surroundings	6.6	20.3	12.0	4.3	6.0	4.9	2.4	7.4
9	East UP to Roorkee and surroundings	1.6	0.0	0.0	1.4	1.6	0.8	0.7	1.2
10	East UP to SIDCUL/Haridwar/Rishikesh and Beyond	0.8	1.3	1.8	1.0	1.9	0.5	0.5	1.8
11	East UP to West UP & Beyond	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
12	East UP to Dehradun & Surroundings	0.3	0.4	0.0	0.2	0.2	0.2	0.2	0.5
13	Rajasthan/Central/South India to Roorkee and surroundings	0.6	0.0	0.0	1.6	1.9	2.1	2.3	10.8
14	Rajasthan/Central/South India to SIDCUL/Haridwar/Rishikesh and Beyond	2.4	5.2	3.9	3.3	4.5	3.0	9.8	6.4

Sr. No.	Traffic Streams	Car	MBus	Bus	MLCV	LCV	2A	3A	MAV
15	Rajasthan/Central/South India to West UP & Beyond	0.1	0.2	0.0	0.1	0.0	0.2	0.0	0.0
16	Rajasthan/Central/South India to Dehradun & surroundings	0.1	1.2	3.7	0.3	1.1	2.6	0.8	1.5
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
TP02- Bahadrabad									
1	Meerut/Muzaffarnagar/Panipat and surroundings to SIDCUL/Haridwar/Rishikesh and Beyond	18.2	23.8	28.3	16.7	23.6	17.5	18.3	17.3
2	Meerut/Muzaffarnagar/Panipat and surroundings to Dehradun & surroundings	2.0	1.6	0.4	1.7	0.9	1.2	1.5	1.1
3	Delhi/Ghaziabad/Noida and surroundings to SIDCUL/Haridwar/Rishikesh and Beyond	22.2	26.1	28.3	16.7	27.5	17.5	19.4	19.9
4	Delhi/Ghaziabad/Noida and surroundings to Dehradun & surroundings	3.9	1.5	3.1	2.4	2.2	0.9	1.1	1.9
5	Roorkee and surroundings to SIDCUL/Haridwar/Rishikesh and Beyond	43.7	41.5	34.8	51.2	36.5	46.1	37.3	34.3
6	Roorkee and surroundings to Dehradun & surroundings	4.2	2.5	2.2	3.9	2.7	3.1	1.8	2.4
7	West UP/Punjab & Beyond to SIDCUL/Haridwar/Rishikesh and Beyond	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	West UP/Punjab & Beyond to Dehradun & surroundings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	East UP to SIDCUL/Haridwar/Rishikesh and Beyond	1.6	1.5	1.0	2.6	1.3	2.9	2.2	3.0
10	East UP to Dehradun & surroundings	0.0	0.0	0.0	0.1	0.0	0.0	0.4	0.0
11	Rajasthan/Central/South India to SIDCUL/Haridwar/Rishikesh and Beyond	3.7	1.5	1.8	4.0	4.0	9.7	16.6	18.4
12	Rajasthan/Central/South India to Dehradun & surroundings	0.4	0.0	0.0	0.7	1.3	1.1	1.4	1.7
Total		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 2-9: Traffic Streams (%) at TP01 and TP02

Passenger Traffic:

- At TP01 (Stream 1), around 32.7 percent of car traffic was found plying between Meerut/Muzaffarnagar/Panipat and surroundings to/from Roorkee and surroundings.

- The car traffic from/to Delhi/Ghaziabad/Noida and surroundings to/from SIDCUL/Haridwar/Rishikesh and Surroundings is about 19-22 percent at TP01 (Stream 6) and TP02 (Stream 3).
- At TP01 (Stream 2) and TP02 (Stream 1), around 15-18 percent of car traffic was found plying between Meerut/Muzaffarnagar/Panipat and surroundings to/from SIDCUL/Haridwar/Rishikesh and surroundings.
- At TP02 (Stream 5), around 43.7 percent of car traffic was found plying between Roorkee and surroundings to SIDCUL/Haridwar/Rishikesh and Beyond.
- About 28-33 percent of Bus traffic at TP01 (Stream 6) and TP02 (Stream 3) was found to be travelling from/to Delhi/Ghaziabad/Noida and surroundings to/from SIDCUL/Haridwar/Rishikesh and surroundings.
- At TP01 (Stream 2) and TP02 (Stream 1), around 25-28 percent of Bus traffic was found plying between Meerut/Muzaffarnagar/Panipat and surroundings to/from SIDCUL/Haridwar/Rishikesh and surroundings.

Freight Traffic:

- At TP01 (Stream 2) and TP02 (Stream 1) about 22-24 percent of LCVs were found plying between Meerut/Muzaffarnagar/Panipat and surroundings to/from SIDCUL/Haridwar/Rishikesh and surroundings.
- At TP02 (Stream 5), about 46.1 percent of 2A trucks were found plying between Roorkee and surroundings to/from SIDCUL/Haridwar/Rishikesh and Beyond.
- At TP01 (Stream 2) 28.1 percent and TP02 (Stream 1) 18.3 percent of 3A trucks were found plying between Meerut/Muzaffarnagar/Panipat and surroundings to/from SIDCUL/Haridwar/Rishikesh and surroundings.
- 3A trucks from/to Rajasthan/Central/South India to/from SIDCUL/Haridwar/Rishikesh and surroundings is about 10-17 percent at TP01 (Stream 14) and TP02 (Stream 11).
- In case of MAVs, around 8 and 20 percent at TP01 (Stream 6) and TP02 (Stream 3) respectively, were found to be plying between Delhi/Ghaziabad/Noida and surroundings to SIDCUL/Haridwar/Rishikesh and surroundings.
- At TP02 (Stream 5), around 34.3 percent of MAVs were found plying between Roorkee and surroundings to SIDCUL/Haridwar/Rishikesh and Beyond.

It is worth mentioning that the results of additional OD surveys carried out in January 2025 are similar to those observed in August 2024. The regional distribution and traffic streams from additional OD surveys are presented in **Appendix 2.4.**

2.5.6 Commodity Distribution

Analysis was also carried out to understand the different commercial vehicles being used to transport different commodities. The direction wise commodity distribution for the two toll plazas is presented in **Appendix 2.5**.

The commodity distribution for TP01 and TP02 is presented in **Figure 2-7**.



Figure 2-7: Commodity Distribution at TP01 and TP02

- Major commodities being transported across both the toll plazas are iron and steel, consumer items, industrial products and equipment's, petroleum/gas products, parcels etc.

TP01:

- Around 12-18 percent of LCVs, 2A, and 3A trucks are found to be transporting parcels with OD pairs are between Roorkee-Meerut, Haridwar-Delhi and Roorkee-Delhi.
- In case of petroleum products around 9-13 percent of 3A trucks and MAVs are transporting them as a commodity. Major OD pairs found are between Roorkee-Muzaffarnagar.
- Around 8-13 percent of LCVs and 2A trucks are transporting industrial products with major OD pairs found are between Roorkee-Delhi and Roorkee-Muzaffarnagar.
- Around 12 percent of MAVs are transporting building materials as a commodity. Major OD pairs found are between Roorkee- Muzaffarnagar.
- Around 8 percent of 3A/MAVs are found to be transporting iron and steel. Major OD pairs are between Roorkee-Muzaffarnagar.

TP02:

- Around 18-21 percent of LCVs/3A/MAVs are found to be transporting iron and steel. Major OD pairs are between Haridwar-Panipat, Haridwar-Ahmedabad and Roorkee-Bahadrabad.
- In case of petroleum products around 8-11 percent of 2A/3A trucks and MAVs are transporting them as a commodity. Major OD pairs found are between Roorkee-Haridwar and Roorkee-Bahadrabad.
- Around 9-10 percent of LCVs and 2A trucks are transporting industrial products with major OD pairs found are between SIDCUL-Delhi and Haridwar-Muzaffarnagar.
- Around 9 percent of MAVs are transporting building materials as a commodity. Major OD pairs found are between Haridwar-Chandigarh.
- Around 6-9 percent of LCVs, 2A trucks are found to be transporting parcels with OD pairs are between Haridwar-Delhi and Roorkee-Haridwar.

The distribution of building materials on the project is presented in **Table 2-10** and the major components are found to be sand and cement from the OD survey data.

Commodities	MLCV	LCV	2A	3A	MAV
TP01-Chhapar					
Sand	22.6	25.0	36.1	42.5	24.2
Marble	6.5	6.8	11.1	7.5	1.1
Cement	51.6	47.7	50.0	47.5	70.3
Other Building Materials - Bricks, Chips, Tiles	19.4	20.5	2.8	2.5	4.4
Total	100.0	100.0	100.0	100.0	100.0
BM % Of total commodity	4.8	5.1	5.6	5.4	12.2
TP02-Bahadrabad					
Sand	0.0	15.4	4.8	7.1	0.0
Cement	55.6	84.6	85.7	92.9	100.0
Other Building Materials - Bricks, Chips, Tiles	44.4	0.0	9.5	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0
BM % Of total commodity	2.8	3.2	3.4	3.7	9.1

Table 2-10: Distribution (%) of Building Materials on Project Road

In case of TP01, about 47-52 percent of all MLCV/LCV/2A/3A trucks and 70 percent of MAVs transporting building materials, are found to be carrying cement with major OD pairs between Haridwar-Delhi, Haridwar-Meerut and Roorkee-Meerut.

Among all the trucks carrying building materials, about 36-43 percent of 2A/3A trucks at TP01 are transporting sand with major OD pairs between Bhagwanpur-Delhi, Manglaur-Meerut and Roorkee-Meerut.

In case of TP02, more than 85 percent of all heavy freight vehicles carrying building materials are found to be transporting cement as a commodity with major OD pairs between Haridwar-Delhi, Haridwar-Meerut and Roorkee-Meerut. Additionally, about 44 percent of MLCVs are found to be transporting other building materials which include bricks, chips, tiles, etc.

3. TRAFFIC GROWTH RATE AND PROJECTIONS

3.1 General

The project road is a part of the NHAI InvIT Round 4 portfolio and the projections of traffic and revenue have been presented till FY55 in line with the maximum extendable concession period of 30 years. The estimation of the traffic using the tolled highway, and its future growth are important elements to assess the project's economics as these are generally the main/sole source of revenue for the project This chapter details various aspects of the current traffic of the project road and its growth potential as assessed by Ramboll.

3.2 Project Road Traffic

The traffic that is likely to use the project road was estimated on the basis of the traffic and travel characteristics gathered as part of the study. The traffic on the project road would normally consist of the following components:

- Normal Traffic
- Diverted Traffic
- Induced/Developmental Traffic

3.2.1 Normal Traffic

Normal traffic is the traffic which is already plying on the project road as assessed in section 2.4.4.

3.2.2 Diverted Traffic

Diverted traffic is generally dictated by the presence of an alternative route at a lower generalised cost, which is in-turn defined by the road configuration and its condition, the type of vehicle and its operating costs, the average riding speed, the route distance, and any tolling that may apply on a specific route. A detailed road network assessment along with site reconnaissance survey was conducted on the project road and vicinity to identify alternate routes.

The assessment of any likely traffic diversion from/to the Project Road (PR) has been done using the cost-ratio analysis as described below:

- Assessment of the potential divertible traffic sensitive to network improvements based on the observed travel pattern.
- Calculation of road user cost of travelling on the project road and the alternative route. The road user cost includes vehicle operating cost (VOC), travel time cost (TTC) and toll cost (TC), if any. VOC comprises of the cost of fuel, spare parts, maintenance labour, tyre, engine oil, grease, fixed cost, depreciation and crew wages.

- The toll rates for expressway have been considered as 1.6 times the normal NHAI per km toll rates (accounting for 1.25 times for normal length of expressway and increase for the likely equivalent structure length).

The road user cost is estimated based on vehicle operating cost equations presented in IRC SP-30,2019 which is based on updation of Road User Cost Study (RUCS) carried out by Central Road Research Institute in 2019 for Ministry of Road Transport and Highways. Using the likely traffic stream speeds and lane configuration, the vehicle operating, and travel time costs are estimated for each of the routes. Road user cost on the identified routes is calculated and diversion percentages are estimated using diversion curve method mainly for trucks. In this method, traffic likely to be diverted from/to the project road, was estimated using Logit model, which computes expected diversion percentage based on the ratio of perceived cost on the existing and proposed facilities. The perceived cost is the financial vehicle operating cost and the time saving cost including toll charges (if any). According to the model, a vehicle will shift if the perceived cost on an alternative route is lower in comparison to existing route. The diversion equations for estimating diversion have been adopted from Indian National Expressway Network Report, MORTH (2009) as mentioned in IRC 108:2015. These equations are presented in **Table 3-1**.

Vehicle	Cost Ratio (CR) Interval	Equations
Truck	<= 0.750	% Div. = 100 - ((CR/0.75) * 5)
	0.750 <= CR <= 1.250	% Div. = 95 - ((CR-0.75)/0.5) * 90
	1.250 <= CR <= 2.0	% Div. = ((2-CR)/0.75) * 5

Source: IRC 108-2015

Table 3-1: Diversion Equations Used for Analysis

In case of project road, there are no short distance alternative route options in the vicinity of the toll plazas which could be used to bypass the project road toll plazas.

However, in wider context, there are three major developments in the project road network that could provide alternative route options for the traffic using the project road at present and may divert away to these routes once operational. These network level developments have been studied in detail and analysed to work out the impact on the PR traffic. The proposed network developments are:

A. Delhi-Dehradun Expressway - DDE (with spur to Haridwar)

B. Ganga Expressway Phase II

C. Upper Ganga Canal Road (Kawar Path)

A. Impact of Delhi-Dehradun Expressway (with spur to Haridwar)

The Delhi-Dehradun Expressway is one of the transformative infrastructure projects to enhance the connectivity between Delhi and Dehradun, 210 kilometres in length, is an under construction 12 lane (Phase-I) and 6 lane (Phase II, III & IV) access-controlled road by NHAI with a route alignment through Delhi, Uttar Pradesh & Uttarakhand. The expressway starts at Akshardham in Delhi and ends in Dehradun, Uttarakhand.

DDE is being developed in four phases -

- First phase from Akshardham to Baghpat with brownfield upgradation, 32 kms in length consisting of 12 lanes, includes 6 express and 6 local lanes.
- Second phase starts from Baghpat and ends at Saharanpur with greenfield alignment, 118 km in length and consists of 6 lanes.
- Third phase from Saharanpur to Ganeshpur with brownfield upgradation, 40 km in length and consists of 6 lanes.
- The last phase or fourth phase starts from Ganeshpur and ends at Dehradun with brownfield upgradation, 19.5 km in length and consists of 4/6 lanes.

The expressway is having 8 interchanges in total with other NHs, SHs. It also has one spur, Saharanpur Bypass-Haridwar (50.7 km), which increases the connectivity between Delhi and Haridwar. The proposed Delhi-Dehradun Expressway aims to tackle the persistent challenge of traffic congestion and disruptions caused by the submergence of the existing highways, especially during the monsoon season. The Delhi-Dehradun expressway is expected to be opened to traffic by July 2025, with the Haridwar spur segment scheduled for completion by September 2025.

The Haridwar spur of the Delhi-Dehradun Expressway is a significant extension designed to enhance connectivity between the main expressway and the holy city of Haridwar. This spur is approximately 50.7 kilometres long and will serve as a crucial link for travellers heading to Haridwar from the expressway. The spur begins at the 108-kilometer mark on the Delhi-Dehradun Expressway, just south of Saharanpur. It will pass north of Roorkee before terminating at the proposed Haridwar ring road.

Delhi-Dehradun Expressway with spur to Haridwar and interchanges is represented in **Figure 3-1**.

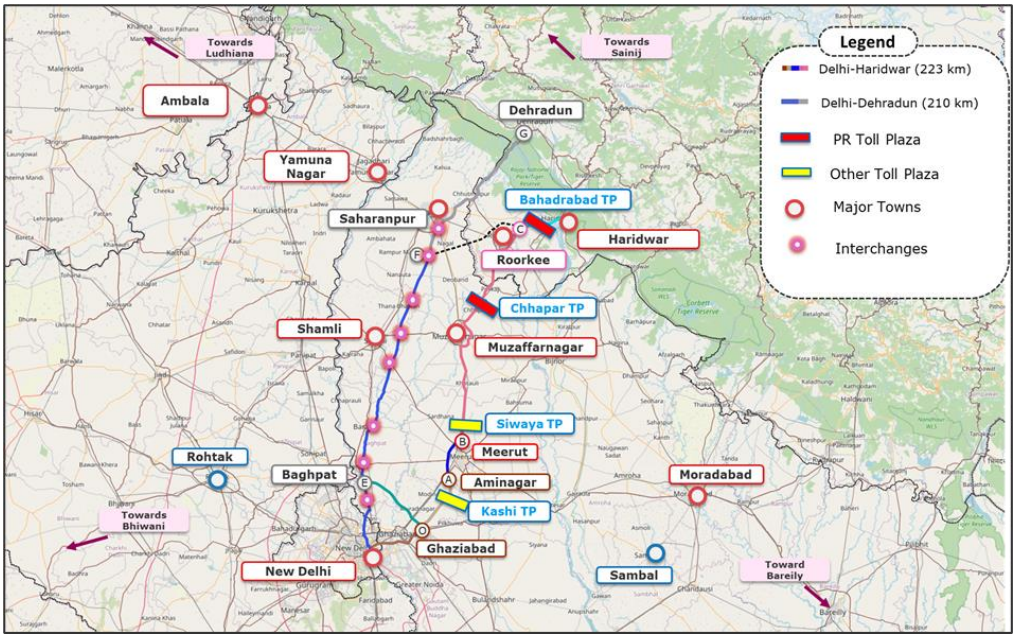


Figure 3-1: Delhi-Dehradun Expressway with Haridwar Spur

Saharanpur to Haridwar spur of DDE will be having an overlap of about 7 km with the project road section of Muzaffarnagar – Haridwar. The spur will be merging with NH-334 at chainage km 182.070 on the project road and will be an elevated section on PR till it lands through the spur after Bahadrabad toll plaza (km 187.370). It will diverge into service roads on each side continuing till km 188.900 and will merge with PR after Bahadrabad toll plaza. The merging of spur of DDE with NH-334 is represented in **Figure 3-2**.

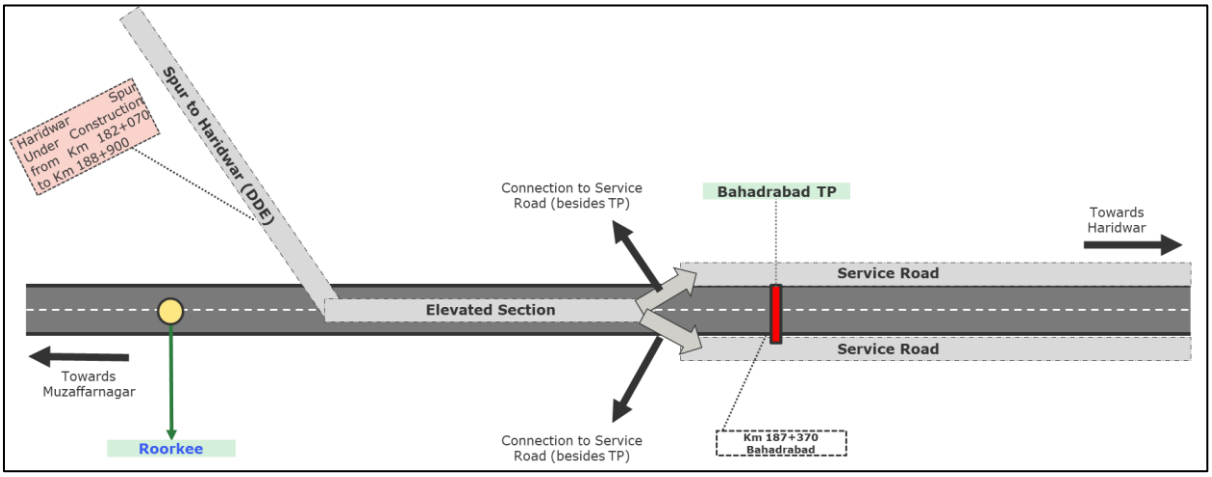


Figure 3-2: DDE Spur to Haridwar Merging with NH-334

The completion of Delhi Dehradun Expressway coupled with Haridwar spur corridor may provide an alternate route option to long distance traffic from/to Delhi NCR & beyond to/from Dehradun/Haridwar/Rishikesh & beyond.

For the traffic originating from North/ Northwest Delhi (considered 25 percent of Total Delhi traffic), the start point for taking the route via DDE has been considered as Wazirabad bridge and the start point for rest of Delhi (considered 75 percent of total Delhi traffic) has been considered as Akshardham.

The impact of completion of this corridor has been studied for two streams of traffic:

- Traffic from/to Delhi NCR & beyond to/from Dehradun & beyond (for Chhapar TP)
    - Northwest Delhi to Dehradun & beyond
    - Rest of Delhi/Noida/Gurgaon to Dehradun & beyond
    - Ghaziabad & surroundings to Dehradun & beyond
    - Panipat, Shamli & surroundings to Dehradun & beyond
    - Central/South India to Dehradun & beyond
    - Meerut & surroundings to Dehradun & beyond
    - Muzaffarnagar & surroundings to Dehradun & beyond
- Traffic from/to Delhi NCR & beyond to/from Haridwar/Rishikesh & beyond (for Chhapar and Bahadrabad TP)
    - Northwest Delhi to Haridwar/Rishikesh & beyond

- Rest of Delhi/Noida/Gurgaon to Haridwar/Rishikesh & beyond
- Ghaziabad & surroundings to Haridwar/Rishikesh & beyond
- Panipat, Shamli & surroundings to Haridwar/Rishikesh & beyond
- Central/South India to Haridwar/Rishikesh & beyond

A.I Route Choice between Delhi NCR & Beyond and Dehradun & Beyond For Chhapar TP

The route via project road and the alignment of the Delhi-Dehradun Expressway for Dehradun & Beyond traffic is presented in **Figure 3-3**.

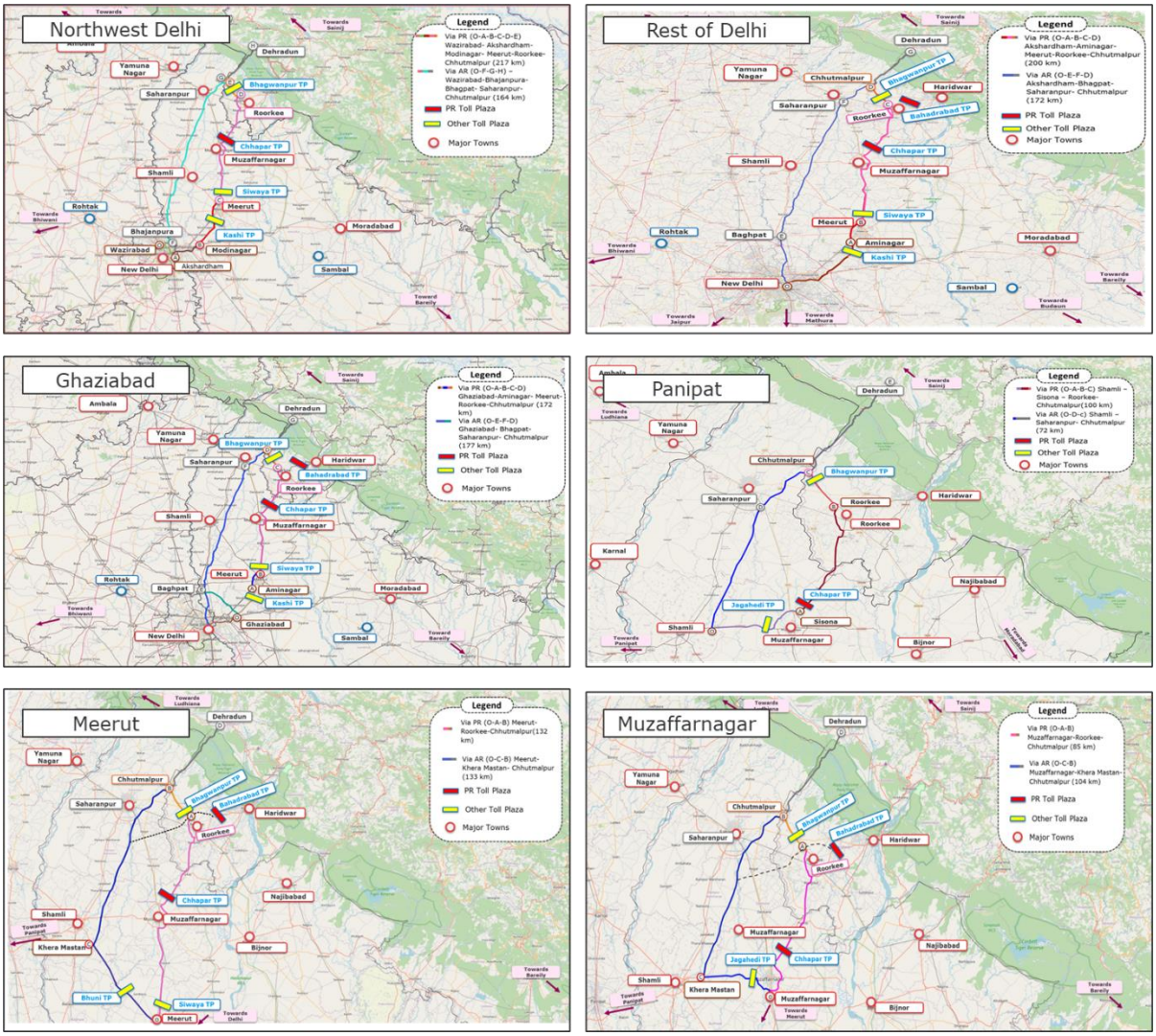


Figure 3-3: Project Road and Delhi-Dehradun Expressway Alignment for Dehradun & Beyond traffic

The potential divertible traffic is the traffic plying between Delhi NCR & beyond to Dehradun and beyond which has been estimated from the OD survey conducted during the present study.

The results of diversion analysis along with the potential divertible traffic, diversion percentages and diverted traffic estimated for FY25 is presented in **Table 3-2**.

Potential Streams	Length (In Km)		Modes					
	PR	AR	Car	LCV	2A	3A	MAV	PCU
Potential for Delhi NCR & Beyond to Dehradun & Beyond								
Potential As % of AADT								
North-West Delhi to Dehradun & Beyond	217	164	1.3	0.4	0.8	0.3	0.5	1.0
Rest of Delhi/Noida/Gurgaon & Surroundings to Dehradun & Beyond	200	172	4.4	1.7	3.0	1.6	2.1	3.5
Ghaziabad & Surroundings to Dehradun & Beyond	172	177	0.7	0.9	0.8	0.5	4.7	1.4
Panipat, Shamli & Surroundings to Dehradun & Beyond	100	72	0.9	0.3	1.1	0.0	3.3	1.3
Central/South India to Dehradun & Beyond	200	172	0.1	0.5	2.4	0.8	1.5	0.9
Meerut & Surroundings-Dehradun & Beyond	132	133	2.1	0.6	1.4	1.8	1.0	1.7
Muzaffarnagar & Surroundings-Dehradun & Beyond	81	104	1.5	0.9	1.4	1.3	1.9	1.5
Total			11.0	5.3	10.8	6.2	15.0	11.3
Diversion Percentage Based on Cost Ratio								
North-West Delhi to Dehradun & Beyond			85.6	100.0	100.0	96.0	95.9	
Rest of Delhi/Noida/Gurgaon & Surroundings to Dehradun & Beyond			69.0	74.0	90.0	93.7	88.9	
Ghaziabad & Surroundings to Dehradun & Beyond			46.7	35.9	48.9	51.8	47.4	
Panipat, Shamli & Surroundings to Dehradun & Beyond			94.3	95.8	96.8	96.8	96.7	
Central/South India to Dehradun & Beyond			69.0	74.0	90.0	93.7	88.9	
Meerut & Surroundings-Dehradun & Beyond			50.1	44.5	56.2	61.4	55.6	
Muzaffarnagar & Surroundings-Dehradun & Beyond			26.4	4.9	8.9	8.3	6.4	
Diverted Traffic to DDE								
North-West Delhi to Dehradun & Beyond			1.1	0.4	0.8	0.2	0.5	0.9
Rest of Delhi/Noida/Gurgaon & Surroundings to Dehradun & Beyond			3.0	1.3	2.7	1.5	1.9	2.7
Ghaziabad & Surroundings to Dehradun & Beyond			0.3	0.3	0.4	0.3	2.2	0.7
Panipat, Shamli & Surroundings to Dehradun & Beyond			0.8	0.3	1.0	0.0	3.2	1.2
Central/South India to Dehradun & Beyond			0.1	0.4	2.1	0.7	1.3	0.8
Meerut & Surroundings-Dehradun & Beyond			1.0	0.3	0.8	1.1	0.5	0.9
Muzaffarnagar & Surroundings-Dehradun & Beyond			0.4	0.0	0.1	0.1	0.1	0.3
Total			6.9	2.9	7.9	3.9	9.8	7.3
Total Diverted Traffic			**1,552**	**30**	**228**	**17**	**144**	**2,979**

Table 3-2: Diversion Analysis for Delhi-Dehradun Expressway for Dehradun & Beyond traffic – FY25

The proposed expressway may take away around 4-10 percent of the car & freight traffic from Chhapar toll plaza for the Dehradun & beyond traffic which is approximately 2,979 PCUs in absolute terms.

A.II Route Choice between Delhi NCR & Beyond and Haridwar/Rishikesh & Beyond (via Haridwar Spur) For Chhapar and Bahadrabad TP

The route via project road and the alignment of the Delhi-Dehradun Expressway via Haridwar spur for Haridwar/Rishikesh & beyond traffic is presented in **Figure 3-4**.

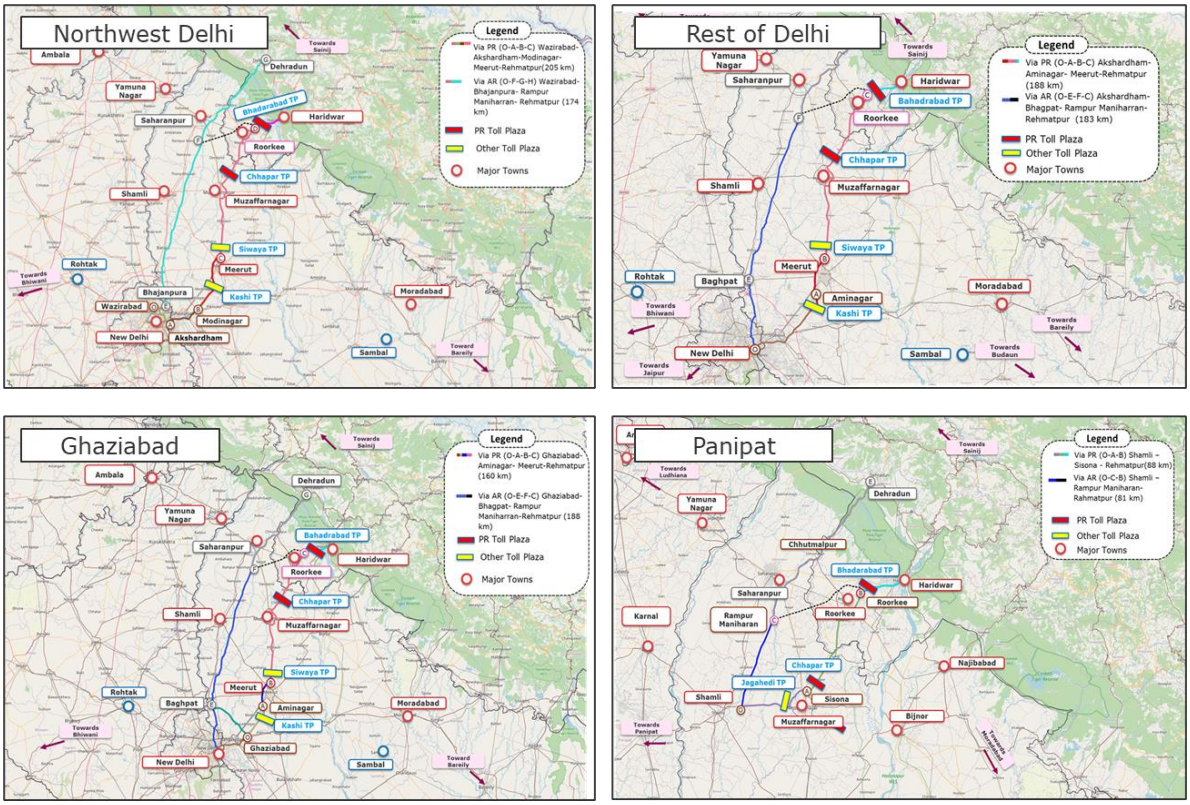


Figure 3-4: Project Road and Delhi-Dehradun Expressway Alignment via Spur to Haridwar for Haridwar & Beyond traffic

The potential divertible traffic is the traffic plying between Delhi NCR & beyond to Haridwar/Rishikesh and beyond which has been estimated from the OD survey conducted during the present study. This diversion analysis is considered for both Chhapar and Bahadrabad toll plazas.

The results of diversion analysis along with the potential divertible traffic, diversion percentages and diverted traffic estimated for FY25 for Chhapar toll plaza is presented in **Table 3-3.**

Potential Streams	Length (In Km)		Modes					
	PR	AR	Car	LCV	2A	3A	MAV	PCU
Potential for Delhi NCR & Beyond to Haridwar & Beyond								
Potential As % of AADT								
North-West Delhi to Haridwar & Beyond	211	180	3.5	0.4	1.8	1.6	1.2	2.6
Rest of Delhi/Noida/Gurgaon & Surroundings to Haridwar & Beyond	194	189	13.0	4.3	6.5	6.4	4.7	9.8
Ghaziabad & Surroundings to Haridwar & Beyond	166	194	1.8	2.8	0.9	3.7	1.6	1.7
Panipat, Shamli & Surroundings to Haridwar & Beyond	94	87	5.9	2.7	5.8	8.9	2.2	5.2
Central/South India to Haridwar & Beyond	188	183	2.4	2.3	2.7	9.8	6.4	3.4
Total			26.6	12.4	17.7	30.4	16.2	22.6
Diversion Percentage Based on Cost Ratio								
North-West Delhi to Haridwar & Beyond			70.5	77.5	94.0	95.1	93.0	
Rest of Delhi/Noida/Gurgaon & Surroundings to Haridwar & Beyond			56.8	53.9	69.8	73.6	69.1	
Ghaziabad & Surroundings to Haridwar & Beyond			37.0	19.9	33.2	36.3	32.0	
Panipat, Shamli & Surroundings to Haridwar & Beyond			69.8	68.2	94.6	95.0	93.6	
Central/South India to Haridwar & Beyond			56.8	53.9	69.8	73.6	69.1	
Diverted traffic to DDE								
North-West Delhi to Haridwar & Beyond			2.4	0.3	1.7	1.5	1.1	2.0
Rest of Delhi/Noida/Gurgaon & Surroundings to Haridwar & Beyond			7.4	2.3	4.6	4.7	3.3	5.9
Ghaziabad & Surroundings to Haridwar & Beyond			0.7	0.6	0.3	1.3	0.5	0.6
Panipat, Shamli & Surroundings to Haridwar & Beyond			4.1	1.8	5.4	8.5	2.0	4.1
Central/South India to Haridwar & Beyond			1.4	1.2	1.9	7.2	4.5	2.2
Total			16.0	6.2	13.9	23.2	11.4	14.7
Total Diverted Traffic			**3,624**	**64**	**400**	**102**	**167**	**5,974**

Table 3-3: Diversion Analysis for Delhi-Dehradun Expressway for Haridwar & Beyond Traffic for Chhapar Toll Plaza – FY25

The proposed expressway may take away around 16 percent of car traffic, 6 percent of LCVs & 11-23 percent of higher axle freight vehicles from Chhapar toll plaza for the Haridwar & beyond traffic which is approximately 5,974 PCUs in absolute terms.

The results of diversion analysis along with the potential divertible traffic, diversion percentages and diverted traffic estimated for FY25 for Bahadrabad toll plaza is presented in **Table 3-4.**

Potential Streams	Length (In Km)		Modes					
	PR	AR	Car	LCV	2A	3A	MAV	PCU
Potential for Delhi NCR & Beyond to Haridwar & Beyond								
Potential As % of AADT								
North-West Delhi to Haridwar & Beyond	211	180	4.6	2.3	3.3	3.6	4.2	4.1
Rest of Delhi/Noida/Gurgaon & Surroundings to Haridwar & Beyond	194	189	14.2	7.1	10.0	11.1	13.3	12.9
Ghaziabad & Surroundings to Haridwar & Beyond	166	194	1.6	3.1	1.8	4.8	2.4	1.8
Panipat, Shamli & Surroundings to Haridwar & Beyond	94	87	7.7	6.2	6.1	9.9	8.6	7.4
Central/South India to Haridwar & Beyond	188	183	3.4	1.8	8.4	16.6	18.4	6.2
Total			31.4	20.5	29.6	45.9	46.9	32.5
Diversion Percentage Based on Cost Ratio								
North-West Delhi to Haridwar & Beyond			70.5	77.5	94.0	95.1	93.0	
Rest of Delhi/Noida/Gurgaon & Surroundings to Haridwar & Beyond			56.8	53.9	69.8	73.6	69.1	
Ghaziabad & Surroundings to Haridwar & Beyond			37.0	19.9	33.2	36.3	32.0	
Panipat, Shamli & Surroundings to Haridwar & Beyond			69.8	68.2	94.6	95.0	93.6	
Central/South India to Haridwar & Beyond			56.8	53.9	69.8	73.6	69.1	
Diverted traffic to AR future								
North-West Delhi to Haridwar & Beyond			3.2	1.8	3.1	3.4	3.9	3.2
Rest of Delhi/Noida/Gurgaon & Surroundings to Haridwar & Beyond			8.1	3.8	7.0	8.1	9.2	7.8
Ghaziabad & Surroundings to Haridwar & Beyond			0.6	0.6	0.6	1.7	0.8	0.6
Panipat, Shamli & Surroundings to Haridwar & Beyond			5.3	4.2	5.8	9.4	8.1	5.8
Central/South India to Haridwar & Beyond			1.9	1.0	5.8	12.2	12.7	4.0
Total			19.2	11.4	22.3	34.9	34.6	21.6
Total Diverted Traffic			**4,253**	**95**	**594**	**131**	**247**	**7,684**

Table 3-4: Diversion Analysis for Delhi-Dehradun Expressway for Haridwar & Beyond Traffic for Bahadrabad Toll Plaza – FY25

The proposed expressway may take away around 19 percent of car traffic, 11 percent of LCV and 22-34 percent of higher axle freight traffic from Bahadrabad toll plaza for the Dehradun & beyond traffic which is approximately 7,684 PCUs in absolute terms.

A.III Total Diverted Traffic to Delhi Dehradun Expressway

The results of total potential and diverted traffic estimated for FY25 for both Chhapar and Bahadrabad toll plazas is presented in **Table 3-5.**

Potential Streams	Modes					
	Car	LCV	2A	3A	MAV	PCU
Chhapar TP						
Potential As % of AADT						
Dehradun & beyond traffic	11.0	5.3	10.8	6.2	15.0	11.3
Haridwar & beyond traffic	26.6	12.4	17.7	30.4	16.2	22.6
Total traffic in %	37.6	17.7	28.5	36.6	31.2	33.9
Total	**8,517**	**181**	**822**	**160**	**457**	**13,791**
Diverted Traffic as % of AADT						
Dehradun & beyond traffic	6.9	2.9	7.9	3.9	9.8	7.3
Haridwar & beyond traffic	16.0	6.2	13.9	23.2	11.4	14.7
Total traffic in %	22.9	9.2	21.8	27.1	21.2	22.0
Diverted Traffic	**5,175**	**94**	**628**	**119**	**310**	**8,953**
Bahadrabad TP						
Potential As % of AADT						
Haridwar & beyond traffic	31.4	20.5	29.6	45.9	46.9	32.5
Total	**6,970**	**168**	**784**	**169**	**328**	**11,559**
Diverted Traffic as % of AADT						
Haridwar & beyond traffic	19.2	11.4	22.3	34.9	34.6	21.6
Diverted Traffic	**4,253**	**95**	**594**	**131**	**247**	**7,684**

Table 3-5: Total Diverted Traffic to Delhi-Dehradun Expressway – FY25

In total Delhi-Dehradun Expressway may take away around 8,953 PCUs from Chhapar toll plaza and 7,684 PCUs from Bahadrabad toll plaza. This traffic has been grown and considered appropriately in the respective years of impact. The negative impact of traffic at the toll plazas has been considered as 40 percent in FY26 and 100 percent from FY27 onwards.

In addition to this, during the six laning of the project road section DDE may take away higher traffic due to construction activities on PR. For estimating this impact, six laning toll rates at 75 percent and reduced speeds on PR due to construction activity have been considered. A comparison of diversion percentages before and during six laning estimated for FY25 is presented in **Table 3-6**.

Potential Streams	Modes				
	Car	LCV	2A	3A	MAV
Diverted Traffic Before Six Laning of PR					
Chhapar TP	22.9	9.2	21.8	27.1	21.2
Bahadrabad TP	19.2	11.4	22.3	34.9	34.6
Diverted Traffic During Construction Period for Six Laning of PR					
Chhapar TP	28.8	10.2	24.5	30.7	24.4
Bahadrabad TP	24.3	12.6	25.8	39.7	39.8

Table 3-6: Impact of Six Laning of PR on DDE Diversion – FY25

B. Impact of Ganga Expressway Phase II

The Ganga Expressway is a major infrastructure project in Uttar Pradesh, designed to enhance connectivity across the state and facilitate smoother transportation between key cities. As of February 2025, the expressway is approximately 80 percent complete, with significant progress made in both phases of construction. The first phase is nearing operational readiness ahead of the Prayagraj Maha Kumbh Mela, while the entire expressway is expected to be fully operational by April 2025. Spanning about 602 kilometres, the Ganga Expressway will connect Meerut to Prayagraj and further extend into surrounding districts. Currently the expressway phase I from Prayagraj to Meerut on BOT basis.

Under Phase II of Ganga Expressway, it will be extended from Meerut to Haridwar for which the timelines are yet not known.

The impact of completion of this corridor has been studied for two streams of traffic:

- Traffic from/to East UP & beyond to/from SIDCUL/Haridwar & beyond
- Traffic from/to Meerut & surroundings to/from SIDCUL/Haridwar & beyond

The impact has been considered for both the toll plazas (Chhapar and Bahadrabad toll plaza). The route via project road and the alignment of the Ganga Expressway Phase II is presented in **Figure 3-5.**

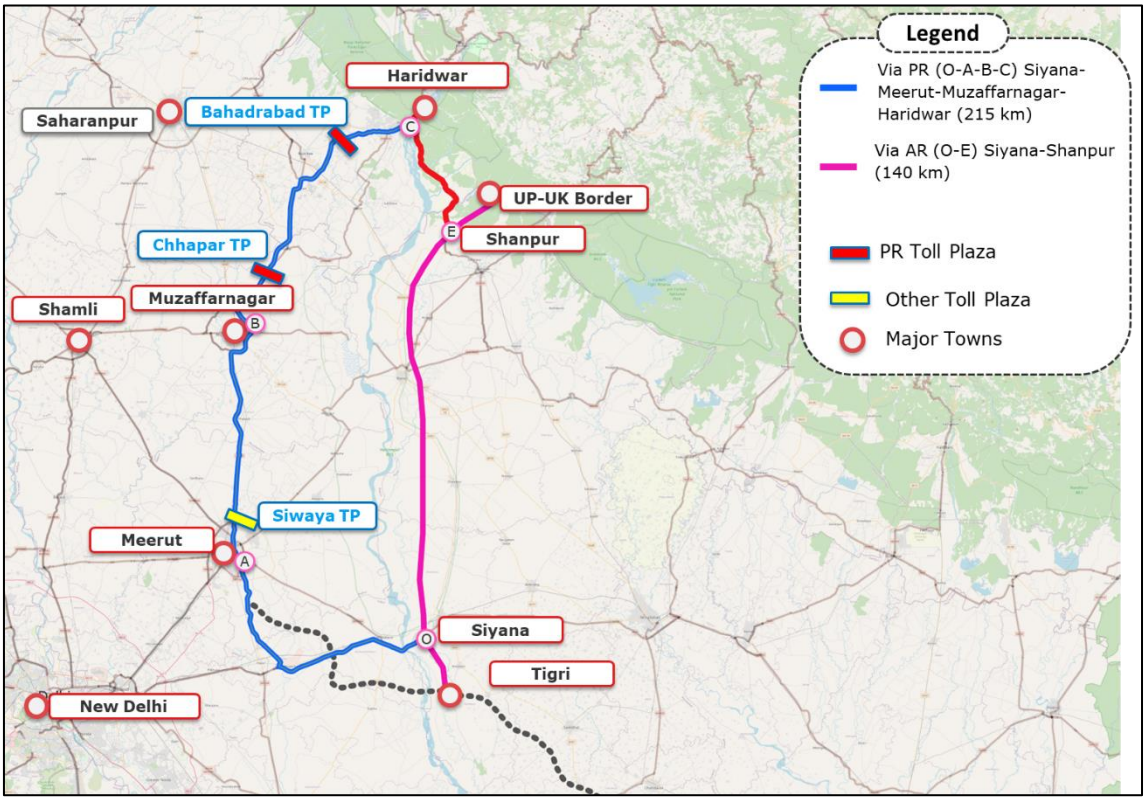


Figure 3-5: Project Road and Tentative Ganga Expressway Phase II Alignment

B.I Route Choice between East UP and Haridwar & Beyond

The prominent route for East UP - Haridwar traffic via project road (O-A-B-C) is about 215 km and the proposed alternate route (O-E) via Ganga Expressway Phase II will be

about 140 km for Haridwar bound traffic. Thus, the alternate route will be about 75 km shorter than the route via PR.

Thus, route via Ganga Expressway Phase II once completed may attract some of the car & freight vehicles which are currently using the project road.

The potential divertible traffic is the traffic plying between East UP/Bihar & beyond to Haridwar and beyond which has been estimated from the OD survey conducted during the present study. The results of diversion analysis for East UP & beyond to Haridwar & beyond traffic, diversion percentages and diverted traffic estimated for FY25 is presented in **Table 3-7**.

Potential Streams	Length (In Km)		Modes					
	PR	AR	Car	LCV	2A	3A	MAV	PCU
Potential for East UP & Beyond to Haridwar & Beyond								
Potential As % of AADT								
East UP Bound – Chhapar TP	215	140	1.3	0.7	1.5	1.5	1.8	1.4
East UP Bound – Bahadrabad TP	215	140	1.4	0.9	1.6	1.7	3.7	1.6
Diversion based on Cost Ratio								
East UP Bound			95.5	96.9	97.7	97.9	97.7	
Diverted traffic to AR future								
East UP Bound – Chhapar TP			1.3	0.7	1.4	1.4	1.7	1.4
East UP Bound – Bahadrabad TP			1.3	0.8	1.6	1.7	3.6	1.6
Total Diverted Traffic			**291**	**7**	**42**	**6**	**25**	**560**

Table 3-7: Diversion Analysis for Ganga Expressway Phase II for East UP to Haridwar & beyond traffic – FY25

The proposed expressway may take away around 1-4 percent of the car & freight traffic from both toll plazas for the East UP & beyond to Haridwar & beyond traffic which is approximately 560 PCUs in absolute terms.

B.II Route Choice between Meerut & Surroundings and Haridwar & Beyond

The prominent route for Meerut - Haridwar traffic via project road is about 132 km and the proposed alternate route via Ganga Expressway Phase II will be 193 km long for Haridwar bound traffic. Thus, the alternate route is about 61 km longer than the route via PR.

The results of diversion analysis for Meerut & surroundings to Haridwar & beyond traffic, diversion percentages and diverted traffic estimated for FY25 is presented in **Table 3-8**.

Potential Streams	Length (In Km)		Modes					
	PR	AR	Car	LCV	2A	3A	MAV	PCU
Potential for East UP NCR & Beyond to Dehradun & Beyond								
Potential As % of AADT								
Meerut - Haridwar & Beyond - Chhapar	132.2	193.3	4.7	4.0	4.3	6.6	3.9	4.6
Meerut - Haridwar & Beyond - Bahadrabad	132.2	193.3	4.8	5.0	4.7	7.8	8.2	5.2
Diversion based on Cost Ratio								
Meerut Bound			9.2	4.0	4.3	4.4	4.3	
Diverted traffic to AR future								
Meerut Bound – Chhapar TP			0.4	0.2	0.2	0.3	0.2	0.3
Meerut Bound – Bahadrabad TP			0.4	0.2	0.2	0.3	0.4	0.4
Total Diverted Traffic			**99**	**2**	**5**	**1**	**2**	**132**

Table 3-8: Diversion Analysis for Ganga Expressway Phase II for Meerut to Haridwar & Beyond Traffic – FY25

The proposed expressway may take away around 0.2 – 0.4 percent of the car & freight traffic from both toll plazas for the Meerut & surroundings to Haridwar & beyond traffic which is approximately 132 PCUs.

In total from both the traffic streams of East UP and Meerut, Ganga Expressway Phase II may take away around 692 PCUs from both the toll plazas. This traffic has been grown and considered appropriately in the respective years of impact. The negative impact of traffic at all the toll plazas has been considered as 50 percent in FY35 and 100 percent from FY36 onwards.

C. Impact of Upper Ganga Canal Road (Kawar Path)

The Upper Ganga Canal Road is a significant infrastructure project aimed at enhancing connectivity between Delhi/Ghaziabad/Noida/Greater Noida and Dehradun/Haridwar, spanning approximately 147.8 kilometres. It is planned to be constructed on the western bank of Ganga Canal. The canal road will commence from the Sanauta Bridge in Bulandshahar and extend to Purquazi in Muzaffarnagar, crossing through key locations such as Ghaziabad, Meerut, and Deoband. The eastern bank already has existing canal road consists of 2 lanes with other side having farmland, the new road will add up 2 more lanes and make it as 4 lane road. Due to the presence of 54 villages along the route across all the districts whose residents rely on this as primary route but during the month of Sharvan it gets congested because of influx of lot of pilgrimages because of Kawar Yatra from various parts of India to collect holy water from the Ganges which runs along this route. This upcoming Upper Ganga canal road aims to ease the traffic congestion during the yatra.

As the Dehradun bound traffic has already been considered as a potential for Delhi-Dehradun Expressway, only to/from Purquazi & beyond traffic is considered for canal road for Chhapar toll plaza.

The route via project road and the tentative alignment of the Upper Ganga Canal Road is presented in **Figure 3-6**.

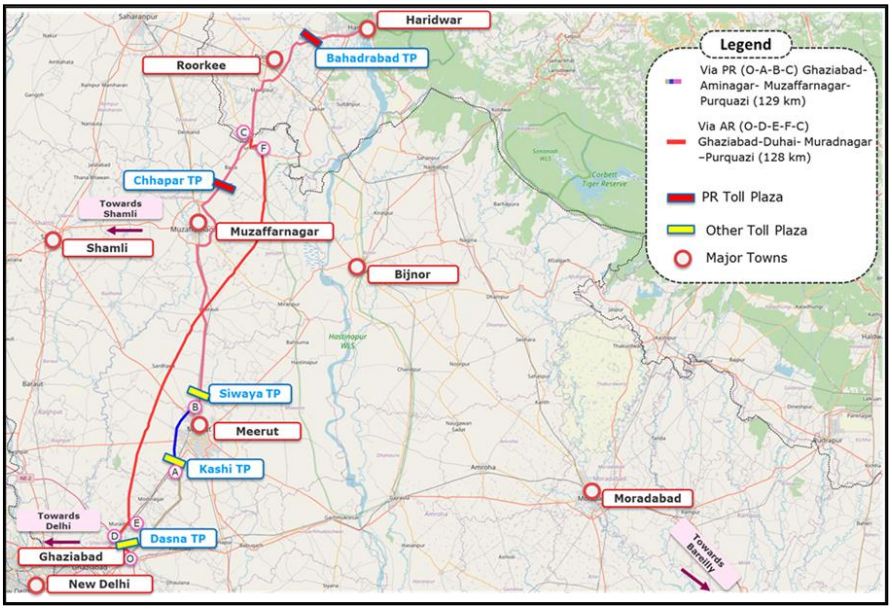


Figure 3-6: Project Road and Upper Ganga Canal Road alignment

The prominent route for Ghaziabad-Purquazi is via project road (O-A-B-C) which is about 129 km and the alternate route via Upper Ganga Canal Road (O-D-E-F-C) will be about 128 km for Purquazi & beyond traffic. Thus, the route via canal road will be about 1 km shorter than the route via PR.

The results of diversion analysis for the traffic to/from Purquazi & beyond, diversion percentages and diverted traffic estimated for FY25 is presented in **Table 3-9**.

Potential Streams	Length (In Km)		Modes					
	PR	AR	Car	LCV	2A	3A	MAV	PCU (Car & LCV)
Potential for Upper Ganga Canal Road (Kawar Path)								
Potential As % of AADT								
Potential	129	128	32.4	17.7	37.8	30.6	40.2	18.7
Diversion percentage Based on Cost Ratio Analysis								
Diversion %			47.5	65.3	47.0	54.4	50.4	
Diverted Traffic to AR future								
Loss in %			15.4	11.6	17.8	16.7	20.2	9.0
Total Diverted Traffic			**3,481**	**119**	**513**	**73**	**297**	**3,659**

Table 3-9: Diversion Analysis for Upper Ganga Canal Road for Purquazi & Beyond Traffic - FY25

The proposed expressway may take away around 15 percent in cars and 12 percent in LCVs. Because of the two-way movement on this two-lane road abutting farmlands, presence of height restriction barriers and difficulty in manoeuvring higher axle vehicles, only Car & LCV traffic have been considered for further analysis and freight traffic is not considered. This traffic has been grown and considered appropriately in the respective years of impact. The negative impact of traffic at all the toll plazas has been considered as 50 percent in FY28 and 100 percent from FY29 onwards.

3.2.3 Induced/ Development Traffic

Developmental /new generated traffic is the one which would be generated, over and above normal growth, because of lowering of transport costs or new developments in the immediate influence area of the project road. In case of the project road, there is no development envisaged in the vicinity of the project road.

Bharatmala Pariyojana is the second largest highways construction project in the country since NHDP, under which almost 50,000 km or highway roads were targeted across the country. It will look to improve connectivity particularly on economic corridors, border areas and far-flung areas with an aim of quicker movement of cargo and boosting exports. The Phase-I includes economic corridors of around 9,000 km; inter-corridor and feeder routes of around 6,000 km; 5,000 km roads under the National Corridors Efficiency Program, border and international connectivity roads of around 2,000 km; coastal and port connectivity roads of around 2,000 km; expressways of around 800 km and 10,000 km of NHDP roads. The total length in phase 1 comes to around 34,800 km.

Uttar Pradesh is developing multiple economic corridors to enhance industrial growth, improve logistics, and attract investments. One of the key projects is the Uttar Pradesh Defence Industrial Corridor (UPDIC) which covers Aligarh, Agra, Jhansi, Kanpur, Lucknow and Chitrakoot. This corridor aims to promote domestic defence manufacturing and reduce dependence on imports.

The Eastern Dedicated Freight Corridor (EDFC) is another major infrastructure project passing through Uttar Pradesh. It connects Ludhiana in Punjab to Sonnagar in Bihar, facilitating efficient freight movement. Cities like Kanpur, Prayagraj, and Meerut benefit from improved logistics, with multimodal logistics parks planned along the corridor to support industrial activities.

The Delhi-Mumbai Industrial Corridor (DMIC) also has a presence in UP, with the Integrated Industrial Township at Greater Noida (IITGN) being a key initiative. The township is designed to support manufacturing sectors such as electronics, automobiles, and logistics, offering modern infrastructure for industries.

Additionally, UP’s expressways are being developed as economic corridors. The Ganga Expressway, Purvanchal Expressway and Bundelkhand Expressway have designated industrial zones to attract businesses. Along the Ganga Expressway, around 1,522 hectares have been identified for industrial development, with an expected investment of ₹2,300 crore.

As the project road caters to the long/ short distance traffic, this project section will continue to remain as an important highway and cater to the industrial needs along the corridor and may see sustained growth in the future.

3.3 Methodology for Traffic Growth Rate Estimation

Traffic growth for both passenger and freight vehicles has been estimated using the econometric approach as described in IRC-108, 2015. For freight traffic, due consideration has been given to the total tonnage transported and the shift in types of vehicles used for moving goods.

The econometric model applied, relates traffic growth to changes in state (or district) domestic product via an elasticity factor. According to IRC guidelines, elasticity based econometric model for highway projects should be derived in the following form:

$Log_e(P) = A0 + A1\ Log_e\ (EI)$, where:

P - Traffic Volume

EI - Economic Indicator

A0 - Regression Constant

A1 - Regression Co-efficient (Elasticity Index)

In order to estimate traffic on the project road, the methodology described below has been followed:

Identify the influence area - From the analysis of OD survey data, the project influencing states and districts, which are likely to impact the traffic growth on the project road, were identified.

Review Past traffic Data – Based on toll data available for the project, a review of past traffic and tonnage growth is carried out.

Analysis of economic growth of the Project Influencing Area (PIA) - For each PIA state, an economic profile describing past performance and future outlook was prepared. This also considers India's past economic performance and its future outlook.

Estimation of traffic elasticity to income – in order to translate economic growth into traffic growth, an elasticity factor was estimated.

Derivation of traffic growth rates – On the basis of the weighted (based on OD shares) PIA outlook and related traffic elasticity, traffic growth rates were estimated.

The methodology thus adopted incorporates, as basic data inputs, the perspective growth envisaged in the influence area and the changes in transport demand elasticities over a period of time. The traffic growth rates by vehicle type for the project road have been determined till FY55 in line with the maximum extendable concession period of 30 years

3.4 Identification of PIA States

The regional distribution observed on the project road shows that Uttarakhand is the main contributor of traffic at both the toll plaza locations; additionally, for TP02, Uttar Pradesh also has a significant share in case of both passenger and freight vehicles. Thus,

these two states have been considered as primary PIA states. Moreover, the states of Delhi, Haryana and Rajasthan also contribute to the project road traffic.

The mode wise normalized regional distribution at both the toll plazas is presented in **Figure 3-7**.

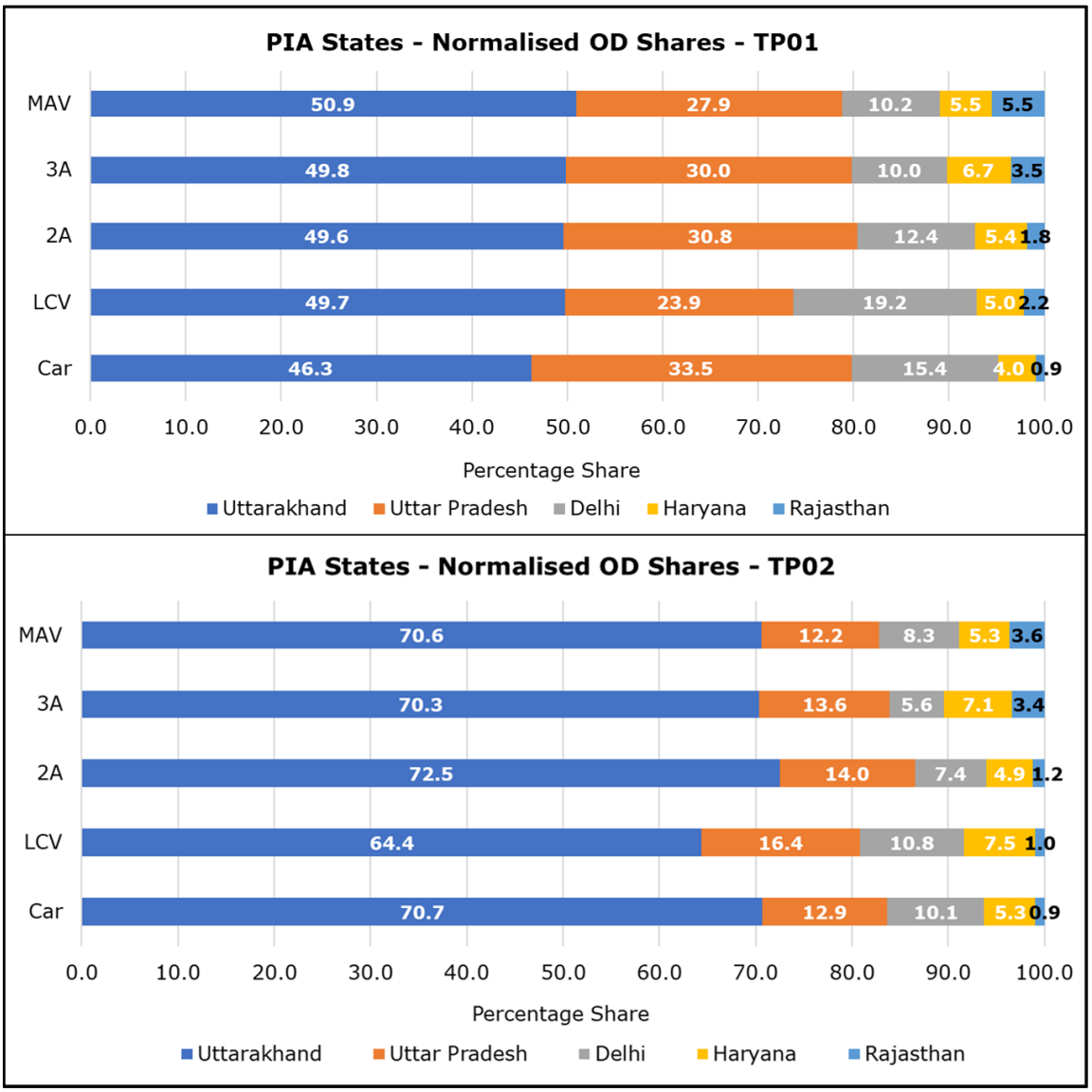


Figure 3-7: Normalised Regional Distribution (%) for PR

The OD shares show that for car traffic, around 46.3 percent at TP01 and 70.7 percent at TP02 is coming from Uttarakhand. Moreover, around 33.5 percent at TP01 and about 12.9 percent of traffic is being generated from Uttar Pradesh. Similarly, Delhi has a share of around 15.4 percent at TP01 and about 10.1 percent at TP02 whereas, the remaining 1-5 percent traffic is from Rajasthan and Haryana for both the toll plazas.

The share of 2A traffic from Uttarakhand is around 49.6 percent for TP01 and 72.5 percent for TP02; the state of Uttar Pradesh contributes around 30.8 percent for TP01 and 14.0 percent for TP02. Moreover, Delhi has a share of about 12.4 percent and 7.4 percent at TP01 and TP02 respectively whereas, Delhi and Haryana have a share of around 1-5 percent for each toll plaza locations.

In case of 3A truck category, Uttarakhand has a share of around 49.8 percent for TP01 and 70.3 percent for TP02. Around 30.0 percent and 13.6 percent is from Uttar Pradesh for TP01 and TP02 respectively, followed by 3-10 percent of the traffic being generated from Rajasthan, Delhi, and Haryana.

For MAVs, around 50.9 percent and 70.6 percent traffic is being generated from Uttarakhand for TP01 and TP02 respectively whereas, around 12 percent and 28 percent traffic is coming from Uttar Pradesh for TP01 and TP02. The remaining 3-10 percent is from Rajasthan, Delhi, and Haryana for both the toll plazas.

Considering the predominance of Uttarakhand and Uttar Pradesh in the project road traffic, these two states have been considered as the primary PIA states for both passenger and freight traffic. In addition to Uttarakhand and Uttar Pradesh, the other PIA states which have been considered for both passenger and freight traffic are Rajasthan, Delhi, and Haryana.

3.5 Past Economic Growth of PIA

Growth of traffic on the project road depends on existing development and future growth prospects of the connecting regions. A number of economic indicators for the PIA states, as published by Central Statistical Organisation (2011-12 prices), have been studied to assess their past performance.

PIA State - Uttarakhand

Past economic performance of the state has been as follows:

- Uttarakhand's Gross State Domestic Product (GSDP) stood at Rs 2,133.8 billion in FY24 and has been growing at a trendline growth rate of 4.7 percent since FY12.
- The secondary sector is the largest contributor to GSDP of Uttarakhand, with a share of about 49.8 percent. Tertiary sector stood at 41.7 percent and primary sector at 8.4 percent of the GSDP in FY24.

PIA State – Uttar Pradesh

Past economic performance of the state has been as follows:

- Uttarakhand's Gross State Domestic Product (GSDP) stood at Rs 14,233.6 billion in FY24 and has been growing at a trendline growth rate of 5.6 percent since FY12.
- The tertiary sector is the largest contributor to GSDP of Uttar Pradesh, about 47.5 percent. Secondary sector has a share of about 28.4 percent and about 24.2 percent is contributed by primary sector to GSDP in FY24.

The change of sectoral composition of GSDP over the years is presented in **Figure 3-8**.

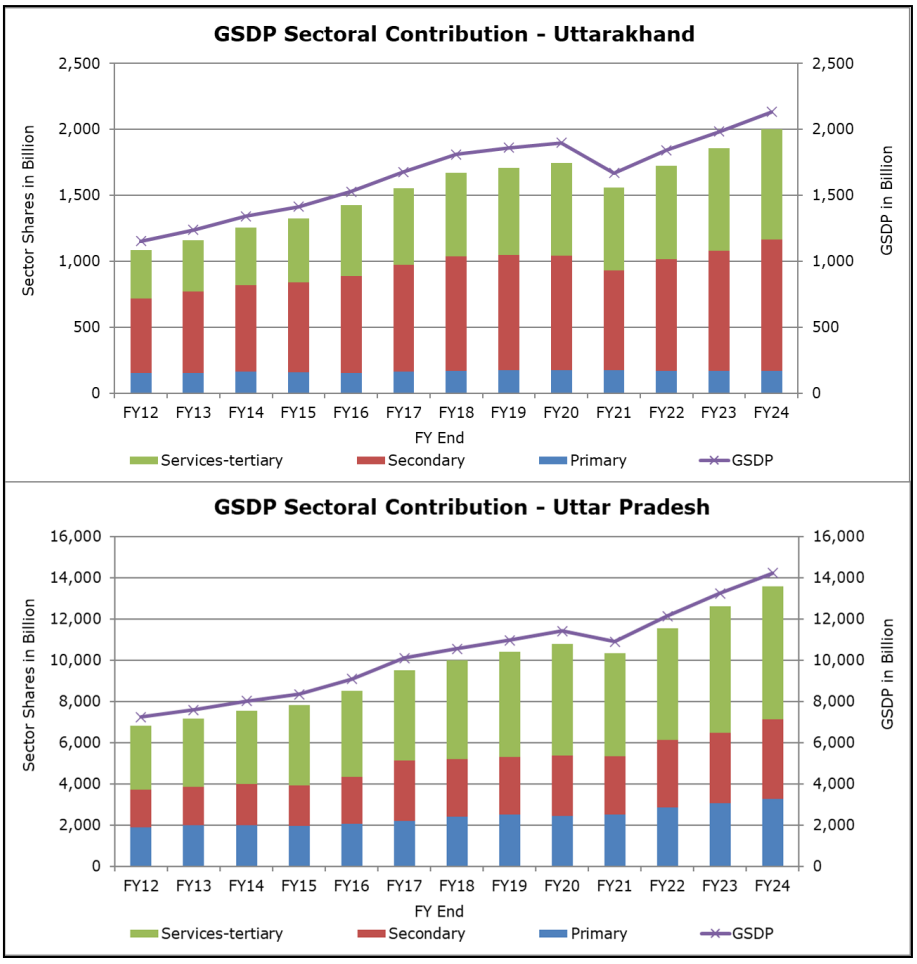


Figure 3-8: GSDP (in Rs Billion) and its Sectoral Composition for Uttarakhand and Uttar Pradesh

The performance of the state economy and its different sectors has been studied using time trend analysis. The average annual growth rates as obtained using regression analysis are presented in **Table 3-10**.

Particulars	Uttarakhand		Uttar Pradesh	
	FY12 to FY24	FY14 to FY24	FY12 to FY24	FY14 to FY24
GSDP	4.7	3.6	5.6	5.3
Agriculture and Allied	1.0	1.0	4.6	5.4
Industry	4.0	2.9	6.2	6.0
Services	6.7	5.3	6.0	5.3
Construction	5.9	5.8	5.8	6.5
Per Capita Income	3.5	2.4	4.1	3.9

Table 3-10 : Average Annual Growth Rates (%) of State Income for Uttarakhand and Uttar Pradesh

Uttarakhand

Uttarakhand is a predominant exporter of organic agricultural products, agro-based and processed foods, aromatic and medicinal plant-based products, pharmaceuticals, nutraceuticals, and services sectors like tourism and wellness.

Uttarakhand has a well-developed Integrated Industrial Estates (IIEs), IT Parks and growth centers at various well approachable locations within the state. In addition to the existing IT Park at Dehradun, the state government will set up additional IT Park at Ram Nagar/Pant Nagar. Some of the key IT players are Hiltron, Wipro, HCL, Modi Infotech etc.

The budget for 30 national highway (NH) projects worth is Rs 4,755 crore is allotted to Haridwar and eight NH projects worth Rs 2,200 crore in Tanakpur, Champawat.

As of October 2024, the Char Dham Highway Development Project, initiated in December 2016, has achieved around 75 percent completion. This project aims to enhance connectivity to the sacred Char Dham pilgrimage sites—Gangotri, Yamunotri, Kedarnath, and Badrinath—and improve access to the India-China border roads. The project is systematically divided into multiple packages, with significant segments commencing from Rishikesh. The anticipated completion date is set for December 2024.

According to Department for Promotion of Industry and Internal Trade (DPIIT), the state has enticed the Foreign Direct Investment (FDI) equity inflows worth US$ 189.5 million during the period October 2019 to June 2024.

Due to the availability of fertile soil and favourable climatic conditions, the state has rich agricultural regions. Sugarcane, wheat, rice and potato are the major agricultural products of the state. Fruits like apple, orange, pear, grapes, peaches, plums, apricots, litchi, mango and guava are widely grown in the state, which has huge potential for crop development horticulture and processing industries.

The state also has a mega food park at Haridwar. These two mega food parks are anticipated to contribute US$ 995.35 million to the GSDP of the state and expected to generate about 30,000 direct and 290,000 indirect employment opportunities in the state by 2020. The Government is planning to develop Uttarakhand as a manufacturing hub for organically processed food units. So, it invites food processing companies to come and produce organic processed food products in the state.

Uttarakhand aims to double tourist arrivals to 70 million by 2030. Sonprayag-Gaurikund-Kedarnath Ropeway Project is being implemented by National Highways Logistics Management Limited (NHMLL) with a length of 13 km and the estimated cost of the project will be over $985 billion (US$ 126.77 million).

Uttar Pradesh

Uttar Pradesh is a predominant exporter of telecom instruments, meat and edibles, apparel and clothing, footwear, iron and steel products, aluminium products, handmade carpet (excl. silk), mechanical appliances, and organic chemicals, etc.

Currently, the state has 14 operational Special Economic Zones (SEZs), 24 have been formally approved and 23 have been notified. These SEZs are dispersed over a manifold range of sectors including textiles, handicrafts, electronics hardware, non-conventional energy, and IT SEZs. The state has emerged as an IT hub and supports units of key IT players like Tech Mahindra, IBM, TCS, HCL, Adobe, etc. The state has proposed the development of 40 IT/ITeS parks, excluding IT SEZs, along with 2 biotech zones and a knowledge park.

The state has made significant strides in fostering economic growth and attracting substantial investments by developing world-class road infrastructure. Major operational projects include the 165 km, six-lane Yamuna Expressway linking Greater Noida to Agra, the 302 km Agra-Lucknow Expressway, and the 340 km Purvanchal Expressway connecting Lucknow to Ghazipur near the Bihar border. Additionally, the 296 km Bundelkhand Expressway connects backward regions like Chitrakoot and Banda to the national capital region through other expressways. Ongoing projects like the Gorakhpur Link Expressway, which connects Gorakhpur to the Purvanchal Expressway, and the Ganga Expressway, stretching from Meerut to Prayagraj, promise to further enhance connectivity across the state. These initiatives are paving the way for faster, more reliable, and access-controlled transport networks, facilitating regional development, and boosting economic opportunities.

According to Department for Promotion of Industry and Internal Trade (DPIIT), the state has enticed the Foreign Direct Investment (FDI) equity inflows worth US$ 1,679 million during the period April 2019 to June 2024.

Due to the availability of fertile soil and favourable climatic conditions, the state has a rich agricultural belt. Food grains such as wheat, rice, maize, millet, gram, pea, and lentils are produced in large quantities giving Uttar Pradesh the tag of the country's largest food grains producer. Uttar Pradesh is also the country's largest producer of vegetables. The state has proposed the development of an integrated agro/food processing zone at Hapur.

The state is also the second largest producer of sugar in the country. Most of the sugar mills are in the western Uttar Pradesh belt in districts of Meerut, Muzaffarnagar, Bijnor, Saharanpur, Moradabad, Rampur, Bareilly, etc. The prominent sugar mills operated by large players are Bajaj Hindustan Sugar Limited, Balarampur Chini Mills Limited, Dhampur Sugar Mills Limited, and Oudh Sugar Mills Limited. The state has also introduced National Dairy Plan (NDP) to boost the dairy industry of the state. It houses large number of units of key players in dairy products like Mother Dairy, Amul, Gyan, Paras, Namaste India, etc.

The per capita income of Uttarakhand is Rs. 182,281 in the year FY24. During FY12 to FY24, a growth of about 3.5 percent is seen in the state Uttarakhand. Similarly, the per capita income of Uttar Pradesh is Rs. 60,037 in the year FY24. During FY12 to FY24, a growth of about 4.1 percent is seen in the state Uttar Pradesh. The growth in per capita income of Uttarakhand and Uttar Pradesh since FY12 is presented in **Figure 3-9**.

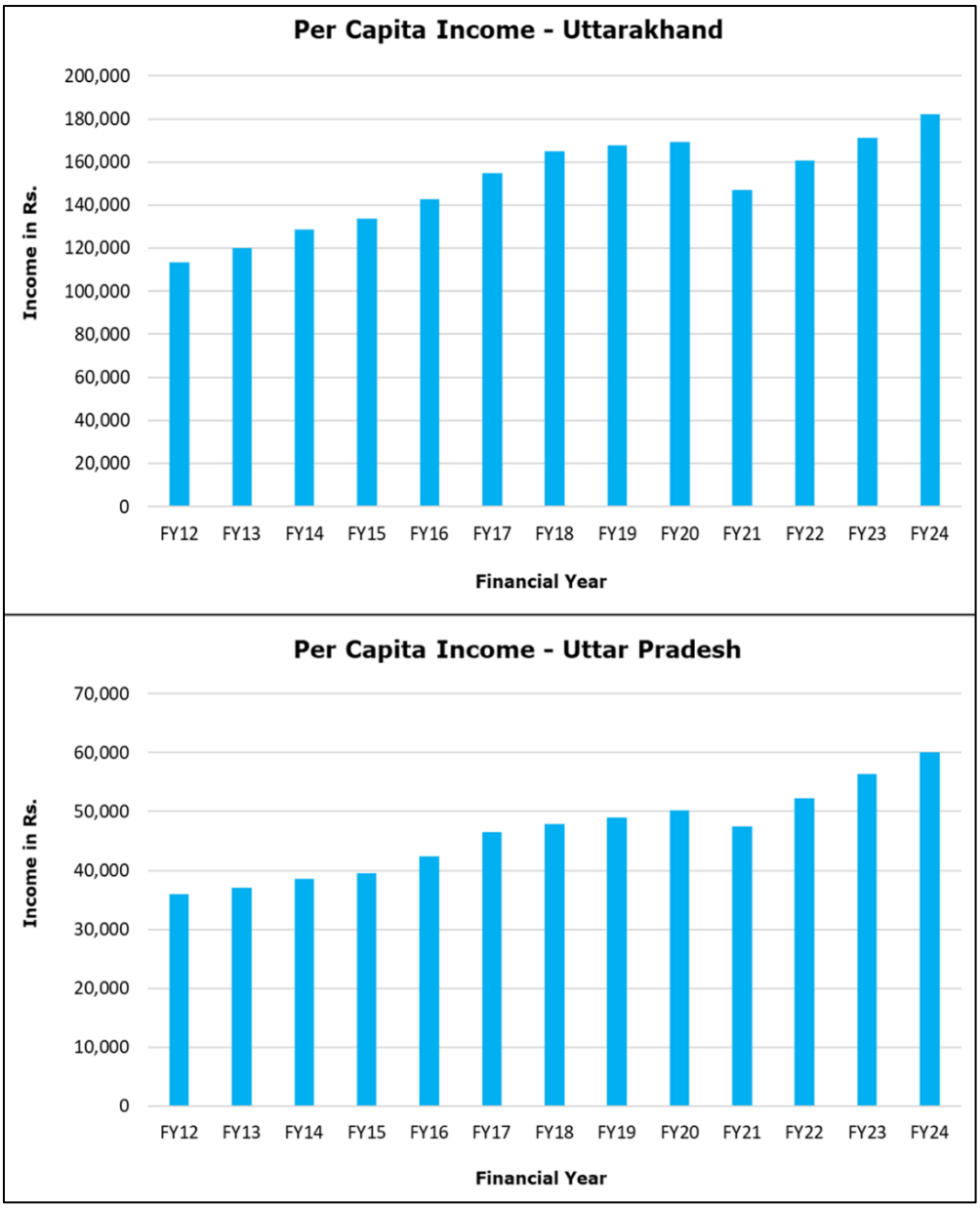


Figure 3-9: Per Capita Income of Uttarakhand and Uttar Pradesh from FY12 to FY24

Other PIA States

The other PIA states contributing to the traffic on the project road are Delhi, Haryana and Rajasthan. Economic indicators of PIA states are as follows.

- Gross State Domestic Product (GSDP) of Delhi stood at Rs 6,722.5 billion in FY24 and has been growing at a compounded annual growth rate of 5.3 percent since FY12.
- Haryana's Gross State Domestic Product (GSDP) stood at Rs 6,340.3 billion in FY24 and has been growing at a compounded annual growth rate of 6.2 percent since FY12.
- Gross State Domestic Product (GSDP) of Rajasthan stood at Rs 8,451.2 billion in FY24 and has been growing at a compounded annual growth rate of 5.3 percent since FY12.
- The service sector is the largest contributor to GSDP for the PIA states in FY24 – about 84.4 percent in Delhi, 50.7 percent in Haryana and 44.0 percent in Rajasthan.

The average annual growth rates as obtained using regression analysis for the period FY12 to the latest available year are presented in **Table 3-11**.

Particular/States	Delhi	Haryana	Rajasthan
	FY12 To FY24		
GSDP	5.3	6.2	5.3
Primary	0.5	3.6	3.5
Secondary	5.7	6.2	5.6
Tertiary	5.3	6.6	6.1
Construction	5.5	3.9	3.2
Per Capita Income	3.3	4.7	3.9

Table 3-11: Average Annual Growth Rates (%) of State Income for Other PIA States

The GSDP over the years for the PIA states are presented in **Figure 3-10**.

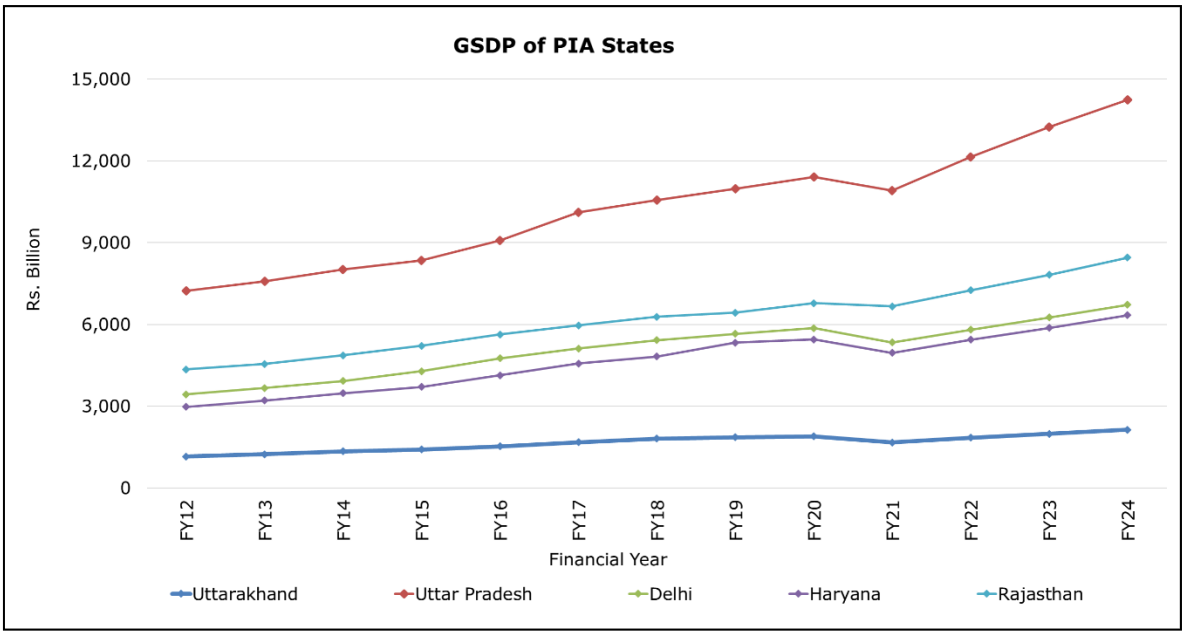


Figure 3-10: GSDP (in Rs Billion) for PIA States

3.6 India and PIA Outlook

3.6.1 India's Past Performance and Outlook for Future

India's growth trend during the recent years has been presented in **Figure 3-11**.

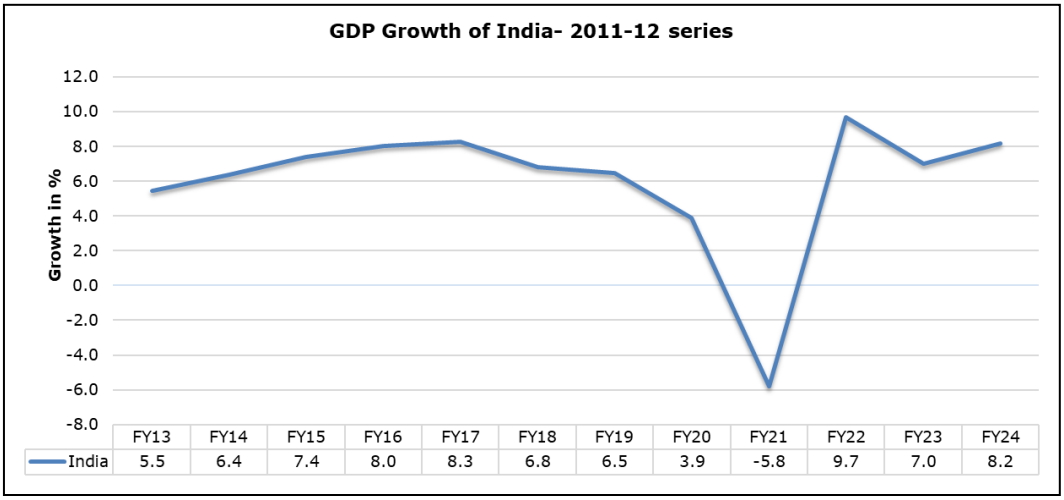


Figure 3-11: GDP Growth in India

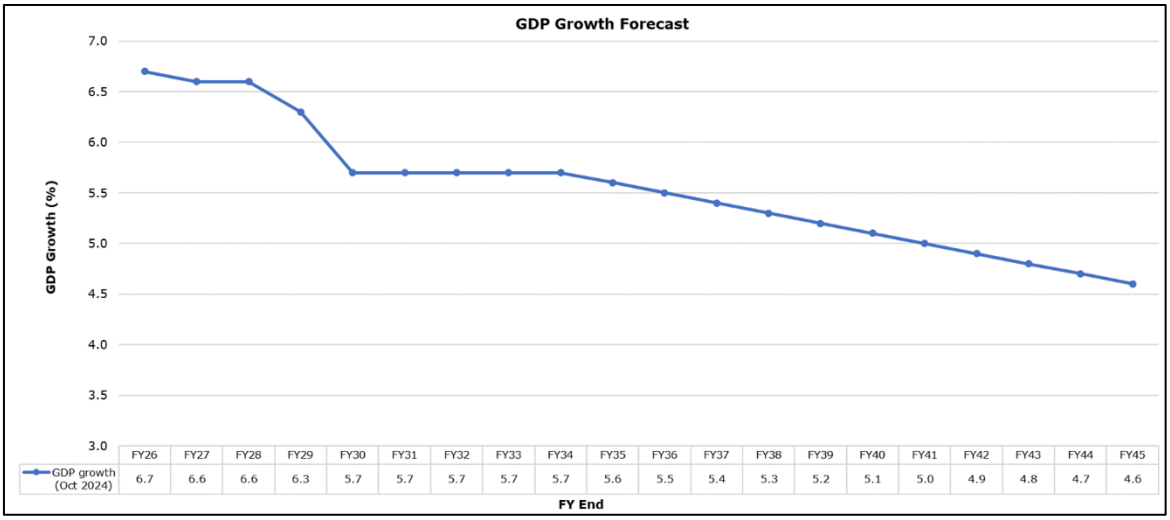
India’s economy has navigated through a series of fluctuations since FY12, from a slowdown to a sharp contraction due to the pandemic, followed by a strong recovery. Structural reforms and global dynamics continue to play crucial roles in shaping India's economic future.

India’s economic growth has generally followed an accelerating trajectory until FY18, positioning it as one of the fastest-growing major economies in the world over the medium term. The real GDP growth rates were 8.3 percent in FY17, 6.8 percent in FY18, and 6.5 percent in FY19, reflecting a solid performance. Over the period from FY12 to FY19, the long-term average growth rate stood at 7.2 percent.

However, in FY20, the economy slowed down due to a combination of structural challenges and global economic headwinds, leading to a more modest growth rate of 3.9 percent. The outbreak of COVID-19 further exacerbated the situation, triggering a global recession and imposing significant economic disruptions. The Indian government's lockdown measures severely impacted the economy, contributing to a contraction of 5.8 percent in FY21.

India’s GDP grew by 9.7 percent in FY22 and continued its recovery with a growth of 7.0 percent in FY23 and 8.2 percent in FY24. The recent forecast by Reserve Bank of India (RBI) indicates a growth rate of 6.4 percent for FY25.

In light of the outlook being predicted by various agencies for the current and future years, the year-on-year growth for Indian economy based on the forecast of Consensus Economics (October 2024 Publication), provided by the client for FY26 and beyond as used in the analysis are presented in **Figure 3-12**.



	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	FY38	FY39	FY40	FY41	FY42	FY43	FY44	FY45
GDP growth (Oct 2024)	6.7	6.6	6.6	6.3	5.7	5.7	5.7	5.7	5.7	5.6	5.5	5.4	5.3	5.2	5.1	5.0	4.9	4.8	4.7	4.6

Figure 3-12: GDP Forecast of India

3.6.2 PIA States Outlook

A snapshot of the main economic indicators in the past years is based on data published by Central Statistical Organisation (CSO) for the PIA states and is presented in **Table 3-12**.

Indicators	Uttarakhand	Uttar Pradesh	Delhi	Haryana	Rajasthan
GSDP in Rs Billion (Till FY24)	2,133.8	14,233.6	6,722.5	6,340.3	8,451.2
GSDP growth (FY12 to FY24)	4.7%	5.6%	5.3%	6.2%	5.3%
Per capita Income in Rs (FY24)	1,82,281	60,037	3,11,398	2,09,499	1,03,652
Sector Share (%) in FY24					
Agriculture and allied	8.4	24.2	1.6	16.3	29.4
Industry	49.8	28.4	13.9	33.0	26.6
Services	41.7	47.5	84.4	50.7	44.0

Table 3-12: Main Economic Indicators of PIA States

To forecast the PIA states' performance, the past growth of State GDPs relative to India's GDP has been analysed, and both short-term and long-term multipliers have been derived. In determining future multipliers, year-on-year variations and the size of the state's economy have been carefully considered.

The past and adopted multipliers for PIA states to Indian economy are presented in **Table 3-13**.

Period	India	Uttarakhand	Uttar Pradesh	Delhi	Haryana	Rajasthan
Past growth (%)						
FY12 to FY24	5.9	5.3	5.8	5.7	6.5	5.7
FY15 to FY24	5.7	4.7	6.1	5.1	6.1	5.5
Past Multipliers - Average of years						
FY13 to FY24		1.1	0.9	1.1	1.2	0.9
FY15 to FY24		1.0	0.9	1.0	1.1	0.9
Multipliers adopted for future						
States w.r.t. India		1.0	0.9	1.0	1.1	0.9

Table 3-13: Past and Future Multipliers of PIA States

3.7 Past Traffic Data on Project Road

Past ETC traffic data is provided by the client from December 2021 to November 2024 for the toll plaza locations. A comparison of the ETC data of FY23 and FY24 has been carried out with estimated AADT for FY25 without considering cash and exempt. Traffic data with respect to financial year and vehicular modes along with the end point growth from the time series analysis of the traffic data is presented in **Table 3-14** for both the project road toll plazas.

FY/Mode	CJV	LCV/MBus	2 Axle	3 Axle	MAV/OSV	PCU
TP01 – Chhapar						
Past Traffic						
FY23	14,657	923	2,299	505	1,194	29,827
FY24	15,766	876	2,570	456	1,396	32,441
FY25	17,333	931	2,706	433	1,454	34,688
YoY Growth (%)						
FY23 vs FY24	7.6	-5.1	11.8	-9.5	16.9	8.8
FY24 vs FY25	9.9	6.3	5.3	-5.2	4.2	6.9
End Point Growth (%)						
FY23 vs FY25	8.7	0.5	8.5	-7.4	10.3	7.8
TP02 – Bahadrabad						
Past Traffic						
FY23	12,835	771	2,188	340	503	23,839
FY24	14,891	711	2,429	392	610	27,167
FY25	15,020	735	2,580	356	687	28,023
YoY Growth (%)						
FY23 vs FY24	16.0	-7.7	11.0	15.3	21.2	14.0
FY24 vs FY25	0.9	3.3	6.2	-9.1	12.7	3.2
End Point Growth (%)						
FY23 vs FY25	8.2	-2.4	8.6	2.4	16.9	8.4

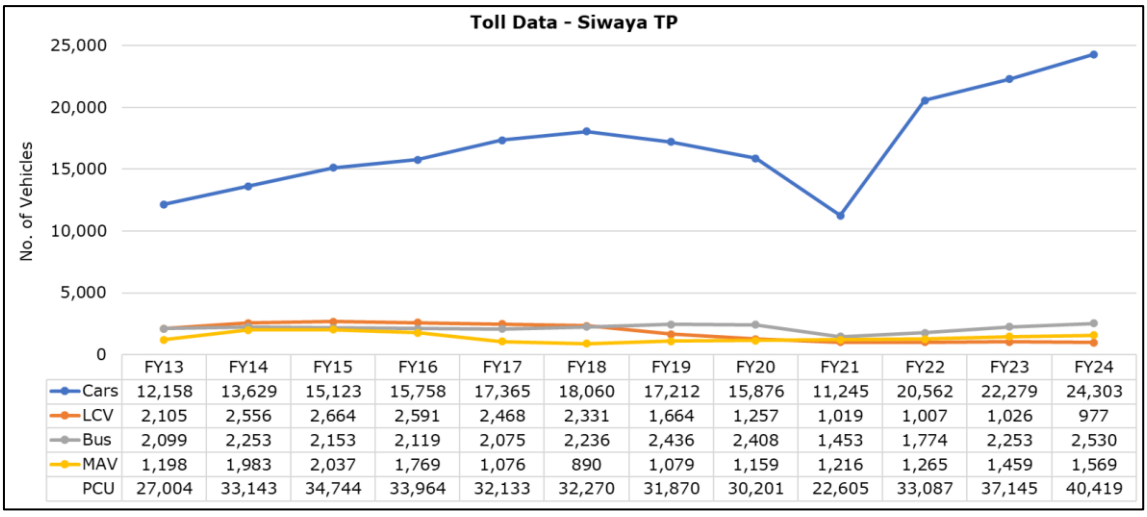
Table 3-14: Past Traffic Trend Analysis of ETC Data

In case of car traffic, a growth between 8-9 percent is observed at each toll plaza during FY23 and FY25. For 2A trucks, around 9 percent growth is observed between FY23 and FY25 at both toll plaza locations. MAVs have a growth of about 10.3 percent at TP01 and about 16.9 percent at TP02 while comparing FY23 to FY25. The overall PCU growth is around 8 percent at both toll plazas during FY23 to FY25.

3.7.1 Past Toll Data from adjacent section

In addition to the project road traffic data, past traffic of Siwaya TP of adjacent road section in proximity has also been analysed to study the traffic growth trends on NH-334.

The traffic for different years is presented in **Figure 3-13**.



	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24
Cars	12,158	13,629	15,123	15,758	17,365	18,060	17,212	15,876	11,245	20,562	22,279	24,303
LCV	2,105	2,556	2,664	2,591	2,468	2,331	1,664	1,257	1,019	1,007	1,026	977
Bus	2,099	2,253	2,153	2,119	2,075	2,236	2,436	2,408	1,453	1,774	2,253	2,530
MAV	1,198	1,983	2,037	1,769	1,076	890	1,079	1,159	1,216	1,265	1,459	1,569
PCU	27,004	33,143	34,744	33,964	32,133	32,270	31,870	30,201	22,605	33,087	37,145	40,419

Figure 3-13: Past Traffic at NH-334 toll section - Siwaya TP

A time series analysis of the past traffic data is presented in **Table 3-15**.

FY/Mode	CJV	LCV	Bus/Truck	3A/MAV	PCU
Siwaya TP					
End Point Growth in %					
FY13 vs FY20	3.9	-7.1	2.0	-0.5	1.6
FY15 vs FY20	1.0	-13.9	2.3	-10.7	-2.8
FY13 vs FY23	6.2	-6.9	0.7	2.0	3.2
FY13 vs FY24	6.5	-6.7	1.7	2.5	3.7
FY18 vs FY24	5.1	-13.5	2.1	9.9	3.8
FY22 vs FY24	8.7	-1.5	19.4	11.4	10.5

Table 3-15: Past Growth Analysis at NH-334 Toll Section – Siwaya TP

The FY13 vs FY24 comparison shows about 6.5 percent growth at the toll plaza. The MAV growth has been around 9.9 percent between FY18 and FY24 and about 11.4 percent during FY22 to FY24. For overall PCUs, about 3.8 percent growth has been observed between FY18 and FY24 at the toll plaza.

3.8 Past and Future Transport Demand Elasticity

The econometric model applied for the project, relates traffic growth to changes in state domestic product via an elasticity factor according to IRC guidelines.

A regression between weighted GSDP (as independent variable) and weighted registered vehicles (as dependant variable) of PIA states was carried out.

Vehicle registration data is also used as a proxy wherein operational toll data is not available. Vehicle registration data represents all vehicles registered in the state, but does not indicate actual number of vehicles plying on the road as it does not account for factors such vehicles taken off the road due to lack road worthiness, those registered in a state but mostly used elsewhere, etc. Consequently, the elasticity values based on vehicle registration may not be representative of the traffic growth trends on the project road.

Also, the elasticity values from the adjacent section of Siwaya have been assessed in forming the project road future elasticities. The trend line elasticities observed in Siwaya toll road section over the past years is presented in **Table 3-16**.

FY/Mode	Car	LCV	Bus/2A	3A/MAV
FY22 vs FY24	1.7	-0.1	4.1	2.5
FY17 vs FY24	1.5	-3.6	0.6	1.6
FY16 vs FY24	1.0	-3.1	0.3	0.1

Table 3-16: Past Elasticities on Siwaya Toll Plaza of Meerut Muzaffarnagar Section

The point to point and trend line actual elasticity between weighted income (GSDP) and traffic is presented in **Table 3-17**.

FY/Mode	CJV	LCV	Bus/Truck	3 Axle	MAV/OSV
Point to Point Elasticity					
TP01 - Chhapar					
FY23 vs FY24	1.0	-0.7	1.6	-1.3	2.2
TP02 - Bahadrabad					
FY23 vs FY24	2.1	-1.0	1.5	2.0	2.8

Table 3-17: Actual Past Traffic Elasticity on PR based on Toll data

Cars

- The motorization rate for cars (per 1000 population) in India has gone up from 6.6 in 2001 to 25 in 2019. Although India's car fleet has been growing at 10 percent for nearly 25 years, its motorization rate is low compared to other countries of similar wealth and much lower than developed countries with motorization rate of around 450. The low motorization rate suggests that there is room for continued growth for many years to come. With the continual increase in motorization rate and improved road network usage of cars for inter-urban travel is showing a growing trend.
- A regression between GSDP (as independent variable) and registered vehicles (as dependent variable) of PIA state was carried out for the states of Uttarakhand and Uttar Pradesh which showed an elasticity of 2.0 and 1.4 during the period between FY12 and FY24.
- The past elasticity of 1.0 and 2.1 is observed for the period between FY23 and FY24 at TP01 and TP02 respectively. For Siwaya TP, elasticity is observed to be 1.0 for FY16 vs FY24 period.
- It is likely that this growth would slow down over time as the market becomes more mature and saturated, therefore elasticity to GSDP can be expected to decline over time. With the anticipated growth momentum in the coming years, for the project road an elasticity value of 1.0 have been considered for the concession period for the project road.

LCV/Minibus

- Predominance of Mini LCV in the LCV category for short haul traffic is being witnessed across many national highways. The LCV segments are also witnessing a smart uptick in demand in the goods carrier segment, where the 2T mini-truck and 2-3.5T pickups dominate with 90 percent share of the total LCV goods segment.
- For project road, an elasticity of 0.2 has been adopted till the end of concession period.

Bus/Truck

- Over the years in India there has been a change in passenger's travel mode preferences with increasingly more people shifting from public transport systems towards personalised modes. This has resulted, in general, in elasticity of bus traffic/demand to GSDP lower than unity.

- The toll plaza data shows a past elasticity of 1.5-1.6 for both toll plazas between FY23 and FY24 comparison in combined Bus/Truck category. The same is observed to be 4.1 during FY22 vs FY24 at the adjacent section at Siwaya TP. For the project road, an elasticity of Bus/Truck traffic to GSDP of 0.9 has been adopted till FY30 and has been tapered thereafter.

3A Truck/MAV

- In India as a whole, the freight vehicle mix has been changing in the last decade favouring MAV to 2A/3A vehicles for long-distance traffic, given the operational efficiencies achievable with larger vehicles. Considering the ongoing technical advancements in automobile industry, some of the standard 2A/3A trucks would gradually be replaced by MAVs. Mature National Highways with tolling in operation for few years, have already witnessed the shift in 2A/3A trucks to MAV for long distance movement and the limited number of 2A/3A trucks are being used for local movements.
- For the project road, past elasticity of 2.2 and 2.8 between FY23 and FY24 comparison is observed for MAVs. Siwaya TP shows the past elasticity of 1.6 for MAVs between FY17 vs FY24 period.
- For the project road, 0.2 has been considered for 3A trucks till the end of concession period and an elasticity of 1.0 has been considered for MAVs till FY30 and has been tapered thereafter.

It has been assumed that transport demand elasticity, for both freight and passenger traffic, would gradually decline over time, despite growth in per capita income, as regions becomes more mature, self-sufficient and with alternative mode of transport available to users. Due consideration has been given to the tonnage shifts happening in the market with Mini LCV gaining importance for short distance movements over LCVs and MAVs being preferred over 2A/3A for long distance movements due to better operational efficiencies.

While assigning elasticities to different modes, freight travel pattern and over all elasticity of cargo tonnage with respect to weighted GSDP has been an important consideration. The recommended elasticity values adopted for all vehicle types in line with the traffic growth being observed on other national highways and changes in freight traffic pattern observed on the project road are presented in **Table 3-18**.

TP01 & TP02					
Period/Modes	**Cars**	**LCV**	**Bus/2A**	**3A**	**MAV**
Up to FY30	1.0	0.2	0.9	0.2	1.0
FY31-FY35	1.0	0.2	0.8	0.2	0.9
FY36-2040	1.0	0.2	0.7	0.2	0.8
Beyond FY40	1.0	0.2	0.7	0.2	0.8

Table 3-18: Recommended Elasticity for Project Road Toll Plazas

3.9 Projected Traffic Growth Rates

Based on the moderated perspective elasticity values and the projected growth rates of the income for PIA states, the future average annual compound traffic growth rates by vehicle type have been estimated for the project road by using the following relationship:

$T_{gr} = (GSDP_{gr}) \times E;$

where,

T_{gr} – Traffic growth rate for mode

$GSDP_{gr}$ – Growth rate of GSDP

E – Elasticity value for mode

Using the year-on-year mode wise weighted income for PIA and elasticity for different time periods, traffic growth rates have been estimated for each year till FY55 in line with the maximum extendable concession period of 30 years. The estimated traffic growth rates for the project road along with the implied growth rates after considering the impact of diversions including six laning of PR have been presented in **Table 3-19**.

FY/Modes	Cars	LCV	2A	3A	MAV/ OSV	Cars	LCV	Bus/ 2A	3A	MAV/ OSV
	Normal Growth Rates					Implied Growth Rates				
	TP01 - Chhapar									
FY26	6.3	1.3	5.7	1.3	6.3	-3.5	-2.4	-3.6	-9.7	-2.7
FY27	6.2	1.3	5.6	1.2	6.2	-9.9	-4.5	-9.6	-17.3	-8.6
FY28	6.2	1.3	5.6	1.2	6.2	-4.4	-5.2	5.6	1.2	6.2
FY29	5.9	1.2	5.3	1.2	5.9	-5.8	-5.7	5.3	1.2	5.9
FY30	5.3	1.1	4.8	1.1	5.3	5.3	1.1	4.8	1.1	5.3
FY31	5.3	1.1	4.3	1.1	4.8	5.3	1.1	4.3	1.1	4.8
FY32	5.3	1.1	4.3	1.1	4.8	5.3	1.1	4.3	1.1	4.8
FY33	5.3	1.1	4.3	1.1	4.8	5.3	1.1	4.3	1.1	4.8
FY34	5.3	1.1	4.3	1.1	4.8	5.3	1.1	4.3	1.1	4.8
FY35	5.2	1.1	4.2	1.1	4.7	-6.3	-0.8	-0.5	-5.1	-0.9
FY36	5.1	1.0	3.6	1.0	4.1	3.5	0.5	2.5	-0.2	2.8
FY37	5.1	1.0	3.5	1.0	4.1	16.6	2.3	7.3	6.4	8.6
FY38	5.0	1.0	3.5	1.0	4.0	5.0	1.0	3.5	1.0	4.0
FY39	4.9	1.0	3.4	1.0	3.9	4.9	1.0	3.4	1.0	3.9
FY40	4.8	1.0	3.3	1.0	3.8	4.8	1.0	3.3	1.0	3.8
FY41	4.7	0.9	3.3	0.9	3.8	4.7	0.9	3.3	0.9	3.8
FY42	4.6	0.9	3.2	0.9	3.7	4.6	0.9	3.2	0.9	3.7
FY43	4.5	0.9	3.2	0.9	3.6	4.5	0.9	3.2	0.9	3.6
FY44	4.4	0.9	3.1	0.9	3.5	4.4	0.9	3.1	0.9	3.5
FY45 and beyond	4.3	0.9	3.0	0.9	3.5	4.3	0.9	3.0	0.9	3.5
TP02 - Bahadrabad										
FY26	6.5	1.3	5.8	1.3	6.4	-1.7	-3.3	-3.6	-12.9	-8.3
FY27	6.4	1.3	5.7	1.3	6.3	-6.9	-6.0	-9.8	-23.4	-19.3
FY28	6.4	1.3	5.7	1.3	6.3	6.4	1.3	5.7	1.3	6.3
FY29	6.1	1.2	5.4	1.2	6.1	6.1	1.2	5.4	1.2	6.1
FY30	5.5	1.1	4.9	1.1	5.5	5.5	1.1	4.9	1.1	5.5
FY31	5.5	1.1	4.4	1.1	4.9	5.5	1.1	4.4	1.1	4.9
FY32	5.5	1.1	4.4	1.1	4.9	5.5	1.1	4.4	1.1	4.9
FY33	5.5	1.1	4.4	1.1	4.9	5.5	1.1	4.4	1.1	4.9
FY34	5.5	1.1	4.4	1.1	4.9	5.5	1.1	4.4	1.1	4.9
FY35	5.4	1.1	4.3	1.1	4.8	-2.5	-0.9	-1.6	-7.9	-6.6
FY36	5.3	1.1	3.7	1.1	4.2	4.1	0.4	2.4	-0.7	0.7
FY37	5.2	1.0	3.6	1.0	4.2	12.5	2.4	8.6	9.3	13.7
FY38	5.1	1.0	3.6	1.0	4.1	5.1	1.0	3.6	1.0	4.1
FY39	5.0	1.0	3.5	1.0	4.0	5.0	1.0	3.5	1.0	4.0
FY40	4.9	1.0	3.4	1.0	3.9	4.9	1.0	3.4	1.0	3.9
FY41	4.8	1.0	3.4	1.0	3.8	4.8	1.0	3.4	1.0	3.8
FY42	4.7	0.9	3.3	0.9	3.8	4.7	0.9	3.3	0.9	3.8
FY43	4.6	0.9	3.2	0.9	3.7	4.6	0.9	3.2	0.9	3.7
FY44	4.5	0.9	3.2	0.9	3.6	4.5	0.9	3.2	0.9	3.6
FY45 and beyond	4.4	0.9	3.1	0.9	3.5	4.4	0.9	3.1	0.9	3.5

Table 3-19: Traffic Growth Rates for Project Road (%)

In derivation of above growth rates, the likely shift of buses to cars in case of passenger vehicles and the replacement/ tonnage shift of 2A/3A trucks to MAV for long distance in case of freight vehicles has been duly considered.

The above growth rates relate to the most likely Base Case. In addition, two sets of traffic growth rates under low and high cases have also been considered and impact on toll revenue evaluated for both these cases. Based on the risk analysis of key parameters like economic growth and elasticity of travel demand impacting traffic growth, two additional growth scenarios have been presented. Low growth scenario considers a 20 percent reduction in growth rates relating to about 10 percent decline each in elasticity and economic growth. The high growth scenario considers a 20 percent increase in

growth rates signifying about 10 percent increase each in elasticity and economic parameters.

3.10 Projections Mode-wise Traffic

Table 3-20 presents the projections of the mode-wise vehicles under Base Case after diversion till FY55.

TP01 - Chhapar TP							
FY End	CJV	LCV	Bus/2A	3A	MAV	OSV	Total PCU
2025	22,624	1,023	2,883	437	1,460	5	40,711
2026	21,842	998	2,781	394	1,420	5	39,279
2027	19,687	953	2,515	326	1,299	6	35,510
2028	18,818	903	2,655	330	1,379	6	35,361
2029	17,718	852	2,796	334	1,461	6	34,989
2030	18,663	861	2,931	338	1,539	7	36,715
2031	19,658	870	3,056	342	1,613	7	38,445
2032	20,706	880	3,187	345	1,690	7	40,261
2033	21,811	889	3,323	349	1,771	8	42,167
2034	22,973	899	3,465	353	1,857	8	44,167
2035	21,521	892	3,449	335	1,841	8	42,531
2036	22,273	896	3,535	334	1,892	9	43,777
2037	25,960	917	3,793	355	2,056	9	49,073
2038	27,247	927	3,925	359	2,137	10	51,150
2039	28,572	936	4,059	362	2,221	10	53,279
2040	29,935	945	4,195	366	2,306	10	55,458
2041	31,336	954	4,333	369	2,392	11	57,686
2042	32,772	963	4,473	372	2,480	11	59,962
2043	34,243	971	4,614	376	2,570	11	62,283
2044	35,749	980	4,756	379	2,660	12	64,648
2045	37,287	988	4,900	382	2,752	12	67,055
2046	38,892	997	5,048	386	2,847	13	69,556
2047	40,565	1,006	5,200	389	2,945	13	72,154
2048	42,311	1,015	5,357	392	3,047	14	74,853
2049	44,132	1,023	5,519	396	3,152	14	77,658
2050	46,031	1,032	5,686	399	3,261	15	80,572
2051	48,011	1,041	5,858	403	3,373	15	83,601
2052	50,077	1,050	6,035	406	3,490	16	86,748
2053	52,232	1,060	6,217	410	3,610	16	90,018
2054	54,480	1,069	6,405	413	3,735	17	93,417
2055	56,824	1,078	6,598	417	3,863	17	96,949
TP02 – Bahadrabad TP							
FY End	CJV	LCV	Bus/2A	3A	MAV	OSV	Total PCU
2025	22,173	823	2,651	368	697	4	35,619
2026	21,795	796	2,554	321	639	4	34,509
2027	20,293	748	2,303	246	516	5	31,404
2028	21,585	757	2,435	249	549	5	33,262
2029	22,896	766	2,567	252	582	5	35,145
2030	24,155	775	2,694	255	614	5	36,948
2031	25,483	783	2,812	257	644	6	38,788
2032	26,883	792	2,935	260	676	6	40,724
2033	28,361	801	3,063	263	709	6	42,760
2034	29,920	809	3,197	266	744	7	44,902
2035	29,184	802	3,146	245	695	7	43,718
2036	30,370	806	3,223	243	699	7	45,157
2037	34,177	825	3,501	266	795	7	50,330
2038	35,924	834	3,626	269	828	8	52,619
2039	37,726	842	3,753	271	861	8	54,971
2040	39,581	850	3,881	274	895	8	57,386
2041	41,490	859	4,012	277	929	9	59,863
2042	43,451	867	4,144	279	964	9	62,399
2043	45,462	875	4,277	282	1,000	9	64,992
2044	47,523	883	4,412	284	1,036	10	67,642
2045	49,631	890	4,549	287	1,073	10	70,345
2046	51,833	898	4,689	289	1,110	10	73,160
2047	54,132	906	4,834	292	1,150	11	76,093
2048	56,534	914	4,984	295	1,190	11	79,147
2049	59,042	922	5,138	297	1,233	12	82,329
2050	61,661	930	5,297	300	1,276	12	85,642
2051	64,397	939	5,460	302	1,321	12	89,094
2052	67,253	947	5,629	305	1,368	13	92,690
2053	70,237	955	5,803	308	1,417	13	96,436
2054	73,353	964	5,982	310	1,467	14	100,339
2055	76,607	972	6,167	313	1,519	14	104,405

Table 3-20: Mode-Wise Projected Traffic for PR

3.11 Traffic Projections and Capacity Analysis

Table 3-21 presents the projections of the total traffic in PCUs based on the most likely growth rates till FY55 as assessed in this study for both with and without diversion. The traffic after diversion considers all the network impacts including increased diversion during construction period for six laning of PR.

FY	Total Traffic Before Diversion			Total Traffic After Diversion		
	TP01	TP02	Average	TP01	TP02	Average
2025	40,711	35,619	38,165	40,711	35,619	38,165
2026	43,068	37,745	40,407	39,279	34,509	36,894
2027	45,532	39,971	42,751	35,510	31,404	33,457
2028	48,142	42,333	45,237	35,361	33,262	34,312
2029	50,783	44,727	47,755	34,989	35,145	35,067
2030	53,309	47,020	50,164	36,715	36,948	36,831
2031	55,858	49,355	52,606	38,445	38,788	38,617
2032	58,535	51,810	55,173	40,261	40,724	40,492
2033	61,345	54,393	57,869	42,167	42,760	42,463
2034	64,296	57,110	60,703	44,167	44,902	44,534
2035	67,340	59,918	63,629	42,531	43,718	43,124
2036	70,348	62,719	66,534	43,777	45,157	44,467
2037	73,440	65,605	69,522	49,073	50,330	49,702
2038	76,614	68,574	72,594	51,150	52,619	51,885
2039	79,869	71,624	75,747	53,279	54,971	54,125
2040	83,204	74,755	78,979	55,458	57,386	56,422
2041	86,616	77,964	82,290	57,686	59,863	58,774
2042	90,103	81,251	85,677	59,962	62,399	61,180
2043	93,663	84,611	89,137	62,283	64,992	63,638
2044	97,292	88,043	92,668	64,648	67,642	66,145
2045	100,987	91,544	96,266	67,055	70,345	68,700
2046	104,828	95,190	100,009	69,556	73,160	71,358
2047	108,822	98,986	103,904	72,154	76,093	74,123
2048	112,973	102,940	107,957	74,853	79,147	77,000
2049	117,290	107,058	112,174	77,658	82,329	79,993
2050	121,777	111,346	116,562	80,572	85,642	83,107
2051	126,443	115,813	121,128	83,601	89,094	86,348
2052	131,294	120,464	125,879	86,748	92,690	89,719
2053	136,338	125,310	130,824	90,018	96,436	93,227
2054	141,583	130,356	135,970	93,417	100,339	96,878
2055	147,036	135,613	141,325	96,949	104,405	100,677
CAGR (FY25-FY45)	4.6%	4.8%	4.7%	2.5%	3.5%	3.0%

Table 3-21: Projected Traffic in PCUs on the Project Road (Before and After Diversion)

With the considered diversion impacts, the projected traffic is expected to reach 40,000 PCUs by FY32, serving as a trigger for six-laning. Allowing a two-year period for DPR preparation and land acquisition, the impact of six-laning construction on traffic is anticipated during FY35 and FY36 for the Meerut-Muzaffarnagar-Haridwar section.

As a result of this, higher diversion percentages (as provided in Table 3-6 of DDE diversion) have been considered for diversion to DDE during construction period of FY35 and FY36 and lower percentage of diversion is applicable once the six laning is complete from FY37 onwards.

4. TOLL REVENUE PROJECTIONS

4.1 Tolling Strategy

The project road will continue to have an "Open System" of toll collection which enables the concessionaire to collect tolls from through traffic as well as from short distance one.

As mentioned earlier, there are two operational toll plazas on the project road, TP01-Chhapar at km 138.552 and TP02 - Bahadrabad at 187.370 with an effective tolling length of 40.519 km and 85.957 km respectively being charged at present.

4.2 Schedule of User Fee

As per Schedule of User Fee for the project, the per km toll rates applicable from 2007-08 for normal tolling length, bypasses and permanent structures, the revision basis and concessions are provided.

The concessions to traffic have been given in the form of rates as below:

Local traffic

Car / Jeep / Vans - includes local users owning a vehicle registered for non-commercial purposes, residing within a distance of 20 km from the toll plaza and crossing the same for commuting purposes.

Commercial vehicles - includes local users owning a commercial vehicle (excluding vehicles under National Permit), registered with address on the Registration Certificate of a particular district and uses such vehicle for commuting on a section of National Highway, permanent bridge, tunnel or bypass, as the case may be, which is located within that district, shall be levied user fee on all toll plazas which are located within that district at the rate of fifty per cent of the prescribed rate of fee (single journey rate). No such concession shall be provided, if a service road or alternative road is available for use by such commercial vehicles. Thus, local commercial traffic has to pay only 50 percent of the normal ticket.

Daily Pass

When the vehicle has to cross the tolled section more than once in a day, the user shall have the option to pay one and half times (1.5 times) of the fee for a single entry; this pass shall be valid for 2 entries within 24 hours of purchase.

Monthly Pass

A user, who makes use of the project road frequently during a month, may opt to purchase a monthly pass upon payment of a charge equal to two-thirds of the fee payable for 50 single journeys; this pass can be used for a maximum 50 one-way journeys over the month of validity.

Thus, the different categories of toll tickets are as follows:

(i) Traffic paying normal toll rates (single trip)

(ii) Traffic paying return journey rates

(iii) Traffic paying monthly pass rates

(iv) Traffic paying local personal rates

(v) Traffic paying local commercial rates

4.3 Tolling Segmentation

The tolling stream distribution for the project road has been derived from the average of ETC toll data of FY25 from April 2024 to November 2024. The cash and exemption traffic (April – October 2024) has been added to the ETC traffic distribution and the resultant tolling segmentation is presented in **Table 4-1**.

Type	Car	LCV	Bus/2A Trucks	3A Trucks	MAV	OSV
TP01-Chhapar						
Single	42.2	42.8	31.7	67.3	56.0	100.0
Return	34.7	48.3	62.0	31.7	43.5	0.0
Monthly	0.0	0.0	0.0	0.0	0.0	0.0
Local personal	0.2	0.0	0.0	0.0	0.0	0.0
Local commercial	0.0	0.1	0.2	0.0	0.0	0.0
Exemptions	22.8	8.8	6.1	1.0	0.5	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
TP02 – Bahadrabad						
Single	38.6	40.7	27.4	48.5	62.8	100.0
Return	28.6	45.9	63.2	35.7	34.2	0.0
Monthly	0.0	0.0	0.0	0.0	0.0	0.0
Local personal	1.8	0.0	0.0	0.0	0.0	0.0
Local commercial	0.9	3.8	6.8	12.8	1.4	0.0
Exemptions	30.2	9.6	2.6	3.0	1.5	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 4-1: Tolling Distribution

In case of cars, the normal toll paying traffic is likely to be about 42.2 percent at TP01 and 38.6 percent at TP02. The car traffic for return journey is around 34.7 percent at TP01 and 28.5 percent. The share of exempted traffic is between 23-30 percent at both toll plaza locations.

In case of LCVs, both toll plazas display a consistent share for single tickets varying between 41-43 percent and similarly in return journey tickets with a share between 46-48 percent.

Across the two toll plazas, Bus/2A Trucks exhibit around 27-32 percent share for single tickets and around 62-63 percent for return tickets.

In case of 3A trucks, the share of normal toll paying traffic is around 67.3 percent at TP01 and around 48.5 percent at TP02 whereas, share of return traffic is around 32-36 percent across both the toll plazas. The share of local commercial ticket is around 12.8 percent TP02.

In case of MAVs, at TP01 around 56.0 percent and 62.8 percent of traffic at TP02 is opting for normal ticket due to their long lead of travel and around 43.5 and 34.2 percent of MAV falling under return journey category at TP01 and TP02 respectively.

Trip rate for local personal pass users for cars is 0.2 percent at TP01 and 1.8 percent at TP02 for monthly pass it is considered as 1.67 across all the modes. For daily pass, trip rate of 2.0 has been considered for all the modes.

4.4 Toll Rates

This section presents details on the toll rates that are likely to be imposed on the users of the project road during the study period. The toll rates (Rs/km) for the base year 2007-08 for different vehicle categories as per toll fee rules are presented in **Table 4-2**.

Mode	Base rate per km (in Rs)
Car, Jeep, Van, LMV	0.65
LCV /M Bus	1.05
Bus/ 2 Axle Truck	2.20
3 Axle	2.40
MAV	3.45
Oversized	4.20
Local Passenger	150

Table 4-2: Toll Rates in Rs/km for Different Vehicle Categories

The toll notification states that the 2007 toll rates shall be increased without compounding by three per cent each year with effect from the 1st day of April 2008 and such increased rate shall be deemed to be the base rate for the subsequent years.

In addition to this, the rate of fee for use of bypass forming part of a section of a National Highway constructed with a cost of Rs 10 crore or more, for the base year 2007, shall be one and a half times of the per km base rates specified above and the length of such bypass shall be excluded from the length of such section of National Highway.

In addition to this, the fee levied and collected hereunder for permanent bridge/ structures, as the case may be, having a length of 60 m or more on the basis of the equivalent length for structure as specified shall be due and payable at the toll plaza.

The details of normal tolling lengths, bypass length (at 1.5 times) and equivalent structure lengths being charged at Chhapar and Bahadrabad as per the information in the Gazette notification and Schedule M for the project are presented in **Table 4-3**.

Particulars	Gaz. Notification Length	Schedule M Length	
		Before Completion of Improvement (till 31st May FY28)	After Completion of Improvement (From 1st June FY28)
TP01 Chhapar at km 138.552			
A. Normal	27.595	27.595	26.545
B. Bypass	7.709	7.709	7.709
C. Equivalent structure	0.136	0.136	1.186
Base Length	35.440	35.440	35.440
Tolling Length = A+(B*1.5) + (C*10)	40.519	40.519	49.969
TP02 Bahadrabad at km 187.370			
A1. Normal - 2 lane (to be charged at 60%)		0.397	0.397
A2. Normal - 4/6 lane	24.471	22.621	22.531
B. Bypass	16.224	16.224	16.224
C1. Equivalent structure - 2 lane (to be charged at 60%)	0.525	0.653	0.653
C2. Equivalent structure - 4/6 lane	1.900	3.750	3.840
Base Length	43.120	43.645	43.645
Tolling Length = A+(B*1.5) + (C*10)	85.957	88.613	89.423

Table 4-3: Tolling Length (in km) for the Project Road

It is to be noted that for TP02, current toll rates are not matching with the effective tolling length, for which additional 15 km of tollable length to be charged to match the toll rates for FY25.

The applicable base rates shall be revised annually with effect from April 1 each year to reflect the increase in wholesale price index for the month of December of the immediate preceding year in which such revision is undertaken but such revision shall be restricted for 40 per cent of the increase in wholesale price index.

Actual WPI information for December 2024 of 155.4 under 2011-12 series converted into 1999-00 series (155.4*1.873*1.641=477.636) has been used. WPI increase of 4.5 is considered for FY27 & FY28, while WPI forecast for remaining years beyond December 2027 has been considered as 3.5 percent as provided by the client.

The stream of toll rates likely to be charged basis schedule -M lengths and adopted WPI assumptions at the toll plaza of the project road in cardinal years till FY55 is presented in **Table 4-4**. The toll fee has been rounded to nearest 5 Rupees as per toll fee rules.

FY End	Car	LCV/ M Bus	Bus/ 2A Truck	3-axle Truck	MAV	OSV	Car Local
TP01 - Chappar							
2025 (Existing)	60	95	200	220	315	385	340
With Schedule-M Lengths							
2025	60	95	200	220	315	385	340
2030	90	145	305	335	480	580	415
2035	110	180	370	405	585	710	510
2040	135	215	455	495	715	870	620
2045	165	265	555	605	870	1,060	760
2050	200	325	680	740	1,065	1,295	925
2055	245	395	830	905	1,300	1,585	1,130
TP02 - Bahadrabad							
2025 (Existing)	125	205	425	465	670	815	340
With Schedule-M Lengths							
2025	130	210	440	480	690	840	340
2030	160	260	545	595	855	1,040	415
2035	195	320	665	725	1,045	1,275	510
2040	240	390	815	890	1,275	1,555	620
2045	295	475	995	1,085	1,560	1,895	760
2050	360	580	1,215	1,325	1,905	2,320	925
2055	440	710	1,485	1,620	2,330	2,835	1,130

Table 4-4: Toll Rates at Toll Plazas (in Rs)

The users purchasing return journey tickets will pay 1.5 times the above toll rates; the traffic opting for monthly pass will pay 33.3 times (two-thirds of 50 single journeys) the normal traffic toll rates.

4.5 Toll Revenue Estimates

Total Revenue collected at the toll plaza location during for FY24 and FY25 (Apr-Nov) is Rs 1,544.0 million and Rs 1,250.2 million respectively. The mode wise past revenue for the project road toll plaza is presented in **Table 4-5**.

FY/TP	Car/Jeep/ Van	LCV	2-Axle	3-Axle	MAV	OSV	Total
TP01 - Chhapar							
FY23 - 8 months	163.7	16.1	87.5	22.1	79.5	0.3	369.3
FY24 - 12 months	305.5	25.9	151.8	32.1	138.1	0.4	653.7
FY25 - 8 months	231.8	18.8	106.8	19.9	92.5	0.1	469.9
TP02 - Bahadrabad							
FY23 - 8 months	229.1	22.3	139.1	25.1	58.5	0.4	474.6
FY24 - 12 months	473.3	34.7	238.1	39.6	104.3	0.4	890.3
FY25 - 8 months	418.8	31.0	206.5	31.3	92.5	0.1	780.4

Table 4-5: Mode-wise Past Revenue (In Millions)

The total assured remittance amount for FY25 for the project road toll plaza is Rs. 1,826.7 million as against model estimate of 1,877.8 million resulting in a variation of 2.8 percent, the details of which are presented in **Table 4-6**.

Particulars	TP01	TP02	Total
Actual Remittance	662.4	1,164.3	1,826.7
FY25 Revenue (Model)	703.6	1,174.3	1,877.8
Variation (%)	6.2	0.9	2.8

Table 4-6: Remittance vs Estimated Revenue (In Millions) Comparison for FY25

As per the site findings, WIM is currently installed in all the lanes at both toll plazas whereas no overloading is being charged currently.

In view of this, 7- day axle load survey data has been provided by the technical consultants of the client which has been analysed to understand the extent of overloaded vehicles at both toll plazas. The analysis shows similar overloading trends across the seven days. The findings of the overloading analysis are presented in **Table 4-7**.

S.No.	Vehicle Type	Within Permissible Limit	Within Tolerance up to 5%	>5%-<10%	>10%-<20%	>20%	Total	Adopted %
TP01 – Chhapar (%)								
1	LCV	99.8	0.0	0.2	0.0	0.0	100.0	
2	2A	98.3	0.7	0.2	0.4	0.3	100.0	
3	3A	61.8	12.1	13.1	11.1	2.0	100.0	1.9
4	MAV	59.7	6.3	7.0	12.3	14.7	100.0	12.3
TP02 – Bahadrabad (%)								
1	LCV	100.0	0.0	0.0	0.0	0.0	100.0	
2	2A	99.7	0.2	0.0	0.0	0.05	100.0	
3	3A	58.8	21.2	12.6	7.3	0.1	100.0	0.1
4	MAV	75.5	7.8	6.6	5.5	4.6	100.0	4.0

Table 4-7: Overloaded Vehicles on the PR

As observed from the axle load analysis, around 14.7 and 4.6 percent of the MAVs are above 20 percent overloading limit at TP01 and TP02 respectively whereas, this percentage is around 2.0 and 0.1 percent in 3A trucks at TP01 and TP02 respectively. However, the commodities such as fruits and vegetables, petroleum products, chemicals and gas, heavy machinery and industrial equipment are less likely to be overloaded. Hence, the revised overloading percentage after excluding these commodities in the category of above 20 percent overloading comes out to be around 1.9 percent and 0.1 percent in 3A Trucks and about 12.3 percent and 4.0 percent for MAVs, which has been adopted for the further analysis.

The overloading vehicles are liable to pay the overloading penalty as per the provisions of the concession agreement. The concession agreement of the latest TOT project states that overloading penalty should be charged as per the NHAI overloading circular. As per the amended National Highways Fee (Determination of Rates and Collection) Rules, 2018, "the driver or owner or person in charge of a mechanical vehicle shall be liable to pay fee, for entering the overloaded vehicle on the National Highway, to the user fee collecting agency, equal to fees as presented in **Table 4-8**.

Percentage of excess load over Maximum Permissible Gross Vehicular Weight	Multiplying factor to base rate fees	Fees
0% to 20%	Two	[(Fees applicable for such category of mechanical vehicle under sub-rule (2) of rule 4) X (Multiplying factor)]
>20% to 40%	Four	
>40% to 60%	Six	
>60% to 80%	Eight	
>80% and above	Ten	

Table 4-8: User Fee for Overloaded Vehicles

However, as per the operational overloading practices at the toll plazas where overloading penalty is being charged, it is either the next higher category toll or two times the normal fee which is usually being collected.

Continuing with the practice of two times toll, since 3A Trucks and MAVs are heavily overloaded, with WIM in place at Chhapar and Bahadrabad, the practice of charging them for one-time extra payment can be put in place.

Although the quantum of overloaded vehicles is high but after factoring in the practical number of vehicles from whom overloading can be charged, under a more pragmatic scenario, it is assumed that around 25 percent of this adopted overloaded category is charged for one-time additional payment. This results in 0.5 percent in 3A and 1.0-3.0 percent of MAV AADT of FY25 at the two toll plazas - paying one-time extra toll. However, with strict overloading compliance in place in the future years, this overloading percentage is likely to decline over the years of concession.

At present, overloading is not being collected at the two TPs and the proportion of the overloading revenue is not much, therefore, it has not been considered in the base case.

4.6 Toll Revenue Projections

Toll revenue streams have been calculated assuming that:

- Toll would be collected for all 365 days in a year and for 366 days in a leap year
- Toll revenues have been presented from FY25 to FY55 in line with the maximum extendable concession period of 30 years

The toll revenue for both toll plazas at the project road after considering the impacts of all diversions for the base case is presented in **Table 4-9**.

FY Ending	TP01 -Chhapar	TP02 - Bahadrabad	Total
2025	703.6	1,213.0	1,916.6
2026	691.3	1,203.5	1,894.8
2027	661.8	1,128.8	1,790.6
2028	835.3	1,284.1	2,119.5
2029	889.6	1,402.7	2,292.3
2030	973.5	1,530.8	2,504.3
2031	1,062.5	1,682.2	2,744.6
2032	1,164.3	1,831.9	2,996.2
2033	1,250.2	1,994.3	3,244.5
2034	1,369.0	2,185.2	3,554.1
2035	1,379.0	2,191.2	3,570.2
2036	1,480.9	2,366.6	3,847.6
2037	1,718.8	2,752.0	4,470.8
2038	1,857.7	2,967.3	4,825.0
2039	2,013.6	3,220.7	5,234.4
2040	2,178.4	3,509.1	5,687.5
2041	2,350.9	3,794.7	6,145.5
2042	2,540.7	4,107.2	6,647.9
2043	2,731.8	4,442.0	7,173.9
2044	2,976.5	4,819.2	7,795.7
2045	3,194.5	5,216.3	8,410.8
2046	3,434.2	5,629.3	9,063.5
2047	3,721.0	6,095.9	9,816.8
2048	4,022.7	6,584.9	10,607.6
2049	4,339.7	7,114.0	11,453.7
2050	4,660.3	7,714.3	12,374.6
2051	5,047.3	8,338.6	13,385.9
2052	5,427.3	9,050.9	14,478.2
2053	5,854.0	9,738.8	15,592.8
2054	6,326.4	10,519.5	16,845.9
2055	6,834.0	11,427.2	18,261.2

Table 4-9: Toll Revenue (in Rs Million) for the Project Road

Majority of the revenue is expected to come from cars with about 53.3 percent of the total revenue. Amongst other categories, Bus/2A Trucks represent a share of around 25.4 percent of total revenue followed by MAV/OSVs having a share of about 15.9 percent and LCV is likely to generate about 2.9 percent of total revenue followed by around 2.6 percent share by 3A Trucks.

Vehicles paying normal tolls are around 56.8 percent of total toll revenue for the project road section and around 41.9 percent of the traffic may fall in return pass category, while the remaining 1.3 percent is generated from monthly and local concession passes.

4.7 Scenario Analysis

For toll road projects, revenue streams are generally based on the assessment of the traffic volume (base and future) crossing the toll plazas and the applicable toll imposed on the user of the road. There is an inherent element of uncertainty in any forecast and

whilst is not possible to measure risk in a strictly statistical sense (as many of the risks are largely or partly unknown), in this section an attempt is made at quantifying the main risks that could have an impact on this forecast.

The econometric approach used to derive traffic growth, is based on the estimation of GSDP growth rates for the influence area economies and traffic demand elasticity by mode; the estimation of both variables contains a certain degree of uncertainty which can be represented in the scenario analysis. Scenario analysis has been done in the following subheadings for the base case:

High Case

The high case is based on a more optimistic economic outlook for future years and higher elasticity values as compared to the base case. Therefore, traffic growth rates of 20 percent higher than the base case for every year and for all the mode are considered.

Low Case

A growth rate of 20 percent lower than base case for all types of vehicles has been considered in the present analysis to reflect uncertainty with regard to economic performance of PIA states and lower elasticity values.

The result of base case and scenario is presented in **Table 4-10**. A comparison versus base case has been presented for the Present Value of the project (at 12 percent discount rate) and the compounded annual growth rate (CAGR) from FY25 to FY45/FY55.

FY Ending March	Base Case	High Growth (+20%)	Low Growth (-20%)
2025	1,916.6	1,916.6	1,916.6
2026	1,894.8	1,915.9	1,873.6
2027	1,790.6	1,830.4	1,751.3
2028	2,119.5	2,189.9	2,050.6
2029	2,292.3	2,393.2	2,194.8
2030	2,504.3	2,639.5	2,374.9
2031	2,744.6	2,919.6	2,578.9
2032	2,996.2	3,216.6	2,789.4
2033	3,244.5	3,515.4	2,992.8
2034	3,554.1	3,886.9	3,247.8
2035	3,570.2	3,940.1	3,233.0
2036	3,847.6	4,282.3	3,454.7
2037	4,470.8	5,019.0	3,979.9
2038	4,825.0	5,463.1	4,258.7
2039	5,234.4	5,976.0	4,581.8
2040	5,687.5	6,546.7	4,937.9
2041	6,145.5	7,131.3	5,292.7
2042	6,647.9	7,775.7	5,680.3
2043	7,173.9	8,456.1	6,082.4
2044	7,795.7	9,260.5	6,558.9
2045	8,410.8	10,067.0	7,023.3
2046	9,063.5	10,930.2	7,511.7
2047	9,816.8	11,929.6	8,074.3
2048	10,607.6	12,988.1	8,659.5
2049	11,453.7	14,132.2	9,278.9
2050	12,374.6	15,385.5	9,949.1
2051	13,385.9	16,771.5	10,679.9
2052	14,478.2	18,279.2	11,463.9
2053	15,592.8	19,838.1	12,252.4
2054	16,845.9	21,598.5	13,135.8
2055	18,261.2	23,596.8	14,129.0
PV12 FY25 till FY45	23,267.7	25,350.4	21,409.2
PV12 till FY45 vs base		9.0%	-8.0%
CAGR FY25 to FY45	7.7%	8.6%	6.7%
PV12 FY25 till FY55	29,686.9	33,346.6	26,562.9
PV12 till FY55 vs base		12.3%	-10.5%
CAGR FY25 to FY55	7.8%	8.7%	6.9%

Table 4-10: Comparison of Annual Revenues Forecasts in Rs Million (Base) to Alternate Traffic Growth Assumptions

The project road revenues will have a CAGR of 7.7 percent for the period FY25 to FY45. The high growth scenario would generate about 9.0 percent higher PV than the base case while low growth scenario may result in 8.0 percent lower PV than the base case.

APPENDICES

APPENDIX 2.1
MONTH ON MONTH PAST TRAFFIC DATA

Traffic Study for Muzaffarnagar-Haridwar section of NH-334 (Old NH-58) in the States of Uttar Pradesh and Uttarakhand
Month on Month Past Traffic Data

Chhapar TP

Month	CJV	LCV	2-Axle	3-Axle	MAV	OSV	Total Traffic	PCUs
Aug-22	13,388	820	2,232	504	1,187	6	18,138	28,198
Sep-22	12,380	885	2,347	484	1,154	6	17,257	27,423
Oct-22	14,277	845	2,332	483	1,129	5	19,071	29,093
Nov-22	14,009	871	2,357	513	1,218	6	18,974	29,432
Dec-22	12,747	841	2,237	487	1,266	4	17,583	27,899
Jan-23	11,872	791	2,220	460	1,264	4	16,611	26,805
Feb-23	14,069	887	2,433	490	1,320	4	19,204	30,131
Mar-23	14,335	874	2,335	499	1,323	4	19,370	30,120
Apr-23	19,409	959	2,478	468	1,316	5	24,636	35,632
May-23	20,679	1,013	2,690	473	1,240	4	26,100	37,288
Jun-23	25,096	978	2,820	502	1,217	4	30,617	42,024
Jul-23	11,495	738	2,254	436	1,075	4	16,002	25,525
Aug-23	12,454	784	2,379	448	1,188	4	17,258	27,478
Sep-23	14,558	869	2,566	454	1,315	4	19,765	30,856
Oct-23	15,838	921	2,719	433	1,368	4	21,284	32,854
Nov-23	15,328	820	2,602	413	1,352	3	20,518	31,702
Dec-23	13,637	820	2,528	467	1,608	3	19,063	31,101
Jan-24	11,781	775	2,443	433	1,646	4	17,083	29,001
Feb-24	12,687	906	2,659	473	1,670	4	18,400	30,977
Mar-24	16,228	925	2,703	477	1,707	3	22,043	34,850
Apr-24	18,152	917	2,560	419	1,396	3	23,446	34,757
May-24	22,574	1,111	2,919	437	1,634	2	28,677	41,671
Jun-24	25,991	1,090	3,027	432	1,477	2	32,019	44,658
Jul-24	13,913	835	2,454	360	1,204	2	18,767	29,030
Aug-24	13,855	868	2,620	446	1,373	2	19,164	30,543
Sep-24	14,620	949	2,714	391	1,292	2	19,968	31,182
Oct-24	15,690	978	2,728	417	1,377	2	21,192	32,797
Nov-24	18,090	884	2,600	408	1,344	3	23,328	34,498

Bahadrabad TP

Month	CJV	LCV	2-Axle	3-Axle	MAV	OSV	Total Traffic	PCUs
Aug-22	11,210	703	2,117	337	530	5	14,902	22,034
Sep-22	10,666	778	2,261	348	511	6	14,569	21,984
Oct-22	11,847	742	2,327	353	506	6	15,780	23,299
Nov-22	11,576	722	2,284	356	502	5	15,446	22,863
Dec-22	9,919	680	2,097	336	502	4	13,538	20,516
Jan-23	9,045	646	2,097	323	503	4	12,617	19,554
Feb-23	12,254	697	2,280	348	584	3	16,166	23,825
Mar-23	12,787	704	2,252	349	568	4	16,663	24,216
Apr-23	18,595	803	2,390	368	565	4	22,725	30,634
May-23	19,637	859	2,647	360	555	3	24,062	32,459
Jun-23	24,014	810	2,713	344	574	3	28,458	36,995
Jul-23	10,671	629	2,204	300	544	4	14,353	21,594
Aug-23	11,599	650	2,182	315	574	4	15,324	22,664
Sep-23	13,290	716	2,361	328	612	3	17,309	25,197
Oct-23	14,364	734	2,491	573	609	3	18,773	27,409
Nov-23	13,876	654	2,460	403	579	3	17,974	26,060
Dec-23	13,377	627	2,373	418	636	3	17,434	25,564
Jan-24	11,276	598	2,257	454	612	4	15,200	23,076
Feb-24	12,034	718	2,471	409	698	3	16,334	24,908
Mar-24	15,960	736	2,607	436	720	3	20,462	29,448
Apr-24	17,465	738	2,491	377	651	3	21,725	30,116
May-24	21,451	914	2,860	363	659	1	26,249	35,466
Jun-24	24,189	863	2,884	335	666	1	28,937	38,140
Jul-24	11,673	689	2,381	310	636	1	15,691	23,650
Aug-24	11,797	695	2,444	350	715	3	16,004	24,450
Sep-24	12,806	777	2,580	334	655	2	17,152	25,665
Oct-24	13,237	767	2,553	381	650	1	17,589	26,119
Nov-24	15,264	693	2,469	332	602	2	19,362	27,424

APPENDIX 2.2
TRAFFIC ZONING SYSTEM

Traffic Study for Muzaffarnagar-Haridwar section of NH-334 (Old NH-58) in the States of Uttar Pradesh and Uttarakhand
Traffic Zoning System

Zone	Place/Region	District/ State	State
1	Rampur/Baghonwali/Banamheri/Maleera/Bajhiri/Bannagar/Didaheri	Project Corridor	Project Corridor
2	Badheri/Sisona/Saidpur/Rai/ Datiyana/Madpur		
3	Parai/ Bijopura/Badhiwala		
4	Chappar/ Mahraipur/ Mirzapur/ Samarthi/Qasimpur/ Jaibhagwanpur/Khudda		
5	Tajpur/Bhamavir/Retanagla		
6	Barla/kutubpur/Phaluda/Bhasani/Mandala		
7	Harenti/Purquazi/Salempur/Shakarpurmaphi/Zahirpur		
8	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur		
9	Roorkee		
10	Dhandera/Rajendra nagar/Zabardastpur/Sumannagar/Bhonri/Modipuram/Bhaderi/Bharapur/Belra		
11	Panchayanpur/Bhadarpur/Begampur		
12	SIDCUL/BHEL/Bahadrabad Industrial Area		
13	Patanjali		
14	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur		
15	Kharkhari/Hiranwara/Indrabasti/bhootpatwala		
16	Haridwar		
17	Muzaffarnagar	Muzaffarnagar	Uttarpradesh
18	Pinna/mirapur/Bhagra/Bahadurpur/Nirana/Charthawal		
19	Khatauli/Bhainsi/Mansurpur		
20	Shahpur/Tawli/Mirapur		
21	Meerut	Meerut	
22	Sardhana/Daurala/Mataur/Sakoti		
23	Saharanpur	Saharanpur	
24	Yamunanagar/Sarsawa/Nangal/Behat/Jagadhiri		
25	Deoband/Lakhnauti/Mandi/Talheri Buzurg		
26	Baghpat	Baghpat	
27	Shamli	Shamli	
28	Agra/Mathura/Vrindavan	Agra	
29	Aligarh/Firozabad/Hathras		
30	Ghaziabad	Ghaziabad	
31	Noida/Greater Noida/Dadri/Palwal		
32	Modinagar/Hapur/Hastinapur/Ganganagar/Partapur/Maranpur		
33	Bulandshahr/Khurja	Bulandshahr	
34	Bijnor/Najibabad	Bijnor	
35	Moradabad/Bareilly/Amroha/Rampur/Sambhal	Moradabad	
36	Gorakhpur/Deoria/Basti/Azamgarh/Bettiah	Gorakhpur	
37	Ayodhya/Gonda/Sultanpur	Ayodhya	
38	Kanpur/Raebareli/Unnav/Orai	kanpur	
39	Prayagraj/Kunda/Mau aina/Handia/Phoolpur	Prayagraj	
40	Sahajahanpur/Sitapur/Lakhimpur/Baharaich	Lucknow	
41	Varanasi/Mirzapur/jaunpur/Chandauli/Ghazipur/Baliya	Varanasi	
42	Dehradhun/Masoorie/Sudhowala/Dwara	Dehradhun	Uttarakhand
43	Kedarnath/Sonprayag/Rudraprayag/Karnaprayag/Gopeshwar	Kedranath	
44	Bhadrinath/Govindghat/Urgam/Tapovan/Chamoli	Bhadrinath	
45	Bhimtal/Ramgarh/Mukteshwar/Kotabagh/Haldwani	Nanital	
46	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Rishikesh	
47	Uttarkashi/Barahat Range/Barkot/Thandi	Uttarkashi	
48	Patna/Gaya/Chhapra	Bihar	Bihar
49	Kishanganj/Purnia/Bhagalpur		
50	Darbhanga/Samastipur/Madhubani/Sitamarhi/Motihari		
51	Amritsar/ Ambala/ Ludhiana/ Patiala/ Hoshiarpur/ Pathankot	Punjab	Punjab
52	Chandigarh/Rest of Punjab		
53	Jammu & Kashmir/Srinagar	Jammu & Kashmir	Jammu & Kashmir
54	Delhi	Delhi	Delhi
55	Gurgaon/Manesar/Panchgao/Gokalgarh/Jhajjar	Gurugram	Haryana
56	Palwal/Sikari/Khalilpur/Shona	Faridabad	
57	Jind/Hansi/Bhiwani/Guhana	Rohtak	
58	Panipat	Panipat	
59	Karnal/Sonipat	Panipat	
60	Ambala/shahbad/Yamunanagar/Ladwa/Pahowa/Thanisar	Kurukshetra	
61	Shimla/Manali/Himachal Pradesh	Himachal Pradesh	Himachal Pradesh
62	Kolkata/Kharagpur/Durgapur/Krishnanagr/Bardhaman/Asansol/Bankora/Shiliguri	Westbengal	Westbengal
63	Shillong/Cherrapunji/Umiam/Nongstoin/Mairang/Jowai/Lakadong/Dawki	Meghalaya	Meghalaya
64	Dimapur/Kohima/Wokha/Mokochung/Tuensang/Zunheboto	Nagaland	Nagaland
65	Imphal/Senapati/Kangpokpi/Thoubai/Moirang/Kakching	Manipur	Manipur
66	Aizawl/Khawazawl/Sercchip/Lunglei/Siaha/Kolasib	Mizoram	Mizoram
67	Agartala/Khowai/Dharmanagar	Tripura	Tripura
68	Itanagar/Bomdila/Dirang/Ziro	Arunachal Pradesh	Arunachal Pradesh
69	Ranchi	Jharkhand	Jharkhand
70	Dhanbad/Giridih/Hazaribagh		
71	Jamshedpur/Chakradharpur/Chaibasa		
72	Cuttack/Bhubaneswar/Puri/Bhadrak/Balasore/Paradeep Port	Orissa	Orissa
73	Rourkela/Jharsuguda/Deogarh/Balangir/Rest of Orissa		
74	Bilaspur/Korba/Ambikapur	Chattisgarh	Chattisgarh
75	Raipur/Bhilai/Durg		
76	Jagdalpur/Narayanpur/Rest of Chattisgarh		
77	Indore/Ujjain/Dewas/Ratlam	Madhya Pradesh	Madhya Pradesh
78	Bhopal/Guna/Shivpuri/Gwalior/Sagar/Vidisha/Betul/Sehore/Rest of Madhya Pradesh		
79	Jabalpur/Rewa/Katni/Satna/Chindwara/Seoni/Lakhnadone		
80	Ahmedabad/ Surat/ Morbi/ Vadodara/ Rajkot/ Bhuj/ Kandla/ Mundra/ Rest of Gujarat	Gujarat	Gujarat
81	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	Rajasthan	Rajasthan
82	Nagpur/Wardha/Amaravati/Nanded/Aurangabad/Akola	Maharashtra	Maharashtra
83	Mumbai/Pune/Nashik/Dhule/Ahmednagar/Satara		
84	Solapur/Kolhapur/Rest of Maharashtra		
85	Vijaywada/Machlipatnam/Guntoor/Jaggaipet/ Piduguralla	Andra Pradesh	Andhra Pradesh
86	Vizag/ Kakinada/ Rajamundry/ Srikakulam		
87	Kurnool/Nandiyal/Anantapur/Kadappa/Tirupati		
88	Ongole/ Nellore/ Rest of Andhra Pradesh		
89	Hyderabad/Karimnagar/Warangal/Nizamabad/Rest of Telangana	Telangana	Telangana
90	Bijapur/Hubbali/Belgavi/Davangere/Hospet	Karnataka	Karnataka
91	Bangalore/Tumkur/Hosur/Mysore/Rest of Karnataka		
92	Panjim/Rest of Goa	Goa	Goa
93	Chennai/Madurai/Vellore/Thanjavur/Nellore/Tirupati/Rest of Tamil Nadu	Tamil Nadu	Tamil Nadu
94	Kochi/ Thrissur/ Kollam/ Thiruvananthapuram/ Kozhikode/ Rest of Kerala	Kerala	Kerala

Confidential

APPENDIX 2.3
TOP 20 OD PAIRS

Traffic Study for Muzaffarnagar-Haridwar section of NH-334 (Old NH-58) in the States of Uttar Pradesh and Uttarakhand - Chhapar (TP01)

TOP 20 Origin Destination Pairs

Car

S.No.	Origin	Destination	% of total
1	Roorkee	Meerut	14%
2	Roorkee	Delhi	11%
3	Haridwar	Delhi	10%
4	Roorkee	Muzaffarnagar	10%
5	Dehradhun/Masoorie/Sudhowala/Dwara	Delhi	5%
6	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Delhi	3%
7	Haridwar	Panipat	3%
8	Roorkee	Ghaziabad	3%
9	Meerut	Dehradhun/Masoorie/Sudhowala/Dwara	2%
10	Haridwar	Meerut	1%
11	Harenti/Purquazi/Salempur/Shakarpurmaphi/Zahirpur	Muzaffarnagar	1%
12	Muzaffarnagar	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
13	Haridwar	Noida/Greater Noida/Dadri/Palwal	1%
14	Meerut	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
15	Muzaffarnagar	Dehradhun/Masoorie/Sudhowala/Dwara	1%
16	Barla/kutubpur/Phaluda/Bhasani/Mandala	Muzaffarnagar	1%
17	Haridwar	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	1%
18	Haridwar	Muzaffarnagar	1%
19	Haridwar	Ghaziabad	1%
20	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Panipat	1%
Total			**75%**

MiniBus

S.No.	Origin	Destination	% of total
1	Dehradhun/Masoorie/Sudhowala/Dwara	Delhi	19%
2	Haridwar	Delhi	17%
3	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Delhi	9%
4	Haridwar	Meerut	8%
5	Haridwar	Muzaffarnagar	4%
6	Haridwar	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	4%
7	Haridwar	Panipat	3%
8	Roorkee	Muzaffarnagar	3%
9	Meerut	Dehradhun/Masoorie/Sudhowala/Dwara	3%
10	Roorkee	Meerut	3%
11	Roorkee	Delhi	2%
12	Meerut	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
13	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Panipat	1%
14	Haridwar	Ghaziabad	1%
15	Dehradhun/Masoorie/Sudhowala/Dwara	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	1%
16	Muzaffarnagar	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
17	Haridwar	Aligarh/Firozabad/Hathras	1%
18	Khatauli/Bhainsi/Mansurpur	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
19	Ghaziabad	Dehradhun/Masoorie/Sudhowala/Dwara	1%
20	Haridwar	Jind/Hansi/Bhiwani/Guhana	1%
Total			**85%**

Bus

S.No.	Origin	Destination	% of total
1	Haridwar	Delhi	18%
2	Haridwar	Meerut	12%
3	Dehradhun/Masoorie/Sudhowala/Dwara	Delhi	11%
4	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Delhi	8%
5	Haridwar	Muzaffarnagar	7%
6	Roorkee	Muzaffarnagar	4%
7	Dehradhun/Masoorie/Sudhowala/Dwara	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	4%
8	Roorkee	Delhi	3%
9	Haridwar	Noida/Greater Noida/Dadri/Palwal	3%
10	Haridwar	Panipat	3%
11	Roorkee	Meerut	2%
12	Haridwar	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	2%
13	Meerut	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	2%
14	Meerut	Dehradhun/Masoorie/Sudhowala/Dwara	2%
15	Roorkee	Panipat	1%
16	Aligarh/Firozabad/Hathras	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
17	Barla/kutubpur/Phaluda/Bhasani/Mandala	Delhi	1%
18	Dehradhun/Masoorie/Sudhowala/Dwara	Panipat	1%
19	Barla/kutubpur/Phaluda/Bhasani/Mandala	Aligarh/Firozabad/Hathras	1%
20	Haridwar	Ghaziabad	1%
Total			**87%**

Traffic Study for Muzaffarnagar-Haridwar section of NH-334 (Old NH-58) in the States of Uttar Pradesh and Uttarakhand - Chhapar (TP01)			
TOP 20 Origin Destination Pairs			
Mini LCV			
S.No.	**Origin**	**Destination**	**% of total**
1	Roorkee	Delhi	14%
2	Roorkee	Muzaffarnagar	10%
3	Haridwar	Muzaffarnagar	9%
4	Haridwar	Meerut	7%
5	Roorkee	Meerut	5%
6	Harenti/Purquazi/Salempur/Shakarpurmaphi/Zahirpur	Muzaffarnagar	5%
7	Dehradhun/Masoorie/Sudhowala/Dwara	Delhi	3%
8	Haridwar	Panipat	2%
9	Roorkee	Ghaziabad	2%
10	Haridwar	Delhi	2%
11	Haridwar	Ghaziabad	2%
12	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Muzaffarnagar	2%
13	Harenti/Purquazi/Salempur/Shakarpurmaphi/Zahirpur	Meerut	2%
14	Roorkee	Panipat	2%
15	Muzaffarnagar	Dehradhun/Masoorie/Sudhowala/Dwara	1%
16	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Muzaffarnagar	1%
17	Haridwar	Noida/Greater Noida/Dadri/Palwal	1%
18	Meerut	Dehradhun/Masoorie/Sudhowala/Dwara	1%
19	Muzaffarnagar	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
20	Haridwar	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	1%
Total			**73%**
LCV			
S.No.	**Origin**	**Destination**	**% of total**
1	Roorkee	Delhi	16%
2	Haridwar	Meerut	10%
3	Roorkee	Meerut	9%
4	Haridwar	Ghaziabad	5%
5	Haridwar	Muzaffarnagar	4%
6	Haridwar	Panipat	4%
7	Roorkee	Muzaffarnagar	3%
8	Dehradhun/Masoorie/Sudhowala/Dwara	Delhi	3%
9	Roorkee	Ghaziabad	3%
10	Haridwar	Delhi	2%
11	Haridwar	Noida/Greater Noida/Dadri/Palwal	2%
12	Roorkee	Panipat	2%
13	Ghaziabad	Dehradhun/Masoorie/Sudhowala/Dwara	2%
14	Muzaffarnagar	Dehradhun/Masoorie/Sudhowala/Dwara	2%
15	Haridwar	Palwal/Sikari/Khalilpur/Shona	1%
16	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Delhi	1%
17	Roorkee	Noida/Greater Noida/Dadri/Palwal	1%
18	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Muzaffarnagar	1%
19	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Delhi	1%
20	Haridwar	Gurgaon/Manesar/Panchgao/Gokalgarh/Jhajjar	1%
Total			**76%**
2 Axle			
S.No.	**Origin**	**Destination**	**% of total**
1	Roorkee	Delhi	11%
2	Roorkee	Meerut	11%
3	Roorkee	Muzaffarnagar	11%
4	Roorkee	Ghaziabad	7%
5	Haridwar	Delhi	5%
6	Haridwar	Noida/Greater Noida/Dadri/Palwal	3%
7	Haridwar	Panipat	3%
8	Dehradhun/Masoorie/Sudhowala/Dwara	Delhi	3%
9	Haridwar	Meerut	3%
10	Haridwar	Muzaffarnagar	2%
11	Dehradhun/Masoorie/Sudhowala/Dwara	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	2%
12	Roorkee	Panipat	2%
13	Meerut	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	2%
14	Meerut	Dehradhun/Masoorie/Sudhowala/Dwara	1%
15	Muzaffarnagar	Dehradhun/Masoorie/Sudhowala/Dwara	1%
16	Roorkee	Noida/Greater Noida/Dadri/Palwal	1%
17	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Muzaffarnagar	1%
18	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Delhi	1%
19	Roorkee	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	1%
20	Muzaffarnagar	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
Total			**74%**

Traffic Study for Muzaffarnagar-Haridwar section of NH-334 (Old NH-58) in the States of Uttar Pradesh and Uttarakhand - Chhapar (TP01)			
TOP 20 Origin Destination Pairs			
3 Axle			
S.No.	**Origin**	**Destination**	**% of total**
1	Haridwar	Delhi	10%
2	Haridwar	Meerut	7%
3	Roorkee	Muzaffarnagar	7%
4	Haridwar	Muzaffarnagar	6%
5	Roorkee	Delhi	6%
6	Roorkee	Meerut	5%
7	Haridwar	Panipat	5%
8	Haridwar	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	4%
9	Roorkee	Ghaziabad	3%
10	Haridwar	Ghaziabad	3%
11	Haridwar	Noida/Greater Noida/Dadri/Palwal	3%
12	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Delhi	2%
13	Roorkee	Noida/Greater Noida/Dadri/Palwal	2%
14	Roorkee	Panipat	2%
15	Haridwar	Modinagar/Hapur/Hastinapur/Ganganagar/Partapur/Maranpur	2%
16	Meerut	Dehradhun/Masoorie/Sudhowala/Dwara	2%
17	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	2%
18	Muzaffarnagar	Dehradhun/Masoorie/Sudhowala/Dwara	1%
19	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Muzaffarnagar	1%
20	Meerut	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
Total			**72%**
MAV			
S.No.	**Origin**	**Destination**	**% of total**
1	Roorkee	Delhi	12%
2	Roorkee	Muzaffarnagar	9%
3	Roorkee	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	8%
4	Roorkee	Meerut	6%
5	Ghaziabad	Dehradhun/Masoorie/Sudhowala/Dwara	5%
6	Haridwar	Meerut	4%
7	Roorkee	Ghaziabad	3%
8	Dehradhun/Masoorie/Sudhowala/Dwara	Panipat	3%
9	Haridwar	Noida/Greater Noida/Dadri/Palwal	2%
10	Haridwar	Delhi	2%
11	Muzaffarnagar	Dehradhun/Masoorie/Sudhowala/Dwara	2%
12	Roorkee	Panipat	2%
13	Dehradhun/Masoorie/Sudhowala/Dwara	Delhi	2%
14	Haridwar	Mumbai/Pune/Nashik/Dhule/Ahmednagar/Satara	2%
15	Haridwar	Ahmedabad/ Surat/ Morbi/ Vadodara/ Rajkot/ Bhuj/ Kandla/ Mundra/ Rest of Gujarat	1%
16	Ghaziabad	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
17	Haridwar	Muzaffarnagar	1%
18	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Muzaffarnagar	1%
19	Roorkee	Modinagar/Hapur/Hastinapur/Ganganagar/Partapur/Maranpur	1%
20	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Delhi	1%
Total			**69%**

Traffic Study for Muzaffarnagar-Haridwar section of NH-334 (Old NH-58) in the States of Uttar Pradesh and Uttarakhand - Chhapar (TP01)			
TOP 20 Origin Destination Pairs			
Car			
S.No.	**Origin**	**Destination**	**% of total**
1	Roorkee	Haridwar	18%
2	Haridwar	Delhi	12%
3	Roorkee	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	9%
4	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Delhi	4%
5	Haridwar	Panipat	4%
6	Haridwar	Saharanpur	3%
7	Haridwar	Muzaffarnagar	3%
8	Dehradhun/Masoorie/Sudhowala/Dwara	Delhi	3%
9	Haridwar	Meerut	3%
10	Roorkee	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	3%
11	Roorkee	Dehradhun/Masoorie/Sudhowala/Dwara	2%
12	Roorkee	SIDCUL/BHEL/Bahadrabad Industrial Area	2%
13	Haridwar	Chandigarh/Rest of Punjab	2%
14	Haridwar	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	1%
15	Haridwar	Karnal/Sonipat	1%
16	Saharanpur	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
17	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Saharanpur	1%
18	Haridwar	Ghaziabad	1%
19	Haridwar	Noida/Greater Noida/Dadri/Palwal	1%
20	Muzaffarnagar	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
Total			**76%**
MiniBus			
S.No.	**Origin**	**Destination**	**% of total**
1	Roorkee	Haridwar	18%
2	Haridwar	Delhi	15%
3	Haridwar	Saharanpur	10%
4	Haridwar	Meerut	7%
5	Haridwar	Muzaffarnagar	5%
6	Haridwar	Panipat	5%
7	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Delhi	5%
8	Haridwar	Ambala/shahbad/Yamunanagar/Ladwa/Pahowa/Thanisar	4%
9	Roorkee	Dehradhun/Masoorie/Sudhowala/Dwara	3%
10	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Delhi	2%
11	Haridwar	Chandigarh/Rest of Punjab	2%
12	Saharanpur	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	2%
13	Haridwar	Noida/Greater Noida/Dadri/Palwal	2%
14	Dehradhun/Masoorie/Sudhowala/Dwara	Delhi	2%
15	Meerut	Dehradhun/Masoorie/Sudhowala/Dwara	1%
16	Roorkee	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	1%
17	Roorkee	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
18	Meerut	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
19	Haridwar	Khatauli/Bhainsi/Mansurpur	1%
20	Haridwar	Amritsar/ Ambala/ Ludhiana/ Patiala/ Hoshiarpur/ Pathankot	1%
Total			**88%**
Bus			
S.No.	**Origin**	**Destination**	**% of total**
1	Haridwar	Delhi	18%
2	Roorkee	Haridwar	13%
3	Haridwar	Muzaffarnagar	10%
4	Haridwar	Saharanpur	7%
5	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Delhi	6%
6	Haridwar	Panipat	6%
7	Haridwar	Meerut	4%
8	Dehradhun/Masoorie/Sudhowala/Dwara	Delhi	3%
9	Roorkee	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	3%
10	Saharanpur	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	2%
11	Haridwar	Chandigarh/Rest of Punjab	2%
12	Roorkee	Dehradhun/Masoorie/Sudhowala/Dwara	2%
13	Meerut	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	2%
14	Haridwar	Ambala/shahbad/Yamunanagar/Ladwa/Pahowa/Thanisar	2%
15	Haridwar	Ghaziabad	1%
16	Roorkee	SIDCUL/BHEL/Bahadrabad Industrial Area	1%
17	Roorkee	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
18	Haridwar	Khatauli/Bhainsi/Mansurpur	1%
19	Haridwar	Noida/Greater Noida/Dadri/Palwal	1%
20	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Delhi	1%
Total			**87%**

Traffic Study for Muzaffarnagar-Haridwar section of NH-334 (Old NH-58) in the States of Uttar Pradesh and Uttarakhand - Chhapar (TP01)

TOP 20 Origin Destination Pairs

Mini LCV

S.No.	Origin	Destination	% of total
1	Roorkee	Haridwar	17%
2	Roorkee	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	10%
3	Haridwar	Delhi	7%
4	Roorkee	SIDCUL/BHEL/Bahadrabad Industrial Area	5%
5	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	4%
6	Haridwar	Muzaffarnagar	3%
7	Roorkee	Dehradhun/Masoorie/Sudhowala/Dwara	3%
8	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Haridwar	2%
9	Haridwar	Saharanpur	2%
10	SIDCUL/BHEL/Bahadrabad Industrial Area	Delhi	2%
11	Haridwar	Meerut	2%
12	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Saharanpur	2%
13	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Meerut	2%
14	SIDCUL/BHEL/Bahadrabad Industrial Area	Saharanpur	1%
15	Patanjali	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	1%
16	Haridwar	Panipat	1%
17	Dehradhun/Masoorie/Sudhowala/Dwara	Delhi	1%
18	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Delhi	1%
19	Roorkee	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
20	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Muzaffarnagar	1%
Total			**68%**

LCV

S.No.	Origin	Destination	% of total
1	Haridwar	Delhi	9%
2	Roorkee	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	6%
3	Roorkee	Haridwar	6%
4	SIDCUL/BHEL/Bahadrabad Industrial Area	Delhi	6%
5	Haridwar	Saharanpur	4%
6	Haridwar	Panipat	4%
7	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	4%
8	Roorkee	SIDCUL/BHEL/Bahadrabad Industrial Area	4%
9	SIDCUL/BHEL/Bahadrabad Industrial Area	Panipat	4%
10	Haridwar	Ghaziabad	4%
11	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Haridwar	3%
12	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Saharanpur	3%
13	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Panipat	3%
14	Roorkee	Dehradhun/Masoorie/Sudhowala/Dwara	2%
15	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Meerut	2%
16	Haridwar	Muzaffarnagar	2%
17	Haridwar	Palwal/Sikari/Khalilpur/Shona	2%
18	SIDCUL/BHEL/Bahadrabad Industrial Area	Meerut	2%
19	Haridwar	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	2%
20	Dehradhun/Masoorie/Sudhowala/Dwara	Delhi	2%
Total			**74%**

2 Axle

S.No.	Origin	Destination	% of total
1	Roorkee	Haridwar	12%
2	Roorkee	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	7%
3	Haridwar	Delhi	6%
4	Roorkee	SIDCUL/BHEL/Bahadrabad Industrial Area	4%
5	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	3%
6	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Haridwar	3%
7	Roorkee	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	3%
8	Haridwar	Saharanpur	3%
9	Haridwar	Muzaffarnagar	3%
10	Haridwar	Panipat	2%
11	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	2%
12	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Delhi	2%
13	Haridwar	Meerut	2%
14	SIDCUL/BHEL/Bahadrabad Industrial Area	Delhi	2%
15	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Delhi	2%
16	Roorkee	Dehradhun/Masoorie/Sudhowala/Dwara	1%
17	Haridwar	Noida/Greater Noida/Dadri/Palwal	1%
18	Haridwar	Ahmedabad/ Surat/ Morbi/ Vadodara/ Rajkot/ Bhuj/ Kandla/ Mundra/ Rest of Gujarat	1%
19	Haridwar	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	1%
20	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Muzaffarnagar	1%
Total			**63%**

Traffic Study for Muzaffarnagar-Haridwar section of NH-334 (Old NH-58) in the States of Uttar Pradesh and Uttarakhand - Chhapar (TP01)

TOP 20 Origin Destination Pairs

3 Axle

S.No.	Origin	Destination	% of total
1	Roorkee	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	8%
2	Roorkee	Haridwar	7%
3	Roorkee	SIDCUL/BHEL/Bahadrabad Industrial Area	5%
4	Haridwar	Panipat	5%
5	Haridwar	Delhi	4%
6	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Haridwar	3%
7	Haridwar	Ahmedabad/ Surat/ Morbi/ Vadodara/ Rajkot/ Bhuj/ Kandla/ Mundra/ Rest of Gujarat	3%
8	Haridwar	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	3%
9	Haridwar	Saharanpur	3%
10	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Delhi	2%
11	Haridwar	Meerut	2%
12	Haridwar	Ghaziabad	2%
13	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	2%
14	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	2%
15	SIDCUL/BHEL/Bahadrabad Industrial Area	Delhi	2%
16	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Muzaffarnagar	2%
17	Haridwar	Muzaffarnagar	2%
18	Roorkee	Dehradhun/Masoorie/Sudhowala/Dwara	1%
19	Roorkee	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	1%
20	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Saharanpur	1%
Total			**62%**

MAV

S.No.	Origin	Destination	% of total
1	Roorkee	Haridwar	8%
2	Haridwar	Delhi	6%
3	Roorkee	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	5%
4	Roorkee	SIDCUL/BHEL/Bahadrabad Industrial Area	4%
5	Haridwar	Panipat	4%
6	Haridwar	Jaipur/Kota/Chittorgarh/Udaipur/Jodhpur/Bikaner/Jaisalmer/Rest of Rajasthan	4%
7	SIDCUL/BHEL/Bahadrabad Industrial Area	Delhi	3%
8	Haridwar	Meerut	3%
9	Haridwar	Chandigarh/Rest of Punjab	3%
10	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	Delhi	3%
11	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Haridwar	2%
12	Haridwar	Muzaffarnagar	2%
13	Haridwar	Ahmedabad/ Surat/ Morbi/ Vadodara/ Rajkot/ Bhuj/ Kandla/ Mundra/ Rest of Gujarat	2%
14	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Delhi	2%
15	Haridwar	Saharanpur	2%
16	Roorkee	Rishikesh/Devprayag/Shivpuri/Veerbhadra/Narendranagar	2%
17	Gurukul narsan/Narsenkalan/Tikaulakalan/Mundyaki/Manglaur	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	1%
18	SIDCUL/BHEL/Bahadrabad Industrial Area	Ahmedabad/ Surat/ Morbi/ Vadodara/ Rajkot/ Bhuj/ Kandla/ Mundra/ Rest of Gujarat	1%
19	Bahadarabad/Salempur mahdood/ Ranipur/Jamalpur kalan/Sitapur/Jwalapur/Kankhal/Jagjeetpur	Panipat	1%
20	Haridwar	Ghaziabad	1%
Total			**60%**

APPENDIX 2.4
REGIONAL DISTRIBUTION & TRAFFIC STREAMS OF ADDITIONAL OD SURVEYS IN JANUARY 2025

Traffic Study for Muzaffarnagar-Haridwar section of NH-334 (Old NH-58) in the States of Uttar Pradesh and Uttarakhand

Regional Distribution of Additional OD Surveys in January 2025

Chhapar TP

S. No.	Region/Modes	Car	Mini Bus	Bus	Mini - LCV	LCV	2Axle	3Axle	MAV
1	Uttarakhand	43.9%	47.7%	49.2%	41.2%	47.5%	46.8%	44.1%	46.0%
2	Uttar Pradesh	35.0%	22.5%	20.5%	44.8%	30.5%	31.6%	34.4%	29.8%
3	Delhi	15.6%	21.4%	21.4%	8.7%	15.2%	10.5%	8.6%	9.7%
4	Haryana	3.8%	4.6%	2.2%	3.4%	4.6%	5.6%	5.2%	5.8%
5	Rajasthan	0.9%	2.4%	4.8%	0.7%	0.8%	1.9%	2.9%	5.4%
6	Maharashtra	0.1%	0.0%	0.0%	0.1%	0.5%	1.4%	1.1%	0.3%
7	Gujarat	0.1%	0.2%	0.0%	0.5%	0.4%	1.0%	1.1%	0.6%
8	Rest of India	0.6%	1.2%	1.9%	0.7%	0.5%	1.2%	2.7%	2.4%
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Bahadrabad TP

S. No.	Region/Modes	Car	Mini Bus	Bus	Mini - LCV	LCV	2Axle	3Axle	MAV
1	Uttarakhand	68.9%	56.8%	56.2%	66.1%	62.9%	65.5%	65.7%	57.5%
2	Uttar Pradesh	12.6%	17.7%	18.2%	17.5%	18.1%	14.2%	14.6%	14.7%
3	Delhi	11.1%	14.9%	17.9%	9.0%	9.2%	10.4%	7.4%	7.0%
4	Haryana	2.9%	3.7%	3.8%	4.5%	4.9%	4.6%	5.8%	6.0%
5	Rajasthan	1.5%	1.0%	1.5%	0.4%	1.5%	1.3%	1.6%	3.9%
6	Maharashtra	0.1%	0.0%	0.5%	0.2%	1.5%	0.6%	0.6%	3.3%
7	Gujarat	0.2%	0.8%	0.0%	0.5%	0.9%	0.6%	0.4%	1.2%
8	Rest of India	2.7%	5.1%	1.8%	1.8%	0.9%	2.7%	4.0%	6.3%
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Traffic Streams of Additional OD Surveys in January 2025

Chhapar TP

S. No.	Traffic Stream	Car	MiniBus	Bus	MLCV	LCV	2A	3A	MAV
1	Meerut/Muzaffarnagar/Panipat and Surroundings to Roorkee and Surroundings	31.5%	11.3%	10.4%	39.3%	21.8%	23.0%	24.6%	21.9%
2	Meerut/Muzaffarnagar/Panipat and Surroundings to SIDCUL/Haridwar/Rishikesh and Beyond	12.7%	20.7%	18.7%	17.7%	16.6%	16.8%	17.4%	12.0%
3	Meerut/Muzaffarnagar/Panipat and Surroundings to West UP & Beyond	2.0%	1.5%	0.0%	1.1%	1.1%	1.0%	1.8%	2.8%
4	Meerut/Muzaffarnagar/Panipat and Surroundings to Dehradun & Surroundings	4.1%	3.5%	4.0%	3.6%	2.6%	3.5%	3.5%	6.8%
5	Delhi/Ghaziabad/Noida and Surroundings to Roorkee and Surroundings	16.0%	4.1%	8.8%	14.0%	14.9%	13.0%	11.9%	18.9%
6	Delhi/Ghaziabad/Noida and Surroundings to SIDCUL/Haridwar/Rishikesh and Beyond	21.0%	26.5%	29.0%	16.1%	32.8%	19.7%	19.5%	7.7%
7	Delhi/Ghaziabad/Noida and Surroundings to West UP & Beyond	0.8%	2.2%	0.0%	0.5%	0.0%	1.5%	0.4%	1.0%
8	Delhi/Ghaziabad/Noida and Surroundings to Dehradun & Surroundings	6.6%	19.5%	13.8%	3.0%	4.2%	7.6%	2.7%	7.9%
9	East UP to Roorkee and Surroundings	1.3%	0.5%	0.6%	0.7%	0.8%	2.3%	1.4%	1.7%
10	East UP to SIDCUL/Haridwar/Rishikesh and Beyond	1.0%	2.9%	2.5%	0.7%	1.5%	1.1%	3.0%	3.5%
11	East UP to West UP & Beyond	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.3%
12	East UP to Dehradun & Surroundings	0.4%	0.6%	1.0%	0.0%	0.0%	0.4%	0.0%	0.4%
13	Rajasthan/Central/South India to Roorkee and Surroundings	0.3%	0.0%	0.3%	0.9%	2.1%	3.5%	3.0%	7.1%
14	Rajasthan/Central/South India to SIDCUL/Haridwar/Rishikesh and Beyond	1.6%	4.7%	9.4%	1.6%	1.6%	5.2%	7.3%	5.3%
15	Rajasthan/Central/South India to West UP & Beyond	0.3%	0.0%	0.0%	0.0%	0.0%	0.3%	0.8%	0.5%
16	Rajasthan/Central/South India to Dehradun & Surroundings	0.3%	1.9%	1.6%	0.7%	0.0%	0.8%	2.6%	2.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Bahadrabad TP

S. No.	Traffic Stream	Car	MiniBus	Bus	MLCV	LCV	2A	3A	MAV
1	Meerut/Muzaffarnagar/Panipat and Surroundings to SIDCUL/Haridwar/Rishikesh and Beyond	19.3%	23.6%	21.5%	16.4%	20.9%	16.1%	17.3%	21.2%
2	Meerut/Muzaffarnagar/Panipat and Surroundings to Dehradun & Surroundings	2.0%	3.3%	2.0%	1.9%	1.2%	1.1%	1.7%	1.7%
3	Delhi/Ghaziabad/Noida and Surroundings to SIDCUL/Haridwar/Rishikesh and Beyond	24.1%	27.5%	35.1%	28.6%	30.7%	28.8%	23.6%	19.9%
4	Delhi/Ghaziabad/Noida and Surroundings to Dehradun & Surroundings	3.2%	7.5%	8.6%	3.8%	2.4%	4.5%	4.0%	2.5%
5	Roorkee and Surroundings to SIDCUL/Haridwar/Rishikesh and Beyond	43.2%	22.5%	21.3%	36.2%	24.5%	37.3%	40.0%	22.2%
6	Roorkee and Surroundings to Dehradun & Surroundings	2.9%	1.3%	1.5%	2.4%	3.7%	2.4%	2.6%	1.2%
7	West UP/Punjab & Beyond to SIDCUL/Haridwar/Rishikesh and Beyond	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
8	West UP/Punjab & Beyond to Dehradun & Surroundings	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
9	East UP to SIDCUL/Haridwar/Rishikesh and Beyond	1.1%	8.1%	5.0%	6.2%	6.1%	3.2%	4.4%	7.5%
10	East UP to Dehradun & Surroundings	0.0%	0.0%	0.0%	0.9%	1.2%	0.4%	0.7%	0.6%
11	Rajasthan/Central/South India to SIDCUL/Haridwar/Rishikesh and Beyond	3.9%	5.2%	4.3%	3.4%	7.4%	5.9%	5.4%	22.5%
12	Rajasthan/Central/South India to Dehradun & Surroundings	0.3%	1.1%	0.8%	0.4%	1.9%	0.4%	0.4%	0.6%
Total		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Confidential

APPENDIX 2.5
COMMODITY DISTRIBUTION AT TOLL PLAZA LOCATIONS

Traffic Study for Muzaffarnagar-Haridwar section of NH-334 (Old NH-58) in the States of Uttar Pradesh and Uttarakhand
Commodity Distribution on Toll Plaza Locations

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
	Chhapar (TP01)					
1	Food Grains and Cash Crops	2.6	1.1	1.3	1.5	1.2
2	Fruits & Vegetables	3.0	1.6	1.2	1.3	1.5
3	Building Materials	4.8	5.1	5.6	5.4	12.2
4	Iron & Steel Products	5.2	5.8	6.5	8.0	8.2
5	Petroleum Products, Chemicals and Gas	6.5	3.6	6.3	12.9	9.3
6	Heavy Machinery & Industrial Equipments	0.9	1.3	1.3	0.0	2.6
7	Industrial Products	6.4	12.9	8.3	4.9	7.3
8	Consumer Items	11.7	8.5	7.6	8.0	6.4
9	Automobile and New Chasis	2.6	5.3	3.3	5.7	6.8
10	Containers	0.3	0.4	0.9	1.8	2.1
11	Ores & Minerals (Coal , Bauxite, lime stone)	0.3	0.7	0.8	0.5	0.7
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	6.5	8.5	6.4	4.4	2.5
13	Parcles	7.1	17.6	15.1	11.6	6.6
14	Empty Vehicles	42.2	27.6	35.4	34.0	32.6
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Meerut-Haridwar						
Sr. No.	**Commodity Type**	**MLCV**	**LCV**	**2 Axle**	**3 Axle**	**MAV**
	Chhapar (TP01)					
1	Food Grains and Cash Crops	3.0	1.1	1.5	1.1	1.2
2	Fruits & Vegetables	3.6	2.2	1.3	0.5	1.6
3	Building Materials	4.7	5.9	4.6	8.7	14.6
4	Iron & Steel Products	4.1	7.0	7.0	10.9	9.8
5	Petroleum Products, Chemicals and Gas	7.2	2.2	7.2	17.9	9.6
6	Heavy Machinery & Industrial Equipments	1.1	3.2	1.8	0.0	4.2
7	Industrial Products	6.6	21.5	8.5	4.9	10.0
8	Consumer Items	11.0	12.4	8.1	8.2	8.2
9	Automobile and New Chasis	2.2	5.4	3.9	4.3	6.8
10	Containers	0.3	0.5	0.7	2.2	2.0
11	Ores & Minerals (Coal , Bauxite, lime stone)	0.0	0.5	0.7	0.0	1.0
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	7.4	11.8	7.7	6.0	3.0
13	Parcles	5.8	10.8	13.6	4.9	6.0
14	Empty Vehicles	43.0	15.6	33.3	30.4	22.0
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Haridwar-Meerut						
Sr. No.	**Commodity Type**	**MLCV**	**LCV**	**2 Axle**	**3 Axle**	**MAV**
	Chhapar (TP01)					
1	Food Grains and Cash Crops	2.1	1.1	1.1	2.0	1.2
2	Fruits & Vegetables	2.4	1.1	1.1	2.0	1.4
3	Building Materials	4.9	4.6	6.4	2.5	9.5
4	Iron & Steel Products	6.4	4.9	6.1	5.4	6.4
5	Petroleum Products, Chemicals and Gas	5.8	4.6	5.5	8.3	9.0
6	Heavy Machinery & Industrial Equipments	0.6	0.0	0.8	0.0	0.7
7	Industrial Products	6.1	6.8	8.2	4.9	4.0
8	Consumer Items	12.5	5.7	7.2	7.8	4.3
9	Automobile and New Chasis	3.0	5.3	2.9	6.9	6.9
10	Containers	0.3	0.4	1.1	1.5	2.1
11	Ores & Minerals (Coal , Bauxite, lime stone)	0.6	0.8	0.8	1.0	0.2
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	5.5	6.1	5.1	2.9	1.9
13	Parcles	8.5	22.4	16.4	17.6	7.3
14	Empty Vehicles	41.3	36.1	37.1	37.3	45.2
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Sr. No.	Commodity Type	MLCV	LCV	2 Axle	3 Axle	MAV
	Bahadrabad (TP02)					
1	Food Grains and Cash Crops	1.3	3.7	0.6	1.8	1.1
2	Fruits & Vegetables	2.3	3.7	0.9	1.1	0.9
3	Building Materials	2.8	3.2	3.4	3.7	9.1
4	Iron & Steel Products	13.9	20.5	11.4	21.2	17.9
5	Petroleum Products, Chemicals and Gas	4.9	5.0	9.7	8.4	11.2
6	Heavy Machinery & Industrial Equipments	0.4	0.9	0.5	0.0	0.4
7	Industrial Products	11.5	9.1	9.9	6.6	6.7
8	Consumer Items	5.6	6.8	4.3	5.5	2.8
9	Automobile and New Chasis	0.8	4.1	2.4	1.8	3.2
10	Containers	0.3	0.5	0.1	1.8	1.5
11	Ores & Minerals (Coal , Bauxite, lime stone)	0.3	0.0	0.1	0.0	0.0
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	2.9	3.7	4.3	3.7	2.4
13	Parcles	5.2	9.1	6.3	5.5	4.5
14	Empty Vehicles	47.9	29.7	46.0	38.8	38.2
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Meerut-Haridwar						
Sr. No.	**Commodity Type**	**MLCV**	**LCV**	**2 Axle**	**3 Axle**	**MAV**
	Bhadarabad (TP02)					
1	Food Grains and Cash Crops	1.9	7.0	1.2	3.0	2.2
2	Fruits & Vegetables	2.6	4.4	1.2	2.2	0.9
3	Building Materials	3.2	5.3	4.6	3.7	12.6
4	Iron & Steel Products	24.1	29.8	16.9	33.6	28.1
5	Petroleum Products, Chemicals and Gas	6.1	5.3	10.7	10.4	9.1
6	Heavy Machinery & Industrial Equipments	0.5	0.9	0.8	0.0	0.9
7	Industrial Products	14.0	6.1	10.6	4.5	7.8
8	Consumer Items	8.5	9.6	6.9	9.0	4.3
9	Automobile and New Chasis	0.8	2.6	2.3	0.0	0.9
10	Containers	0.0	0.0	0.2	3.7	3.0
11	Ores & Minerals (Coal , Bauxite, lime stone)	0.0	0.0	0.2	0.0	0.0
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	2.6	5.3	5.8	2.2	1.3
13	Parcles	6.3	8.8	6.1	7.5	5.2
14	Empty Vehicles	29.4	14.9	32.6	20.1	23.8
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Haridwar-Meerut						
Sr. No.	**Commodity Type**	**MLCV**	**LCV**	**2 Axle**	**3 Axle**	**MAV**
	Bhadarabad (TP02)					
1	Food Grains and Cash Crops	0.3	0.0	0.0	0.7	0.0
2	Fruits & Vegetables	1.8	2.9	0.7	0.0	0.9
3	Building Materials	1.8	1.0	2.0	3.6	5.6
4	Iron & Steel Products	4.7	10.5	5.0	9.4	7.8
5	Petroleum Products, Chemicals and Gas	3.7	4.8	8.4	6.5	13.4
6	Heavy Machinery & Industrial Equipments	0.0	1.0	0.2	0.0	0.0
7	Industrial Products	8.6	12.4	9.1	8.6	5.6
8	Consumer Items	2.6	3.8	1.1	2.2	1.3
9	Automobile and New Chasis	0.3	5.7	2.5	3.6	5.6
10	Containers	0.3	1.0	0.0	0.0	0.0
11	Ores & Minerals (Coal , Bauxite, lime stone)	0.3	0.0	0.0	0.0	0.0
12	Miscellaneous Items (Medicines,Powder, Livestock, Forest products, Fertilizers, Milk, etc.)	2.3	1.9	2.5	5.0	3.4
13	Parcles	4.2	9.5	6.6	3.6	3.9
14	Empty Vehicles	69.2	45.7	61.9	56.8	52.6
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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TOLL TRAFFIC AND REVENUE ASSESSMENT FOR RAIPUR-BILASPUR SECTION OF NH30/NH130 IN THE STATE OF CHHATTISGARH

FINAL TRAFFIC REPORT | February 2025



NHIT
National Highways Infra Trust

IBI

by IBI Group India Private Limited

Prepared for : National Highways Infra Investment Managers Pvt Ltd (NHIIMPL)

Final Traffic Report

Toll traffic and revenue assessment for Raipur-Bilaspur section of NH30/NH130 in the state of Chhattisgarh



Prepared for National Highways Infra Investment Managers Pvt Ltd,
By IBI Group India Private Limited

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Prepared by: Amal Datta Mikkilineni

Reviewed by:

Date	Details	Name/ Position
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IBI Group India Private Limited. New Delhi

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ABBREVIATION

AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
AR	Alternate Road
BIA	Broad Influence Area
CA	Concession Agreement
CAGR	Compound Annual Growth Rate
COD	Commercial Operation Date
Cr.	Crore
DES	Directorate of Economics and Statistics
FY	Financial Year
GC	Generalized Cost
GDP	Gross Domestic Product
GSDP	Gross State Domestic Product
GQ	Golden Quadrilateral
IIA	Immediate Influence Area
INR	Indian Rupee
IRC	Indian Roads Congress
Kms	Kilometers
LCV	Light Commercial Vehicle
MAV	Multi-axle Vehicle
Mn.	Millions
NHAI	National Highways Authority of India
MSME	Ministry of Micro, Small and Medium Enterprises
NH	National Highway
NHAI	National Highways Authority of India
PWD	Public Works Department
O-D	Origin – Destination
OEA	Office of Economic Advisor
OSV	Over Sized Vehicle
PCI	Per Capita Income
PIA	Project Influence Area
PPP	Public Private Partnership
PR	Project Road
Rs.	Indian Rupees
RDEC	**Raipur Dhanbad Economic Corridor**
SCF	Seasonal Correction Factor
SEZ	Special Economic Zone
SH	State Highway
SP	State Permit
TL	Trip Length
TLFD	Trip Length Frequency Distribution
TP	Toll Plaza
VOC	Vehicle Operating Cost
VOT	Value of Time
WPI	Wholesale Price Index
YOY	Year on Year
ZIF	Zonal Influence Factor

CHAPTER 1

Executive Summary

1. Executive Summary

IBI Group India Private Ltd (Consultant) was appointed by National Highways Infra Investment Managers Pvt Ltd to carry out the traffic due diligence study for the Raipur-Bilaspur section of NH-30/130. This study "Toll Traffic and Revenue Assessment for Raipur-Bilaspur section of NH-30/NH-130 in the state of Chhattisgarh" summarizes IBI's evaluation of the future traffic and toll revenues considering Risk factors and Growth drivers expected during the project concession period.

1.1 Project Overview

The project road, a combination of NH-30 and NH-130, connects Raipur in the south to Bilaspur in the north, passing through Simga and Nandghat. After Simga, NH-30 bifurcates, linking Raipur to Jabalpur in the north while also passing through Jagdalpur, Sukma, Bhadrachalam, and Kothagudem before terminating in Vijayawada in the south. NH-130 extends further, connecting Raipur with Bilaspur, Katghora, and Ambikapur with Korba, a coal mining hub to the north, and Durg and Bhilai, major steel production centers to the south, the project road plays a vital role in transporting iron ore, coal, steel, and other goods. The project road has three toll plazas (TPs), Tarapongi Toll Plaza, Bhojpuree Toll Plaza and Mudhipar Toll Plaza.

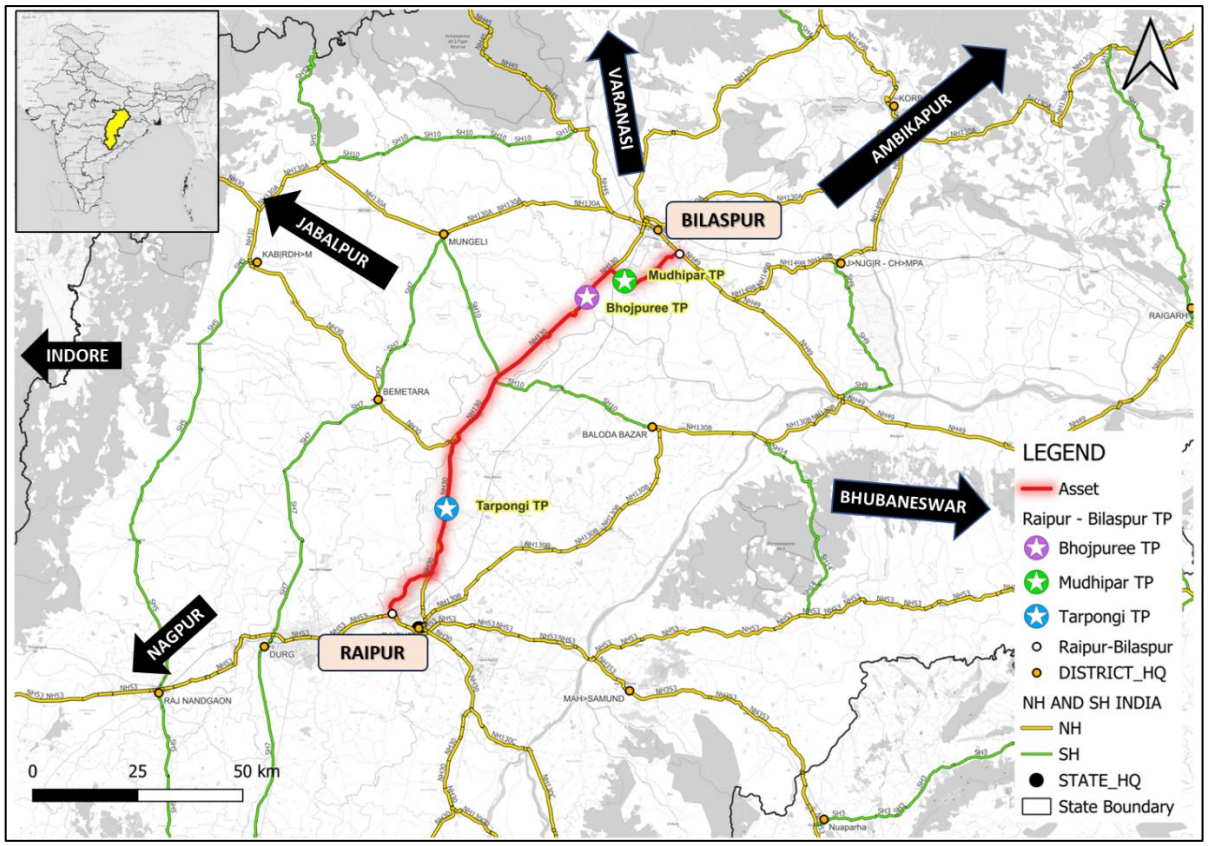


Figure 1-1: Corridor with existing toll plaza location

1.2 Salient growth features and traffic generators

The Raipur-Bilaspur section is a vital economic corridor influenced by multiple industries, playing a crucial role in regional and national logistics.

The coal mining industry significantly impacts this corridor, with major coalfields such as Gevra, Dipka, Kusmunda, and Mand-Raigarh collectively producing over 150 million tonnes of coal annually. These mines support power plants and industries across the country, generating substantial freight traffic through hundreds of daily truck and rail shipments. This industrial activity positions the road as a critical backbone for regional economic growth.

The cement industry also thrives along this corridor, with major plants operated by Ultratech Cement, Ambuja Cement, ACC Cement, and Shree Cement. These facilities contribute over 15 million tonnes of cement production annually, serving infrastructure and construction needs across central and eastern India. The high freight movement of raw materials and finished products further reinforces the road’s importance in economic development.

Similarly, the steel industry plays a crucial role, with major steel plants such as Jindal Steel and Power (Raigarh), SAIL's Bhilai Steel Plant, and multiple sponge iron units in Raipur. These plants produce over 20 million tonnes of steel annually, catering to the construction, automotive, and industrial sectors. The constant movement of raw materials like iron ore and finished steel products highlights the corridor’s significance in industrial transportation.

Additionally, the corridor facilitates the transportation of fly ash, a byproduct of several thermal power plants in the region, including Korba, Sipat, and Tamnar. These plants generate over 30 million tonnes of fly ash annually, which is extensively used in cement manufacturing, brick production, and infrastructure projects. The steady demand for fly ash ensures continuous freight movement, making the road an essential link for efficient resource utilization.

Looking ahead, the cement sector is witnessing significant investments, further reinforcing the region's industrial growth. Ambuja Cement is investing Rs. 1,600 crore in Nawada for a 6 MTPA unit, expected to create 250 direct and 1,000 indirect jobs by December 2025. Shree Cement has allocated Rs. 2,000 crore for capacity expansion, while Ramco Cements plans to invest Rs. 1,403 crore to double its Andhra Pradesh capacity and install a 10 MW waste heat recovery system by FY26. UltraTech Cement is committing Rs. 32,400 crore to expand its capacity to 200 MTPA. Additionally, ACC and the Adani Group have introduced "Bagcrete" and launched a Concrete R&D facility, while Dalmia Cement has launched Dalmia Supreme Cement in Eastern India. These investments position the corridor as a future growth driver in the cement industry.

With coal, steel, cement, and power industries fuelling freight traffic, the Raipur-Bilaspur corridor remains a key driver of industrial and economic growth in the region.

1.3 Traffic volume and composite of vehicles

1.3.1 Historical traffic data

Traffic and revenue data for Tarapongi, Bhojpuree (Oct 2022 – Nov 2024), and Mudhipar (Nov 2022 – Oct 2024) toll plazas were sourced from the Concessionaire. The data, includes toll categories like single journey, local pass, and exempted traffic, was analyzed for trends, & seasonal variations.

Monthly ADT in PCU for Tarapongi Toll Plaza:

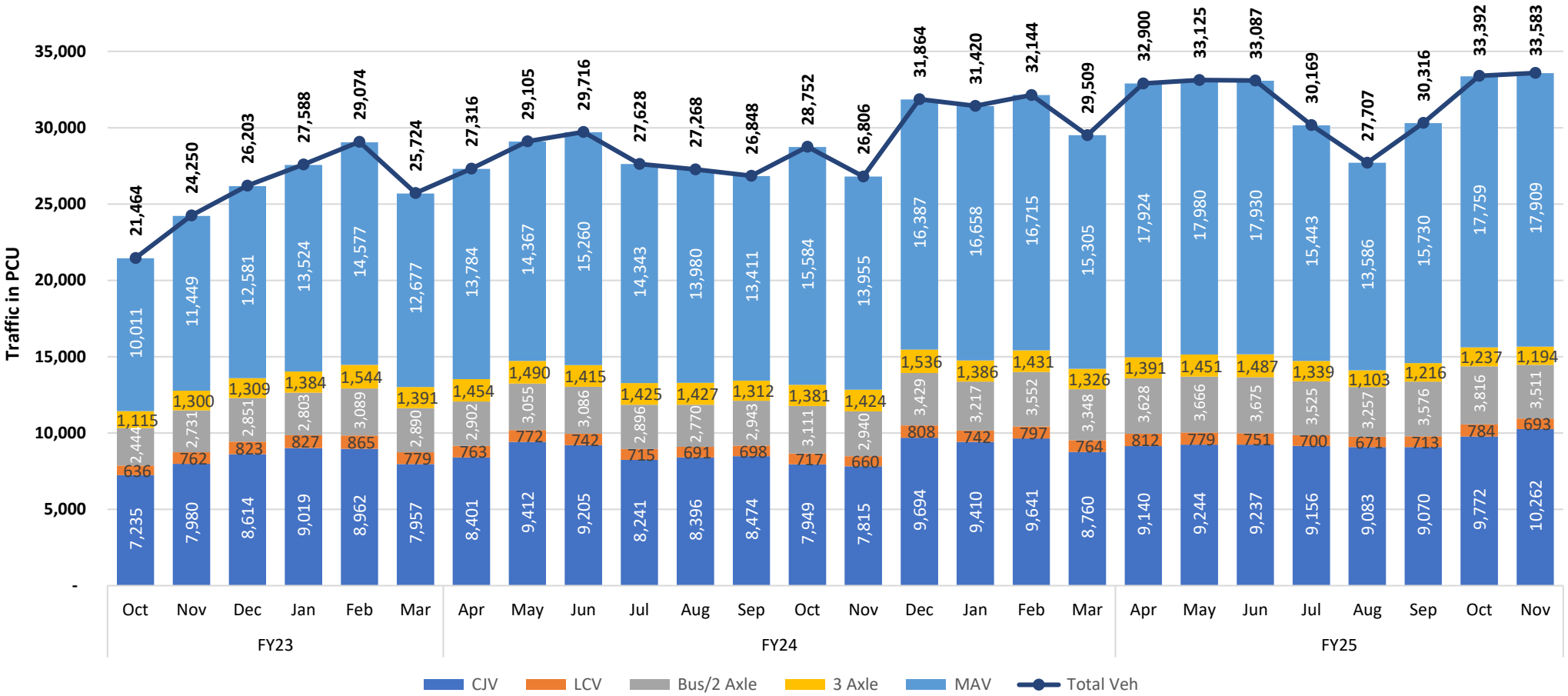


Figure 1-2 Historic Traffic Trend of Tarapongi Toll Plaza

The daily traffic, measured in Passenger Car Units (PCUs), has generally been in the range of 20,000 to 30,000 PCUs over the period from December FY23 to October FY25.The traffic has shown an upward trend, with a Compound Annual Growth Rate (CAGR) of 12.5% from FY23 to FY25.The daily revenue has also grown consistently, reaching ₹28.94 lakhs in October FY25.The revenue has shown a CAGR of 14.5% from FY23 to FY25.

Monthly ADT in PCU for Bhojpuri Toll Plaza:

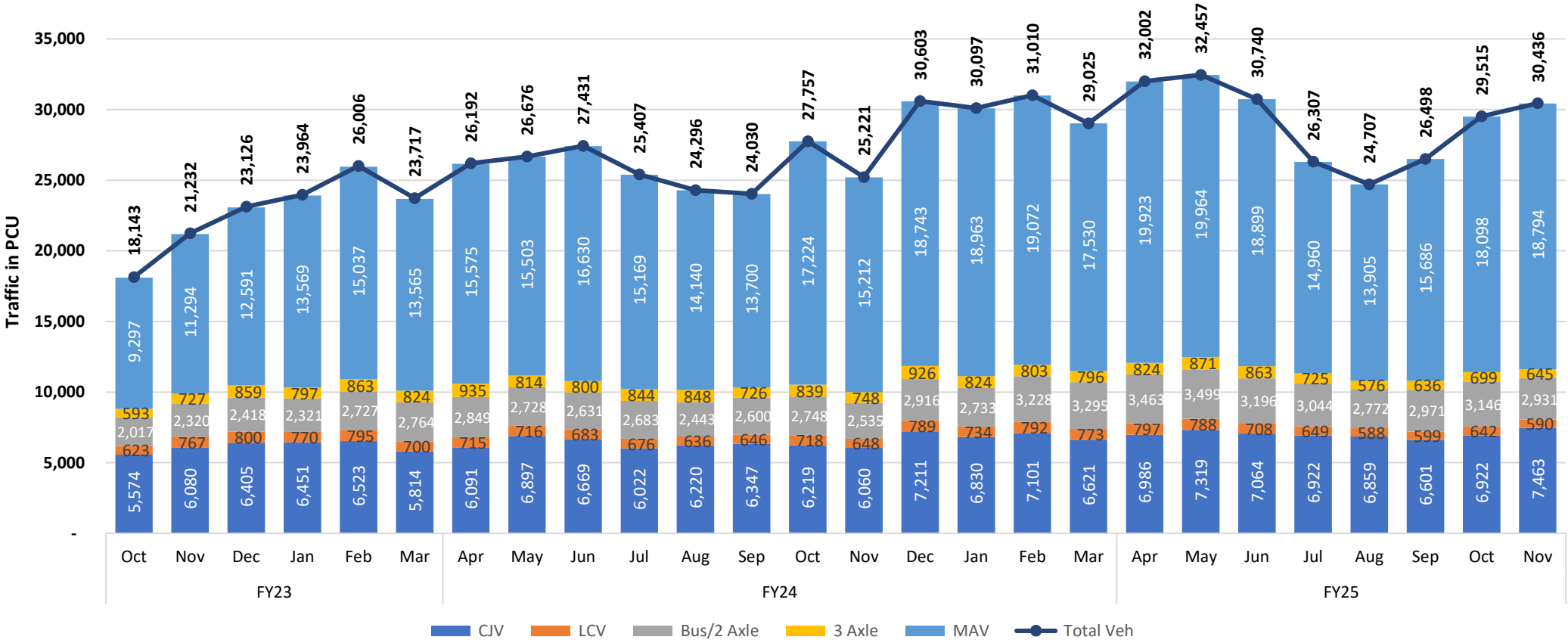


Figure 1-3 Historic Traffic Trend of Bhojpuri Toll Plaza

The daily traffic, measured in Passenger Car Units (PCUs), has generally been in the range of 6,000 to 8,500 PCUs over the period from December FY24 to October FY25. The traffic has shown an upward trend, with a Compound Annual Growth Rate (CAGR) of 16.9% from FY23 to FY25.The daily revenue has grown consistently, reaching ₹28.26 lakhs in October FY25.The revenue has shown a CAGR of 15.6% from FY23 to FY25.

Monthly ADT in PCU for Mudhipar Toll Plaza:

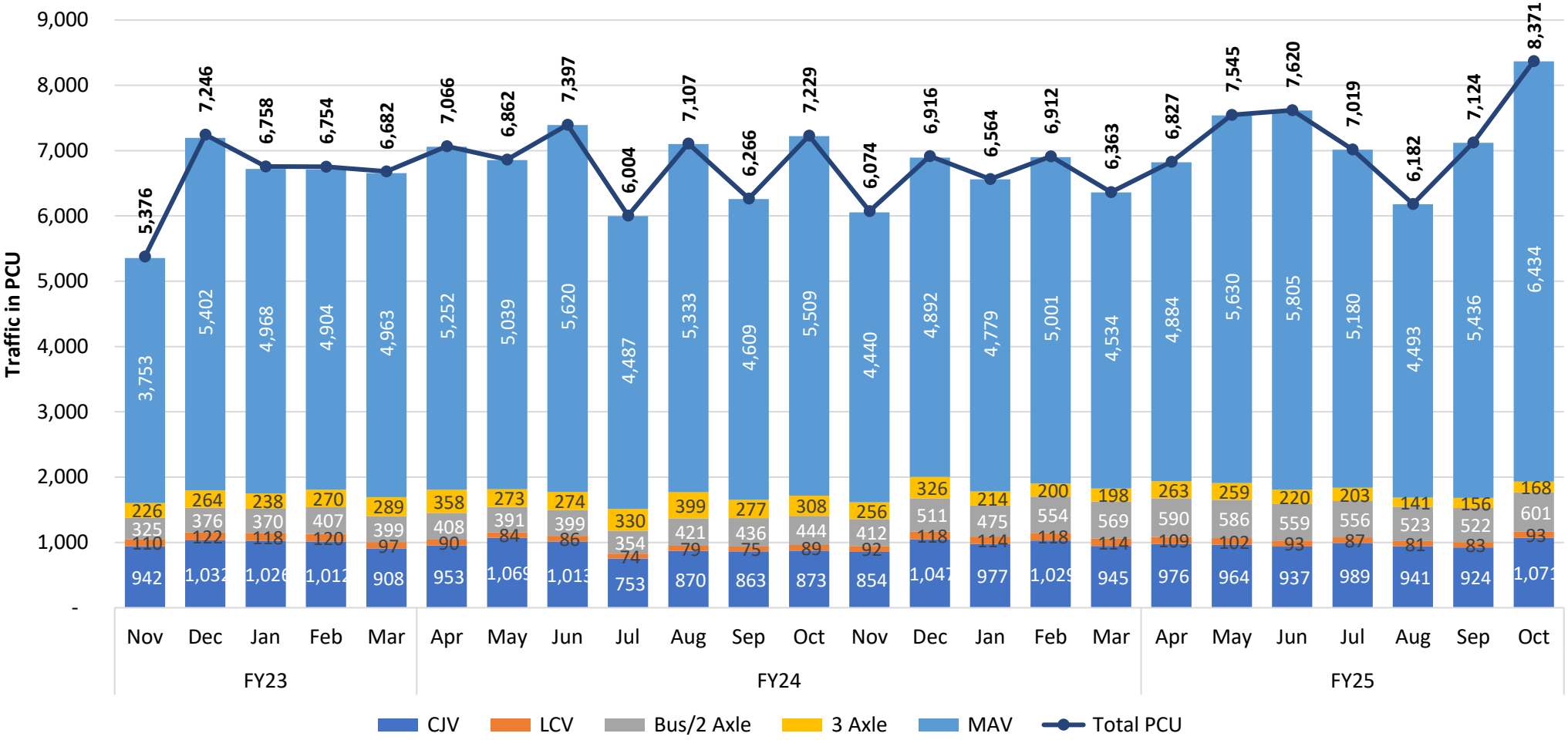


Figure 1-4 Historic Traffic Trend of Mudhipar Toll Plaza

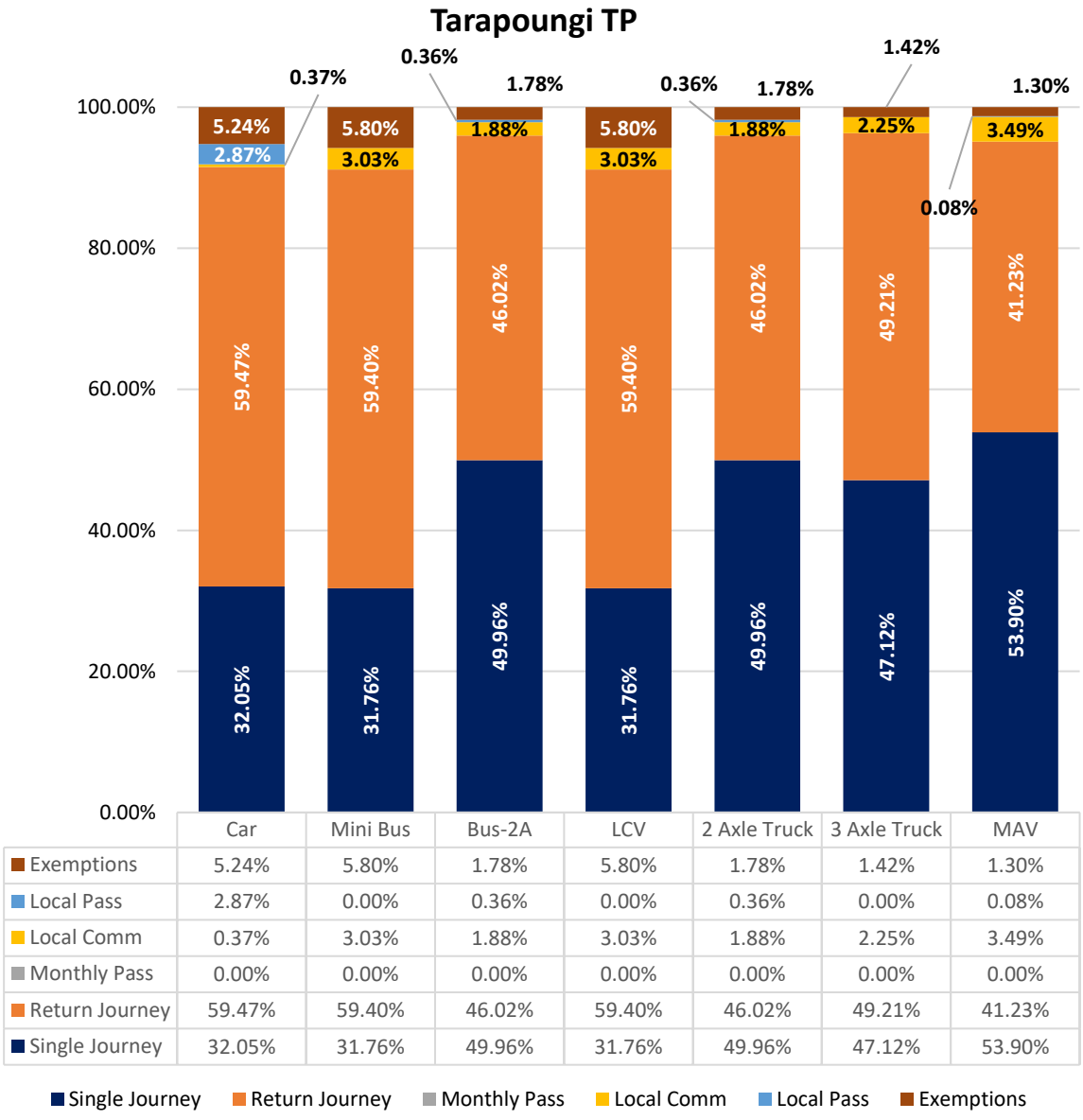
Based on the available data from Dec-FY24 to Oct-FY25 it can be observed that the traffic has been varying around 6000 to 8500 PCUs daily and having revenue of around 3 lack to 4 lacks daily. Daily revenue grew consistently, reaching ₹4.04 lakh in October FY25, with a CAGR of 22.7% from FY23 to FY25.Daily traffic ranged from 6,378 to 8,499 PCU, showing an upward trend with a CAGR of 18.8% over the same period.

1.3.2 Toll segmentation

The combined data from Tarapongi, Bhojpuri, and Mudhipar Toll Plazas shows varied travel patterns across vehicle types. Tarapongi and Bhojpuri see more return journeys for cars and LCVs, while Mudhipar has a higher share of single journeys. Trucks and MAVs at Tarapongi and Bhojpuri have a balanced mix of single and return trips, whereas Mudhipar is dominated by single journeys. Local commercial traffic and exemptions are present at all three plazas in different proportions.

Local pass usage varies across locations and vehicle types. The consultant has estimated a potential increase in Local Daily Commuter (LDC) share, especially at Tarapongi, with a phased rise from FY-26 to FY-30. Each toll plaza reflects distinct travel characteristics in trip types, local pass reliance, and exemptions.

Tarapongi Toll Plaza:



	Car	Mini Bus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
Exemptions	5.24%	5.80%	1.78%	5.80%	1.78%	1.42%	1.30%
Local Pass	2.87%	0.00%	0.36%	0.00%	0.36%	0.00%	0.08%
Local Comm	0.37%	3.03%	1.88%	3.03%	1.88%	2.25%	3.49%
Monthly Pass	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Return Journey	59.47%	59.40%	46.02%	59.40%	46.02%	49.21%	41.23%
Single Journey	32.05%	31.76%	49.96%	31.76%	49.96%	47.12%	53.90%

Figure 1-5 Base Year (FY25) Trip Segmentation for Tarapongi Toll Plaza

Future trip Segmentation for Tarapongi Toll Plaza:

LDC shall increase and shall cap at 75% (25% of the users will not obtain the LDC due to insufficient LDC compliance) of the Actual Share estimated from Survey. For future projections, the consultant has noted an expected increase in Local Daily Commuter (LDC) share at Tarapongi in a phased manner from FY-26 to FY-30 for LCV, 2A,3A and MAV. Additionally, exemptions are factored in using available data, ensuring alignment with observed trends. The final adopted segmentation reflects these adjustments, and it is assumed that the forecast segmentation will remain consistent throughout the concession period.

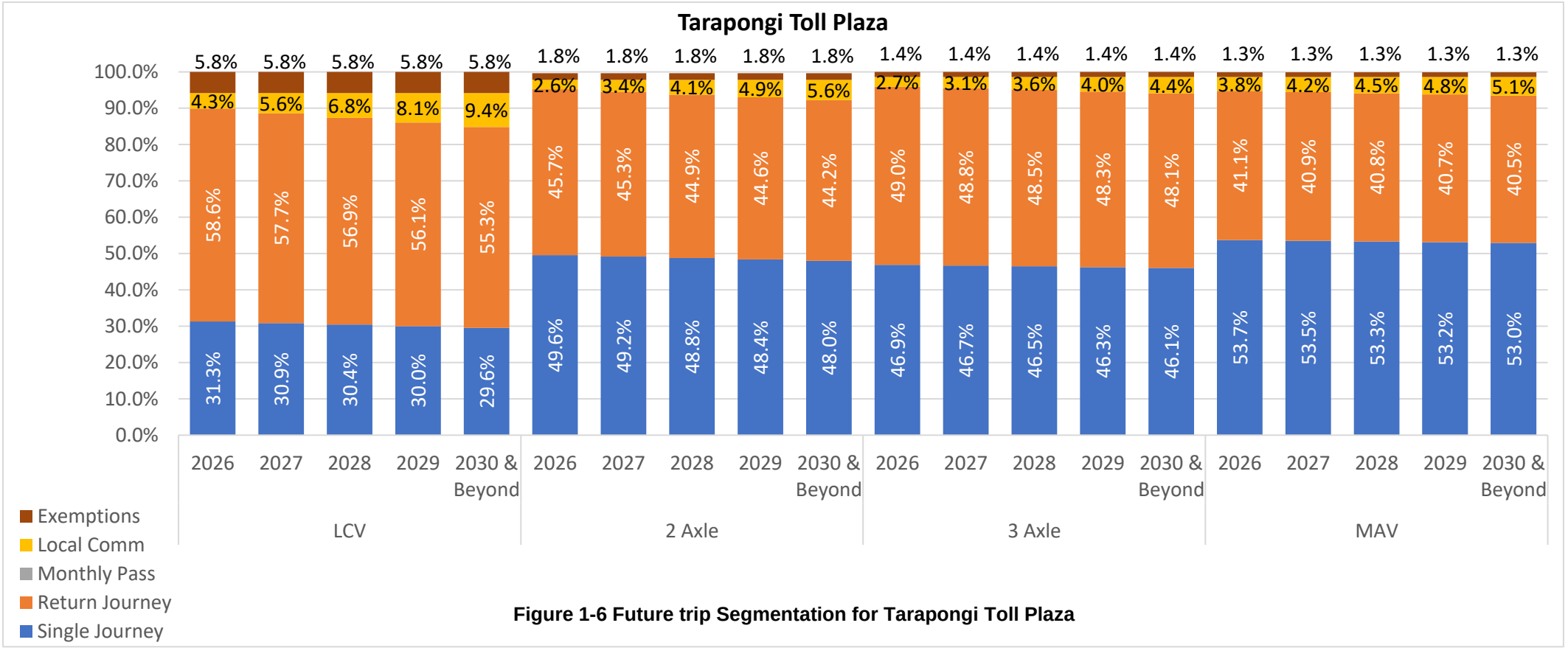
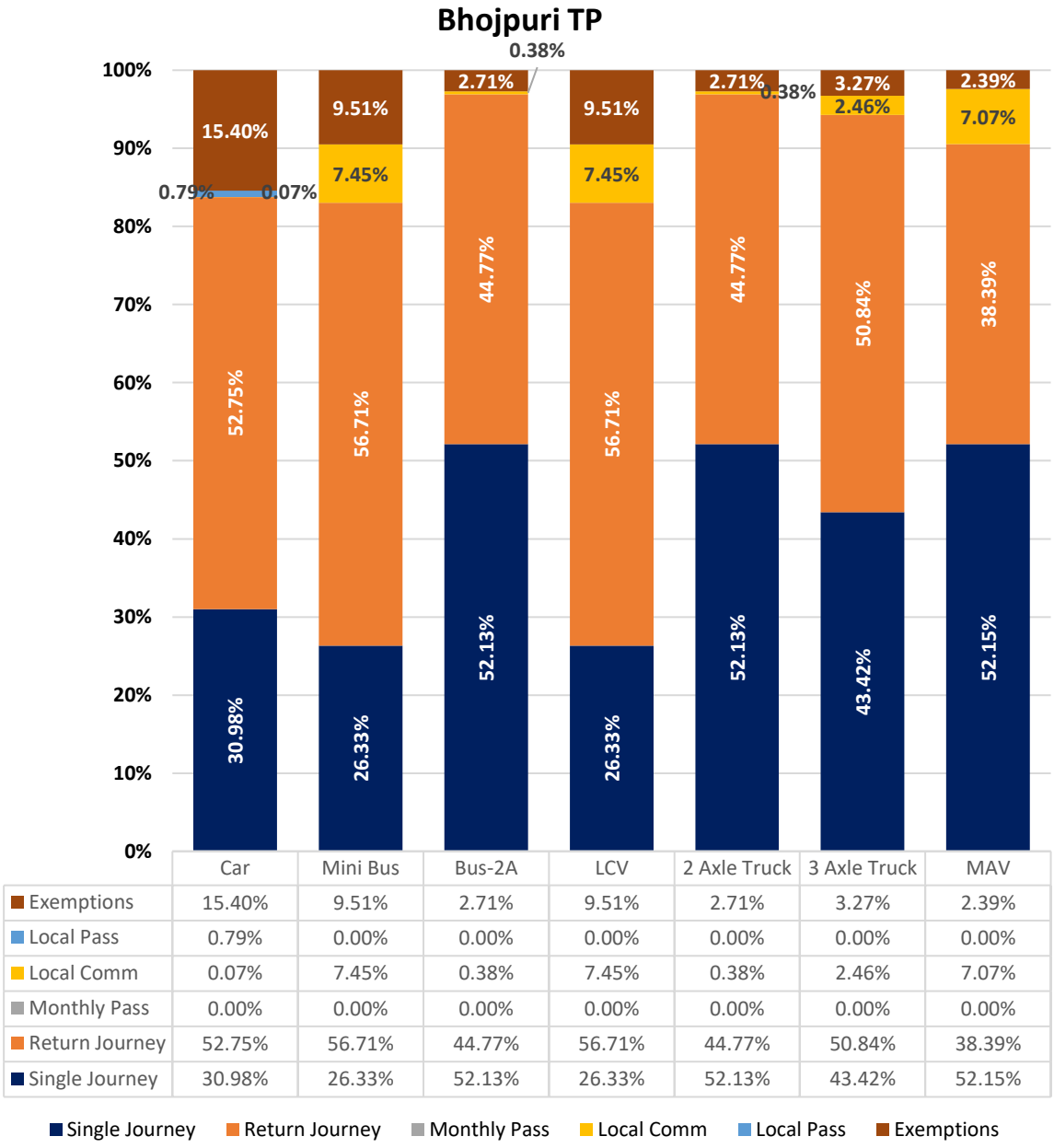


Figure 1-6 Future trip Segmentation for Tarapongi Toll Plaza

Bhojpuri Toll Plaza:

Trip segmentation for FY25



	Car	Mini Bus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
Exemptions	15.40%	9.51%	2.71%	9.51%	2.71%	3.27%	2.39%
Local Pass	0.79%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Local Comm	0.07%	7.45%	0.38%	7.45%	0.38%	2.46%	7.07%
Monthly Pass	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Return Journey	52.75%	56.71%	44.77%	56.71%	44.77%	50.84%	38.39%
Single Journey	30.98%	26.33%	52.13%	26.33%	52.13%	43.42%	52.15%

Figure 1-7 Base Year (FY25) Trip Segmentation for Bhojpuri Toll Plaza

Future trip Segmentation for Bhojpuri Toll Plaza

DC shall increase and shall cap at 75% (25% of the users will not obtain the LDC due to insufficient LDC compliance) of the Actual Share estimated from Survey. For future projections, the consultant has noted an expected increase in Local Daily Commuter (LDC) share at Bhojpuri in a phased manner from FY-26 to FY-30 for LCV, 2A,3A and MAV. Additionally, exemptions are factored in using available data, ensuring alignment with observed trends. The final adopted segmentation reflects these adjustments, and it is assumed that the forecast segmentation will remain consistent throughout the concession period.

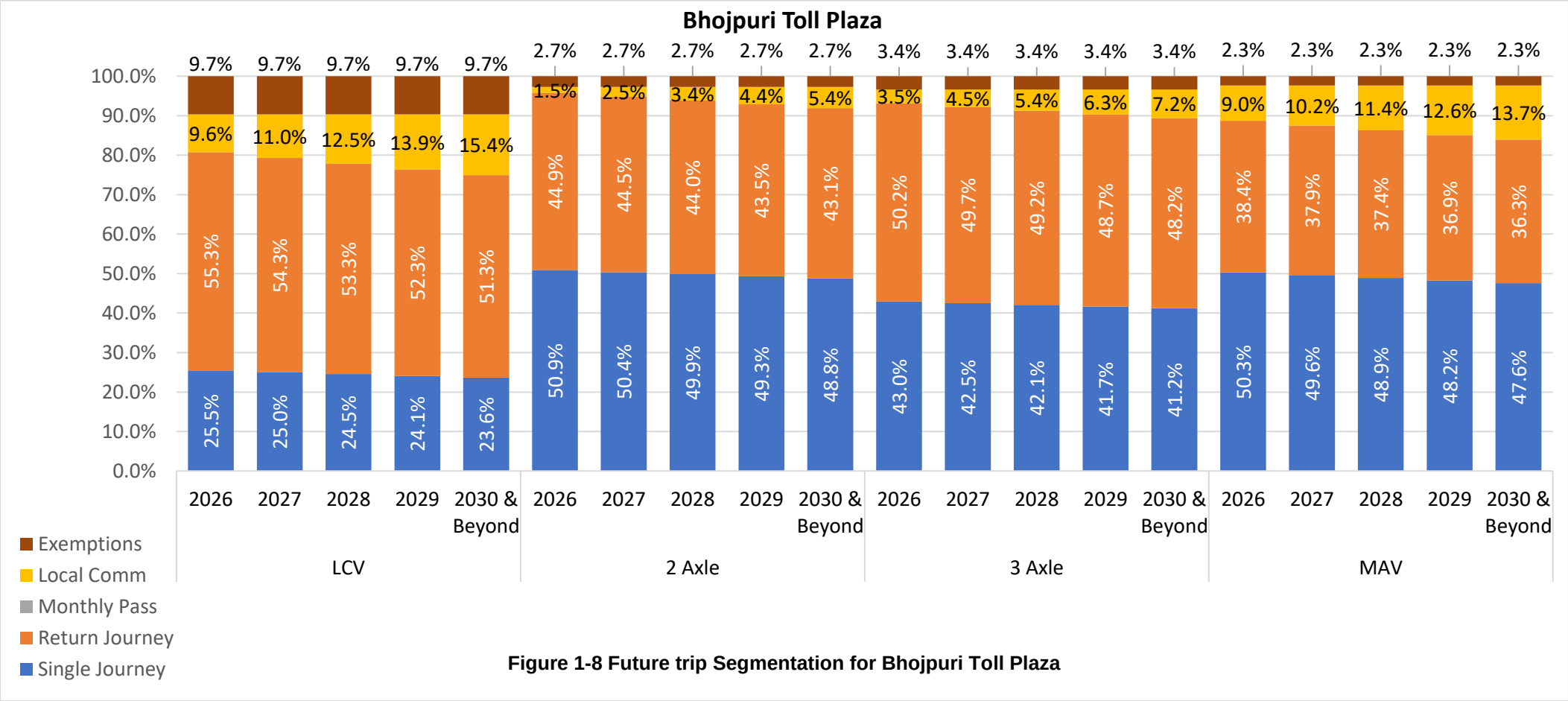
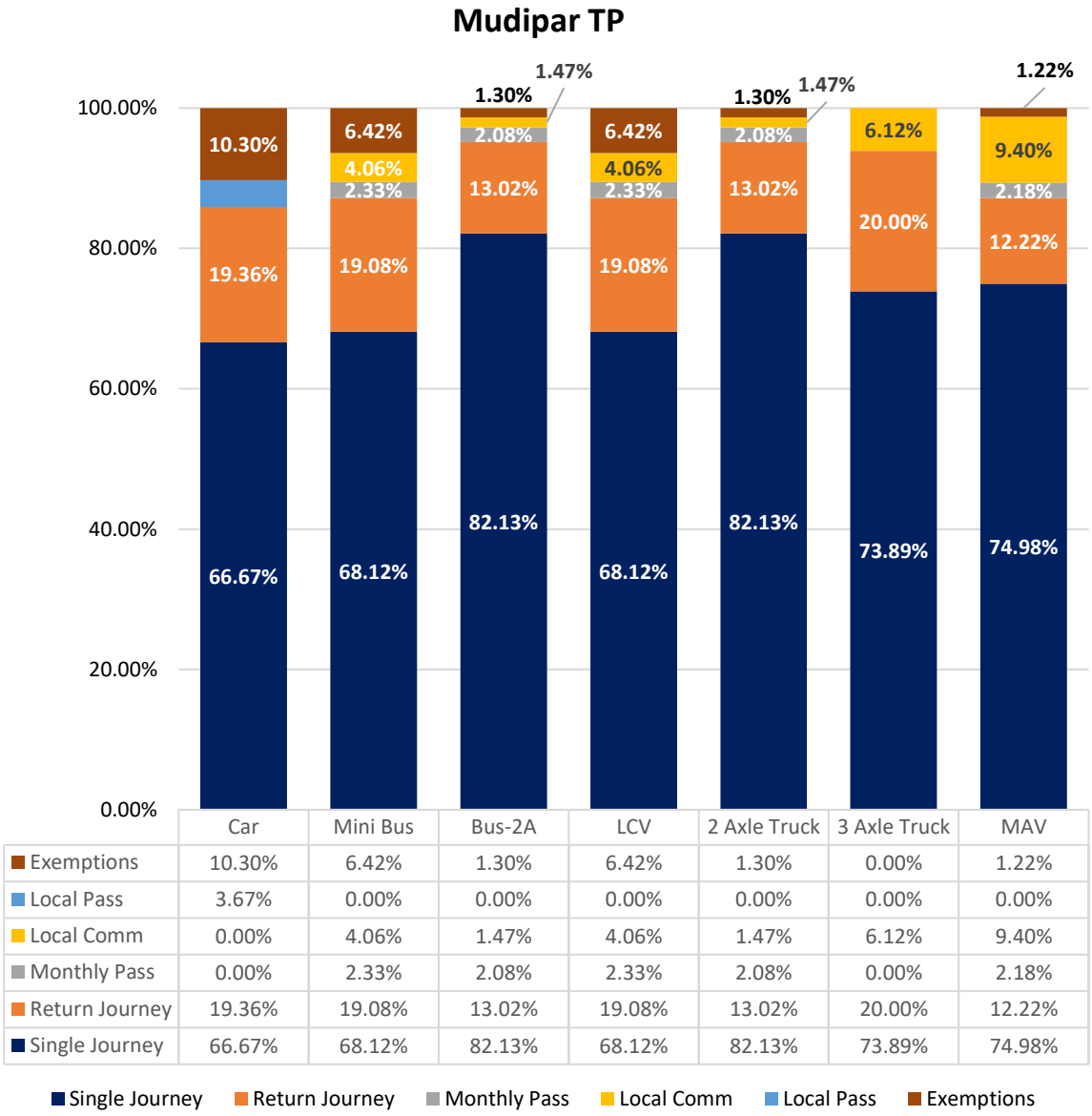


Figure 1-8 Future trip Segmentation for Bhojpuri Toll Plaza

Mudhipar Toll plaza:

Trip segmentation for FY25



	Car	Mini Bus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
Exemptions	10.30%	6.42%	1.30%	6.42%	1.30%	0.00%	1.22%
Local Pass	3.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Local Comm	0.00%	4.06%	1.47%	4.06%	1.47%	6.12%	9.40%
Monthly Pass	0.00%	2.33%	2.08%	2.33%	2.08%	0.00%	2.18%
Return Journey	19.36%	19.08%	13.02%	19.08%	13.02%	20.00%	12.22%
Single Journey	66.67%	68.12%	82.13%	68.12%	82.13%	73.89%	74.98%

Figure 1-9 Base Year (FY25) Trip Segmentation for Mudhipar Toll Plaza

Future trip Segmentation for Mudhipar Toll Plaza:

LDC shall increase and shall cap at 75% (25% of the users will not obtain the LDC due to insufficient LDC compliance) of the Actual Share estimated from Survey. For future projections, the consultant has noted an expected increase in Local Daily Commuter (LDC) share at Mudhipar in a phased manner from FY-26 to FY-30 for LCV, 2A,3A and MAV. Additionally, exemptions are factored in using available data, ensuring alignment with observed trends. The final adopted segmentation reflects these adjustments, and it is assumed that the forecast segmentation will remain consistent throughout the concession period.

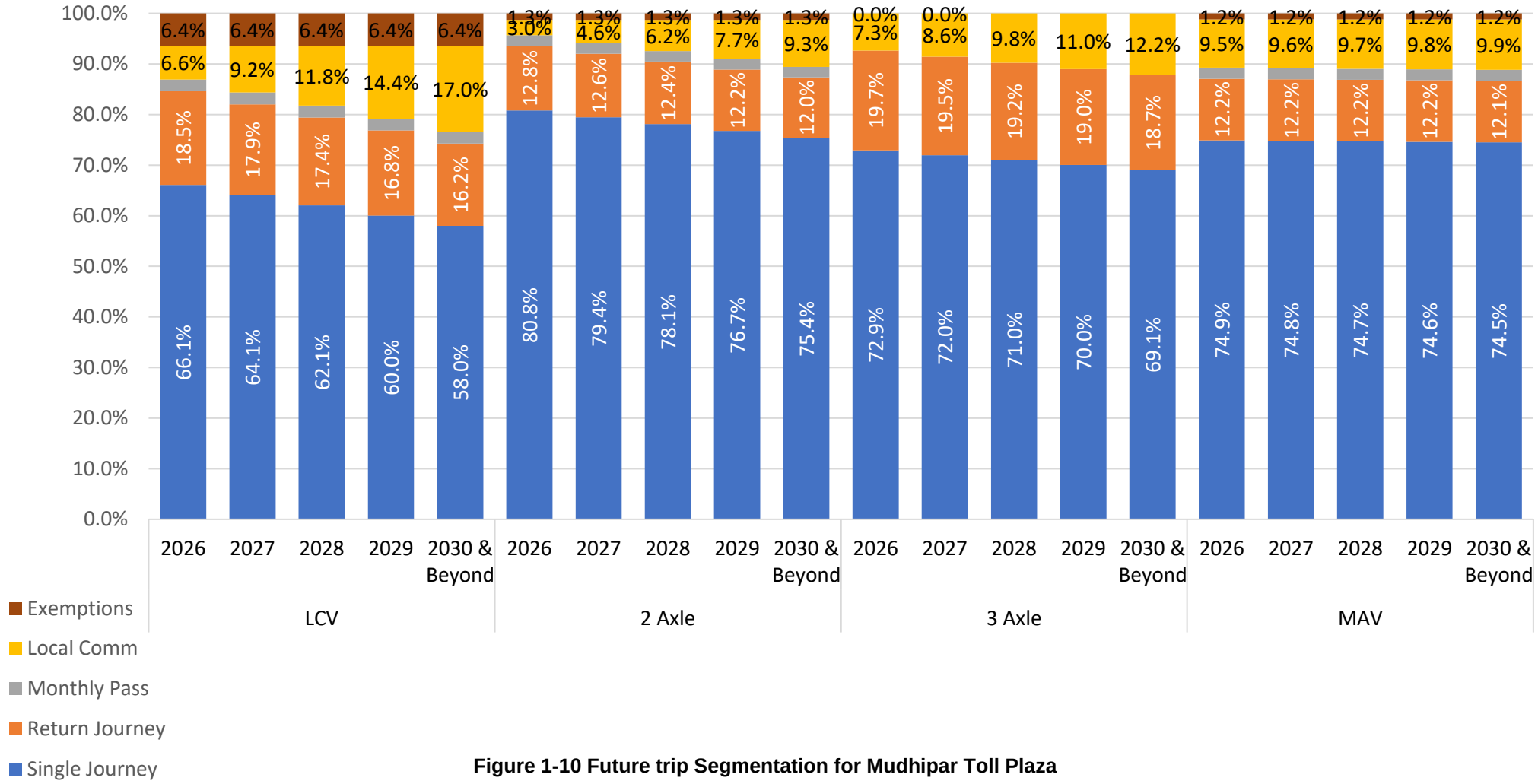


Figure 1-10 Future trip Segmentation for Mudhipar Toll Plaza

1.3.3 Base Year Traffic (AADT)

- The Consultant recommends FY 25 (Apr to Nov 2024) ETC Toll plaza data for Base Year AADT for Tarapongi & Bhojpuri and FY25(Apr-Oct) for Mudhipar Toll Plaza, as it is based on the most recent data.
- IHMCL data for FY23 and ETC data FY24 is considered most suitable for SCF calculation for all three toll plazas.
- Final AADT has arrived by adding adjusted ADT (with selected SCF) arrived from ETC data (April to Nov 2024/Oct 2024, which excludes cash & exemption/violation traffic), cash & exempt traffic from non-ETC data (April to Nov/Oct 2024) and forced exemption/violation data obtained from traffic survey.

Adopted AADT for all three toll plazas has been mentioned below.

Table 1-1 AADT FOR TARAPONGI TOLL PLAZA FY25

TARAPONGI TOLL PLAZA FY25 (Apr-Nov)						
Mode	**ADT(a)**	**SCF**	**AADT (ETC)**	**Cash**	**Exempt**	**Final AADT**
CJV	8,827	*1.03*	9,131	80	491	9,701
LCV	461	*1.01*	466	3	29	498
Bus/2 Axle	1,173	*1.05*	1,227	0	21	1,249
3 Axle	428	*1.02*	439	0	6	445
MAV	3,682	*1.05*	3,876	1	49	3,926
Total	**14,572**		**15,138**	**84**	**596**	**15,818**
PCU	**30,893**		**32,268**	**89**	**838**	**33,195**

Table 1-2 AADT FOR BHOJPURI TOLL PLAZA FY25

BHOJPURI TOLL PLAZA FY25 (Apr-Nov)						
Mode	**ADT(a)**	**SCF**	**AADT (ETC)**	**Cash**	**Exempt**	**Final AADT**
CJV	6,641	1.03	6,863	17	1,195	8,075
LCV	405	1.02	413	1	43	457
Bus/2 Axle	1,015	1.05	1,067	0	28	1,096
3 Axle	235	1.03	242	0	8	250
MAV	3,807	1.08	4,097	0	91	4,186
Total	**12,104**		**12,681**	**18**	**1,366**	**14,065**
PCU	**28,134**		**29,843**	**19**	**1,781**	**31,644**

Table 1-3 AADT FOR MUDHIPAR TOLL PLAZA FY25

MUDHIPAR TOLL PLAZA FY25 (Apr-Oct)						
Mode	**ADT(a)**	**SCF**	**AADT (ETC)**	**Cash**	**Exempt**	**Final AADT**
CJV	972	1.04	1,007	23	115	1,145
LCV	59	1.02	60	2	4	67
Bus/2 Axle	187	1.05	197	0	2	200
3 Axle	67	1.02	68	0	0	68

MUDHIPAR TOLL PLAZA FY25 (Apr-Oct)						
Mode	**ADT(a)**	**SCF**	**AADT (ETC)**	**Cash**	**Exempt**	**Final AADT**
MAV	1,203	1.08	1,296	1	15	1,312
Total	**2,507**		**2,605**	**27**	**78**	**2,792**
PCU	**7,279**		**7,624**	**33**	**137**	**7,954**

1.3.4 Traffic Forecast

Traffic forecasting for project road traffic was done considering past trend in growth and analysing prospects of project influence area. Elasticity approach of growth rate estimation was used for long term traffic forecasting.

The network developments near the Asset's alignment, which are expected to impact traffic on the Asset during the concession period, include the 4-laning of NH-130B (Raipur – Baloda Bazar – Sarangarh), the Raipur–Dhanbad Economic Corridor (EC-07), and associated upgrades in the region.

The 4-laning of NH-130B, covering approximately 169 km out of the total 216 km, is currently in the planning stage, with an estimated completion in FY-31. This development is expected to have a negative impact on the Asset's traffic from FY-32 onward.

The Raipur–Dhanbad Economic Corridor (EC-07), a 707 km-long access-controlled expressway, is under construction to enhance connectivity between Chhattisgarh and Jharkhand. The corridor comprises both greenfield and brownfield sections, including the upgrade of the Raipur–Bilaspur Expressway to a six-lane highway. The ongoing construction between Bilaspur and Urga is expected to be completed by FY-27, positively impacting the Asset from the same year. A subsequent phase of the corridor is anticipated to be completed by FY-31, further influencing traffic patterns from FY-32.

All these network impacts are considered in the Traffic Projections.

The methodology used for the study included following steps:

- The influencing factors obtained from OD surveys are utilized in deriving the key socio-economic parameters of the Project Influence Area (PIA) for the historic trend.
- Through regression analysis for various combinations of dependent and independent parameters is conducted to evaluate the significance of the relation.
- Potential growth of various vehicle categories was separately assessed based on its probable market share in expected multi-modal development.
- The elasticity values for the selected relation are taken & used for the traffic growth rates estimation. However, there are several steps performed before obtaining the traffic growth rates which are explained in the chapter 6.

Traffic and Revenue Assumptions

Traffic Assumptions: -

- Future traffic forecasting was done using elasticity approach which considers the elasticity of transport demand and probable pattern of future growth of the economy.

- Elasticity values for each mode is estimated using the past vehicle registration data, past traffic trend and AADT-tonnage with the growth of PCI, GSDP and Moderated elasticity values chosen for the analysis based on previous trends in socioeconomic variables.
- For Car, Bus and truck traffic, the adopted elasticity values are as follows –
    - Tarapongi TP – 1.20, 0.50, 0.90
    - Bhojpuree TP – 1.20, 0.50, 0.90
    - Mudhipar TP - 1.20, 0.50, 0.90
- Based on the projected elasticity values for TP 1, TP2 and TP 3 the growth of PIA, the future average annual compound traffic growth rates by vehicle type have been estimated by using the following relationship:
    - For freight vehicle, the tonnages on the corridors are projected. The existing market share of different category of goods vehicles are then adjusted for the future years based on the past tonnage trend observed.
    - Normal traffic projections have arrived by applying the traffic growth on the base year traffic.
- The future traffic projections are presented for Effective case traffic projections & the Effective case has arrived by considering the future adjustments in the form of diversions and developments detailed in the chapter 5.

Revenue Assumptions: -

- Toll revenue projections or forecasting will be calculated based on the projected traffic and projected toll rates.
- Toll rates by vehicle and toll category depends on the tolling length, wholesale price index (WPI) and the base rates which are applicable by vehicle category are according to the NH fee notification for the project.
- Toll fee shall be computed based on the base rate fixed by NHAI and is revised annually as per the formula provided by NHAI in Schedule R of the Concession agreement which is according to the National highway fee rules 2008.
- Fee applicable shall be the rate multiplied by the length of the highway section for which toll is to be collected.
- The amount of fee and the revision thereof effective from 1st April every year shall be calculated as follows:

$$\text{Applicable rate of fee} = \text{Base Rate} + \text{Base Rate X} \left\{\frac{\text{WPIA} - \text{WPI B}}{\text{WPI B}}\right\} * 0.40$$

Were
WPI-A means the Wholesale Price Index on December 31, 2023.
WPI-B means the Wholesale Price Index of week ending on 6th January 2007.i.e 208.7.
The actual fees to be charged shall be rounded off to the nearest Five rupees.

Traffic and Toll revenue projections

Tarapongi Toll Plaza:

Table 1-4 EFFECTIVE FUTURE TRAFFIC PROJECTIONS FOR TARAPONGI TOLL PLAZA

EFFECTIVE FUTURE TRAFFIC PROJECTIONS									
FINANCIAL YEAR	CAR	MINI BUS	BUS	LCV	2AT	3AT	MAV	TOTAL VEH	PCU
2025	9,701	11	488	486	760	445	3,926	15,818	33,195
2026	10,402	12	506	506	804	460	4,176	16,865	35,279
2027	11,152	12	523	526	849	476	4,438	17,976	37,475
2028	11,958	13	542	546	897	492	4,717	19,164	39,813
2029	12,779	13	560	566	945	508	4,999	20,369	42,181
2030	13,560	14	577	583	990	521	5,270	21,514	44,434
2035	17,862	15	659	661	1,185	578	6,529	27,488	55,518
2040	22,749	17	747	754	1,437	646	8,205	34,557	69,322
2045	27,820	19	832	836	1,692	702	9,997	41,897	83,763
2046	28,843	19	848	850	1,739	711	10,350	43,360	86,615
2056	39,981	23	1,011	973	2,206	781	14,139	59,116	1,17,100

Table 1-5 EFFECTIVE TRAFFIC GROWTH RATES FOR TARAPONGI TOLL PLAZA

EFFECTIVE TRAFFIC GROWTH							
Year	CAR	MINIBUS	BUS	LCV	2AT	3AT	MAV
2026-26	7.2%	3.6%	3.6%	4.0%	5.7%	3.5%	6.4%
2027-27	7.2%	3.5%	3.5%	3.9%	5.6%	3.4%	6.3%
2028-28	7.2%	3.5%	3.5%	3.9%	5.6%	3.4%	6.3%
2029-29	6.9%	3.3%	3.3%	3.6%	5.3%	3.1%	6.0%
2030-30	6.1%	3.0%	3.0%	3.1%	4.8%	2.6%	5.4%
2031-35	5.9%	2.9%	2.9%	2.9%	4.1%	2.6%	5.2%
2036-40	5.0%	2.5%	2.5%	2.7%	3.9%	2.3%	4.7%
2041-45	4.1%	2.2%	2.2%	2.1%	3.3%	1.7%	4.0%
2046-56	3.4%	1.8%	1.8%	1.4%	2.4%	1.0%	3.2%

Bhojpuri Toll Plaza:

Table 1-6 EFFECTIVE FUTURE TRAFFIC PROJECTIONS FOR BHOJPURI TOLL PLAZA

EFFECTIVE FUTURE TRAFFIC PROJECTIONS									
FINANCIAL YEAR	CAR	MINI BUS	BUS	LCV	2AT	3AT	MAV	TOTAL VEH	PCU
2025	8,075	15	404	442	691	250	4,188	14,065	31,644
2026	8,658	15	419	458	729	256	4,459	14,995	33,648
2027	9,284	16	433	474	769	263	4,744	15,981	35,759
2028	9,955	16	448	490	810	270	5,046	17,036	38,006
2029	10,639	17	463	506	852	276	5,353	18,106	40,285
2030	11,289	17	477	519	891	281	5,649	19,124	42,461
2035	14,836	19	543	573	1,046	294	6,932	24,245	52,571
2040	18,894	22	615	641	1,259	319	8,655	30,404	65,412
2045	23,101	24	685	695	1,469	336	10,482	36,793	78,822

EFFECTIVE FUTURE TRAFFIC PROJECTIONS									
FINANCIAL YEAR	CAR	MINI BUS	BUS	LCV	2AT	3AT	MAV	TOTAL VEH	PCU
2046	23,949	25	698	703	1,507	339	10,848	38,069	81,491
2056	33,175	30	833	769	1,882	354	14,734	51,776	1,09,881

Table 1-7 EFFECTIVE TRAFFIC GROWTH RATES FOR BHOJPURI TOLL PLAZA

EFFECTIVE TRAFFIC GROWTH							
Year	CAR	MINIBUS	BUS	LCV	2AT	3AT	MAV
2026-26	7.2%	3.5%	3.5%	3.5%	5.5%	2.7%	6.5%
2027-27	7.2%	3.5%	3.5%	3.4%	5.4%	2.6%	6.4%
2028-28	7.2%	3.5%	3.5%	3.5%	5.4%	2.6%	6.4%
2029-29	6.9%	3.3%	3.3%	3.2%	5.1%	2.3%	6.1%
2030-30	6.1%	3.0%	3.0%	2.6%	4.6%	1.8%	5.5%
2031-35	5.9%	2.9%	2.9%	2.5%	3.9%	1.7%	5.0%
2036-40	5.0%	2.5%	2.5%	2.2%	3.8%	1.6%	4.5%
2041-45	4.1%	2.2%	2.2%	1.6%	3.1%	1.0%	3.9%
2046-56	3.3%	1.8%	1.8%	0.9%	2.3%	0.5%	3.1%

Mudhipar Toll Plaza:

Table 1-8 EFFECTIVE FUTURE TRAFFIC PROJECTIONS FOR MUDHIPAR TOLL PLAZA

EFFECTIVE FUTURE TRAFFIC PROJECTIONS									
FINANCIAL YEAR	CAR	MINI BUS	BUS	LCV	2AT	3AT	MAV	TOTAL VEH	PCU
2025	1,145	1	4	66	196	68	1,312	2,792	7,954
2026	1,221	1	4	68	206	69	1,390	2,959	8,418
2027	1,537	1	6	80	219	74	1,550	3,466	9,528
2028	1,886	1	7	92	231	78	1,721	4,017	10,720
2029	2,011	1	8	95	242	79	1,820	4,256	11,332
2030	2,143	1	8	97	254	81	1,926	4,510	11,984
2035	2,823	1	6	131	289	74	2,450	5,775	15,156
2040	3,585	1	7	150	346	78	3,052	7,219	18,839
2045	4,389	2	7	166	402	79	3,692	8,737	22,719
2046	4,541	2	7	168	412	79	3,814	9,024	23,455
2056	6,364	2	9	195	512	82	5,217	12,380	31,941

Table 1-9 EFFECTIVE TRAFFIC GROWTH RATES FOR MUDHIPAR TOLL PLAZA

EFFECTIVE TRAFFIC GROWTH							
Year	CAR	MINIBUS	BUS	LCV	2AT	3AT	MAV
2026-26	6.6%	3.3%	3.3%	3.0%	4.9%	1.7%	6.0%
2027-27	6.7%	3.3%	3.3%	3.0%	5.0%	1.7%	6.0%
2028-28	6.4%	3.2%	3.2%	2.7%	4.7%	1.5%	5.7%

EFFECTIVE TRAFFIC GROWTH							
Year	CAR	MINIBUS	BUS	LCV	2AT	3AT	MAV
2029-29	6.5%	3.2%	3.2%	2.7%	4.7%	1.5%	5.7%
2030-30	6.5%	3.2%	3.2%	2.8%	4.7%	1.5%	5.7%
2031-35	6.0%	2.9%	2.9%	2.7%	3.8%	1.2%	5.0%
2036-40	4.9%	2.5%	2.5%	2.6%	3.6%	0.9%	4.4%
2041-45	4.0%	2.2%	2.2%	2.0%	3.0%	0.3%	3.8%
2046-56	3.4%	1.8%	1.8%	1.4%	2.2%	0.2%	3.2%

Toll rates

Table 1-10 Toll Fees for the year FY-2025 from June'24 to March'25 for TP1 – Tarapongi

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	95	140	3,140	45	340
Light Commercial Vehicle or Minibus	150	230	5,070	75	-
Bus - 2 Axle	320	480	10,620	160	-
Truck - 2 Axle	320	480	10,620	160	-
3Axle	350	520	11,585	175	-
MAV (4-6) Axle	500	750	16,655	250	-
OSV	610	910	20,275	305	-

Table 1-11 Toll Fees for the year FY-2025 from June'24 to March'25 for TP2 – Bhojpuree

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	100	150	3,320	50	340
Light Commercial Vehicle or Minibus	160	240	5,360	80	-
Bus - 2 Axle	335	505	11,235	170	-
Truck - 2 Axle	335	505	11,235	170	-
3Axle	370	550	12,255	185	-
MAV (4-6) Axle	530	795	12,255	185	-
OSV	645	965	21,445	320	-

Table 1-12 Toll Fees for the year FY-2025 from June'24 to March'25 for TP3 – Mudhipar

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	50	70	1,585	25	340
Light Commercial Vehicle or Minibus	75	115	2,565	40	-
Bus - 2 Axle	160	240	5,370	80	-
Truck - 2 Axle	160	240	5,370	80	-
3Axle	175	265	5,860	90	-
MAV (4-6) Axle	255	380	8,425	125	-
OSV	310	460	10,255	155	-

Traffic and Toll revenue projections

Toll revenue is projected based on the future traffic projections, toll fees by vehicle and toll category and trip rates. Traffic numbers are projected by fiscal year i.e., FY25, FY26 etc. and toll rates are revised on 01st April every year. Toll revenues are projected by fiscal year till the end of concession period and considering maximum possible extension referring clauses related to Additional toll way, Capacity augmentation and modification of concession period.

(a) Toll would be collected for all the days in a year.

(b) Revenue projected from FY-2025 to FY-2056. (End of Concession period is 2046, How ever the same has been estimated till FY-2056 as long-term projections)

The toll revenue projections are done for the effective case which is basically the consideration of all network improvements and land developments as described in the chapter “Traffic Growth Rate Estimation”. Like the effective traffic projections, the below table summarizes the projected annual toll revenue for all the toll plazas for Most Likely scenario.

Table 1-1-13: Estimated Annual Toll revenue (Effective case) in Rs. Crores – Most Likely

FY YEAR	Tarapongi TP	Bhojpuree TP	Mudhipar TP	Total Revenue
FY25	107	105	14	227
FY26	117	115	16	247
FY27	130	127	18	276
FY28	145	142	22	308
FY29	159	155	24	337
FY30	174	169	26	369
FY31	191	184	28	403
FY32	207	200	31	437
FY33	222	214	33	469
FY34	243	234	37	513
FY35	265	255	40	559
FY36	289	278	44	611
FY37	316	302	47	664
FY38	343	328	52	722
FY39	372	356	56	784
FY40	406	388	61	855
FY41	438	418	65	921
FY42	472	452	71	995
FY43	511	487	77	1,075
FY44	555	527	83	1,165
FY45	596	568	89	1,253
FY46	642	610	96	1,348
FY47	691	655	103	1,449
FY48	743	706	111	1,560
FY49	794	758	119	1,671
FY50	853	812	128	1,793
FY51	915	871	137	1,923
FY52	983	935	148	2,066
FY53	1,050	998	158	2,205
FY54	1,126	1,072	170	2,367
FY55	1,205	1,149	182	2,537
FY56	1,297	1,231	196	2,724
CAGR (25-46)	**8.90%**	**8.73%**	**9.47%**	**8.86%**
CAGR (25-56)	**8.38%**	**8.26%**	**8.79%**	**8.35%**

CHAPTER 2
Introduction

2. Introduction

2.1 General

IBI Group India Private Ltd (Consultant) was appointed by National Highways Infra Investment Managers Pvt Ltd to carry out the traffic due diligence study for the Raipur-Bilaspur section of NH-30.

The project road is part of the major National Highway 30, Providing connectivity between states like Chhattisgarh, Karnataka. The project road has three toll plazas (TPs), Tarapongi Toll Plaza, Bhojpuree Toll Plaza and Mudhipar Toll Plaza.

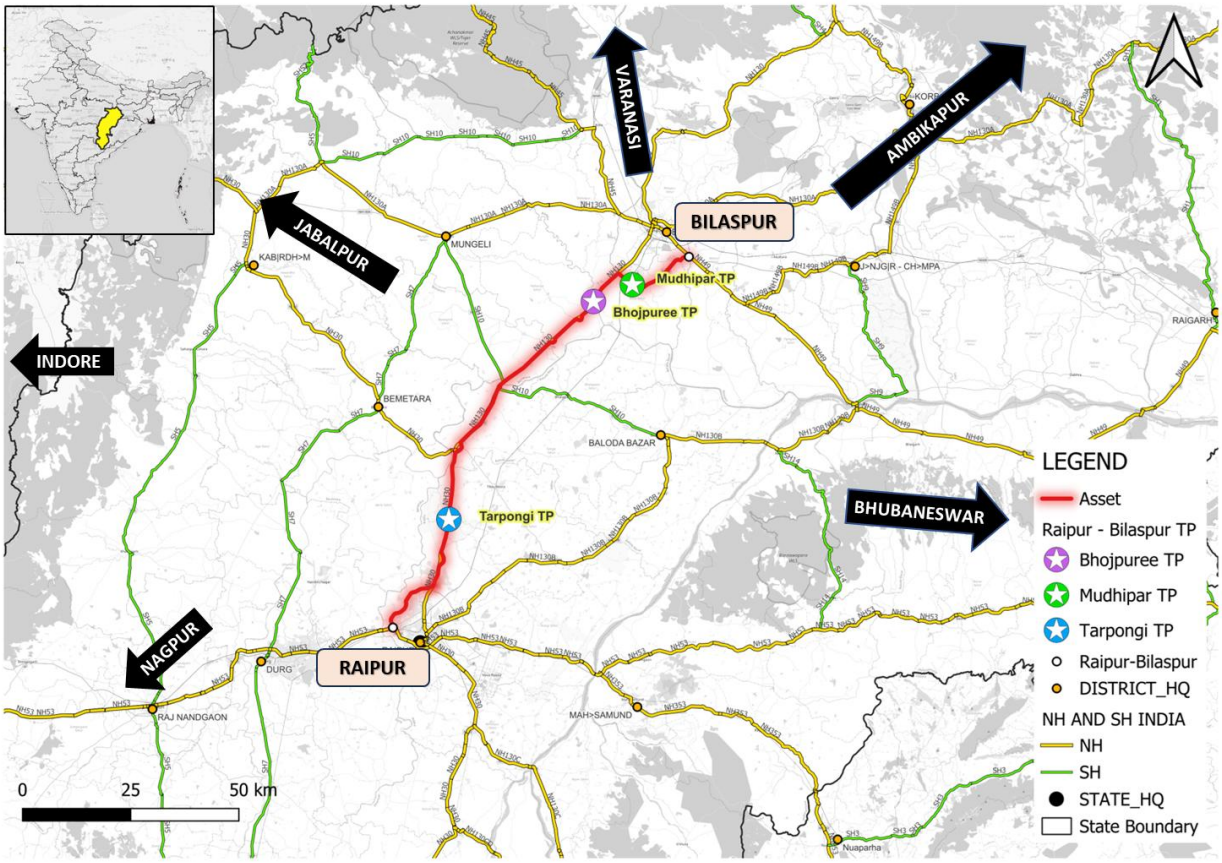


Figure 2-1: Project Corridor with existing toll plaza location

As part of this study, a systematic methodology has been followed to assess the characteristics of the existing traffic on the project road and traffic growth during the remaining period of the concession i.e., till (FY-2046). however traffic projections are estimated till FY2056 as long term projections considering the maximum extension of concession period. The details pertaining to the data collection, primary as well as secondary, and results from its analysis are presented in the subsequent chapters of this report.

The Traffic report presents the existing traffic characteristics, methodology used to derive traffic growth rates, details on adopted traffic growth rates, forecasted traffic, diverted, and generated traffic if any for the next Twenty (20) years. Based on these, future tollable traffic and toll revenues at the existing toll plaza locations are assessed and presented.

2.2 Objective and Scope of work

The main objective of the study is to carry out review of existing traffic & revenue data and forecasting the future traffic and revenues for the project road for the remaining concession period considering the potential risks and developments in view of the micro and macro characteristics related to demographics, economy, alternate routes, project road, regional network & peripheral development in the project influence area (PIA).

The scope of work is to assess the horizon year traffic & toll revenue at the toll plaza locations on the project road through:

- Review of Data and Documents:
    - Reviewing the Historical data on classified traffic volume & revenue data for the project highway's Toll Plazas.
    - Reviewing the Past traffic study reports.
    - Conducting gap analysis between actual and projected traffic & revenue for current/last year and ascertaining the reasons thereof.
    - ETC & Non ETC data for the historic period for the project road toll plazas .
    - Traffic volume/ revenue data collected from the concerned PIUs, and actual amount remitted by User Fee Collection Agencies to NHAI.
- Traffic Surveys:
    - 7 Days Traffic Volumes counts at all the toll plazas of project road using Videography method. The vehicle classification system as given in relevant IRC code may be followed.
    - All results shall be analyzed, and the annual average daily traffic (AADT) shall be worked out by applying seasonal correction / variation factors.
    - Triangulation of traffic forecasts shall be undertaken based on data from secondary sources and analysis of variations (if any), from the traffic as per TVC and as per data shared by NHIIMPL.
    - 1 Day Origin- Destination study at all the toll plazas of project road using roadside interview techniques.
    - The road-side interviews on random sample basis to cover all vehicles. The location of the O-D survey and commodity movement surveys shall normally be the same as for the classified traffic volume count.
    - Identification of Project Influence Area and traffic generators (industrial areas, towns, ports etc.) from analysis of travel pattern covering:
        a) Regional distribution of traffic – through/ bypassing traffic/ inter-state, intra-state/interdistrict, intra-district etc.
        b) Commodity composition- Goods type distribution.
        c) Top OD pairs by vehicle types.
        d) Travel frequency and trip purpose distribution leading to traffic segmentation by toll rate category.
    - Traffic diversion analysis, in case, there are existing routes, or new alternative routes are planned by relevant Authority.
    - Identification of and traffic analysis relating to Competing Routes ((including rail/DFC etc.), if any.
    - Assessment of impact of network improvements based on observed travel pattern.

  - Traffic growth rate estimation based on the elasticity approach using econometric modelling
  -

- Traffic & Revenue Estimates:
  - The values of elasticity of transport demand shall be based on the prevailing practices in the country. The Advisors shall give complete background including references for selecting the value of transport demand elasticity.
  - The demand estimates shall be done assuming three scenarios, namely, optimistic, pessimistic and most likely traffic growth. The growth factors shall be worked out for five- yearly intervals or as appropriate.
  - Above all will include formulation of future economic outlook based on recent economic performance, extent of impact of covid waves and expected economic recovery thereafter.
  - Key factors to be considered in forecasting traffic/ revenue:
    a) Seasonal Correction Factors
    b) Influence area of the project and its economic perspective
    c) Key traffic drivers of the project
    d) Present and future elasticity of transport demand by vehicle type
    e) Traffic growth rate trends observed
    f) Impact of upcoming developments and future development potential of the region
    g) Study of impact of competing routes in terms of diversion from/to the project road - Identification of competing routes and network condition, traffic characteristics & level of tolls charged, if any on the competing corridors
    h) Review of nearby toll plaza/past traffic & revenue data for accurate estimation of traffic growth and to study the past traffic growth trend.
    i) Scenario testing for toll revenue
    j) Any other competing transportation facility
    k) Distribution of traffic into different tolling streams (normal paying and concessions as applicable in line with CA)

2.3 Composition of the Report

This Report is further divided into seven chapters. Chapter 1 contains the executive summary of the report providing a brief outcome of the study. Chapter 2 provides a brief description of the project including the background and key objectives of the study. Chapter 3 contains details of the project road existing connectivity and its influence area. Chapter 4 contains details pertaining to various secondary and primary data and its analysis to understand the base year traffic and travel characteristics. Chapter 5 presents the traffic diversion analysis. This chapter details out the approach and methodology adopted for identification of the potential divertible traffic. It also, elaborately illustrates the approach and methodology adopted for the identification of alternate networks & routes and finally presents the Diverted traffic.

Chapter 6 illustrate the potential developments, growth drivers in the PIA and the potential developmental traffic generated out of the identified developments and, presents the estimation of the traffic growth rates used for traffic forecasting and Final chapter 7 presents the traffic and revenue projections for the entire concession period.

CHAPTER 3

Characteristics of the Project Influence Region

3. Project Influence Area Characteristics

This chapter examines various areas which significantly influence the project road. Demographic, geographical, agricultural & industrial sector, and industrial profile of project influence area is discussed in this chapter.

3.1 Project Road

Key element of any traffic assessment is the understanding of the spread of regions around the project that influence the traffic on the highway and establish the relationship between them. This was achieved through extensive data collection from secondary sources/past reports.

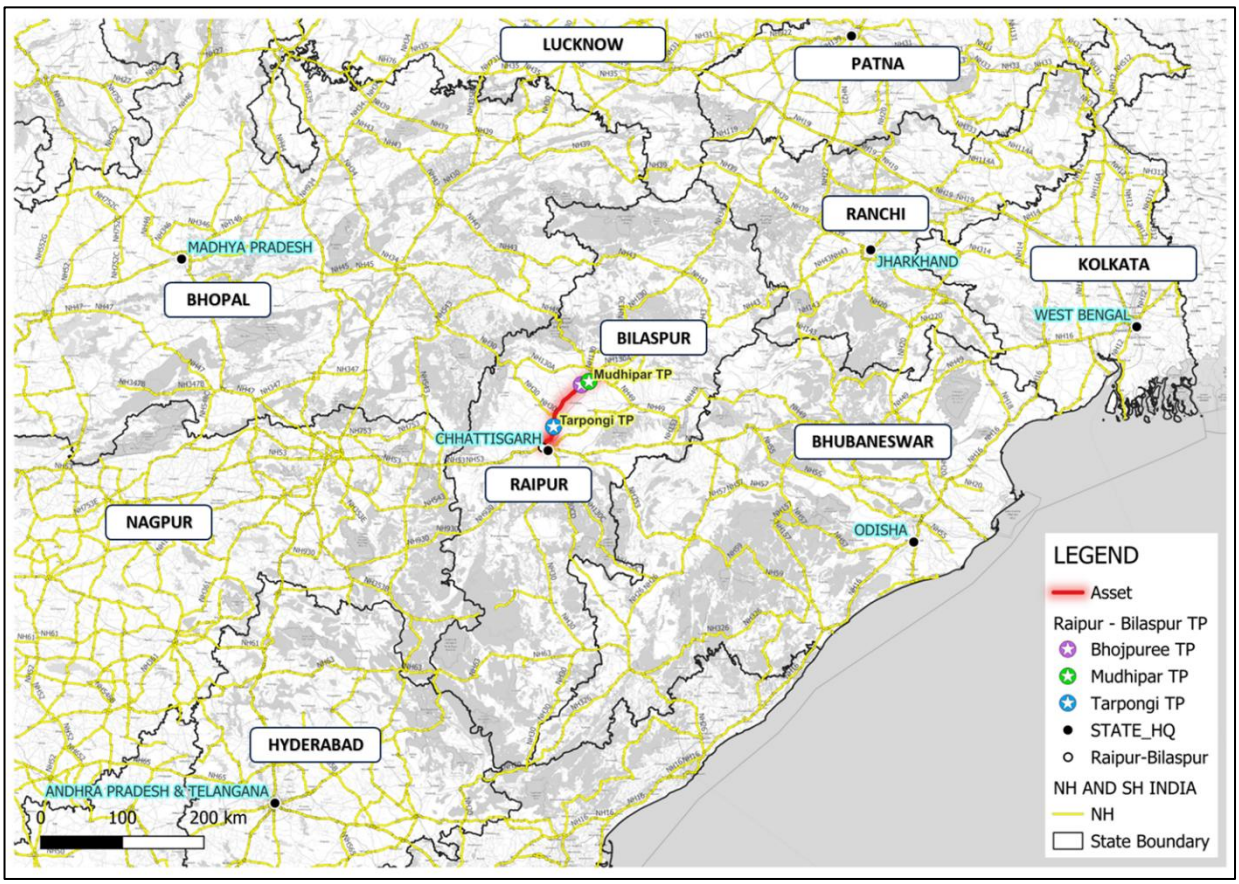


Figure 3-1: Project Road Network at Regional Level

Generally, the area which contributes to the total traffic plying on project road is called the project influence area (PIA). PIA is further classified into primary (immediate) and secondary (broad) influence area, depending on its distance from the project road. The immediate influence area of the project corridor comprises of region/districts of Chhattisgarh, Maharashtra & Madya Pradesh which are in immediate proximity to the project road contributing above 90% of the project road traffic.

Based on the study of the secondary information and past traffic data, the project influence area is divided into: Immediate Influence Area, which comprises of the traffic generators located along the project highway including the end points. Broad Influence Area, which comprises of long-distance destinations which are catered by project highway beyond immediate influence area. The project road with its primary and secondary influence area is as presented in the table below.

Table 3-1: Major Traffic Generating Nodes for Project Road

SL. NO.	STATES	IMPORTANT CITIES
Immediate Influence Area		
A1	Chhattisgarh	Raipur, Bilaspur, Baloda bazar
Broad Influence Area		
B1	Madhya Pradesh	
B2	Maharashtra	

3.2 Chhattisgarh Profile

Chhattisgarh is the ninth largest state by area and 17th most populous in India, comprising 33 districts. Its capital city is Raipur-an important industrial and commercial center. Naya Raipur, also called Atal Nagar, is the first greenfield smart city of India. Chhattisgarh borders Uttar Pradesh in the north, Madhya Pradesh in the northwest, and Maharashtra in the southwest as well as Telangana in the south and Jharkhand in northeast and Odisha in its southeast. The state area comes to 135,192 sq km, being very rich in minerals: a key factor behind large-scale



production of India's steel and power. Chhattisgarh has five administrative divisions named: Raipur, Bilaspur, and Bastar. These are the main regions in governance and economic activity.

The state is marked with dense forests, undulating plains, and the Maikal Hills. It also has prominent rivers like Mahanadi, Indravati, and Shivnath, which play a crucial role in irrigation

and drinking water supply. The region has natural attractions in the form of waterfalls, caves, and wildlife sanctuaries, it is a developing tourist destination for eco-tourism.

Raipur and Bhilai are major industrial centers, Bhilai having one of the largest steel plants in India. Other cities, Bilaspur and Korba, are important trade and power generation centers, making Chhattisgarh the "Power Hub of India."

The state has 26 districts across three regions: Coastal Andhra, Uttarandhra, and Rayalaseema, separated by the Eastern Ghats. Coastal plains are agriculturally productive, while Rayalaseema's peneplains suit livestock grazing. 62% of the population depends on agriculture. Four cities - Amaravati, Kakinada, Tirupati, and Visakhapatnam - are designated as smart cities.

3.2.1 Economic & Industrial Profile

The GSDP of Chhattisgarh would be around Rs. 5.61 trillion (US$ 67.27 billion) in the financial year 2024-25. Chhattisgarh State GSDP grew at a CAGR of 10.67% from 2015-16 to 2024-25.

Chhattisgarh is one of the few states that have surplus power. Korba district is in Chhattisgarh, and that region is also termed as India's power capital. It is one of the most remunerative states in terms of electricity in utility terms. Chhattisgarh as of May 2024 has a total installed capacity for power generation at 14,161.12 MW that includes 9,227 MW under private utilities, 1,971.05 MW under state utilities, and 2,9162 MW under central utilities.



Figure 3-2: GSDP and NSDP of Chhattisgarh (Source: MoSPI)

Mineral resources are Chhattisgarh's greatest strength. It has significant reserves of minerals, including coal, iron ore and dolomite, which are leading producers of these minerals. Besides this, the state has vast deposits of bauxite, limestone and quartzite. The state has an estimated 35.4% of India's tin ore reserves.

Chhattisgarh is the only state in the country that produces tin concentrate Chhattisgarh has a diversified industrial base mainly in automobile and auto component manufacturing. There are over 150 such manufacturing units located mainly in cities like Visakhapatnam and Chittoor. Hyundai, Kia, Ashok Leyland, and Mahindra & Mahindra are some of the key players that have gained a lot of ground here, which further developed the state in this regard.

3.2.2 Agriculture Profile

Chhattisgarh is a big contributor to the agricultural sector of India as 76% of the population is residing in the rural areas and depends on agriculture for their livelihood. Agriculture accounts for about 20% of the state's GDP. The net cultivated area covers about 5.9 million hectares, and an extensive network of irrigation system fed by rivers like Mahanadi, Indravati, Shivnath, and Hasdeo.

Rice is the major crop in the state. Besides rice, pulses, oilseeds, maize, and small millets are the major crops grown in the state. Wheat, sugarcane, groundnuts, and cotton are the other important crops of the state. Tendu leaves, mahua, and tamarind are the minor forest produces and, therefore, add to the rural sectors' economy of the state.

Livestock, poultry farming, and fishery are the sectors related to the agricultural economy of Chhattisgarh. The state promotes organic and sustainable farming. There are agricultural export zones for rice in Raipur and for vegetables in Durg. A special variety of red rice is also being cultivated in the Bastar region that is becoming a popular variety due to its nutritional content.

Since the state has concentrated on traditional crops and forest produce and emphasizes modern agricultural practices, Chhattisgarh has significant contributions to make to the agricultural sector of India.

3.2.3 Infrastructure Profile

Chhattisgarh has come a long way in creating infrastructure, which has well aided the state's growth.

Transportation:

Roads: The state consists of a vast network of roads. The state has major national highways like NH-16, the central government sanctioned ₹11,000 crore to improve connectivity via roads. Four national highways amounting to 236.1 km will be developed.

Railways: Chhattisgarh has excellent railway connectivity and falls under the Southeast Central Railway zone, and two major junctions Raipur and Bilaspur form important centers of passage.

Ports: Chhattisgarh is a landlocked state, but for the purpose of trade, it depends on the ports available in the neighboring states for all import and export operations.

Water Infrastructure:

Chhattisgarh has undertaken huge irrigation schemes and integrated water supply plans to promote agriculture and water supply to towns and villages.

Smart City Projects:

Raipur, Bilaspur, and Naya Raipur (Atal Nagar) come under Smart City Mission, which focuses on upgrading urban development to improve life and infrastructure. Projects cover roads, international cricket stadium, and educational institutions.

3.3 Madhya Pradesh Profile



Figure 3-3 District Map of Madhya Pradesh

Madhya Pradesh is the second-largest state by area and the fifth-most populous state in India, comprising 52 districts. The state capital, Bhopal, is known as the "City of Lakes," while Indore, the largest city, is a major commercial hub. Madhya Pradesh is bordered by Uttar Pradesh to the northeast, Chhattisgarh to the southeast, Maharashtra to the south, Gujarat to the west, and Rajasthan to the northwest. Known as the "Heart of India" due to its central location, the state spans an area of 308,252 sq km. Madhya Pradesh is divided into ten administrative divisions, including Bhopal, Indore, Gwalior, and Jabalpur, which serve as key centers for governance and development.

Madhya Pradesh boasts diverse geography, encompassing the Vindhya and Satpura ranges, fertile plains, and the rugged Chambal ravines. The state is known for its rich landscapes, including dense forests, sprawling plateaus, and attractive river valleys. Major rivers such as the Narmada, Chambal, Betwa, and Tapti serve as vital lifelines, supporting agriculture and providing drinking water to the region.

Indore is recognized as an emerging hub for commerce and education, alongside other prominent cities like Bhopal and Jabalpur, which are known for their industrial and cultural significance in central India.

3.3.1 Economic & Industrial Profile

Madhya Pradesh's GSDP at current money prices, in 2023-24 is roughly Rs. 13.87 trillion / US$ 166.31 billion. The State's NSDP has also been estimated to be around Rs. 12.42 trillion / US$ 148.92 billion, respectively, for 2023-24.

The NSDP of the state during the period between 2015-16 and 2023-24 registered a CAGR of about 12.44%. The state of Madhya Pradesh is rich in fuel, minerals, agriculture, and biodiversity. The diamond production in the state was 38,437 carats in the year 2018-19.

Apart from the strategies/ policies of IT, Biotechnology, Tourism, and SEZs, there are specific monetary as well as strategy/policy incentives to the organizations under Industrial Promotion Policy-2014 of Madhya Pradesh. To attract investors and help entrepreneurs, the State Government has identified TRIFAC as the agency that fosters the single window system for quick clearance and approval of all the clearances and consents.

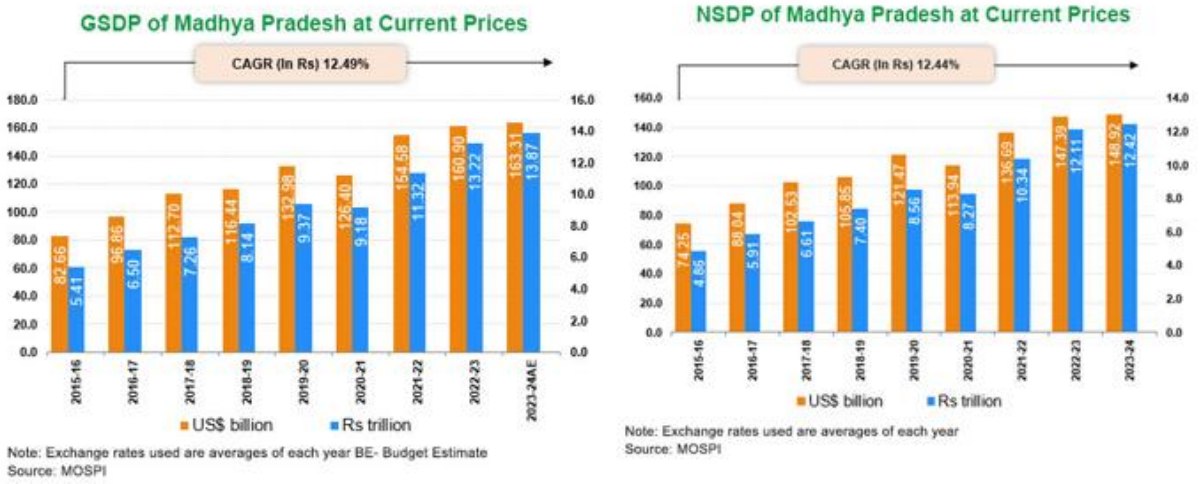


Figure 3-4 GSDP and NSDP of Madhya Pradesh (Source: DoES, Madhya Pradesh)

At current prices, GSDP of Madhya Pradesh was estimated at Rs. 13.87 trillion (US$ 166.31 billion) in 2023-24. GSDP grew at a CAGR (in Rs.) of 12.49% from 2015-16 to 2023-24. NSDP of Madhya Pradesh was estimated to be about Rs. 12.42 trillion (US$ 148.92 billion) in 2023-24. Between 2015-16 and 2023-24, the state's NSDP increased at a CAGR of about 12.44%.

Madhya Pradesh is blessed with immense natural resources- fuel, minerals, agriculture, and biodiversity. In fact, it is also the only diamond-producing state in the country. Diamond production in the state had reached 25,603 thousand tonnes in the year 2019-20.

The state is rich in natural resources, fuels, minerals, agriculture, and biodiversity. Sectoral growth is inducted by SEZs near Jabalpur, industry parks in Indore and food parks at multiple places. The state is rich with minerals and has the richest reserves of stone, diamonds and copper in India not-withstanding the notable ones in coal, coal-bed methane, manganese and dolomite, amongst others. In addition to the above, more than 280 pharmaceutical units are under operation in the industrial area of Dewas, Indore, Pithampur, Mandideep, and Malanpur.

3.3.2 Agriculture Profile

Being described as the "Heart of India," Madhya Pradesh is one of the large contributors to the agricultural economy of India. About 70% of its population inhabits rural areas, while agriculture and allied sectors make it a corner stone of its economy, accounting for about 25% to the GDP of the state. About 20 million hectares are cultivable land in this state, which is recharged by major rivers, namely Narmada, Chambal, Betwa, and Tapti.

Wheat is the state's flag crop and therefore the leading producer of wheat in India. It ranks first as a producing state in India for soybean and pulses. Other major crops are rice, maize, gram, oilseeds, and cotton. The aromatic basmati rice of Madhya Pradesh is in high demand and not only in India but all over the world.

The state's agricultural economy is diversified, comprising horticulture, livestock rearing, poultry farming, and fisheries. Madhya Pradesh is the leading producer of oranges, guavas, and

bananas, while Malwa and Vidisha regions are famous for producing high-quality fruits. The state is also India's largest producer of herbs and medicinal plants; hence it has been called the "Herbal State."

Sharbati variety of wheat, black salt rice produced in the state, acquired geographical indication tags to underline its unique qualities as well as cultural significance. Agricultural export zones have been created for fruits such as mangoes, oranges, and medicinal plants.

3.3.3 Infrastructure Profile

Madhya Pradesh, being in the heart of India, is rapidly developing its infrastructure to support strong economic growth and investment. Its strategic location puts it at the heart of the country's trade and industry.

Transport

Madhya Pradesh has a vast road network of 2,90,000 km that connects it with major cities of India through 20 National Highways. It has roughly 5,000 km of rail network, which gives the state an important connectivity route both for passengers and freight movements. The Inland Container Depot at Mandideep in Madhya Pradesh enables the state to become a player in logistics and trade activities. Further, it is endowed with five airports of which the busiest one is Devi Ahilya Bai Holkar Airport at Indore that is also newly accredited among the cleanest airports of India.

Power:

The installed power generation capacity in Madhya Pradesh is about 25,000 MW with increasing focus on renewable energy. It is one of the largest producers of wind and solar energy in the country. The Rewa Ultra Mega Solar Park is one of the largest solar projects in Asia.

Industrial Infrastructure

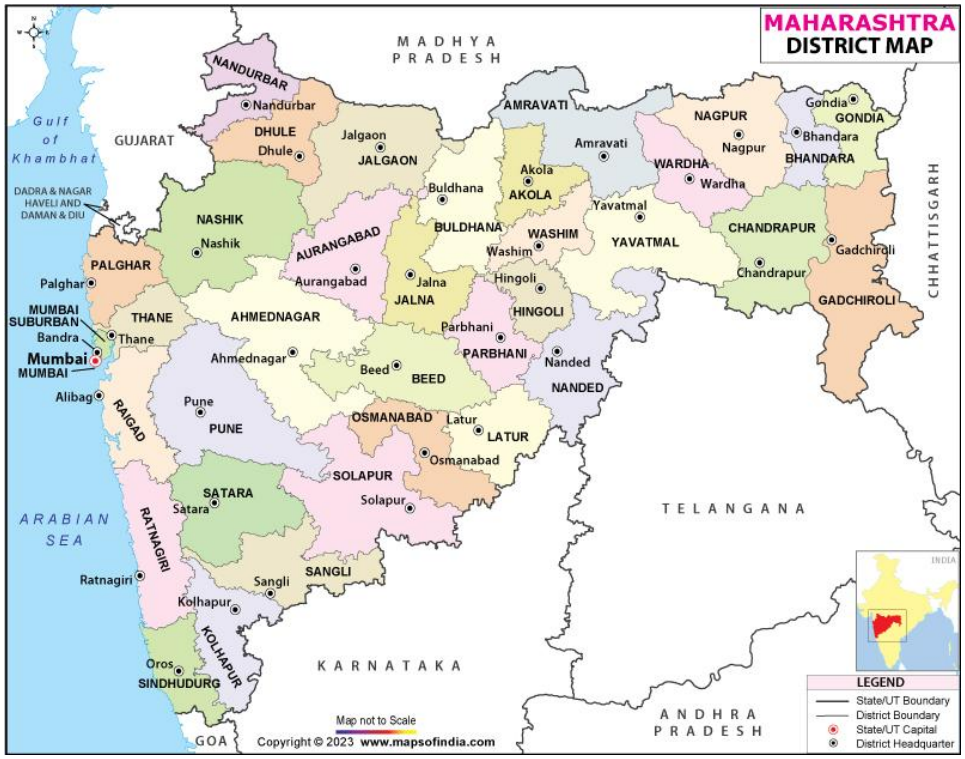
Madhya Pradesh has 78 industrial areas and several SEZs in the state, focusing on IT, textiles, and pharmaceuticals. The state is a part of major industrial corridors, such as the Delhi-Mumbai Industrial Corridor, and has established industrial hubs such as Pithampur, often referred to as the "Detroit of India," for its automotive industries.

IT Infrastructure:

IT destinations emerging in Madhya Pradesh include Indore and Bhopal. The cities house various IT companies and startups within IT parks and SEZs. IT and e-governance initiatives are actively being promoted by the state government to help create an enabling environment for technology-driven growth.

3.4 Maharashtra Profile

Maharashtra is the third largest in terms of area and second by population of states in India covering 36 districts. Mumbai is the state capital. This city is also a financial capital of India and among the world's most populous cities. The state is bordered with Gujarat and Madhya Pradesh towards the north, Chhattisgarh towards the east, Telangana toward southeast, Karnataka to its south, Goa toward its southwest, and Arabian Sea to the west. The state covers an area of 307,713 sq. km and is an economic powerhouse and the leader in industrial, agricultural, and cultural domains. Maharashtra is further divided into six administrative divisions: Konkan, Pune, Nagpur, and Aurangabad, which are vital regions for growth and governance.



Maharashtra geographical landscape consists of the Western Ghats, the Deccan Plateau, and a long coastline along the Arabian Sea. The state comprises fertile plains, rugged hills, and dense forests. The major rivers in the state are Godavari, Krishna, Bhima, and Tapi, which provide lifeblood to agriculture and drinking water.

Mumbai, Pune, and Nagpur are big cities. Mumbai is an important financial, entertainment, and cultural city. Pune is IT and an educational hub; Nagpur is a logistics and trade center. Maharashtra's industrial belt - Nashik, Aurangabad, and Kolhapur, contributes significantly to the Indian economy.

3.4.1 Economic & Industrial Profile

Maharashtra's GSDP came in at Rs. 42.67 trillion (US$ 512.83 billion) during 2024-25, growing 10.17% CAGR between 2015-16.

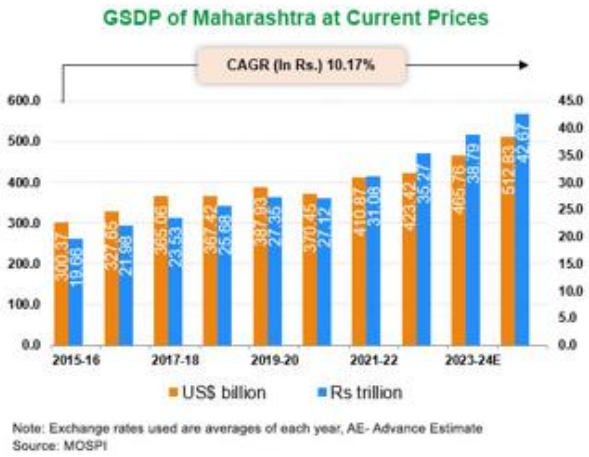
Mumbai is the state capital, which is India's commercial capital and a global financial hub with many banking services. Pune has become the educational center. Maharashtra is a key hub for IT, electronics, and business outsourcing.

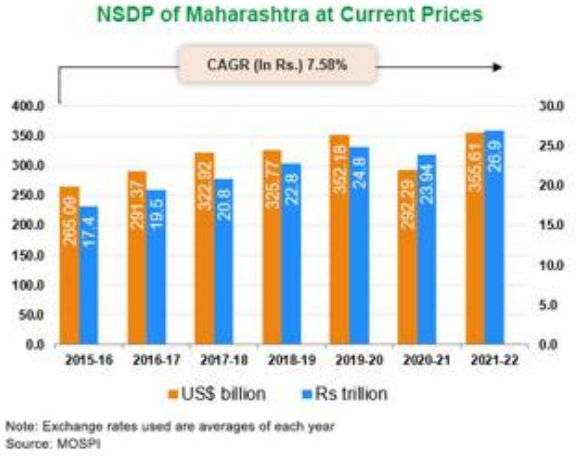
Besides having pro-industry policies in favour of good business climate, the State has policies encouraging investments in multiple industries for its economic growth in the state, as per DPIIT,

FDI inflow in Maharashtra (In October 2019-June 2024) stands at US$ 77,573 million. Maharashtra stood as the number one in FDI reception.

Investment proposals of Rs. 1.13 lakh crore (US$ 15.23 billion) were attracted with expected employment >2.50 lakh in June 2020, at Magnetic Maharashtra 2.0.

The total exports from the state during FY25 (April-August 2024) were US$ 26.50 billion. Engineering goods, pearls, precious stones, gold jewellery, drug formulations, and electronics were exported.





Maharashtra is India's largest producer of sugar and the most industrialized state. Sugarcane production had reached as high as 109.67 lakh tons during 2022-23, cotton 8.31 million bales, and raw silk production had risen from 523 MT in 2021-22 to 620 MT during 2022-23.

3.4.2 Agriculture Profile

Geographically, Maharashtra located in the western part of India and spans a diverse landscape, ranging from coastal plains along the Arabian Sea to the Western Ghats and vast plateaus. It falls under the category of semi-arid to sub-humid tropics. Maharashtra is the third-largest state in India, covering an area of 307,713 sq km. According to the 2011 census, it is the second-most populous state, with a population of 112.4 million. Maharashtra occupies approximately 9.4% of India's total land area, holds 9.3% of the country's population, and is supplied by around 9% of India's total water resources. The state's varied geography supports a diverse range of industries and agricultural activities.

3.4.3 Infrastructure Profile

The economy of the state is well supported by highly developed infrastructures. The road network of the state, with national highways and state highways connecting the urban and rural sectors of the state, is excellent in nature. Major cities like Mumbai, Pune, Nagpur, and Nashik are well connected through road networks and hence transportation is accessible throughout the state.

Maharashtra is quite well-connected by rail network that is the primary means of public transport in the state. The major cities of the state are Mumbai, Pune, Nashik, and Aurangabad. The state capital, Mumbai is home to one of the world's busiest airports, Chhatrapati Shivaji Maharaj International Airport which hosts both domestic and international flights. Maharashtra also has

a very long coastline with the Arabian Sea and comprises major ports that include the Mumbai Port as well as Jawaharlal Nehru Port-Nhava Sheva. Collectively these ports hold the majority share of India's maritime trade.

Maharashtra relies on the total of thermal, hydroelectric, and renewable sources of energy. There is considerable investment in solar and wind power. It is also ahead in the development of solutions for energy efficiency and clean technologies. Maharashtra boasts of having one of the highest installed capacities of power generation in the country.

Maharashtra has good water supply and sanitation infrastructure. It gives equal importance to both urban and rural water management. The cities of Mumbai and Pune have highly modern sanitation and waste management facilities.
Telecommunication is very advanced in the state, with a wide reach of high-speed internet and mobile connectivity. Maharashtra has emerged as the hub for technology and digital innovation, especially in cities like Pune and Mumbai.

Maharashtra is also investing in its widening educational and healthcare infrastructure. Some of India's best universities and research institutions are in the state, including the University of Mumbai and Indian Institute of Technology (IIT) Bombay. Its healthcare sector comprises both government and private institutions with the promise of quality service to the people. All these efforts will help it maintain its position at the front line of India's economy and culture.

3.5 Raipur District

Raipur is a city and the administrative headquarters of the Raipur district in Chhattisgarh, India. It is centrally located in the state and serves as an important cultural, industrial, and economic hub.

3.5.1 Demographic & Geographical Profile

According to the 2011 census, Raipur district has a population of 2,163,754, which comprises about 7.4% of Chhattisgarh's total population. The district covers an area of approximately 13,083 square kilometers, making up around 5.5% of the total area of the state. Raipur has a tropical climate with distinct summer, monsoon, and winter seasons. The district shares borders with Durg on the west, Mahasamund on the east, and Baloda Bazar on the north.

Raipur is rich in biodiversity and fertile plains, nourished by the Mahanadi River, which runs through the district and supports agriculture and daily needs of the people. There are several reservoirs and irrigation projects, such as Tandula and Kharun dams, that contribute to the water management system of the district.

3.5.2 Economy

Raipur is a major economic hub of Chhattisgarh, with diversified economy through agriculture, manufacturing, and services. The city is labeled as an industrial powerhouse hosting a variety of steel plants, cement factories, and other heavy industries. The district also benefits from its strategic location on national highways and rail networks, which are used for trade and commerce.

Small-scale industries, retail markets, and the increasing service sector are the support elements of the district economy. This is due to Raipur's status as an essential regional distributor of goods within the district and across borders

3.5.3 Agriculture & Allied Sector

Agriculture is an essential sector in Raipur as it provides employment to most of the population. The area has fertile alluvial soil and favourable climatic conditions, which supports varied crops.

Principal Crops

Kharif (summer) crops: Paddy (rice), maize, soybeans, and pulses like arhar (pigeon pea) and moong (green gram).

Rabi (winter) crops: Wheat, chickpeas, mustard, and linseed.

Horticulture: Fruits like mangoes, guavas, and bananas, and vegetables like tomatoes, onions, and green chilies.

Besides crop cultivation, the district has a significant dairy farming and poultry industry, which adds to its agricultural output.

3.5.4 Industrial Profile

Raipur is one of the most industrialized districts in Chhattisgarh, with industries ranging from heavy manufacturing to small-scale enterprises.

Key Industrial Sectors:

- Steel and Cement Industries: Raipur is known as the “Steel Capital of India” due to its large number of steel plants and rolling mills. The district also houses several cement factories, making it a significant contributor to the construction sector.
- Argo-Based Industries: The region is marked by the prominent rice mills, oil extracting units, and food processing industries. Processed rice as well as edible oils prepared from Raipur are very contributory to the state agricultural export.
- Small-Scale Industries: Small-scale Industries engaged in manufacturing handicrafts, ceramics, etc., are growing in numbers in Raipur.
- Tourism-Related Industries: Though Raipur is primarily an industrial center, it also supports tourism-related industries, including hotels, restaurants, and travel agencies, due to the local attractions such as the Purkhauti Muktangan museum and nearby wildlife sanctuaries.

3.6 Bilaspur District

Bilaspur is a city and the administrative headquarters of the Bilaspur district in Chhattisgarh, India. Situated in the central part of the state, Bilaspur acts as an important cultural, commercial, and educational center.

3.6.1 Demographic & Geographical Profile

According to the 2011 census, the population of Bilaspur district is 2,663,629 that constitutes nearly 9% of Chhattisgarh's population. The area covered by the district is 8,272 square kilometers and is about 6.1% of the state's total area.

Bilaspur is a place having a tropical climate with the summers being extremely hot, it has monsoon season during which it is relatively cool in winters. It lies in the Mahanadi River basin plains that sustain agriculture activities of the district. It is flanked by Korba on the north, by

Raipur to the south and Janjgir-Champa to the east. The population density is 322 persons per square kilometer. The participation rate of labor force in the district is approximately 46.5%.

Water resources in Bilaspur are Arpa and Maniari rivers, along with major reservoirs like the Khudia Dam and Hasdeo Barrage, providing for irrigation and drinking water.

3.6.2 Economy

Bilaspur is an active business center in Chhattisgarh, mainly due to its strong agricultural base and growing industries and services. Its rice mills give it a nickname: "Rice Bowl of Chhattisgarh." The region also acts as a regional commercial center, facilitated by its location and connectivity with rail and road links.

The presence of coalfields in the region further boosts Bilaspur's economy, with coal mining and related industries contributing significantly to its industrial profile.

3.6.3 Agricultural & Allied Sector

Agriculture is the backbone of Bilaspur's economy, providing livelihoods for most of its population. The district's fertile soils and abundant water resources make it one of the most agriculturally productive regions in Chhattisgarh.

Main Crops:

Kharif (monsoon) crops: Paddy (rice), maize, pulses (arhar and moong), and soybeans

Rabi (winter) crops: Wheat, chickpeas, mustard and linseed

Horticulture: Bilaspur also grows vegetables like tomatoes, onions, and green chilies, and fruits include mangoes, guavas, and bananas.

Besides the products of agriculture, the district enjoys a rich dairy and poultry industry, which is part of the agricultural economy

3.6.4 Industrial Profile

Bilaspur is an emerging industrial hub, with industries ranging from Agro-processing to coal-based manufacturing.

Important Industrial Sector:

Rice Mills: There are several rice mills that process the huge paddy harvest of the region in Bilaspur, and its rice is supplied to other parts of the state and country.

Coal Mining and Energy: The district is close to the rich coalfields of Korba, and it is a center for coal mining and thermal power generation. Coal-based industries are one of the major contributors to the local economy.

Agro-based Industries: The district has several Agro-processing units, including oil extraction plants, flour mills, and units producing packaged food products.

Small-Scale Industries: Small-scale manufacturing units manufacture things like pottery, bamboo, and handloom products for which Bilaspur is identified.

Tourism-Dependent Industries: Ratanpur Temple, Achanakmar Wildlife Sanctuary, and Khutaghat Dam, etc. are the attractions of Bilaspur that support the tourism-related sector. Hospitality services, local handicrafts, and travel agency provide employment in the tourism-based sector.

3.7 Baloda Bazar District

Baloda Bazar is a city, in which the administrative headquarters of Baloda Bazar district exists in Chhattisgarh, India. In the central part of the state, Baloda Bazar exists near approximately 80 km northeast of the state capital of Raipur.

3.7.1 Demographic & Geographical Profile

According to the 2011 census, Baloda Bazar district has a population of 1,300,000, accounting for about 5.4% of Chhattisgarh's population. The district covers an area of 4,529 square kilometers, which is 2.2% of the state's total area. Baloda Bazar has a tropical climate with well-defined summer, monsoon, and winter seasons.

The district is geographically diverse, with a mix of plains and plateaus. To the west, it borders Raipur district, while to the east lies Mahasamund district, Bilaspur district to the north, and Gariaband district to the south. The main water sources are the Shivnath and Jonk rivers, which support agriculture and daily needs. There are also several reservoirs and irrigation projects in Baloda Bazar, enhancing its agricultural potential.

The population density is 287 inhabitants per square kilometer, and the district has shown steady population growth. The labor force participation rate for the district was recorded at approximately 48.3% for the year 2017-2018

3.7.2 Economy

Baloda Bazar is an emerging economic hub of Chhattisgarh with increasing industrial sectors, strong base of agriculture and small industries. The cement manufacturing industries have made it popular enough to be referred as "Cement Hub of Chhattisgarh".

The economy of the district is further supported by its proximity to major trade routes and connectivity with urban centers like Raipur. Small-scale industries and trade in agricultural products are also other significant contributors to the economic landscape

3.7.3 Agricultural & Allied Sector

Baloda Bazar is an emerging economic hub of Chhattisgarh with increasing industrial sectors, strong base of agriculture and small industries. The cement manufacturing industries have made it popular enough to be referred as "Cement Hub of Chhattisgarh".

The economy of the district is further supported by its proximity to major trade routes and connectivity with urban centers like Raipur. Small-scale industries and trade in agricultural products are also other significant contributors to the economic landscape

3.7.4 Industrial Profile

Baloda Bazar is an industrial growth center, mainly focused on cement manufacturing, small-scale industries, and agro-based processing units.

Major Industries:

Cement Industry: The district is known for its large number of cement factories, which produce a significant portion of Chhattisgarh's cement output. Major cement companies, such as ACC and Ultratech, have facilities in Baloda Bazar.

Agro-Based Industries: Rice mills, oil extraction units, and other processing plants are present here. Packaged food production and processing of fruits and vegetables are also notable contributors.

Small-Scale Industries: Handicrafts, ceramics, and local goods manufacturing are emerging industries that support the local economy.

Tourism-Related Industries: Baloda Bazar is not a prominent tourism site; however, some religious destinations, such as temples and natural reservoirs, attract visitors to a lesser extent, making ways for small-scale tourism-related activities, including hospitality and retailing.

CHAPTER 4

Primary & Secondary Data Collection & Analysis

4. Primary and Secondary Data Collection & Analysis

4.1 General

As part of the traffic study of Raipur-Bilaspur section of NH-30/ NH-130/ Bilaspur Bypass spanning 126.5 km, in the state of Chhattisgarh, extensive data collection was conducted to develop base data. The main objective is to understand the present traffic situation based on primary traffic surveys and the historical toll operations data shared by the client, highlight the future threats (if any), and Final recommendation of a suitable growth rate for traffic forecast. The data collection included the primary surveys in the field and the secondary data collection from toll operations and the data available in public domain. This chapter presents the details of traffic surveys, the locations, schedule, and the findings of the primary surveys conducted.

4.2 Past Data from Secondary Sources and Primary Surveys

The findings from the data are summarized in the following subsequent sections.

4.2.1 Past traffic trend findings: Project Corridor

Past traffic trends were derived based on the past traffic data sourced from the Toll operations data. Past traffic AADT, (CAGR%) is presented in the following tables. Monthly traffic and Revenue numbers are mentioned in Annexures. Remittance collected at both the project road locations for FY24 is mentioned in below table.

Table 4-1 Remittance collected at both the Toll Plazas for FY24

Project Stretch	Plaza Name	Period	Contract Period	Total/Daily	Amount in)Rs.)
Raipur - Simga section	**Tarpongi**	01.04.2023-31.03.2024	**24.08.2023 - 24.08.2024**	Total	90,57,11,000
Saragaon - Bilaspur 4l	**Bhojpuri**	01.04.2023-31.03.2024	**25.03.2023 - 25.03.2024**	Total	75,45,00,000
	Mudipar	01.04.2023-31.03.2024	**09.06.2023 - 09.06.2024**	Total	9,89,51,865

Table 4-2: Past Traffic Trend at Tarapongi Toll Plaza (TP1)

Source	FY	CJV	LCV	Bus/2 Axle	3 Axle	MAV	OSV	Total Vehicles	Total PCUs	Growth %
ETC Summary	FY23	7,634	486	878	432	2,618	7	**12,055**	**24,106**	-
ETC Summary	FY24	8,299	462	1,019	467	3,301	2	**13,550**	**28,313**	12.4%
ETC Summary	FY25	9,131	466	1,227	439	3,874	2	**15,138**	**32,268**	11.7%
CAGR %	*FY23 to FY25*	*9.4%*	*-2.1%*	*18.2%*	*0.7%*	*21.6%*	*-51.0%*	***12.1%***	***15.7%***	
CAGR %	*FY24 to FY25*	*10.0%*	*0.8%*	*20.4%*	*-6.2%*	*17.4%*	*-13.4%*	***11.7%***	***14.0%***	

*FY2023 Oct-Mar & FY-2025 * - Apr24-Nov24 Based AADT*

Toll Operational Data Outcomes: -

Between FY23 & FY25, the traffic in PCU terms has grown by **15.7%** In the same period, cars have witnessed growth at a rate of **9.4%** whereas goods vehicles especially 3Axle have witnessed a growth of **0.7%** respectively. In the same period MAVs have grown at **21.6%** at Tarapongi Toll Plaza.

Table 4-3: Past Traffic Trend at Bhojpuree Toll Plaza (TP2)

Source	FY	CJV	LCV	Bus/2 Axle	3 Axle	MAV	OSV	Total Vehicles	Total PCUs	Growth %
ETC Summary	FY23	5,893	485	770	257	2,587	12	**10,003**	**21,395**	
ETC Summary	FY24	6,331	438	901	268	3,532	3	**11,474**	**26,404**	14.7%
ETC Summary	FY25	6,863	413	1,067	242	4,095	2	**12,681**	**29,843**	10.5%
CAGR %	*FY23 to FY25*	***7.9%***	***-7.8%***	***17.7%***	***-3.0%***	***25.8%***	***-61.5%***	***12.6%***	***18.1%***	
CAGR %	*FY24 to FY25*	***8.4%***	***-5.8%***	***18.4%***	***-9.9%***	***15.9%***	***-41.2%***	***10.5%***	***13.0%***	

*FY2023 Oct-Mar & FY-2025 * - Apr24-Nov24 Based AADT*

Between FY23 & FY25, the traffic in PCU terms has grown by **18.1%**. In the same period, cars have witnessed growth at a rate of **7.9%** whereas goods vehicles 3Axle have witnessed negative growth of **-3.0%** and Bus/2Axle have witnessed a growth at a rate of **17.7%**. In the same period MAVs have grown at **25.8%** at Bhojpuree Toll Plaza.

Table 4-4: Past Traffic Trend at Mudhipar Toll Plaza (TP3)

Source	FY	CJV	LCV	Bus/2 Axle	3 Axle	MAV	OSV	Total Vehicles	Total PCUs	Growth %
ETC Summary	FY23	904	61	107	83	963	5	2,340	5,923	
ETC Summary	FY24	937	61	149	92	1,102	2	2,343	6,718	0.1%
ETC Summary	FY25	1,007	60	197	68	1,295	1	2,628	7,725	12.2%
CAGR %	*FY23 to FY25*	***5.5%***	***-0.3%***	***35.6%***	***-9.7%***	***16.0%***	***-54.5%***	***6.0%***	***14.2%***	
CAGR %	*FY24 to FY25*	***7.5%***	***-0.7%***	***32.1%***	***-26.5%***	***17.6%***	***-40.5%***	***12.2%***	***15.0%***	

*FY2023 Nov-Mar & FY-2025 * - Apr24-Oct24 Based AADT*

Between FY23 & FY25, the traffic in PCU terms has grown by **14.2%**. In the same period, cars have witnessed growth at a rate of **5.5%** whereas goods vehicles 3Axle have witnessed negative growth of **-9.7%** and Bus/2Axle have witnessed a growth at a rate of **35.6%**. In the same period MAVs have grown at **16.0%** at Bhojpuree Toll Plaza.

- The toll plaza locations have seen a consistent decline in 3Axle trucks and high growth in MAV traffic over the years. This is mostly due to preference of Higher axled trucks by the Transporters observed similarly across India.

- India general election & Chhattisgarh legislative assembly elections were held in May-2024, which might have impacted the passenger traffic (recreational trips) in the current year FY25.

4.3 Traffic surveys

The traffic surveys are generally conducted to achieve the various project objectives. The Key outcomes of CTVC Survey are), to derive the average daily traffic by type of vehicle along the project corridor, Traffic composition and Vehicle composition.

Similarly, the key outcomes of the OD analysis include,

i) Origin zone & Destination zone of the vehicle type
ii) The frequency of travel i.e., daily, weekly, monthly, or occasionally and Toll Category.
iii) Trip purpose
iv) Commodity carried of goods vehicle.

For this Study, the Consultant has analyzed the survey data i.e., both the Classified Traffic Volume Count (Project Roads) and the Origin – Destination Survey (Project Roads) obtained through the Primary Surveys. Nevertheless, the Consultant before analyzing and utilizing the data for the project, has conducted a detailed and thorough review of the primary data and found the data to be accurate enough for achieving the objectives of the study. The subsequent sections would provide a more detailed analysis.

- Major traffic generators and routes
- Past traffic trend at each toll plaza location
- Travel pattern of the road users at the toll plaza locations
- Probable diversion routes

The various vehicle types having varied sizes and characteristics were converted into equivalent passenger car units (PCU). The Passenger Car Unit recommended by Indian Road Congress in “Guidelines for Capacity of Roads in Rural Areas” (IRC-64-1990) have been used for PCU conversion and are presented in below table.

Table 4-5 Vehicle Classification and PCU Factors

VEHICLE TYPE	PCU	VEHICLE TYPE	PCU
Car/Jeep/Taxi	1.0	Auto Rickshaw	1.0
Minibus/ LCV	1.5	Agricultural Tractor	1.5
Standard Bus	3.0	Agricultural Tractor & Trailer	4.5
2/3 Axle Truck	3.0	Animal Drawn Vehicle	6.0
MAV	4.5	Cycle	0.5
Two-Wheeler	0.5	Cycle Rickshaw	2.0

4.3.1 Average Daily Traffic

The traffic volume count data was collected for Seven days (24 Hrs) at the survey locations on the project route to arrive at the average daily traffic (ADT).

The summary of ADT in terms of vehicles and PCUs at each survey location along the Project routes are presented in below figure and table.

Table 4-6: ADT Summary from the surveys

S.NO	VEHICLE	TARAPONGI TP	BHOJPUREE TP	MUDHIPAR TP
1	Car	8,811	7,235	1,094
2	Mini LCV	1,314	1,089	189
3	Minibus	26	34	4
4	Bus	373	260	2
5	3-Ax Bus	0		
6	LCV	1,113	1,003	191
7	Truck-2 Axle	580	443	116
8	Truck-3Axle	471	264	72
9	MAV	4,263	4,405	1,624
10	OSV	5	7	7
Traffic vehicles		**16,956**	**14,739**	**3,299**
Traffic PCU		**35,309**	**32,631**	**9,485**

The Consultant, for the purpose of the study has relied on the historic data for the computation of Base year Average Daily Traffic for Project Road locations. The Consultant considered toll operation data obtained from the months of April to November (for Tarapongi and Bhojpuri Toll Plaza) and April to October (For Mudhipar Toll Plaza) of Fiscal Year 2025 for the computation of the base year Average Daily Traffic. Final ADT arrived from ETC data (April to November 2024 for Tarapongi & Bhojpuri and April-October 2024 for Mudhipar, which excludes cash & exemption/violation traffic). The table below illustrates the Recommended Average Daily Traffic adopted for the base year.

Table 4-7: Base Year Recommended ADT

S.NO	VEHICLE	TARAPONGI TP-1	BHOJPUREE TP-2	MUDHIPAR TP-3
1	**CJV**	8,827	6,641	972
2	**LCV**	461	405	59
3	**Bus/2 Axle**	1,173	1,015	187
4	**3 Axle**	428	235	67
5	**MAV**	3,681	3,806	1,202
6	**OSV**	2	2	1
Traffic vehicles		**14,572**	**12,104**	**2,507**
Traffic PCU		**30,893**	**28,134**	**7,279**

4.3.2 Vehicle Composition

Analysis was conducted to find the traffic composition by type of vehicles among the tollable traffic at Three Toll Plaza locations on the Project Road sections. Vehicular composition distribution in terms of cars, buses and trucks is summarized in below table and shown in below figure and traffic composition by type of vehicle by location is shown in below figure. Salient findings from the analysis are presented below:

- It is observed that, car mode has highest share at Tarapongi & Bhojpuri toll plaza. Approximately, 52% Car traffic observed at Tarapongi TP, 49% at Bhojpuri TP. The 2nd highest traffic at both locations is MAV traffic.

- MAV traffic share is highest at Mudhipar toll plaza. The 2nd highest traffic is car.

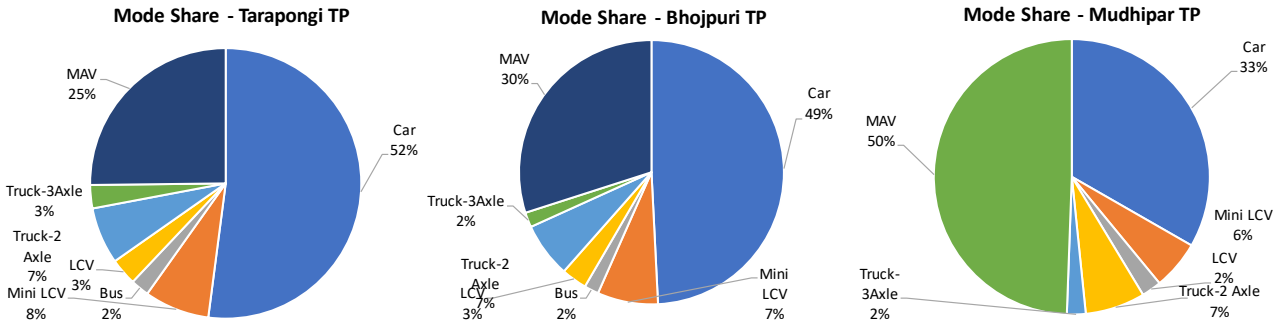


Figure 4-1: Traffic composition (Vehicles) by Locations

4.3.3 Seasonal Correction Factors

SCF values adjust the ADT to calculate the Annual Average Daily Traffic (AADT). Since the ADT values are based on traffic data for an 8-month period (April 2024 to November 2024) for Tarapongi and Bhojpuri plazas, and a 7-month period (April 2024 to October 2024) for Mudhipar plaza, SCFs are applied to account for seasonal variations. The SCFs are derived as the average of FY-23 (from IHMCL) and FY-24 traffic data (from ETC data) across all modes of traffic.

4.3.4 Annual Average Daily Traffic (AADT)

- Annual Average Daily Traffic = (Average Daily Traffic X Seasonal Correction Factor) + Cash Traffic (from Non ETC) + Exemption/violation data obtained from traffic survey conducted on 26th July (for 24 hrs).
- As discussed in the earlier sections, owing to higher reliability, and based on the latest data, the consultant considered the toll operations data (ETC data) obtained for the months of April 2024 to November 2024 (FY-25) as base year ADT for Tarapongi & Bhojpuri Plaza and April 2024 to October 2024 (FY-25) as base year ADT for Mudhipar Toll Plaza, cash & Exemptions traffic from Non-ETC Transaction Data (April 2024 to November 2024) and Further Forced exemption/violation data obtained from traffic survey conducted during 22nd October to 28th October and recommends the same for the computation of base year Average Annual Daily Traffic (AADT).

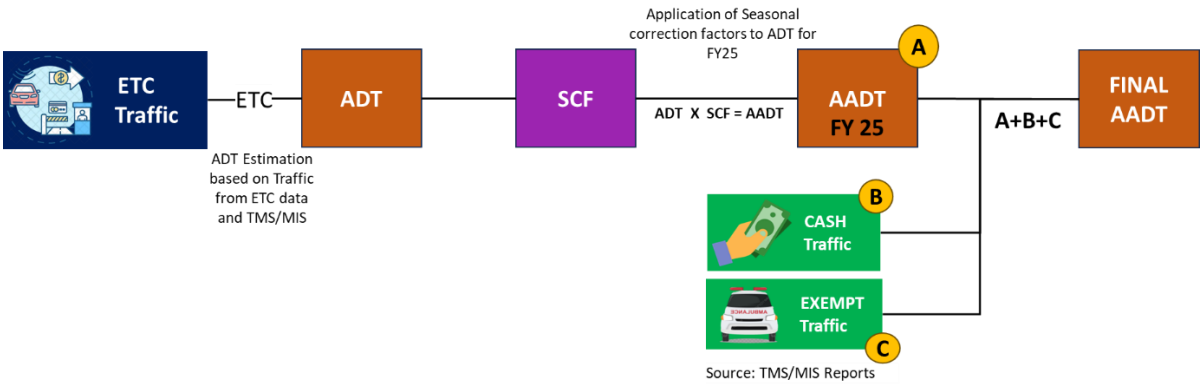


Table 4-8: Base Year Recommended AADT

S.NO	VEHICLE	TARAPONGI TP-1	BHOJPUREE TP-2	MUDHIPAR TP-3
1	Car	9,701	8,075	1,145
2	Minibus	11	15	1
3	Bus-2A	488	404	4
4	Bus 3A	0	0	0
5	LCV	486	442	66
6	Truck-2A	760	691	196
7	Truck-3A	445	250	68
8	MAV	3,923	4,186	1,311
9	OSV	2	2	1
Traffic vehicles		**15,818**	**14,065**	**2,792**
Traffic PCU		**33,195**	**31,644**	**7,954**

4.4 Travel Characteristics of the Road users

4.4.1 Survey Methodology

Origin Destination Survey helps in understanding the travel demand pattern of the traffic on the project road. The travel characteristics obtained by O-D survey facilitate the identification of:

- Local and through traffic on the project road.
- Major influence zones of both the passenger and commercial traffic.
- Major commodities carried by the truck traffic.

The O-D survey elicited characteristics like origin, destination, and frequency, purpose of trip for passenger vehicles and commodity type, the information pertaining to origin and destination of trips was analyzed to obtain the trip distribution based on a zoning system provided.

4.4.2 Sample Size

The vehicles during the OD surveys were interviewed on a random sample basis and Table below shows the sample size distribution (in percentage terms) captured at the survey locations along the Project stretches.

Table 4-9 Sample Size Collected from Origin-Destination Survey

LOCATION	CAR/ MINI LCV	MINI BUS	Bus	LCV	2-AXLE TRUCK	3-AXLE TRUCK	MAV & ABOVE	GRAND TOTAL
Tarapongi Toll Plaza	39%	42%	55%	39%	77%	53%	67%	**48%**
Bhojpuree Toll Plaza	32%	21%	16%	22%	53%	46%	64%	**42%**
Mudhipar Toll Plaza	46%	84%	84%	37%	80%	57%	61%	**55%**

4.4.3 Traffic Zoning System

To understand the spatial dimensions of the trip characteristics of the vehicles interviewed during the O-D survey, a detailed zoning system was developed considering the following factors:

- The road network catering to the traffic on the project road and its generating points.
- Important towns, villages, factories, and industrial centers around the project road area.
- Administrative boundaries of districts and states.
- Configuration of the project road in the regional road network with respect to other roads.

Two major types of areas were identified for analysis purposes.

Immediate Influence Area (IIA): Immediate Influence Area includes the cities/towns/villages and districts along the project road and adjacent to its which generates/attracts trips to the project road.

Broad Influence Area (BIA): Broad Influence Area includes other major traffic generating/attracting trips, but to a lesser degree when compared to IIA.

Detailed zoning system is prepared for IIA, while more aggregate or broad zoning is developed for BIA.

The zoning system adopted for data collection was based on 172 zones for better understanding the zonal influence by vehicle category at each toll plaza location. Detailed TAZ list is presented in Annexure.

4.4.4 Travel Pattern and Zone Influence Factors

From the origin & Destination survey data, location wise base year OD matrices were developed for each type of vehicle. Sample OD matrix is expanded to AADT by applying the expansion factors. The O-D matrices describing the travel pattern of both goods and passenger vehicles are used for identification of major OD pairs on the project corridor and for further analysis of movement pattern and estimation of through traffic. It is observed that the major influencing States for the project Sections are Chhattisgarh, Karnataka, Tamil Nadu, West Bengal, Odisha, Kerala, Jharkhand, Assam, Puducherry, and Maharashtra.

Different vehicles interact in different degrees with the different zones depending on their purpose, commodity transported, frequency of travel etc. Vehicle category-wise zone-wise influence factors are established for interpretation of OD patterns.

Section wise influence factors were derived from the average of Influence factors by category at survey locations in the respective project sections. Section wise influence factors for cars, buses and trucks are summarized and shown in Below tables.

Regional Distribution of traffic at Tarapongi Toll Plaza: -

Table 4-10 Regional Distribution of traffic at Tarapongi Toll Plaza

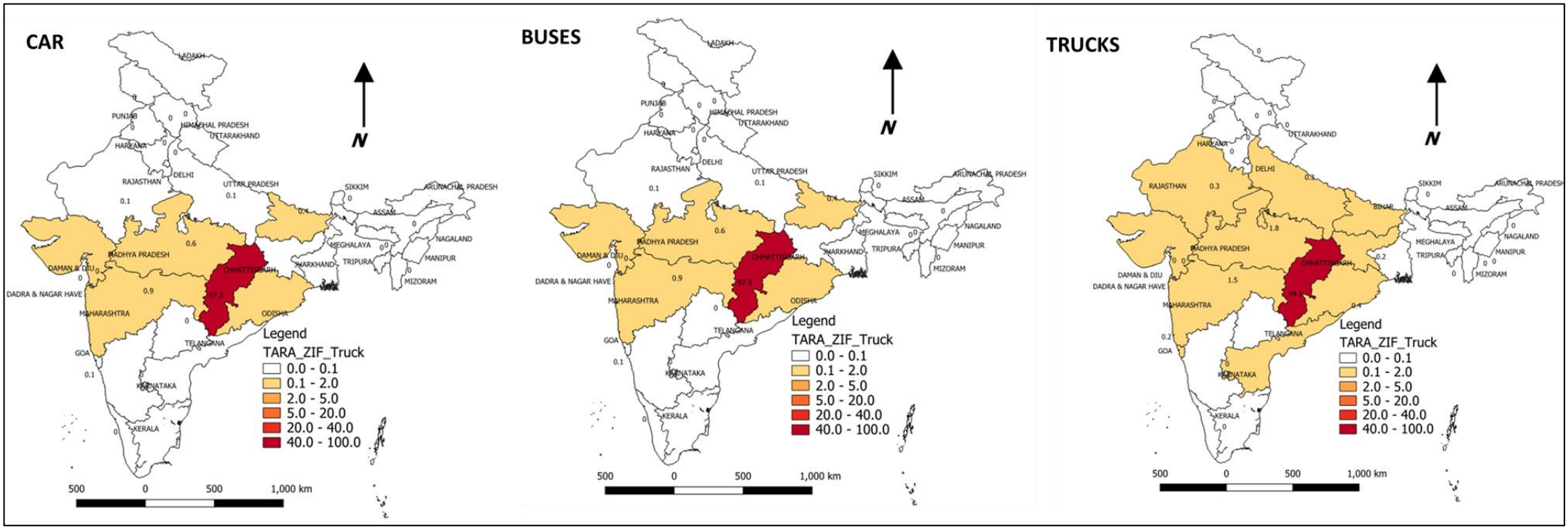
TARAPONGI TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Chhattisgarh	97.2%	98.6%	94.0%

TARAPONGI TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Maharashtra	0.9%	0.5%	1.5%
Madhya Pradesh	0.6%	0.0%	1.8%
Jharkhand	0.1%	0.0%	0.2%
Bihar	0.4%	0.2%	0.7%
Odisha	0.3%	0.4%	0.4%
Uttar Pradesh	0.1%	0.3%	0.3%
Gujarat	0.2%	0.0%	0.5%
Rajasthan	0.1%	0.0%	0.3%
Goa	0.1%	0.0%	0.2%
West Bengal	0.0%	0.0%	0.0%
Andhra Pradesh	0.0%	0.0%	0.2%
Tamil Nadu	0.1%	0.0%	0.1%
Total	**100%**	**100%**	**100%**

On detailed analysis of the Zonal influence factors, it was observed that,

- Approximately 97% of the Car passenger vehicle trips are happening within the state of Chhattisgarh at Tarapongi toll plaza, significant amount of the Car vehicle trips is origin-destined in Maharashtra & Madya Pradesh.
- Approximately 94% of the truck traffic is plying within the state of Chhattisgarh. Also, significant amount of truck traffic observed from Maharashtra & Madya Pradesh.

Figure 4-2: Regional distribution of Passenger & Goods traffic at Tarapongi Toll Plaza



Regional Distribution of traffic at Bhojpuree Toll Plaza-

Table 4-11 Regional Distribution of traffic at Bhojpuree Toll Plaza

BHOJPUREE TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Chhattisgarh	97.6%	96.6%	94.1%
Maharashtra	0.6%	0.9%	2.6%
Madhya Pradesh	1.0%	2.5%	1.6%
Jharkhand	0.1%	0.0%	0.6%
Bihar	0.1%	0.0%	0.4%
Odisha	0.1%	0.0%	0.2%
Uttar Pradesh	0.4%	0.0%	0.1%
Gujarat	0.0%	0.0%	0.1%
Rajasthan	0.2%	0.0%	0.0%
Goa	0.0%	0.0%	0.1%
West Bengal	0.0%	0.0%	0.1%
Andhra Pradesh	0.0%	0.0%	0.0%
Tamil Nadu	0.0%	0.0%	0.0%
Total	**100%**	**100%**	**100%**

On detailed analysis of the Zonal influence factors, it was observed that,

- Approximately 97% of the Car passenger vehicle trips are happening within the state of Chhattisgarh at Bhojpuree toll plaza, significant amount of the Car vehicle trips are origin-destined in Maharashtra & Madya Pradesh
- Approximately 94% of the truck traffic is plying in the state of Chhattisgarh. Also, significant amount of truck traffic observed from Maharashtra & Madhya Pradesh states.

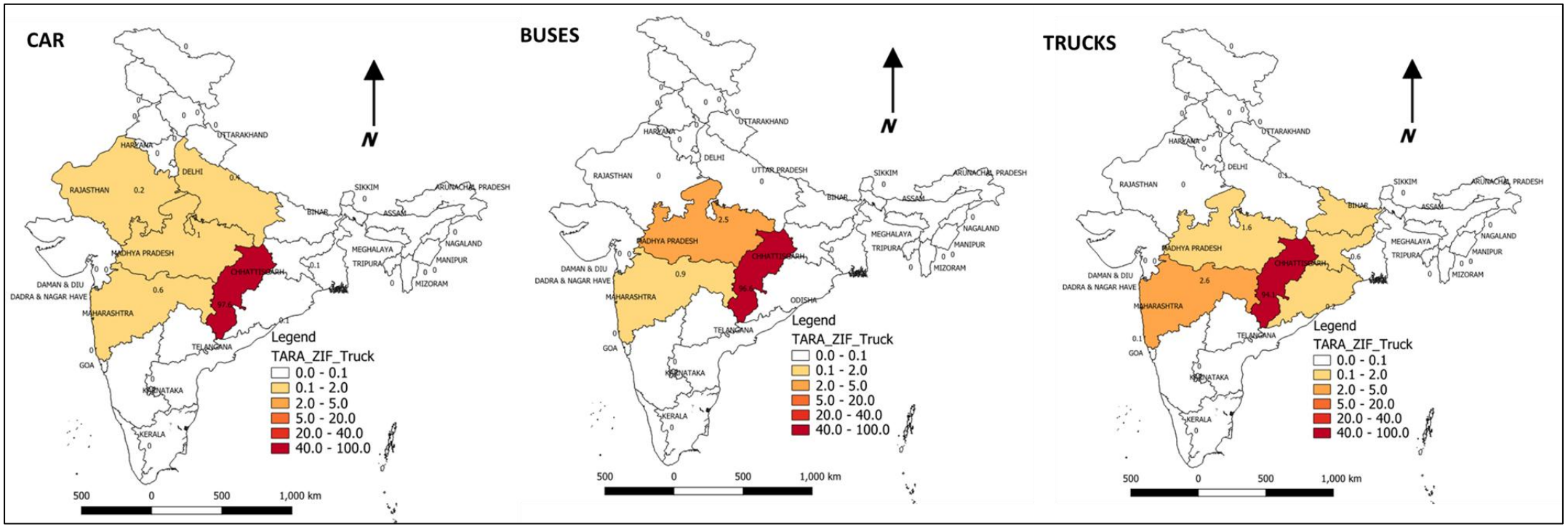


Figure 4-3: Regional distribution of Passenger & Goods traffic at Bhojpuree Toll Plaza

Regional Distribution of traffic at Mudhipar Toll Plaza-

Table 4-12 Regional Distribution of traffic at Mudhipar Toll Plaza

MUDHIPAR TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Chhattisgarh	93.9%	100.0%	86.1%
Maharashtra	1.0%	0.0%	3.8%
Madhya Pradesh	1.2%	0.0%	3.2%
Jharkhand	1.7%	0.0%	3.0%
Bihar	0.0%	0.0%	0.3%
Odisha	0.1%	0.0%	1.0%
Uttar Pradesh	0.4%	0.0%	0.2%
Gujarat	0.1%	0.0%	0.5%
Rajasthan	0.7%	0.0%	0.8%
Goa	0.0%	0.0%	0.3%
West Bengal	0.9%	0.0%	0.6%
Andhra Pradesh	0.0%	0.0%	0.0%
Tamil Nadu	0.0%	0.0%	0.1%
Total	**100%**	**100%**	**100%**

On detailed analysis of the Zonal influence factors, it was observed that,

- Approximately 94% of the Car passenger vehicle trips are happening within the state of Chhattisgarh at Mudhipar toll plaza, significant amount of the Car vehicle trips are origin-destined in Jharkhand & Madhya Pradesh.

Approximately 86% of the truck traffic is plying in the state of Chhattisgarh. Also, significant amount of truck traffic observed from Jharkhand, Madya Pradesh & Maharashtra.

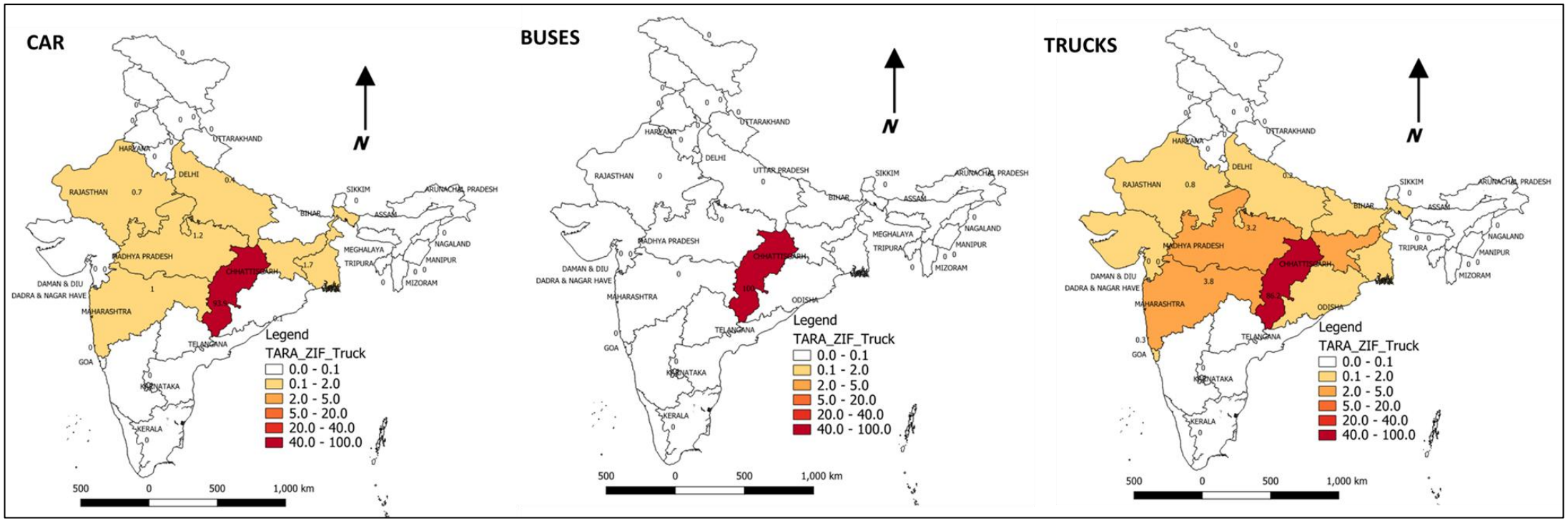


Figure 4-4: Regional distribution of Passenger & Goods traffic at Mudhipar Toll Plaza

4.4.5 Commodity Distribution of Freight traffic

An analysis was also carried out to understand the different commercial vehicles being used to transport different commodities. Table below presents the toll plaza wise commodity distribution.

Commodity pattern at Tarapongi Toll Plaza: -

- The overall share of empty vehicle is observed to be around **36.6**% at Tarapongi Toll Plaza.
- The Major Commodities observed at Tarapongi Toll Plaza are **Steel, Coal and Fly Ash** are contributing to almost **64.1%** of overall Commodities when Empty trucks are also included.
- Major commodities transported by LCV and 2-Axles are Food Items, Fruits & Vegetables, Parcel, Parchoon, Automobile, Plastics & Livestock.
- Major Commodities transported by HGVs are Steel, Coal and Fly Ash, Parcel, Automobile & Plastics.

Table 4-13 Commodity Pattern at Tarapongi Toll Plaza (TP1)

TARAPONGI TP (TP1)					
COMMODITY	**LCV**	**TRUCK**	**3-AXLE**	**MAV**	**GRAND TOTAL**
Empty	35.3%	39.1%	34.2%	37.1%	36.6%
Steel	6.7%	11.9%	11.0%	12.1%	10.6%
Coal	2.1%	0.4%	5.6%	12.8%	8.6%
Fly Ash	0.7%	0.9%	4.1%	13.2%	8.4%
Parchoon	10.4%	6.6%	6.0%	3.9%	5.9%
Parcel	7.2%	12.1%	7.9%	2.4%	4.8%
Food Items	6.2%	5.4%	4.8%	3.3%	4.3%
POL	3.3%	5.1%	13.0%	1.5%	3.0%
Wood	4.9%	2.1%	0.8%	2.0%	2.7%
Fruits & Vegetables	4.1%	3.0%	0.8%	1.0%	1.9%
Other Construction	2.2%	1.5%	2.8%	1.2%	1.6%
Chemicals	3.2%	0.4%	0.8%	0.8%	1.4%
Livestock	3.0%	1.4%	0.5%	0.7%	1.3%
Plastic	0.6%	0.7%	2.0%	1.6%	1.3%
Electrical	3.0%	0.5%	0.0%	0.5%	1.1%
Others	7.1%	9.0%	5.8%	5.9%	6.5%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Commodity pattern at Bhojpuree Toll Plaza: -

- The overall share of empty vehicle is observed to be around **36.9%** at Bhojpuree toll plaza.
- The Major Commodities observed at Bhojpuree Toll Plaza are **Steel, Coal, Fly ash** are contributing to almost **66.7%** of overall Commodities when Empty trucks are also included.
- Major commodities transported by LCV and 2-Axles are Food Items, Fruits & Vegetables, Parcel, Parchoon, Automobile, Plastics & Livestock.
- Major Commodities transported by HGVs are Steel, Coal and Fly Ash, Parcel, Automobile & Plastics, POL.

Table 4-14 Commodity Pattern at Bhojpuree toll plaza (TP2)

BHOJPURI TP (TP2)					
COMMODITY	**LCV**	**TRUCK**	**3-AXLE**	**MAV**	**GRAND TOTAL**
Empty	46.8%	38.0%	40.4%	32.9%	36.9%
Coal	2.7%	5.4%	6.2%	18.4%	13.3%
Fly Ash	0.8%	1.8%	1.2%	14.9%	10.1%
Steel	4.6%	3.9%	4.3%	7.5%	6.4%
Food Items	6.5%	6.1%	4.3%	5.7%	5.8%
Cement	1.3%	1.7%	0.0%	5.3%	3.9%
Fruits & Vegetables	8.2%	4.8%	4.3%	1.9%	3.7%
Parchoon	6.6%	6.0%	3.1%	2.0%	3.4%
Parcel	7.3%	8.7%	5.0%	1.1%	3.3%
POL	1.1%	5.2%	19.3%	1.3%	2.2%
Plastic	2.5%	2.2%	0.0%	1.6%	1.8%
Automobiles	2.0%	3.4%	1.9%	0.6%	1.2%
Miscellaneous	2.5%	2.2%	2.5%	0.2%	1.0%
Livestock	1.4%	0.9%	0.0%	0.8%	0.9%
Garments	1.2%	3.5%	0.0%	0.6%	0.9%
Others	4.6%	6.0%	7.5%	5.2%	5.2%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Commodity pattern at Mudhipar Toll Plaza: -

- The overall share of empty vehicle is observed to be around **38.7%** at Bhojpuree toll plaza.
- The Major Commodities observed at Bhojpuree Toll Plaza are **Coal, Fly ash and Steel** are contributing to almost **67.5%** of overall Commodities when Empty trucks are also included.
- Major commodities transported by LCV and 2-Axles are Food Items, Fruits & Vegetables, Parcel, Parchoon, Automobile, Plastics & Livestock.
- Major Commodities transported by HGVs are Steel, Coal and Fly Ash, Parcel, Automobile & Plastics, POL.

Table 4-15 Commodity Pattern at Bhojpuree toll plaza (TP3)

BHOJPURI TP (TP2)					
COMMODITY	**LCV**	**TRUCK**	**3-AXLE**	**MAV**	**GRAND TOTAL**
Empty	35.3%	23.2%	33.6%	40.7%	38.7%
Coal	0.0%	1.2%	0.0%	13.9%	10.8%
Fly Ash	3.4%	3.6%	2.0%	11.9%	9.9%
Steel	6.6%	8.5%	8.0%	8.3%	8.1%
Food Items	10.4%	9.7%	5.9%	2.8%	4.3%
Other Construction	1.1%	3.6%	2.0%	3.6%	3.2%
Parcel	11.6%	8.0%	10.8%	0.8%	3.1%
Parchoon	4.8%	6.3%	6.0%	2.4%	3.0%
Fruits & Vegetables	5.8%	7.7%	2.9%	1.8%	2.7%
Heavy Industrial Goods	3.7%	3.1%	0.0%	2.0%	2.2%
Cement	1.1%	0.0%	4.0%	2.1%	1.9%
Automobiles	0.8%	10.2%	5.9%	1.4%	1.9%
Plastic	0.8%	1.2%	2.0%	2.0%	1.8%
Chemicals	1.5%	2.2%	0.0%	1.1%	1.2%

BHOJPURI TP (TP2)					
COMMODITY	**LCV**	**TRUCK**	**3-AXLE**	**MAV**	**GRAND TOTAL**
Wood	2.9%	5.3%	4.0%	0.4%	1.2%
Others	10.1%	6.1%	12.8%	4.8%	5.9%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

4.4.6 Trip length frequency Distribution

An analysis was carried out to understand the trip length frequency of the passenger and goods vehicles at all the toll plaza locations. Figures below presents the toll plaza wise trip length frequency distribution for goods and passenger vehicles.

Goods Vehicles

Trip length Frequency Distribution at Tarapongi Toll Plaza

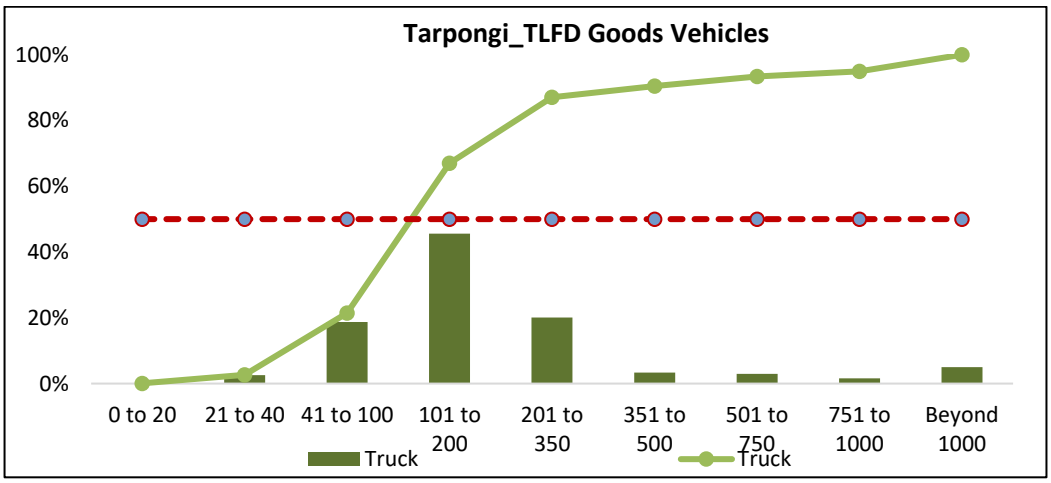


Figure 4-5: Trip length Frequency Distribution at Tarapongi Toll Plaza – Goods

- Around 87.07% Trucks are having trip length less than 200 km.
- 6.34% of Trucks are having trip lengths more than 200 km and less than 750 km. There is significant short and medium-distance traffic through the Tarapongi Toll plaza.
- Around 6.59% Trucks are having trip lengths more than 750 km.
- Major OD pairs are generated from Raipur, Baloda Bazar, Durg, Ambikapur, Dhamtari, etc

Trip length Frequency Distribution at Bhojpuree Toll Plaza

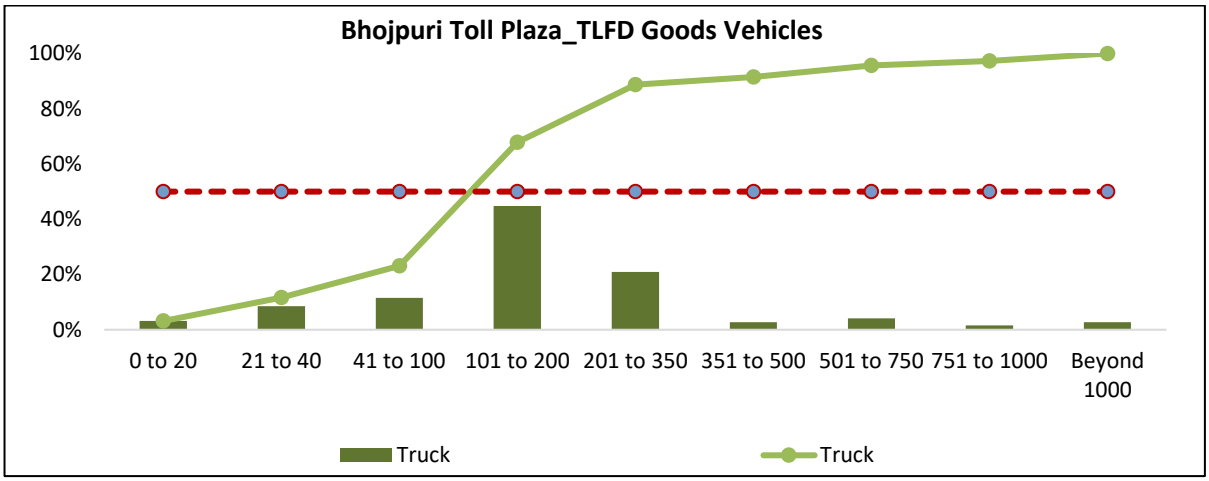


Figure 4-6: Trip length Frequency Distribution at Bhojpuree Toll Plaza – Goods

- Around 88.8% Trucks are having trip length less than 200 km.
- 6.9% of Trucks are having trip lengths more than 200 km and less than 750 km. There is significant short and medium-distance traffic through the Tarapongi Toll plaza.
- Around 4.3% Trucks are having trip lengths more than 750 km.
- Major OD pairs are generated from Raipur, Baloda Bazar, Durg, Ambikapur, Dhamtari, etc.

Trip length Frequency Distribution at Mudhipar Toll Plaza

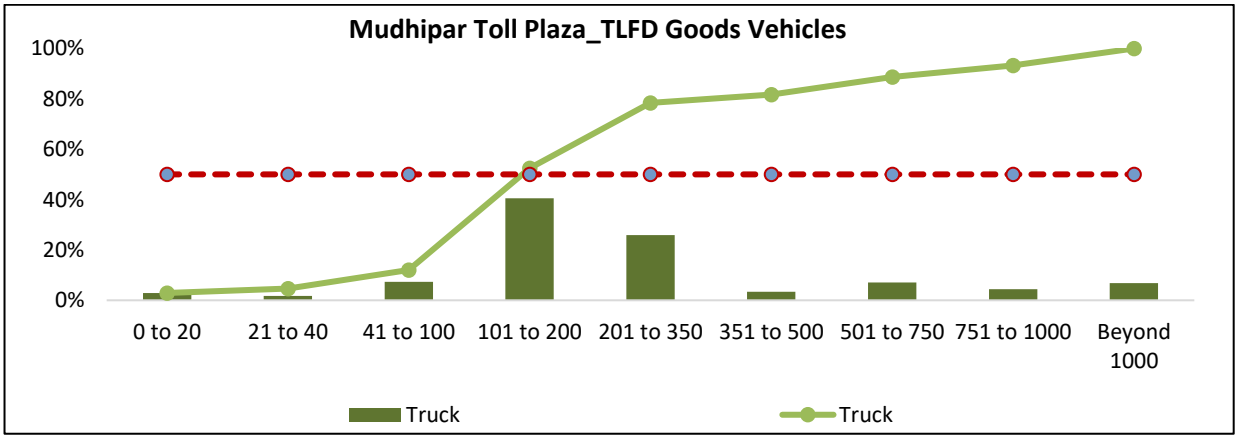


Figure 4-7: Trip length Frequency Distribution at Bhojpuree Toll Plaza – Goods

- Around 78.4% Trucks are having trip length less than 200 km.
- 10.3% of Trucks are having trip lengths more than 200 km and less than 750 km. There is significant short and medium-distance traffic through the Tarapongi Toll plaza.
- Around 11.3% Trucks are having trip lengths more than 750 km.
- Major OD pairs are generated from Raipur, Bilaspur, Raigarh, Korba, Nagpur, Champa, Ambikapur, etc.

Passenger Vehicles

Trip length Frequency Distribution at Tarapongi Toll Plaza

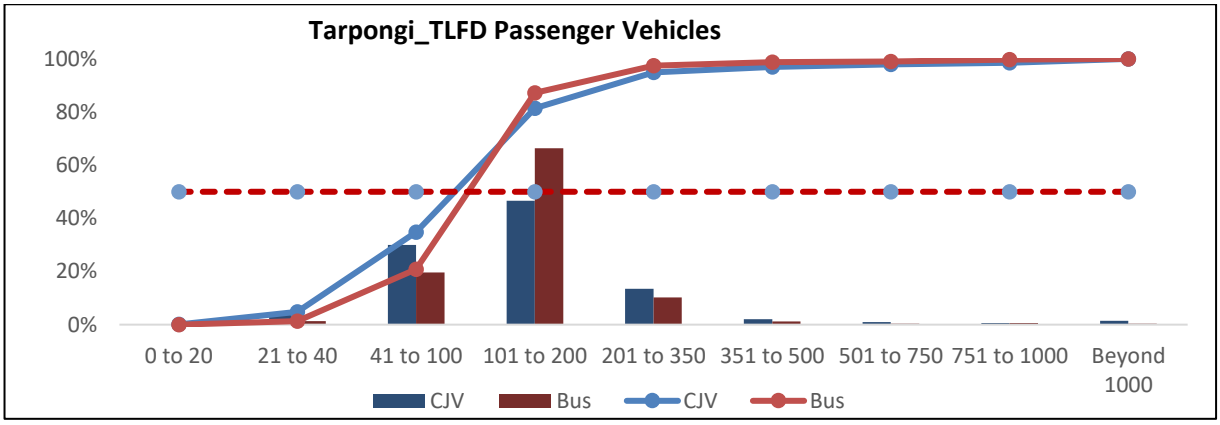


Figure 4-8: Trip length Frequency Distribution at Tarapongi Toll Plaza - Passengers

- Around 34.8% of Cars and 20.9% Busses are having less than 100 km trip length.
- Approximately 81.4% of Cars and 87.3% of Busses are having less than 200 km trip length. 13.5% of Cars and 10.3% of Busses are observed to be having trip lengths more than 200 km and less than 350 km.
- 3.6% of cars and 2.2% of Busses trips are between 351 km to 1000 km, and 1.5% of Cars and 0.3% of Busses trips are beyond 1000 km.
- Major OD pairs are Bilaspur-Raipur, Raipur-Simga, Raipur-Bemetara, Raipur-Kawardha, Bilaspur-Bhilai, etc.

Trip length Frequency Distribution at Bhojpuree Toll Plaza

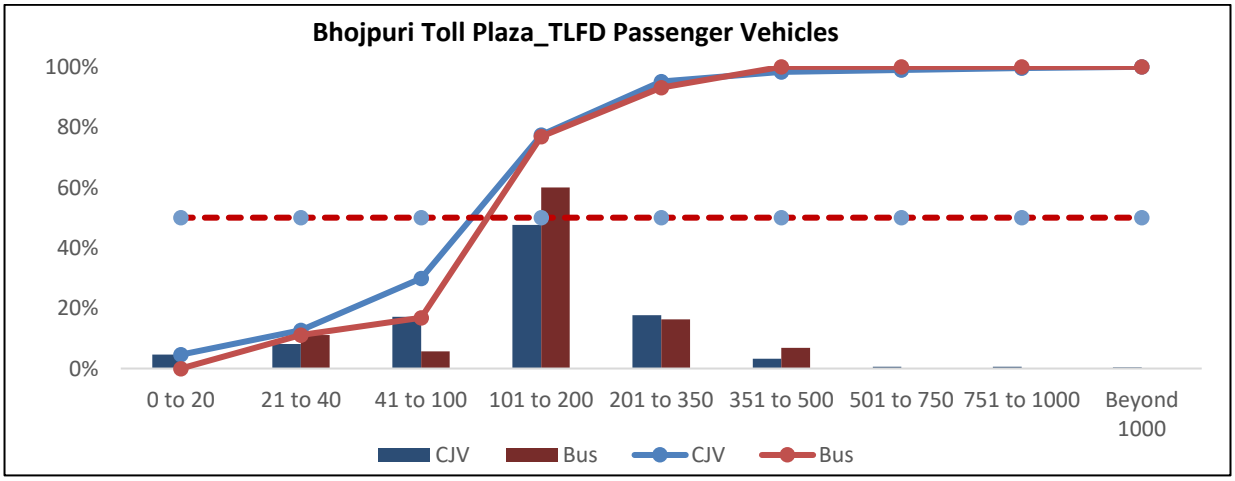


Figure 4-9: Trip length Frequency Distribution at Bhojpuree Toll Plaza-Passengers

- Around 29.9% of Cars and 16.8% Busses are having less than 100 km trip length.

- Approximately 77.4% of Cars and 76.8% of Busses are having less than 200 km trip length. 17.7% of Cars and 16.3% of Busses are observed to be having trip lengths more than 200 km and less than 350 km.

- 4.5% of cars and 6.9% of Busses trips are between 351 km to 1000 km, and 0.4% of Cars are beyond 1000 km.

- Major OD pairs are Bilaspur-Raipur, Raipur-Korba, Bilaspur-Sargaon, Bilha-Sargaon, Bilaspur-Simga, etc.

Trip length Frequency Distribution at Mudhipar Toll Plaza

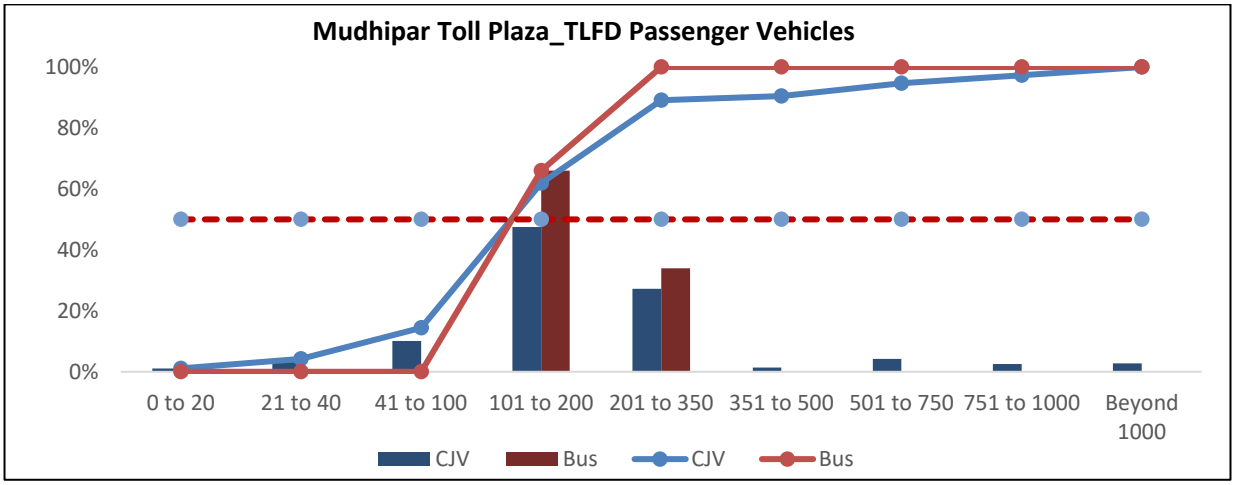


Figure 4-10: Trip length Frequency Distribution at Bhojpuree Toll Plaza-Passengers

- Around 14.4% of Cars are having less than 100 km trip length.
- Approximately 61.9% of Cars and 66.0% of Busses are having less than 200 km trip length. 27.2% of Cars and 34.0% of Busses are observed to be having trip lengths more than 200 km and less than 350 km.
- 8.2% of cars trips are between 351 km to 1000 km, and 2.7% of Cars trips are beyond 1000 km.
- Major OD pairs are Raipur-Raigarh, Raipur-Champa, Bilaspur-Raigarh, Raipur-Korba, Raipur-Sipat, etc.

-

4.4.7 Major Trip Generators

An analysis was carried out to identify the major trip generators. Table and figure below present the major trip generators of all passenger and goods vehicles at the toll plazas.

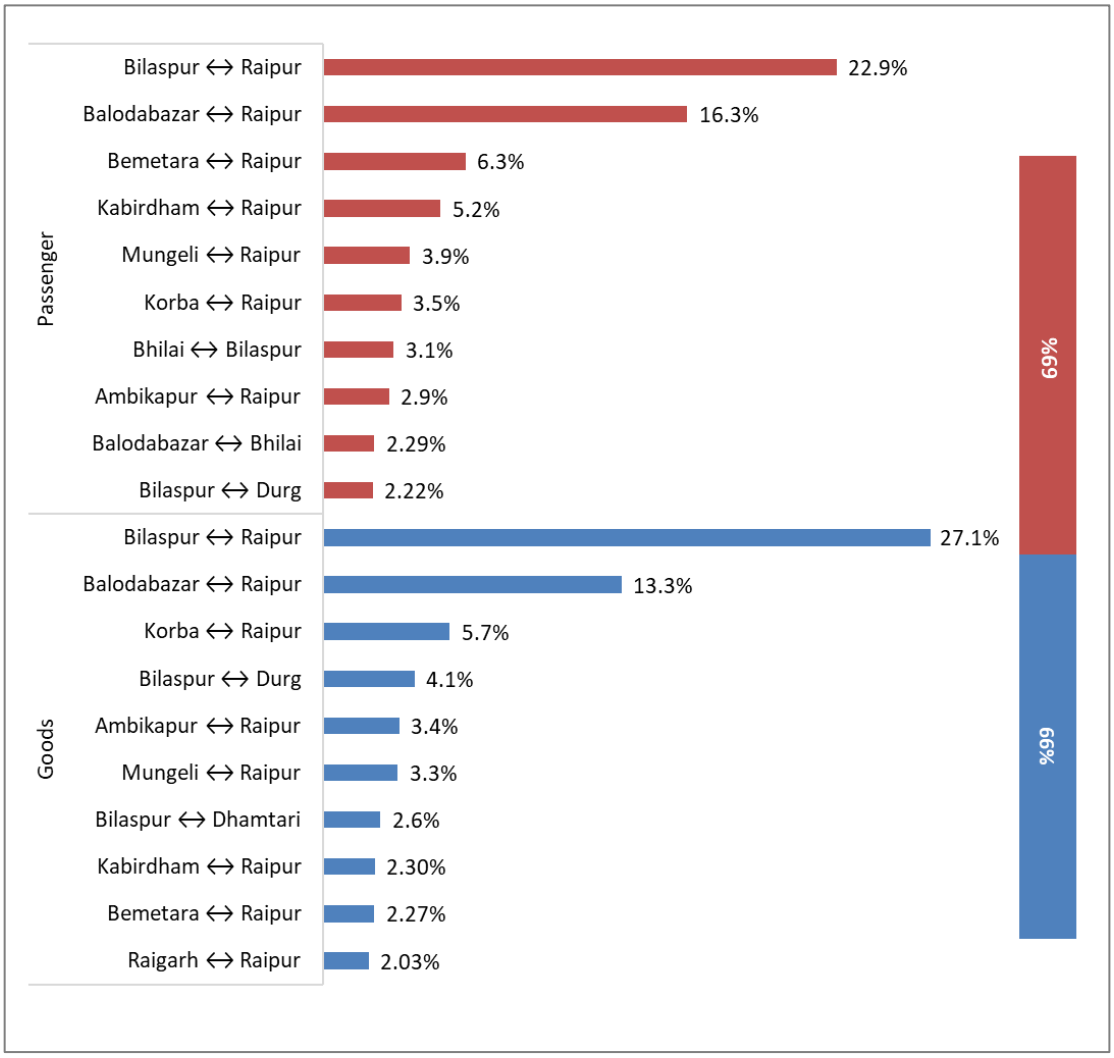


Figure 4-11: Major OD Pairs at Tarapongi TP

From the Top Origin- Destination pair analysis of both passengers and Goods (3 Axle trucks & MAV), it is observed that the top ten OD Pairs comprises around 69% of total passenger traffic and 66% of goods traffic (3A & MAV only) at Tarapongi Toll Plaza.

Passenger wise Major OD Pair at Toll Plaza:

Top five OD Pair from passenger mode share is of 54.6%. Major OD pairs are generated from Bilaspur, Raipur, Baloda Bazar, Bemetara, Kabirdham, Mungeli, Korba etc.

Goods wise Major OD Pair at Toll Plaza:

Top five OD Pair from goods mode share is of 53.6%. Major OD pairs are generated from Raipur, Baloda Bazar, Durg, Ambikapur, Dhamtari, etc.

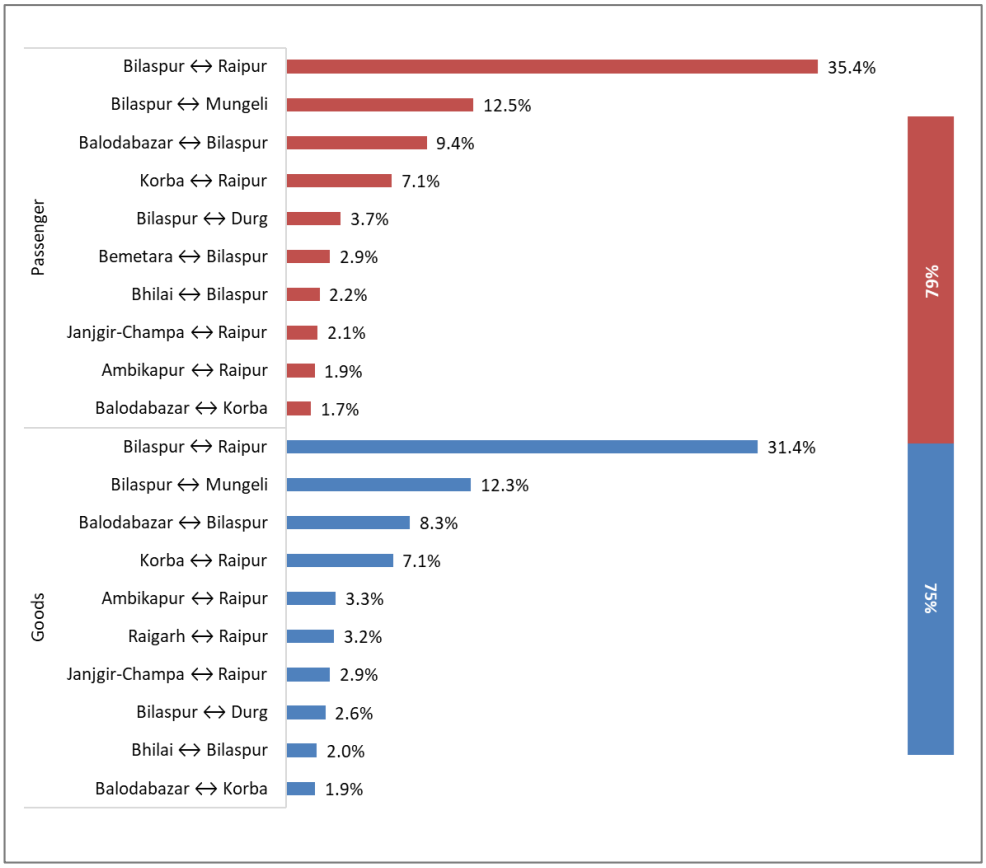


Figure 4-12: Major OD Pairs at Bhojpuri TP

From the Top Origin- Destination pair analysis of both passengers and Goods it is observed that the top ten OD Pairs comprises around 79% of total passenger traffic and 75% of total goods traffic at Bhojpuree Toll Plaza.

Passenger wise Major OD Pair at Toll Plaza:

Top five OD Pair from goods mode share is of 68%. Major OD pairs are generated from Raipur, Baloda Bazar, Durg, Ambikapur, Dhamtari, etc.

Goods wise Major OD Pair at Toll Plaza:

Top five OD Pair from goods mode share is of 62.4%. Major OD pairs are generated from Raipur, Baloda Bazar, Durg, Ambikapur, Dhamtari, etc.

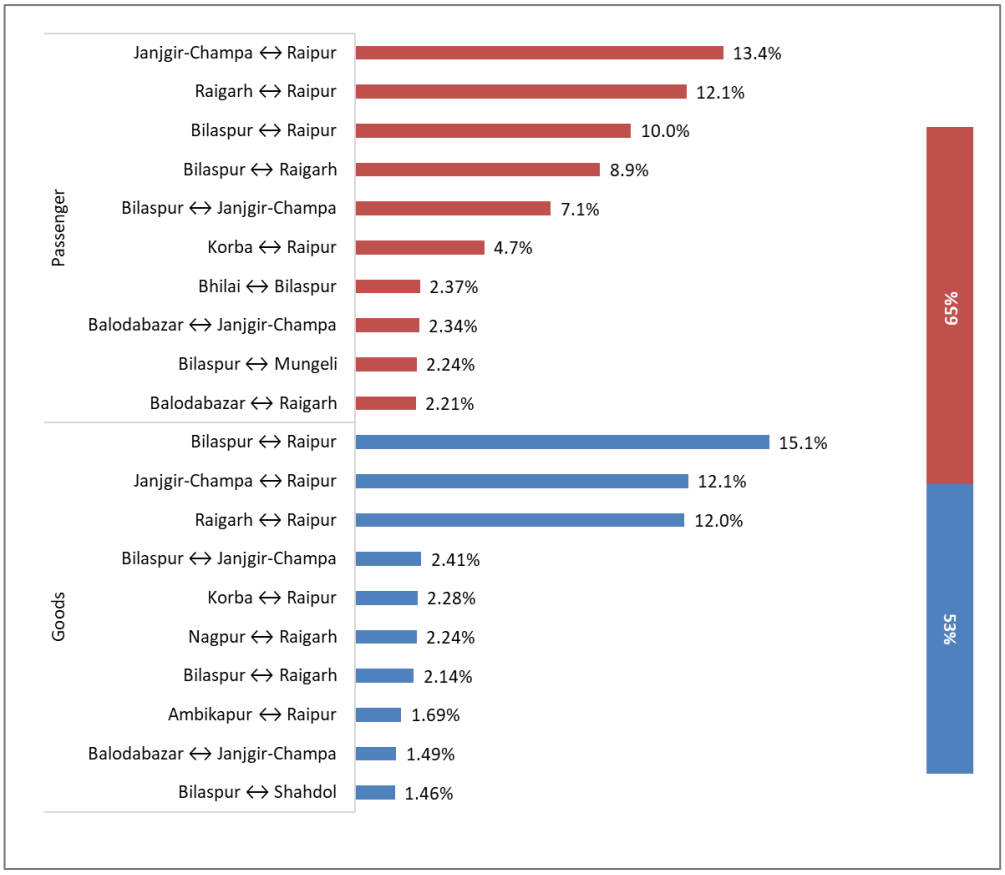


Figure 4-13: Major OD Pairs at Mudhipar TP

From the Top Origin- Destination pair analysis of both passengers and Goods it is observed that the top ten OD Pairs comprises around 65% of total passenger traffic and 53% of total goods traffic at Mudhipar Toll Plaza.

Passenger wise Major OD Pair at Toll Plaza:

Top five OD Pair from passenger mode share is of 51.5%. Major OD pairs are generated from Raigarh, Raipur, Bilaspur, Champa, Korba, Bhilai, etc.

Goods wise Major OD Pair at Toll Plaza:

Top five OD Pair from goods mode share is of 43.8%. Major OD pairs are generated from Raipur, Bilaspur, Raigarh, Korba, Nagpur, Champa, Ambikapur, etc.

CHAPTER 5

Diversion & Development Traffic Impact Assessment

5. Diversion & Development Traffic Impact Assessment

5.1 Introduction

This chapter presents the details of road network in the project influence area and the potential impact on the project road traffic during concession period. The traffic diversion section covers the comparison of the potential alternate routes with the project road.

Road network assessment and alternate modes were identified, and risk assessment has been done to determine traffic likely to be diverted to / from various routes by mode-wise based on generalized costs including toll fees on project road and alternate routes. This chapter also presents the details of land development in the project influence area and the potential impact on the project road traffic. Growth rates obtained from elasticity method needs to be adjusted for diversions as some of the upcoming development near project area can significantly affect the traffic estimates. The diversion and development section cover the potential land use development near project area and their effect on the future traffic estimates.

5.2 Diversion Traffic to Project Road/Alternate Routes

5.2.1 Road network assessment

Road network in the project influence area (PIA) was studied in detail from the past reports, latest news articles for all the potential impact roads on the project road traffic. Based on the site appreciation and desktop research it has been observed that there are viable alternate road that exists for the project road the & table below illustrates the list of alternate road development.

Table 5-1: Alternative Roads /Development Impacts on Project Road

S.NO	ALTERNATIVE ROAD/ NETWORK/ LAND /IMPROVEMENTS	IMPACT TYPE	YEAR OF IMPACT
1	Widening of NH-130B to 4L	Negative Impact	FY 32
2	Raipur–Dhanbad Economic Corridor (Korba Traffic)	Positive Impact.	FY 27
3	Raipur–Dhanbad Economic Corridor (Regional Traffic)	Positive Impact.	FY 32

5.2.2 Approach & Methodology

The Diversion Analysis process starts with the identification of potential alternate routes which was described in the earlier section. Post identification of the alternate routes, the next step involves quantification of the potential divertible traffic on the project road and the identified alternate routes.

The potential divertible traffic is the traffic which could shift from one road to the other road considering all the factors such as Vehicle operating cost, Travel time and Tolls. Subsequently a diversion analysis (binomial model) is performed to identify the quantum of the traffic that shift to the project road (positive diversion) or shift to the alternate road (negative diversion). The positive or the negative diversion is based on the generalized costs obtained from the diversion analysis model.

In this case, as seen in the earlier section there are potential alternate routes which are combination of greenfield & brownfield upgradations. With respect to the potential divertible

traffic for the project road it has been quantified based on the O-D analysis. The potential divertible traffic for the proposed alternate for the base year is not available as it is not operational at present (base year). In the absence of potential divertible traffic on the alternate route, the potential divertible traffic on project road is considered as total potential divertible traffic (PR+AR) for the diversion analysis.

The subsequent sections provide further elaboration on the potential divertible traffic, generalized costs and the divertible traffic and future divertible traffic on the project road till the end of the concession period.

The estimation of Traffic diversion away from project road for various diversions mentioned above are explained below.

Diversion 1:

- Negative diversion due to proposed Widening of NH-130B to 4L for the traffic plying between Raipur and Raigarh & nearby regions.

Diversion 2:

- Positive diversion due to proposed Raipur–Dhanbad Economic Corridor (Korba) for the traffic plying between Raipur and Korba.

Diversion 3:

- Positive diversion due to proposed Raipur–Dhanbad Economic Corridor (Regional) for the traffic plying between Raipur and Dhanbad and Nearby regions.

5.2.3 Widening of NH-130B to 4L

The proposed widening of NH-130B from a 2-lane to a 4-lane configuration along the Raipur – Baloda Bazar – Sarangarh corridor is a significant infrastructure upgrade aimed at improving regional connectivity. Spanning a total length of 216 km, approximately 169 km of this highway is planned for expansion to 4 lanes. This project is expected to decongest traffic, boost economic activities, and enhance safety for commuters traveling along this critical route. It will also facilitate better trade and tourism opportunities between the cities and surrounding areas.

However, this development could negatively impact the Raipur to Bilaspur toll road, which serves as a primary arterial route in the region. The improved NH-130B may divert traffic, particularly long-haul and commercial vehicles, reducing the overall toll revenue on the Raipur-Bilaspur corridor.

Project Status:

As of January 2025, the National Highways Authority of India (NHAI) has not publicly disclosed specific details regarding the current status of the NH-130B widening project on their official platforms, including the NHAI Data Lake.

Since the Project is in Planning stage the estimated completion can be assumed as in FY31.

5.2.4 Diversion-1 (Impact of Widening of NH-130B to 4Lane on All Three Plaza)

Traffic coming from the Raipur and Raigarh & nearby regions will have two route options available one Via Project Road and another is Via Baloda Bazar. The common point for both the Project Road and alternate route will be Raipur and Raigarh and the route comparison between Raipur to Raigarh via Project Road vis a-vis alternate route is described below.

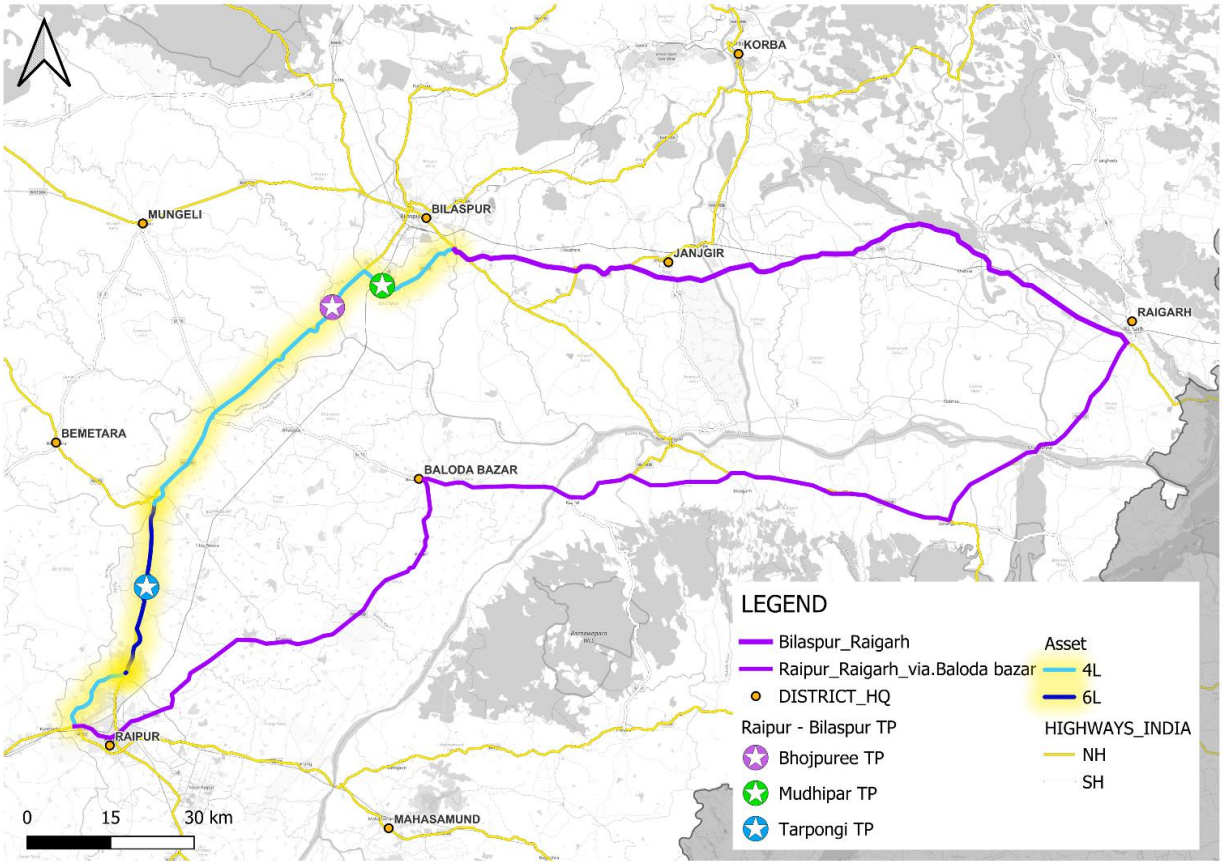


Figure 5-1: Raipur to Raigarh Route Comparison

Network Characteristics like Length, Road configuration etc. for both PR and AR are mentioned in the below table.

ROUTE COMPARISON				
YEAR	ROAD (PR or AR)	SECTION	LENGTH (KM)	ROAD CONFIG
FY25	PR	Raipur Bypass	15	4L
	PR	Raipur Simga	33	6L
	PR	Simga to Bilaspur Bypass	58	4L
	PR	Bilaspur Bypass to Amartal	45	4L

ROUTE COMPARISON				
YEAR	ROAD (PR or AR)	SECTION	LENGTH (KM)	ROAD CONFIG
	PR	Amartal to Raigarh	109	2L
	PR	Raigarh Urban Section	2	4L
FY28	AR	Raipur Urban Section	20	4L
	AR	Raipur to Baloda Bazar	71	2L
	AR	Baloda Bazar Urban Section	4	4L
	AR	Baloda bazar to Sarangarh	98	2L
	AR	Sarangarh to Raigarh	47	2L
	AR	Raigarh Urban Section	2	4L

Road Section	Highway No.	Length (Km)
Project Road	**Raipur to Raigarh**	**262**
Alternate Road	**Raipur to Raigarh**	**242**

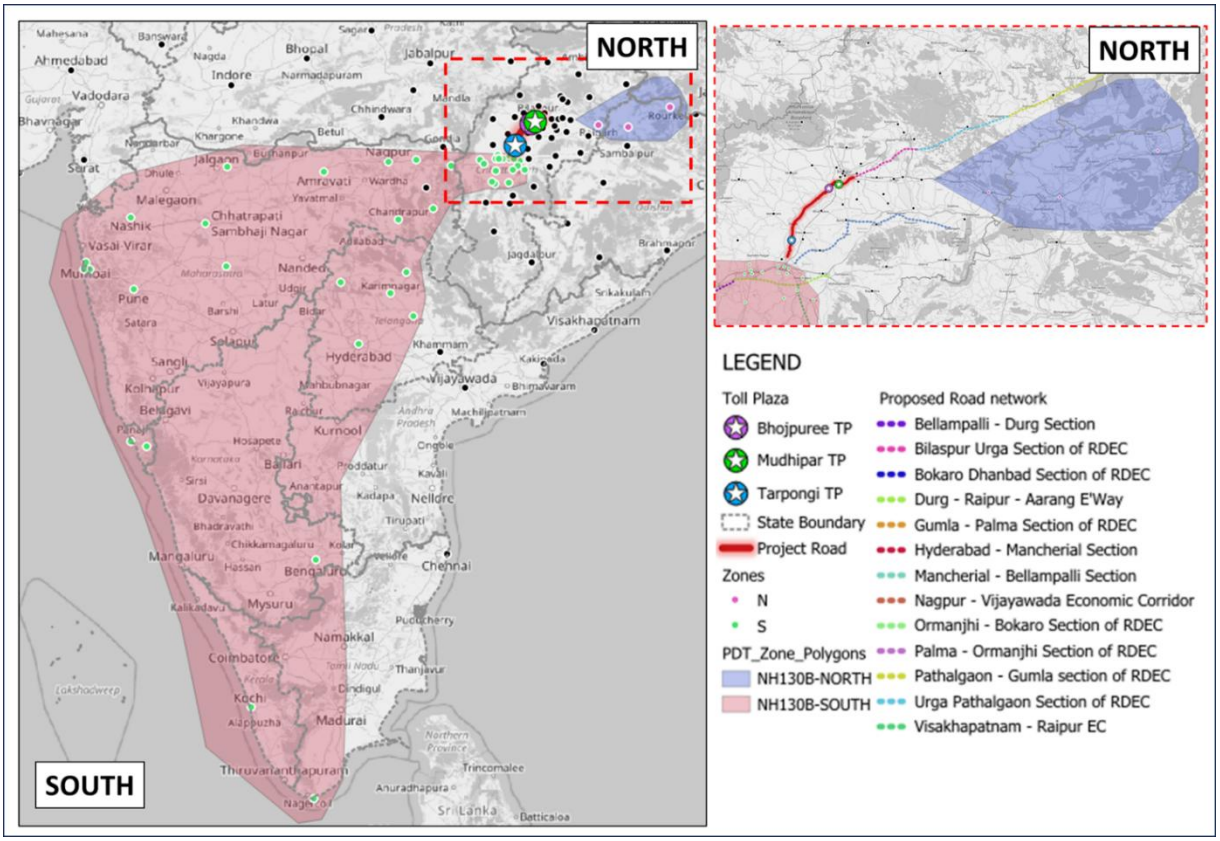


Table 5-2: Raipur to Raigarh Route Comparison b/w PR & AR

It is observed that Project Road is 20 kms longer than alternative route for Raipur-Raigarh route. Traffic zones which are considered for this part of diversion is shown below.

The fig:5-4 shows the PDT Zoning scheme. The figure refers to the region or zones considered under PDT estimation for NH130B for all three-toll plaza

Table 5-3: Potential Divertible Traffic in Base year

Mode	Project Road (TP1)	Project Road (TP2)	Project Road (TP3)
Car	182	184	169
Minibus	1	1	0
Bus-2A	6	7	3
Bus-3A	-	-	-
LCV	14	14	11
2 Axle	23	27	29
3 Axle	13	13	13
MAV	203	210	178

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the project road is estimated. Generalized cost is calculated based on the value of time (VOT) and

Figure 5-2: NH-130B zoning Scheme

vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic Evaluation of Highway Projects in India” and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion.

The consultant has considered that this diversion shall happen phase wise with 50% of the divertible traffic diverting in FY-32 and 100% of the divertible traffic diverting in FY-33. The table below illustrates the quantum of divertible traffic obtained, the diverted traffic considered and the percentage composition of the diverted traffic with respect to AADT.

Table 5-4: Traffic diversion from Tarapingi toll plaza to NH130B-Diversion1 in (FY25)

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	182	(110)	-1.1%
Bus	6	(4)	-0.8%
LCV	14	(9)	-1.9%
2 Axle	23	(17)	-2.2%
3 Axle	13	(10)	-2.2%
MAV	203	(156)	-4.0%

Table 5-5: Traffic diversion from Bhojpuri toll plaza to NH130B-Diversion1 in (FY25)

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	184	(111)	-1.4%
Bus	7	(5)	-1.2%
LCV	14	(9)	-2.1%
2 Axle	27	(20)	-2.9%
3 Axle	13	(10)	-3.9%
MAV	210	(161)	-3.8%

Table 5-6: Traffic diversion from Mudhipar toll plaza to NH130B-Diversion1 in (FY25)

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	169	(102)	-8.9%
Bus	3	(2)	-68.0%
LCV	11	(7)	-11.3%
2 Axle	29	(22)	-11.2%
3 Axle	13	(10)	-14.7%
MAV	178	(136)	-10.4%

5.2.5 Diversion-2 (Impact of Raipur–Dhanbad Economic Corridor (Korba) At Mudhipar Toll Plaza)

The route analysis between Bilaspur and Korba presents two distinct options for Traffic in this region. The primary route incorporates the Project Road, which forms part of the strategic Raipur-Dhanbad Economic Corridor (RDEC). This alignment offers improved infrastructure and enhanced connectivity, making it an attractive option for traffic between these cities.

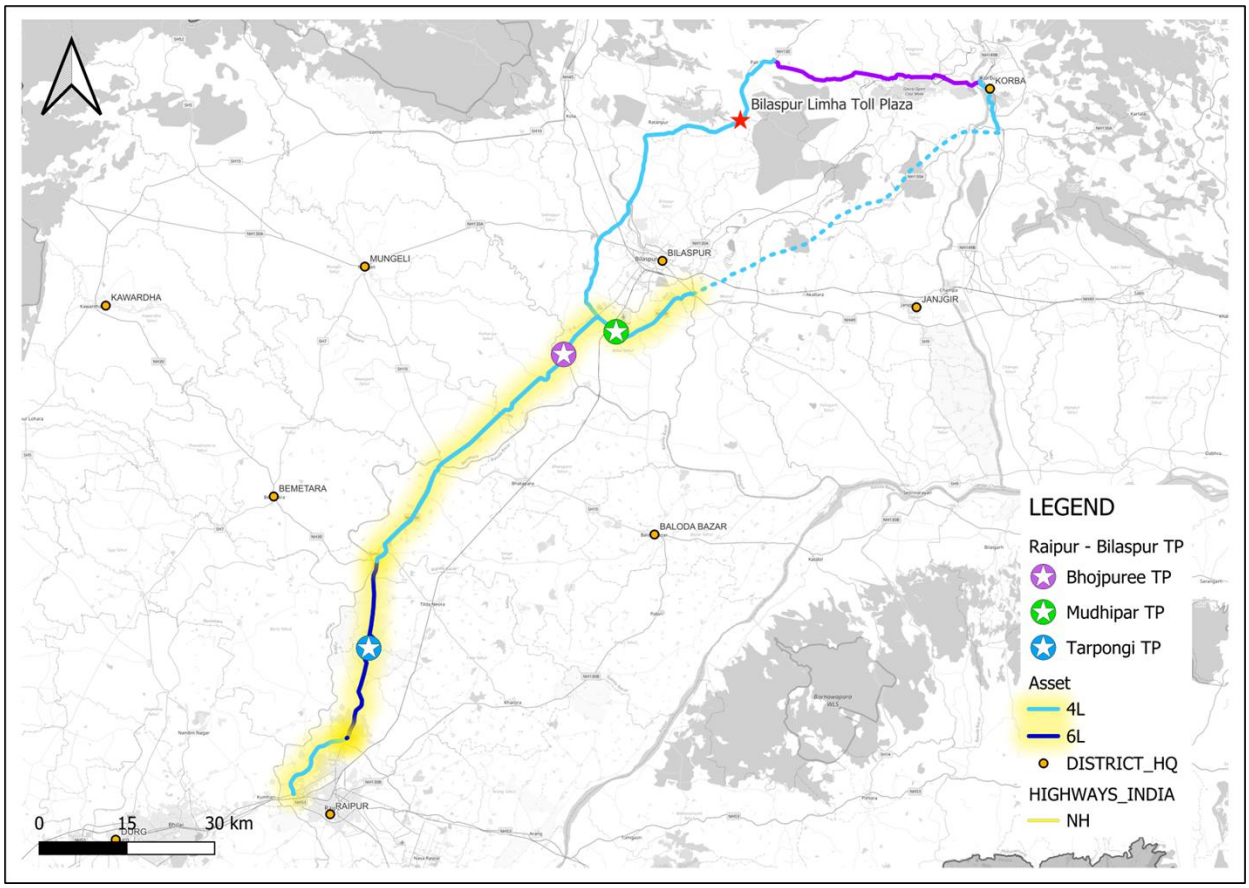


Figure 5-3: Bilaspur to Korba Route Comparison

The alternative route utilizes the existing National Highway 130 (NH130), which has traditionally served as the connection between these urban centers. Both routes share common points at the Bilaspur Bypass Start point and Korba, creating natural nodes for traffic distribution and interchange. The the Project Road along the RDEC is expected to create a positive traffic diversion from NH130, as Trips opt for the improved infrastructure and potentially reduced travel times offered by the new corridor.

This traffic redistribution pattern demonstrates the effectiveness of the RDEC's alignment along the Project Corridor, suggesting successful infrastructure planning that addresses regional connectivity needs while providing users with viable routing options based on their specific requirements and preferences.

Network Characteristics like Length, Road configuration etc. for both PR and AR are mentioned in the below table.

ROUTE COMPARISON				
YEAR	ROAD (PR or AR)	SECTION	LENGTH (KM)	ROAD CONFIG
FY27	PR	Bilaspur Bypass	21	4L
	PR	Bilaspur Bypass - Urga	65	4L-E'Way
	PR	Urga - Korba	10	2L
	PR	Korba - Kusmunda/Gevra	8	2L
FY25	AR	Bilaspur Bypass to Makhanpur	67	4L
	AR	Makhanpur to Kusmunda	32	2L

Road Section	Highway No.	Length (Km)
Project Road	**Bilaspur Bypass to Korba (via RDEC)**	**104**
Alternate Road	**Bilaspur Bypass to Korba**	**99**

Table 5-7: Bilaspur to Korba Route Comparison b/w PR & AR

It is observed that Project Road is 05 kms longer than alternative route for Bilaspur-Korba route. Traffic zones which are considered for this part of diversion is shown below.

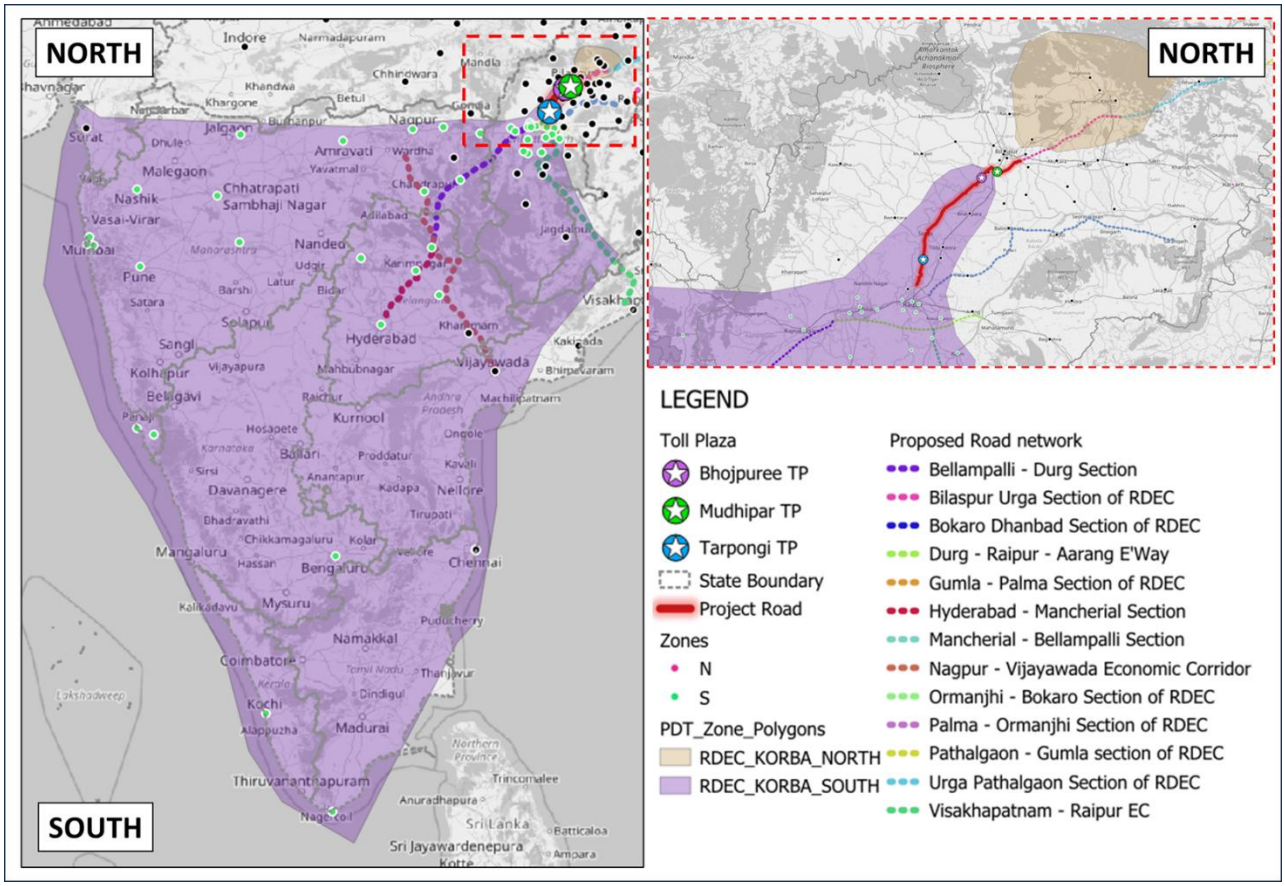


Figure 5-4: NH-130B zoning Scheme

The fig shown shows the PDT Zoning scheme. The figure refers to the region or zones considered under PDT estimation for NH130B for all mudhipar toll plaza

Table 5-8: Potential Divertible Traffic in Base year

Mode	Alternate Road (TP3)
Car	868
Minibus	0
Bus-2A	6
Bus-3A	0
LCV	54
2 Axle	29
3 Axle	23
MAV	511

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the project road is estimated. Generalized cost is calculated based on the value of time (VOT) and vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic Evaluation of Highway Projects in India” and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion.

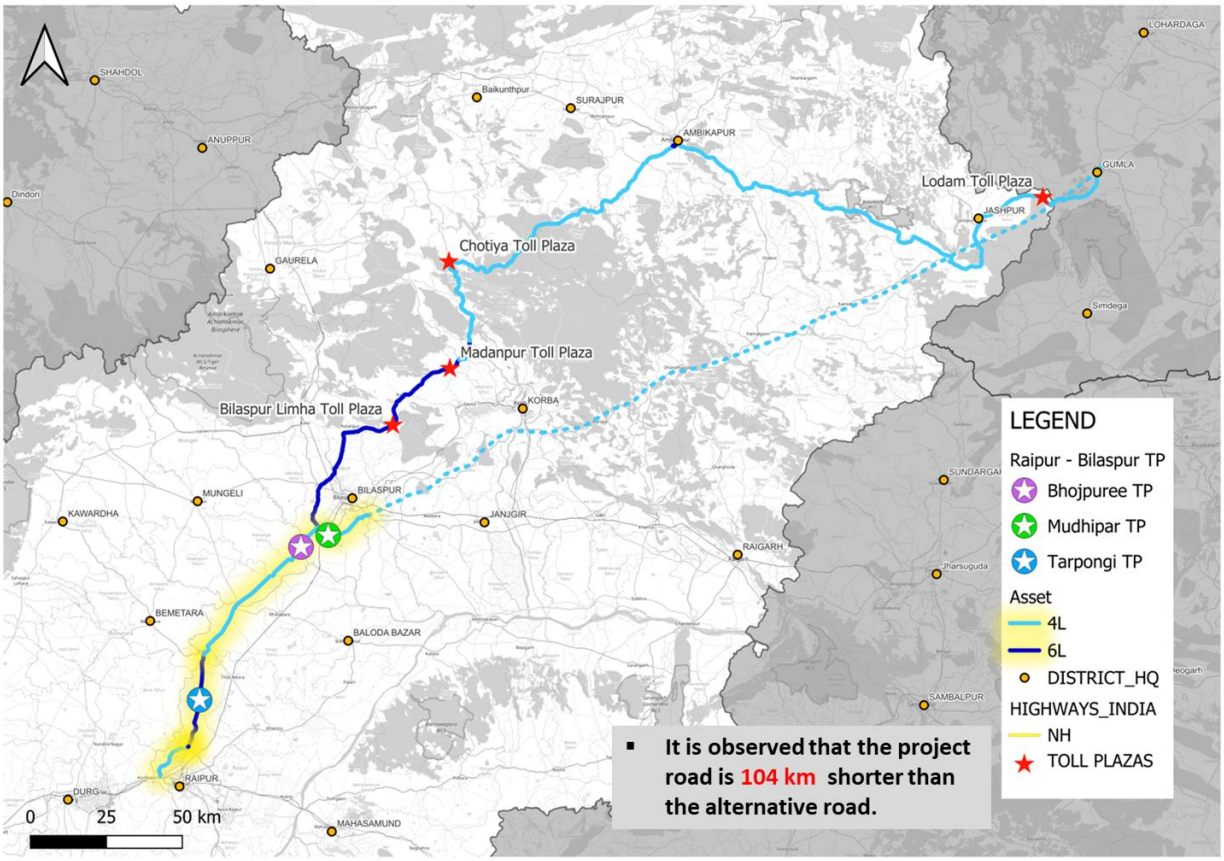
The consultant has considered that this diversion shall happen phase wise with 50% of the divertible traffic diverting in FY-27 and 100% of the divertible traffic diverting in FY-28. The table below illustrates the quantum of divertible traffic obtained, the diverted traffic considered and the percentage composition of the diverted traffic with respect to AADT.

Table 5-9: Traffic diversion to Mudhipar toll plaza From NH130-Diversion2 in (FY25)

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	868	384	33.5%
Bus	6	3	77.4%
LCV	54	17	26.2%
2 Axle	29	3	1.4%
3 Axle	23	5	7.8%
MAV	511	111	8.5%

5.2.6 Diversion-3 (Impact of Raipur–Dhanbad Economic Corridor (Regional) At Mudhipar Toll Plaza)

The route analysis between Bilaspur and Gumla highlights two key options for traffic flow in the region. The proposed Raipur-Dhanbad Economic Corridor (RDEC), incorporating the Project



Road, is poised to serve as a vital infrastructure upgrade, offering improved connectivity and enhanced road conditions that make it an attractive choice for traffic between these cities.

Figure 5-5: Bilaspur to Korba Route Comparison

In contrast, the alternate route via National Highway 130 (NH130) is serving as a primary link but faces limitations in terms of capacity and infrastructure quality. Both routes share natural nodes for traffic distribution, such as the Bilaspur Bypass, creating opportunities for efficient traffic interchange.

The development of the RDEC is expected to create a significant positive diversion of traffic to the Project Road, as road users, particularly commercial and long-haul traffic, will likely opt for the superior infrastructure, reduced travel times, and greater reliability provided by the new corridor.

The RDEC's alignment strategically addresses regional connectivity needs, attracting diverted traffic from NH130 and other surrounding routes. This diversion will not only reduce congestion on NH130 but also enhance the utility of the Project Road, boosting its role as a backbone for economic and logistical movement in the region. By providing a faster, safer, and more efficient alternative, the Project Road is well-positioned to handle increased traffic volumes, reinforcing the benefits of strategic infrastructure planning under the RDEC initiative.

Network Characteristics like Length, Road configuration etc. for both PR and AR are mentioned in the below table.

ROUTE COMPARISON				
YEAR	ROAD (PR or AR)	SECTION	LENGTH (KM)	ROAD CONFIG
FY32	PR	Bilaspur Bypass	21	4L
	PR	Bilaspur Bypass - Urga	70	4L-E'Way
	PR	Urga - Pathalgaon	88	4L-E'Way
	PR	Pathalgaon - Gumla	137	4L-E'Way
FY25	AR	Bilaspur Bypass to Madanpur	87	4L
	AR	Madanpur to Ambikapur	142	2L
	AR	Ambikar Pur Bypass	2	4L
	AR	Ambikapur to Gumla	189	2L

Road Section	Highway No.	Length (Km)
Project Road	**Raipur to Gumla (via RDEC)**	**316**
Alternate Road	**Raipur to Gumla**	**420**

Table 5-10: Bilaspur to Gumla Route Comparison b/w PR & AR

It is observed that Project Road is 104 kms Shorter than alternative route for Bilaspur-Gumla route. Traffic zones which are considered for this part of diversion is shown below.

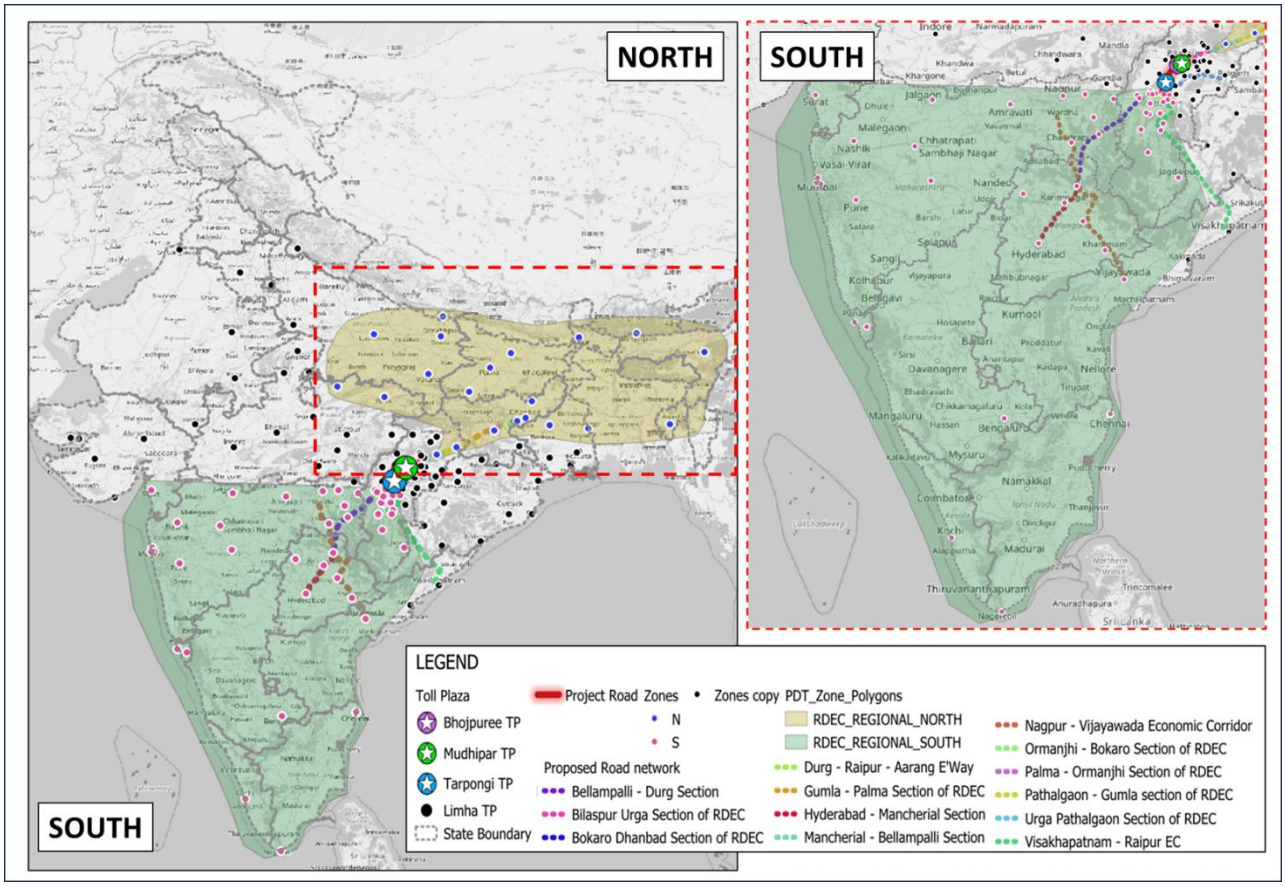


Figure 5-6: NH-130B zoning Scheme

The fig shown shows the PDT Zoning scheme. The figure refers to the region or zones considered under PDT estimation for NH130B for all mudhipar toll plaza

Table 5-11: Potential Divertible Traffic in Base year

Mode	Alternate Road (TP3)
Car	86
Minibus	0
Bus-2A	0
Bus-3A	0
LCV	23
2 Axle	11
3 Axle	0
MAV	131

Diversion analysis has been done by comparing the project and alternate routes in terms of generalized costs. Using the spreadsheet diversion analysis tool, traffic diversion to / from the

project road is estimated. Generalized cost is calculated based on the value of time (VOT) and vehicle operating costs (VOC) including toll fee rates. These generalized cost variables are sourced from the Indian Roads Congress publication IRC: SP:30: 2019 “Manual on Economic Evaluation of Highway Projects in India” and applicable inflation values are used to arrive at the cost variables in the year of applicable diversion.

The consultant has considered that this diversion shall happen phase wise with 50% of the divertible traffic diverting in FY-32 and 100% of the divertible traffic diverting in FY-33. The table below illustrates the quantum of divertible traffic obtained, the diverted traffic considered and the percentage composition of the diverted traffic with respect to AADT.

Table 5-12: Traffic diversion to Mudhipar toll plaza From NH130-Diversion2 in (FY25)

Vehicle Type	Divertible traffic	Diverted traffic	% Of diverted traffic w.r.t. to AADT
Car	86	74	6.5%
Bus	0	-	0.0%
LCV	23	23	34.5%
2 Axle	11	11	5.6%
3 Axle	0	-	0.0%
MAV	131	130	9.9%

CHAPTER 6

Traffic Growth Rate Estimation

6. Traffic Growth Rate Estimation

6.1 Background

Demand for transport is derived demand. Derived demand is an economic term which refers demand for a good in one sector occurring because of demand from another sector. Transport users are accessing services not because of its direct benefits but because they wish to access product. Transport demand is basically movement of goods and passengers. Passengers travel to satisfy the need (work, school, college, recreation, etc.) and nobody travel just for the sake of travelling and we transport good as a part of overall economic activity. Derived demand for transportation is often difficult to estimate for future just by analysing the traffic growth in past years as it has derived from demand from some other sectors which may or may not vary in future in the same way. To consider trend in other sector and effect of the same on transport demand factors such as GDP, Primary GDP, secondary GDP, tertiary GDP, states GDP, Per Capita Income and vehicle registrations data is considered. These data are readily available as published by various organizations and more representative of growth in economy and related sectors.

The investment priorities are governed by the traffic demand, assessed benefits, and cost of the project. Demand plays the significant role, which governs the type of facility / infrastructure to be created. This in turn determines likely benefits and costs to develop the same. Prediction of traffic demand becomes an important task and must be conducted near accurately. The accurate estimation of traffic has direct bearing on the viability of project. Recognizing this, efforts were made to carefully assess all the parameters that help in predicting the traffic demand in future which necessitates realistic estimation of traffic growth rates. This chapter explains the methodology and estimation of traffic growth rates for the project for the horizon years. Traffic growth on a road facility is generally estimated based on the historical trends, in the present case traffic growth rates are estimated using Elasticity method as per IRC-108-2015 - *Guidelines for Traffic Forecast on Highways*.

6.2 Methodology

Traffic growth rate estimation follows systematic approach which is based on econometric modelling. The detailed methodology to arrive at growth rate is explained in the following sections.

6.2.1 Governing Factors for Traffic Growth

Traffic growth is governed by number of factors such as Gross National Product (GNP) or Gross Domestic Product (GDP), Agricultural output, Industrial Output which are mainly economic indicators and Population, Rural/Urban mix of population which are demographic factors. Since these indicators vary widely across the country, traffic growth rate varies from state to state, and within state from region to region. So, it is necessary to identify project influence zones and giving consideration while arriving at above indicators.

6.2.2 Determination of Past Trends

Past trend of traffic growth is key parameter in determination of future trend. Past trend of traffic can be analysed from variety of indicators such as traffic flow from census, vehicle registration and fuel sales. Vehicle registrations data is readily available as published by trusted organization is used for this study. For establishing reliable growth rates data should be taken

for considerable for number of years. The ideal way to arrive at rate of growth is through regression analysis. Once we have analysed growth in traffic, we can arrive at traffic growth in project influence area by finding out weight of different project influence areas using surveys.

6.2.3 Goods Vehicle Forecasting

Goods vehicle forecasting is done based on growth in tonnage and splits among distinct categories of vehicles. Growth in tonnage is obtained like procedure explained above. For vehicular splits base year splits were considered as benchmark and future year splits were projected based on experience and past growth trends in the same category of vehicles. Once we have tonnage and splits projections number of goods based on vehicle category and corresponding growth rate is calculated.

Traffic forecasting for project road traffic was done considering past trend in growth and analysing prospects of project influence area. Elasticity approach of growth rate estimation was used for long term traffic forecasting.

6.3 Determination of Growth Trends

Past data pertaining to the project corridor was sourced from the client. This includes traffic data for all the two toll plazas Tarapongi & Bhojpuree. The findings from the data are summarized in the following subsequent sections.

6.3.1 Past Traffic Trend at All Toll Plazas

Past traffic trends were derived based on the historic traffic data provided by the client. Separate analysis was carried out for toll plaza 01 at Tarapongi and toll plazas 02 at Bhojpuree, respectively. Traffic count summary, travel pattern for both passenger and goods traffic from the historic traffic data is presented below.

Table 6-1: Past Traffic Trend at Tarapongi Toll Plaza (TP1)

Source	FY	CJV	LCV	Bus/2 Axle	3 Axle	MAV	OSV	Total Vehicles	Total PCUs	Growth %
ETC Summary	FY23	7,634	486	878	432	2,618	7	**12,055**	**24,106**	-
ETC Summary	FY24	8,299	462	1,019	467	3,301	2	**13,550**	**28,313**	12.4%
ETC Summary	FY25	9,131	466	1,227	439	3,874	2	**15,138**	**32,268**	11.7%
CAGR %	*FY23 to FY25*	*9.4%*	*-2.1%*	*18.2%*	*0.7%*	*21.6%*	*-51.0%*	***12.1%***	***15.7%***	
CAGR %	*FY24 to FY25*	*10.0%*	*0.8%*	*20.4%*	*-6.2%*	*17.4%*	*-13.4%*	***11.7%***	***14.0%***	

*FY2023 Oct-Mar & FY-2025 * - Apr24-Nov24 Based AADT*

Table 6-2:Past Traffic Trend at Bhojpuree Toll Plaza (TP2)

Source	FY	CJV	LCV	Bus/2 Axle	3 Axle	MAV	OSV	Total Vehicles	Total PCUs	Growth %
ETC Summary	FY23	5,893	485	770	257	2,587	12	**10,003**	**21,395**	
ETC Summary	FY24	6,331	438	901	268	3,532	3	**11,474**	**26,404**	14.7%
ETC Summary	FY25	6,863	413	1,067	242	4,095	2	**12,681**	**29,843**	10.5%
CAGR %	*FY23 to FY25*	***7.9%***	***-7.8%***	***17.7%***	***-3.0%***	***25.8%***	***-61.5%***	***12.6%***	***18.1%***	
CAGR %	*FY24 to FY25*	***8.4%***	***-5.8%***	***18.4%***	***-9.9%***	***15.9%***	***-41.2%***	***10.5%***	***13.0%***	

*FY2023 Oct-Mar & FY-2025 * - Apr24-Nov24 Based AADT*

Table 6-3:Past Traffic Trend at Mudhipar Toll Plaza (TP3)

Source	FY	CJV	LCV	Bus/2 Axle	3 Axle	MAV	OSV	Total Vehicles	Total PCUs	Growth %
ETC Summary	FY23	904	61	107	83	963	5	2,340	5,923	
ETC Summary	FY24	937	61	149	92	1,102	2	2,343	6,718	0.1%
ETC Summary	FY25	1,007	60	197	68	1,295	1	2,628	7,725	12.2%
CAGR %	*FY23 to FY25*	***5.5%***	***-0.3%***	***35.6%***	***-9.7%***	***16.0%***	***-54.5%***	***6.0%***	***14.2%***	
CAGR %	*FY24 to FY25*	***7.5%***	***-0.7%***	***32.1%***	***-26.5%***	***17.6%***	***-40.5%***	***12.2%***	***15.0%***	

*FY2023 Nov-Mar & FY-2025 * - Apr24-Oct24 Based AADT*

6.3.2 Project Influence Area

A study of the socio-economic profiles of the regions comprising the project influence area (PIA) provides an overview of the factors likely to influence the pattern of economic development and hence the flows and volumes of traffic on the proposed highway. The details include Population, Per-capita Income (PCI), GDP (India), GSDP (States), GDDP (Districts), Registered Vehicle population and targeted growth rates of the economy. The profiles help to generate basic inputs for the estimation of future growth in transport demand based on past scenarios, perspective changes in transport demand elasticity and economic growth rates.

The analysis of traffic pattern observed on the project road (at all the toll plaza locations) from traffic studies indicates that most of the traffic is generated from Chhattisgarh, Karnataka, Tamil Nadu & West Bengal. Hence, the above-mentioned states have been considered as PIA zones in assessing traffic growth. Since drivers of growth for all the traffic streams would be different, these were analysed separately. In addition, truck traffic was analysed considering LCV, 2 Axle and 3 Axle, MAV separately to consider the expected changes in freight vehicle market share in future years.

Table 6-4:Project Influence Areas Impact on TP 01 – Tarapongi

TARAPONGI TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Chhattisgarh	97.2%	98.6%	94.0%
Maharashtra	0.9%	0.5%	1.5%
Madhya Pradesh	0.6%	0.0%	1.8%
Jharkhand	0.1%	0.0%	0.2%
Bihar	0.4%	0.2%	0.7%
Odisha	0.3%	0.4%	0.4%
Uttar Pradesh	0.1%	0.3%	0.3%
Gujarat	0.2%	0.0%	0.5%
Rajasthan	0.1%	0.0%	0.3%
Goa	0.1%	0.0%	0.2%
West Bengal	0.0%	0.0%	0.0%
Andhra Pradesh	0.0%	0.0%	0.2%
Tamil Nadu	0.1%	0.0%	0.1%
Total	**100%**	**100%**	**100%**

Table 6-5: Project Influence Areas Impact on TP 02 – Bhojpuree

BHOJPUREE TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Chhattisgarh	97.6%	96.6%	94.1%
Maharashtra	0.6%	0.9%	2.6%
Madhya Pradesh	1.0%	2.5%	1.6%
Jharkhand	0.1%	0.0%	0.6%
Bihar	0.1%	0.0%	0.4%
Odisha	0.1%	0.0%	0.2%
Uttar Pradesh	0.4%	0.0%	0.1%
Gujarat	0.0%	0.0%	0.1%
Rajasthan	0.2%	0.0%	0.0%

BHOJPUREE TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Goa	0.0%	0.0%	0.1%
West Bengal	0.0%	0.0%	0.1%
Andhra Pradesh	0.0%	0.0%	0.0%
Tamil Nadu	0.0%	0.0%	0.0%
Total	**100%**	**100%**	**100%**

Table 6-6: Project Influence Areas Impact on TP 03 – Mudhipar

MUDHIPAR TOLL PLAZA			
STATES	**CARS**	**BUSES**	**TRUCKS**
Chhattisgarh	93.9%	100.0%	86.1%
Maharashtra	1.0%	0.0%	3.8%
Madhya Pradesh	1.2%	0.0%	3.2%
Jharkhand	1.7%	0.0%	3.0%
Bihar	0.0%	0.0%	0.3%
Odisha	0.1%	0.0%	1.0%
Uttar Pradesh	0.4%	0.0%	0.2%
Gujarat	0.1%	0.0%	0.5%
Rajasthan	0.7%	0.0%	0.8%
Goa	0.0%	0.0%	0.3%
West Bengal	0.9%	0.0%	0.6%
Andhra Pradesh	0.0%	0.0%	0.0%
Tamil Nadu	0.0%	0.0%	0.1%
Total	**100%**	**100%**	**100%**

6.3.3 Growth in Tonnage

To accommodate the dynamic change within the sale of goods vehicles of distinct categories in growth rate estimates, it is pragmatic to consider the overall growth of tonnage on project road at distinct locations. Once the growth of tonnage is established, tonnage share for distinct categories of trucks shall be assumed based on the past trend observed at the toll plaza locations and the potential market share of the individual truck categories with respect to the region (PIA). Using this growth in tonnage and assumed future tonnage share of distinct categories of goods vehicles the growth rate of each category will be back calculated.

To determine, growth of Historic traffic tonnage, PIA registered vehicles data was converted into total tonnage based on the historic vehicle split. The growth in payloads over the years is shown in the table below.

Table 6-7 Pay load for Different Categories

Mode	LCV	2A TRUCK	3 A TRUCK	MAV
FY-2018	5	9	16	25
FY-2019	5	11.1	17.1	28.5

6.3.4 Growth in Registered Vehicles

The growth in vehicle registrations in the project road influence region is generally a good indicator, as it is found to correlate reasonably well with traffic growth. Thus, it is possible to establish a definite trend and correlation between traffic growth and vehicle registration. To establish future traffic on the project corridor, the trend in vehicle registrations of the influencing areas, which are significantly contributing traffic to the corridor is also studied. Significant growth in registrations of car, buses and trucks has been observed in the project influence areas.

Growth in personal car is observed to be highest followed by Freight vehicles and Buses in the state of Chhattisgarh. Compounded annual growth rate of cars, buses and trucks weighted for project area of Toll Plaza 1 at Tarapongi is 10.84%, 7.37%, 6.86% respectively (Ref: Annexure) Similarly, for Bhojpuree TP 2 it is 10.97%, 7.11%, 6.75% respectively (Ref: Annexure).

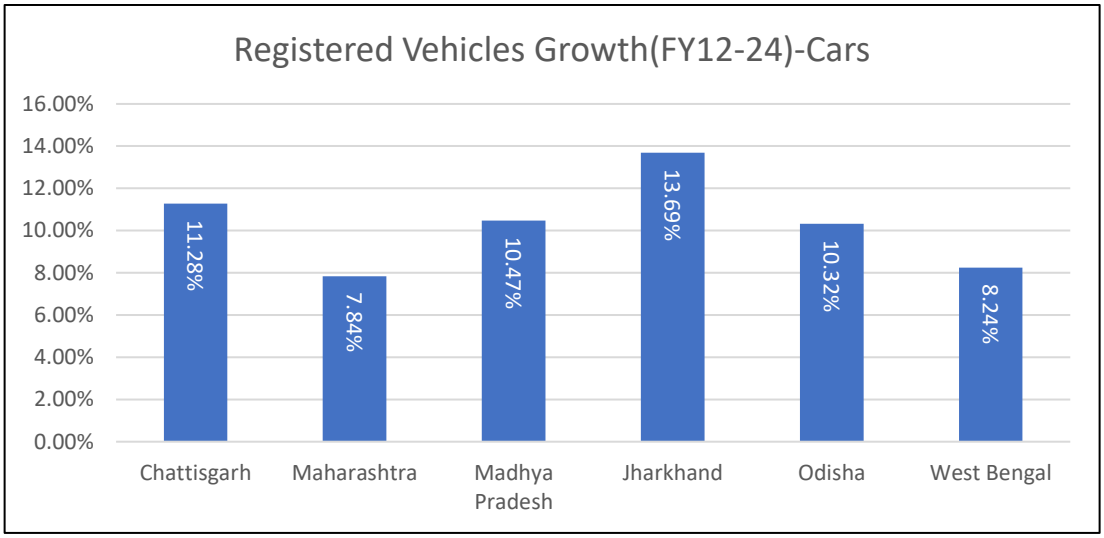


Figure 6-1: Long Term Growth Trends – Registered Cars in the PIA

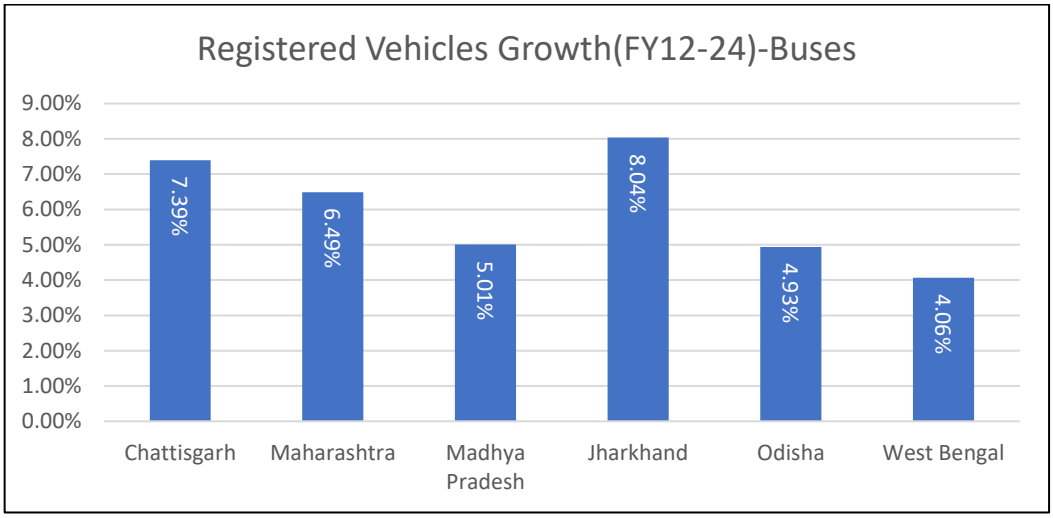


Figure 6-2: Long Term Growth Trends – Registered Buses in the PIA

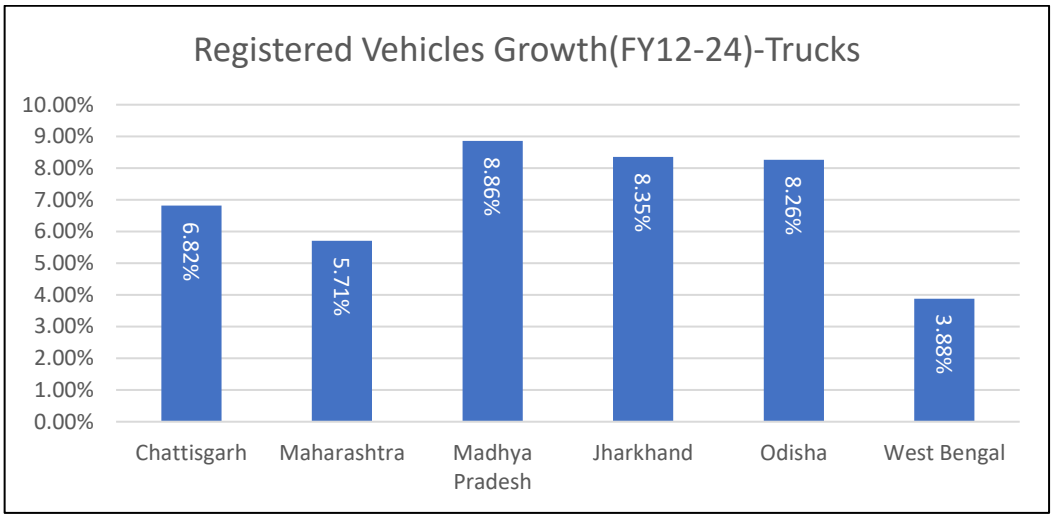


Figure 6-3 Long Term Growth Trends – Registered Trucks in the PIA

Source: MoRTH & VAHAN Database

6.3.5 Past Growth in Regional Economies

Growth of traffic on the project road depends on existing development and future growth prospects of the connecting regions. The time series data of economic indicators is one major economic variable followed in the econometric method of traffic forecasting through establishing a relationship between dependent (traffic / registered vehicles) and independent variable (GDP / GSDP / GDD) for project influence areas. Past economic growth for the PIA zones is sourced from the Central Statistical Organisation (CSO) and are presented below.

Table 6-8: GSDP for PIA zones

YEAR	Chhattisgarh	Madya Pradesh	Maharashtra
2012	1,58,07,382	3,15,56,159	12,80,36,944
2013	1,65,97,740	3,51,68,262	13,57,94,185
2014	1,82,57,954	3,65,13,394	14,51,61,464
2015	1,85,81,344	3,83,94,448	15,43,16,487
2016	1,90,58,377	4,18,73,574	16,54,28,361
2017	2,13,70,477	4,70,66,916	18,07,04,575
2018	2,20,13,569	4,97,10,165	18,88,70,619
2019	2,44,57,916	5,43,27,196	19,57,38,075
2020	2,51,54,906	5,67,52,504	20,04,66,252
2021	2,51,19,230	5,41,01,572	18,58,36,988
2022	2,80,60,929	5,84,46,991	20,27,97,104
2023	3,02,11,868	6,22,90,790	21,23,41,262
2024	3,21,94,473	6,60,36,335	22,23,34,593
CAGR (12-24)	**7.67%**	**6.58%**	**4.71%**

6.3.6 Commercial Vehicles Sale Trend

Category wise commercial sales trend is presented in the below figure. From the figure it is observed that market share of 2 Axle truck and 3 Axle truck is declining from the previous

Years whereas MAV market share is increasing. Due to improved road infrastructure and over the years and due to technological advancements in commercial vehicle segments, there is a shift from 2 Axle /3 Axle trucks to MAVs.

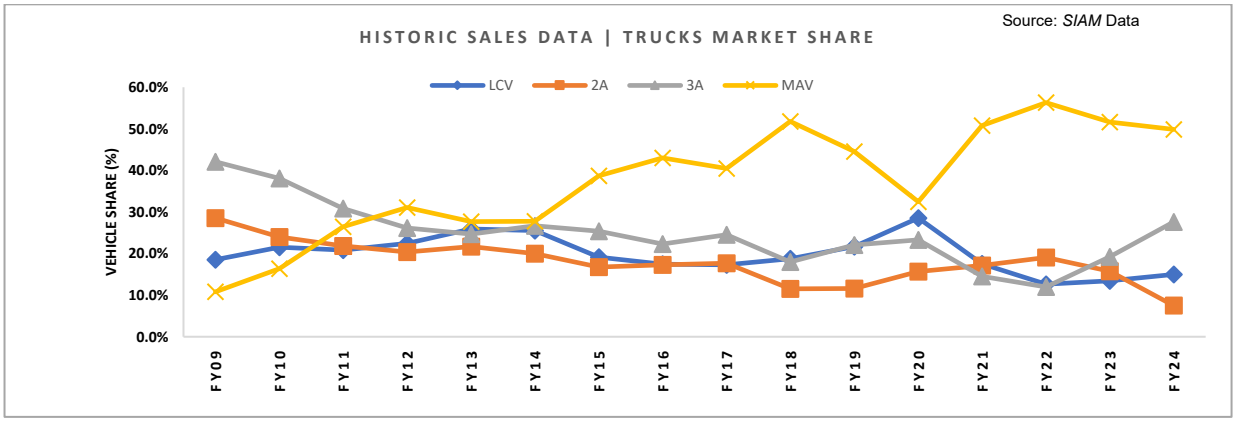


Figure 6-4: Market Share between Commercial Truck Categories

6.4 Traffic Growth Drivers

Before going to the traffic growth estimation through the established relation between economic variables and traffic variables, it is prudent to highlight the growth profile of the project corridor in terms of the geographic location and local economic growth potential. The table below summarises the major growth prospects for the traffic in the future on the project road.

Table 6-9: List of Developments in the PIA-Growth Driver

SL. NO	DEVELOPMENTS	DESCRIPTION	IMPACT TYPE
1	Coal Mines	The Raipur-Bilaspur section is a vital corridor influenced by the coal mining industry, with major coalfields such as Gevra, Dipka, Kusmunda, and Mand-Raigarh located nearby. These coal mines collectively produce over 150 million tonnes of coal annually, supporting power plants and industries across the country. The industrial activity from these mines generates substantial freight traffic, with hundreds of trucks and rail shipments daily, positioning this road as a critical backbone for regional economic growth and logistics.	Growth Driver
2	Cement Industries	The Raipur-Bilaspur Road section is a critical corridor for the cement industry, with prominent plants such as those operated by Ultratech Cement, Ambuja Cement, ACC Cement, and Shree Cement located in and around this region. These plants collectively contribute to over 15 million tonnes of cement production annually, catering to infrastructure and construction demands	Growth Driver

SL. NO	DEVELOPMENTS	DESCRIPTION	IMPACT TYPE
		across central and eastern India. This industrial activity generates substantial freight movement, with hundreds of trucks transporting raw materials and finished products daily, making this road a key driver of regional economic growth and logistics.	
3	Steel Industries	The Raipur-Bilaspur Road section is a crucial corridor for the steel industry, hosting major steel plants such as Jindal Steel and Power (Raigarh), SAIL's Bhilai Steel Plant, and several sponge iron units in Raipur. These facilities collectively produce over 20 million tonnes of steel annually, supplying construction, automotive, and industrial sectors across India. The industry generates significant freight movement, with hundreds of trucks and rail shipments transporting raw materials like iron ore and finished steel products daily, reinforcing the road's importance as a driver of industrial and economic growth in the region.	Growth Driver
5	Flyash Depositions	The Raipur-Bilaspur Road section is a key corridor for fly ash transportation, with several thermal power plants in the region, such as Korba, Sipat, and Tamnar, generating over 30 million tonnes of fly ash annually. This byproduct is widely utilized in cement manufacturing, brick production, and infrastructure projects, leading to substantial freight movement along the route. The steady demand for fly ash in construction and industrial sectors positions this road as an essential link for efficient resource utilization and economic activity in the region.	Growth Driver
6	Cement Sector	Ambuja Cement: Rs. 1,600 crore investment in Nawada for a 6 MTPA unit, creating 250 direct and 1,000 indirect jobs by December 2025. - Shree Cement: Rs. 2,000 crore (USD 240 million) for capacity expansion. - Ramco Cements: Rs. 1,403 crores to double Andhra Pradesh capacity and install	Future growth driver

SL. NO	DEVELOPMENTS	DESCRIPTION	IMPACT TYPE
		a 10 MW waste heat recovery system by FY26. - UltraTech Cement: Rs. 32,400 crores for 200 MTPA capacity expansion. - ACC & Adani Group: Introduced "Bagcrete" and launched a Concrete R&D facility. - Dalmia Cement: Launched Dalmia Supreme Cement in Eastern India.	

6.5 Transport Demand Elasticity

An Econometric method is proposed for forecasting future traffic trend based on elasticity which considers transport demand and most likely pattern of economic growth. The Elasticity Method relates traffic growth to changes in the related economic parameters. To calculate elasticity for various modes mode-wise impact of project influence area on project stretch is calculated which further useful in getting weighted GSDP values for project area. Based on individual state GDP and their mode-wise weight, weighted statistics for State GDP, registered number of vehicles, per capita income and other parameters were calculated for all the previous years. Elasticities were estimated based on regression analysis between registered vehicles & Historic AADT and all economic parameters. From the statistical significance and observations from major highways the elasticities are moderated for the base year. Base year elasticity serves as a base for moderating elasticities for the horizon years.

Plaza wise Elasticity values for each mode is estimated using the past vehicle registration data, past traffic trend with the GSDP, PCI, Population and tonnage are shown in below table.

Table 6-10: Elasticity values – Complete statistical analysis

VEHICLE TYPE	DEPENDENT VARIABLE	INDEPENDENT VARIABLE	ELASTICITY		
			TP1 – Tarapongi	TP 2- Bhojpuree	TP 3- Mudhipar
Car	Registered Vehicles	PCI	**2.23**	**2.26**	**2.23**
Car	Registered Vehicles	GSDP	**1.75**	**1.77**	**1.76**
Car	Registered Vehicles	GSDP Tertiary sector	**2.04**	**2.07**	**2.01**
Bus	Registered Vehicles	PCI	**1.58**	**1.53**	**1.58**
Bus	Registered Vehicles	GSDP	**1.24**	**1.21**	**1.23**
Bus	Registered Vehicles	Population	**5.48**	**5.28**	**5.45**
Trucks	Registered Vehicles	GSDP	**1.14**	**1.15**	**1.18**
Trucks	Registered Vehicles	Secondary Sector GSDP	**0.87**	**0.89**	**0.96**

Elasticity values obtained from Reg vehicles are adopted for car & bus and trucks, average elasticity value obtained from the similar projects which is again moderated is considered for the traffic projections. Moderated elasticities are shown in below table.

Table 6-11: Moderated Elasticity Values for All TPs

VEHICLE TYPE	DEPENDENT VARIABLE	INDEPENDENT VARIABLE	Tarapongi TP	Bhojpuri TP	Mudhipar TP
Car	Reg Veh	PCI	**1.20**	**1.20**	**1.20**
Buses		GSDP	**0.50**	**0.50**	**0.50**
Trucks		GSDP	**0.90**	**0.90**	**0.90**

Generally, the spread of economic development induces changes in the spatial distribution of activities and corresponding changes in transport demand elasticity. As regions become more self-sufficient, the need for long-distance transport diminishes. Accordingly, it was assumed that transport demand elasticity, for both freight and passenger traffic, would tend to decline over time, despite growth in per capita income.

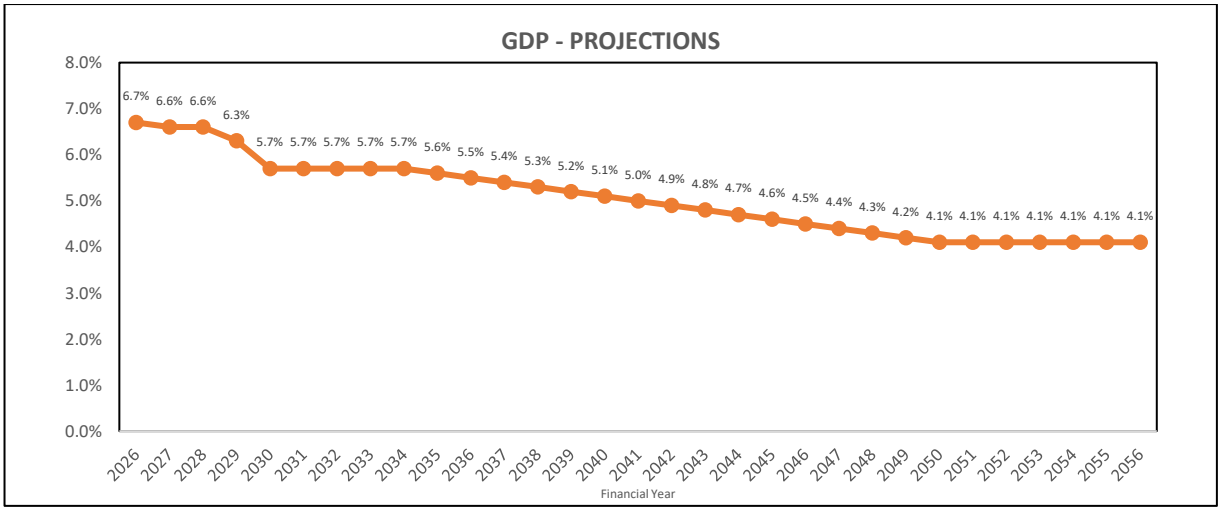
Table 6-12: Moderated Future Elasticity Values for Car, Bus, and Trucks for All TPs

REGRESSION ANALYSIS - FUTURE ELASTICITIES				
VEHICLE TYPE	FY	Tarapongi (TP 1)	Bhojpuree (TP 2)	Mudhipar (TP3)
Car	**FY 26 – FY 30**	1.20	1.20	1.20
	FY 31 – FY 35	1.14	1.14	1.14
	FY 36 – FY 40	1.08	1.08	1.08
	FY 41 – FY 45	1.03	1.03	1.03
	FY 46 – FY 50	1.00	1.00	1.00
	FY 51 – FY 55	1.00	1.00	1.00
Bus	**FY 26 – FY 30**	0.50	0.50	0.50
	FY 31 – FY 35	0.48	0.48	0.48
	FY 36 – FY 40	0.45	0.45	0.45
	FY 41 – FY 45	0.43	0.43	0.43
	FY 46 – FY 50	0.41	0.40	0.40
	FY 51 – FY 55	0.40	0.40	0.40
Trucks [GDP]	**FY 26 – FY 30**	0.90	0.90	0.90
	FY 31 – FY 35	0.86	0.86	0.86
	FY 36 – FY 40	0.81	0.81	0.81
	FY 41 – FY 45	0.77	0.77	0.77
	FY 46 – FY 50	0.73	0.70	0.70
	FY 51 – FY 55	0.70	0.66	0.66

6.6 Future Growth of PIA

The economic impact of the 2020 coronavirus pandemic in India has been largely disruptive. The World Bank and other rating agencies had initially downgraded India's growth for fiscal year 2021 with the lowest figures India has seen in three decades since India's economic liberalization in the 1990s.

The consultant has adopted the consensus GDP provided by client for Future years. The Consultant has established a relationship between the GDP growth of India and the growth in GSDP of PIA. The same past relationship has moderated and applied to PIA states for the future GSDP Projections. The projected values of GDP of India and GSDP of PIA zones considered for the analysis is provided in the table below.



Source: Consensus GDP.

Figure 6-5: GDP Projections of India – Scenario Wise

6.7 Projected Traffic Growth Rates – Normal

The upcoming network improvements in the Raipur-Bilaspur region, including the development of multiple economic corridors and expressways, are expected to have a significant impact on traffic growth rates.

1. Raipur – Dhanbad Economic Corridor (700 km): A proposed/under-construction 6L & 4L expressway, improving connectivity between Raipur, Ranchi, and Dhanbad, linking to the Kolkata – Varanasi Expressway.
2. Hyderabad – Raipur Economic Corridor (530 km): A proposed Greenfield/Brownfield expressway, enhancing travel between Hyderabad and Raipur.
3. Visakhapatnam – Raipur Expressway (460 km): A 6-lane access-controlled expressway under construction, connecting Visakhapatnam Port with Raipur.
4. Nagpur – Vijayawada Economic Corridor (405 km): A 4-lane expressway under construction, linking Nagpur, Telangana, and Andhra Pradesh.

The following figure shows the future road network improvements around the project corridor.

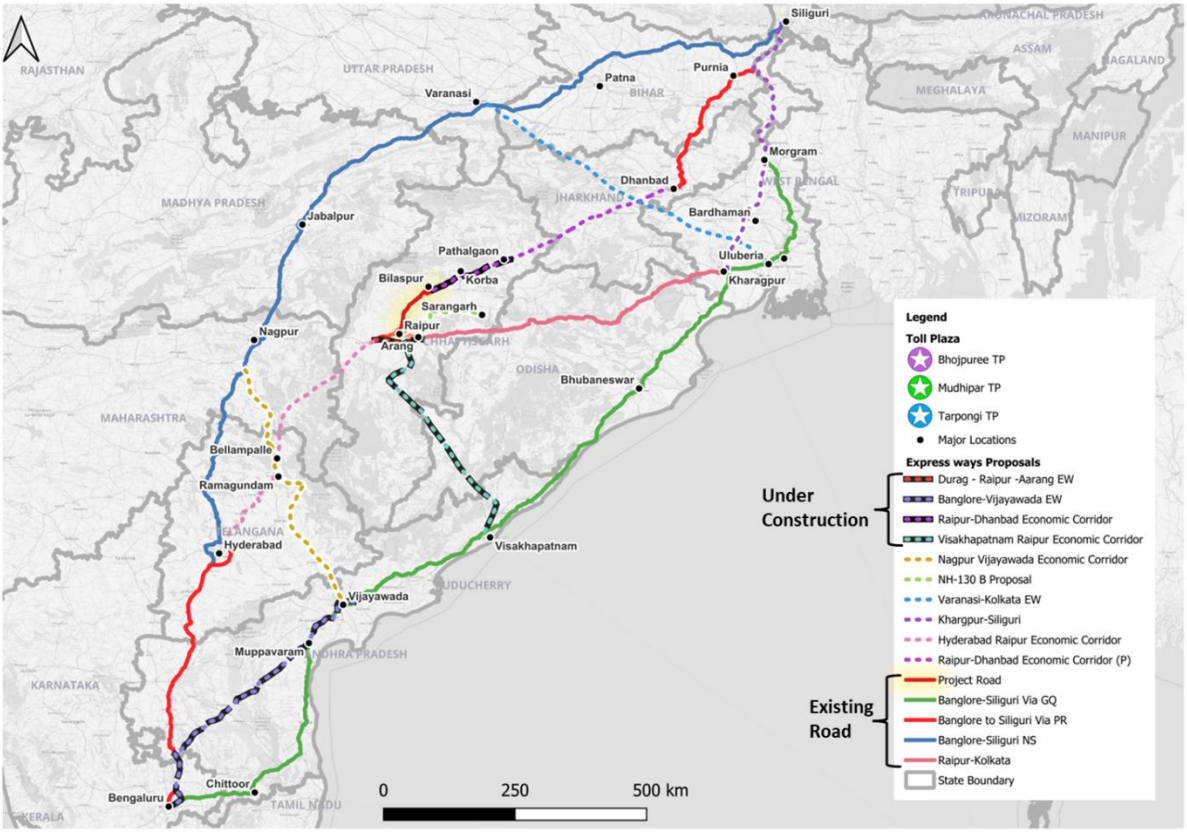


Figure 6-6 Future Road network Improvements around the Project corridor

Based on the projected elasticity values for TP 01 TP 02 and TP 03 the growth of PIA, the future average annual compound traffic growth rates by vehicle type have been estimated.

The traffic growth for the of most likely scenario is estimated and are presented in the following tables.

6.7.1 Traffic Growth Rates: TP 01 – Tarapongi

The section illustrates the Normal traffic Growth rates for Tarapongi Toll Plaza for Most Likely scenario.

Table 6-13: Normal Traffic Growth Rates for Toll Plaza 01 – Tarapongi – Most Likely

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
2026	7.2%	3.6%	3.6%	4.0%	5.7%	3.5%	6.4%
2027	7.2%	3.5%	3.5%	3.9%	5.6%	3.4%	6.3%
2028	7.2%	3.5%	3.5%	3.9%	5.6%	3.4%	6.3%
2029	6.9%	3.3%	3.3%	3.6%	5.3%	3.1%	6.0%
2030	6.1%	3.0%	3.0%	3.1%	4.8%	2.6%	5.4%
2031	5.9%	2.9%	2.9%	2.9%	4.1%	2.6%	5.2%
2032	5.9%	2.9%	2.9%	2.9%	4.1%	2.6%	5.2%
2033	5.9%	2.9%	2.9%	2.9%	4.1%	2.6%	5.2%
2034	6.0%	2.9%	2.9%	2.9%	4.1%	2.6%	5.2%
2035	5.8%	2.8%	2.8%	2.9%	4.1%	2.5%	5.1%
2036	5.4%	2.6%	2.6%	2.9%	4.1%	2.4%	4.9%
2037	5.0%	2.6%	2.6%	2.8%	4.0%	2.4%	4.8%
2038	4.9%	2.5%	2.5%	2.7%	3.9%	2.3%	4.7%
2039	4.8%	2.5%	2.5%	2.6%	3.9%	2.2%	4.6%
2040	4.7%	2.4%	2.4%	2.5%	3.8%	2.1%	4.5%
2041	4.3%	2.3%	2.3%	2.2%	3.5%	1.8%	4.2%
2042	4.2%	2.2%	2.2%	2.1%	3.4%	1.7%	4.1%
2043	4.1%	2.2%	2.2%	2.1%	3.3%	1.7%	4.0%
2044	4.0%	2.1%	2.1%	2.0%	3.2%	1.6%	3.9%
2045	3.9%	2.1%	2.1%	1.9%	3.2%	1.5%	3.9%
2046	3.7%	1.9%	1.9%	1.7%	2.8%	1.3%	3.5%
2047	3.6%	1.9%	1.9%	1.7%	2.7%	1.2%	3.5%
2048	3.5%	1.9%	1.9%	1.6%	2.6%	1.2%	3.4%

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
2049	3.4%	1.8%	1.8%	1.5%	2.5%	1.1%	3.3%
2050	3.3%	1.8%	1.8%	1.4%	2.5%	1.0%	3.2%
2051	3.3%	1.7%	1.7%	1.3%	2.3%	0.8%	3.1%
2052	3.3%	1.7%	1.7%	1.3%	2.3%	0.8%	3.1%
2053	3.3%	1.7%	1.7%	1.3%	2.3%	0.9%	3.1%
2054	3.3%	1.7%	1.7%	1.3%	2.3%	0.9%	3.1%
2055	3.3%	1.7%	1.7%	1.3%	2.3%	0.9%	3.1%
2056	3.3%	1.7%	1.7%	1.1%	2.2%	0.7%	3.0%

6.7.2 Traffic Growth Rates: TP 02 – Bhojpuree

The section illustrates the Normal traffic Growth rates for Bhojpuree Toll Plaza for Most Likely scenario.

Table 6-14: Normal Traffic Growth Rates for Toll Plaza 02 – Bhojpuree – Most Likely

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
2026	7.2%	3.5%	3.5%	3.5%	5.5%	2.7%	6.5%
2027	7.2%	3.5%	3.5%	3.4%	5.4%	2.6%	6.4%
2028	7.2%	3.5%	3.5%	3.5%	5.4%	2.6%	6.4%
2029	6.9%	3.3%	3.3%	3.2%	5.1%	2.3%	6.1%
2030	6.1%	3.0%	3.0%	2.6%	4.6%	1.8%	5.5%
2031	5.9%	2.9%	2.9%	2.5%	3.9%	1.7%	5.0%
2032	5.9%	2.9%	2.9%	2.5%	3.9%	1.7%	5.0%
2033	5.9%	2.9%	2.9%	2.5%	3.9%	1.7%	5.0%
2034	6.0%	2.9%	2.9%	2.5%	3.9%	1.7%	5.0%
2035	5.8%	2.8%	2.8%	2.4%	3.8%	1.7%	4.9%
2036	5.4%	2.6%	2.6%	2.4%	3.9%	1.8%	4.7%
2037	5.0%	2.6%	2.6%	2.3%	3.8%	1.7%	4.6%
2038	4.9%	2.5%	2.5%	2.2%	3.8%	1.6%	4.5%
2039	4.8%	2.5%	2.5%	2.2%	3.7%	1.6%	4.5%

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
2040	4.7%	2.4%	2.4%	2.1%	3.6%	1.5%	4.4%
2041	4.3%	2.3%	2.3%	1.8%	3.3%	1.2%	4.1%
2042	4.2%	2.2%	2.2%	1.7%	3.2%	1.1%	4.0%
2043	4.1%	2.2%	2.2%	1.6%	3.1%	1.0%	3.9%
2044	4.0%	2.1%	2.1%	1.6%	3.1%	1.0%	3.8%
2045	3.9%	2.1%	2.1%	1.5%	3.0%	0.9%	3.7%
2046	3.7%	1.9%	1.9%	1.2%	2.6%	0.8%	3.5%
2047	3.6%	1.9%	1.9%	1.2%	2.5%	0.7%	3.4%
2048	3.5%	1.9%	1.9%	1.1%	2.4%	0.6%	3.3%
2049	3.4%	1.8%	1.8%	1.0%	2.4%	0.6%	3.3%
2050	3.2%	1.8%	1.8%	0.9%	2.3%	0.5%	3.2%
2051	3.2%	1.7%	1.7%	0.8%	2.1%	0.3%	3.0%
2052	3.2%	1.7%	1.7%	0.8%	2.1%	0.3%	3.0%
2053	3.2%	1.7%	1.7%	0.8%	2.1%	0.3%	3.0%
2054	3.2%	1.7%	1.7%	0.8%	2.1%	0.3%	3.0%
2055	3.2%	1.7%	1.7%	0.8%	2.1%	0.3%	3.0%
2056	3.2%	1.7%	1.7%	0.8%	2.2%	0.4%	2.8%

6.7.3 Traffic Growth Rates: TP 03 – Mudhipar

The section illustrates the Normal traffic Growth rates for Bhojpuree Toll Plaza for Most Likely scenario.

Table 6-15: Normal Traffic Growth Rates for Toll Plaza 03 – Mudhipar – Most Likely

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
2026	6.6%	3.3%	3.3%	3.0%	4.9%	1.7%	6.0%
2027	6.7%	3.3%	3.3%	3.0%	5.0%	1.7%	6.0%
2028	6.4%	3.2%	3.2%	2.7%	4.7%	1.5%	5.7%
2029	6.5%	3.2%	3.2%	2.7%	4.7%	1.5%	5.7%
2030	6.5%	3.2%	3.2%	2.8%	4.7%	1.5%	5.7%

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
2031	5.9%	2.9%	2.9%	2.7%	3.8%	1.1%	5.0%
2032	6.0%	2.9%	2.9%	2.7%	3.8%	1.1%	5.0%
2033	6.0%	2.9%	2.9%	2.7%	3.8%	1.2%	5.0%
2034	6.0%	2.9%	2.9%	2.7%	3.8%	1.2%	5.0%
2035	6.0%	2.9%	2.9%	2.7%	3.8%	1.2%	5.0%
2036	5.1%	2.5%	2.5%	2.6%	3.6%	0.9%	4.4%
2037	4.8%	2.5%	2.5%	2.6%	3.6%	0.9%	4.4%
2038	4.8%	2.5%	2.5%	2.6%	3.6%	0.9%	4.4%
2039	4.8%	2.5%	2.5%	2.6%	3.6%	0.9%	4.4%
2040	4.8%	2.5%	2.5%	2.6%	3.6%	0.9%	4.4%
2041	4.0%	2.2%	2.2%	2.0%	3.0%	0.3%	3.8%
2042	4.0%	2.2%	2.2%	2.0%	3.0%	0.3%	3.8%
2043	4.0%	2.2%	2.2%	2.0%	3.0%	0.3%	3.8%
2044	4.0%	2.2%	2.2%	2.0%	3.0%	0.3%	3.8%
2045	4.0%	2.2%	2.2%	2.0%	3.0%	0.3%	3.8%
2046	3.4%	1.8%	1.8%	1.5%	2.3%	0.3%	3.3%
2047	3.4%	1.8%	1.8%	1.5%	2.3%	0.3%	3.3%
2048	3.4%	1.8%	1.8%	1.5%	2.3%	0.3%	3.3%
2049	3.4%	1.8%	1.8%	1.5%	2.3%	0.3%	3.3%
2050	3.4%	1.8%	1.8%	1.5%	2.3%	0.3%	3.3%
2051	3.4%	1.8%	1.8%	1.4%	2.1%	0.2%	3.1%
2052	3.4%	1.8%	1.8%	1.4%	2.1%	0.2%	3.1%
2053	3.4%	1.8%	1.8%	1.4%	2.1%	0.2%	3.1%
2054	3.4%	1.8%	1.8%	1.4%	2.1%	0.2%	3.1%
2055	3.4%	1.8%	1.8%	1.4%	2.1%	0.2%	3.1%
2056	3.4%	1.8%	1.8%	1.4%	2.0%	0.1%	2.9%

6.8 Projected Traffic Growth Rates – Effective

There are some developments in road and land use pattern surrounding project stretch which were detailed in the "diversion & Development Traffic Impact Assessment" chapter. Effective traffic growth rates include the normal traffic projections and the impacts of diversions and developments in the PIA which are detailed in the chapter "Diversion and Development Traffic Impact Assessment". Considering the significance of the effective growth rates, the future traffic projections and associated toll revenue estimations are provided in the next chapter "Traffic and Toll Revenue Forecast."

6.8.1 Traffic Growth Rates: TP 01 – Tarapongi

The section illustrates the Effective traffic Growth rates for Tarapongi Toll Plaza for Most Likely scenario.

Table 6-16: Effective Traffic Growth Rates for Toll Plaza 01 – Tarapongi – Most Likely

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
2026	7.2%	3.6%	3.6%	4.0%	5.7%	3.5%	6.4%
2027	7.2%	3.5%	3.5%	3.9%	5.6%	3.4%	6.3%
2028	7.2%	3.5%	3.5%	3.9%	5.6%	3.4%	6.3%
2029	6.9%	3.3%	3.3%	3.6%	5.3%	3.1%	6.0%
2030	6.1%	3.0%	3.0%	3.1%	4.8%	2.6%	5.4%
2031	5.9%	2.9%	2.9%	2.9%	4.1%	2.6%	5.2%
2032	5.3%	1.2%	2.4%	1.9%	3.0%	1.4%	3.2%
2033	5.3%	1.2%	2.4%	1.9%	3.0%	1.4%	3.1%
2034	6.0%	2.9%	2.9%	2.9%	4.1%	2.6%	5.2%
2035	5.8%	2.8%	2.8%	2.9%	4.1%	2.5%	5.1%
2036	5.4%	2.6%	2.6%	2.9%	4.1%	2.4%	4.9%
2037	5.0%	2.6%	2.6%	2.8%	4.0%	2.4%	4.8%
2038	4.9%	2.5%	2.5%	2.7%	3.9%	2.3%	4.7%
2039	4.8%	2.5%	2.5%	2.6%	3.9%	2.2%	4.6%
2040	4.7%	2.4%	2.4%	2.5%	3.8%	2.1%	4.5%
2041	4.3%	2.3%	2.3%	2.2%	3.5%	1.8%	4.2%
2042	4.2%	2.2%	2.2%	2.1%	3.4%	1.7%	4.1%

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
2043	4.1%	2.2%	2.2%	2.1%	3.3%	1.7%	4.0%
2044	4.0%	2.1%	2.1%	2.0%	3.2%	1.6%	3.9%
2045	3.9%	2.1%	2.1%	1.9%	3.2%	1.5%	3.9%
2046	3.7%	1.9%	1.9%	1.7%	2.8%	1.3%	3.5%
2047	3.6%	1.9%	1.9%	1.7%	2.7%	1.2%	3.5%
2048	3.5%	1.9%	1.9%	1.6%	2.6%	1.2%	3.4%
2049	3.4%	1.8%	1.8%	1.5%	2.5%	1.1%	3.3%
2050	3.3%	1.8%	1.8%	1.4%	2.5%	1.0%	3.2%
2051	3.3%	1.7%	1.7%	1.3%	2.3%	0.8%	3.1%
2052	3.3%	1.7%	1.7%	1.3%	2.3%	0.8%	3.1%
2053	3.3%	1.7%	1.7%	1.3%	2.3%	0.9%	3.1%
2054	3.3%	1.7%	1.7%	1.3%	2.3%	0.9%	3.1%
2055	3.3%	1.7%	1.7%	1.3%	2.3%	0.9%	3.1%
2056	3.3%	1.7%	1.7%	1.1%	2.2%	0.7%	3.0%

6.8.2 Traffic Growth Rates: TP 02 – Bhojpuree

The section illustrates the Effective traffic Growth rates for Bhojpuree Toll Plaza for Most Likely scenario.

Table 6-17: Effective Traffic Growth Rates for Toll Plaza 02 – Bhojpuree – Most Likely

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
2026	7.2%	3.5%	3.5%	3.5%	5.5%	2.7%	6.5%
2027	7.2%	3.5%	3.5%	3.4%	5.4%	2.6%	6.4%
2028	7.2%	3.5%	3.5%	3.5%	5.4%	2.6%	6.4%
2029	6.9%	3.3%	3.3%	3.2%	5.1%	2.3%	6.1%
2030	6.1%	3.0%	3.0%	2.6%	4.6%	1.8%	5.5%
2031	5.9%	2.9%	2.9%	2.5%	3.9%	1.7%	5.0%
2032	5.2%	1.5%	2.2%	1.4%	2.4%	-0.3%	3.0%
2033	5.2%	1.5%	2.2%	1.4%	2.4%	-0.3%	3.0%

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
2034	6.0%	2.9%	2.9%	2.5%	3.9%	1.7%	5.0%
2035	5.8%	2.8%	2.8%	2.4%	3.8%	1.7%	4.9%
2036	5.4%	2.6%	2.6%	2.4%	3.9%	1.8%	4.7%
2037	5.0%	2.6%	2.6%	2.3%	3.8%	1.7%	4.6%
2038	4.9%	2.5%	2.5%	2.2%	3.8%	1.6%	4.5%
2039	4.8%	2.5%	2.5%	2.2%	3.7%	1.6%	4.5%
2040	4.7%	2.4%	2.4%	2.1%	3.6%	1.5%	4.4%
2041	4.3%	2.3%	2.3%	1.8%	3.3%	1.2%	4.1%
2042	4.2%	2.2%	2.2%	1.7%	3.2%	1.1%	4.0%
2043	4.1%	2.2%	2.2%	1.6%	3.1%	1.0%	3.9%
2044	4.0%	2.1%	2.1%	1.6%	3.1%	1.0%	3.8%
2045	3.9%	2.1%	2.1%	1.5%	3.0%	0.9%	3.7%
2046	3.7%	1.9%	1.9%	1.2%	2.6%	0.8%	3.5%
2047	3.6%	1.9%	1.9%	1.2%	2.5%	0.7%	3.4%
2048	3.5%	1.9%	1.9%	1.1%	2.4%	0.6%	3.3%
2049	3.4%	1.8%	1.8%	1.0%	2.4%	0.6%	3.3%
2050	3.2%	1.8%	1.8%	0.9%	2.3%	0.5%	3.2%
2051	3.2%	1.7%	1.7%	0.8%	2.1%	0.3%	3.0%
2052	3.2%	1.7%	1.7%	0.8%	2.1%	0.3%	3.0%
2053	3.2%	1.7%	1.7%	0.8%	2.1%	0.3%	3.0%
2054	3.3%	1.7%	1.7%	0.8%	2.1%	0.3%	3.0%
2055	3.3%	1.7%	1.7%	0.8%	2.1%	0.3%	3.0%
2056	3.2%	1.7%	1.7%	0.8%	2.2%	0.4%	2.8%

6.8.3 Traffic Growth Rates: TP 03 – Mudhipar

The section illustrates the Effective traffic Growth rates for Bhojpuree Toll Plaza for Most Likely scenario.

Table 6-18: Effective Traffic Growth Rates for Toll Plaza 03 – Mudhipar – Most Likely

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
2026	6.6%	3.3%	3.3%	3.0%	4.9%	1.7%	6.0%
2027	25.8%	3.3%	46.9%	17.5%	6.1%	6.5%	11.5%
2028	22.8%	3.2%	33.9%	15.6%	5.9%	6.1%	11.0%
2029	6.6%	3.2%	3.2%	2.8%	4.7%	1.5%	5.8%
2030	6.6%	3.2%	3.3%	2.8%	4.8%	1.5%	5.7%
2031	6.0%	2.9%	3.0%	2.8%	3.8%	1.2%	5.0%
2032	5.1%	-9.5%	-15.9%	12.0%	1.0%	-5.6%	4.8%
2033	5.1%	-11.2%	-20.1%	11.3%	0.9%	-6.1%	4.8%
2034	6.0%	2.9%	3.0%	2.7%	3.8%	1.2%	5.0%
2035	6.0%	2.9%	3.0%	2.7%	3.8%	1.2%	5.1%
2036	5.2%	2.5%	2.7%	2.6%	3.7%	0.9%	4.5%
2037	4.8%	2.5%	2.7%	2.6%	3.7%	1.0%	4.5%
2038	4.8%	2.5%	2.6%	2.6%	3.6%	1.0%	4.5%
2039	4.8%	2.5%	2.6%	2.6%	3.6%	1.0%	4.5%
2040	4.8%	2.5%	2.6%	2.7%	3.6%	1.0%	4.5%
2041	4.1%	2.2%	2.3%	2.1%	3.1%	0.4%	3.9%
2042	4.1%	2.2%	2.2%	2.0%	3.0%	0.4%	3.9%
2043	4.1%	2.2%	2.2%	2.0%	3.0%	0.4%	3.9%
2044	4.1%	2.2%	2.2%	2.0%	3.0%	0.4%	3.9%
2045	4.1%	2.2%	2.3%	2.0%	3.0%	0.4%	3.9%
2046	3.5%	1.8%	1.9%	1.6%	2.3%	0.4%	3.3%
2047	3.4%	1.8%	1.9%	1.6%	2.3%	0.4%	3.3%
2048	3.4%	1.9%	1.9%	1.5%	2.3%	0.4%	3.3%
2049	3.4%	1.9%	1.9%	1.6%	2.3%	0.4%	3.3%
2050	3.4%	1.9%	1.9%	1.6%	2.3%	0.4%	3.3%
2051	3.4%	1.8%	1.9%	1.4%	2.2%	0.2%	3.1%
2052	3.4%	1.8%	1.9%	1.4%	2.2%	0.2%	3.1%

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV
2053	3.5%	1.8%	1.9%	1.4%	2.2%	0.2%	3.1%
2054	3.5%	1.8%	1.9%	1.4%	2.2%	0.2%	3.1%
2055	3.4%	1.8%	1.9%	1.4%	2.2%	0.2%	3.1%
2056	3.4%	1.8%	1.9%	1.4%	2.0%	0.2%	2.9%

CHAPTER 7

Traffic and Toll Revenue Forecast

7. Traffic & Toll Revenue Forecast

7.1 General

This chapter presents estimates of total traffic for all the two toll plazas of project corridor with Most likely scenario as explained in previous chapter. Normal traffic projections arrived by applying the traffic growth rates on the base year traffic. Effective traffic projection arrived by considering the future adjustments in the form of diversions and developments detailed in the Chapter “Diversion and Development Traffic Impact assessment” in overall traffic growth estimate.

7.2 Effective Traffic Projections at Tarapongi (TP 1)

Effective traffic projections include the impact of road network improvement and land developments (if any). Traffic beyond year FY 2025 is summaries based on effective traffic growth rates and base year AADT. Mode wise traffic projection for Most likely Scenario for all the horizon years for Tarapongi (TP 1) are estimated and effective future traffic is as shown in below table.

Table 7-1: Effective Future Traffic (AADT): Tarapongi (TP 1) – Most Likely

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV	Total Veh	PCU
2025	9,701	11	488	486	760	445	3,923	15,818	33,195
2026	10,402	12	506	506	804	460	4,173	16,865	35,279
2027	11,152	12	523	526	849	476	4,435	17,976	37,475
2028	11,958	13	542	546	897	492	4,714	19,164	39,813
2029	12,779	13	560	566	945	508	4,996	20,369	42,181
2030	13,560	14	577	583	990	521	5,267	21,514	44,434
2031	14,354	14	593	600	1,031	534	5,543	22,673	46,711
2032	15,120	14	608	612	1,061	542	5,718	23,679	48,441
2033	15,927	14	623	624	1,093	550	5,896	24,731	50,231
2034	16,876	15	640	642	1,138	564	6,205	26,085	52,831
2035	17,862	15	659	661	1,185	578	6,525	27,488	55,519
2036	18,834	15	676	680	1,233	592	6,842	28,876	58,186
2037	19,777	16	693	698	1,283	606	7,167	30,245	60,869
2038	20,744	16	711	717	1,334	620	7,503	31,649	63,620
2039	21,736	17	729	736	1,385	633	7,847	33,087	66,439
2040	22,749	17	747	754	1,437	646	8,200	34,557	69,322
2041	23,733	17	763	771	1,487	658	8,544	35,980	72,116
2042	24,734	18	781	788	1,538	670	8,896	37,428	74,961
2043	25,749	18	798	804	1,589	681	9,254	38,898	77,853
2044	26,779	19	815	820	1,640	691	9,619	40,389	80,788
2045	27,820	19	832	836	1,692	702	9,990	41,897	83,764
2046	28,843	19	848	850	1,739	711	10,344	43,360	86,616
2047	29,873	20	864	864	1,786	720	10,701	44,835	89,494
2048	30,909	20	880	878	1,833	728	11,063	46,317	92,392
2049	31,947	20	896	891	1,880	736	11,428	47,805	95,308
2050	32,987	21	912	904	1,926	743	11,796	49,297	98,235
2051	34,061	21	928	915	1,970	749	12,158	50,810	1,01,153

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV	Total Veh	PCU
2052	35,170	22	944	927	2,016	756	12,530	52,372	1,04,160
2053	36,315	22	960	938	2,063	762	12,913	53,982	1,07,259
2054	37,498	22	977	950	2,110	769	13,308	55,644	1,10,452
2055	38,719	23	994	963	2,159	775	13,716	57,358	1,13,744
2056	39,981	23	1,011	973	2,207	781	14,131	59,116	1,17,103

7.3 Effective Traffic Projections at Bhojpuree (TP 2)

Effective traffic projections include the impact of road network improvement and land developments (if any). Traffic beyond year FY 2025 is summaries based on effective traffic growth rates and base year AADT. Scenario wise and Mode wise traffic projection for all the horizon years for Bhojpuree (TP 2) are estimated and effective future traffic is shown in below table.

Table 7-2: Effective Future Traffic (AADT): Bhojpuree (TP 2) – Most Likely

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV	Total Veh	PCU
2025	8,075	15	404	442	691	250	4,186	14,065	31,644
2026	8,658	15	419	458	729	256	4,457	14,995	33,648
2027	9,284	16	433	474	769	263	4,741	15,981	35,759
2028	9,955	16	448	490	810	270	5,043	17,036	38,006
2029	10,639	17	463	506	852	276	5,350	18,106	40,285
2030	11,289	17	477	519	891	281	5,646	19,124	42,461
2031	11,951	18	491	532	926	286	5,929	20,135	44,576
2032	12,574	18	502	539	948	285	6,107	20,976	46,109
2033	13,229	18	513	547	970	284	6,288	21,852	47,689
2034	14,017	19	528	560	1,008	289	6,603	23,028	50,091
2035	14,836	19	543	573	1,046	294	6,929	24,245	52,572
2036	15,644	20	557	587	1,087	299	7,255	25,454	55,052
2037	16,427	20	571	601	1,129	304	7,591	26,648	57,550
2038	17,230	21	586	614	1,172	309	7,935	27,871	60,110

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV	Total Veh	PCU
2039	18,053	21	600	628	1,215	314	8,288	29,124	62,733
2040	18,894	22	615	641	1,259	319	8,650	30,404	65,413
2041	19,710	22	629	652	1,300	323	9,002	31,644	68,010
2042	20,540	23	643	663	1,342	326	9,361	32,904	70,653
2043	21,383	23	657	674	1,384	330	9,727	34,184	73,337
2044	22,237	24	671	684	1,427	333	10,099	35,481	76,062
2045	23,101	24	685	695	1,469	336	10,477	36,793	78,823
2046	23,949	25	698	703	1,507	339	10,843	38,070	81,492
2047	24,803	25	712	711	1,545	341	11,213	39,356	84,187
2048	25,661	26	725	719	1,583	343	11,587	40,650	86,900
2049	26,522	26	738	726	1,620	345	11,964	41,949	89,630
2050	27,383	27	751	733	1,657	347	12,345	43,250	92,372
2051	28,273	27	764	739	1,693	348	12,718	44,569	95,100
2052	29,192	28	778	745	1,729	349	13,103	45,929	97,911
2053	30,140	28	791	751	1,766	350	13,499	47,332	1,00,806
2054	31,120	29	805	757	1,803	351	13,906	48,779	1,03,789
2055	32,131	29	819	763	1,842	352	14,326	50,270	1,06,862
2056	33,175	30	833	769	1,882	354	14,727	51,777	1,09,885

7.4 Effective Traffic Projections at Mudhipar (TP 3)

Effective traffic projections include the impact of road network improvement and land developments (if any). Traffic beyond year FY 2025 is summaries based on effective traffic growth rates and base year AADT. Scenario wise and Mode wise traffic projection for all the horizon years for Mudhipar (TP 3) are estimated and effective future traffic is shown in below table.

Table 7-3: Effective Future Traffic (AADT): Mudhipar (TP 3) – Most Likely

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV	Total Veh	PCU
2025	1,145	1	4	66	196	68	1,311	2,792	7,954
2026	1,221	1	4	68	206	69	1,389	2,959	8,418
2027	1,537	1	5	80	219	74	1,549	3,465	9,526
2028	1,886	1	7	92	231	78	1,718	4,016	10,716
2029	2,011	1	8	95	242	79	1,817	4,255	11,328
2030	2,143	1	8	97	254	81	1,922	4,507	11,973
2031	2,272	1	8	100	264	81	2,018	4,746	12,572
2032	2,389	1	7	112	266	77	2,115	4,969	13,133
2033	2,511	1	5	125	269	72	2,217	5,202	13,722
2034	2,662	1	6	128	279	73	2,328	5,479	14,415
2035	2,823	1	6	131	289	74	2,446	5,773	15,146
2036	2,968	1	6	135	300	75	2,556	6,044	15,828
2037	3,112	1	6	138	311	75	2,671	6,317	16,529
2038	3,262	1	6	142	322	76	2,792	6,604	17,265
2039	3,420	1	6	146	334	77	2,917	6,904	18,030
2040	3,585	1	7	150	346	78	3,047	7,217	18,830
2041	3,734	1	7	153	357	78	3,165	7,498	19,547
2042	3,888	1	7	156	368	78	3,288	7,789	20,292
2043	4,049	2	7	159	379	79	3,415	8,092	21,064
2044	4,215	2	7	162	390	79	3,548	8,406	21,870
2045	4,389	2	7	166	402	79	3,685	8,733	22,702

FY	Car	Minibus	Bus-2A	LCV	2 Axle Truck	3 Axle Truck	MAV	Total Veh	PCU
2046	4,541	2	7	168	412	79	3,807	9,020	23,437
2047	4,696	2	8	171	421	80	3,932	9,313	24,190
2048	4,857	2	8	173	431	80	4,062	9,617	24,972
2049	5,023	2	8	176	441	80	4,196	9,931	25,778
2050	5,195	2	8	179	451	81	4,335	10,254	26,609
2051	5,373	2	8	181	461	81	4,471	10,581	27,434
2052	5,557	2	8	184	471	81	4,611	10,919	28,287
2053	5,750	2	9	187	481	81	4,756	11,270	29,167
2054	5,949	2	9	189	491	81	4,905	11,632	30,074
2055	6,153	2	9	192	502	81	5,060	12,004	31,009
2056	6,364	2	9	195	512	82	5,208	12,376	31,923

7.5 Traffic Comparison for All TPS

The table below illustrates the traffic comparison in terms of Vehicles and PCUs for each toll plaza for Most Likely scenario. The average of all three toll plazas is also presented for the purpose of calculation of capacity of the project highway.

Table 7-4: Traffic comparison by Vehicles and PCU – Most Likely – TP 01

FINANCIAL YEAR	VEHICLES		PCU	
	Normal Traffic	Effective Traffic	Normal Traffic	Effective Traffic
2025	15,818	15,818	33,195	33,195
2026	16,865	16,865	35,279	35,279
2027	17,976	17,976	37,475	37,475
2028	19,164	19,164	39,813	39,813
2029	20,369	20,369	42,181	42,181
2030	21,514	21,514	44,434	44,434
2031	22,673	22,673	46,711	46,711
2032	23,908	23,679	49,119	48,441
2033	25,212	24,731	51,656	50,230
2034	26,591	26,085	54,329	52,831
2035	28,020	27,488	57,092	55,518
2036	29,435	28,876	59,833	58,186
2037	30,830	30,245	62,592	60,868
2038	32,261	31,649	65,422	63,619
2039	33,726	33,087	68,321	66,439
2040	35,223	34,557	71,286	69,322
2041	36,674	35,980	74,160	72,116
2042	38,149	37,428	77,086	74,960
2043	39,648	38,898	80,061	77,852
2044	41,167	40,388	83,080	80,787
2045	42,704	41,897	86,142	83,763
2046	44,195	43,360	89,076	86,615
2047	45,698	44,834	92,036	89,493
2048	47,208	46,317	95,017	92,391
2049	48,725	47,805	98,015	95,306
2050	50,244	49,296	1,01,026	98,232
2051	51,787	50,810	1,04,027	1,01,150
2052	53,378	52,371	1,07,119	1,04,157
2053	55,018	53,982	1,10,306	1,07,255
2054	56,711	55,643	1,13,590	1,10,449
2055	58,457	57,357	1,16,974	1,13,740
2056	60,248	59,116	1,20,429	1,17,100
CAGR (25-46)	**5.01%**	**4.92%**	**4.81%**	**4.67%**
CAGR (25-56)	**4.41%**	**4.34%**	**4.24%**	**4.15%**

- **At Tarapongi Toll Plaza, Normal Traffic (PCU) CAGR (FY 25-46) at Tarapongi TP is estimated to be 4.81% and the effective Traffic (PCU) observed CAGR of 4.67% over the concession period.**

- **Normal Traffic (PCU) CAGR (FY 25-56) at Tarapongi TP is estimated to be 4.24% and the effective Traffic (PCU) observed CAGR of 4.15% over the concession period.**

Table 7-5: Traffic comparison by Vehicles and PCU – Most Likely – TP 02

FINANCIAL YEAR	VEHICLES		PCU	
	Normal Traffic	Effective Traffic	Normal Traffic	Effective Traffic
2025	14,065	14,065	31,644	31,644
2026	14,995	14,995	33,648	33,648
2027	15,981	15,981	35,759	35,759
2028	17,036	17,036	38,006	38,006
2029	18,106	18,106	40,285	40,285
2030	19,124	19,124	42,461	42,461
2031	20,135	20,135	44,576	44,576
2032	21,211	20,975	46,810	46,108
2033	22,347	21,852	49,161	47,688
2034	23,548	23,028	51,636	50,091
2035	24,791	24,245	54,190	52,571
2036	26,026	25,454	56,745	55,051
2037	27,246	26,647	59,319	57,549
2038	28,496	27,871	61,958	60,110
2039	29,776	29,124	64,660	62,732
2040	31,084	30,404	67,422	65,412
2041	32,351	31,644	70,098	68,009
2042	33,639	32,904	72,820	70,652
2043	34,946	34,184	75,587	73,336
2044	36,271	35,480	78,395	76,061
2045	37,613	36,793	81,240	78,822
2046	38,917	38,069	83,992	81,491
2047	40,232	39,356	86,768	84,185
2048	41,554	40,650	89,564	86,899
2049	42,881	41,948	92,378	89,629
2050	44,211	43,250	95,203	92,370
2051	45,558	44,569	98,014	95,098
2052	46,948	45,929	1,00,909	97,908
2053	48,381	47,331	1,03,892	1,00,803
2054	49,858	48,778	1,06,965	1,03,786
2055	51,382	50,270	1,10,130	1,06,859
2056	52,920	51,776	1,13,243	1,09,881
CAGR (25-46)	**4.97%**	**4.86%**	**4.76%**	**4.61%**
CAGR (25-56)	**4.37%**	**4.29%**	**4.20%**	**4.10%**

- At Bhojpuree Toll Plaza, Normal Traffic (PCU) CAGR (FY 25-46) at Bhojpuri TP is estimated to be **4.76%** and the effective Traffic (PCU) observed CAGR of **4.61%** over the concession period.

- Normal Traffic (PCU) CAGR (FY 25-56) at Bhojpuri TP is estimated to be **4.20%** and the effective Traffic (PCU) observed CAGR of **4.10%** over the concession period.

Table 7-6: Traffic comparison by Vehicles and PCU – Most Likely – TP 03

FINANCIAL YEAR	VEHICLES		PCU	
	Normal Traffic	Effective Traffic	Normal Traffic	Effective Traffic
2025	2,792	2,792	7,954	7,954
2026	2,959	2,959	8,418	8,418
2027	3,138	3,466	8,911	9,528
2028	3,320	4,017	9,412	10,720
2029	3,513	4,256	9,941	11,332
2030	3,717	4,510	10,502	11,984
2031	3,909	4,748	11,019	12,582
2032	4,112	4,971	11,564	13,143
2033	4,327	5,204	12,137	13,732
2034	4,554	5,482	12,740	14,425
2035	4,793	5,775	13,374	15,156
2036	5,013	6,046	13,964	15,838
2037	5,237	6,319	14,574	16,538
2038	5,471	6,606	15,211	17,275
2039	5,716	6,906	15,877	18,039
2040	5,972	7,219	16,572	18,839
2041	6,198	7,501	17,191	19,559
2042	6,433	7,792	17,834	20,305
2043	6,677	8,095	18,501	21,079
2044	6,931	8,410	19,194	21,885
2045	7,195	8,737	19,913	22,719
2046	7,425	9,024	20,544	23,455
2047	7,663	9,317	21,196	24,208
2048	7,909	9,621	21,869	24,989
2049	8,163	9,934	22,563	25,794
2050	8,426	10,259	23,281	26,628
2051	8,689	10,585	23,990	27,452
2052	8,961	10,923	24,721	28,304
2053	9,242	11,273	25,475	29,183
2054	9,532	11,636	26,253	30,093
2055	9,831	12,008	27,055	31,028
2056	10,129	12,380	27,835	31,941
CAGR (25-46)	**4.77%**	**5.74%**	**4.62%**	**5.28%**
CAGR (25-56)	**4.24%**	**4.92%**	**4.12%**	**4.59%**

- At Mudhipar Toll Plaza, Normal Traffic (PCU) CAGR (FY 25-46) at Mudhipar TP is estimated to be **4.62%** and the effective Traffic (PCU) observed CAGR of **5.28%** over the concession period.
- Normal Traffic (PCU) CAGR (FY 25-56) at Mudhipar TP is estimated to be **4.12%** and the effective Traffic (PCU) observed CAGR of **4.58%** over the concession period.

Table 7-7: Traffic comparison by Vehicles and PCU – Most Likely – Overall Project

FINANCIAL YEAR	VEHICLES		PCU	
	Normal Traffic	Effective Traffic	Normal Traffic	Effective Traffic
2025	10,892	10,892	24,264	24,264
2026	11,606	11,606	25,782	25,782
2027	12,365	12,474	27,382	27,587
2028	13,173	13,405	29,077	29,512
2029	13,996	14,243	30,802	31,265
2030	14,785	15,048	32,465	32,956
2031	15,572	15,851	34,102	34,620
2032	16,410	16,541	35,831	35,894
2033	17,295	17,262	37,651	37,214
2034	18,231	18,197	39,568	39,113
2035	19,201	19,169	41,552	41,079
2036	20,158	20,124	43,514	43,022
2037	21,104	21,070	45,495	44,983
2038	22,076	22,042	47,530	46,999
2039	23,073	23,038	49,619	49,067
2040	24,093	24,059	51,760	51,188
2041	25,074	25,041	53,816	53,224
2042	26,074	26,041	55,914	55,302
2043	27,090	27,058	58,050	57,418
2044	28,123	28,092	60,223	59,573
2045	29,171	29,141	62,432	61,763
2046	30,179	30,150	64,537	63,849
2047	31,198	31,168	66,666	65,957
2048	32,224	32,195	68,817	68,088
2049	33,256	33,228	70,985	70,239
2050	34,294	34,267	73,170	72,405
2051	35,345	35,320	75,343	74,562
2052	36,429	36,407	77,583	76,786
2053	37,547	37,528	79,891	79,077
2054	38,700	38,685	82,269	81,439
2055	39,890	39,877	84,720	83,872
2056	41,099	41,090	87,169	86,304
CAGR (25-46)	**4.97%**	**4.97%**	**4.77%**	**4.72%**
CAGR (25-56)	**4.38%**	**4.38%**	**4.21%**	**4.18%**

- Similarly Entire Project has Normal Traffic (PCU) CAGR (FY 25-46) at All plaza is estimated to be **4.77%** and the effective Traffic (PCU) observed CAGR of **4.72%** over the concession period.
- Normal Traffic (PCU) CAGR (FY 25-56) at All plaza is estimated to be **4.21%** and the effective Traffic (PCU) observed CAGR of **4.18%** over the concession period.

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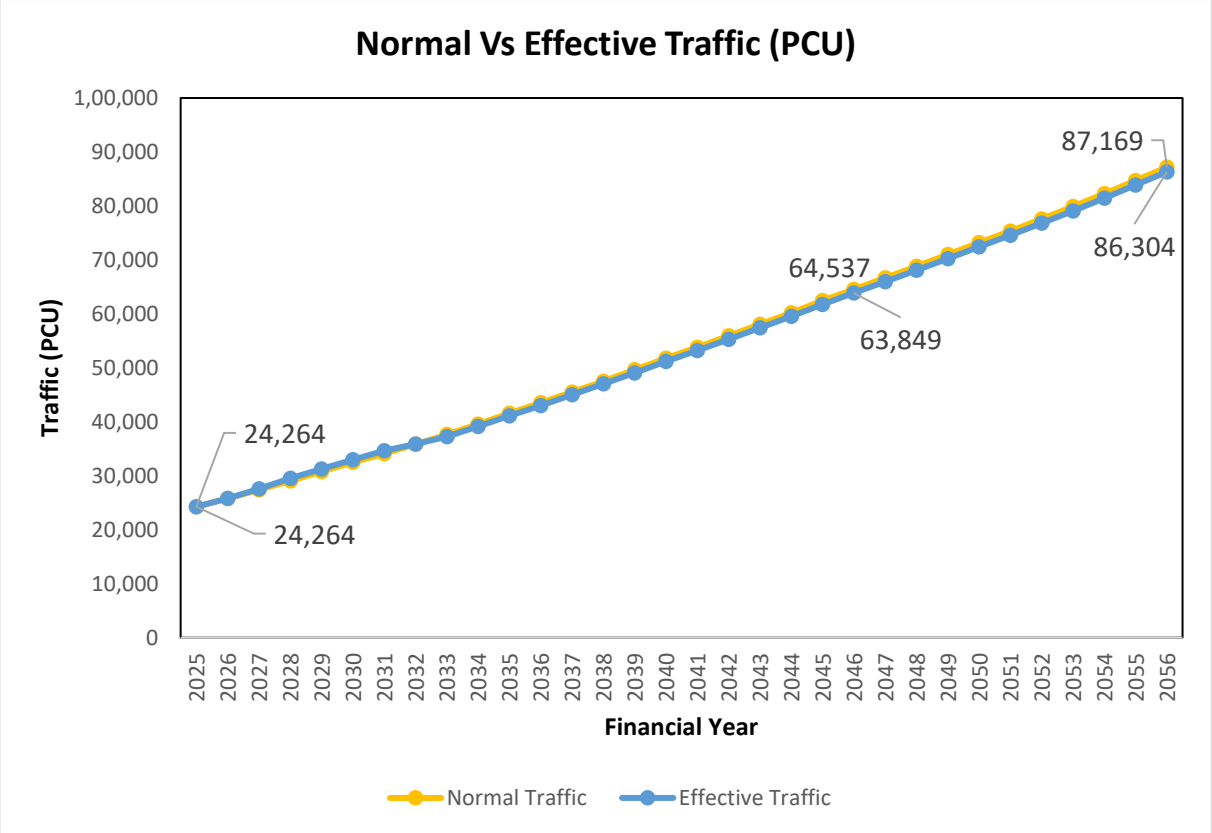


Figure 7-1: Future Traffic Projections in PCU

7.6 Toll Revenue Forecasting

Toll revenue projections or forecasting is calculated based on the projected traffic and projected toll rates. Toll rates by vehicle and toll category depends on the tolling length, wholesale price index (WPI) and the base rates which are applicable by vehicle category are according to the National Highway fee notification for the project.

7.6.1 Toll Plaza Control Length

Toll plaza control length for two plazas has been mentioned in the below table.

Table 7-8: Base rate fee by vehicle category for payable length for FY 25

TOLL PLAZA	Highway Length (Kms)	Net Bypass Length (Kms)	Structure Length (Kms)	Total Length (Kms)
Tarapongi (TP1)	23.720	24.486	0.374	48.580
Bhojpuree (TP2)	47.798	8.933	0.669	57.400
Mudhipar (TP3)	0.000	20.351	0.194	20.545

7.6.2 Toll revenue estimation

i. Toll Fee Revision Methodology

Toll fee shall be computed based on the base rate fixed by NHAI and is revised annually as per the formula provided by NHAI in Schedule R of the Concession agreement which is according to the toll rules 2008.

a) Base Rate

As per the National Highway Fee Rules, 2008 and subsequent amendments till to date, the rate of fee for use of a section of national highway of four or more lanes for the base year 2007-08 are given as mentioned in below table. Fee applicable shall be the rate multiplied by the length of the highway section for which toll is to be collected.

Table 7-9: Base rate fee by vehicle category for payable length

TYPE OF VEHICLE	BASE RATE FEE PER KM (IN RUPEES)
Car	0.65
LCV	1.05
Bus or Truck	2.20
Truck 3A	2.40
HCM or EME or MAV (3-6 Axles)	3.45
Over Sized Vehicle (OSV)	4.20

b) Annual Revision of Rate of Fee

The amount of fee and the revision thereof effective from 1st April. The user fee shall be increased annually, without compounding by 3%. revision because of variation in WPI shall be restricted to 40%.

$$\text{Applicable rate of fee} = \text{Base Rate} + \text{Base Rate X} \left\{\frac{\text{WPIA} - \text{WPI B}}{\text{WPI B}}\right\} * 0.40$$

Were
WPI-A means the Wholesale Price Index on December 31, 2023.
WPI-B means the Wholesale Price Index of week ending on 6th January 2007.i.e 208.7.
The actual fees to be charged shall be rounded off to the nearest Five rupees.

ii. WPI Forecasts

WPI Inflation values for the future years have been provided by client and are presented in the below Figure.

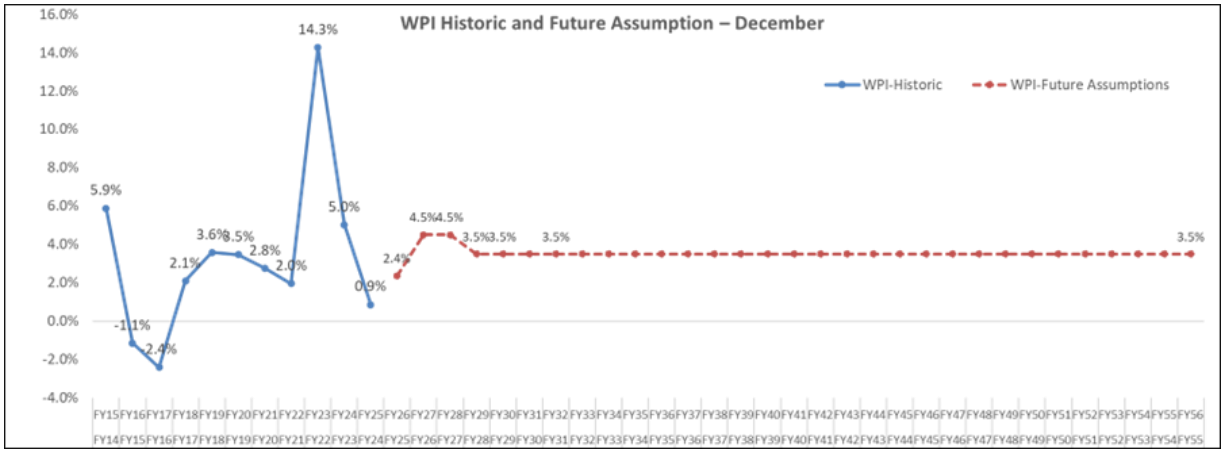


Figure 7-2: Past & Future Trend of Wholesale Price Index

The decrease in inflation in the recent years can be attributed to the lower commodity prices like oil, metals etc. along with the drop in the prices of the primary articles like food products etc.

Toll Fee Projections

a) Base Year (FY25)

As per the NH Fee rules 2007-08:

Toll fee for the fiscal year FY-2024 has been arrived by considering the toll plaza control length which were mentioned in the toll plaza control length table. From 01st April 2024 the toll fee rates for the Toll Plaza locations are presented in the Tables below.

Table 7-10: Toll Fees for the year FY-2025 from June'24 to March'25 for TP1 – Tarapongi

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	95	140	3,140	45	340
Light Commercial Vehicle or Minibus	150	230	5,070	75	-
Bus - 2 Axle	320	480	10,620	160	-
Truck - 2 Axle	320	480	10,620	160	-
3Axle	350	520	11,585	175	-
MAV (4-6) Axle	500	750	16,655	250	-
OSV	610	910	20,275	305	-

Table 7-11: Toll Fees for the year FY-2024 from June'24 to March'25 for TP2 – Bhojpuree

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	100	150	3,320	50	340
Light Commercial Vehicle or Minibus	160	240	5,360	80	-
Bus - 2 Axle	335	505	11,235	170	-
Truck - 2 Axle	335	505	11,235	170	-
3Axle	370	550	12,255	185	-
MAV (4-6) Axle	530	795	12,255	185	-
OSV	645	965	21,445	320	-

Table 7-12: Toll Fees for the year FY-2024 from June'24 to March'25 for TP3 – Mudhipar

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
Car, Jeep, Van	50	70	1,585	25	340
Light Commercial Vehicle or Minibus	75	115	2,565	40	-
Bus - 2 Axle	160	240	5,370	80	-
Truck - 2 Axle	160	240	5,370	80	-
3Axle	175	265	5,860	90	-

VEHICLE TYPE	SINGLE	RETURN	MONTHLY PASS	DISTRICT REGISTERED	LOCAL PASS
MAV (4-6) Axle	255	380	8,425	125	-
OSV	310	460	10,255	155	-

7.6.3 Vehicle wise Trip Categories

Toll revenue is estimated by considering different concessions provided to the road users by vehicle category and eligible number of trips based on the toll category. The number of eligible trips in crossing toll plaza varies by the toll fee category i.e., Single (Full fare), Local passenger and Monthly Pass of both passenger and commercial vehicles are presented in the below tables. The estimation of the share of individual toll vehicle by type of toll ticket category is based on the recent toll traffic data of the period from Apr'2024 to July'2024.

Table 7-13: Vehicle wise Trip Categories at Tarapongi (TP 1)

VEHICLE TYPE / TOLL CATEGORY	Single Journey	Return Journey	Monthly Pass	Local Comm	Local Pass	Exemptions	TOTAL (Excl. Penalties)
Car	32.05%	59.47%	0.00%	0.37%	2.87%	5.24%	100.00%
Minibus	31.76%	59.40%	0.00%	3.03%	0.00%	5.80%	100.00%
Bus-2A	49.96%	46.02%	0.00%	1.88%	0.36%	1.78%	100.00%
Bus-3A	49.96%	46.02%	0.00%	1.88%	0.36%	1.78%	100.00%
LCV	31.76%	59.40%	0.00%	3.03%	0.00%	5.80%	100.00%
2 Axle Truck	49.96%	46.02%	0.00%	1.88%	0.36%	1.78%	100.00%
3 Axle Truck	47.12%	49.21%	0.00%	2.25%	0.00%	1.42%	100.00%
MAV	53.90%	41.23%	0.00%	3.49%	0.08%	1.30%	100.00%

Table 7-14: Vehicle wise Trip Categories at Bhojpuree (TP 2)

VEHICLE TYPE / TOLL CATEGORY	Single Journey	Return Journey	Monthly Pass	Local Comm	Local Pass	Exemptions	TOTAL (Excl. Penalties)
Car	30.92%	53.06%	0.00%	0.07%	0.72%	15.23%	100.00%
Minibus	25.92%	56.29%	0.00%	8.14%	0.00%	9.65%	100.00%
Bus-2A	51.41%	45.37%	0.00%	0.50%	0.00%	2.72%	100.00%
Bus-3A	51.41%	45.37%	0.00%	0.50%	0.00%	2.72%	100.00%
LCV	25.92%	56.29%	0.00%	8.14%	0.00%	9.65%	100.00%
2 Axle Truck	51.41%	45.37%	0.00%	0.50%	0.00%	2.72%	100.00%
3 Axle Truck	43.38%	50.68%	0.00%	2.59%	0.00%	3.35%	100.00%
MAV	50.96%	38.93%	0.00%	7.77%	0.00%	2.34%	100.00%

Table 7-15: Vehicle wise Trip Categories at Mudhipar (TP 3)

VEHICLE TYPE / TOLL CATEGORY	Single Journey	Return Journey	Monthly Pass	Local Comm	Local Pass	Exemptions	TOTAL (Excl. Penalties)
Car	66.67%	19.36%	0.00%	0.00%	3.67%	10.30%	100.00%
Minibus	68.12%	19.08%	2.33%	4.06%	0.00%	6.42%	100.00%
Bus-2A	82.13%	13.02%	2.08%	1.47%	0.00%	1.30%	100.00%
Bus-3A	82.13%	13.02%	2.08%	1.47%	0.00%	1.30%	100.00%
LCV	68.12%	19.08%	2.33%	4.06%	0.00%	6.42%	100.00%
2 Axle Truck	82.13%	13.02%	2.08%	1.47%	0.00%	1.30%	100.00%
3 Axle Truck	73.89%	20.00%	0.00%	6.12%	0.00%	0.00%	100.00%
MAV	74.98%	12.22%	2.18%	9.40%	0.00%	1.22%	100.00%

7.6.4 Toll revenue projections

Toll revenue is projected based on the future traffic projections, toll fees by vehicle and toll category and trip rates. Traffic numbers are projected by fiscal year i.e., FY25, FY26 etc. and toll rates are revised on 01st April every year. Toll revenues are projected by fiscal year till the end of concession period and considering maximum possible extension referring clauses related to Additional toll way, Capacity augmentation and modification of concession period.

(c) Toll would be collected for all the days in a year.

(d) Revenue projected from FY-2025 to FY-2044.

The toll revenue projections are done for the effective case which is basically the consideration of all network improvements and land developments as described in the chapter "Traffic Growth Estimation". The below table summarizes the projected annual toll revenue at both the toll plazas and Overall project.

Table 7-16: Estimated Annual Toll revenue (Effective case) in Rs. Crores – Most Likely

Financial Year	TARAPONGI TP (In Crore. INR)	BHOJPURI TP (In Crore. INR)	MUDHIPAR TP (In Crore. INR)	TOTAL (In Crore. INR)
2025	107	105	14	227
2026	117	115	16	247
2027	130	127	18	276
2028	145	142	22	308
2029	159	155	24	337
2030	174	169	26	369
2031	191	184	28	403
2032	207	200	31	437
2033	222	214	33	469
2034	243	234	37	513
2035	265	255	40	559
2036	289	278	44	611
2037	316	302	47	664
2038	343	328	52	722
2039	372	356	56	784
2040	406	388	61	855
2041	438	418	65	921
2042	472	452	71	995
2043	511	487	77	1,075
2044	555	527	83	1,165
2045	596	568	89	1,253
2046	642	610	96	1,348
2047	691	655	103	1,449
2048	743	706	111	1,560
2049	794	758	119	1,671
2050	853	812	128	1,793
2051	915	871	137	1,923
2052	983	935	148	2,066
2053	1,050	998	158	2,205

Financial Year	TARAPONGI TP (In Crore. INR)	BHOJPURI TP (In Crore. INR)	MUDHIPAR TP (In Crore. INR)	TOTAL (In Crore. INR)
2054	1,126	1,072	170	2,367
2055	1,205	1,149	182	2,537
2056	1,297	1,231	196	2,724
CAGR (25-46)	**8.90%**	**8.73%**	**9.47%**	**8.86%**
CAGR (25-56)	**8.38%**	**8.26%**	**8.79%**	**8.35%**

- It is estimated that the toll revenues are expected to grow (FY 25-46) at **8.86%** CAGR on overall Raipur-Bilaspur project Corridor.
- Consultant doesn't recommend Cash penalty going forward after few years due to FasTAG penetration is likely to be close to 100%. Also, Concessionaire needs to deposit Cash penalty revenue with Authority.

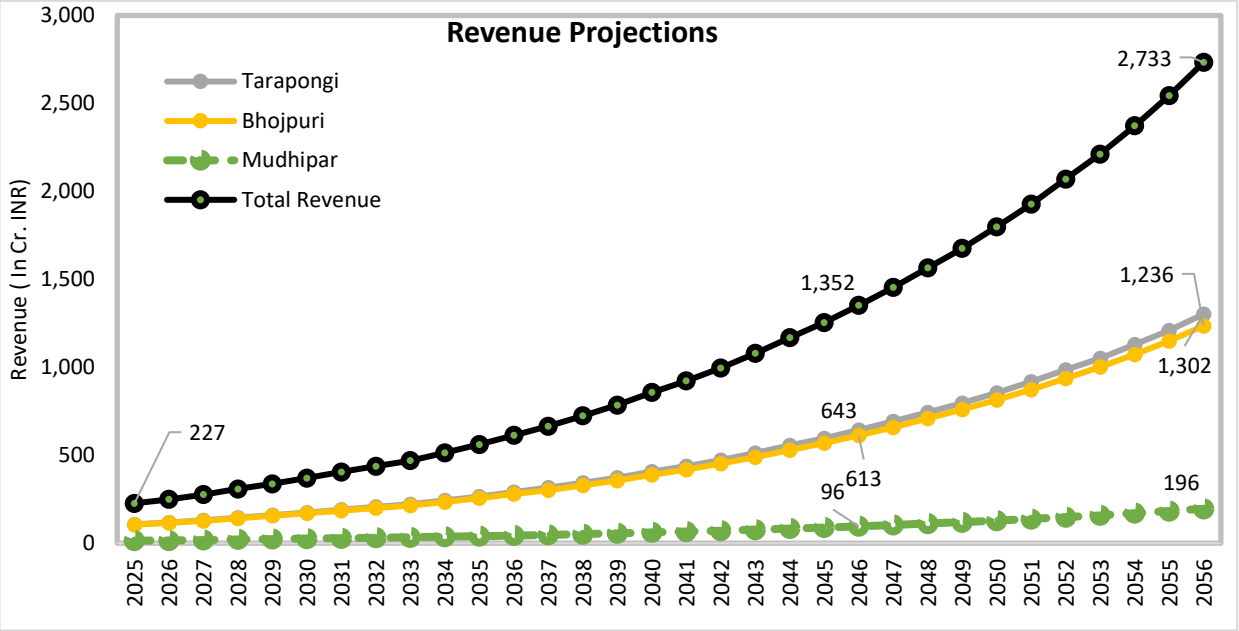


Figure 7-3 : Toll Revenue Projections

Overloading Analysis

7- day axle load survey data (as part of technical due diligence) has been provided by the technical consultant of the client which has been analysed to understand the extent of overloaded vehicles

Table 7-17: Overloading Analysis for Project Road Toll Plazas

Mode	Sample-All Commodities (a)			Overloaded(>20%)-(b)			%ge Overloaded(>20%)-(b/a)			Final %ge Overloaded(>20%) after applying Factors		
	Tarpongi	Bhojpuri	Mudhipar	Tarpongi	Bhojpuri	Mudhipar	Tarpongi	Bhojpuri	Mudhipar	Tarpongi	Bhojpuri	Mudhipar
LCV	1335	597	505	13	4	23	1.0%	0.7%	4.6%	0.2%	0.1%	0.2%
2AT	508	701	178	28	19	5	5.5%	2.7%	2.8%	0.7%	0.2%	0.1%
3AT	543	229	173	73	22	25	13.4%	9.6%	14.5%	0.7%	0.9%	0.6%
MAV	3688	4574	2483	846	1010	873	22.9%	22.1%	35.2%	3.6%	3.1%	2.6%

As observed from the seven-day axle load analysis, around 13.4% of 3A trucks and 22.9% of the MAVs are above the 20% overloading limit at Tarpongi. Similarly, around 9.6% of 3A trucks and 22.1% of the MAVs are above the 20% overloading limit at Bhojpuri, while 14.5% of 3A trucks and 35.2% of the MAVs exceed the 20% limit at Mudhipar.

However, after excluding commodities such as fruits and vegetables, petroleum products, chemicals and gas, heavy machinery, and industrial equipment—which have a strong association with the project road and OD pairs with a lead greater than 500 km—and applying a 25% adjustment factor to the final overloading numbers, the revised percentage of vehicles exceeding the 20% overloading limit is significantly reduced. The adjusted figures indicate that the overloading percentage stands at around 0.7% for 3A trucks and 3.6% for MAVs at Tarpongi, 0.9% for 3A trucks and 3.1% for MAVs at Bhojpuri, and 0.6% for 3A trucks and 2.6% for MAVs at Mudhipar.

Based on the surveys conducted, there is potential for collecting overloading revenue. However, the presence of alternate routes makes the implementation of overloading revenue collection less feasible

Conclusion

Consultant recommended Net Traffic growth for the period FY-2025 to FY-2046 at 4.72% for the overall project after considering all the possible risks on the project and future growth opportunities which were detailed in previous chapters and in the Executive summary. The Toll revenue growth is projected at a CAGR% of 8.86% for the period between FY25 to FY46.

CHAPTER 8

Annexures

8. Annexures

Table 8-1 and 8-2 represents Daily traffic and revenue data for Tarapongi and Bhojpuri Toll Plazas from FY23 (October) to FY25 (November), covering ETC, cash, and exempt traffic.

Table 8-1 : Monthly ADT and ADR for Tarapongi TP

FY	Month	CJV	LCV	Bus/2 Axle	3 Axle	MAV	OSV	Total Veh	PCU	Revenue (Lacks per dy)
FY23	Oct	7,500	449	820	375	2,235	5	11,384	21,837	18.15
	Nov	8,334	537	921	436	2,557	6	12,791	24,744	20.49
	Dec	8,629	551	948	435	2,789	6	13,358	26,183	21.87
	Jan	8,918	546	934	462	3,010	7	13,877	27,500	22.83
	Feb	8,943	580	1,031	515	3,241	8	14,318	29,071	24.02
	Mar	7,964	494	960	462	2,815	7	12,701	25,668	21.25
FY24	Apr	8,492	516	971	486	3,066	2	13,534	27,444	23.80
	May	9,359	506	1,019	496	3,198	2	14,581	29,064	25.16
	Jun	9,169	495	1,027	473	3,388	2	14,553	29,664	25.90
	Jul	8,280	473	965	474	3,189	2	13,382	27,663	24.39
	Aug	8,243	465	930	477	3,118	1	13,235	27,201	23.54
	Sep	8,366	457	974	435	2,968	2	13,202	26,646	23.35
	Oct	7,910	487	1,047	463	3,460	3	13,369	28,750	25.39
	Nov	8,195	464	987	478	3,151	3	13,279	27,481	23.52
	Dec	9,594	522	1,128	507	3,597	2	15,349	31,475	27.53
	Jan	9,326	484	1,067	461	3,687	2	15,027	31,235	27.30
	Feb	9,672	534	1,186	477	3,714	2	15,586	32,187	28.01
	Mar	8,758	513	1,119	442	3,402	1	14,236	29,528	25.77
FY25	Apr	9,128	538	1,211	465	3,990	1	15,333	32,923	28.75
	May	9,203	512	1,215	481	3,988	1	15,401	33,013	28.88
	Jun	9,245	503	1,236	498	4,014	2	15,497	33,273	29.69
	Jul	9,167	470	1,177	448	3,447	2	14,711	30,267	26.81
	Aug	9,215	449	1,088	369	3,026	3	14,148	27,884	24.40

FY	Month	CJV	LCV	Bus/2 Axle	3 Axle	MAV	OSV	Total Veh	PCU	Revenue (Lacks per dy)
	Sep	9,425	491	1,207	408	3,535	5	15,070	30,933	26.90
	Oct	9,484	506	1,259	407	3,907	4	15,566	32,836	29.02
	Nov	22,525	1,300	1,562	527	4,732	9	16,784	52,074	35.59

Table 8-2 : Monthly ADT and ADR for Bhojpuri TP

FY	Month	CJV	LCV	Bus/2 Axle	3 Axle	MAV	OSV	Total Veh	PCU	Revenue (Lacks per dy)
FY23	Oct	5,623	421	674	198	2,071	9	8,996	18,229	16.28
	Nov	6,120	515	775	243	2,515	10	10,178	21,308	19.02
	Dec	6,383	530	806	286	2,795	12	10,812	23,085	20.68
	Jan	6,451	516	776	266	3,023	12	11,043	24,008	21.39
	Feb	6,525	531	907	288	3,340	14	11,604	25,996	23.28
	Mar	5,803	465	920	279	3,014	11	10,493	23,711	21.50
FY24	Apr	6,135	481	956	308	3,486	6	11,373	26,364	24.64
	May	6,849	472	904	271	3,425	4	11,925	26,511	24.92
	Jun	6,701	462	886	267	3,711	4	12,031	27,571	25.99
	Jul	6,127	465	902	285	3,434	4	11,216	25,855	23.51
	Aug	6,291	431	822	284	3,170	1	10,999	24,523	22.54
	Sep	6,417	453	881	246	3,131	2	11,130	24,579	22.24
	Oct	6,086	466	905	280	3,780	2	11,519	27,357	25.25
	Nov	6,083	437	844	254	3,391	4	11,013	25,309	23.00
	Dec	7,221	526	975	306	4,181	4	13,213	30,683	28.14
	Jan	6,863	494	920	274	4,234	3	12,789	30,255	27.69
	Feb	7,161	545	1,081	270	4,269	3	13,329	31,255	28.27
	Mar	6,749	521	1,113	263	3,904	3	12,551	29,234	26.29
FY25	Apr	7,209	548	1,172	282	4,473	2	13,685	32,530	28.63
	May	7,015	475	1,111	288	4,216	3	13,108	30,907	28.71
	Jun	6,974	454	1,052	277	4,149	2	12,907	30,320	29.25
	Jul	7,000	434	1,015	240	3,326	2	12,017	26,391	25.43

FY	Month	CJV	LCV	Bus/2 Axle	3 Axle	MAV	OSV	Total Veh	PCU	Revenue (Lacks per dy)
	Aug	6,844	393	926	194	3,095	1	11,454	24,729	23.88
	Sep	6,616	408	991	218	3,485	2	11,720	26,546	25.72
	Oct	6,786	411	1,045	227	4,014	2	12,484	29,288	28.28
	Nov	12,984	1,189	1,524	366	6,437	10	13,402	49,451	30.64

Table 8-3 represents Daily traffic and revenue data for Mudhipar Toll Plazas from FY23 (October) to FY25 (November) ETC traffic.

Table 8-3: Monthly ADT and ADR for Mudhipar TP

FY	Month	CJV	LCV	Bus/2 Axle	3 Axle	MAV	OSV	Total Veh	PCU	Revenue (Lacks per dy)
FY23	Nov	942	73	108	75	834	5	2,037	5,376	2.41
	Dec	1,032	81	125	88	1,200	11	2,538	7,246	3.23
	Jan	1,026	78	123	79	1,104	8	2,420	6,758	3.04
	Feb	1,012	80	136	90	1,090	9	2,417	6,754	3.03
	Mar	908	65	133	96	1,103	6	2,310	6,682	3.01
FY24	Apr	953	60	136	119	1,167	1	2,436	7,066	3.26
	May	1,069	56	130	91	1,120	1	2,467	6,862	3.17
	Jun	1,013	57	133	91	1,249	1	2,545	7,397	3.48
	Jul	753	50	118	110	997	1	2,029	6,004	2.85
	Aug	870	53	140	133	1,185	1	2,383	7,107	3.39
	Sep	863	50	145	92	1,024	1	2,176	6,266	3.01
	Oct	873	59	148	103	1,224	1	2,409	7,229	3.43
	Nov	854	61	137	85	987	4	2,129	6,074	2.88
	Dec	1,047	79	170	109	1,087	5	2,497	6,916	3.28
	Jan	977	76	158	71	1,062	1	2,346	6,564	3.12
	Feb	1,029	79	185	67	1,111	2	2,473	6,912	3.32
	Mar	945	76	190	66	1,008	1	2,285	6,363	3.11
FY25	Apr	976	72	197	88	1,085	1	2,419	6,827	3.28
	May	964	68	195	86	1,251	1	2,566	7,545	3.57

FY	Month	CJV	LCV	Bus/2 Axle	3 Axle	MAV	OSV	Total Veh	PCU	Revenue (Lacks per dy)
	Jun	937	62	186	73	1,290	2	2,550	7,620	3.71
	Jul	989	58	185	68	1,151	1	2,452	7,019	3.45
	Aug	941	54	174	47	998	1	2,215	6,182	3.07
	Sep	924	55	174	52	1,208	1	2,414	7,124	3.52
	Oct	1,071	62	200	56	1,430	1	2,820	8,371	4.02

Table 8-4 Zoning List of Project corridor

Zone No.	Major Place/Backup Column	District/State	State
1	Bilaspur	Bilaspur	Chhattisgarh
2	Raipur	Raipur	Chhattisgarh
3	Lakhoti	Raipur	Chhattisgarh
4	Sirgitti/Silpahri	Bilaspur	Chhattisgarh
5	Bodri	Bilaspur	Chhattisgarh
6	Siliyari	Raipur	Chhattisgarh
7	Sarora/Ranka/ Jewara	Baloda Bazar	Chhattisgarh
8	Bilha	Bilaspur	Chhattisgarh
9	Bhatapara/ Tarenga/Deori/ Rawan/ Suhela	Balodabazar	Chhattisgarh
10	Takhatpur/ Mungeli	Bilaspur	Chhattisgarh
11	Tilda Newra/ Hathbandh	Raipur	Chhattisgarh
12	Pathariya/ Baitalpur/ Maro/ Singarpur	Mungeli	Chhattisgarh
13	Atal Nagar-Nava Raipur	Raipur	Chhattisgarh
14	Bagbahara	Mahasamund	Chhattisgarh
15	Koliha/Damakheda/ Tulsi/ Tuma/ Ghursena/ Rohra	Durg	Chhattisgarh
16	Pachpedi/ Malhar	Bilaspur	Chhattisgarh
17	Charauda	Durg	Chhattisgarh
18	Sondra/Bhimbhori	Balod	Chhattisgarh
19	Kasdol/ Giraudpuri	Balodabazar	Chhattisgarh
20	Tifra	Bilaspur	Chhattisgarh
21	Sipat	Bilaspur	Chhattisgarh
22	Dhenka/ Darrighat	Bilaspur	Chhattisgarh
23	Akaltara	Janjgir-Champa	Chhattisgarh
24	Samoda/Kodawa/ Hirmi	Raipur	Chhattisgarh
25	Ratanpur/ Beltara	Janjgir Champa	Chhattisgarh
26	Binauri/ Binauri/Parsada/ Kota	Bilaspur	Chhattisgarh
27	Loharsi	Janjgir-Champa	Chhattisgarh
28	Bhadra	Janjgir-champa	Chhattisgarh
29	Chhuri/Dhanras/ Katghora	Bilaspur	Chhattisgarh
30	Khaira/Kesla/ Raseda	Bilaspur	Chhattisgarh
31	Janjgir	Janjgir-Champa	Chhattisgarh
32	Baradwar/ Sakti/ Kharsia	Janjgir-Champa	Chhattisgarh
33	Pendri	Rajnandgaon	Chhattisgarh
34	Abhanpur	Abhanpur	Chhattisgarh
35	Amleshwar/ Mahuda/ Khudmuda/ Jheet/ Sikola/ Jamgaon/ Tarra	Durg	Chhattisgarh
36	Sarangarh/ Baramkela/ Bilaigarh/ Shivrinarayan	Janjgir-Champa	Chhattisgarh
37	Tamnar/ Gharghoda	Sakti	Chhattisgarh
38	Pithora	Mahasamund	Chhattisgarh
39	Kachandur	Durg	Chhattisgarh
40	Baikunth	Tilda-Nevra	Chhattisgarh
41	Khairagarh/Chhuikhadan/ Gandai	Durg	Chhattisgarh

Zone No.	Major Place/Backup Column	District/State	State
42	Sirsa/ Saja	Durg	Chhattisgarh
43	Kachna/BhakharaPatan/ Tarrighat/ Kasahi	Dhamtari	Chhattisgarh
44	Shankar Nagar/ Mandir Hasaud/Serikhedi	Raipur	Chhattisgarh
45	Urla/Â Bhanpuri	Raipur	Chhattisgarh
46	Tatibandh	Raipur	Chhattisgarh
47	Mathpurena/ Bhatagaon/ Sejbahar/ Mujgahan/Khorpa	Raipur	Chhattisgarh
48	Charmara	Dhamtari	Chhattisgarh
49	Amarkantak/ Pendra/ Gaurella	Mungeli	Chhattisgarh
50	Mungeli/ Pandariya/ Pandarbhata/ Sambalpur/ Kanteli/ Kunda/ Mandhar	Mungeli	Chhattisgarh
51	Dharmagarh	Kalahandi	Odisha
52	Gariyaband/Dhawalpur/ Mainpur	Gariyaband	Chhattisgarh
53	Baloda Bazar	Baloda Bazar-Bhatapara	Chhattisgarh
54	Ramgarh	Surguja	Chhattisgarh
55	Champa	Janjgir-Champa	Chhattisgarh
56	Siltara	Raipur	Chhattisgarh
57	Chamorshi/Dhanora/Sindesur	Gadchiroli	Maharashtra
58	Dhobisarad/Bhagi/Bharregaon/Deori/Chichewada	Gondia	Maharashtra
59	Bhanupratappur	Kanker	Chhattisgarh
60	Kanker/Keshkal	Kanker	Chhattisgarh
61	Narayanpur/Umerkote/Bijapur/Dakshin Bastar Dantewada/Sukma/Jagdalpur/Kondagaon/Keshkal/Kurrubhat	Narayanpur	Chhattisgarh
62	Korba/ Jamnipali (NTPC)/Kusmunda/ Dipka/Gewra/ Haldi Bazar	Korba	Chhattisgarh
63	Ambikapur/Koriya/Baikunthpur/Patna/Surajpur /Birnidand/Shivpur/Pratappur/Jashpur/Kunkuri /Tapkara/Bagicha/Ramanujganj/Balrampur/Nawki/Wadraf Nagar	Ambikapur	Chhattisgarh
64	Saraipali/ Basna	Mahasamund	Chhattisgarh
65	Raigarh/ Chandrapur/Dabhara/ Sariya	Raigarh	Chhattisgarh
66	Durg	Durg	Chhattisgarh
67	Bhilai	Bhilai	Chhattisgarh
68	Banbhedi/Mohra/Parri Nallah/ Dongargarh	Rajnandgaon	Chhattisgarh
69	Kawardha/ Lohara	Kabirdham	Chhattisgarh
70	Bemetara/Baghamuda/Mungeli/Hardidih/Laudapara/ Bijabhat	Bemetara	Chhattisgarh
71	Rajim/Gariaband/Panduka/Chhura/Fingeshwar/ Dhawalpur/Kodobhat/Mainpur	Gariaband	Chhattisgarh
72	Balod	Balod	Chhattisgarh
73	Sitanadi Wildlife Santury/Kurrubhat/Â Deobhog	Dhamtari	Chhattisgarh
74	Mumbai/Thane/ Palghar	Mumbai	Maharashtra
75	Pune/Satara/Ratnagiri/Kolhapur/Sidhudurg	Pune	Maharashtra

Zone No.	Major Place/Backup Column	District/State	State
76	Nagpur/Wardha/Yavatmal/Hinganghat/Warora	Nagpur	Maharashtra
77	Aurangabad/Jalna	Aurangabad	Maharashtra
78	Nashik	Nashik	Maharashtra
79	Amravati/Warud/Akola	Amravati	Maharashtra
80	Beed/Ahmednagar/Shirdi/Nanded/Parbhani/Washim/Hingoli/Latur/Osmanabad/Solapur	Beed	Maharashtra
81	Chandrapur/Sindewahi/Mulu/Sawali	Chandrapur	Maharashtra
82	Armori/Brahmapuri/Arjuni	Chandrapur	Maharashtra
83	Goregaon/Kirnapur	Gondia	Maharashtra
84	Bhandara	Bhandara	Maharashtra
85	Jharsuguda/Sundargarh	Jharsuguda	Odisha
86	Deogarh	Deogarh	Jharkhand
87	Balasore	Baleswar	Odisha
88	Bhubaneswar/ Puri/ Konark	Bhubaneswar	Odisha
89	Balangir	Balangir	Odisha
90	Rourkela	Rourkela	Odisha
91	Sambalpur/Hirakud/Maneswar	Sambalpur	Odisha
92	Barbil/Champua/Jagannathpur/Keonjhar	Barbil	Odisha
93	Paradeep	Jagatsinghpur	Odisha
94	Ranchi	Ranchi	Jharkhand
95	Tatanagar	Jamshedpur	Jharkhand
96	Kharagpur/Midnapore	Kharagpur	West Bengal
97	Kolkata	Kolkata	West Bengal
98	Durgapur/Bardhaman	Durgapur	West Bengal
99	Siliguri/Darjeeling	Darjeeling	West Bengal
100	Haldia Port	Haldia	West Bengal
101	Bangladesh	Bangladesh	Bangladesh
102	Rewa /Satna	Rewa	Madhya Pradesh
103	Sagar	Sagar	Madhya Pradesh
104	Shivpuri/ Guna	Shivpuri	Madhya Pradesh
105	Indore/ Ujjain	Indore	Madhya Pradesh
106	Bhopal/ Vidisha	Bhopal	Madhya Pradesh
107	Bhind/ Gwalior	Gwalior	Madhya Pradesh
108	Jabalpur/Shahdol	Jabalpur	Madhya Pradesh
109	Mandla	Seoni	Madhya Pradesh
110	Assam/ Meghalaya/ Nagaland/ Arunanchal Pradesh	Assam	Assam
111	Tripura/ Manipur/ Mizoram	Tripura	Tripura
112	Chhatarpur	Chhatarpur	Madhya Pradesh
113	Patna/ Gaya	Patna	Bihar
114	Chhindwara/Betul/Seoni	Chhindwara	Madhya Pradesh
115	Bhutan	Bhutan	Bhutan
116	Darbhanga/ Bhagalur/ Purnia	Darbhanga	Bihar
117	Prayagraj/Varanasi/Mirzapur	Prayagraj/Varanasi/Mirzapur	Uttar Pradesh

Zone No.	Major Place/Backup Column	District/State	State
118	Lucknow/Kanpur/Sitapur	Lucknow/Kanpur	Uttar Pradesh
119	Gorakhpur/Deoria/Basti	Gorakhpur	Uttar Pradesh
120	Agra	Agra	Uttar Pradesh
121	Kota	Kota	Rajasthan
122	Jhansi	Jhansi	Uttar Pradesh
123	Nepal	Nepal	Nepal
124	New Delhi/ Gurugram/ Noida	Delhi	Delhi
125	Haryana	Haryana	Haryana
126	Banswara/Kalinjara	Banswara	Rajasthan
127	Bharatpur/ Bikaner/ Sikar	Jaipur	Rajasthan
128	Ganganagar/ Hanumangarh	Ganganagar	Rajasthan
129	Rajkot/ Porbandar/ Jamnagar	Rajkot	Gujarat
130	Kandla/Mundra Port/Gandhidham	Kachchh	Gujarat
131	Hazira port/ Bharuch/ Surat	Surat	Gujarat
132	Ahmedabad/ Vadodara	Ahmedabad	Gujarat
133	Haridwar / Dehradun/ Roorke	Haridwar / Dehradun/ Roorke	Uttarakhand
134	Karimnagar/Nizamabad/Adilabad	Karimnagar/Nizamabad/Adilabad	Telangana
135	Hyderabad	Hyderabad	Telangana
136	Warangal	Warangal	Telangana
137	Karimnagar/Mancherial/Ramagundam/Siddipet	Karimnagar	Telangana
138	Khammam/Kodad/Suryapet/Kothagudem/Nalgonda/Miryalaguda	Khammam	Telangana
139	Mancherial/ Ramagundam	Mancherial	Telangana
140	Vijayawada	Guntur	Andhra Pradesh
141	Visakhapatnam/Srikakulam/Kakinada	Visakhapatnam/Srikakulam/Kakinada	Andhra Pradesh
142	South of Tamil Nadu	Kanniyakumari	Tamil Nadu
143	Chennai	Chennai	Tamil Nadu
144	Goa/ Hubbali	Goa	Goa
145	Bengaluru/Mysuru/Vellore	Bengaluru	Karnataka
146	Balod	Balod	Chhattisgarh
147	Dhule/Nandurbar/Jalgaon/Dhule/Buldana	Jalgaon	Maharashtra
148	Aurangabad	Aurangabad	Bihar
149	Jagdalpur	Bastar	Chhattisgarh
150	Rayagada	Rayagada	Odisha
151	Brahmapur	Ganjam	Odisha
152	Chirimiri	Manendragarh-Chirmiri-Bharatpur	Chhattisgarh
153	Jashpur Nagar/Lodam/Kansabel/ Tapkara	Jashpur	Chhattisgarh
154	Dharamjaigarh/Sisringa/ Pathalgaon/ Lailunga	Raigarh	Chhattisgarh
155	Jawaharlal Nehru Port	Raigad	Maharashtra

Zone No.	Major Place/Backup Column	District/State	State
156	Mumbai port	Mumbai	Maharashtra
157	Mundra port	Kachchh	Gujarat
158	APM Terminals	Amreli	Gujarat
159	Mormugao Port	Goa	Goa
160	Cochin Port	Ernakulam	Kerala
161	Chennai Port	Chennai	Tamil Nadu
162	Ennore Port	Tiruvallur	Tamil Nadu
163	Vizag Port	Visakhapatnam	Andhra Pradesh
164	Paradip Port	Jagatsinghpur	Odisha
165	Kolkata Port	Kolkata	West Bengal
166	Dhanbad	Dhanbad	Jharkhand
167	Bokaro	Bokaro	Jharkhand
168	Mohada	Bilaspur	Chhattisgarh
169	Gatoura	Gatoura	Chhattisgarh
170	Amlai/ Burhar	Shahdol	Madhya Pradesh
171	Jamnipali	Korba	Chhattisgarh
172	Maniyari chauk/ Khamhardih	Mungeli	Chhattisgarh

Table 8-5: Weighted Vehicle Registration Data for Project Influence Area of TP1 – Tarapongi

CATEGORY	CARS	BUSES	TRUCKS
2012	2,15,136	10,076	98,573
2013	2,43,330	11,161	1,05,535
2014	2,74,167	12,172	1,12,650
2015	3,06,530	13,152	1,19,731
2016	3,41,804	14,619	1,29,077
2017	3,77,891	16,315	1,37,843
2018	4,21,116	18,042	1,49,537
2019	4,64,763	19,624	1,63,419
2020	5,11,383	21,077	1,73,265
2021	5,61,055	21,203	1,76,953
2022	6,12,449	21,403	1,84,624
2023	6,73,151	22,217	2,00,658
2024	7,39,791	23,641	2,18,434
CAGR (FY12-FY24)	**10.84%**	**7.37%**	**6.86%**

Table 8-6: Weighted Vehicle Registration Data for Project Influence Area of TP2 – Bhojpuree

CATEGORY	CARS	BUSES	TRUCKS
2012	2,09,548	11,099	1,01,023
2013	2,37,343	12,260	1,08,017
2014	2,67,860	13,348	1,15,292
2015	2,99,805	14,409	1,22,440

CATEGORY	CARS	BUSES	TRUCKS
2016	3,34,513	15,950	1,31,858
2017	3,69,829	17,735	1,40,776
2018	4,12,582	19,537	1,52,596
2019	4,56,136	21,152	1,66,493
2020	5,02,796	22,639	1,76,316
2021	5,52,439	22,774	1,79,914
2022	6,03,688	22,993	1,87,554
2023	6,64,232	23,830	2,03,565
2024	7,30,775	25,313	2,21,315
CAGR (FY12-FY24)	**10.97%**	**7.11%**	**6.75%**

Table 8-7: Weighted Vehicle Registration Data for Project Influence Area of TP3 – Mudhipar

CATEGORY	CARS	BUSES	TRUCKS
2012	2,29,981	9,407	1,08,104
2013	2,60,331	10,429	1,15,711
2014	2,93,111	11,360	1,23,562
2015	3,27,537	12,271	1,31,397
2016	3,64,788	13,662	1,41,396
2017	4,03,184	15,258	1,51,089
2018	4,49,085	16,912	1,63,814
2019	4,95,631	18,420	1,79,115
2020	5,44,872	19,769	1,90,388
2021	5,96,618	19,877	1,94,711
2022	6,50,331	20,044	2,03,280
2023	7,13,877	20,799	2,20,277
2024	7,83,507	22,131	2,39,062
CAGR (FY12-FY24)	**10.75%**	**7.39%**	**6.84%**

Table 8-8: PIA GSDP by Vehicle Category at Toll Plaza 01 - Tarapongi

YEAR	GSDP IN RS.		
	CARS	BUSES	TRUCKS
2012	1,71,45,774	1,66,32,321	1,83,05,483
2013	1,80,33,861	1,74,70,504	1,92,86,704
2014	1,97,70,890	1,91,82,576	2,10,77,406
2015	2,02,09,629	1,95,64,218	2,16,26,927
2016	2,08,36,690	2,01,29,026	2,24,00,869
2017	2,33,11,490	2,25,45,055	2,50,16,745
2018	2,40,74,204	2,32,50,896	2,58,99,864
2019	2,65,91,102	2,57,26,691	2,84,87,710
2020	2,73,61,080	2,64,60,196	2,93,37,658
2021	2,71,50,731	2,63,22,197	2,89,86,374

YEAR	GSDP IN RS.		
	CARS	BUSES	TRUCKS
2022	3,02,63,006	2,93,74,331	3,22,47,018
2023	3,25,31,448	3,16,01,084	3,46,31,528
2024	3,46,35,731	3,36,60,451	3,68,57,063
CAGR(FY12-24)	**6.03%**	**6.05%**	**6.01%**

Table 8-9: PIA GSDP by Vehicle Category at TP2 - Bhojpuree

YEAR	GSDP IN RS.		
	CARS	BUSES	TRUCKS
2012	1,69,51,417	1,72,65,114	1,91,97,242
2013	1,78,27,820	1,81,91,974	2,02,30,502
2014	1,95,45,443	1,99,17,449	2,20,84,901
2015	1,99,58,986	2,03,63,495	2,26,93,446
2016	2,05,68,692	2,10,16,330	2,35,19,409
2017	2,30,26,530	2,35,23,317	2,62,37,255
2018	2,37,60,873	2,42,87,688	2,71,50,051
2019	2,62,61,719	2,68,28,209	2,97,59,687
2020	2,70,23,200	2,76,06,567	3,06,08,999
2021	2,68,45,184	2,73,67,180	3,01,16,883
2022	2,99,33,938	3,04,76,905	3,34,76,007
2023	3,21,93,144	3,27,40,225	3,58,80,611
2024	3,42,84,931	3,48,42,819	3,81,31,237
CAGR(FY12-24)	**6.05%**	**6.03%**	**5.89%**

Table 8-10: PIA GSDP by Vehicle Category at TP3 - Mudhipar

YEAR	GSDP IN RS.		
	CARS	BUSES	TRUCKS
2012	1,79,00,362	1,58,07,382	2,14,65,801
2013	1,88,39,596	1,65,97,740	2,26,82,423
2014	2,05,74,366	1,82,57,954	2,46,19,445
2015	2,10,87,177	1,85,81,344	2,54,67,850
2016	2,17,67,744	1,90,58,377	2,65,23,870
2017	2,43,02,382	2,13,70,477	2,94,98,941
2018	2,51,39,038	2,20,13,569	3,06,50,072
2019	2,76,69,784	2,44,57,916	3,33,59,447
2020	2,84,75,761	2,51,54,906	3,43,37,314
2021	2,81,57,731	2,51,19,230	3,35,35,129
2022	3,13,66,238	2,80,60,929	3,71,76,617
2023	3,36,98,495	3,02,11,868	3,97,75,854
2024	3,58,79,709	3,21,94,473	4,22,44,882
CAGR(FY12-24)	**5.97%**	**6.11%**	**5.80%**

Table 8-11: Economic Forecast for Comparison with PIA states – Most Likely Scenario

YEAR	India	Chhattisgarh	Maharashtra	Madhya Pradesh	Jharkhand	Bihar	Odisha	Uttar Pradesh	Gujarat
FY2026	6.70%	7.16%	5.59%	7.57%	6.03%	6.37%	7.71%	7.37%	9.85%
FY2027	6.60%	7.05%	5.51%	7.46%	5.94%	6.27%	7.59%	7.26%	9.70%
FY2028	6.60%	7.05%	5.51%	7.46%	5.94%	6.27%	7.59%	7.26%	9.70%
FY2029	6.30%	6.73%	5.26%	7.12%	5.67%	5.99%	7.25%	6.93%	9.26%
FY2030	5.70%	6.09%	4.76%	6.44%	5.13%	5.42%	6.56%	6.27%	8.38%
FY2031	5.70%	6.09%	4.76%	6.44%	5.13%	5.42%	6.56%	6.56%	8.38%
FY2032	5.70%	6.09%	4.76%	6.44%	5.13%	5.42%	6.56%	6.56%	8.38%
FY2033	5.70%	6.09%	4.76%	6.44%	5.13%	5.42%	6.56%	6.56%	8.38%
FY2034	5.70%	6.09%	4.76%	6.44%	5.13%	5.42%	6.56%	6.56%	8.38%
FY2035	5.60%	5.98%	4.67%	6.33%	5.04%	5.32%	6.44%	6.44%	8.23%
FY2036	5.50%	5.87%	4.59%	6.22%	4.95%	5.23%	6.33%	6.05%	8.09%
FY2037	5.40%	5.77%	4.50%	6.10%	4.86%	5.13%	6.21%	5.94%	7.94%
FY2038	5.30%	5.66%	4.42%	5.99%	4.77%	5.04%	6.10%	5.83%	7.79%
FY2039	5.20%	5.55%	4.34%	5.88%	4.68%	4.94%	5.98%	5.72%	7.64%
FY2040	5.10%	5.45%	4.25%	5.76%	4.59%	4.85%	5.87%	5.61%	7.50%
FY2041	5.00%	5.34%	4.17%	5.65%	4.50%	4.75%	5.75%	5.23%	7.35%
FY2042	4.90%	5.23%	4.09%	5.54%	4.41%	4.66%	5.64%	5.12%	7.20%
FY2043	4.80%	5.13%	4.00%	5.42%	4.32%	4.56%	5.52%	5.02%	7.06%
FY2044	4.70%	5.02%	3.92%	5.31%	4.23%	4.47%	5.41%	4.91%	6.91%
FY2045	4.60%	4.91%	3.84%	5.20%	4.14%	4.37%	5.29%	4.81%	6.76%
FY2046	4.50%	4.81%	3.75%	5.09%	4.05%	4.28%	5.18%	4.70%	6.62%
FY2047	4.40%	4.70%	3.67%	4.97%	3.96%	4.18%	5.06%	4.60%	6.47%
FY2048	4.30%	4.59%	3.59%	4.86%	3.87%	4.09%	4.95%	4.49%	6.32%
FY2049	4.20%	4.49%	3.50%	4.75%	3.78%	3.99%	4.83%	4.39%	6.17%
FY2050	4.10%	4.38%	3.42%	4.63%	3.69%	3.90%	4.72%	4.28%	6.03%
FY2051	4.10%	4.38%	3.42%	4.63%	3.69%	3.90%	4.72%	4.28%	6.03%
FY2052	4.10%	4.38%	3.42%	4.63%	3.69%	3.90%	4.72%	4.28%	6.03%
FY2053	4.10%	4.38%	3.42%	4.63%	3.69%	3.90%	4.72%	4.28%	6.03%
FY2054	4.10%	4.38%	3.42%	4.63%	3.69%	3.90%	4.72%	4.28%	6.03%
FY2055	4.10%	4.38%	3.42%	4.63%	3.69%	3.90%	4.72%	4.28%	6.03%
FY2056	4.10%	4.38%	3.42%	4.63%	3.69%	3.90%	4.72%	4.28%	6.03%

Table 8-12: Weighted Economic Forecast for Passenger & Commercial Vehicles for all TP's – Most Likely Scenario

YEAR	TP1 - Tarapongi			TP2 - Bhojpuree			TP3 - Mudhipar		
	CARS	BUSES	TRUCKS	CARS	BUSES	TRUCKS	CARS	BUSES	TRUCKS
FY2026	7.22%	3.55%	6.37%	7.23%	3.54%	6.25%	6.63%	3.34%	5.76%
FY2027	7.22%	3.50%	6.28%	7.22%	3.49%	6.16%	6.75%	3.34%	5.77%

YEAR	TP1 - Tarapongi			TP2 - Bhojpuree			TP3 - Mudhipar		
	CARS	BUSES	TRUCKS	CARS	BUSES	TRUCKS	CARS	BUSES	TRUCKS
FY2028	7.23%	3.50%	6.28%	7.23%	3.49%	6.16%	6.45%	3.20%	5.54%
FY2029	6.86%	3.34%	6.00%	6.87%	3.33%	5.88%	6.46%	3.20%	5.55%
FY2030	6.11%	3.02%	5.43%	6.12%	3.01%	5.32%	6.47%	3.20%	5.55%
FY2031	5.85%	2.87%	5.16%	5.86%	2.86%	5.06%	5.89%	2.92%	5.06%
FY2032	5.94%	2.87%	5.17%	5.94%	2.86%	5.06%	5.98%	2.92%	5.06%
FY2033	5.94%	2.88%	5.17%	5.95%	2.87%	5.07%	5.98%	2.92%	5.07%
FY2034	5.96%	2.88%	5.17%	5.96%	2.87%	5.07%	6.00%	2.92%	5.07%
FY2035	5.84%	2.83%	5.08%	5.84%	2.82%	4.98%	6.00%	2.92%	5.08%
FY2036	5.44%	2.63%	4.74%	5.44%	2.63%	4.65%	5.14%	2.53%	4.40%
FY2037	5.01%	2.59%	4.66%	5.00%	2.58%	4.57%	4.81%	2.53%	4.41%
FY2038	4.89%	2.54%	4.57%	4.89%	2.53%	4.48%	4.82%	2.53%	4.41%
FY2039	4.78%	2.49%	4.49%	4.78%	2.49%	4.40%	4.82%	2.53%	4.41%
FY2040	4.66%	2.44%	4.40%	4.66%	2.44%	4.32%	4.82%	2.53%	4.42%
FY2041	4.32%	2.27%	4.10%	4.32%	2.27%	4.02%	4.03%	2.17%	3.80%
FY2042	4.21%	2.23%	4.02%	4.21%	2.23%	3.94%	4.03%	2.17%	3.80%
FY2043	4.11%	2.18%	3.94%	4.10%	2.18%	3.86%	4.03%	2.17%	3.80%
FY2044	4.00%	2.14%	3.86%	3.99%	2.14%	3.78%	4.04%	2.17%	3.80%
FY2045	3.89%	2.09%	3.78%	3.89%	2.09%	3.71%	4.04%	2.17%	3.81%
FY2046	3.68%	1.95%	3.51%	3.67%	1.94%	3.44%	3.40%	1.85%	3.24%
FY2047	3.57%	1.90%	3.44%	3.57%	1.90%	3.37%	3.40%	1.85%	3.24%
FY2048	3.47%	1.86%	3.36%	3.46%	1.86%	3.29%	3.40%	1.85%	3.24%
FY2049	3.36%	1.82%	3.28%	3.35%	1.81%	3.22%	3.40%	1.85%	3.24%
FY2050	3.26%	1.77%	3.20%	3.25%	1.77%	3.14%	3.40%	1.85%	3.25%
FY2051	3.26%	1.74%	3.05%	3.25%	1.74%	2.99%	3.40%	1.82%	3.09%
FY2052	3.26%	1.74%	3.05%	3.25%	1.74%	2.99%	3.40%	1.82%	3.09%
FY2053	3.26%	1.74%	3.05%	3.25%	1.74%	2.99%	3.40%	1.82%	3.09%
FY2054	3.26%	1.74%	3.05%	3.25%	1.74%	2.99%	3.40%	1.82%	3.09%
FY2055	3.26%	1.74%	3.05%	3.25%	1.74%	2.99%	3.40%	1.82%	3.09%
FY2056	3.26%	1.74%	2.90%	3.25%	1.74%	2.84%	3.40%	1.82%	2.94%

Crisil
Intelligence

Assessment and projection of traffic and revenue for Gandhidham (Kandla)-Mundra Port section of NH-8A/41

Final Report

February 2025



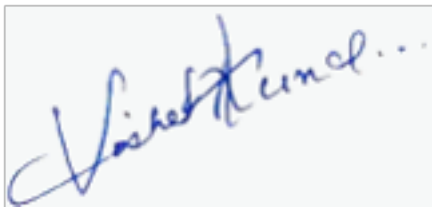


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Crisil Intelligence

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1 Executive Summary

Project overview

Project road Gandhidham-Mundra is a 4-lane, 71.400 kms long stretch with 8.730 kms Anjar bypass, on national highways (NH) 8A/41 which connects Gandhidham and Mundra. Project road gives connectivity to Mundra port & Kandla Ports in the west region. The project stretch has one toll plaza by the name of Mokha which lies at the chainage of km 44+500 near Mokha Village. Most of the traffic is originating/destined to Mundra port. Around 61% of the truck is container trucks.

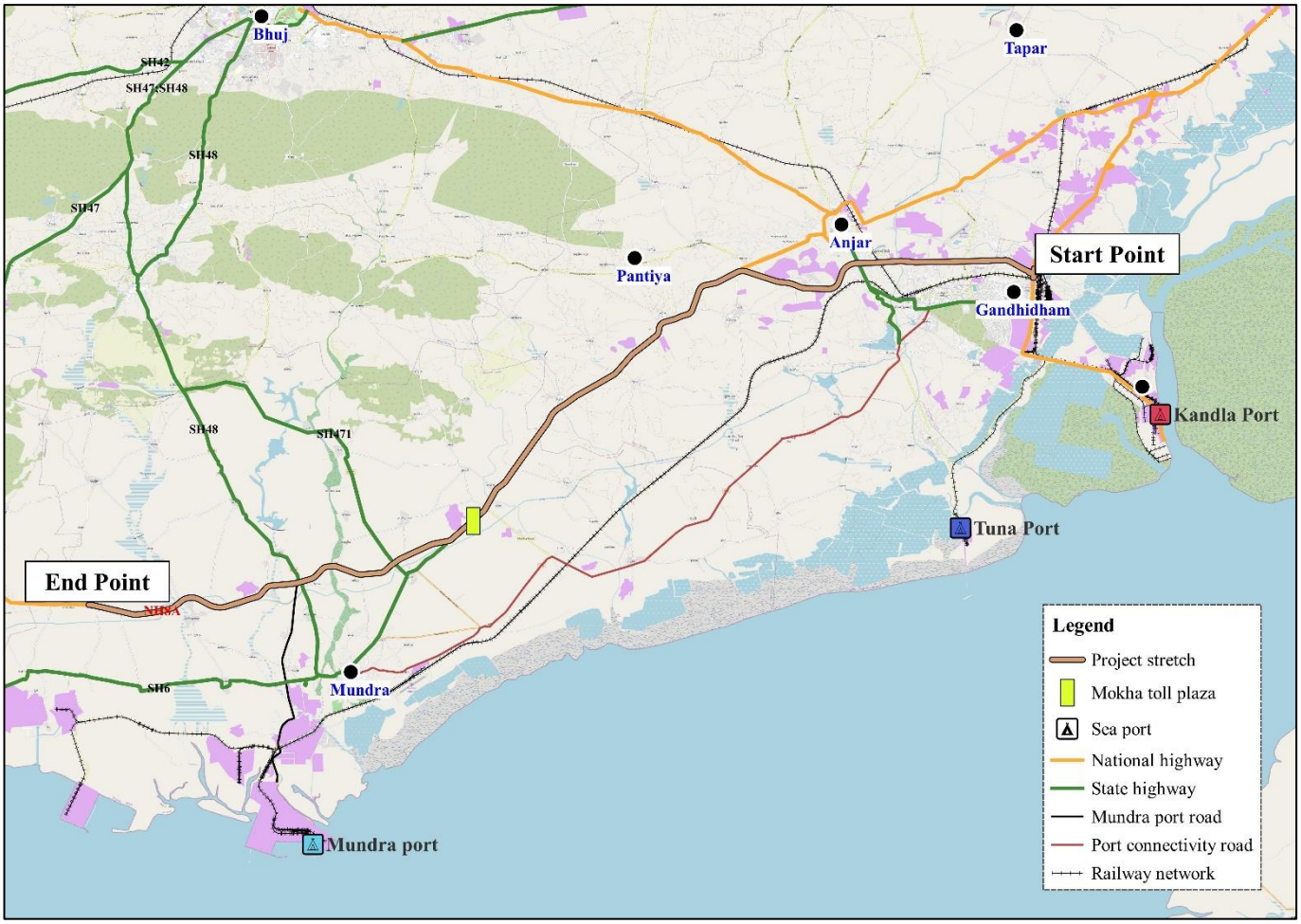


Figure 1-1: Project Road

Source: Open Street Map, Crisil Intelligence

Salient growth features and traffic generators

Container traffic holds major share around 61% in the overall traffic. Project road gives connectivity to two important seaports in the region which are Mundra Port and Kandla Port. Mundra Port, located in Gujarat, India, is the largest commercial port in the country and a critical hub for container traffic. It handles a significant volume of cargo, including containers, dry bulk, liquid bulk, and automobiles. The port's strategic location on the western coast of India allows it to serve the vast hinterland regions, including the National Capital Region, Gujarat, Punjab, Rajasthan, and Madhya Pradesh. Mundra Port operates five container terminals across 12 berths, with a combined capacity of 9.5 million TEUs (twenty-foot equivalent units). India’s container traffic decadal growth (FY14-FY24) is around 7.7% and Mundra port’s container traffic decadal growth (FY14-FY24) is around 12.0%.

Second most carried commodity is tiles and ceramics, which is around 5.3%. The Morbi Ceramic Cluster, located in Gujarat, India, is one of the largest and most significant ceramic industry clusters in the world. It is situated about 250 km from Ahmedabad and is renowned for its extensive production of ceramic products. The cluster comprises over 600 units, producing a wide range of items including wall tiles, floor tiles, vitrified tiles, polished glazed vitrified tiles, and sanitary ware.

Traffic volume and composite of vehicles

Traffic Survey Data

The following table shows the TVC seven-day traffic count of Gandhidham (Kandla)-Mundra Port section of NH-8A/41 according to the Traffic Consultant:

Table 1-1: Average Daily Traffic (ADT) from Traffic Volume Count Survey

Date	Days	Car	LCV + 2 Axle	3-axle	MAV	Vehicles	PCUs
7/28/2024	Sunday	2,155	366	608	9,614	12,743	48,114
7/29/2024	Monday	2,167	518	534	8,430	11,649	42,963
7/30/2024	Tuesday	2,092	552	635	9,014	12,293	45,930
7/31/2024	Wednesday	2,056	646	703	9,740	13,145	49,564
8/1/2024	Thursday	2,252	592	671	9,880	13,395	50,110
8/2/2024	Friday	2,018	524	662	9,444	12,648	47,761
8/3/2024	Saturday	2,800	562	627	9,307	13,296	47,874
ADT		**2,220**	**537**	**634**	**9,347**	**12,738**	**47,473**

Source: Crisil Intelligence

Historical traffic data

The chart below shows the average daily traffic on Gandhidham-Mundra stretch from April 2022 to November 2024.

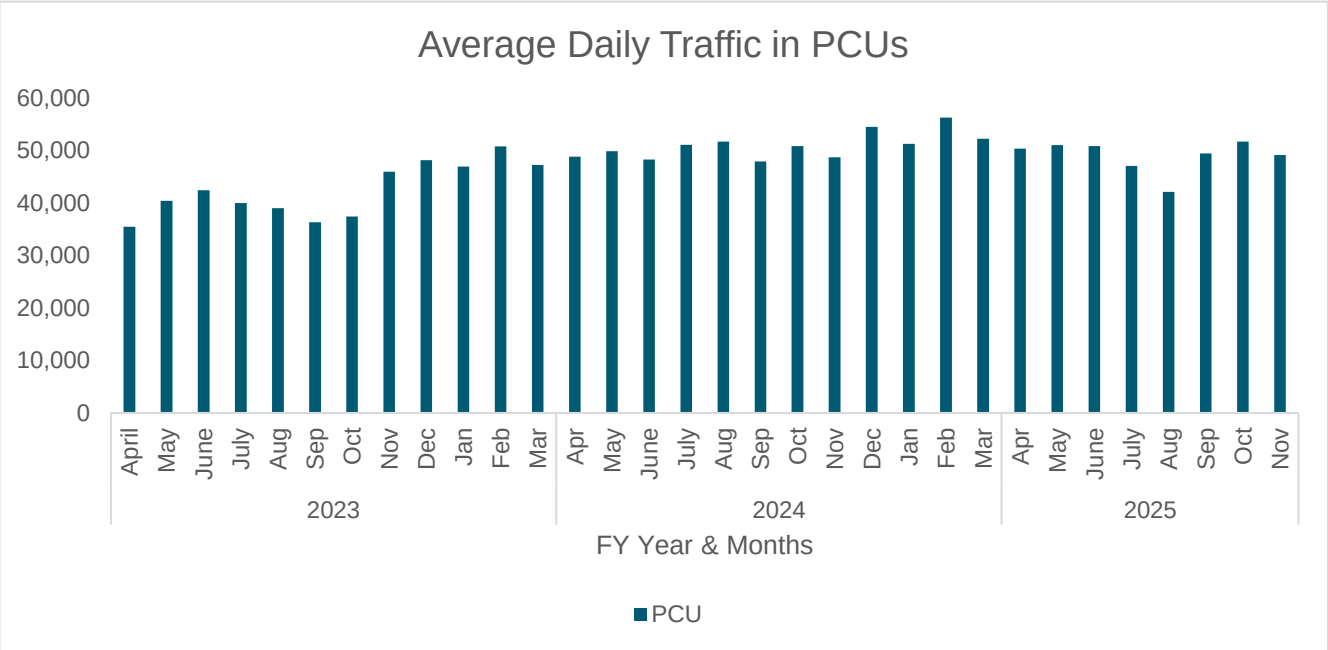


Figure 1-2: Historic Monthly Average Daily Traffic (MADT) in PCU

Source: Crisil Intelligence

Overloading scenario on the project stretch

To ascertain the quantum of overloading, a seven-day axle load survey was done by the technical consultants of the client. The results of axle load survey provided by the client, reveal that overloaded vehicles form a sizeable share of vehicles across categories. As per the survey, 41% of the MAVs, 40% of 3 axle and 3% of the 2 Axle vehicles are overloaded (considering more than 5% overload than permissible limits).

Tiles, Wood, Rice and Coal are key commodities which are overloaded.

As per discussions with the client, it is proposed that overloading will be levied on 25% of MAV and 3 Axle vehicles which are overloaded for more than 20% of the threshold and applied to the traffic which is travelling with trip length of less than 350kms and excluding commodities like fruits & vegetables, petroleum products and machinery. The quantum of vehicles for charging overloading penalty is decided after considering the practical numbers which can be charged per lane per hour. The revenue potential is arrived at, by considering an overloading levy equivalent to 1x of single journey toll rates.

Following table shows the overloading scenario for commercial vehicles on the stretch.

Table 1-2: Overloading survey Analysis

Direction	Vehicle Category	Sample	>5% overload	>20% overload	>5% overload	>20% overload
Overall	MAV	723	296	78	41%	11%
Overall	2A	107	3	0	3%	0%
Overall	3A	111	44	11	40%	10%
Gandhidham-Mundra	MAV	391	161	52	41%	13%
Gandhidham-Mundra	2A	36	2	0	7%	1%
Gandhidham-Mundra	3A	51	30	9	58%	17%
Mundra-Gandhidham	MAV	331	134	26	41%	8%
Mundra-Gandhidham	2A	71	1	-	1%	0%
Mundra-Gandhidham	3A	60	14	3	23%	4%

Source: Crisil Intelligence

Toll Segmentation

The table below presents a segmentation which is considered for the traffic based on the historic data.

Table 1-3: Trip segmentation

Vehicle category	Single journey	Return journey	Local Commercial Discount	Discount Monthly Local Pass	Exemptions
Car, jeep, van or LMV	26.5%	31.0%	0.0%	4.9%	37.6%
LCV, light goods vehicle, or minibus	25.8%	47.9%	2.0%	0.0%	24.3%
Bus or truck (2-axle)	36.4%	59.0%	3.5%	0.1%	1.0%
3-axle truck	17.6%	24.2%	38.0%	11.9%	8.3%
HCM, EME or MAV (4-6 axle)	26.1%	19.0%	42.0%	10.7%	2.2%

Source: Crisil Intelligence

The table below provides the traffic growth rates considering various diversion/impacts, as provided by the Traffic Consultant:

Table 1-4: Projected Traffic Growth Rates

Vehicle Type	FY 25-26	FY 26-30	FY 30-35	FY 35-40	FY 40-45	FY 45-55
Car/Jeep/Van	7.0%	6.4%	5.5%	4.6%	3.8%	2.9%
Minibus	3.0%	2.9%	2.6%	2.4%	2.1%	1.8%
2 Axle Bus	3.0%	2.9%	2.6%	2.4%	2.1%	1.8%
LCV	5.0%	4.1%	4.0%	3.2%	1.7%	0.6%
Truck	2.5%	1.9%	3.3%	2.5%	1.1%	0.2%
3 Axle Truck	2.5%	1.8%	2.4%	1.6%	0.3%	0.0%
MAV	5.7%	5.2%	6.0%	5.2%	3.8%	1.8%
OSV	7.2%	6.2%	6.0%	5.2%	3.8%	1.8%
Total Vehicles	**5.7%**	**5.2%**	**5.7%**	**4.9%**	**3.6%**	**2.0%**
Total PCU	**5.6%**	**5.1%**	**5.8%**	**5.0%**	**3.7%**	**1.8%**
Revenue Growth	**9.4%**	**9.6%**	**10.2%**	**9.4%**	**7.8%**	**6.0%**

Source: Crisil Intelligence

Table 1-5: Projected Traffic

Vehicle Type	FY 25	FY 30	FY 35	FY 40	FY 45	FY 55
Car/Jeep/Van	2,385	3,271	4,268	5,337	6,438	8,601
Minibus	17	20	22	25	28	33
2 Axle Bus	181	208	237	266	296	354
LCV	142	175	213	248	271	286
Truck	216	239	281	317	336	343
3 Axle Truck	626	690	776	841	852	851
MAV	10,266	13,296	17,833	22,996	27,676	33,210
OSV	9	12	16	21	25	30
Total Vehicles	**13,841**	**17,911**	**23,645**	**30,051**	**35,921**	**43,709**
Total PCU	**51,928**	**66,861**	**88,821**	**113,595**	**135,990**	**163,306**

Source: Crisil Intelligence

Tollable Length and Toll Rates

In terms of tollable length of 78.500 Km, includes road length of 61.881 Kms (excluding 0.7889 km of structure) and Anjar bypass length of 8.730 kms. In India, toll rates are as per notification by the Ministry of Road Transport and Highways in the National Gazette. The present toll rates are determined with reference to the published base toll rates and are adjusted annually at the beginning of each fiscal year equal to 40% of the movement in the wholesale price index in December of the preceding year plus a fixed 3%.

As per Gazette notification dated 05.12.2008, under National Highways Fee (Determination of Rates and Collection) Rules 2008 [GSR 838 (E)] and as per new gazette [S.O. 3272(E)] notification for the Mokha Plaza in July 2023, the per km toll rates applicable from 2007/08 for normal tolling length and permanent structure, the revision basis and concessions are provided

Toll rates at Mokha Toll Plaza, calculated as per schedule-M data, applicable until March 2025 (2024-25) are as provided below:

Table 1-6: Toll Rates

Type of vehicle	Single Journey	Return Journey	Monthly Pass	Commercial Vehicle Discount
Car/Jeep/Van	120	180	4,050	60
LCV	195	295	6,545	100
Bus/Truck	410	615	13,710	205
3 Axle Vehicle	450	675	14,960	225
MAV/4 to 6 Axle	645	970	21,500	325
HCM/EME	645	970	21,500	325
7 or more Axle	785	11,80	26,175	395

Source: Crisil Intelligence

Revenue Projections

The overall revenue including overloading in ₹ crores for the project road is presented in below table.

Table 1-7: Projected Revenue in ₹ crores including overloading

FY Year	Base Revenue	Overloading Revenue	Overall Revenue
FY25	172	0.0	172
FY26	188	0.0	188
FY27	208	8.3	216
FY28	226	8.2	234
FY29	249	8.2	257
FY30	272	8.0	280
FY31	297	7.6	304
FY32	333	7.3	340
FY33	363	6.6	369
FY34	400	5.8	406
FY35	441	4.8	446
FY36	485	3.5	489
FY37	530	0.0	530
FY38	578	0.0	578
FY39	632	0.0	632
FY40	691	0.0	691
FY41	745	0.0	745
FY42	804	0.0	804
FY43	868	0.0	868
FY44	939	0.0	939
FY45	1,005	0.0	1,005
FY46	1,077	0.0	1,077
FY47	1,148	0.0	1,148
FY48	1,227	0.0	1,227
FY49	1,299	0.0	1,299
FY50	1,374	0.0	1,374
FY51	1,455	0.0	1,455
FY52	1,540	0.0	1,540

FY Year	Base Revenue	Overloading Revenue	Overall Revenue
FY53	1,621	0.0	1,621
FY54	1,708	0.0	1,708
FY55	1,801	0.0	1,801
CAGR (FY25-45)	**9.2%**	**-**	**9.2%**
CAGR (FY25-55)	**8.1%**	**-**	**8.1%**

Source: Crisil Intelligence

2 Overview of project stretch

Project stretch delineation

Project road Gandhidham-Mundra is a 4-lane, 71.400 kms long stretch with 8.730 kms Anjar bypass, on national highways (NH) 8A/41 which connects Gandhidham and Mundra. Project road gives connectivity to Mundra port & Kandla Ports in the west region. The project stretch has one toll plaza by the name of Mokha which lies at the chainage of km 44+500 near Mokha Village.

Table 2-1: Details of the road stretch

Project stretch	State	Toll plaza	Length (km)
Gandhidham (Kandla) to Mundra Port section of NH-41 (from Existing Km 0+000 to Existing Km 71+400) in the State of Gujarat	Gujarat	Mokha	71.4

Source: Crisil Intelligence

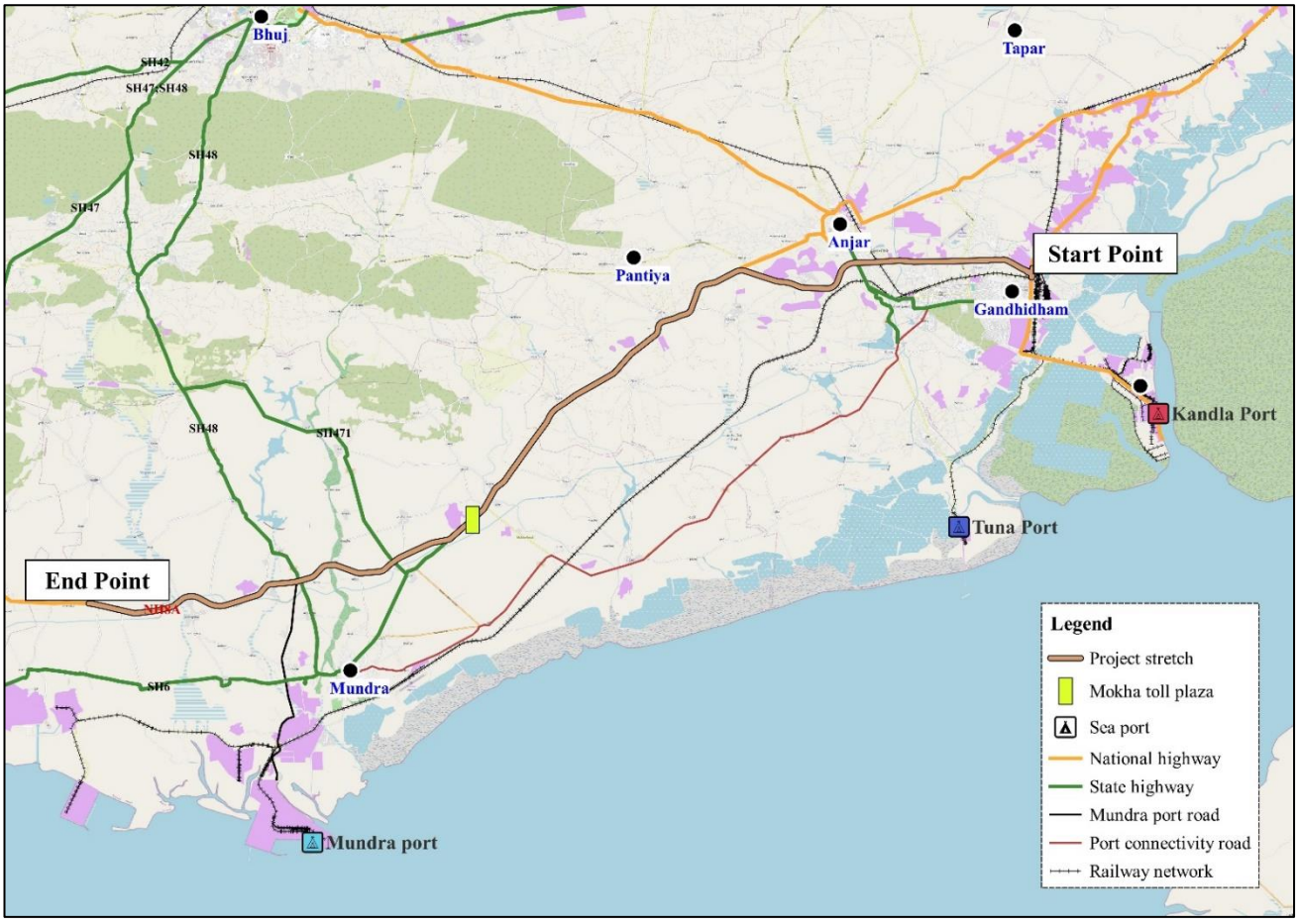


Figure 2-1: Project stretch alignment

Source: Open Street Map, Crisil Intelligence

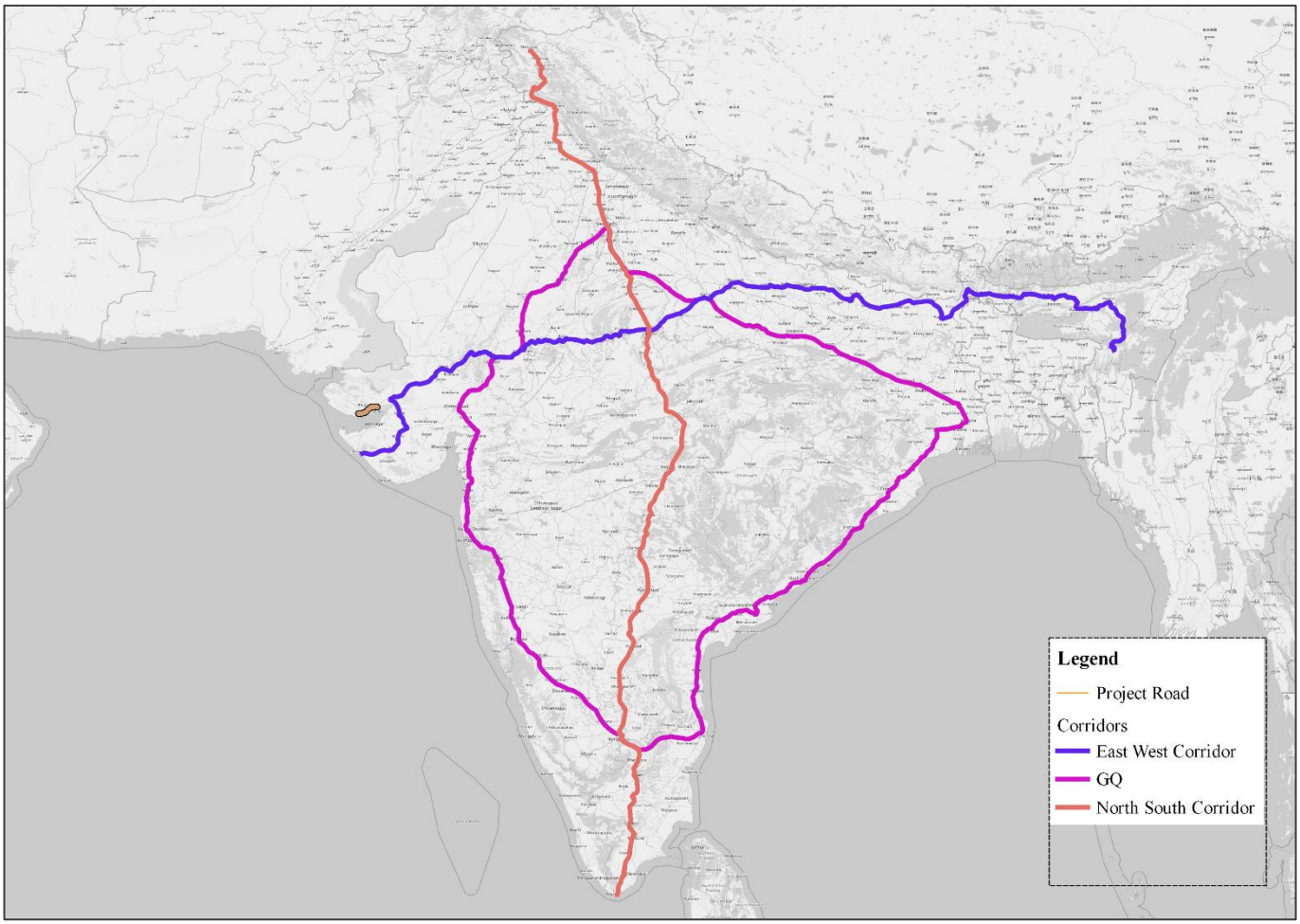


Figure 2-2: Project stretch alignment with major road corridors

Source: Open Street Map, Crisil Intelligence

Table 2-2: Key details of project stretch

Project stretch	Gandhidham (Kandla) to Mundra Port section of NH-8A/41
Authority	National Highway Authority of India
No. of lanes	4-lane configuration
Length of Project Stretch	71.400 Km
No. of Toll Plaza(s)	01
Name of Toll Plaza(s)	Mokha Plaza (Km 44.500)
Concession Period	20 Years

Source: NHAI, Crisil Intelligence

Industrial profile

Kutch district has several key industrial areas that contribute significantly to its economy. Major industrial areas are developed by Gujarat Industrial Development Corporation (GIDC), which are in Gandhidham, Mundra, Bhuj, Mith Rohar and Anjar. Kutch district is home to a diverse range of industries such are cement industry, agro based, chemical, salt production, power industry, textile, etc. The Kandla Special Economic Zone (KASEZ), located in the

Kutch district of Gujarat, is one of India's most prominent SEZs. with area about 1000 acres with 318 operational units. Hosts a variety of industries, including textiles, chemicals, engineering goods, etc.

Kutch produces nearly 75% of Gujarat's minerals, including bauxite, China clay, lignite, and limestone. Industrial areas along the project road and major industries in the region is presented in the below figure.

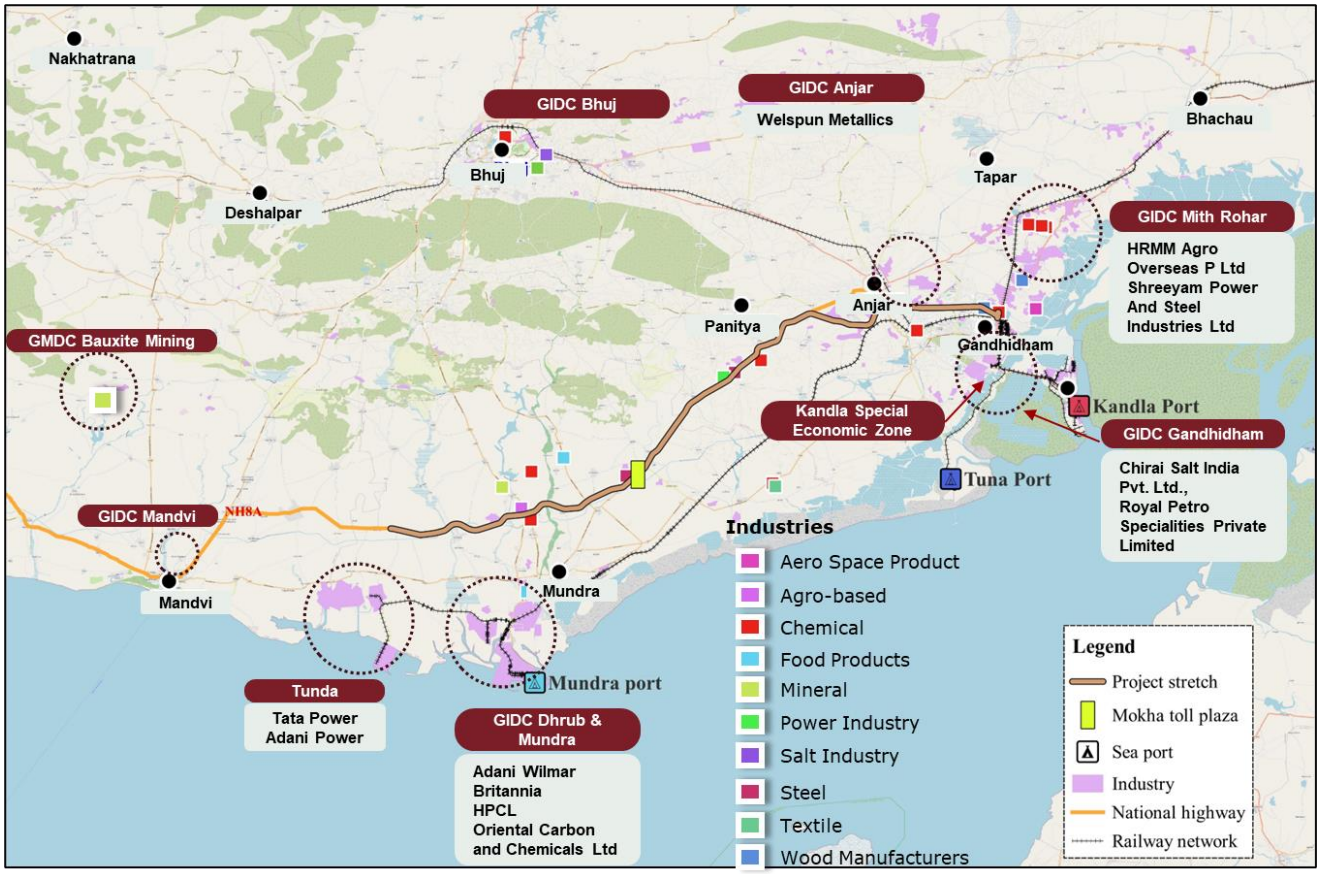


Figure 2-3: Industrial areas

Source: Open Street Map, Crisil Intelligence

Plenty of Warehouses are in the project influence are especially near Mundra port, Gandhidham, Anjar region. These warehouses cater to store Agro products, Plywood, FMCG, Iron & Steel, Pharmaceuticals commodities. Warehouses along the project road is presented in below figure.

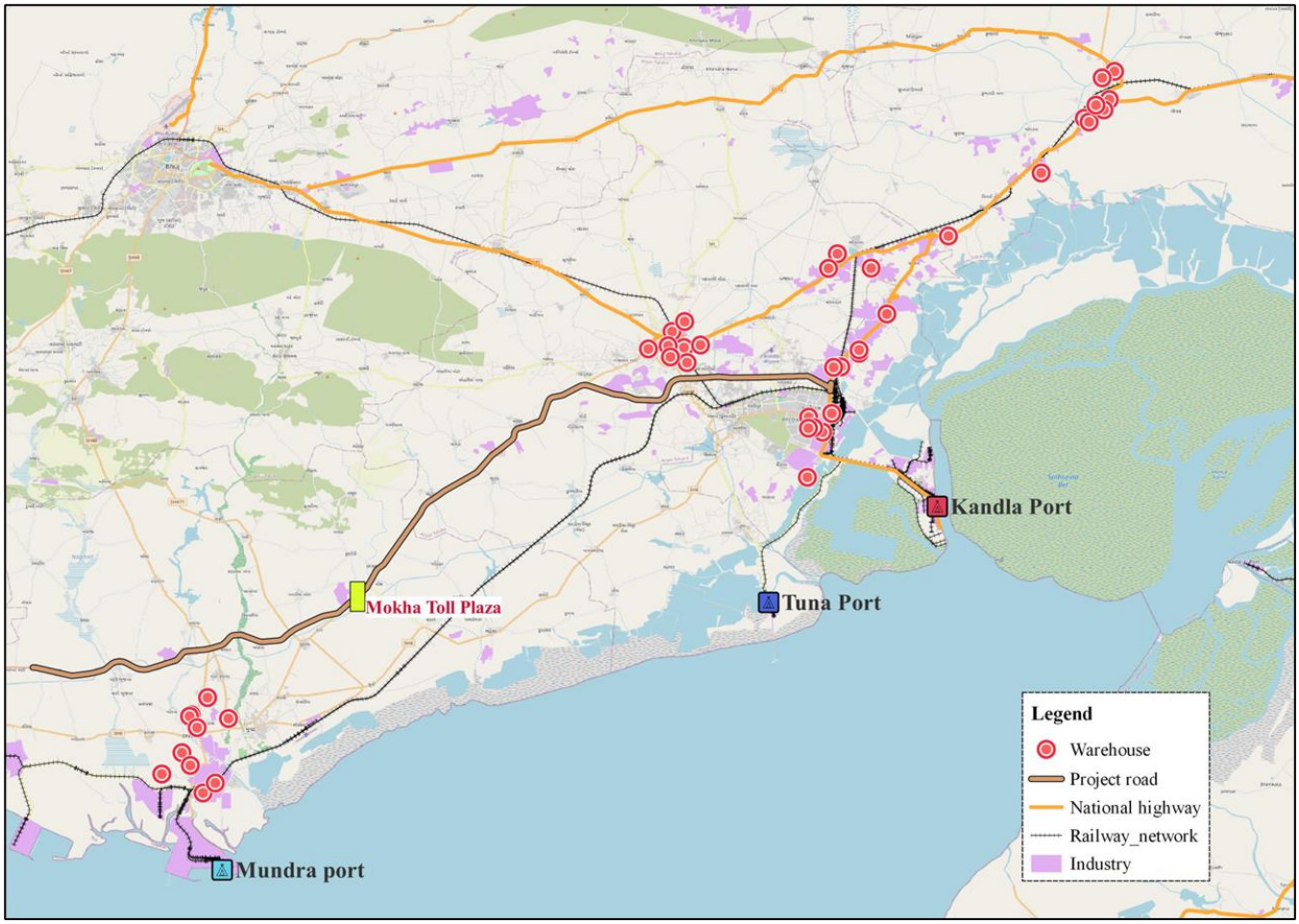


Figure 2-4: Warehouses along project road

Source: Open Street Map, Crisil Intelligence

3 Primary Data Collection & Analysis

General

Primary traffic surveys, i.e. Traffic volume count and Origin Destination surveys were collected on the project road to understand the traffic and travel pattern of vehicles plying on the project road.

For the present study, seven days video-based traffic volume count and one day origin destination survey conducted at the toll plaza location on the project road. The schedule of the traffic surveys carried out as part of the study on the project road are presented in the below table and figure.

Table 3-1: Type of Survey & Schedule

Location	Type of Survey	Survey Duration	Survey Date
Mokha Toll Plaza	Traffic Volume Count (TVC) Survey	7 Days	28th July-2024 to 3rd August-2024
	Origin-Destination (O-D) Survey	1 Day	31st July 2024
	Local District Count (LDC) Survey	1 Day	31st July 2024
Vadala Junction	Turning Movement Count (TMC) Survey	1 Day	30th July 2024
Gandhidham		1 Day	3rd August 2024
Pragpar		1 Day	4th August 2024
Vadala-Luni Road	Origin-Destination (O-D) Survey	1 Day	31st July 2024

Source: Crisil Intelligence

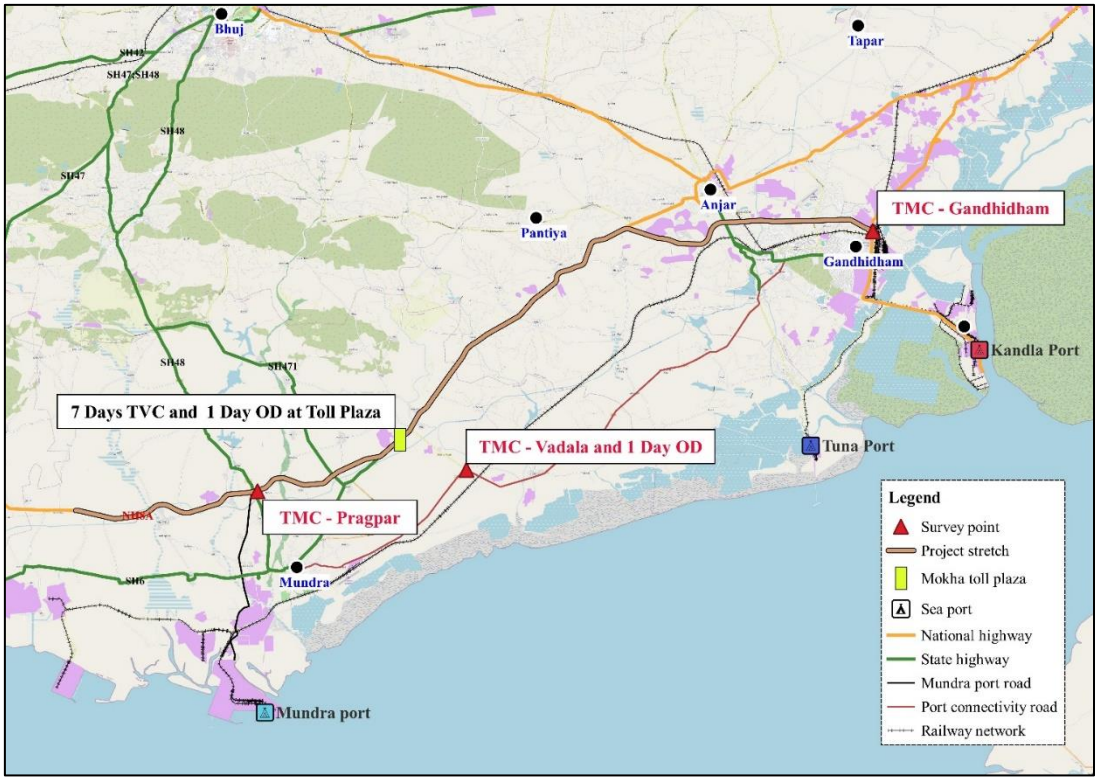


Figure 3-1: Survey Locations

Source: Open Street Map, Crisil Intelligence

Traffic Characteristics

The seven days traffic volume count was analysed to get existing traffic intensity, daily variations, and traffic composition.

The vehicle classification and there PCU values as suggested in IRC: 64-1990 are presented in **Table 3-2**.

Table 3-2: PCU Factors-IRC:64-1990

Mode	PCU
Car/Jeep	1.0
Two-Wheeler	0.5
Three-Wheeler	1.0
Minibus/School Bus	1.5
Bus (Govt/Pvt)	3.0
Mini LCV	1.0
LCV	1.5
2-Axle	3.0
3-Axle	3.0
MAV (4-6 Axles)	4.5
HME/OSV	4.5
Agricultural Tractor	1.5
Agricultural Tractor with Trailer	4.5
Cycle	0.5
Cycle Rickshaw	2.0
Animal Drawn Crat	6.0

Source: IRC:64-1990

The average daily tollable traffic volume at the toll plaza locations were analysed. The summary of ADT in terms of vehicles and PCUs is presented in table.

Table 3-3: Average Daily Traffic (ADT) for the Project Section

Mode	Gandhidham to Mundra	Mundra to Gandhidham	ADT
Car	817	843	1,660
Minibus	12	11	23
Bus	73	74	147
3-Ax Bus	0	0	0
Mini LCV	279	281	560
LCV	97	95	192
Truck-2 Axle	86	89	175
Truck-3Axle	321	313	634
MAV	4,685	4,662	9,347
Vehicles	**6,369**	**6,369**	**12,738**
PCU	**23,780**	**23,692**	**47,473**

Source: Crisil Intelligence

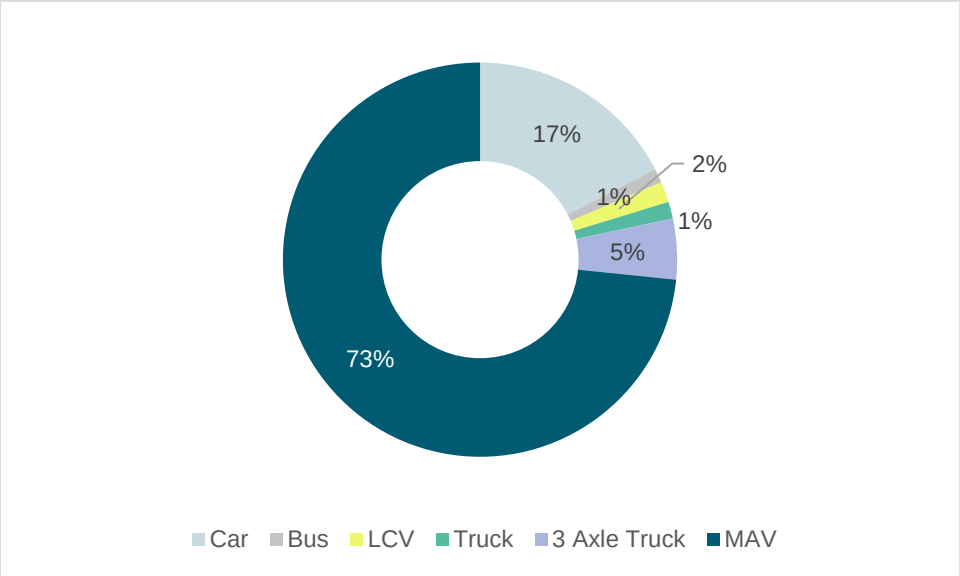


Figure 3-2: Tollable traffic composition (%)

An analysis of TVC traffic at Mokha Plaza is presented below.

- Passenger vehicles constitute 19% of the tollable traffic and Goods 81% of the tollable traffic in vehicle terms.
- MAV is having highest share with around 73%, followed by 3 Axle truck with 17% share.
- Average Daily traffic is about 12,738 and 47,473 in traffic vehicles and PCU terms respectively.

TVC survey data for the seven-day period is presented in the below table.

Table 3-4: Daily traffic volume at Mokha Plaza based on TVC survey

Date	CAR/Jeep/Van	LCV	2-Axle	3-Axle	MAV	OSV	Total
7/28/2024	2,155	151	215	608	9,614	0	12,743
7/29/2024	2,167	197	321	534	8,429	1	11,649
7/30/2024	2,092	191	361	635	9,014	0	12,293
7/31/2024	2,056	246	400	703	9,740	0	13,145
8/1/2024	2,252	261	331	671	9,880	0	13,395
8/2/2024	2,018	209	315	662	9,444	0	12,648
8/3/2024	2,800	250	312	627	9,306	1	13,296
ADT	**2,220**	**215**	**322**	**634**	**9,347**	**0**	**12,738**

Source: Crisil Intelligence

Origin-Destination (OD) and Commodity Analysis

Origin-Destination survey was carried out at Mokha Plaza for 24-hours, by roadside interview method as described in IRC: 102-1988. A random sampling approach was employed to interview both passenger and freight vehicles traversing the project road at the toll plaza locations. The survey aimed to gather information on various aspects, including origin, destination, frequency of trips, purpose of travel and for freight vehicles, the type of commodity being transported.

The regional distribution of tollable vehicles at the toll plaza locations has been estimated based on OD matrices is presented in below table and figure.

The project influencing states will provide an overview of the factors likely to influence the pattern of economic development and hence the flows and volumes of traffic on the project road.

The key influencing regions from the origin destination survey are Mundra, Gandhidham, Ahmedabad and Morbi for passenger traffic and for goods traffic Mundra, Gandhidham, Morbi and Rajasthan. Regional distribution for passenger traffic and goods traffic is given in the below table.

Based on the O-D survey analysis insights, it was observed the in goods most of the traffic movement was towards/starting from Gandhidham region, it was observed through site visit and interactions with various stakeholders like transporters, warehouse establishments, the commodities movements which are travelling from states Rajasthan, Delhi, Haryana and Punjab and beyond are getting containerised at Gandhidham region (Gandhidham has plenty of warehouse's), potentially transported through a hub and spoke. To capture this traffic, consultants analysed Origin-Destination survey data of Samakhiyali Plaza model (additional Inscope traffic from S is considered for WDFC Impact), which is located after Gandhidham. Samakhiyali OD insights is presented in annexures.

Table 3-5: Regional Distribution in % for passenger traffic

Region	% Influence
Mundra	49.9%
Gandhidham	40.2%
Ahmedabad	4.4%
Morbi	1.6%
North India	1.2%
Other parts of Gujarat	0.7%
Rajasthan	0.7%
Central & East India	0.6%
South Gujarat	0.6%
Maharashtra & South India	0.2%
Total	**100%**

Source: Crisil Intelligence

Table 3-6: Regional Distribution in % for goods traffic

Region	% Influence
Mundra	50.0%
Gandhidham	17.6%
Morbi	13.2%
Rajasthan	6.2%
North India	5.1%
Ahmedabad	3.8%
Central & East India	1.7%
Maharashtra & South India	1.2%
South Gujarat	0.8%
Other parts of Gujarat	0.3%
Total	**100%**

Source: Crisil Intelligence

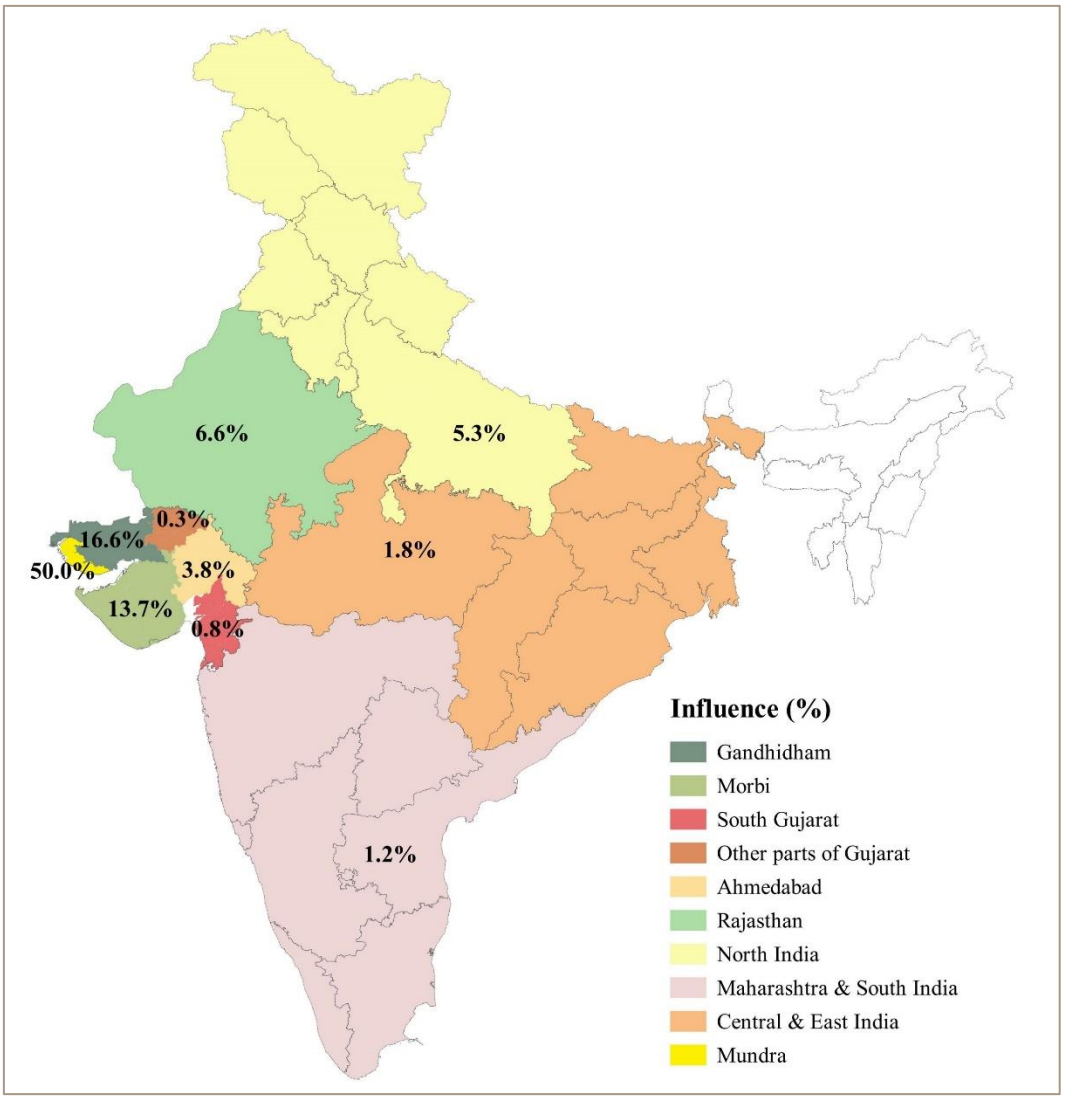


Figure 3-3: Regional Distribution for MAV traffic (%)

Source: Open Street Map, Crisil Intelligence

Passenger Traffic

- **Mundra** contribute to 49.8% car traffic and followed by **Gandhidham** with 41.7% region, indicating the more local movement.
- **Mundra-Gandhidham and Mundra-Anjar** and vice versa are the major OD pairs in car traffic**.**

Freight Traffic

- **Mundra** contribute to 50.0% car traffic and followed by **Gandhidham** with 16.3% region of MAV traffic. Morbi region contribute to 13.7% traffic.
- **For Container traffic, Mundra, Gandhidham and Morbi** region contribute to 83% of MAV traffic.
- **For Tiles & Ceramics commodity traffic, Mundra, Gandhidham and Morbi** region contribute to 82% of MAV traffic.
- **For Agricultural produce (Majorly Rice) commodity traffic apart from top regions like Mundra, Gandhidham and Morbi region, North India** region contribute 6.9% of traffic.

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Commodity Distribution

Analysis was carried out to understand the various freight vehicles being used to transport different commodities. Table below presents the commodity distribution for Mokha Plaza.

Table 3-7: Commodity Distribution (in %) for Mokha Plaza

Commodity	LCV	2 Axle Truck	3 Axle Truck	MAV	Total
Container	45.2%	66.4%	63.8%	61.0%	61.0%
Tiles & Ceramic products	0.0%	1.8%	3.4%	5.6%	5.3%
Agri Produce	2.6%	1.8%	5.6%	3.5%	3.5%
Consumer Foods	4.8%	3.1%	4.3%	3.4%	3.5%
Plastic products	3.7%	2.9%	2.6%	2.6%	2.6%
Courier & parcel	3.9%	2.4%	1.8%	2.2%	2.2%
Construction materials	0.0%	1.3%	1.4%	1.8%	1.8%
Chemical products	0.0%	0.0%	1.6%	1.8%	1.7%
Coal	0.0%	0.0%	0.2%	1.8%	1.7%
Textile & Footwear	0.0%	0.7%	1.2%	1.5%	1.4%
Iron & Steel Products	1.7%	1.1%	0.8%	1.4%	1.4%
Petroleum Products	2.2%	2.9%	1.4%	1.1%	1.1%
Plywood & Timber products	4.8%	0.0%	1.0%	1.0%	1.1%
Others	3.1%	1.8%	1.0%	1.0%	1.0%
Machinery	1.1%	2.0%	0.4%	0.8%	0.8%
Paper products	0.0%	0.0%	0.6%	0.8%	0.7%
Rubber products	0.0%	0.7%	0.4%	0.6%	0.6%
Automobiles	0.0%	0.7%	0.2%	0.5%	0.4%
Consumer Products	0.9%	1.1%	0.8%	0.4%	0.4%
Milk & Animal Food	2.0%	0.7%	0.8%	0.2%	0.2%
Pharmaceuticals	0.0%	0.0%	0.0%	0.2%	0.1%
Empty	24.2%	9.0%	6.9%	6.9%	7.2%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Crisil Intelligence

- The analysis of freight movement across the toll plaza reveals that the major commodities being transported include container, tiles & ceramics, Agri produce and Consumer foods.
- Reason for higher container traffic is due to the project road connects the Mundra port, which is the largest commercial port in India, which has handled 7.4[1] million TEUs of container traffic in FY 24.
- From OD it has been evident that most trips (especially agri produce) are ending at Gandhidham, due to the presence of warehouses around the Gandhidham region, the commodities are getting containerised and potentially transported through a hub and spoke model.
- Around 64% 3 Axle Trucks traffic carry container, followed by 5.6% of agricultural produce.
- Around 61% MAV traffic carry container, followed by 5.6% of tiles and ceramics.

Source: 1. Integrated Annual Report 2023-24, Adani Ports and Special Economic Zone Limited (APSEZ)

Direction wise commodity distribution is presented in the below tables.

Table 3-8: Commodity Distribution (in %) for Gandhidham-Mundra direction

Commodity	LCV	2 Axle Truck	3 Axle Truck	MAV	Total
Container	52.5%	65.3%	64.4%	67.2%	66.8%
Agri Produce	5.1%	1.3%	9.8%	4.6%	4.8%
Tiles & Ceramic products	0.0%	1.3%	2.7%	4.9%	4.7%
Consumer Foods	5.1%	4.0%	4.2%	2.8%	2.9%
Plastic products	5.1%	1.3%	2.3%	2.3%	2.3%
Courier & parcel	3.4%	2.7%	1.5%	1.8%	1.9%
Construction materials	0.0%	2.7%	1.5%	1.8%	1.8%
Machinery	0.0%	4.0%	0.8%	1.3%	1.3%
Textile & Footwear	0.0%	1.3%	1.1%	1.1%	1.1%
Iron & Steel Products	3.4%	0.0%	0.4%	1.0%	1.0%
Chemical products	0.0%	0.0%	1.1%	0.8%	0.8%
Petroleum Products	0.0%	1.3%	1.5%	0.6%	0.7%
Rubber products	0.0%	1.3%	0.8%	0.5%	0.5%
Others	1.7%	1.3%	0.8%	0.4%	0.5%
Consumer Products	1.7%	0.0%	0.4%	0.5%	0.5%
Milk & Animal Food	1.7%	1.3%	1.5%	0.2%	0.3%
Paper products	0.0%	0.0%	0.8%	0.3%	0.3%
Plywood & Timber products	5.1%	0.0%	0.0%	0.2%	0.3%
Automobiles	0.0%	1.3%	0.0%	0.3%	0.3%
Coal	0.0%	0.0%	0.0%	0.3%	0.2%
Pharmaceuticals	0.0%	0.0%	0.0%	0.3%	0.2%
Empty	15.3%	9.3%	4.5%	6.8%	6.8%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Crisil Intelligence

Table 3-9: Commodity Distribution (in %) for Mundra-Gandhidham direction

Commodity	LCV	2 Axle Truck	3 Axle Truck	MAV	Total
Container	37.8%	67.4%	63.3%	54.7%	12.6%
Tiles & Ceramic products	0.0%	2.2%	4.1%	6.2%	9.7%
Consumer Foods	4.4%	2.2%	4.5%	4.0%	7.5%
Coal	0.0%	0.0%	0.4%	3.4%	7.0%
Plastic products	2.2%	4.3%	2.9%	2.9%	5.8%
Chemical products	0.0%	0.0%	2.0%	2.8%	4.5%
Courier & parcel	4.4%	2.2%	2.0%	2.6%	4.4%
Agri Produce	0.0%	2.2%	1.2%	2.3%	4.0%
Plywood & Timber products	4.4%	0.0%	2.0%	1.8%	3.1%
Construction materials	0.0%	0.0%	1.2%	1.9%	2.8%
Iron & Steel Products	0.0%	2.2%	1.2%	1.8%	2.7%
Textile & Footwear	0.0%	0.0%	1.2%	1.8%	2.3%
Petroleum Products	4.4%	4.3%	1.2%	1.5%	2.2%
Others	4.4%	2.2%	1.2%	1.6%	2.2%
Paper products	0.0%	0.0%	0.4%	1.3%	1.4%

Commodity	LCV	2 Axle Truck	3 Axle Truck	MAV	Total
Rubber products	0.0%	0.0%	0.0%	0.8%	1.4%
Automobiles	0.0%	0.0%	0.4%	0.7%	1.1%
Consumer Products	0.0%	2.2%	1.2%	0.3%	0.9%
Machinery	2.2%	0.0%	0.0%	0.3%	0.9%
Milk & Animal Food	2.2%	0.0%	0.0%	0.2%	0.6%
Pharmaceuticals	0.0%	0.0%	0.0%	0.0%	0.6%
Empty	33.3%	8.7%	9.4%	7.0%	22.3%
Grand Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100%**

Source: Crisil Intelligence

- For Gandhidham-Mundra direction, container traffic is slighter higher than the Mundra-Gandhidham direction. agri produce, followed by tiles & ceramic products among the top commodities.
- For Mundra-Gandhidham direction, tiles & ceramics, followed by consumer foods among the top commodities.

Container is the topmost commodity on the stretch

Container traffic holds major share around 61.0% in the overall traffic. Project road gives connectivity to two important seaports in the region which are Mundra Port and Kandla Port. Mundra Port, located in Gujarat, India, is the largest commercial port in the country and a critical hub for container traffic. It handles a significant volume of cargo, including containers, dry bulk, liquid bulk, and automobiles. The port's strategic location on the western coast of India allows it to serve the vast hinterland regions, including the National Capital Region, Gujarat, Punjab, Rajasthan, and Madhya Pradesh. Mundra Port operates five container terminals across 12 berths, with a combined capacity of 9.5 million TEUs (twenty-foot equivalent units). India’s container traffic decadal growth (FY14-FY24) is around 7.7% and Mundra port’s container traffic decadal growth (FY14-FY24) is around 12.0%.

Tiles & Ceramics commodity accounts for nearly 12.6% of the total container traffic and 5% of the total traffic on the project stretch

The Morbi Ceramic Cluster, located in Gujarat, India, is one of the largest and most significant ceramic industry clusters in the world. It is situated about 250 km from Ahmedabad and is renowned for its extensive production of ceramic products. The cluster comprises over 600 units, producing a wide range of items including wall tiles, floor tiles, vitrified tiles, polished glazed vitrified tiles, and sanitary ware.

Morbi's ceramic industry is known for its advanced technology and high-quality products, with many units utilizing state-of-the-art equipment imported from around the globe.

The Morbi Ceramic Cluster provides direct employment to about 68,000 people and indirectly supports many more through related businesses and professions. The industry is a major contributor to the local economy, fostering growth and development in the region. The cluster's products are not only supplied domestically but also exported to various international markets, enhancing its global footprint.

Overall, the Morbi Ceramic Cluster is a vital industrial hub that significantly contributes to India's ceramic production and export capabilities. Its continuous growth and adoption of new technologies ensure that it remains a key player in the global ceramic industry.

Export volumes recorded 28% growth on-year in fiscal 2024 with ceramic tiles exporters benefitting from certain favourable developments like lifting of the anti-dumping duty imposed by UAE on ceramic tiles from India. Meanwhile, despite the European Union announcing anti-dumping duty on ceramic tiles from India in 2023, the same is lesser for ceramic tiles from India as compared to tiles from competitors like Turkey and China giving India an added advantage with regards to expansion in exports to European nations. This is majorly on the back of superior quality tiles being produced in India at comparatively affordable prices. Globally, ceramic tiles import from India are well preferred due to these factors.

Going forward as well, we expect growth momentum to continue owing to continued cost competitiveness of Indian manufacturers as well as major global importers wanting to reduce their dependence on sole supplier i.e. China

In fiscal 2025, volume and value growth expected to be boosted by the growth in new real estate project completions, however replacement demand is estimated to continue its upward trajectory in fiscal 2025 as work from home for service sector continues to aid to overall tiles demand. Also, construction & completion of PMAY Urban to remain buoyant during the period as the government races to complete the scheme before the expected extended timeline.

Commodities carried by container traffic is provided in annexures.

4 Traffic Assessment of Project Stretch

General

This section summarizes the historical performance of the project section in order to understand baseline traffic patterns comprising of historical tollable traffic and revenue growth, traffic and revenue composition, trip distribution, trip factors, seasonality and trend of traffic over the available data set.

The historical tollable traffic and revenue data mode wise was made available by client from April 2022 till November 2024 and is presented in below table.

Table 4-1: Historical Traffic and Revenue Data Availability

Data Source	Type of Data	Period
ETC Data	Traffic & Revenue Data Vehicle Wise & Segment Wise	April 2022 – November 2024
IHMCL (Non ETC Data)	Traffic and Revenue Data Vehicle Wise (Cash & Exemption Data)	Nov 2022 to October 2024

Source: Client, Crisil Intelligence

MAVs contribute 91% of the Plaza traffic in terms of PCUs

Project road has seen steady growth in FY 24, however was dip in traffic this fiscal year of 25, showing negative growth of -0.2% in terms of PCU's (April-Nov YTD). The degrowth traffic is due reasons like cyclone Asna impact and excessive rainfall during the monsoon periods. The summary of historic tollable ETC traffic data from April 2022 to November 2024 is presented in below table.

Table 4-2: Historic Traffic

FY Year	Months	Cars	LCV	2-Axle	3-Axle	MAV	OSV	Vehicles	PCU
2023	Apr	965	91	272	668	7,007	4	9,007	35,470
	May	1,170	96	267	758	7,994	8	10,292	40,399
	June	1,214	112	313	755	8,394	11	10,799	42,410
	July	976	112	285	770	7,920	6	10,069	39,978
	Aug	949	102	310	823	7,657	8	9,849	38,992
	Sep	918	109	285	726	7,143	9	9,190	36,299
	Oct	1,144	98	289	629	7,407	10	9,576	37,419
	Nov	1,103	116	327	785	9,171	9	11,511	45,924
	Dec	1,025	121	348	840	9,629	9	11,971	48,139
	Jan	1,092	105	340	773	9,393	10	11,713	46,901
	Feb	1,270	109	347	879	10,133	9	12,748	50,753
	Mar	1,243	109	347	841	9,384	8	11,931	47,234
2024	Apr	1,262	115	351	824	9,740	9	12,301	48,830
	May	1,509	115	355	831	9,903	10	12,724	49,851
	June	1,416	128	367	707	9,648	7	12,273	48,281
	July	1,236	118	356	779	10,266	9	12,764	51,054
	Aug	1,269	111	357	806	10,381	9	12,933	51,678
	Sep	1,301	110	350	714	9,599	10	12,083	47,896

FY Year	Months	Cars	LCV	2-Axle	3-Axle	MAV	OSV	Vehicles	PCU
	Oct	1,245	116	386	744	10,213	9	12,713	50,808
	Nov	1,676	114	362	690	9,701	8	12,551	48,695
	Dec	1,641	122	413	763	10,901	10	13,850	54,451
	Jan	1,654	115	407	770	10,185	11	13,140	51,234
	Feb	1,739	121	407	809	11,247	12	14,335	56,234
	Mar	1,654	123	413	694	10,448	10	13,342	52,221
2025	Apr	1,590	115	377	642	10,111	8	12,842	50,351
	May	1,656	115	379	657	10,223	9	13,039	50,980
	June	1,600	119	383	676	10,181	8	12,967	50,807
	July	1,333	121	355	596	9,468	7	11,880	47,005
	Aug	1,374	100	367	570	9,485	6	11,902	47,047
	Sep	1,161	110	375	602	10,025	7	12,280	49,401
	Oct	1,241	111	378	646	10,481	8	12,864	51,677
	Nov	1,616	114	386	604	9,841	8	12,569	49,078

June 2023 data is adjusted for the cyclone Bijparjoy Impact (Data till 23rd June).
For August month data is considered till 25th august, rest of the days were affected by floods in Kutch region of Gujarat (Cyclone Asna).
Source: Client ETC Data, Crisil Intelligence

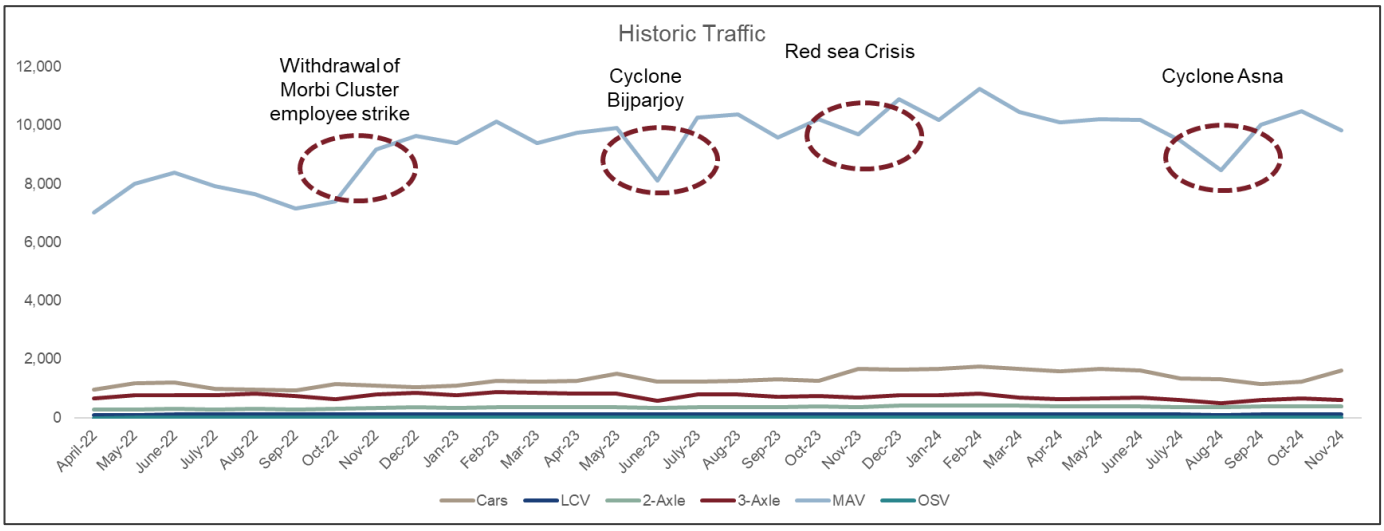


Figure 4-1: Historic traffic with events

Historic traffic has seen some changes in trend due to some events which has occurred during this period. Over the years Kutch region has witnessed cyclones, in June 2023 witnessed cyclone Bijparjoy and in last week of august 2024 Kutch region witnessed cyclone Asna. Traffic also depends on the ceramic cluster of Morbi region. Tiles & ceramics export has been fluctuating over the years due to various factors like antidumping, industry shutdowns, employee strikes. Mundra port also witnessed red crisis impact in October 2023.

Table 4-3: Historic traffic vehicle share (%) (April-Nov 2024)

Mode	Traffic Volume (Vehicles)	Traffic Volume (PCUs)	Share (%) - PCUs
Cars	1,447	1,447	2.9%
LCV	113	170	0.3%
2-Axle	375	1,125	2.3%
3-Axle	625	1,876	3.8%

Mode	Traffic Volume (Vehicles)	Traffic Volume (PCUs)	Share (%) - PCUs
MAV	9,988	44,948	90.6%
OSV	7	34	0.1%
Total	**12,557**	**49,600**	**100.0%**

Source: Client ETC Data, Crisil Intelligence

Based on the analysis of the Non ETC Data of the current fiscal year of FY 25, the cash component (% of ETC) is high for the car category which is around 3.2% and for rest of the categories it is negligible. In case of exemptions (% ETC), for car is significantly higher which is around 50%, for LCV it is around 38% and for MAV it is around 0.4% which is least among all vehicles. The cash & exemption (%) is presented in the below table.

Table 4-4: Cash & Exemption Traffic

Particulars	FY Year	Cars	LCV	2-Axle	3-Axle	MAV	OSV	Vehicles	PCU
ETC ADT (Apr-Oct)	FY 25	1,423	113	374	628	10,010	7	12,555	49,675
Cash ADT (Apr-Oct)	FY 25	46	0	0	0	0	0	46	46
Exemption ADT (Apr-Oct)	FY 25	721	43	4	2	24	1	795	916
Cash & Exemption ADT (Apr-Oct)	FY 25	767	43	4	2	24	1	842	962
Cash (%)		3.2%	0.1%	0.0%	0.0%	0.0%	0.0%		
Exemption (%)		50.7%	38.2%	1.1%	0.4%	0.2%	11.7%		
Cash & Exemption (%)		53.9%	38.3%	1.1%	0.4%	0.2%	11.7%		

For August month data is considered till 25th august, rest of the days were affected by floods in Kutch region of Gujarat (Cyclone Asna).
Source: Client ETC and Non ETC Data, Crisil Intelligence

Analysis of ETC historic traffic showing negative growth of -0.2% in terms of PCU's (April-Nov YTD) for fiscal year 25. The degrowth traffic is due reasons like cyclone Asna impact and excessive rainfall during the monsoon periods.

Table 4-5: Historic traffic growth

Period	Year	Cars	LCV	2-Axle	3-Axle	MAV	OSV	Vehicles	PCU
April-November	FY 24 ADT	1,362	116	360	764	9,944	9	12,555	49,697
April-November	FY 25 ADT	1,447	113	375	625	9,988	7	12,557	49,600

Source: Client ETC Data, Crisil Intelligence

Historic data analysis shows that a negative growth of **-0.2%** in PCU terms during FY 25 for the 8 months from April-November.

The summary of historic revenue data from April 2022 to November 2024 is presented in below table.

Table 4-6: Past Revenue in ₹ Millions

FY Year	Months	Cars	LCV	2-Axle	3-Axle	MAV	OSV	**Total**
2023	July	3.2	0.6	3.0	10.1	121.5	0.1	138.6
	Aug	3.2	0.5	3.4	10.4	114.1	0.2	131.8
	Sep	3.0	0.5	2.9	8.3	102.4	0.2	117.4
	Oct	3.9	0.5	3.1	7.5	110.3	0.2	125.5
	Nov	3.6	0.6	3.4	9.6	127.6	0.2	144.9
	Dec	3.5	0.6	3.8	10.8	140.2	0.2	159.0

FY Year	Months	Cars	LCV	2-Axle	3-Axle	MAV	OSV	Total
	Jan	3.7	0.5	3.7	10.0	137.1	0.2	155.3
	Feb	3.4	0.5	3.4	10.4	133.3	0.2	151.2
	Mar	3.7	0.6	3.8	11.2	137.0	0.2	156.4
2024	Apr	3.8	0.6	3.8	10.6	142.0	0.2	161.0
	May	4.7	0.6	4.0	11.1	150.0	0.2	170.6
	June	3.6	0.6	3.6	7.9	121.4	0.2	137.2
	July	3.7	0.6	4.0	10.7	152.5	0.2	171.8
	Aug	3.8	0.6	4.0	11.3	156.8	0.2	176.8
	Sep	3.9	0.6	3.8	9.8	142.4	0.2	160.8
	Oct	3.9	0.6	4.3	10.6	154.6	0.2	174.2
	Nov	5.3	0.6	3.9	9.5	142.1	0.2	161.6
	Dec	5.0	0.7	4.7	10.4	169.9	0.2	190.9
	Jan	4.9	0.6	4.6	10.2	160.2	0.2	180.8
	Feb	4.7	0.6	4.3	10.2	162.7	0.3	182.8
	Mar	4.8	0.7	4.7	9.0	159.5	0.2	178.8
2025	Apr	4.4	0.6	4.1	8.3	149.5	0.2	167.1
	May	4.8	0.6	4.3	8.9	160.7	0.2	179.4
	June	4.1	0.6	4.0	6.1	148.7	0.2	163.6
	July	3.4	0.6	3.9	5.1	133.0	0.2	146.2
	Aug	3.5	0.5	3.7	4.2	116.3	0.1	128.3
	Sep	2.9	0.5	3.9	5.0	129.7	0.1	142.2
	Oct	3.3	0.6	4.0	5.3	134.1	0.2	147.4
	Nov	4.5	0.6	4.0	4.6	120.7	0.2	134.5

Source: Client ETC Data, Crisil Intelligence

The Historic revenue trends suggest decrease in the revenue in FY 2025 when compared to FY 24 due to start of issuance of the Local commercial discount from June 2024 based on the new gazette notification which was published in July 2023.

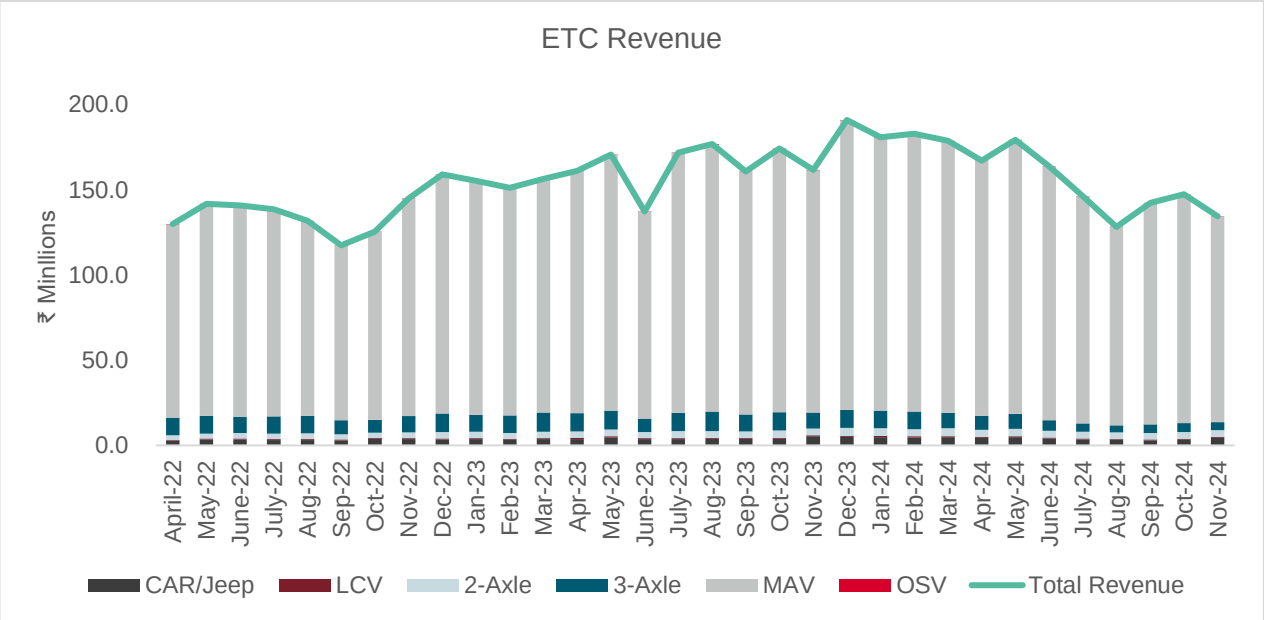


Figure 4-2: Historic Revenue

Source: Client ETC Data, Crisil Intelligence

Trip segmentation

National Highways Authority of India notified new gazette notification for the Mokha Plaza in July 2023 and as per toll rate revision order of FY 25, five types of toll tickets are being issued at Mokha Plaza, which are single journey, return journey, monthly pass, local personal pass, local commercial discount and exemptions. Apart from the notified ticketing, local pass for non-commercial (Discount MP) traffic is being issued at the toll plaza.

Table 4-7: Historic Trip Segmentation

FY Year	Months	Single	Return	LDC	Discount MP	Exemptions	Total
2024	Apr	60.13%	26.21%	0.00%	0.00%	13.67%	100.0%
	May	59.97%	27.52%	0.00%	0.00%	12.51%	100.0%
	June	62.90%	24.62%	0.00%	0.00%	12.48%	100.0%
	July	58.42%	27.48%	0.00%	0.01%	14.08%	100.0%
	Aug	59.40%	27.95%	0.00%	0.00%	12.64%	100.0%
	Sep	60.86%	27.25%	0.00%	0.03%	11.86%	100.0%
	Oct	59.90%	27.23%	0.00%	0.00%	12.86%	100.0%
	Nov	59.61%	27.82%	0.00%	3.99%	8.58%	100.0%
	Dec	61.93%	27.60%	0.00%	10.47%	0.00%	100.0%
	Jan	62.57%	27.70%	0.00%	9.72%	0.00%	100.0%
	Feb	61.08%	28.12%	0.00%	10.80%	0.00%	100.0%
	Mar	60.56%	27.21%	0.00%	12.23%	0.00%	100.0%
2025	April	60.19%	28.06%	0.00%	11.75%	0.00%	100.0%
	May	62.61%	27.47%	0.00%	9.92%	0.00%	100.0%
	June	61.38%	26.12%	1.58%	10.92%	0.00%	100.0%
	July	53.16%	18.65%	15.32%	12.87%	0.00%	100.0%
	Aug	48.96%	17.47%	21.86%	11.71%	0.00%	100.0%
	Sep	44.22%	15.80%	29.17%	10.81%	0.00%	100.0%
	Oct	39.00%	14.53%	35.10%	11.38%	0.00%	100.0%
	Nov	38.92%	12.89%	35.63%	12.56%	0.00%	100.0%

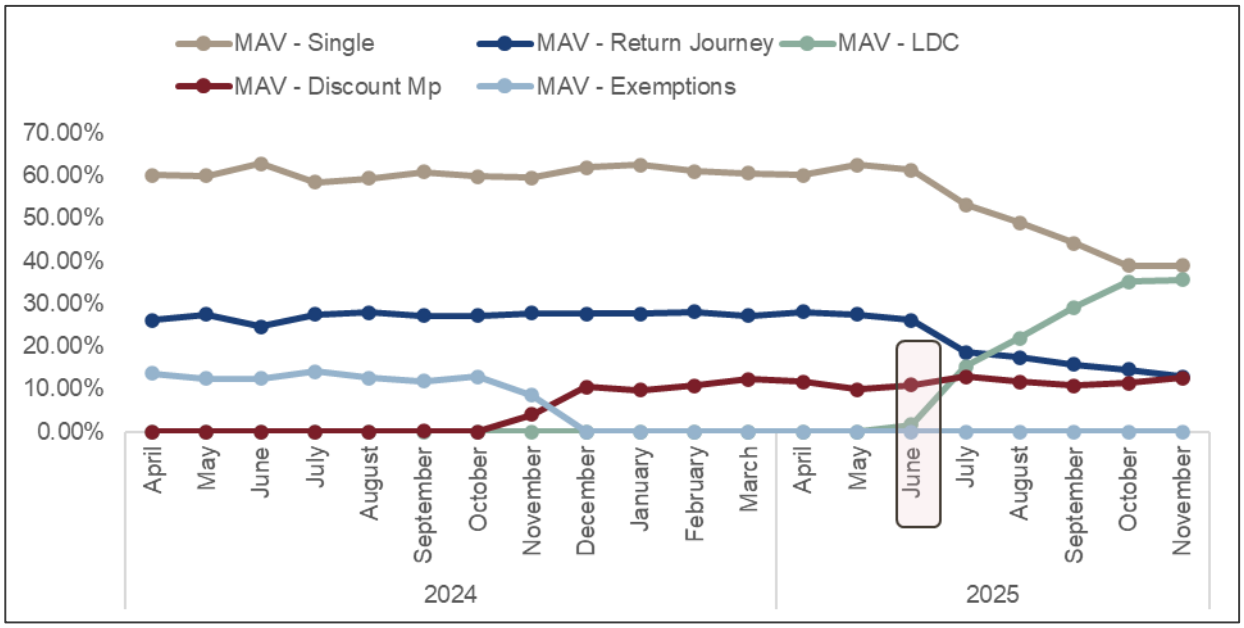


Figure 4-3: Trip Segmentation for MAV from April 2023 to November 2024

Source: Crisil Intelligence

The issuance of the Local Commercial Discount (LDC) started from June 2024 (Rate revision order for FY 25 implemented from June 3rd, 2024, instead of April 1st, 2024, due to modal code of conduct). Fee for commercial vehicle (excluding vehicles plying under National permit) registered in the district where the Toll Plaza falls shall be 50% of the specified rate for that category of vehicle provided no service road or alternative road is available for use of such commercial vehicles. Local Registered Vehicle (RTO Codes) for Kutch District is GJ 19 & GJ 39.

Prior to the new gazette notifications (notified in July 2023), Local Commercial Discount (LDC) toll ticket was not being issued. Local Commercial Discount (LDC) trips gradually increased from June 2024 1.5% to 35.6% in November 2024. Consultants predicts LDC trips will increase further and consolidate.

Estimation of Local Commercial Discount (LDC) trip segmentation is based on the following assumptions (data points).

- Estimated the share of local registered vehicles (GJ 19 & GJ 39) at Mokha plaza in the overall traffic.
- Analysed the nearby toll plaza LDC trip segmentation, which also has the same local registered vehicle plying (GJ 19 & GJ 39). Consultants has also looked at percentage universe of the local registered vehicles (GJ 19 & GJ 39) which is availing the Local Commercial Discount tickets in the total traffic (all registered vehicles). For example, in MAV 59% of vehicles at the plaza are local registered vehicles of the total traffic, 41% of traffic is availing local commercial discount tickets which suggest about 69% of local registered vehicles are availing local commercial discount tickets.

5 Base Traffic Estimation

Base Traffic Estimation

Traffic volumes on roads varies throughout the year, influenced by socio-economic activities in the surrounding regions. To accurately estimate the Annual Average Daily Traffic (AADT) for the road, it is crucial to account for these seasonal variations.

To achieve this, a seasonal correction factor is applied, which is derived from secondary data sources such as historical traffic data, fuel sales and similar indicators.

For base traffic (annual average daily traffic) estimation of the present study, the 8-months (Apr-24-Nov-24) of ETC traffic data were annualized using SCF factor of FY 24 ETC traffic data (excluding the Bijparjoy cyclone impact)to arrive at the annual average daily traffic (AADT) for FY 25. ETC AADT for the fiscal is expanded based on share of cash and exemption traffic, estimated from Non ETC Data, to arrive at total AADT for the fiscal.

The AADT estimation for the base case for FY25 is presented table below

Table 5-1: Base Traffic Estimation -FY25 AADT

Particulars	FY Year	Cars	LCV	2-Axle	3-Axle	MAV	OSV	Vehicles	PCU
ADT (Apr-Nov) *	FY 25	1,447	113	375	625	9,988	7	12,557	49,600
SCF	FY 24**	1.08	1.01	1.05	1.00	1.03	1.05		
AADT	**FY 25**	**1,549**	**115**	**393**	**624**	**10,242**	**8**	**12,930**	**50,894**
Cash (%)		3.2%	0.1%	0.0%	0.0%	0.0%	0.0%		
Exemption (%)		50.7%	38.2%	1.1%	0.4%	0.2%	11.7%		
Cash & Exemption (%)		53.9%	38.3%	1.1%	0.4%	0.2%	11.7%		
AADT	**FY 25**	**2,385**	**159**	**397**	**626**	**10,266**	**9**	**13,841**	**51,928**

**For August month data is considered till 25th august, rest of the days were affected by floods in Kutch region of Gujarat (Cyclone Asna)*
***June 2023 data is adjusted for the cyclone Bijparjoy Impact (Data till 23rd June).*

Source: Client-ETC & Non ETC Data

For estimating the base revenue, the toll rates applicable for FY 25 is multiplied with base year FY 25 ADDT traffic numbers by adopting the trip segmentation which is mentioned section 8 and Table 8-2.

Table 5-2: Base Revenue -FY25 AADT

Particulars	FY Year	Cars	LCV	2-Axle	3-Axle	MAV	OSV	Total
Revenue in ₹ Millions	**FY 25**	52	7	49	62	1,551	2	**1,723**

Source: Crisil Intelligence

The historically remittance is provided in the below table.

Table 5-3: Remittance Details for Mokha Plaza

Contractor/Bidder	Remittance Value	Contract Period
Riddhi Siddhi Associates	₹ 1,801 Million per annum (₹ 49,35,000 per day)	18.10.2024-18.01.2025
A.K. Construction Company	₹ 2,117 Million per annum	15.11.2023- 15.11.2024
A.K. Construction Company	₹ 1,600 Million per annum	12.11.2022-12.11.2023

Source: NHAI, Client

6 Key Influencing factors

Ports in vicinity

Mundra port and Kandla port are located on either side of the project road. Mundra port container traffic directly influences project road traffic.

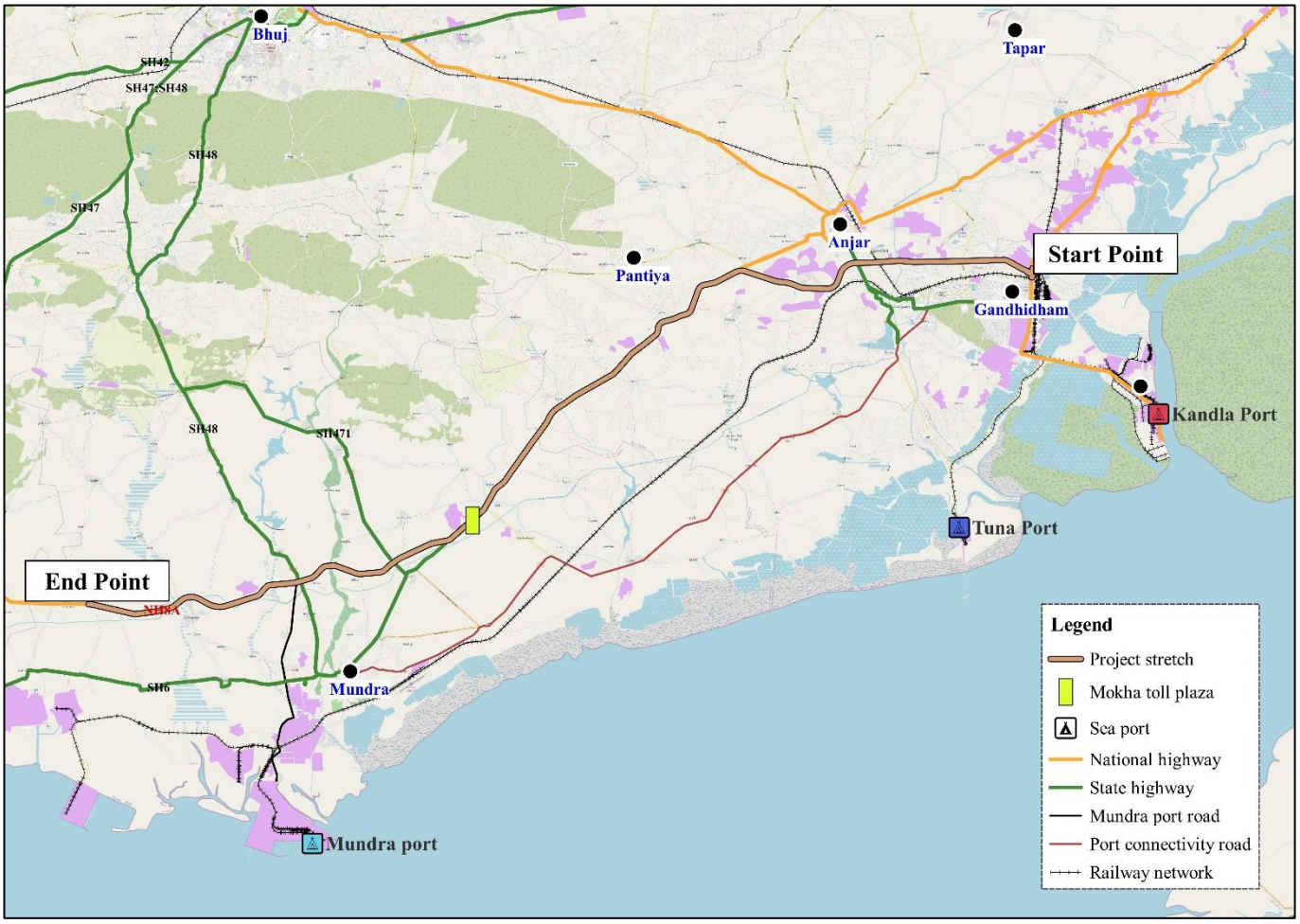


Figure 6-1: Location of Mundra port and Kandla port

Source: Open Street Map, Crisil Intelligence

Mundra Port

Mundra Port, located in Gujarat, is India's largest commercial port and handles a significant amount of container traffic. It is an all-weather port with state-of-the-art facilities for handling various types of cargo, including containers, crude oil, dry bulk, breakbulk, automobiles, and liquid cargo

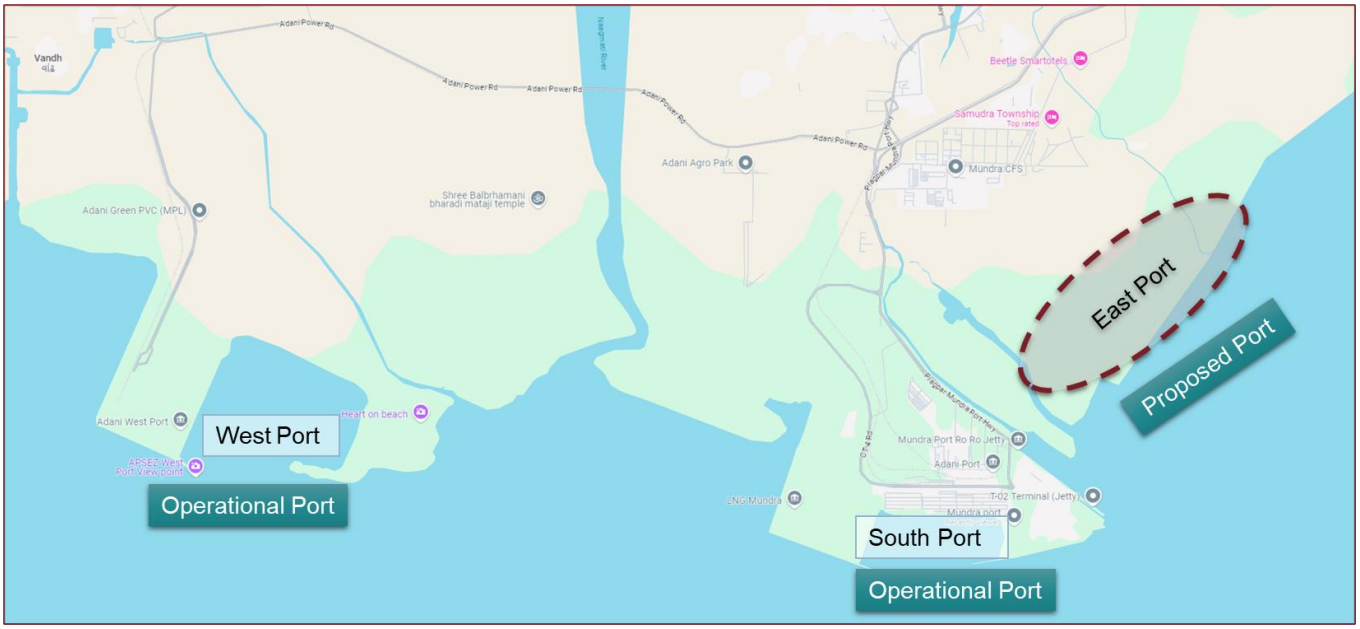


Figure 6-2: Layout Plan for Mundra port

Source: Google Maps, Crisil Intelligence

Mundra Port has cargo capacity of 264 MMT (million metric tons). It has total of 5 container terminals, 12 container berths with combined capacity of 9.5 million TEU's (Twenty Foot Equivalent Units).

Container terminal 1 (CT 1) commenced operation in 2003, operated by Mundra International Container Terminal Pvt Ltd (a unit of DP World), CT1 has a capacity of 1.3 million TEUs (Twenty-foot Equivalent Units) annually. The container terminal 2 or CT2 – Adani Mundra Container Terminal – with a city to handle 1.8 million TEUs is run by APSEZ itself. This terminal was originally designed to handle 1.3 million TEUs, but as demand grew, APSEZ converted an adjacent dry and break-bulk cargo handling terminal into a container handling facility some four years ago, adding 0.5 million TEUs of capacity. It began operation in 2007.

An equal joint venture between APSEZ and Terminal Investment Ltd, a unit of Mediterranean Shipping Co S A, the world's top container carrier by capacity, runs the container terminal 3 (CT3) – Adani International Container Terminal Pvt with a capacity to handle 3.1 million TEUs. It began operations in 2013. The 1.3 million TEU capacity container terminal 4 (CT4) – Adani CMA Mundra Terminal Pvt Ltd - is operated by an equal joint venture between APSEZ and CMA CGM S A. IT began operation in 2017. A new berth - T3 - with a capacity of 0.8 million TEUs is being commissioned to cater to the rising volumes at Mundra Port.



Figure 6-3: Container terminals at Mundra's south port

Source: Google Maps, Crisil Intelligence

Table 6-1: Commodity Distribution (in %) for Mokha Plaza

Terminal	Player	Commissioned Year
CT1	Mundra International Container (MICT)	2003
CT2	Adani Mundra Container Terminal (AMCT 2)	2007
CT3	Adani International Container (AICTPL)	2013
CT4	JV of APSEZ and CMA CGM SA (ACMT)	2017
T2 Extn	Adani Mundra Container Terminal (AMCT 2 Ext)	2022
T3	Adani Mundra Container Terminal (AMCT T3)	2023

Historic container traffic in India and Mundra port

Decadal growth of container traffic in India has shown CAGR (FY14-FY24) of 7.7% with expansion across various major ports across India and western region. Mundra port has shown grown faster than India's container growth with CAGR (FY14-FY24) of 12.0% fuelled by capacity additions at Mundra port.

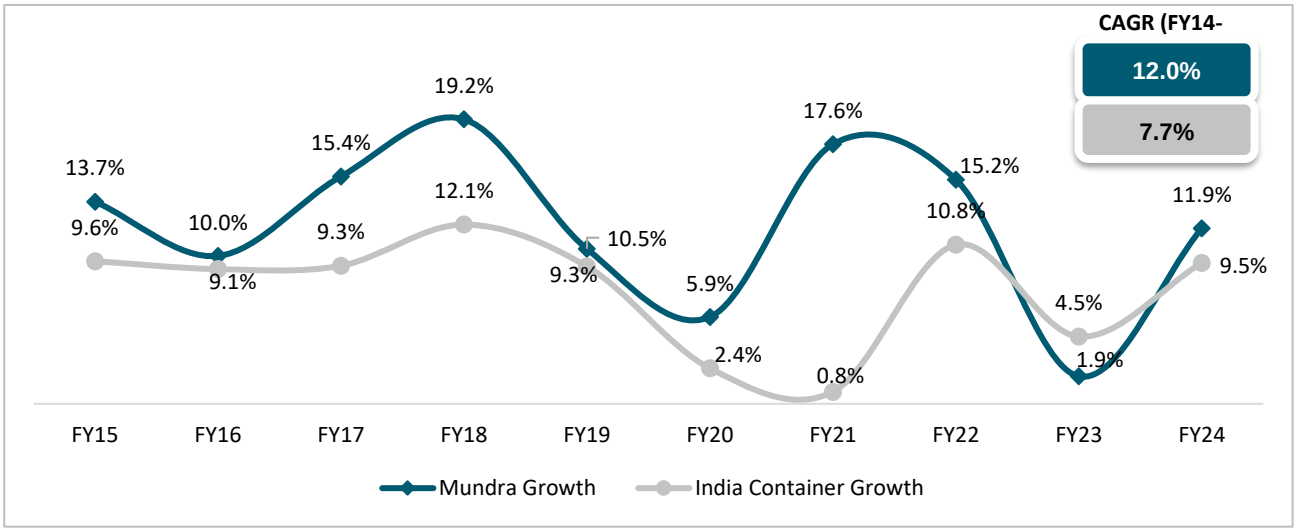


Figure 6-4: Mundra's container traffic vis-à-vis India's container traffic for last decade

Source: Crisil Intelligence

Mundra Port's container traffic has grown significantly more than other competitive ports like JNPT due to factors like its high operational efficiency, which includes quick turnaround times and effective container evacuation strategies, added capacity whenever the utilization has crossed 70% levels, invested heavily in modern infrastructure, including deep draft berths that can handle large vessels. In contrast, while JNPT (Jawaharlal Nehru Port Trust) remains a major container handling port in India, it has faced challenges such as congestion and limited expansion capacity.

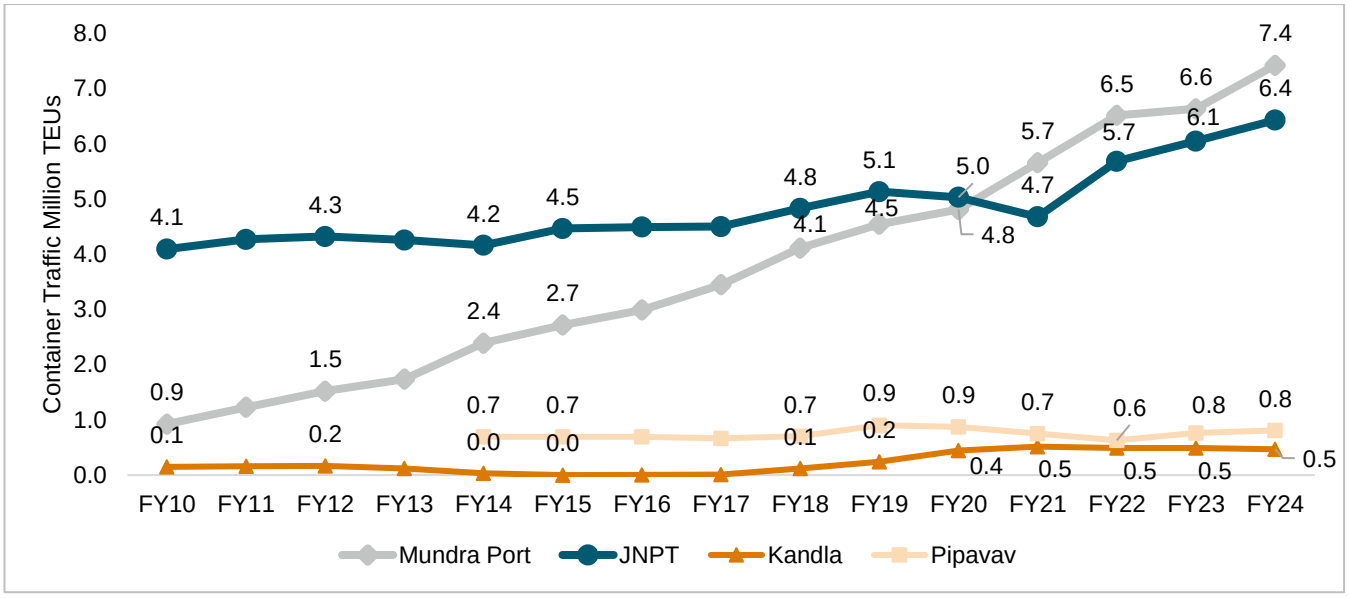


Figure 6-5: Container traffic at competing ports

Source: Crisil Intelligence

Approach for port traffic outlook

To estimate the port traffic outlook for the horizon years, consultants first examined India's container traffic growth over the last decade in relation to the country's GDP and calculated the GDP multiplier for container traffic. Forecasted India's container traffic based on this multiplier. Following this, analyzed the share of western ports and the core hinterland in India's overall hinterland traffic, as well as the share of individual ports within the core hinterland.

To assess the impact on Mundra's container traffic due to the upcoming container terminals at Tuna Tekra and Vadhwan ports, consultants estimated the projected share of competing ports on the core hinterland traffic. Finally, consultants evaluated the impact of railway developments, such as the Western Dedicated Freight Corridor (WDFC) and the Morbi Inland Container Depot (ICD), on road container traffic. The detailed approach for the port traffic outlook is illustrated in the chart below.

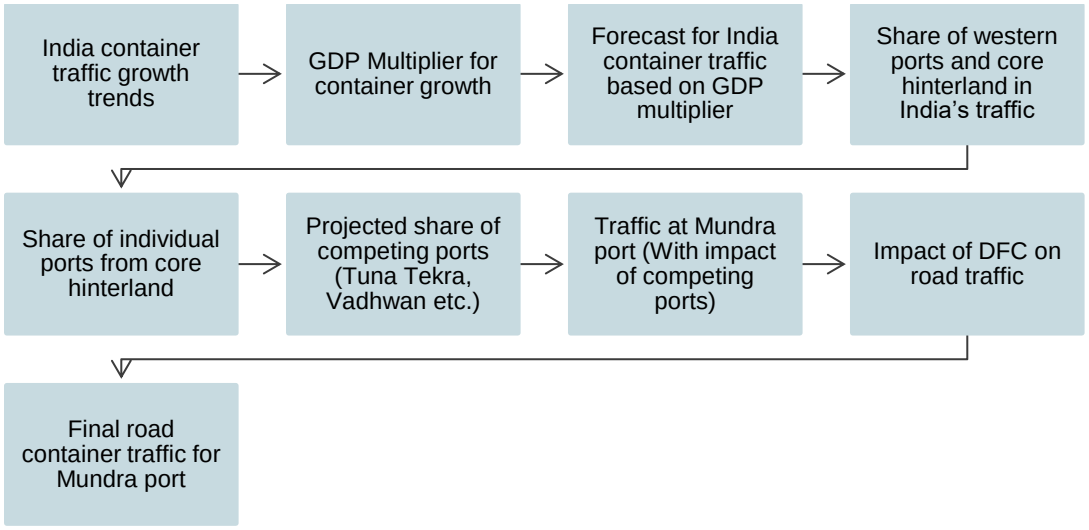


Figure 6-6: Approach adopted for port traffic outlook

Source: Crisil Intelligence

India container traffic growth trends

Consultants has investigated the India's container traffic from FY 2014 to FY 2024. Consultants has looked at the decadal growth of container traffic in India has shown CAGR (FY14-FY24) of 7.7%. India's container growth has been notable in recent years, driven by several key factors like

- India's expanding role in global supply chains has led to a rise in both exports and imports. This growth necessitates efficient logistics solutions, particularly containerized shipping.
- Programs like the Sagarmala Project and the Maritime India Vision 2030 aim to enhance port infrastructure and logistics capabilities.
- The rapid growth of e-commerce in India has transformed logistics and distribution channels.
- Investments in port infrastructure, such as the development of dedicated freight corridors and inland container depots, have improved the efficiency of cargo movement.
- India's strategic partnerships and trade agreements with countries like the UAE and the US have enhanced access to global markets, boosting containerized trade.

The overall economic growth in India has led to increased demand for goods, further driving the need for containerized transport

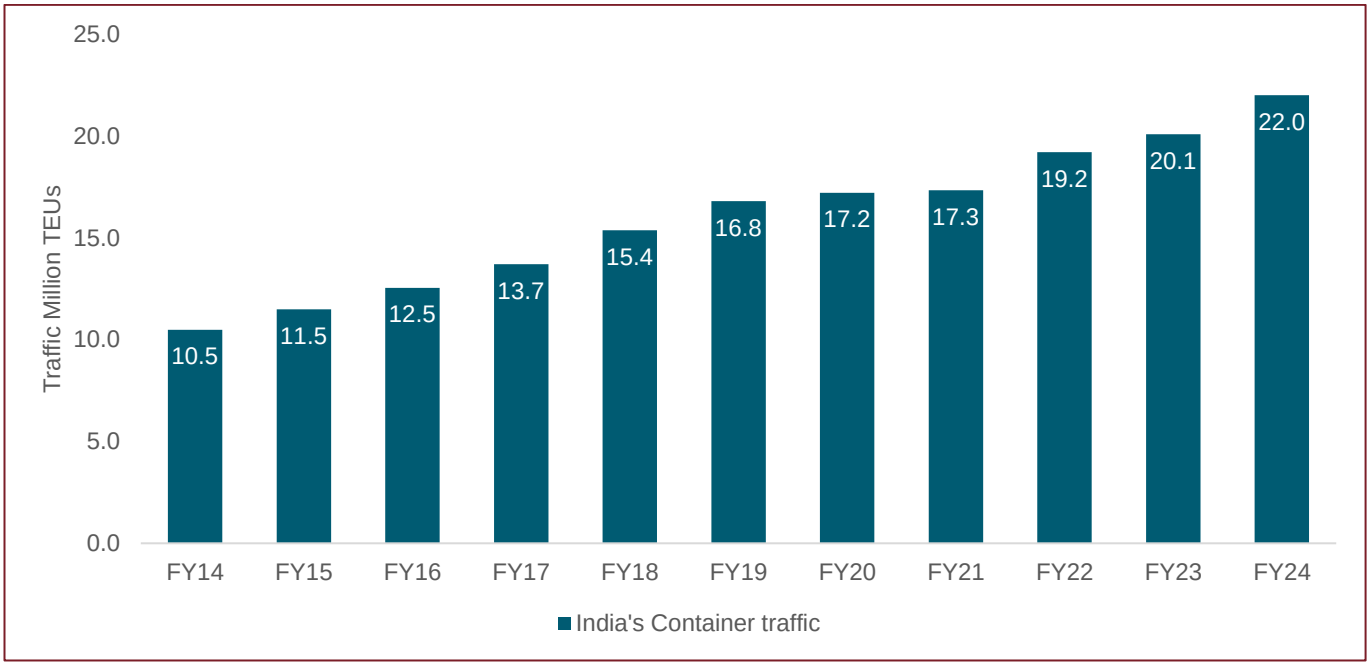


Figure 6-7: India's Container traffic

Source: Crisil Intelligence

GDP multiplier

India's Container traffic growth has shown close correspondence with respect with India's GDP growth. The multiplier between the India's GDP and container traffic growth used in the estimation of the future container traffic.

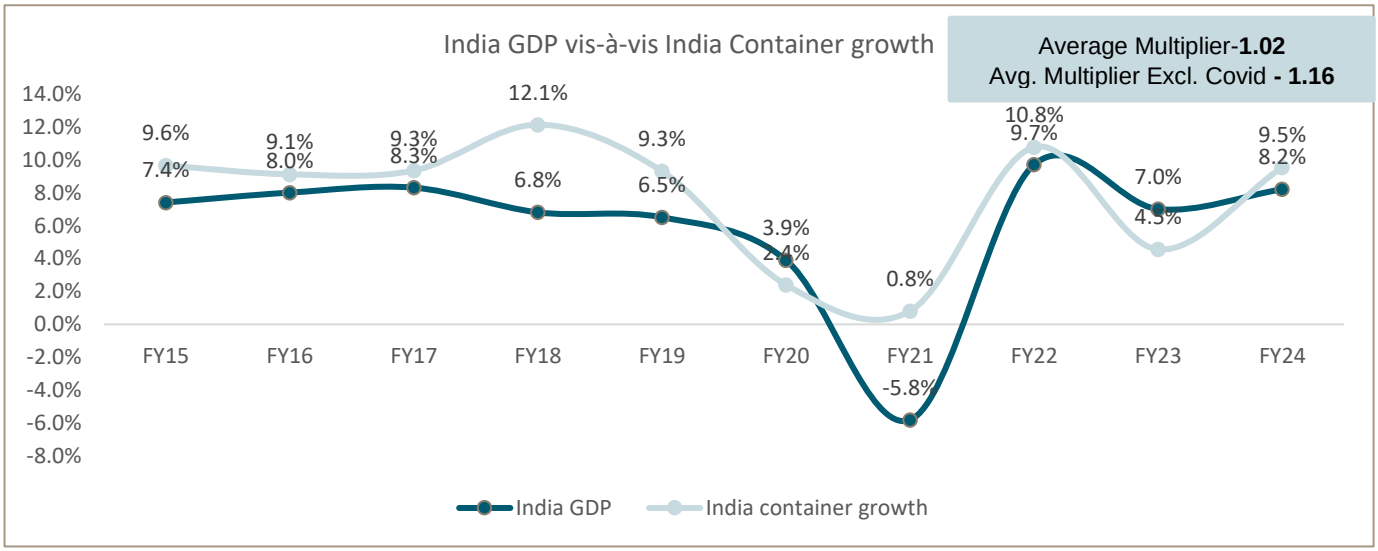


Figure 6-8: GDP Multiplier

Source: Crisil Intelligence

The historic average multiplier between India's GDP with container traffic is about 1.02 including the covid years and the average multiplier excluding covid years is about 1.16 and the same multiplier is used for next five years to estimate the container traffic growth and for horizon years multiplier is reduced gradually.

Table 6-2: GDP Multiplier

Particulars	FY26	FY27	FY28	FY29	FY30	FY31-FY35	FY36-40	FY41-45	FY46-50	FY51-55
GDP growth	6.7%	6.6%	6.6%	6.3%	5.7%	5.7%	5.3%	4.8%	4.3%	4.0%
Multiplier	1.16	1.16	1.16	1.16	1.16	1.13	1.05	0.89	0.71	0.54
Container growth	7.8%	7.7%	7.7%	7.3%	6.6%	6.4%	5.6%	4.3%	3.1%	2.1%

Source: Crisil Intelligence

Share of Western Ports

The container traffic share of the western ports over the years has remained the same, which is around ~70% of the overall India's container traffic share.

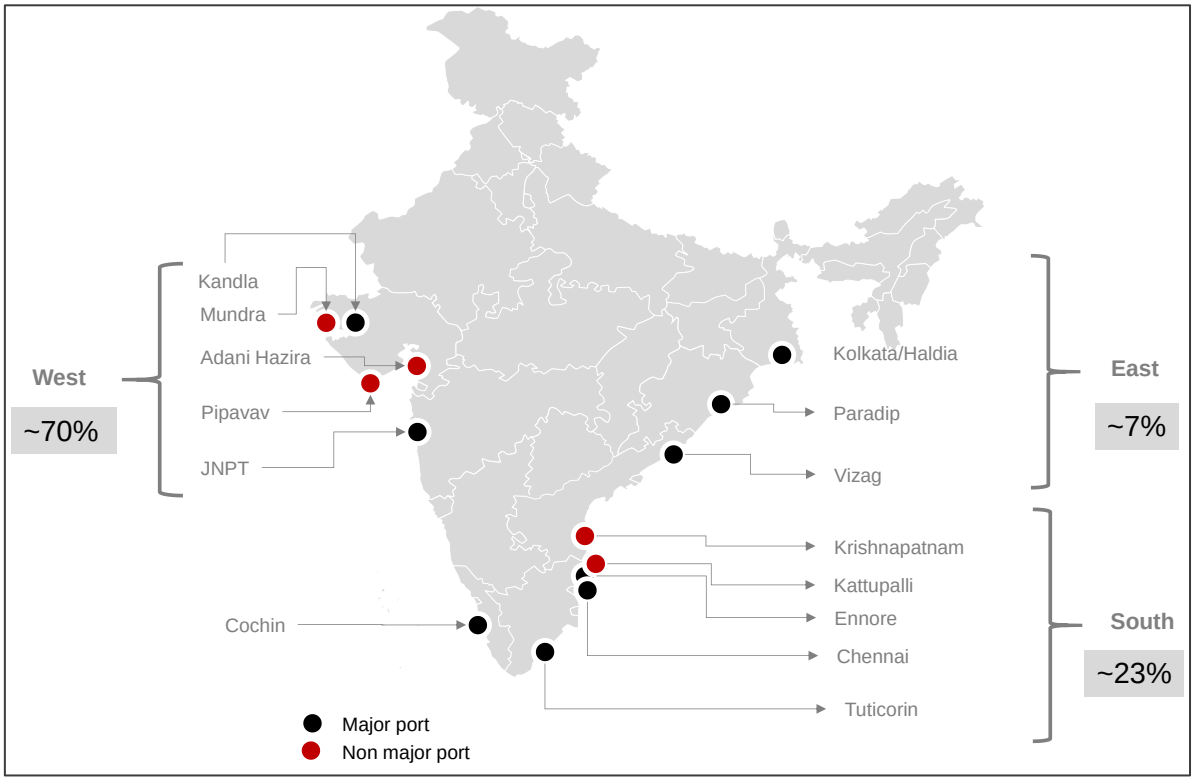


Figure 6-9: Western port share in India's Container traffic

Boxes represent share of region's ports in container traffic of India

Source: Indian Ports Association, Port websites, Industry, Crisil Intelligence

Impact of Upcoming Tuna Tekra and Vadhwan Ports on Mundra's Container Traffic

Tuna Tekra Port

At Tuna Tekra port, container terminal is being developed at a cost of approximately ₹4,244 crore (around $510 million) through a Public-Private Partnership (PPP) between DP World and the Deendayal Port Authority. Once completed, the terminal will have an annual capacity of 2.19 million TEUs (Twenty-foot Equivalent Units). The terminal will feature a 1,100-meter berth capable of handling next-generation vessels carrying over 18,000 TEUs. This state-of-the-art container terminal will cater to future trade demands from Northern, Western, and Central India, connecting these regions to global markets. The Project will be completed by FY 2027. It will start operation from FY 2028.

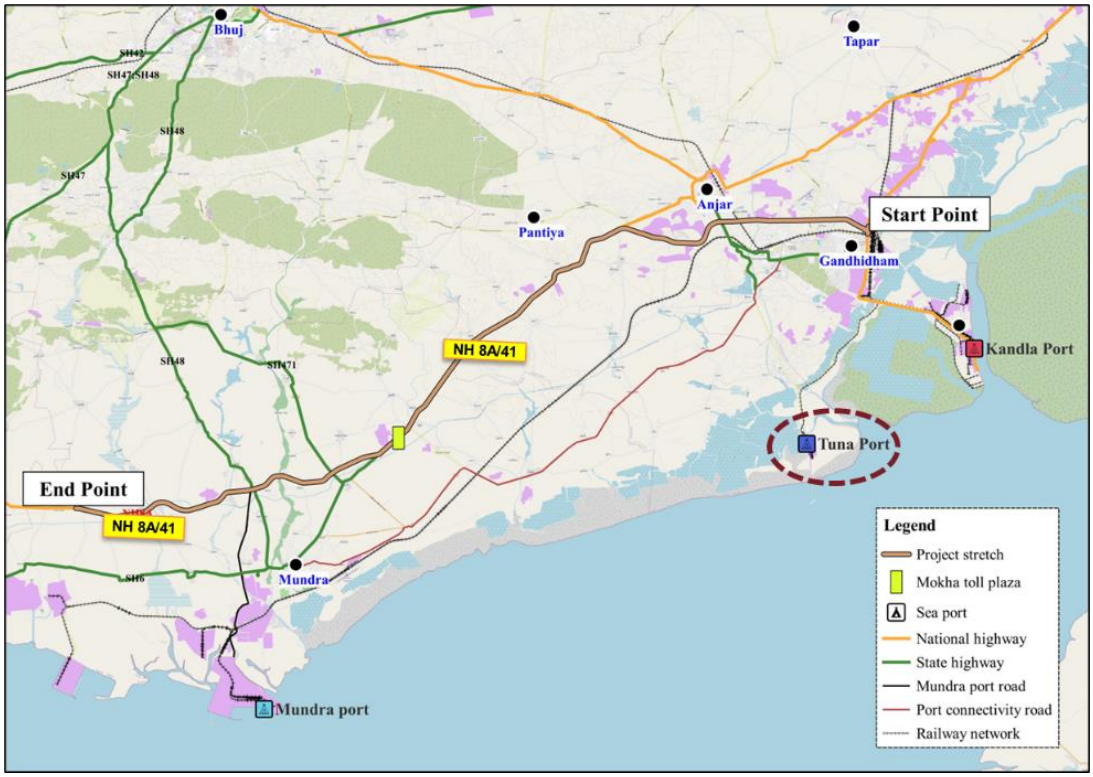


Figure 6-10: Location of Tuna Port

Source: Open Street Maps, Crisil Intelligence

Vadhwan Port

Vadhwan Port is a proposed deep-sea port located in Vadhwan, Palghar district, Maharashtra, India. The port is being developed by Vadhwan Port Project Limited (VPPL), a special purpose vehicle, with the Jawaharlal Nehru Port Authority (JNPA) holding a 74% stake and the Maharashtra Maritime Board holding 26%. The estimated cost of the project is ₹76,220 crore (approximately $8.8 billion). The port will include container berths, liquid berths, ro-ro berths, and multipurpose cargo berths. The proposed container terminal at Vadhwan port will have capacity of 6.8 MTEUs in phase I of the project. Impact year for the project is considered from FY 2032.

Mundra port got environmental and coastal regulation zone clearance for Expansion

Adani Ports & Special Economic Zone Ltd (APSEZ) has received environmental and coastal regulation zone clearance from the Centre to double the capacity of Mundra port at a cost of Rs 45,000 crore.

APSEZ applied to the Expert Appraisal Committee (EAC) of the Ministry of Environment, Forest, and Climate Change to increase the Mundra Port's capacity by 289 million tonnes to 514 million tonnes as part of an expansion plan covering 3,335 hectares. The details of the proposed expansion are given below. The proposed expansion will be carried out in east port of Mundra.

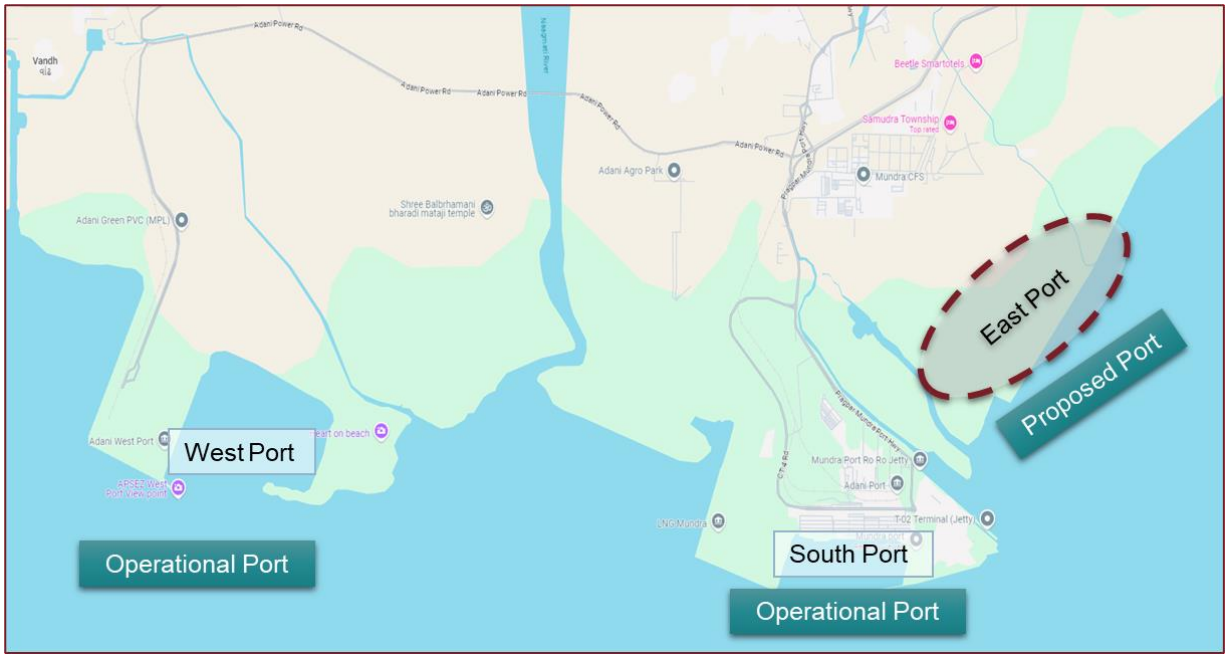


Figure 6-11: Proposed expansion of Mundra Port

Source: Google maps, Crisil Intelligence

Table 6-3: Proposed expansion of Mundra Port

Description	Approved till 2009	Already developed	Proposed Expansion	Cumulative after Expansion	Remarks
Quay Length (m)	22000	7870	8890	16760	The proposed quay length is envisaged due to optimization of layout for multi-purpose cargo handling. (Existing 7870m quay length will also be optimized for multipurpose cargo handling)

Source: Adani ports and special economic zone limited (APSEZ), Crisil Intelligence

Table 6-4: Details of Cargo handling after expansion of Waterfront Development Plan (Proposed)

Cargo Type	Cargo Handling Capacity (MMTPA)
Dry Bulk & Break Bulk Cargo	140
Containers	250 (25 million TEUs)
Liquid Cargo	84
Gas/Cryogenics/Liquid	40
Total	**514**

Source: Adani ports and special economic zone limited (APSEZ), Crisil Intelligence

To assess the impact of upcoming Tuna Tekra port and Vadhwan port, following approach is adopted,

- Existing hinterland traffic pattern is analysed.
- Size of port, connectivity option and distance with hinterland.

To assess impact of new ports, existing hinterland container traffic patterns are analysed for various regions such as Kutch/Morbi, Central Gujarat, Saurashtra, Rajasthan, NCR, Upper North, and Western Madhya Pradesh, which are integral to the hinterland traffic served by western ports like Mundra, Kandla, Pipavav, Hazira, and Nhava Sheva.

- **Kutch/Morbi Region**: Primarily served by Mundra Port, with Kandla Port as a secondary option.

- **Central Gujarat Region**: Mainly served by Mundra Port, followed by Nhava Sheva (JNPT).
- **Saurashtra Region**: Predominantly served by Pipavav Port.
- **Rajasthan, NCR, Upper North**: Primarily served by Mundra Port, with Nhava Sheva as a secondary port.
- **Western Madhya Pradesh Region**: Mainly served by Nhava Sheva Port.
- **Western Maharashtra Region**: Primarily served by Nhava Sheva Port.
- **South Gujarat Region**: Mainly served by Nhava Sheva Port.

Table 6-5: Region wise traffic served by various Western ports

Regions	Mundra	Kandla	Pipavav	Hazira	Nhava Sheva	Traffic (As % of core hinterland)
Kutch/Morbi						
Central Gujarat						
Saurashtra						
Rajasthan						
NCR+						
Upper North						
Western MP						
Core hinterland						
South Gujarat						
Western Maharashtra						
All Other Cargo Belts						
Sub-Total: Outside Core Hinterland						
Grand Total						

Gradient fill is used to represent the share of each port, darker colour indicates majority share and lighter indicates less share. Gradient Scale is given below

> 60%
30%-60%
10%-30%
< 10%

Source: Crisil Intelligence

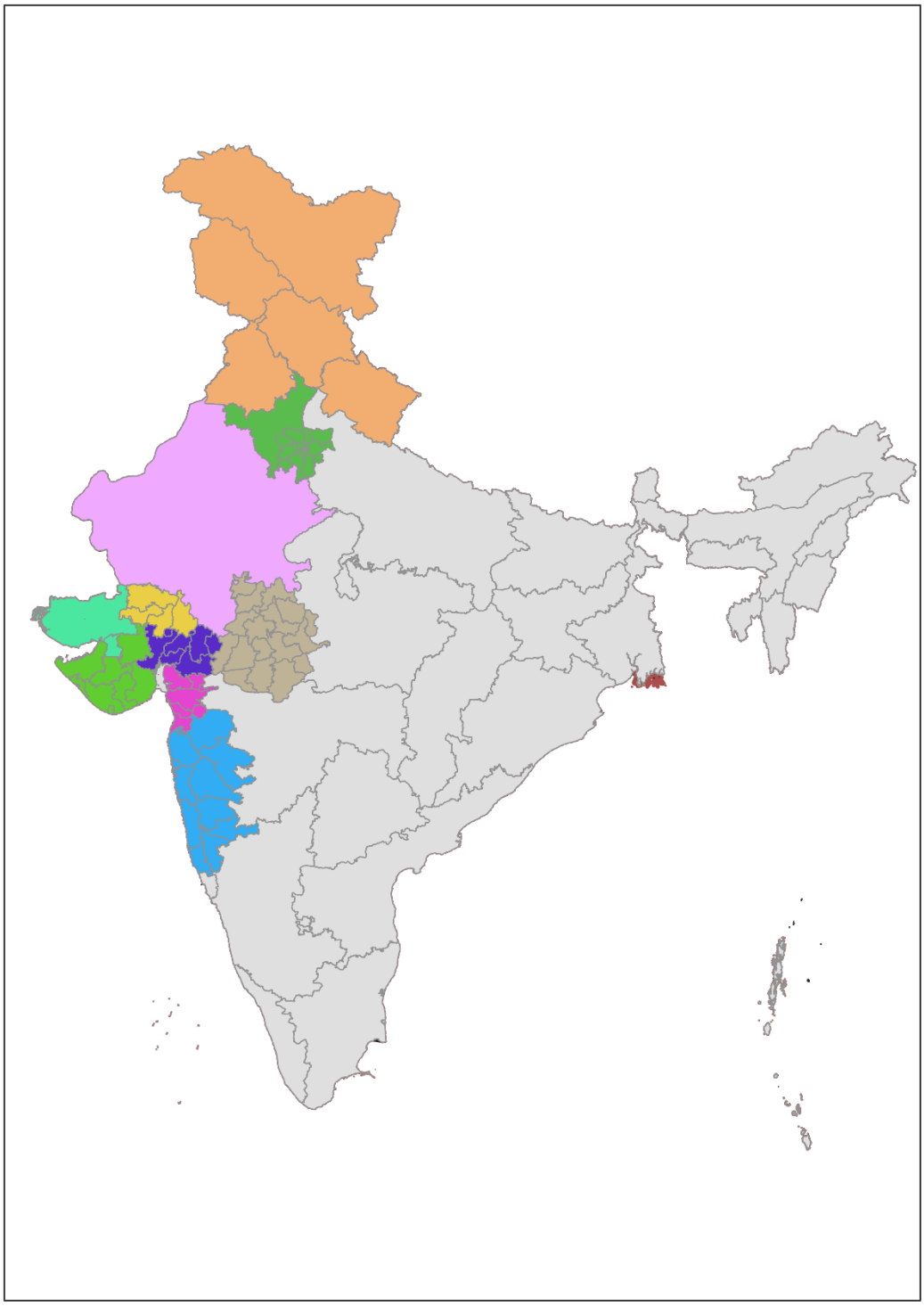


Figure 6-12: Key regions served by western ports

Source: Open Street Map, Crisil Intelligence

Consultants also investigated with size of ports, connectivity options and distance for estimating impact of upcoming ports. To assess the connectivity option, Port Liner Shipping Connectivity Index (PLSCI) is a measure developed by the United Nations Conference on Trade and Development (UNCTAD) to assess how well ports are connected to the global container shipping network. Countries' access to world markets depends largely on their transport connectivity, especially as regards regular shipping services for the import and export of manufactured goods. A higher value is associated with better connectivity. Larger ports only have better connectivity, due to multiple terminals and varied liner calls.

Distance to various regions served by the ports is assessed and Nhava Sheva has bigger disadvantage vis-à-vis Mundra port, and the details are mentioned in the below table.

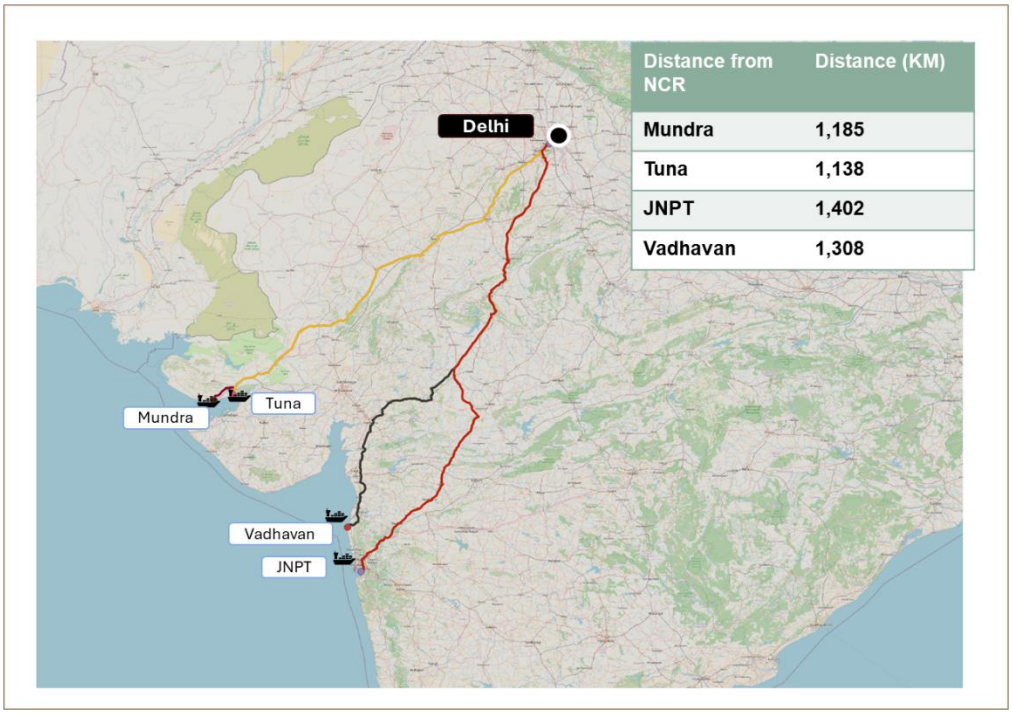


Figure 6-13: Distance to NCR region from various ports

Source: Open Street Map, Crisil Intelligence

Table 6-6: Region wise distance to various ports(km)

Region/Km	Mundra	Kandla	Pipavav	Hazira	Nhava Sheva	Tuna Tekra	Distance Δ Mundra	Distance Δ Mundra
Kutch	193	138	265	480	754	138	-28%	-82%
Central Gujarat	357	301	305	289	564	301	-16%	-47%
Saurashtra	258	202	192	460	723	202	-22%	-72%
Rajasthan	876	819	965	935	1198	819	-7%	-32%
NCR+	1206	1160	1305	1190	1416	1160	-4%	-18%
Upper North	1204	1148	1379	1369	1699	1148	-5%	-32%
Western MP	747	691	660	511	608	691	-7%	14%

Source: Crisil Intelligence

Considering various factors such as existing traffic patterns in the core hinterland, port size, connectivity options, and distance from the hinterland, the estimated share and impact of the Tuna Tekra port on existing ports have been assessed. The impact of Tuna Tekra is expected to begin in FY 2028. From that fiscal year, Tuna Tekra will start handling traffic, with a gradual ramp-up in volumes that aligns with the development of ancillary infrastructure and the Container Freight Station (CFS) ecosystem. The Tuna Tekra port is anticipated to have a mild impact on Mundra port container traffic.

The impact of the upcoming Vadhwan port has been assessed using similar criteria as for Tuna Tekra. Due to its distance disadvantage relative to Mundra port concerning the core hinterland, Vadhwan port is expected to have a lesser impact on Mundra port's traffic. However, it is anticipated to have a more significant impact on the traffic at Nhava Sheva (JNPT) port, for the cargo emanating from the core hinterland. Impact year considered for the Vadhwan port is considered from FY 2032.

Table 6-7: Impact of Tuna Tekra and Vadhwan ports.

Particulars	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33
Mundra BAU	5.5	6.0	6.4	6.9	7.4	7.9	8.4	9.0	9.6
Mundra Impacts	5.5	6.0	6.4	6.8	7.4	7.7	8.1	8.8	9.3
Impact %				*-2.2%*	*-0.7%*	*-2.6%*	*-4.4%*	*-2.1%*	*-3.1%*
CAGR BAU						7.4%			7.1%
CAGR Impacts						6.8%			6.6%

Source: Crisil Intelligence

Mundra's container traffic growth over the concession period from FY 25-45 is presented below figure.

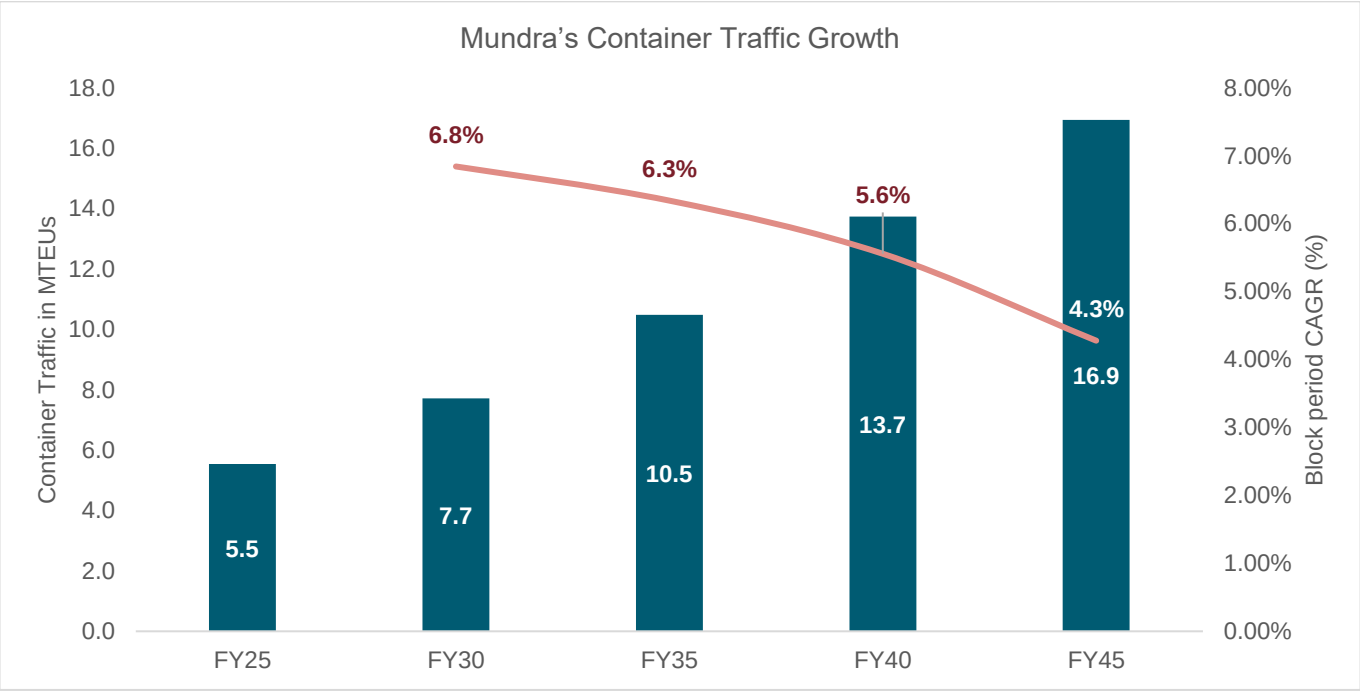


Figure 6-14: Mundra port's container traffic growth

Source: Crisil Intelligence

Other network developments

In the case of the project road, there are no short distance alternate routes available that will impact the traffic on the project road. However ongoing and upcoming long-distance networks that could impact the project road are:

- Western Dedicated Freight Corridor (WDFC)
- Morbi Inland Container Depot -ICD (Railway)

The alignment of the developments along with the project road is presented in Figure 6-15.

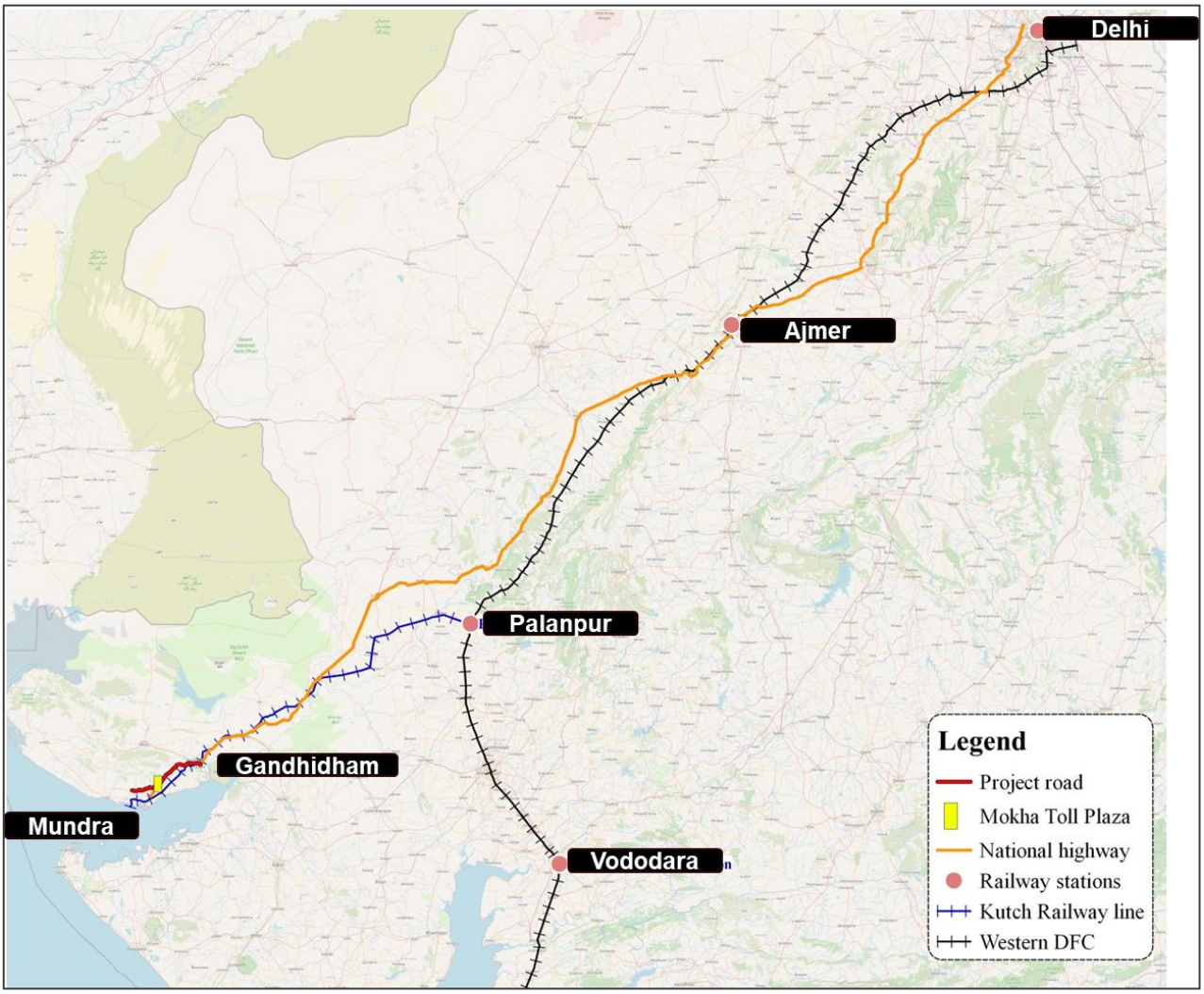


Figure 6-15: Network Development Around the Project Corridor

Source: Open Street Map, Crisil Intelligence

The details of the development in term of milestone, expected completion date and possible impact to project road traffic is presented in below table.

Table 6-8: Details of Network Development and Possible impact

S. No	Details of Development	Milestone/Completion	Possible Impact
1	**WDFC** • 1,506 km long • The freight corridor will pass through the state of Delhi, Uttar Pradesh, Haryana, Rajasthan, Gujarat and Maharashtra	93.2% section is commissioned and rest of section between Sachin – JNPT is under construction.	At present WDFC the partial impact of the WDFC and KRCL Railway which connects the North India region to Mundra Region since the operations of the KRCL line from 2023 and the balance impact of the WDFC is assessed in the current study

S. No	Details of Development	Milestone/Completion	Possible Impact
	KRCL Line connecting Mundra to Palanpur • Kutch Railway Company Limited which connects Mundra to Palanpur station of WDFC	Doubling of the existing railway line completing electrification of the same and these works were completed in February 2023 and May 2023, respectively	
2	**Morbi Inland Container Depot (ICD)** • Morbi ICD connects Mundra port through KRCL Line • ICD handled around ~50,000 TEU in fiscal 2024, equivalent to roughly ~100 MAVs per day	Operational from Feb 2023.	It connects the Morbi Tiles & Ceramic Cluster. Additional impact of 1% of MAV is considered for FY26-FY28 period.

Source: Crisil Intelligence

Impact of Western Dedicated Freight Corridor (WDFC)

The Western Dedicated Freight Corridor (Western DFC) is an ambitious under-construction project spanning 1,506 km in India. It aims to connect Dadri, near Delhi in Uttar Pradesh, to Jawaharlal Nehru Port in Navi Mumbai, Maharashtra. Being developed by the Dedicated Freight Corridor Corporation of India Limited (DFCCIL), a public-sector unit under the Ministry of Railways, the Western DFC will feature electrified double-line operation. Western Dedicated Freight Corridor (DFC) will have a negative impact on traffic.

The alignment of the WDFC and the project section is presented in below figure.

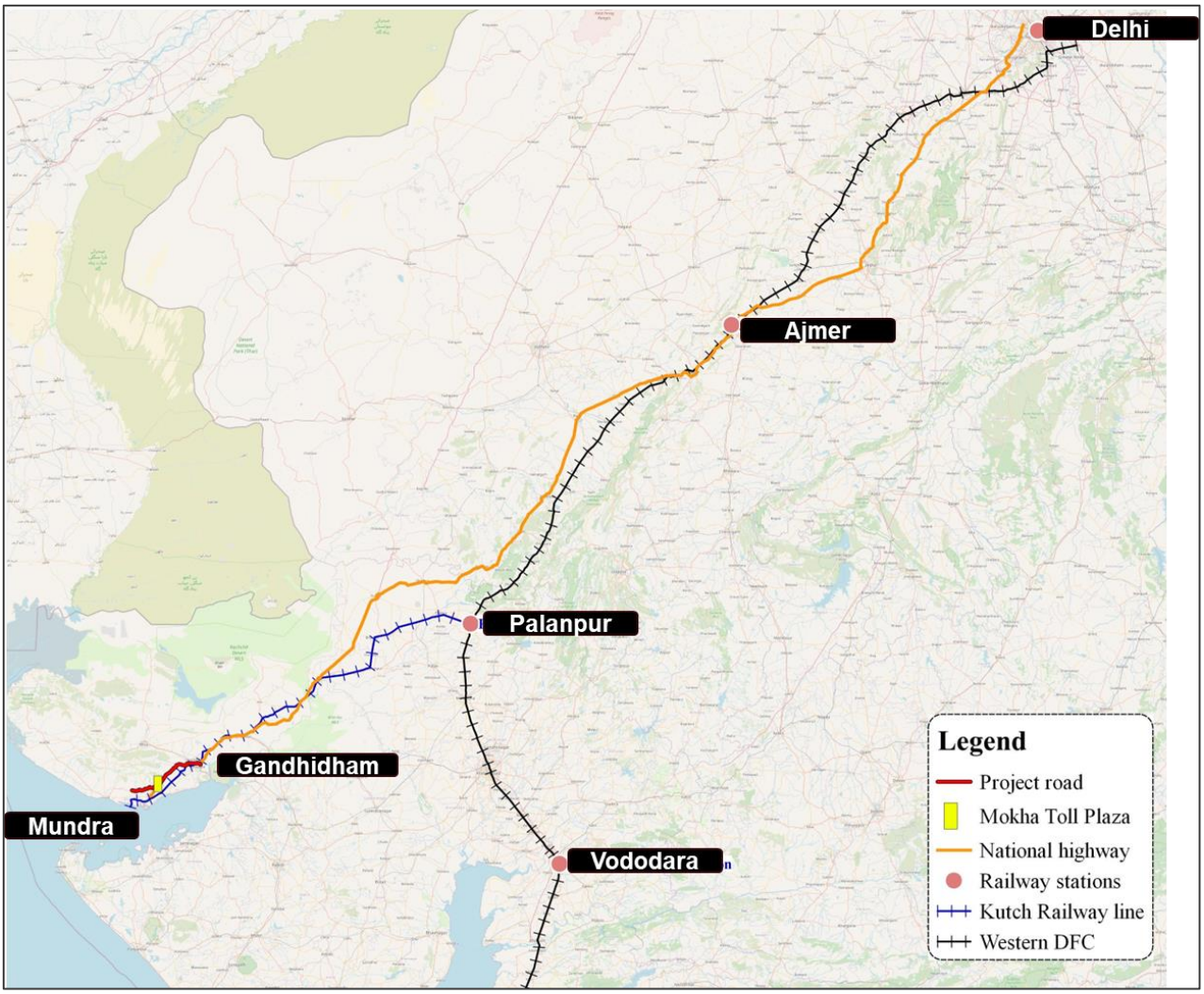


Figure 6-16: Alignment of WDFC and Project Road

Source: Open Street Map, Crisil Intelligence

KRCL was incorporated in January 2004 as an SPV for converting the existing meter gauge to broad gauge on the existing 301-km railway line between Gandhidham and Palanpur in Gujarat. KRCL took up the project for doubling the existing railway line and completing electrification of the same and these works were completed in February 2023 and May 2023, respectively. KRCL railway line which provides connectivity to two major seaports [Adani Port (erstwhile Mundra Port) and Deen-Dayal Port (erstwhile Kandla Port) with the northern mainland. It will also be a feeder route to the Western Dedicated Freight Corridor (WDFC).

The WDFC, may take away some of the traffic which is currently using the project road. The assessment of WDFC diversion from the project road is presented in below table.

Table 6-9: Status of WDFC

Section	Distance (Km)	Status	Completion Date
Dadri – Rewari	127	Operational	2024 January
Rewari - Madar	306	Operational	2021 January
Madar -Palanpur	353	Operational	2022 June
Palanpur-Makarpura	290	Operational	2023 October
Makarpura - Sachin	135	Operational	2023 June

Section	Distance (Km)	Status	Completion Date
Sachin - Vaitarna	193	Operational	2024 December
Vaitarna - JNPT	102	Under Construction	2025 December
Total	1,504		

Source: Dedicated Freight Corridor Corporation of India Limited, Crisil Intelligence

Binary Logit Mode (Mode Choice Model) is used to analyse the impact of the WDFC Impact. Following assumptions are made in assessing the impact of WDFC.

- Zones/traffic falling within the 100km radius of the WDFC stations is considered.
- Binary logit analysis to estimate the diversions.
- Impact year is considered from FY26
- Inscope traffic is considered for more than 500 Km. (Binary logit model suggest shift from rail to road for the trip lengths with more than 500km due to the savings from travel time and travel cost)
- The mode choice model has been used (National Rail Plan) based on the most evident factors of any goods transfer, i.e. Travel Time and Travel Cost.
- Commodities considered are Agri produce, Automobiles, Coal, Iron & steel, POL and Containers.
- Impact is considered in step wise approach with 25% for FY 26 to 100% in FY 2029

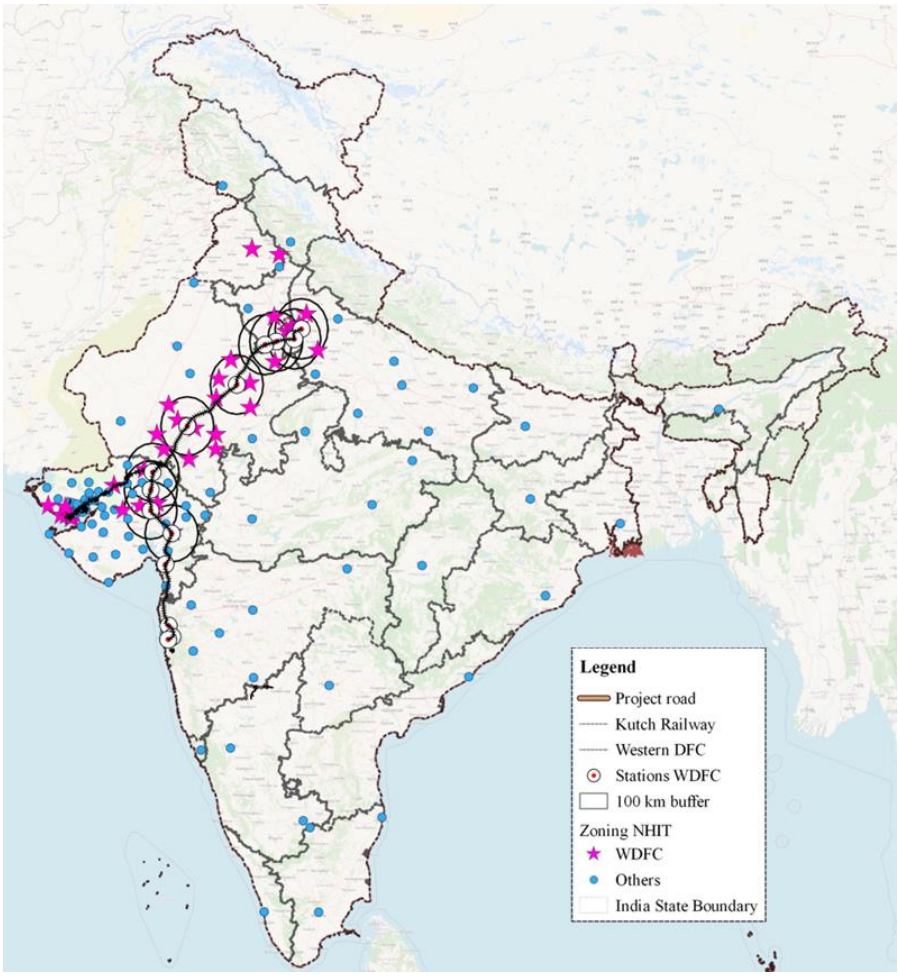


Figure 6-17: Inscope Zones considered for WDFC Impact

Source: Open Street Map, Crisil Intelligence

Binary Logit Model

To estimate the rail share, binary logit model has been used. Choice of Mode to be used is dependent on various factors. Two of the most important factors are **Travel Time and travel cost**. Other factors are availability of modes, transferability and last mile haulage of that commodity and reliability etc. Mode choice model has been developed based on the most evident factors of any goods transfer i.e. Travel Time and Travel Cost and the Probability of any Commodity to be transferred by any mode has been estimated by the Binary Logit Model. Utility equation is developed by the Difference of Travel time and Difference of Travel cost of the same Origin Destination pairs of two different Modes (Road and Rail).

In addition to Inscope traffic from project road (Mokha Plaza) OD, Long distance Inscope traffic (from OD analysis) at Samakhiyali Plaza, potentially transported through a hub and spoke model is also considered (50% of the long-distance traffic is considered as Inscope traffic). The analysis indicates that the WDFC may result in loss of about 7.7% of truck traffic, 3.8% of 3 axle trucks and 4.5% of MAV traffic. Overall impact of 4.3% in PCU terms.

Figure 6-18: Components of Travel Time and Cost

Table 6-10: Diverted Traffic

Vehicle Type	Inscope (Mokha Plaza)	Inscope (Samakhiyali Plaza)	% Diversion
2 Axle Truck	15.2%	8.0%	-7.7%
3 Axle Truck	8.0%	3.4%	-3.8%
MAV	11.3%	2.8%	-4.5%
Vehicle	**9.0%**	**2.4%**	**-3.7%**
PCU	**10.5%**	**2.7%**	**-4.3%**

Source: Crisil Intelligence

Impact of Morbi Inland Container Depot (Railway)

The Navkar Inland Container Depot (ICD) in Morbi started its operations on February 28, 2023. The facility is spread over more than 150 acres near the Industrial Hub of Morbi. It is located on the trunk route from Ahmedabad to Gandhidham. The ICD offers extensive warehousing, real-time visibility of cargo, and a large pool of cargo handling equipment. It provides cost-effective solutions for both export and import cargo movements. The Navkar Inland Container Depot (ICD) in Morbi has a capacity to handle 2,00,000 TEUs (Twenty-foot Equivalent Units) per annum. ICD handled around ~50,000 TEU in fiscal 2024, equivalent to roughly ~100 MAVs per day. Additional impact of 1% of MAV is considered for FY26-FY28 period.

Table 6-11: Summary of WDFC & Morbi ICD Impacts

S No.	Name of Impact	Positive/Negative	Year of Impact	In scope traffic (%)	% Diversion
1.	Western Dedicated Freight Corridor	Negative	FY 26	2 Axle Truck- 23.2% 3 Axle Truck- 11.4% MAV- 14.1%	2 Axle Truck-7.7% 3 Axle Truck-3.8% MAV-4.5% PCU-4.3%
2.	Morbi ICD (Railway)	Negative	FY 26	MAV-18.5%	MAV-1% PCU-0.5%

Source: Crisil Intelligence

7 Traffic Growth Estimation & Traffic Forecast

Commodity Overview

As mentioned in section primary data collection & analysis, the analysis of freight movement across the toll plaza reveals that the major commodities being transported include containers, tiles & ceramics, agri produce and consumer foods.

Containers

Container traffic holds major share around 61.0% in the overall traffic. Project road gives connectivity to two important seaports in the region which are Mundra Port and Kandla Port. Mundra Port, located in Gujarat, India, is the largest commercial port in the country and a critical hub for container traffic. It handles a significant volume of cargo, including containers, dry bulk, liquid bulk, and automobiles. The port's strategic location on the western coast of India allows it to serve the vast hinterland regions, including the National Capital Region, Gujarat, Punjab, Rajasthan, and Madhya Pradesh. Mundra Port operates five container terminals across 12 berths, with a combined capacity of 9.5 million TEUs (twenty-foot equivalent units). India’s container traffic decadal growth (FY14-FY24) is around 7.7% and Mundra port’s container traffic decadal growth (FY14-FY24) is around 12.0%.

Tiles & Ceramics

The Morbi Ceramic Cluster, located in Gujarat, India, is one of the largest and most significant ceramic industry clusters in the world. It is situated about 250 km from Ahmedabad and is renowned for its extensive production of ceramic products. The cluster comprises over 600 units, producing a wide range of items including wall tiles, floor tiles, vitrified tiles, polished glazed vitrified tiles, and sanitary ware.

Morbi's ceramic industry is known for its advanced technology and high-quality products, with many units utilizing state-of-the-art equipment imported from around the globe.

The Morbi Ceramic Cluster provides direct employment to about 68,000 people and indirectly supports many more through related businesses and professions. The industry is a major contributor to the local economy, fostering growth and development in the region. The cluster's products are not only supplied domestically but also exported to various international markets, enhancing its global footprint.

Overall, the Morbi Ceramic Cluster is a vital industrial hub that significantly contributes to India's ceramic production and export capabilities. Its continuous growth and adoption of new technologies ensure that it remains a key player in the global ceramic industry.

Export volumes recorded 28% growth on-year in fiscal 2024 with ceramic tiles exporters benefitting from certain favourable developments like lifting of the anti-dumping duty imposed by UAE on ceramic tiles from India. Meanwhile, despite the European Union announcing anti-dumping duty on ceramic tiles from India in 2023, the same is lesser for ceramic tiles from India as compared to tiles from competitors like Turkey and China giving India an added advantage with regards to expansion in exports to European nations. This is majorly on the back of superior quality tiles being produced in India at comparatively affordable prices. Globally, ceramic tiles import from India are well preferred due to these factors.

Going forward as well, we expect growth momentum to continue owing to continued cost competitiveness of Indian manufacturers as well as major global importers wanting to reduce their dependence on sole supplier i.e. China

In fiscal 2025, volume and value growth expected to be boosted by the growth in new real estate project completions, however replacement demand is estimated to continue its upward trajectory in fiscal 2025 as work from home for service sector continues to aid to overall tiles demand. Also, construction & completion of PMAY Urban to remain buoyant during the period as the government races to complete the scheme before the expected extended timeline.

Agri Produce

Agri produce commodity accounts for 3.5% total traffic on the project stretch. In container sub commodity it accounts for 7.5% of the container traffic.

Basmati Rice is major contributor among agricultural produce. Basmati rice belt in India primarily spans the northern regions, particularly in the states of Punjab, Haryana, Himachal Pradesh, Uttarakhand, and parts of Uttar Pradesh and Jammu & Kashmir. These areas are known for their ideal climatic conditions and fertile soil, which are perfect for cultivating high-quality Basmati rice. Rice gets exported from Mundra port. The top export destinations for Indian Basmati rice include Iran, Saudi Arabia, Iraq, the United Arab Emirates, and Kuwait

Crisil's methodology considers the growth of the Agri produce commodity at the regional level to derive the traffic growth of each vehicle category. Growth in Agri produce is highly volatile as it depends on the positive outcome of the monsoon season. Hence on a long-term period, it grows at a low rate compared to the aggregate GDP.

Consumer Foods

The fast-moving consumer goods (FMCG) industry or consumer packaged goods (CPG) industry is mainly responsible for producing, distributing, and marketing fast-moving consumer goods. Fast-moving consumer goods (FMCG) sector is India's fourth-largest sector and has been expanding at a healthy rate over the years because of rising disposable income, a rising youth population, and rising brand awareness among consumers.

Changing food habits and consumption patterns post the pandemic, rising demand for healthy products, increasing appetite for discretionary spends on processed foods and increasing focus on health and sanitation, shift in demand from loose to branded packaging to support growth. Demand is also expected to be supported by new product launches, rising distribution network with players catering to multiple segments.

Approach for traffic growth rates estimation

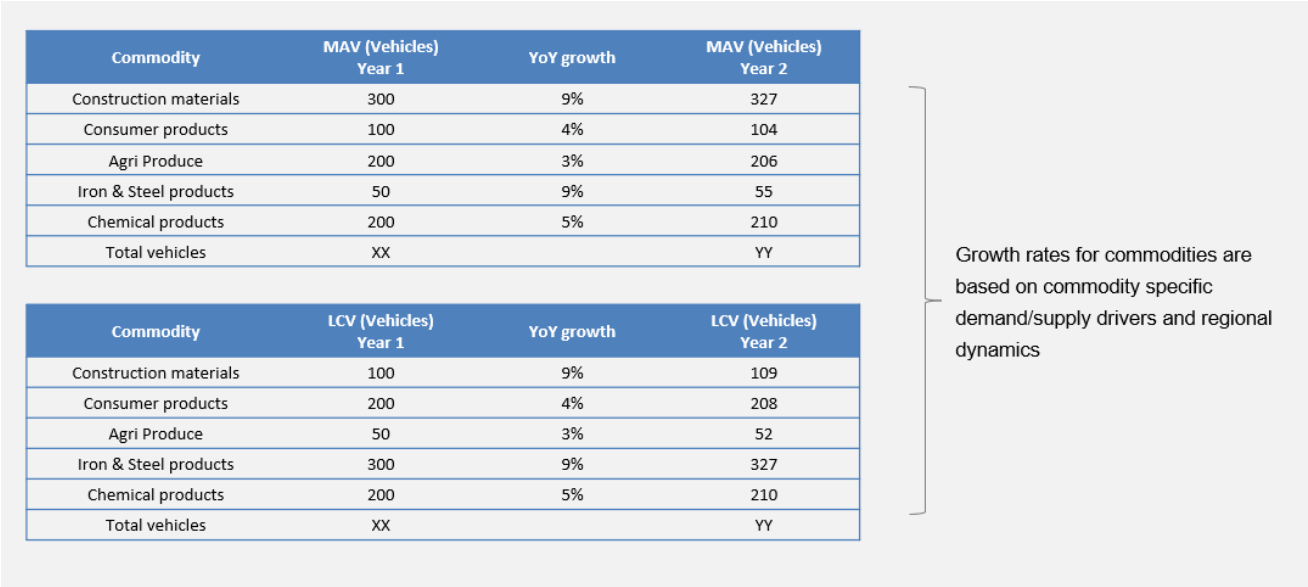
Crisil, based on its coverage of 80+ sectors and the MSME industry, has developed a knowledge base to understand the growth of industries and demand across various regions and clusters. The growth expectations for various industries are applied to each vehicle category based on the commodity composition of the vehicle category. For example, the share of light commercial vehicles (LCVs) carrying agricultural commodities is expected to grow as per agricultural output growth; the share of LCVs carrying consumer products is expected to grow as per the volume growth of durables; and the share of Multi axle vehicles (MAVs) carrying steel commodities is expected to grow as per demand/supply volume of steel products based on regional dynamics. This approach helps Crisil provide a more accurate growth rate of commercial traffic in the region.

For passenger traffic, Crisil assesses the sale of passenger cars in the region, growth of vehicular population, purpose and frequency of passenger travel, population growth, expansion of the city, and infrastructure development in the catchment area.

Further, Crisil also examines the various factors that will impact traffic over the concession period, such as

upcoming alternative road routes, truck aggregation by logistics players, dedicated freight corridors and other transportation options. Thus, the analysis considers the impact of central and state policies, growth in production and consumption centres along the stretch, and infrastructure in the adjoining regions. The report covers both growth drivers and restraints for the traffic along the stretch. CRISIL has enumerated and detailed the parameters that will positively/negatively impact the traffic on the stretch in the future.

Crisil has used its proprietary traffic projection methodology to project traffic using regional industry growth assumptions, macroeconomic developments, infra development and consumption centre growth factors of the catchment area and adjacent regions.



Commodity	MAV (Vehicles) Year 1	YoY growth	MAV (Vehicles) Year 2
Construction materials	300	9%	327
Consumer products	100	4%	104
Agri Produce	200	3%	206
Iron & Steel products	50	9%	55
Chemical products	200	5%	210
Total vehicles	XX		YY

Commodity	LCV (Vehicles) Year 1	YoY growth	LCV (Vehicles) Year 2
Construction materials	100	9%	109
Consumer products	200	4%	208
Agri Produce	50	3%	52
Iron & Steel products	300	9%	327
Chemical products	200	5%	210
Total vehicles	XX		YY

Figure 7-1: Commodity based approach: Illustrative example for Commercial vehicles.

Commodity Outlook

Crisil Intelligence has forecasted the freight traffic growth based on the growth in relevant sectors influencing traffic in the region. Industry growth has been analysed and forecasted based on our proprietary database of industries for the surrounding regions that impact traffic on project road as well as our internal assessment on a relevant set of sectors at the pan India level.

Package wise forecast incorporates the regional dynamics including, but not limited to, investments, commodity trends, district output (GDDP) profile (primary/secondary, construction/manufacturing) etc.

The traffic for the coming years is projected by factoring in the impact of these parameters on commodity wise growth rates and is presented in below table.

Table 7-1: Commodity Outlook for the Project Section

Commodity Type	Share	FY 26	FY27-31	FY32-45
Agri Produce	3.5%	3.0%	2.6%	1.2%
Automobiles	0.4%	7.5%	6.5%	2.9%
Chemical products	1.7%	4.0%	3.9%	1.7%
Coal	1.7%	2.5%	2.3%	1.0%
Construction materials	1.8%	6.5%	5.9%	2.6%

Commodity Type	Share	FY 26	FY27-31	FY32-45
Consumer Foods	3.5%	6.5%	5.5%	2.4%
Consumer Products	0.4%	6.5%	5.5%	2.4%
Courier & parcel	2.2%	8.0%	7.2%	3.2%
Iron & Steel Products	1.4%	6.5%	6.0%	2.6%
Machinery	0.8%	5.0%	3.4%	1.5%
Milk & Animal Food	0.2%	4.0%	3.9%	1.7%
Others	1.0%	5.5%	4.7%	2.1%
Paper products	0.7%	5.5%	4.7%	2.1%
Petroleum Products	1.1%	3.0%	2.2%	1.0%
Pharmaceuticals	0.1%	7.1%	6.8%	3.0%
Plastic products	2.6%	5.5%	5.0%	2.2%
Plywood & Timber products	1.1%	5.0%	4.9%	2.1%
Rubber products	0.6%	6.0%	5.8%	2.6%
Textile & Footwear	1.4%	5.0%	4.9%	2.1%
Tiles & Ceramic products	5.3%	8.0%	7.0%	3.1%
Container	61.0%	7.8%	5.8%	3.8%

Source: Industry, Crisil Intelligence

Traffic Projections

The total traffic projected in terms of PCUs based on most likely growth rates and after impacts is presented in below table.

Table 7-2: Pre-Impact Traffic projections

FY Year	Cars	Minibus	2 Axle Bus	LCV	Truck	3 Axle Truck	MAV	OSV	Total Veh.	Total PCU	YoY Growth (%)
FY-2025	2,385	17	181	142	216	626	10,266	9	13,841	51,928	
FY-2026	2,552	17	186	149	226	648	11,003	9	14,790	55,536	6.9%
FY-2027	2,724	18	192	156	236	669	11,773	10	15,778	59,298	6.8%
FY-2028	2,902	19	197	163	246	691	12,588	11	16,816	63,270	6.7%
FY-2029	3,084	19	203	171	255	712	13,433	12	17,888	67,378	6.5%
FY-2030	3,271	20	208	178	264	731	14,273	12	18,957	71,461	6.1%
FY-2031	3,463	20	214	185	273	749	15,151	13	20,068	75,715	6.0%
FY-2032	3,659	21	220	193	282	767	16,083	14	21,238	80,222	6.0%
FY-2033	3,858	21	225	201	292	786	17,073	15	22,471	84,996	6.0%
FY-2034	4,062	22	231	209	302	806	18,119	16	23,766	90,030	5.9%
FY-2035	4,268	22	237	217	312	825	19,211	17	25,108	95,273	5.8%
FY-2036	4,477	23	243	224	320	841	20,275	17	26,420	100,373	5.4%
FY-2037	4,689	23	248	232	329	855	21,364	18	27,759	105,591	5.2%
FY-2038	4,903	24	254	239	337	869	22,480	19	29,125	110,925	5.1%
FY-2039	5,119	24	260	246	345	882	23,621	20	30,517	116,370	4.9%

FY Year	Cars	Minibus	2 Axle Bus	LCV	Truck	3 Axle Truck	MAV	OSV	Total Veh.	Total PCU	YoY Growth (%)
FY-2040	5,337	25	266	253	352	894	24,786	21	31,934	121,923	4.8%
FY-2041	5,555	26	272	259	357	899	25,812	22	33,202	126,821	4.0%
FY-2042	5,775	26	278	264	362	903	26,829	23	34,460	131,672	3.8%
FY-2043	5,996	27	284	268	366	905	27,839	24	35,709	136,488	3.7%
FY-2044	6,217	27	290	272	370	906	28,846	25	36,953	141,280	3.5%
FY-2045	6,438	28	296	276	373	906	29,850	26	38,192	146,057	3.4%
FY-2046	6,659	28	302	280	376	907	30,714	26	39,292	150,205	2.8%
FY-2047	6,880	29	307	284	377	907	31,504	27	40,315	154,013	2.5%
FY-2048	7,100	29	313	286	378	907	32,223	28	41,264	157,497	2.3%
FY-2049	7,319	30	319	288	379	907	32,876	28	42,146	160,681	2.0%
FY-2050	7,537	31	325	289	379	907	33,467	29	42,964	163,583	1.8%
FY-2051	7,753	31	331	290	380	907	34,014	29	43,735	166,282	1.7%
FY-2052	7,968	32	337	291	381	907	34,518	30	44,463	168,792	1.5%
FY-2053	8,181	32	343	292	381	907	34,984	30	45,149	171,122	1.4%
FY-2054	8,392	33	349	292	381	907	35,413	30	45,797	173,284	1.3%
FY-2055	8,601	33	354	293	381	907	35,847	31	46,448	175,471	1.3%
CAGR (25-45)	**5.1%**	**2.5%**	**2.5%**	**3.4%**	**2.8%**	**1.9%**	**5.5%**	**5.5%**	**5.2%**	**5.3%**	
CAGR (25-55)	**4.4%**	**2.3%**	**2.3%**	**2.4%**	**1.9%**	**1.2%**	**4.3%**	**4.3%**	**4.1%**	**4.1%**	

Source: Crisil Intelligence

Table 7-3: Post-Impact Traffic projections

FY Year	Cars	Minibus	2 Axle Bus	LCV	Truck	3 Axle Truck	MAV	OSV	Total Veh.	Total PCU	YoY Growth (%)
FY-2025	2,385	17	181	142	216	626	10,266	9	13,841	51,928	
FY-2026	2,552	17	186	149	222	643	10,881	9	14,660	54,964	5.8%
FY-2027	2,724	18	192	156	230	661	11,548	10	15,538	58,242	6.0%
FY-2028	2,902	19	197	161	233	668	12,065	11	16,256	60,808	4.4%
FY-2029	3,084	19	203	170	242	693	12,925	11	17,348	64,995	6.9%
FY-2030	3,271	20	208	175	244	697	13,466	12	18,094	67,664	4.1%
FY-2031	3,463	20	214	180	247	701	14,030	13	18,868	70,442	4.1%
FY-2032	3,659	21	220	190	257	727	15,039	14	20,126	75,325	6.9%
FY-2033	3,858	21	225	197	263	740	15,850	14	21,169	79,262	5.2%
FY-2034	4,062	22	231	205	272	758	16,820	15	22,385	83,945	5.9%
FY-2035	4,268	22	237	213	281	776	17,833	16	23,645	88,821	5.8%
FY-2036	4,477	23	243	220	289	791	18,818	17	24,877	93,565	5.3%
FY-2037	4,689	23	248	227	296	804	19,828	18	26,134	98,418	5.2%
FY-2038	4,903	24	254	234	303	817	20,861	19	27,417	103,377	5.0%
FY-2039	5,119	24	260	241	311	829	21,918	20	28,722	108,436	4.9%
FY-2040	5,337	25	266	248	317	841	22,996	21	30,051	113,595	4.8%
FY-2041	5,555	26	272	254	322	845	23,946	22	31,241	118,146	4.0%
FY-2042	5,775	26	278	258	326	849	24,887	23	32,422	122,651	3.8%

FY Year	Cars	Minibus	2 Axle Bus	LCV	Truck	3 Axle Truck	MAV	OSV	Total Veh.	Total PCU	YoY Growth (%)
FY-2043	5,996	27	284	263	330	851	25,820	23	33,593	127,120	3.6%
FY-2044	6,217	27	290	267	333	852	26,749	24	34,759	131,563	3.5%
FY-2045	6,438	28	296	271	336	852	27,676	25	35,921	135,990	3.4%
FY-2046	6,659	28	302	275	338	852	28,474	26	36,953	139,835	2.8%
FY-2047	6,880	29	307	278	340	852	29,203	26	37,914	143,367	2.5%
FY-2048	7,100	29	313	280	340	851	29,866	27	38,808	146,600	2.3%
FY-2049	7,319	30	319	282	341	851	30,469	28	39,639	149,556	2.0%
FY-2050	7,537	31	325	283	342	851	31,014	28	40,410	152,251	1.8%
FY-2051	7,753	31	331	284	342	851	31,518	29	41,139	154,759	1.6%
FY-2052	7,968	32	337	285	343	851	31,984	29	41,828	157,092	1.5%
FY-2053	8,181	32	343	285	343	851	32,413	29	42,478	159,259	1.4%
FY-2054	8,392	33	349	286	343	851	32,809	30	43,092	161,272	1.3%
FY-2055	8,601	33	354	286	343	851	33,210	30	43,709	163,306	1.3%
CAGR (25-45)	**5.1%**	**2.5%**	**2.5%**	**3.3%**	**2.2%**	**1.6%**	**5.1%**	**5.4%**	**4.9%**	**4.9%**	
CAGR (25-55)	**4.4%**	**2.3%**	**2.3%**	**2.4%**	**1.6%**	**1.0%**	**4.0%**	**4.2%**	**3.9%**	**3.9%**	

Source: Crisil Intelligence

Overloading scenario on the project stretch

To ascertain the quantum of overloading, a seven-day axle load survey was done by the technical consultants of the client. The results of axle load survey provided by the client, reveal that overloaded vehicles form a sizeable share of vehicles across categories. As per the survey, 41% of the MAVs, 40% of 3 axle and 3% of the 2 Axle vehicles are overloaded (considering more than 5% overload than permissible limits).

Tiles, Wood, Rice and Coal are key commodities which are overloaded.

As per discussions with the client, it is proposed that overloading will be levied on 25% of MAV and 3 Axle vehicles which are overloaded for more than 20% of the threshold and also applied to the traffic which is travelling with trip length of less than 350kms and excluding commodities like fruits & vegetables, petroleum products and machinery. The quantum of vehicles for charging overloading penalty is decided after considering the practical numbers which can be charged per lane per hour. The revenue potential is arrived at, by considering an overloading levy equivalent to 1x of single journey toll rates.

Following table shows the overloading scenario for commercial vehicles on the stretch.

Table 7-4: Overloading traffic

Direction	Vehicle Category	Sample	>5% overload	>20% overload	>5% overload	>20% overload
Overall	MAV	723	296	78	41%	11%
Overall	2A	107	3	0	3%	0%
Overall	3A	111	44	11	40%	10%
Gandhidham-Mundra	MAV	391	161	52	41%	13%
Gandhidham-Mundra	2A	36	2	0	7%	1%
Gandhidham-Mundra	3A	51	30	9	58%	17%

Direction	Vehicle Category	Sample	>5% overload	>20% overload	>5% overload	>20% overload
Mundra-Gandhidham	MAV	331	134	26	41%	8%
Mundra-Gandhidham	2A	71	1	-	1%	0%
Mundra-Gandhidham	3A	60	14	3	23%	4%

Source: Crisil Intelligence

8 Revenue forecast

General

The project section is under “open tolling system” which enables the concessionaire to collect tolls from long distance as well as short distance traffic joining the project from adjoining highways.

User Fee Schedule

As per the revised toll gazette notification in July 2023 for the project road, National Highways Fee (Determination of Rates and Collection) Rules, 2008 is being followed for estimating the user fee.

The concessions of traffic have been provided under the categories/ toll tickets as presented in below table.

Table 8-1: Tolling Tickets

Ticket	Maximum number of one-way journeys allowed	Period of validity
Single/Normal	Single	-
Daily Pass	Multiple	24 hours
Monthly Pass	Multiple	One month from the date of payment
Local Personal	Single	-
Local Commercial Discount	Single	-

Traffic Segmentation

As mentioned in section historical toll data is used in adopting the segmentation for the project road. In finalising the trip segmentation for the Local commercial discount (LDC) following approach is used.

Estimation of Local Commercial Discount (LDC) trip segmentation is based on the following assumptions (data points).

- Estimated the share of local registered vehicles (GJ 19 & GJ 39) at Mokha plaza in the overall traffic.
- Analysed the nearby toll plaza LDC trip segmentation, which also has the same local registered vehicle plying (GJ 19 & GJ 39). Consultants has also looked at percentage universe of the local registered vehicles (GJ 19 & GJ 39) which is availing the Local Commercial Discount tickets in the total traffic (all registered vehicles). For example, in MAV 59% of vehicles at the plaza are local registered vehicles of the total traffic, 41% of traffic is availing local commercial discount tickets which suggest about 69% of local registered vehicles are availing local commercial discount tickets.

The traffic tolling segmentation in (%) adopted for the present study for FY25 onwards is presented in below table.

Table 8-2: Traffic Segmentation in % - FY25

Vehicle Type	Single Journey	Return Journey	Monthly Pass	Local Commercial	Local Pass	Exemptions	Total
Car/Jeep/Van	26.5%	31.0%	0.0%	0.0%	4.9%	37.6%	100%
Minibus	25.8%	47.9%	0.0%	2.0%	0.0%	24.3%	100%
2 Axle Bus	36.4%	59.0%	0.0%	3.5%	0.1%	1.0%	100%

Vehicle Type	Single Journey	Return Journey	Monthly Pass	Local Commercial	Local Pass	Exemptions	Total
LCV	25.8%	47.9%	0.0%	2.0%	0.0%	24.3%	100%
Truck	36.4%	59.0%	0.0%	3.5%	0.1%	1.0%	100%
3 Axle Truck	17.6%	24.2%	0.0%	38.0%	11.9%	8.3%	100%
MAV	26.1%	19.0%	0.0%	42.0%	10.7%	2.2%	100%
OSV	75.6%	15.6%	0.0%	1.0%	0.0%	7.7%	100%

Source: Historical toll data, Crisil Intelligence

Tolling lengths

The tollable lengths for the project section for plaza as per schedule M is presented in below table.

Table 8-3: Tolling Lengths

No.	Location of Toll Plaza (Existing chainage [km])	Length (km) for which Fee is Payable
1.	At km 44.500 of NH-41 Near Mokha Village in Kutch District of Gujarat	61.881 [excluding 0.7889 km of structure (having length more than 60 m) and excluding bypass length 8.730 km]

Source: Technical schedules (Schedule M), Crisil Intelligence

Table 8-4: Bypass Details

Location of Toll Plaza (Chainage)	Name of Bypass and Location	Taking off	Merging at	Length and Cost of bypass for which additional fee is payable		Rate at which fee payable
				Length (km)	Cost Rs. Crore)	
At km 44.500 of NH-41 Near Mokha Village in Kutch District of Gujarat	Anjar Bypass of NH-41	11.270	20.000	8.730	84.09	150% for four and more lane, of the base rates

Source: Technical schedules (Schedule M), Crisil Intelligence

Table 8-5: Structure Length Details

Location of Toll Plaza (Chainage)	Length of structures (km) to be converted into equivalent road length	Equivalent road length (km)	Rate at which fee is payable
At km 44.500 of NH-41 Near Mokha Village in Kutch District of Gujarat	0.7889	7.889	100% for four and more lane, of the base rates

Source: Technical schedules (Schedule M), Crisil Intelligence

Toll Rates Estimation

The toll rates (Rs/km) for the base year 2007-08 for different vehicle categories are as per fee rule/concession agreement mentioned above and are presented in the below table.

Table 8-6: Base Rate in Rs/km

Vehicle Type	Base rate of fee per km for the Base Year 2007-08 (in Rupees)
Car, Jeep, Van, or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20

Vehicle Type	Base rate of fee per km for the Base Year 2007-08 (in Rupees)
Three-axle commercial vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (four to six axles)	3.45
Oversized Vehicles (seven or more axles)	4.20

Source: NHAI-Determination of Rates and Collection Rule 2008

Review and Outlook of Whole-Sale price index (WPI)

The projected toll rates are dependent on Wholesale Price Index (WPI) assumptions for 2024 to 2045. For WPI projection, Crisil Intelligence has relied on inputs from Client. Past and outlook WPI growth is presented in below table.

Table 8-7: WPI

Year	WPI	Expected Year-on-year growth
2024	466.6	
2025	477.6	**2.4%**
2026	499.1	**4.5%**
2027	521.6	**4.5%**
2028	539.8	**3.5%**
2029	558.7	**3.5%**
2030	477.6	**3.5%**
2031-2053	↓	**3.5%**
2054	1320.4	**3.5%**

Source: Projected WPI (P): Client Input

Revenue Estimates

The revenue projections for the project road are presented in the below table.

Table 8-8: Revenue in ₹ Million for the Project Section

FY Year	Cars	Minibus	2 Axle Bus	LCV	Truck	3 Axle Truck	MAV	OSV	Total Veh.	YoY Growth (%)
FY-2025	52	1	22	6	27	62	1,551	2	1,723	8.9%
FY-2026	59	1	24	7	28	65	1,691	2	1,877	10.5%
FY-2027	65	1	26	8	30	70	1,872	3	2,075	8.8%
FY-2028	74	1	28	8	32	74	2,037	3	2,257	10.4%
FY-2029	82	1	30	9	34	80	2,253	3	2,491	9.1%
FY-2030	90	1	32	10	36	84	2,461	4	2,717	9.2%
FY-2031	99	1	34	10	39	88	2,692	4	2,967	12.2%
FY-2032	109	1	36	11	42	96	3,028	5	3,328	9.0%
FY-2033	120	1	39	12	45	101	3,304	5	3,628	10.3%
FY-2034	131	1	41	13	49	108	3,652	6	4,001	10.3%

FY Year	Cars	Minibus	2 Axle Bus	LCV	Truck	3 Axle Truck	MAV	OSV	Total Veh.	YoY Growth (%)
FY-2035	142	1	44	14	52	115	4,038	6	4,413	9.9%
FY-2036	156	2	47	15	56	122	4,446	7	4,851	9.2%
FY-2037	170	2	50	17	60	129	4,860	7	5,296	9.1%
FY-2038	185	2	53	18	64	137	5,313	8	5,779	9.3%
FY-2039	201	2	57	19	68	144	5,818	9	6,318	9.3%
FY-2040	220	2	60	21	72	153	6,368	10	6,905	7.8%
FY-2041	236	2	64	22	76	160	6,876	10	7,446	8.0%
FY-2042	254	2	68	23	80	166	7,437	11	8,042	7.9%
FY-2043	275	2	73	24	84	174	8,035	12	8,679	8.1%
FY-2044	297	3	77	26	89	182	8,699	13	9,386	7.1%
FY-2045	320	3	82	27	93	188	9,323	14	10,051	7.1%
FY-2046	347	3	87	29	98	196	9,991	15	10,765	6.6%
FY-2047	371	3	92	30	102	204	10,656	16	11,475	6.9%
FY-2048	399	3	98	32	107	213	11,396	17	12,266	5.9%
FY-2049	429	4	104	33	111	221	12,071	18	12,991	5.7%
FY-2050	458	4	110	35	116	230	12,765	19	13,736	5.9%
FY-2051	491	4	116	36	120	240	13,518	20	14,546	5.9%
FY-2052	527	4	124	38	126	250	14,307	22	15,398	5.3%
FY-2053	561	4	131	40	131	259	15,059	23	16,208	5.4%
FY-2054	600	5	138	41	136	270	15,862	24	17,076	5.5%
FY-2055	640	5	147	43	142	281	16,724	25	18,007	8.9%
CAGR (25-45)	**9.5%**	**6.7%**	**6.7%**	**7.5%**	**6.4%**	**5.7%**	**9.4%**	**9.7%**	**9.2%**	
CAGR (25-55)	**8.7%**	**6.5%**	**6.5%**	**6.6%**	**5.7%**	**5.2%**	**8.2%**	**8.5%**	**8.1%**	

Source: Crisil Intelligence

Table 8-9: Projected Revenue in ₹ crores including overloading

FY Year	Base Revenue	Overloading Revenue	Overall Revenue
FY25	172	0.0	172
FY26	188	0.0	188
FY27	208	8.3	216
FY28	226	8.2	234
FY29	249	8.2	257
FY30	272	8.0	280
FY31	297	7.6	304
FY32	333	7.3	340
FY33	363	6.6	369
FY34	400	5.8	406
FY35	441	4.8	446
FY36	485	3.5	489

FY Year	Base Revenue	Overloading Revenue	Overall Revenue
FY37	530	0.0	530
FY38	578	0.0	578
FY39	632	0.0	632
FY40	691	0.0	691
FY41	745	0.0	745
FY42	804	0.0	804
FY43	868	0.0	868
FY44	939	0.0	939
FY45	1,005	0.0	1,005
FY46	1,077	0.0	1,077
FY47	1,148	0.0	1,148
FY48	1,227	0.0	1,227
FY49	1,299	0.0	1,299
FY50	1,374	0.0	1,374
FY51	1,455	0.0	1,455
FY52	1,540	0.0	1,540
FY53	1,621	0.0	1,621
FY54	1,708	0.0	1,708
FY55	1,801	0.0	1,801
CAGR (FY25-45)	**9.2%**	**0.0%**	**9.2%**
CAGR (FY25-55)	**8.1%**	**0.0%**	**8.1%**

Source: Crisil Intelligence

9 Annexures

Commodity Analysis

Container sub commodities which were collected from OD surveys is presented in below table.

Table 9-1: Commodity Distribution (in %) for Mokha Plaza

Commodity	2 Axle Truck	3 Axle Truck	MAV
Tiles & Ceramic products	7.2%	10.1%	13.0%
Container	7.4%	6.7%	10.0%
Agri Produce	5.0%	10.0%	7.4%
Consumer Foods	12.7%	10.0%	6.7%
Textile & Footwear	3.7%	5.3%	6.0%
Construction materials	4.6%	3.5%	4.5%
Courier & parcel	9.7%	4.2%	4.2%
Plastic products	4.6%	4.7%	4.0%
Iron & Steel Products	3.5%	2.1%	3.2%
Chemical products	0.7%	2.0%	2.9%
Plywood & Timber products	0.0%	2.6%	2.7%
Others	2.4%	2.2%	2.2%
Coal	0.0%	0.2%	2.4%
Petroleum Products	2.9%	2.7%	2.1%
Machinery	2.0%	0.4%	1.5%
Paper products	0.0%	1.0%	1.4%
Rubber products	0.7%	0.4%	1.1%
Consumer Products	2.2%	1.4%	0.9%
Automobiles	0.7%	0.4%	1.0%
Pharmaceuticals	0.0%	0.6%	0.6%
Milk & Animal Food	2.0%	1.0%	0.5%
Empty	28.0%	28.6%	21.6%
Grand Total	**100%**	**100%**	**100%**

Source: Crisil Intelligence

Samakhiyali Plaza OD Insights

Samakhiyali Origin-Destination survey analysis insights is as follows.

The regional distribution of tollable vehicles at the toll plaza locations has been estimated based on OD matrices is presented in below table and figure.

Table 9-2: Regional Distribution in % at Samakhiyali Plaza

Region	% Influence
Gandhidham	49.9%
Morbi	21.6%
North India	6.5%

Region	% Influence
Ahmedabad	6.4%
Rajasthan	5.6%
Other parts of Gujarat	4.8%
South Gujarat	2.7%
Central & East India	1.3%
Maharashtra & South India	1.2%
Total	**100%**

Source: Crisil Intelligence

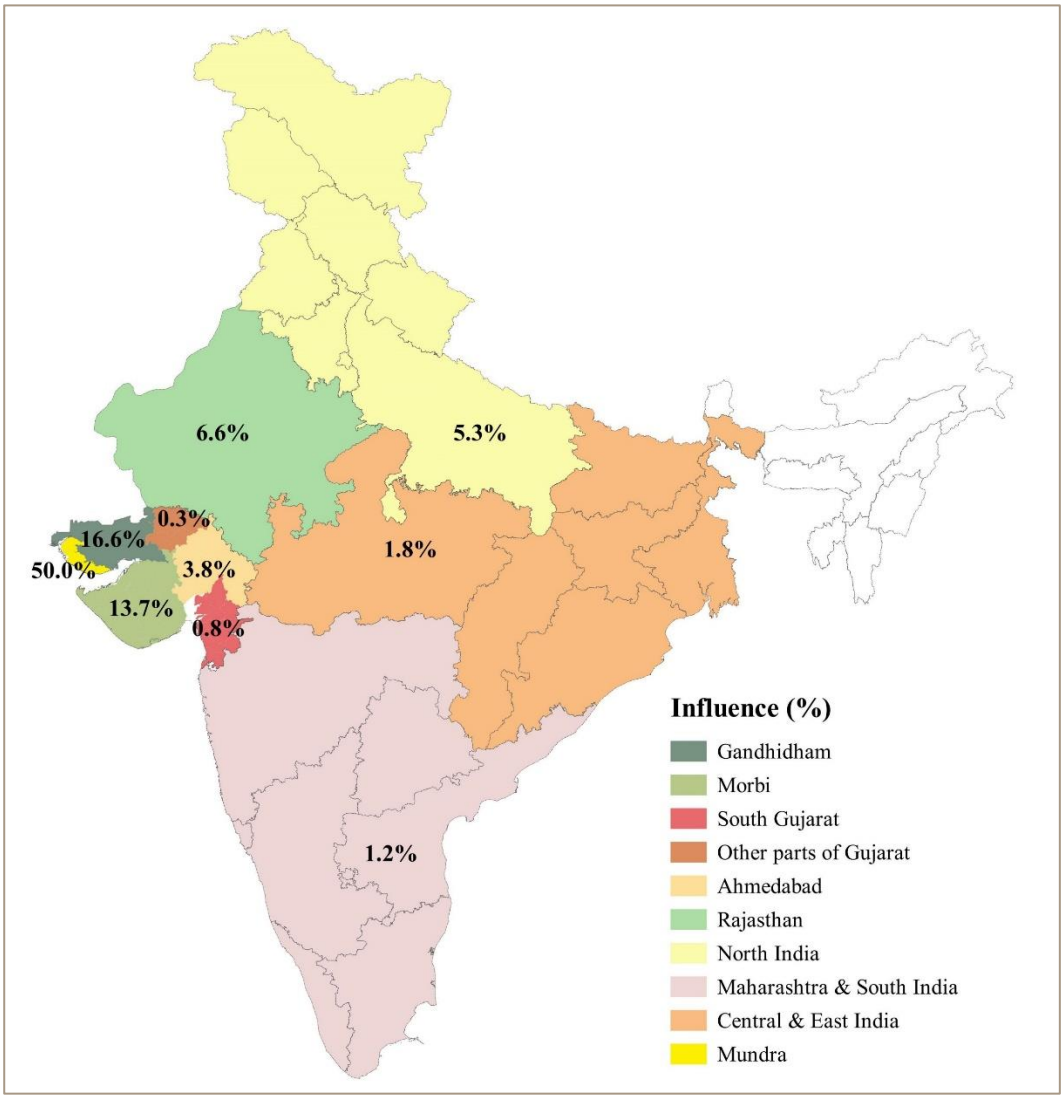


Figure 9-1: Regional Distribution for MAV(%)

Source: Opens Street Map, Crisil Intelligence

Turning Movement Survey Insights

Turning Movement Survey were conducted at three locations. The survey schedule and location are presented in

the below table and figure. Insights are provided in the below figures.

Table 9-3: Type of Survey & Schedule

Location	Type of Survey	Survey Duration	Survey Date
Vadala Junction	Turning Movement Count (TMC) Survey	1 Day	30th July 2024
Gandhidham		1 Day	3rd August 2024
Pragpar		1 Day	4th August 2024

Source: Crisil Intelligence

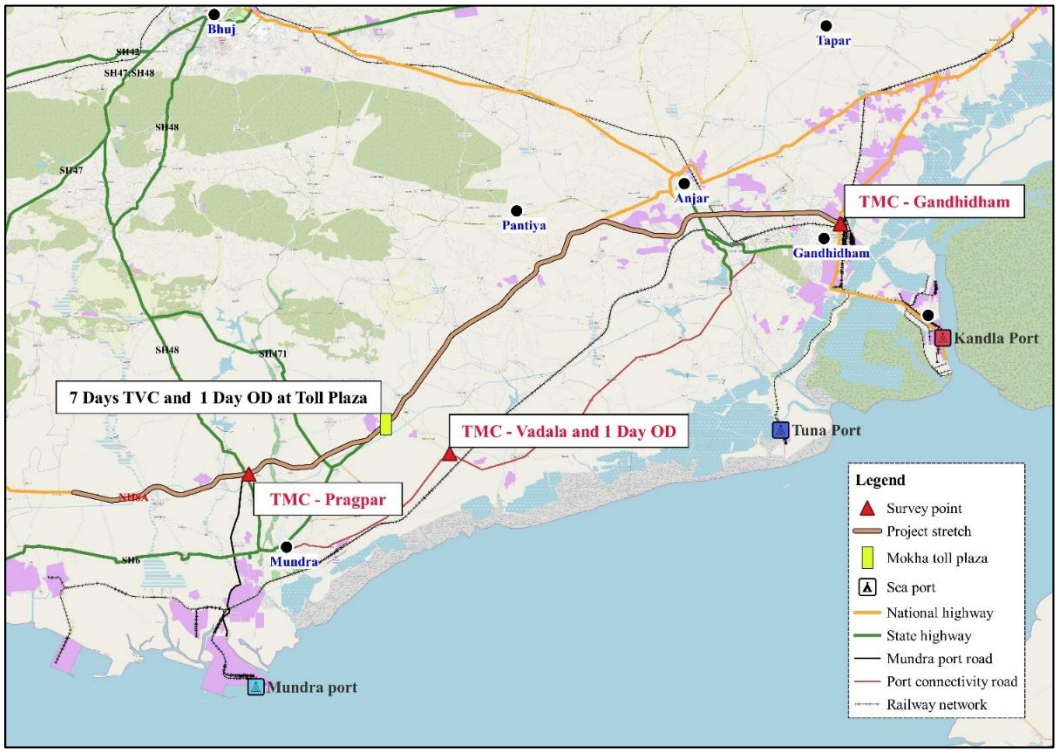


Figure 9-2: Survey Locations

Source: Open Street Map, Crisil Intelligence

TMC at Pragpar

TMC at Pragpar indicates 86% of the traffic uses the project road up to Pragpar moving towards Mundra.

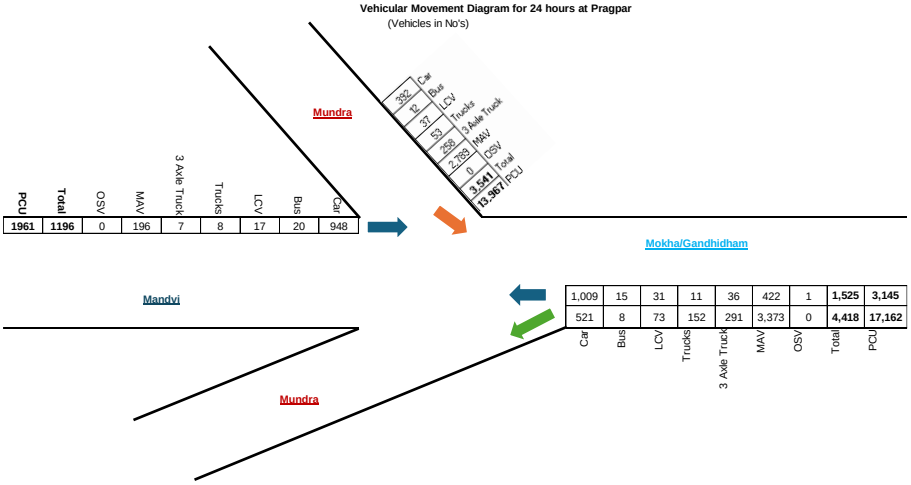


Figure 9-3: TMC at Pragpar

Source: Crisil Intelligence

TMC at Gandhidham

TMC at Gandhidham indicated 40% of the traffic moves towards Gandhidham/Kandla Region.

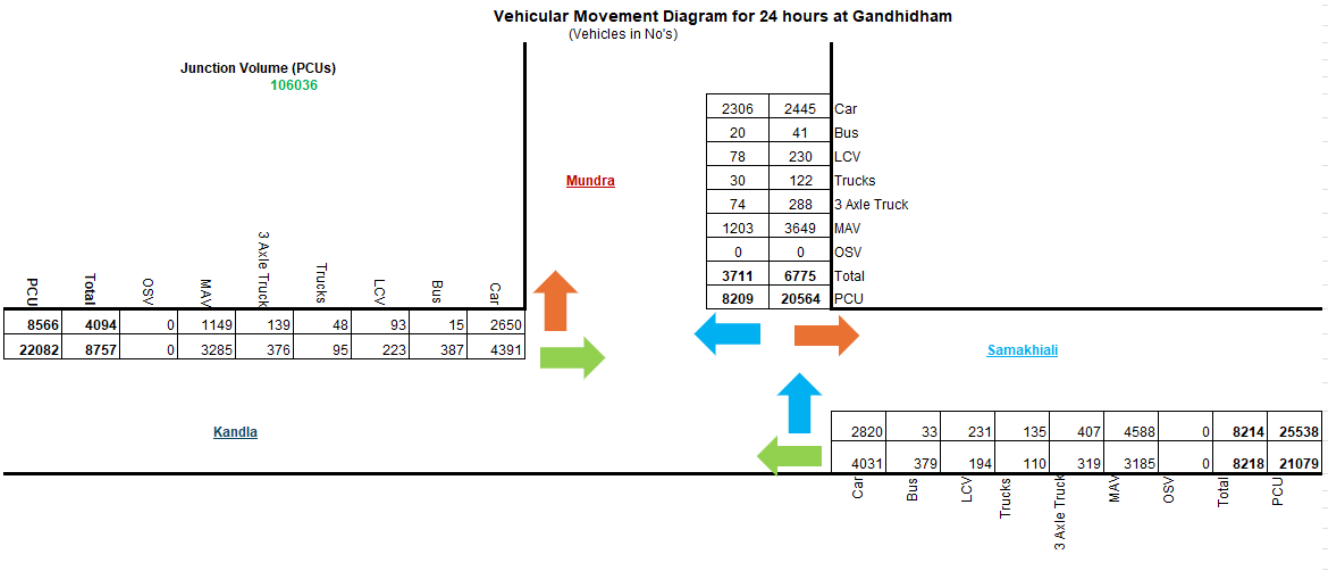
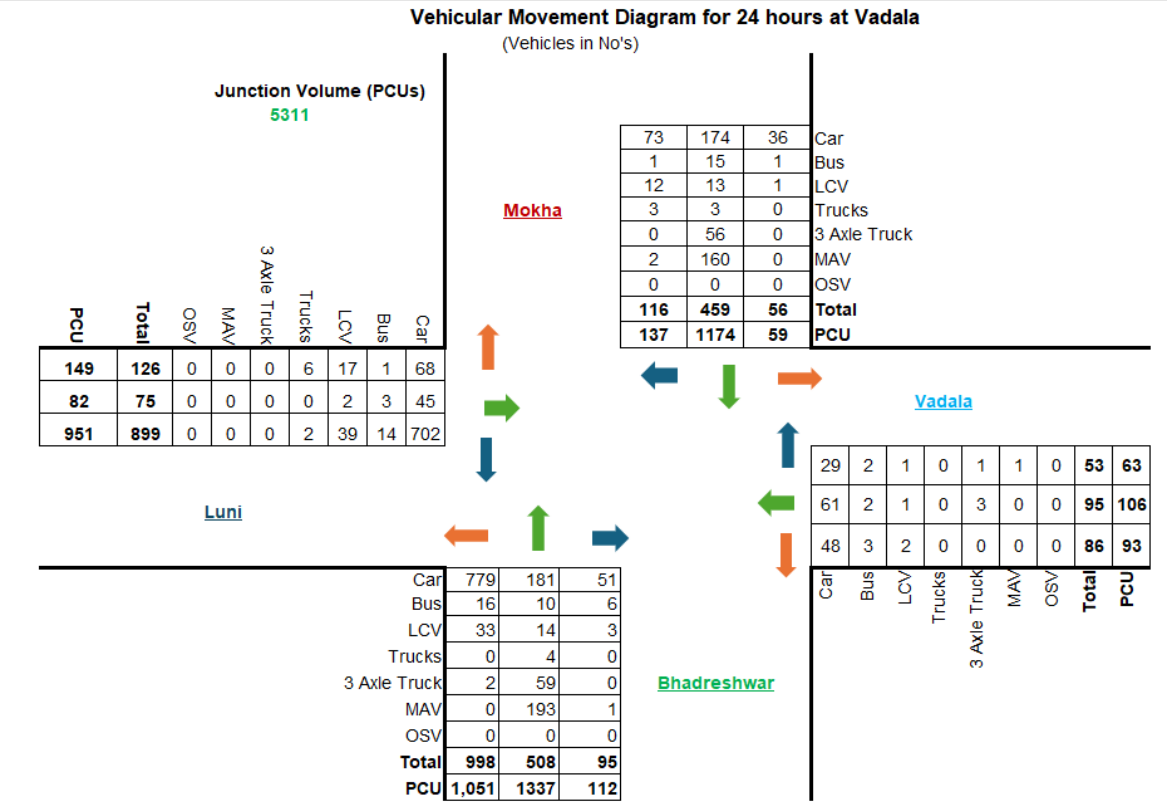


Figure 9-4: TMC at Gandhidham

Source: Crisil Intelligence

TMC at Vadala

TMC at Vadala indicated no traffic is bypassing the plaza to avoid toll using the SH/MDR road at Vadala Junction.



PCU	Total	OSV	MAV	3 Axle Truck	Trucks	LCV	Bus	Car
149	**126**	0	0	0	6	17	1	68
82	**75**	0	0	0	0	2	3	45
951	**899**	0	0	0	2	39	14	702

73	174	36	Car
1	15	1	Bus
12	13	1	LCV
3	3	0	Trucks
0	56	0	3 Axle Truck
2	160	0	MAV
0	0	0	OSV
116	**459**	**56**	**Total**
137	**1174**	**59**	**PCU**

29	2	1	0	1	1	0	**53**	**63**
61	2	1	0	3	0	0	**95**	**106**
48	3	2	0	0	0	0	**86**	**93**
Car	Bus	LCV	Trucks	3 Axle Truck	MAV	OSV	**Total**	**PCU**

Car	779	181	51
Bus	16	10	6
LCV	33	14	3
Trucks	0	4	0
3 Axle Truck	2	59	0
MAV	0	193	1
OSV	0	0	0
Total	**998**	**508**	**95**
PCU	**1,051**	**1337**	**112**

Figure 9-5: TMC at Vadala Junction

Source: Crisil Intelligence

About Crisil Intelligence (formerly Market Intelligence & Analytics)

Crisil Intelligence is a leading provider of research, consulting, risk solutions and advanced data analytics, serving clients across government, private and public enterprises. We leverage our expertise in data-driven insights and strong benchmarking capabilities to help clients navigate complex external ecosystems, identify opportunities and mitigate risks. By combining cutting-edge analytics, machine learning and AI capabilities with deep industry knowledge, we empower our clients to make informed decisions, drive business growth and build resilient capacities.

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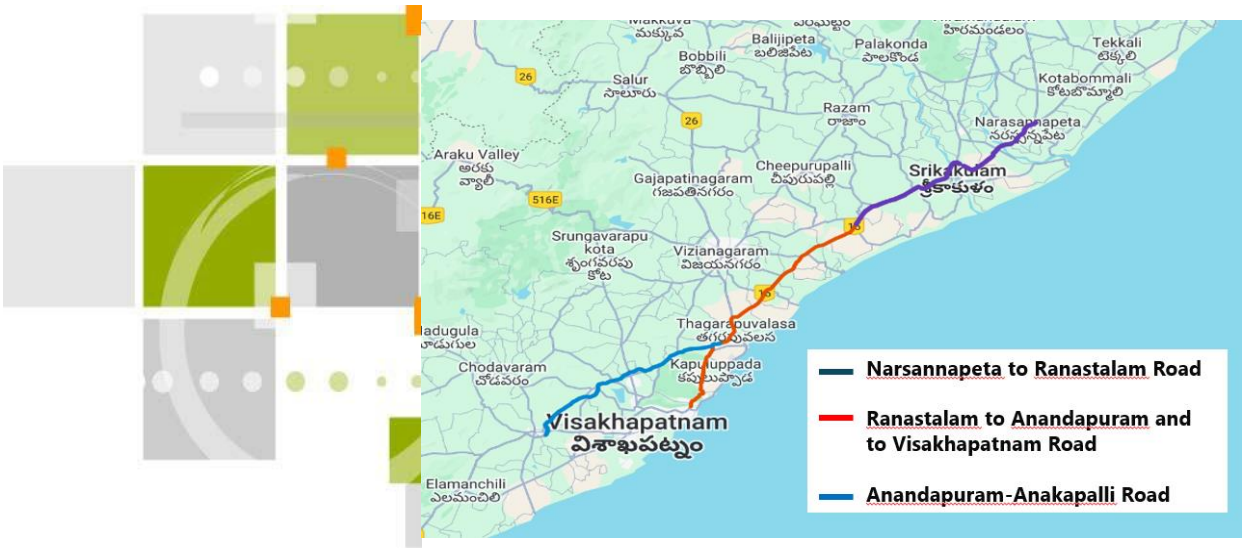
ANNEXURE D

TECHNICAL REPORTS

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FINAL TECHNICAL DUE-DILIGENCE REPORT

Technical Consultant Services for National Highways Infra Trust for Narasannapeta to Ranastalam Section of NH-16 in the State of Andhra Pradesh



February 2025

egis India
Consulting engineers pvt. ltd.

Document Name	Final Technical Due-Diligence Report
Document Number	EIRH1HR011/VO8/FR/01A
Project Name	Technical Consultant Services for National Highways Infra Trust for Narasannapeta to Ranastalam Section of NH-16 in the State of Andhra Pradesh
Project Number	EIRH1HR011

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Approved by	Sanjay Kumar	Team Leader

History of Revisions

Version	Date	Description of Change(s)
R0	14/02/2025	Final Submission

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Acronyms and Abbreviations

BC	Bituminous Concrete
BOQ	Bill of Quantities
C/W	Carriageway
CA	Concession Agreement
COD	Commercial Operation Date
CVPD	Commercial Vehicles Per Day
DLP	Digital Laser Profile
EGIS	Egis India Consulting Engineers Pvt. Ltd.
EPC	Engineering Procurement and Construction
FWD	Falling Weight Deflectometer
IM	Investment Manager
InvIT	National Highways Infra Trust
IRC	Indian Road Congress
Km	Kilometer (Chainage)
km	Kilometer (Length)
LHS	Left Hand Side
MBIU	Mobile Bridge Inspection Unit
MJB	Major Bridge
MNB	Minor Bridge
MPD	Mean Profile Depth
MSA	Million Standard Axles
NH	National Highway
NHAI	National Highways Authority of India
NHIIMPL	National Highways Infra Investment Managers Private Limited
NSV	Network Survey Vehicle
O&M	Operation and Maintenance
RCC	Reinforced Cement Concrete
RHS	Right Hand Side
ROB	Road over Bridge
SH	Stage Highway
SMTD	Sensor Measured Texture Depth
SPV	Special Purpose Vehicle
TA	Technical Advisor / Consultant
VDF	Vehicle Damage Factor
VUP	Vehicular Underpass

Section 1: Executive Summary

1.1 Introduction

1.1.1 Background

NHAI has set up an Infrastructure Investment Trust namely National Highways Infra Trust ("InvIT") and is acting as its Sponsor to the said InvIT. National Highways Infra Investment Managers Private Limited ("NHIIMPL") has been appointed as the Investment Manager to the InvIT.

NHIIMPL appointed M/s Egis India Consulting Engineers Private Limited, as Technical Consultant to conduct the due diligence on the proposed Assets. The Letter of Empanelment (LOE) was received on 3rd November 2022 and Letter of Award (LoA) for the subject Project was received on 15th July 2024 by Egis India and the services commenced immediately thereafter.

The project stretches detail as per LoA are listed below.

Table 1-1: Detail of Project Stretches

Sr. No.	Stretches	Toll Plaza	NH No.	Lane	Length (km)
1	**Narasannapeta to Ranastalam**	**Madapam**	**NH-16**	**4/6 Lane**	**53.799**
2	Ranastalam to Anandapuram via Kopperla	Nathavalasa	NH-16	6 Lane	48.980
	Anandapuram to Visakhapatnam	-	Old NH-16	4 Lane	17.564
3	Anandapuram to Anakapalle via Pendurthi	Dukkavanipalem & Marripalem	NH-16	6 Lane	48.605
Total					**168.948**

This report pertains to the stretch Narasannapeta to Ranastalam section of NH-16 in the state of Andhra Pradesh.

1.1.2 Objectives

The main objective of the present assignment is to

1. review project documents and understanding schedule B and schedule F requirements for improvement works for the assessment of Capex and Opex during the concession period.
2. conduct field investigations to assess the existing asset condition and future deterioration.
3. validate executed works with respect to schedule A and assessment of improvement Works

4. review quality of construction based on available data, design and drawings.
5. undertake designs for rehabilitation requirements of different assets based on field investigation data and available documents.
6. assess operation and maintenance cost including major maintenance expected to be incurred during the concession period.

1.2 Site Visit

The Technical Consultant visited site from 25th July 2024 to 11th August 2024. The important aspects of the project road were noted in the detailed site reconnaissance along with various field investigations. These included general description about the project road, site features, structures, junctions, pavement characteristics, road safety. Field investigation for NSV, FWD test, axle load survey, trail pits, MBIU and drone videography survey were also conducted by Technical Consultant to assess the present condition of the project road.

1.2.1 Salient Features

Table 1-2: Salient Features

Sr. No.	Name of Stretches	Toll Plaza	Chainage (Km)		Length	Lane Configuration	Pavement Type	Date of COD	O&M Handover Date to InVIT	Concessionaire / Remarks
			From	To	(km)					
1	Narsannapeta to Ranasthalam	Madapam @ 589+554 (16 lanes)	580+671	629+880	49.209	6-lane	Flexible, except from km 612+720 to km 616+720 on MCW and Toll Plaza where it is with rigid	16-02-2023	20-01-2037	M/s Apco Arasavalli Expressway Pvt. Ltd (HAM)
			629+880	634+470	4.590	4-lane	Flexible	31-03-2027	31-03-2037	Elevated Corridor; Tender invited under EPC mode with 10 yrs DLP

Asset-wise details of Project assets are given below:

Table 1-3: Detail of Assets

S. No	Description	Narasannapeta to Ranastalam Section (from km 580+671 to km 634+470)	
		Schedule-A	At Site
1	Total Project Length (km)	53.799	53.799
2	Service Roads/ Slip Roads (km)	95.766	**89.077**[1]

[1] In Sch A, service road from km 629+880 to km 634+470 is considered on BHS for entire length however existing SR is there for a length of only 2.88 km for BHS. SR for remaining length yet to be constructed on EPC mode by NHAI, hence not considered by the Consultant as existing SR.

S. No	Description			Narasannapeta to Ranastalam Section (from km 580+671 to km 634+470)	
				Schedule-A	At Site
3	Pavement (km)	Flexible	LHS	49.129	**49.139[β]**
			RHS	49.129	**48.609[β]**
		Rigid	LHS	4.670	**4.660[β]**
			RHS	4.670	**5.190[β]**
4	Bus Shelters (no.)			-	**12[π]**
	Bus bays with Shelters (no.)			40	**30[π]**
	Bus bays (no.)			-	-
5	Truck Lay-bays/Parking (no.)			3	**3**
6	Toll Plaza (no.)			1	1
7	Rest Area (no.)			-	3
8	Major Bridges (no.)			3	3
9	Minor bridges (no.)			14	14
10	ROB's (no.)			-	-
11	Flyover (no.)			3	**2[2]**
12	Overpass for new Int. Airport (no.)			-	-
13	VUP's (no.)			11	11
14	LVUP (no.)			12	12
15	PUP/CUP (no.)			3	3
16	Foot Over Bridge (no.)			1	1
17	Culverts (no.)	Pipe Culvert		119	119
		Slab Culvert		1	1
		Box Culvert		58	58

1.3 Surveys and Investigations

1.3.1 Network Survey Vehicle (NSV)

The Network Survey Vehicle, which is the latest survey technique which utilizes Lasers, Global Positioning System and Video image processing tools, is used for automatic data collection pertains to pavement condition and road inventory data. The NSV survey has been carried out along the project corridor from 27/07/2024 to 01/08/2024 for collection of field data pertains to pavement condition and road inventory. Summary of findings of NSV survey is given in preceding sections.

[β] Major bridge @ km 590+773 on RHS (length – 592.5m) is having rigid pavement whereas Flexible pavement is considered in Sch A. There is negligible difference on LHS.

[π] Sch A indicates that all bus shelters are with bays which is not the case at 10 locations. Moreover, two existing shelters at Ranasthalam urban area from km 629+880 to km 634+470 are not Considered in Sch A.

[2] Flyover at Ranasthalam urban area, i.e. at 632+136, is considered in Sch A which is yet to be constructed.

1.3.1.1 Pavement Type

Project stretch is having flexible pavement except at toll plazas and from km 612+720 to km 616+720 where it is rigid pavement.

1.3.1.2 Pavement Distresses

The summary of pavement distresses for each lane of main carriageway in terms of percentage length are presented below:

Narsannapeta - Ranastalam

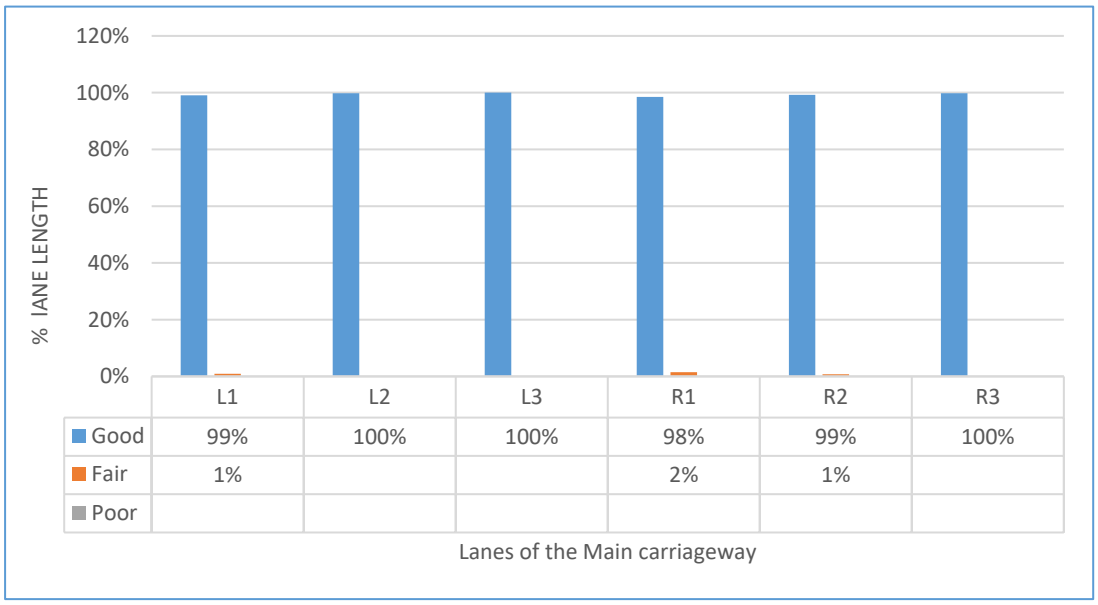


Figure 1-1: Summary of Pavement Distress

1.3.1.3 Pavement Roughness

Roughness value measured for each lane of main carriageway using NSV. The summary of direction-wise roughness distribution for each lane in term of percentage length are presented below.

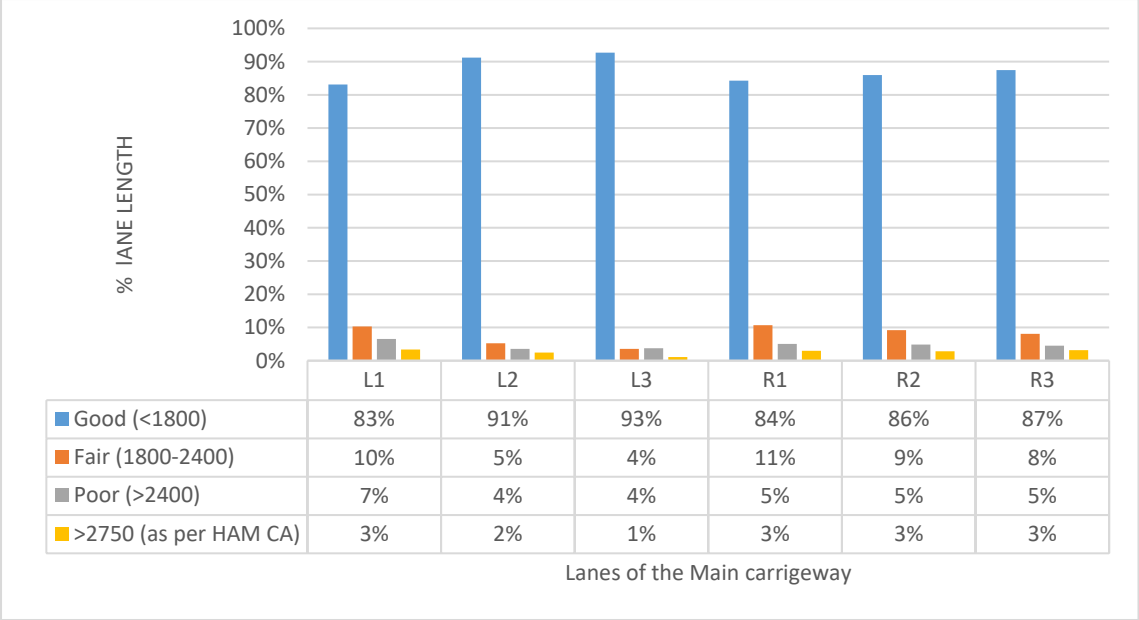


Figure 1-2: Pavement Roughness Charts

Km-wise pavement condition and distress in the form of strip chart is included in **Annexure - 4.2**.

1.3.2 Test Pit Investigations

Test pit investigations was planned to conduct at every 5km in a staggered manner ascertain the existing pavement composition (pavement course, material type, and thickness). However, the project is partially access control throughout the length, thereby no earthen shoulder has been found and thus test pits were taken at the locations where feasible to dug at the interface of the paved and earthen shoulder. The summary of existing pavement crust thickness is presented in table and some of the photographs showing the pavement crust thickness are shown as below.

Table 1-4:Summary of Existing Pavement Crust Thickness

Date of Sampling	Location of Trial Pit	Lanes	Pavement Composition (mm)						
			BT	PQC	DLC	WMM	Cemented layer	GSB	SUBGRADE
Narsannapeta-Ranastalam Section									
07.08.24	587+800LHS	6	170	-	-	100	150	200	500
06.08.24	613+100LHS	6	-	270	130	100	150	200	500
06.08.24	587+600RHS	6	90	-	-	100	150	200	500
06.08.24	619+700RHS	6	120	-	-	100	150	200	500
06.08.24	628+900RHS	6	130	-	-	100	150	200	500
07.08.24	630+900LHS	4	130	-	-	260	-	200	500
06.08.24	633+500RHS	4	130	-	-	250	-	200	500

Observations and Conclusions:

- The existing pavement along the project corridor of Narsannapeta-Ranastalam is flexible in most of the length except Etcherla bypass from km 612+720 to km 616+720 and toll plaza location where it is with rigid type. The pavement composition comprises of bituminous layer, granular base/sub-base on subgrade for flexible pavement whereas PQC, DLC and granular layer for rigid pavement
- The pavement type for service road in all the above project packages is flexible type and has been designed for 10MSA traffic.
- Throughout the project road, consistent bituminous/ cemented/ granular layer thickness are found.

During the above investigations, the existing subgrade soils samples were collected and tested in the laboratory to understand the properties of these foundation soils. The test results are presented in below sections.

Table 1-5:Test Results: Narsannapeta-Ranastalam Section

Location of Trial Pit	Nature of Soil (Visual Identification)	Sieve Analysis by % of passing			Sand Content %	Atterberg Limits			FSI %	MDD g/CC	OMC %	FDD g/CC	FMC %	CBR (4Days Soaked) %	Field CBR (DCPT) %	Depth of Water Table below Subgrade
		4.75mm	0.425mm	0.075mm		LL%	PL %	PI %								
587+800LHS	GC (Clayey Gravel)	55.1	29.6	16.9	38.2	26.3	15.4	10.9	10.0	2.05	8.1	1.82	9.0	8.5	14.0	Not found
613+100LHS	GC (Clayey Gravel)	42.7	23.8	15.7	27.0	24.8	15.5	9.3	10.0	2.08	8.6	1.50	9.0	8.3	14.0	Not found
587+600RHS	GC (Clayey Gravel)	55.6	44.1	28.3	27.3	33.5	18.1	15.4	20.0	1.98	9.2	1.66	8.0	12.2	18.0	Not found
619+700RHS	GC (Clayey Gravel)	58.5	43.6	30.1	28.4	35.0	17.0	18.0	20.0	2.01	8.8	1.71	7.0	11.4	16.0	Not found
628+900RHS	GC (Clayey Gravel)	59.4	42.5	28.1	31.3	35.1	16.9	18.2	20.0	2.01	8.8	1.83	7.0	10.3	14.0	Not found
630+900LHS	GC (Clayey Gravel)	55.3	38.3	25.6	29.7	32.5	17.7	14.8	10.0	2.05	7.5	1.70	8.0	12.4	17.0	Not found
633+500RHS	GC (Clayey Gravel)	58.5	40.9	27.9	30.6	32.9	15.8	17.1	10.0	2.03	8.5	1.64	8.0	12.5	17.0	Not found

Observations and Conclusions

The subgrade soils are generally consistent throughout the project road and CBR values are in compliance with the design CBR as adopted during the 6-lane works. Further, it has been observed during the site visit that most of the soils in the region found to be red soil having CBR values more than 10% and this is one the reason for better performance of the pavement of the project highways.

1.3.3 Axle Load Survey

Axle load survey has been conducted in compliance with IRC 37 2018 for 24 hours in both directions at the existing toll plaza locations. Obtained VDF values comparing the values adopted at the time of pavement design during construction summarized in table below.

Table 1-6: Vehicle Damage Factors (VDF)

Toll Plaza	Direction *	Vehicle Damage factors				
		Bus	LCV	2-Axle	3-Axle	MAV
Madapam Toll Plaza (km 589+550)	LHS	-	2.06	3.61	5.79	10.46
	RHS	-	1.68	2.61	5.36	8.09

** LHS: Srikakulam to Anakapalli RHS: Anakapalli to Srikakulam*

There is a significant difference between the axle loads of commercial vehicles flying in both directions of traffic, due in inconsistent commodity pattern generating from different locations along the project highway and thus, separate factors have been considered for traffic assessment. Further, 7-day axle load survey values are lower than one days and hence adopted the above values in the study.

1.3.4 Falling Weight Deflectometer (FWD)

The structural evaluation of pavement has been carried out in accordance with IRC: 115-2014, “Guidelines for Structural Evaluation and Strengthening of Flexible Road Pavements Using Falling Weight Deflectometer (FWD) Technique” to determine the remaining life of the pavement structure.

The detailed remaining life analysis is done using 90 percent reliability equation of IRC: 115-2014 is presented in tables below for LHS and RHS carriageway.

Table 1-7:Section-wise Pavement Remaining life

S.No	Homogeneous sections			Existing Thickness, mm		Total Crust	Remaining Life @ 90% Reliability		
	From, km	To, km	Length	BT	Granular		Fatigue	Rutting	Remaining Life, MSA
Narsannapeta - Ranastalam Section (LHS)									
1	580.670	583.500	2.830	170	350	520	174.2	1328.7	174.2
2	583.500	585.500	2.000	170	350	520	171.6	1308.8	171.6

S.No	Homogeneous sections			Existing Thickness, mm		Total Crust	Remaining Life @ 90% Reliability		
	From, km	To, km	Length	BT	Granular		Fatigue	Rutting	Remaining Life, MSA
3	585.500	588.500	3.000	170	350	520	146.3	1128.8	146.3
4	588.500	592.500	4.000	170	350	520	142.3	1096.5	142.3
5	592.500	594.500	2.000	170	350	520	146.4	1126.1	146.4
6	594.500	599.200	4.700	170	350	520	148.7	1142.6	148.7
7	599.200	602.600	3.400	170	350	520	155.1	1194.0	155.1
8	602.600	605.000	2.400	170	350	520	152.0	1165.1	152.0
9	605.000	607.000	2.000	170	350	520	158.0	1211.8	158.0
10	607.000	612.200	5.200	170	350	520	156.6	1205.8	156.6
11	616+200	629+680	13.480	170	350	520	143.4	1104.5	143.4
12	629.680	632.000	2.320	130	340	470	52.1	871.0	52.1
13	632.000	634.000	2.000	130	340	470	54.1	895.4	54.1
Narsannapeta - Ranastalam Section (RHS)									
1	634+00	616.200	17.80	170	450	620	133.4	4436.1	133.4
2	612.700	610.400	2.300	170	450	620	135.4	4494.7	135.4
3	610.400	608.400	2.000	170	450	620	158.5	5067.9	158.5
4	608.400	604.200	4.200	170	450	620	156.2	5016.8	156.2
5	604.200	600.000	4.200	170	450	620	158.7	5085.1	158.7
6	600.000	598.200	1.800	170	450	620	164.8	5224.9	164.8
7	598.200	596.200	2.000	170	450	620	156.4	5033.8	156.4
8	596.200	594.400	1.800	170	450	620	160.8	5136.9	160.8
9	594.400	593.200	1.200	170	450	620	166.1	5278.5	166.1
10	593.200	591.600	1.600	170	450	620	159.7	5119.6	159.7
11	591.600	589.200	2.400	170	450	620	165.0	5242.7	165.0
12	589.200	587.000	2.200	170	450	620	188.8	5813.1	188.8
13	587.000	584.000	3.000	170	450	620	175.1	5481.1	175.1
14	584.000	580.671	3.329	170	450	620	168.4	5314.7	168.4

1.3.4.1 FWD data Analysis for Rigid Pavement

As per IRC: 117-2015, the collected FWD data for the rigid pavement has been analysed to determine the following parameters.

- Modulus of subgrade reaction k (MPa/m)
- Elastic modulus of concrete E_c (MPa)
- Flexural Strength of concrete f_{mr} (MPa)
- Load Transfer Efficiency (LTE) of Joints (%)

The detailed analysis of the parameter for PQC and Load Transfer Efficiency is presented in **Annexure 4.7** for both LHS and RHS directions respectively.

From the test results the observations were draw-down. The range of Elastic Modulus, other PQC parameters and their percentage of length and Load Transfer Efficiency (LTE) is presented in table **below**.

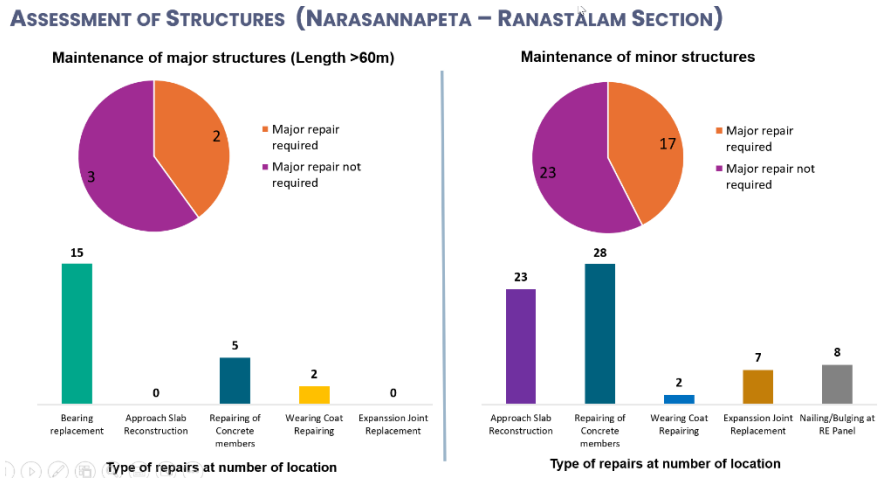
Table 1-8: Outcome of FWD Data Analysis for Rigid Pavement

Side		LHS					RHS				
Chainage (Km)		Modulus of subgrade reaction k (MPa/m)	Elastic modulus of concrete Ec (MPa)	Strength of concrete fc (MPa)	Flexural Strength of concrete f_{mr} (MPa)	LTE (%)	Modulus of subgrade reaction k (MPa/m)	Elastic modulus of concrete Ec (MPa)	Strength of concrete fc (MPa)	Flexural Strength of concrete f_{mr} (MPa)	LTE (%)
From	To										
Narsannapeta - Ransastalam Section (km 612+200 to km 616+200)											
612.200	613.000	73.769	28780	33.8	4.0	91.2	61.180	34856	48.7	4.9	96.1
613.000	614.000	58.496	31302	39.3	4.4	93.0	118.370	33314	44.8	4.7	91.7
614.000	615.000	83.520	32732	43.0	4.6	94.2	83.037	34974	49.5	4.9	90.7
615.000	616.000	79.837	33099	44.3	4.6	93.6	114.721	32249	41.7	4.5	92.0
616.000	616.200	108.318	37212	55.6	5.2	89.4	131.174	33198	44.4	4.6	87.6

- The PQC concrete slab has adequate strength with average flexural strength of more than 4.2MPa for the above rigid pavement project sections.
- Load Transfer Efficiency (LTE) for Transverse joints is more than 50% for both LHS & RHS direction and thus, joints are in good condition.
- Load Transfer Efficiency (LTE) for Longitudinal joints is more than 40% for both LHS & RHS direction so, the joint system is adequate in load transfer.

1.3.5 Structure Inventory and Condition Survey

There are deficiencies noted in the structures and relevant repair-rehabilitation measures are suggested. Requirement of immediate repairs for major structures (length > 60m) and minor structures are presented below.



1.4 Key Technical Issues

1.4.1 Reinforced Earth Wall (RE Wall)

Bulging and cracks are observed in RE wall panels in Narsannapeta – Ranasatalam section at the approaches of flyovers and underpasses. Affected approximate number of panels are provided below:

- VUP @ 581+330: 20 panels
- LVUP @ 582+478: 11 panels
- VUP @ 588+620: 35 panels
- VUP @ 597+725: 05 panels
- Flyover @ 608+780: 08 panels

The Project is under HAM till 15th February 2038. Existing HAM Concessionaire has done nailings to address these bulging. It may be safely assumed that if the stability of RE wall sustains till the end of existing concession terms, wall shall be further stabilised. However, a detailed study may be done to ascertain the reasons for these bulging and its remedial measures.

1.4.2 Damaged Bearings

Problems with the bearings are observed in the form of tilting, cracking, not properly placed and compressed. Affected structures are

MJBR: @ 590+750, @ 605+523, @ 655+573, @ 675+164 and @ 709+692

It is presumed that existing HAM Concessionaires will fix all these bearings before handing over.

1.5 Capital Expenditure Requirement

1.5.1 Improvement Works as Per Schedule B

Schedule B of each stretch specifies the requirements of initial improvement which the concessionaire has to construct within 3/6 months of Handover Date.

Improvement Scope specified for each stretch is tabulated below:

Table 1-9: Improvement works as per Schedule B

S. No.	Description	Unit	Narsannapeta-Ranasatalam
1	Approach slabs reconstructed	Nos.	17
2	Junction improvement	Nos.	30
3	Curve improvement	Nos.	50
4	Truck lay bye: Sewage disposal system	Nos.	3
5	Landscaping and median plantation	Km	16.2

S. No.	Description	Unit	Narsannapeta-Ranasatalam
6	Transverse Bar Marking	Nos.	17
7	Antiglare	Km	2.51
8	Kerb stone	Lm.	10,760

1.5.2 Immediate Maintenance Requirements

This section is under HAM (Annuity) concession up to 2037. So, obligation for immediate repair requirements do not lie with InvIT Concessionaire. However, toll plaza renovation cost and TMS replacement cost has been considered for existing toll plaza.

1.6 O&M Cost Estimation

1.6.1 Recommended MM Cycles for Pavement

Considering the initial pavement design period and crust, remaining life data, anticipated traffic loading during the concession period, and in compliance to the provisions of schedule B, the following cycle of Major maintenance is proposed for satisfactory performance of the pavement during operation period to serve both functional and structural requirements.

Table 1-10: Proposed Major Maintenance Cycles for Balance Concession period

Name of Stretch	InvIT Concession (20 years)				
	CAPEX	Routine Maintenance	Periodic Maintenance	ATMS & TMS Replacement	Toll Operation & Admin Cost
Narsannapeta-Ranastalam	Toll plaza renovation cost TMS (all the existing defects to be rectified by HAM Concessionaire)	**Till O&M Handover**: Manpower cost for clearing considered **After Handing Over**: Regular	**FY37**- Revalid. Survey **FY38**- Improvement works as per Sch.-B & road marking **FY42**- ***MCW:*** 40BC, 50DBM for 10% length ***SR:*** 40BC, 50DBM for 10% length ***Rigid***: Retexturing, replacement of joint sealant and 2.0% of panel ***Structure***: Replacement of wearing coat, expansion Joint, Bearing replacement for 40% of total number **FY45**-Road marking, Micro surfacing	**FY33** 50% TMS **FY40**- 100%TMS 40% ATMS	01.04.2025

1.6.2 Cost Estimate (Initial Improvement, MMR and O&M)

Year-wise estimate of Initial Improvement, MMR and O&M are given below

Table 1-11: Cost Estimate (Initial Improvement, MMR and O&M)

Sl.No.	FY	Initial Improvement Cost (in INR Cr.)	Major Maintenance Cost (in INR Cr.)				Operation & Maintenance Cost (in INR Cr.)								
			Road (MCW,SR, Toll Plaza)	Structure	ATMS	TMS	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026	7.45					0.60					6.30	0.11		3.99
2	2026-2027						0.60					6.30	0.11		4.67
3	2027-2028						0.60					6.30	0.11		4.77
4	2028-2029						0.60					6.13	0.11		4.69
5	2029-2030						0.60					6.13	0.11		5.83
6	2030-2031						0.60					5.71	0.11		5.84
7	2031-2032						0.60					5.28	0.11		5.73
8	2032-2033					2.82	0.60					5.07	0.11		6.42
9	2033-2034						0.60					5.07	0.11		6.00
10	2034-2035						0.60					5.07	0.11		5.85
11	2035-2036						0.60					5.07	0.11		5.94
12	2036-2037		0.57				4.02	2.40	2.27	4.73	2.13	5.07	1.76	2.30	6.00
13	2037-2038		10.01				4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.36	6.08
14	2038-2039						4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.36	5.95
15	2039-2040				8.26	5.63	4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.36	6.69
16	2040-2041						4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.76	6.18
17	2041-2042		154.99	36.43			4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.36	6.32
18	2042-2043						4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.36	6.26
19	2043-2044						4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.36	6.29
20	2044-2045		32.62				4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.76	6.29
Total		**7.45**	**198.18**	**36.43**	**8.26**	**8.45**	**42.71**	**21.60**	**20.44**	**42.61**	**19.15**	**108.02**	**17.03**	**13.96**	**115.78**

Note: The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

1.7 Conclusion

The project highway is a partially access controlled consists of 6-lane divided carriageway with service roads on both sides with minimum number of merging and diversion points on the highway for access to service roads. The 6-lane project has been completed on HAM mode and at present toll is being collected by Toll Collection Agency appointed by NHAI. The project highway is also having 4-lane divided carriageway at Ranastalam built-up area (part of project from Narsannapeta-Ranastalam), for which improvement proposals have been undertaken by NHAI in the form of construction of 6-lane elevated corridor. The performance of the pavement is satisfactory in terms of pavement roughness and quality of the pavement surface without having major distresses. However, few of the locations noted with low severity rutting for which rectification measures in progress for flexible pavement. As part of present study, the required Engineering Investigations along with site visual observations were made for evaluation of the asset condition and accordingly established the required maintenance and rehabilitation measures/decisions for the concession period. The period maintenance by functional/structural overlays are required at every 6th year as per the CA would be sufficient to keep the project stretch in good condition and hence suitable major maintenance strategy has been recommended to improve the service life during the concession period.

Based upon the site visit for assessment of condition of CD structures including MJB, MNBs, ROB, VUPs, Culverts and toll plaza buildings in the project corridor and observations submitted in various chapters of this report it is concluded that most of the structures are in sound condition and no major repair is required in near future. However, there are issues with the bearings for few structures and bulging in RE wall location. As the entire road sections are in HAM, these defects are to be rectified by the existing Concessionaires. It is to be ensured that asset quality assessment is done thoroughly at the time of handing over so that these defects and any other defects occur during the remaining HAM concession period is rectified.

The assessment of estimated cost of such repairs along with the anticipated future repair and rehabilitation cost are considered in the cost estimate of this report.

Section 2: Introduction

2.1 Background

NHAI has set up an Infrastructure Investment Trust namely National Highways Infra Trust ("InvIT") and is acting as its Sponsor to the said InvIT. National Highways Infra Investment Managers Private Limited ("NHIIMPL") has been appointed as the Investment Manager to the InvIT.

NHIIMPL appointed M/s Egis India Consulting Engineers Private Limited, as Technical Consultant to conduct the due diligence on the proposed Assets. The Letter of Empanelment (LOE) was received on 3rd November 2022 and Letter of Award (LoA) for the subject Project was received on 15th July 2024 by Egis India and the services commenced immediately thereafter.

The project stretches detail as per LoA are listed below.

Table 2-1: Detail of Project Stretches

Sr. No.	Stretches	Toll Plaza	NH No.	Lane	Length (km)
1	**Narasannapeta to Ranastalam**	**Madapam**	**NH-16**	**4/6 Lane**	**53.799**
2	Ranastalam to Anandapuram via Kopperla	Nathavalasa	NH-16	6 Lane	48.980
	Anandapuram to Visakhapatnam	-	Old NH-16	4 Lane	17.564
3	Anandapuram to Anakapalle via Pendurthi	Dukkavanipalem & Marripalem	NH-16	6 Lane	48.605

This report pertains to the stretch Narasannapeta to Ranastalam.

2.2 Objectives

The main objectives of the present assignment is to

review project documents and understanding schedule B requirements for improvement works for the assessment of Capex and Opex during the concession period.

1. conduct field investigations to assess the existing asset condition and future deterioration.
2. validate executed works with respect to schedule A and assessment of improvement works
3. review quality of construction based on available data, design and drawings.
4. undertake designs for rehabilitation requirements of different assets based on field investigation data and available documents.
5. assess operation and maintenance cost including major maintenance expected to be incurred during the concession period.

2.3 Technical Consultant Team

The Technical Consultant commenced its services from 15th July 2024 and the team comprising of Highway, Pavement & Structure Engineers and Experts have conducted site visit from 25th July 2024 to 11th August 2024 to appreciate the project corridor characteristics. This report highlights the findings from visual assessment, available documents shared with the consultant, discussion with NHAI officials involved with the maintenance and operation of project road at site and other local enquiries. Analysis of data as obtained from various survey and investigations conducted at site are present in this report.

Date-wise various field activities at site are shown below in bar chart form in **Figure 2.1.**

PROJECT STRETCHES	25-Jul	26-Jul	27-Jul	28-Jul	29-Jul	30-Jul	31-Jul	01-Aug	02-Aug	03-Aug	04-Aug	05-Aug	06-Aug	07-Aug	08-Aug	09-Aug	10-Aug	11-Aug
Narasannapeta - Ranastalam																		
FWD Survey																		
NSV Survey																		
Inventory and Condition Survey																		
Axle Load Survey																		
Drone Survey																		
Test Pits																		
MBIU for Major Structures (Length > 60m)																		

Figure 2-1: Project Activities Schedule

2.4 Disclaimer

The information and documents received from the Client are being reviewed by the Consultant and have been used for preparing this report. Due care has been taken while reproduction of the information where required to avoid typographical or other errors.

2.5 Structure of the Report

The report has been structured into nine sections as follows:

Section 1: Executive Summary
Section 2: Introduction
Section 3: Inventory and Condition Assessment
Section 4: Surveys and Investigations
Section 5: Review of Documents

Section 6: Capital Expenditure (CapEx) Requirement
Section 7: Operation & Maintenance
Section 8: Analysis & Comparisons with Seller Data
Section 9: Conclusions

Section 3: Inventory and Condition Assessment

3.1 General

The Technical Consultant visited site from 25th July 2024 to 11th August 2024. The important aspects of the project road were noted in the detailed site reconnaissance along with various field investigations. These included general description about the project road, site features, structures, junctions, pavement characteristics, road safety. Field investigation for NSV, FWD test, axle load survey, trail pits, MBIU and drone videography survey were also conducted by Technical Consultant to assess the present condition of the project road. This chapter elaborates various findings of these surveys and studies conducted by the Technical Consultant team in different sections.

3.2 Project Corridor

The project stretch details are listed below:

Table 3-1: Detail of Project Stretch

Sr. No.	Name of Stretches	Toll Plaza	Chainage (Km)		Length (km)
			From	To	
1	Narasannapeta to Ranastalam	Madapam	580+671	634+470	53.799



Figure 3-1: Project Location Map

3.3 Project Brief

3.3.1 Salient Features

Sr. No.	Name of Stretches	Toll Plaza	Chainage (Km)		Length	Lane Configuration	Pavement Type	Date of COD	O&M Handover Date to InVIT	Concessionaire / Remarks
			From	To	(km)					
1	Narsannapeta to Ranasthalam	Madapam @ 589+554 (16 lanes)	580+671	629+880	49.209	6-lane	Flexible, except from km 612+720 to km 616+720 on MCW and Toll Plaza where it is with rigid	16-02-2023	20-01-2037	M/s Apco Arasavalli Expressway Pvt. Ltd (HAM)
			629+880	634+470	4.590	4-lane	Flexible	31-03-2027	31-03-2037	Elevated Corridor; Tender invited under EPC mode with 10 yrs DLP

Details of Assets:

Table below provides the quantum of the assets and compare the same with the Schedule A stipulations:

S. No	Description			Narasannapeta to Ranastalam Section (from km 580+671 to km 634+470)	
				Schedule-A	At Site
1	Total Project Length (km)			53.799	53.799
2	Service Roads/ Slip Roads (km)			95.766	**89.077**[3]
3	Pavement (km)	Flexible	LHS	49.129	**49.139**[β]
			RHS	49.129	**48.609**[β]
		Rigid	LHS	4.670	**4.660**[β]
			RHS	4.670	**5.190**[β]
4	Bus Shelters (no.)			-	**12**[π]
	Bus bays with Shelters (no.)			40	**30**[π]
	Bus bays (no.)			-	-
5	Truck Lay-bays/Parking (no.)			3	**3**
6	Toll Plaza (no.)			1	1
7	Rest Area (no.)			-	3
8	Major Bridges (no.)			3	3
9	Minor bridges (no.)			14	14
10	ROB's (no.)			-	-
11	Flyover (no.)			3	**2**[4]
12	Overpass for new Int. Airport (no.)			-	-
13	VUP's (no.)			11	11
14	LVUP (no.)			12	12
15	PUP/CUP (no.)			3	3
16	Foot Over Bridge (no.)			1	1
17	Culverts (no.)	Pipe Culvert		119	119
		Slab Culvert		1	1
		Box Culvert		58	58

[3] In Sch A, service road from km 629+880 to km 634+470 is considered on BHS for entire length however existing SR is there for a length of only 2.88 km for BHS. SR for remaining length yet to be constructed on EPC mode by NHAI, hence not considered by the Consultant as existing SR.

[β] Major bridge @ km 590+773 on RHS (length – 592.5m) is having rigid pavement whereas Flexible pavement is considered in Sch A. There is negligible difference on LHS.

[π] Sch A indicates that all bus shelters are with bays which is not the case at 10 locations. Moreover, two existing shelters at Ranasthalam urban area from km 629+880 to km 634+470 are not Considered in Sch A.

[4] Flyover at Ranasthalam urban area, i.e. at 632+136, is considered in Sch A which is yet to be constructed.

3.4 Road Inventory and Condition Survey

3.4.1 Road Inventory

The Road Inventory is conducted to assess and list out the existing features of the project corridor and to validate that project road is conforming to the requirements of CA. It covers all the existing physical features such as terrain, land use, carriageway surfacing type, shoulder width, junctions, water bodies, roadside arboriculture, general drainage conditions, etc. It was carried out in accordance with the guidelines given in IRC: SP 19-2001, generally by visual means, and supplemented by simple tape measurement.

The road inventory data collected for the project highway is presented in the **Annexure 3.1.**

3.4.2 Terrain

The project highway falls in plain terrain.

3.4.3 Land Use

The land along the project highway is predominantly agricultural followed by built up, barren, forest, residential and commercial areas. Details of land use are given in the **Table 3.2**.

Table 3-2: Land Use

Description	Narasannapeta to Ranastalam			
	Length (km)		%age	
	LHS	RHS	LHS	RHS
Agriculture	27.659	30.999	51.41%	57.62%
Built-Up Area (Residential/Commercial/ Industrial)	24.310	21.550	45.19%	40.06%
Others (Water Bodies/ Forest etc.)	1.830	1.250	3.40%	2.32%
Total	**53.799**	**53.799**	**100%**	**100%**

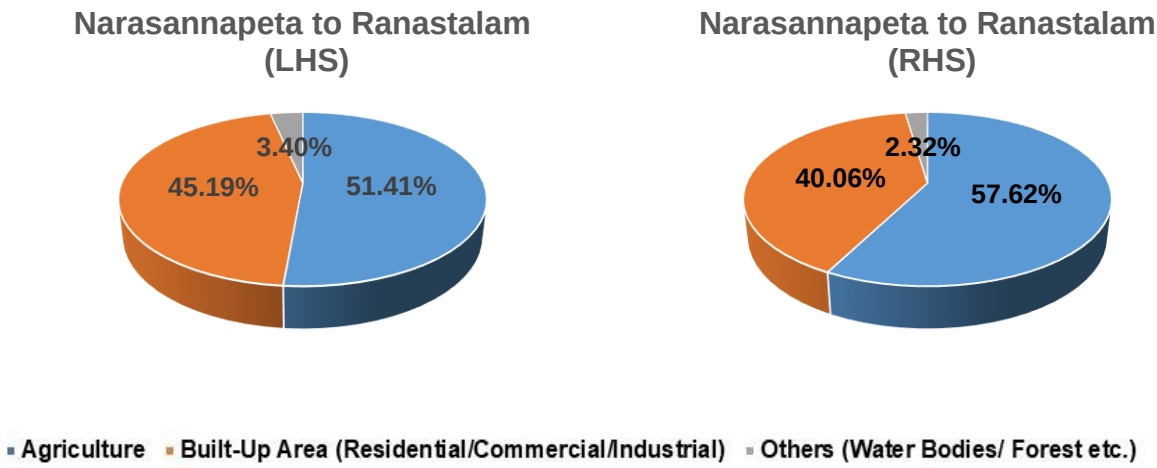


Figure 3-2: Land Use

3.4.4 Main Carriageway

Most of the length of the project highway is a 6-lane divided carriageway with paved shoulder configuration. The carriageway width is 11.0m (with kerb shyness) with 1.5m wide paved shoulder at rural area, 11.0m (with kerb shyness) with 2.0m wide paved shoulder at urban area and 11.0m (with kerb shyness) with 2.5m wide paved shoulder at underpasses location all along the project corridor except at toll plaza, bridges and ROBs.

There are four lane with paved shoulder configuration for around 4.5km towards the end of Narasannapeta to Ranastalam section. Carriageway width for these sections is 7.25m (including kerb shyness) with 1.5m wide paved shoulder on either side on main carriageway.

Details are show in **Table 3.3** and **Figure 3.3** below.

Table 3-3: Main Carriageway

S. No.	Section	Chainage (km)		Length (km)	Lane	Type of Pavement	Remarks
		From	To				
1	Narasannapeta – Ranastalam	580+671	589+200	8.529	6-lane with Paved Shoulder	Flexible	
		589+200	589+850	0.650		Rigid	Madapam @589+580
		589+850	612+720	22.870		Flexible	
		612+720	616+740	4.020		Rigid	
		616+740	629+880	13.140		Flexible	
		629+880	634+470	4.590	4-lane with Paved Shoulder	Flexible	
				53.799			



6 lane Flexible Carriageway (Typ)



6 lane Rigid Carriageway (Etcherla Bypass)

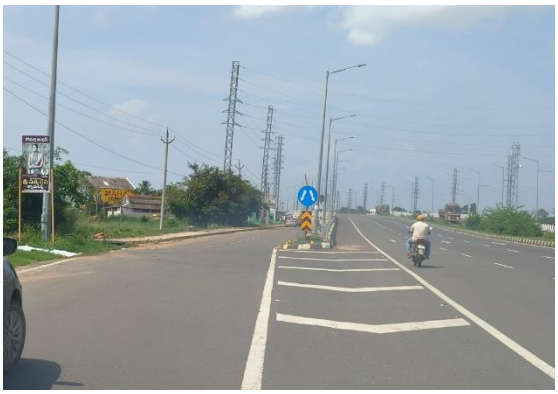
Figure 3-3: Main Carriageway

3.4.5 Service Road/Slip Roads

Total linear length (both side length) of service/slip road length for the project road is 271.608 km with 89.103 km falls in Narasannapeta to Ranastalam section. Flexible pavement is there for the service roads at all the locations. Details of service road are given below.

Table 3-4: Service Road

Service Road (LHS)			Service Road (RHS)		
Chainage (km)		Length (km)	Chainage (km)		Length (km)
From	To		From	To	
Narasannapeta to Ranastalam Section					
580+670	587+640	6.970	580+670	587+350	6.680
588+080	589+050	0.970	588+080	589+050	0.970
589+865	612+720	22.855	589+860	590+110	0.250
612+720	616+720	4.000	591+345	605+000	13.655
616+720	620+860	4.140	606+250	612+720	6.470
622+095	622+995	0.900	612+720	616+720	4.000
623+265	629+815	6.550	616+720	618+310	1.590
631+335	632+775	1.440	619+925	620+865	0.940
			622+090	622+980	0.890
			623+270	624+380	1.110
			625+855	628+010	2.155
			628+730	629+832	1.102
			631+335	632+775	1.440
Total		**47.825**	**Total**		**41.252**



Slip Road at Km 588+095 LHS



Service Road at Km 596+500 LHS

Figure 3-4: Service/Slip Road Carriageway

3.4.6 Towns and Built-Up-Areas

Chainage-wise details of towns and built-up areas are given below:

Table 3-5: Built Up Areas

S. No.	Chainage (km)		Length (km)	Side	Name of Settlement
	From	To			
Narasannapeta to Ranastalam Section					
1	581+200	584+500	3.300	LHS	Narasannapeta
2	585+900	586+100	0.200	Both Side	Srirampuram
3	589+800	590+100	0.300	Both Side	Madapam
4	591+300	591+700	0.400	Both Side	Karajada
5	593+200	594+600	1.400	LHS	Singupuram
6	599+600	600+000	0.400	Both Side	Pedapadu
7	600+200	600+500	0.300	LHS	Patrunivalasa (Rural)
8	603+900	605+100	1.200	RHS	Gopi Nagar
9	604+300	604+700	0.400	LHS	Gopi Nagar
10	608+200	608+700	0.500	LHS	Seepannaidupeta
11	610+100	610+300	0.200	Both Side	FareedPeta
12	610+700	610+900	0.200	LHS	FareedPeta
13	611+500	611+950	0.450	Both Side	Nava Bharat Nagar
14	617+530	618+030	0.500	Both Side	Chilakapalem
15	622+430	622+930	0.500	Both Side	Budumuru Village
16	626+230	626+530	0.300	Both Side	Budatavalasa Village
17	626+580	626+780	0.200	Both Side	Bonthupeta Village
18	628+130	628+580	0.450	Both Side	Laveru Village
19	631+260	633+200	1.940	Both Side	Ranasthalam

3.4.7 Major and Minor Junctions

3.4.7.1 Major Junction

Provision of grade separation in the form of underpasses (CUPs, PUPs, LVUPs, VUPs and Flyovers) are there at all major junctions for the entire project road except for the 4-

lane section from km 630+000 to km 634+500. All access to the project highway is through the Service/Slip Road.

There are 10 nos. of Major Junction. Details of the major junction are given in the **Table 3.6** below:

Table 3-6: List of Major Junction

Sr. No.	Chainage (Km)	Type of Junction	Cross Road leads to	
			LHS	RHS
Narasannapeta to Ranastalam Section				
1	581+300	Y	-	Paralakhemundi
2	586+950	Y	-	Urlam
3	592+340	X	Gara	Amadalavalasa
4	600+160	Y	Srikakulam	-
5	604+520	X	Srikakulam	Ragolu
6	608+780	Y	Srikakulam	-
7	609+710	Y	Srikakulam	-
8	612+700	Y	-	Etcherla
9	616+740	Y	-	Etcherla
10	627+545	Y	-	Cheepurupalli

3.4.7.2 Minor Junction

There are 20 nos. minor junctions all along the project section. Other village or town road are connected with service / slip road and the road users are coming through service / slip road to connect with main carriageway. Summary of the minor junctions are given in the **Table 3.7** below:

Table 3-7: Summary of Minor Junction

Sr. No.	Type of Junction	Narasannapeta to Ranastalam Section
1	T Junction	3
2	Y Junction	8
3	X Junction	9

3.4.8 Median

Median width is predominantly 4.0m-4.5m (excluding shyness). However, narrow median is observed at few locations due to ROW constraints or in built-up stretches. Details of sections with narrow median width are given in the **Table 3.8** below:

Table 3-8: Details of Narrow Median (Width < 4.5m)

Chainage (km)		Width (m)	Section	Remarks
From	To			
613+100	614+200	1.5 - 2.0	Narasannapeta to Ranastalam	ROW constraints
631+200	633+050	1.5 - 2.0		Built-up Area

3.4.9 Earthen / Hard Shoulder

Earthen shoulders are provided on the outer side of the main carriageway. The width of these shoulders is 1.5m to 2.5m.

3.4.10 Drainage

Cover Drains are provided with service and slip road in entire of project road. Median cut drains are provided at super-elevated portion for efficiently draining out rainwater. Package wise details of Drainage are given in the **Table 3.9** and shown in **Figure 3.5.**

Table 3-9: Drainage System

Description	Narasannapeta to Ranastalam Section
Covered lined Drain (km)	77.625
Open Lined Drain (km)	0.410

General observation of drainage conditions during the site reconnaissance are:

- Cleaning and maintenance of roadside drainage needs improvement. Cover at drain is missing at few locations.
- There are provisions of down-take pipes along the RE wall approaches. However, these are not adequate and most of the runoffs are through the longitudinal slope and water was draining off to the service road at the end of the slope.
- Provision of chute drain at high embankment location is observed. Water is draining off from the main carriageway to drain through the service road. This will adversely affect the pavement of service road.
- Median cut drain (chute) connected to longitudinal median drains and then through sumps and hume pipes are provided at super-elevation section to drain out the water from one carriageway to another at curve location. However, this drain system is missing at one or two super-elevation locations and rain waters are stagnant near the median.
- Though there were considerable rains during the time of inventory survey, no overtopping of road was observed at any location. It was further confirmed by the locals also.



Cover Drain at Slip Road Location



Cover Drain at Service Road Location



Missing Median Drain at curve location



Inadequate Drainage at RE wall Approaches

Figure 3-5: Drainage System

3.4.11 Road Furniture

3.4.11.1 W-Beam Crash Barrier, Concrete Crash Barrier and Pedestrian Guardrail

W-Beam Crash Barrier

W-beam Crash Barrier is provided at high embankment location, Separator (in between main carriageway and service road), near major structures and at outer side of sharp curves in the entire project road. Package wise length of W-Beam Crash Barrier are given in the **Table 3.10** and shown in **Figure 3.6.**

Table 3-10: W-Beam Crash Barrier

Description	Narasannapeta to Ranastalam Section
W-Beam Crash Barrier (km)	77.625

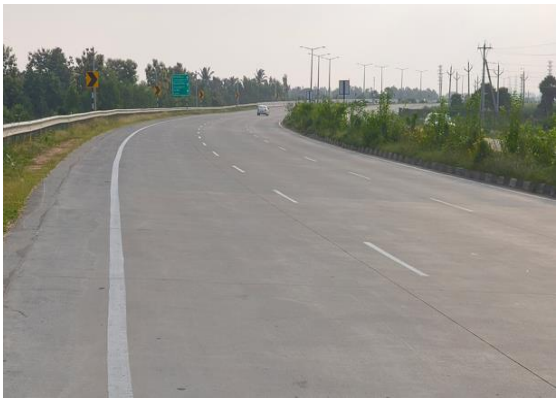




Figure 3-6: W-Beam Crash Barrier near High Embankment and Separator

Concrete Crash Barrier

Concrete Crash Barrier is provided at approaches of ROBs, Flyovers and Underpasses almost all through the project road. Length of CC barrier are given in Table **3.11** and shown in **Figure 3.7.**

Table 3-11: Concrete Crash Barrier

Description	Narasannapeta to Ranastalam Section
Concrete Crash Barrier (km)	42.284




Figure 3-7: Concrete Crash Barrier

Pedestrian Guardrails

Pedestrian guard rail is there between main carriageway and service road. Length of Pedestrian Guardrails are given in the Table 3.12 and shown in Figure 3.8.

Table 3-12: Pedestrian Guardrails

Description	Narasannapeta to Ranastalam Section
Pedestrian Guardrail (km)	5.090




Figure 3-8: Pedestrian Guardrails

3.4.11.2 Sign Boards and Gantry

There are adequate number of signboards along the project road and most of them are in good condition. There are many variable message signs (VMS), overhead and cantilever gantry signs as well. Location of gantry signs are shown in **Table 3.13** and **Figure 3.9** below.

Table 3-13: Variable Message Signs (VMS) / Cantilever & Overhead Gantry

S. No.	Chainage (km)	Side	Type	S. No.	Chainage (km)	Side	Type
Narasannapeta to Ranastalam							
1	580+800	RHS	Cantilever	18	606+585	RHS	VMS
2	580+800	LHS	VMS	19	607+355	LHS	Portal

S. No.	Chainage (km)	Side	Type	S. No.	Chainage (km)	Side	Type
3	585+505	LHS	Cantilever	20	608+590	LHS	VMS
4	587+660	RHS	Cantilever	21	610+995	LHS	Portal
5	588+215	LHS	Cantilever	22	611+210	RHS	Portal
6	589+040	LHS	Cantilever	23	612+260	RHS	VMS
7	590+160	RHS	Cantilever	24	614+975	LHS	VMS
8	591+015	RHS	Cantilever	25	617+100	LHS	Portal
9	593+288	LHS	Cantilever	26	618+910	RHS	Portal
10	595+050	LHS	VMS	27	621+485	RHS	Cantilever
11	595+315	RHS	VMS	28	621+525	LHS	Cantilever
12	595+500	RHS	Portal	29	622+990	LHS	Cantilever
13	598+600	LHS	Portal	30	624+800	LHS	Portal
14	599+310	RHS	VMS	31	626+230	RHS	VMS
15	600+900	RHS	Cantilever	32	628+410	RHS	Cantilever
16	603+500	LHS	Cantilever	33	629+300	LHS	Cantilever
17	605+200	RHS	Cantilever	34	634+475	RHS	Portal



Figure 3-9: VMS and Gantry Signboards

In general, these appurtenances are in good condition.

3.4.11.3 5 km / Km / Hectometer Stones

5Km, Km & Hectometer stones are observed at shoulder & median. Most of stones are in good condition.



Figure 3-10: Kilometer & Hectometer Stones

3.4.12 Project Facilities

3.4.12.1 Bus Bays and Shelters

As main carriageway is access controlled, Bus bays/shelters are at service/slip roads. It is observed that few shelters are of tin shade and are in poor condition. There are three types of facilities for boarding the bus by the road users. There are bus bay with shelters, only bus bay without shelters and only shelters without bays. Package-wise number of these facilities are given in **Table 3.14** and shown in **Figure 3.11** below.

Table 3-14: Bus Bays and Shelters

Description	Unit	Narasannapeta to Ranastalam Section
Bus bay	Nos	-
Bus bay with Shelter	Nos	30
Bus Shelter	Nos	12




Figure 3-11: Bus Bay and Shelters

3.4.12.2 Truck Lay bye

Tuck lay bye are adjacent to the rest areas in section Narsannapeta to Ranastalam and toilets are built in between the lay bye and rest area.

Table 3-15: Truck Lat Bye and Rest Area

Description	Unit	Narasannapeta to Ranastalam Section
Truck Lay Bye	Nos	3
Rest Area	Nos	3




Truck lay bye at Km 625+600 RHS Rest Area at Km 625+670 RHS

Figure 3-12: Truck Lay bye and Rest Area

3.4.12.3 Streetlight

Street light in the form of single/double arm poles are provided in toll plaza, underpasses and built-up area along the project road. Package-wise length provided for street lighting is give in **Table 3.16** and few examples are shown in **Figure 3.13.**

Table 3-16: Highway Lighting

S. No.	Section	Double Arm Light		Single Arm Light	
		Kms	Nos	Kms	Nos
1	Narasannapeta to Ranastalam	45.720	1582	8.249	298



Highway lighting at Flyover



Highway lighting at Built-up area

Figure 3-13: Street Light

3.4.12.4 High Mast Light

High mast lights are provided at toll plazas and few major junctions. Details are show in **Table 3.17** below.

Table 3-17: High Mast Light

S. No.	Chainage (km)	Numbers	Side	Location
Narasannapeta to Ranastalam				
1	581+335	1	RHS	At Junction
2	589+490	1	LHS	At Toll Plaza
3	589+490	1	RHS	At Toll Plaza
4	589+635	1	RHS	At Toll Plaza
5	589+670	1	LHS	At Toll Plaza
6	592+340	1	RHS	At Junction
7	600+160	1	LHS	At Junction
8	604+520	1	LHS	At Junction
9	604+520	1	RHS	At Junction
10	608+780	1	LHS	At Junction
11	609+690	1	Median	
12	612+720	1	RHS	At Junction
13	616+720	1	RHS	At Junction
14	617+685	1	RHS	At Junction

3.5 Toll Plaza

The purpose of the Toll Plaza is to collect toll from road users of the Project highway with transparency in the system. There are four toll plazas along the project road. Booths are available for all lanes. Administrative buildings are there at all four Toll Plazas.

3.5.1 Madapam Toll Plaza (TP-1)

Madapam Toll Plaza (TP-1) is located at km 589+580, Narasannapeta - Ranastalam stretch which has 16 lanes (8+8 Lanes). Reserve lanes are at centre in both directions

and being used as emergency lanes. Extra wide lanes are the outermost lanes in both direction.



Figure 3-14: Madapam Toll Plaza

Table 3-18: Toll Equipment Status at Madapam Toll Plaza

Sr. No.	Particulars	Details
1	Toll Plaza Chainage and name	589+580 Madapam Toll Plaza
2	Toll Configuration	16 Lanes
3	Number of Toll Lanes	18
4	No of ETC system	18
5	No of Toll Booths	18
6	Canopy	Available
7	Admin Building	Available
8	Control Room	Available
9	Server Room	Available
10	UPS & Battery Room	Available
11	Point of Sale Room	Available
12	Plaza Manager Room	Available
13	Cash up Room	Available
14	Cashier Room	Available
15	Cash Van Garage	Not Available
16	Availability of Tunnel	Available
17	PRO Office	Not Available
18	Changing Room	Available
19	Toilets (Gents & Ladies)	Available
20	Weigh In Motion Facility	Available
21	Availability of Static Weigh Bridge	Available
22	Availability of loading/unloading facilities	Not Available
23	Storage facility of overloaded material	Not Available
24	Diesel Generator	Available
25	High Mast Light	Available

Sr. No.	Particulars	Details
26	Street Lights	Available
27	Type of Pavement at Toll Lanes	Rigid



Lane Equipment



Boom barrier



TMS Equipment



Weigh In Motion

Figure 3-15: Toll Equipment, Madapam Toll Plaza

3.5.2 Toll Plaza Administration Building

The Plaza administration building serves as the support structure for the operation and maintenance of the toll plaza. It is from here that utilities are distributed and controlled, employee amenities are maintained, the toll collection process overseen, revenues are processed & audited. Sale of local passes and recharge is done at Plaza building. Transfer of funds from toll booth to plaza building and from plaza building to bank are being facilitated/managed by administration and financial management functions are also conducted in the building.



Figure 3-16: Toll Plaza Administration Buildings

There are ATMS control centres at admin buildings to do the traffic surveillance and incident management. ATMS control centre at TP-1 is shown below



Figure 3-17: ATMS Control Centre

3.6 Structure Inventory and Condition Survey

This section mainly presents the Site Inventory and Condition Survey of all existing Structures likes Culverts, Minor bridges & Major bridges, Flyovers/ Viaducts, VUP, LVUP, PUP, RUB and ROBs along the project roads. The aim of the section is to present the details of existing structures condition of existing structures and functioning of structures. The structure inventory has been done on the basis of visual assessment of each structure. MBIU has been used for visual assessment inspection of major structures having length greater than 60m.

Number of existing structures along the Project roads are given in the following table. Detailed inventory and condition data is presented in **Annexures – 3.2** and **3.3**.

Table 3-19: Number of Structures

S. No.	Description	Narasannapeta to Ranastalam
1	Major Bridge (no.)	3
2	Minor Bridge (no.)	14
3	ROB/RUB (no.)	-

S. No.	Description		Narasannapeta to Ranastalam
4	Flyover (no.)		2
5	Overpass for new international airport(no.)		-
6	VUP (no.)		11
7	LVUP (no.)		12
8	PUP/CUP (no.)		3
9	Foot Over Bridge (no.)		1
10	Culverts (no.)	Box	58
		Slab	1
		Pipe	119

Section 4: Surveys and Investigations

4.1 Visual Condition Assessment

i) In general, pavement condition is good to fair except rutting on wheel paths along middle and inner lane.

ii) As per the IE site team, rutting started after 1 years of COD and 15% of the lane length has already been done the rectification works through milling to a depth of 40mm and relaying back with 40mm fresh BC layer.

iii) Cement treated base (CTB) layer executed in 6-lane widening works.

iv) Bulging of RE wall panel is observed at approaches of underpasses, mainly at LVUP @ 586+920 and VUP @ Ch-597+508.

v) Tiling of bearings observed - One bearings at RHS A1 & One bearings at pier location at MJBR@590+ 750



Rutting in Wheel Path (Section-1)



Bulging of RE wall panels



Joint Gap at MNBR @ 629+315



Tilting of Bearing -MJBR@590+ 750

Figure 4-1: Existing Pavement Distresses (Typ)

4.2 Network Survey Vehicle (NSV)

The Network Survey Vehicle is the latest survey technique which utilizes Lasers, Global Positioning System and Video image processing tools. The survey vehicle is used for automatic data collection pertains to pavement condition and road inventory data, required for preparation of pavement maintenance and management proposals. It allows

all the data to be collected in a single pass consequently minimising the time needed to complete the data collection. The measurement of surface distresses like cracking, ravelling, patching and potholes etc. is done using the calibrated image processing methods. The description of NSV and the methodology adopted is provided in **Annexure-4.1.**

The NSV survey has been carried out along the project corridor from 27/07/2024 to 01/08/2024 for collection of field data pertains to pavement condition and road inventory. The data has been collected separately for each lane of the Carriageway. NSV Vehicle at the site is shown below.



Figure 4-2: NSV survey

4.2.1 Evaluation of Pavement Condition

NSV survey has been conducted for assessment of pavement condition and its distresses. The pavement surface images captured by NSV were processed in Survey board and all the images are geotagged with corresponding co-ordinates and chainage. By manual intervention with Survey Board, it was mapped/ identified various distresses showing distress type, location, magnitude and severity.

Flexible Pavement Distresses

The following Pavement distresses are considered for assessing the flexible pavement condition as per IRC: 82-2015 “Code of Practice for Maintenance of Bituminous Road Surfaces”.

- Cracking
  - Longitudinal cracks
  - Transverse cracks
  - Alligator cracks/ Crocodile cracks
  - Multiple cracks
- Ravelling

- Shoving
- Bleeding
- Slippage/ Delamination
- Potholes
  - Area: Surface Area of the Pothole;
  - Numbers
- Edge break
- Patching
- Settlements, Depressions

Strip chart showing the observed pavement distresses is provided in **Annexure 4.2** separately for LHS and RHS directions along with roughness. Based on the pavement condition, suitable repair and rehabilitation strategy has been suggested and same shall be presented under the section of Major Maintenance of this report.

4.2.2 Pavement Roughness

The roughness data was collected at 100m interval using NSV on each lane in-terms of IRI (International Roughness Index) value. In Indian context, the IRI values were converted to BI as per IRC: SP:16-2019 “Guidelines on Measuring Road Roughness and Norms” with the following equation;

$BI = 630*(IRI)^{1.12}$

Where

BI = Bump Integrator Roughness in mm/km

IRI = International Roughness Index.

Roughness data of Flexible & Rigid Pavement (Toll Plaza Section) was collected through Digital Laser Profilers System (DLP) and the same is presented in **Annexure 4.3**. The summary of Roughness values is presented in tables below

Table 4-1: Narsannapeta - Ranastalam Section: Summary of Pavement Roughness

Condition as per IRC:82-2023, Table 5.1	Unevenness (mm/Km)	LHS						RHS					
		L1		L2		L3		R1		R2		R3	
		Length (Km)	Length (%)	Length (Km)	Length (%)	Length (Km)	Length (%)	Length (Km)	Length (%)	Length (Km)	Length (%)	Length (Km)	Length (%)
Flexible Pavement													
Good	<1800	36.729	82.5	40.229	90.3	41.329	92.8	37.829	85.0	39.4	88.5	40.629	91.2
Fair	1800-2400	4.9	11.0	2.5	5.6	1.6	3.6	4.7	10.6	3.629	8.1	2.4	5.4
Poor	>2400	2.9	6.5	1.8	4.0	1.6	3.6	2	4.5	1.5	3.4	1.5	3.4
Length (Km)		44.529	100	44.529	100	44.529	100	44.529	100	44.529	100	44.529	100
Rigid Pavement													
Good	<2000	3.5	87.5	3.9	97.5	3.7	92.5	3.2	80.0	3.3	82.5	3.2	80.0
Fair	1800-2400	0.4	10.0	0.1	2.5	0.3	7.5	0.6	15.0	0.6	15.0	0.7	17.5
Poor	>2400	0.1	2.5	0	0.0	0	0.0	0.2	5.0	0.1	2.5	0.1	2.5
Length (Km)		4.0	100.0	4.0	100.0	4.0	100.0	4.0	100.0	4.0	100.0	4.0	100.0
Ranastalam-4 LANE-Flexible Pavement													
Good	<1800	3.5	83.3	4.2	100.0			3.5	83.3	3.1	73.8		
Fair	1800-2400	0.5	11.9	0	0.0			0.6	14.3	0.7	16.7		
Poor	>2400	0.2	4.8	0	0.0			0.1	2.4	0.4	9.5		
Length (Km)		4.2	100	4.2	100	0		4.2	100	4.2	100	0	

4.2.3 Rutting

Rutting data of Flexible Pavement has been collected through Digital Laser Profilers System (DLP) of NSV and the same is presented in **Annexure 4.4**. Some of the sections of the project highway has been noted with low-medium severity rutting for which, the existing HAM concessionaire has already done the repair works in removal of such observed wheel path ruts. The section wise observations are as under.

It has been oobserved the wheel path rutting predominantly in middle and inner lane. Milling in progress during the visit for these rutted portions to a depth of 40mm and relaying back with 40mm fresh BC.layer. As per the discussions with IE team, it is learnt that rutting started after 1 years of COD and 15% of the lane length has already been done the rectification works through milling to a depth of 40mm and relaying back with 40mm fresh BC.layer

4.2.4 Test Pit Investigations

Test pit investigations have been planned to conduct at every 5km in a staggered manner ascertain the existing pavement composition (pavement course, material type, and thickness). However, the project is partially access control throughout the length, thereby no earthen shoulder has been found and thus test pits were taken at the locations where feasible to dug at the edge of the paved and earthen shoulder. The summary of existing pavement crust thickness is presented in table and some of the photographs showing the pavement crust thickness are shown as below.

Table 4-2: Summary of Existing Pavement Crust Thickness

Date of Sampling	Location of Trial Pit	Lanes	Pavement Composition (mm)						
			BT	PQC	DLC	WMM	Cemented layer	GSB	SUBGRADE
Narsannapeta-Ranastalam Section									
07.08.24	587+800LHS	6	170	-	-	100	150	200	500
06.08.24	613+100LHS	6	-	270	130	100	150	200	500
06.08.24	587+600RHS	6	90	-	-	100	150	200	500
06.08.24	619+700RHS	6	120	-	-	100	150	200	500
06.08.24	628+900RHS	6	130	-	-	100	150	200	500
07.08.24	630+900LHS	4	130	-	-	260	-	200	500
06.08.24	633+500RHS	4	130	-	-	250	-	200	500



Figure 4-3: Pavement Composition & Thickness Measurement

Observations and Conclusions:

- The existing pavement along the project corridor of Narsannapeta-Ranastalam is flexible in most of the length except Etcherla bypass and toll plaza location where it is with rigid type. The pavement composition comprises of bituminous layer, granular base/sub-base on subgrade for flexible pavement whereas PQC, DLC and granular layer for rigid pavement
- The pavement type for service road is flexible type and has been designed for 10MSA traffic.
- Throughout the project road, consistent bituminous/ Cemented/granular layer thickness is found.

During the above investigations, the existing subgrade soils samples were collected and tested in the laboratory to understand the properties of these foundation soils. The test results are presented in below sections.

Test Results: Narsannapeta-Ranastalam Section

Location of Trial Pit	Nature of Soil (Visual Identification)	Sieve Analysis by % of passing			Sand Content %	Atterberg Limits			FSI %	MDD g/CC	OMC %	FDD g/CC	FMC %	CBR (4Days Soaked) %	Field CBR (DCPT) %	Depth of Water Table below Subgrade
		4.75mm	0.425mm	0.075mm		LL %	PL %	PI %								
587+800LHS	GC (Clayey Gravel)	55.1	29.6	16.9	38.2	26.3	15.4	10.9	10.0	2.05	8.1	1.82	9.0	8.5	14.0	Not found
613+100LHS	GC (Clayey Gravel)	42.7	23.8	15.7	27.0	24.8	15.5	9.3	10.0	2.08	8.6	1.50	9.0	8.3	14.0	Not found
587+600RHS	GC (Clayey Gravel)	55.6	44.1	28.3	27.3	33.5	18.1	15.4	20.0	1.98	9.2	1.66	8.0	12.2	18.0	Not found
619+700RHS	GC (Clayey Gravel)	58.5	43.6	30.1	28.4	35.0	17.0	18.0	20.0	2.01	8.8	1.71	7.0	11.4	16.0	Not found
628+900RHS	GC (Clayey Gravel)	59.4	42.5	28.1	31.3	35.1	16.9	18.2	20.0	2.01	8.8	1.83	7.0	10.3	14.0	Not found
630+900LHS	GC (Clayey Gravel)	55.3	38.3	25.6	29.7	32.5	17.7	14.8	10.0	2.05	7.5	1.70	8.0	12.4	17.0	Not found
633+500RHS	GC (Clayey Gravel)	58.5	40.9	27.9	30.6	32.9	15.8	17.1	10.0	2.03	8.5	1.64	8.0	12.5	17.0	Not found

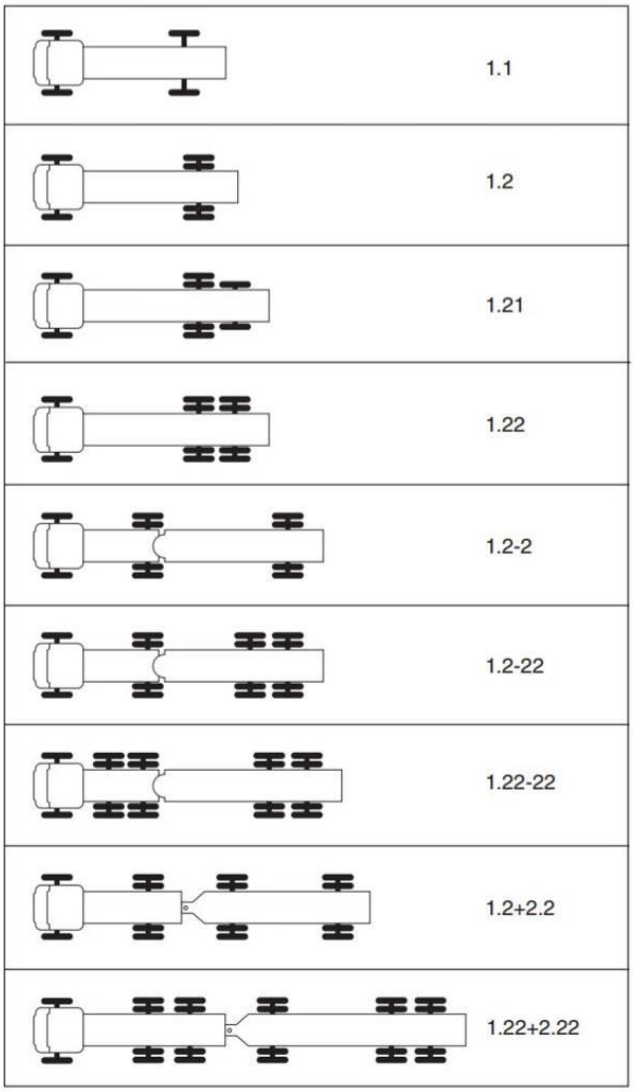
Observations and Conclusions

The subgrade soils are generally consistent throughout the project road and CBR values are in compliance with the design CBR as adopted during the 6-lane works. Further, it has been observed during the site visit that most of the soils in the region found to be red soil having CBR values more than 10% and this is one the reason for better performance of the pavement of the project highways.

4.3 Axle Load Survey

Vehicle axle loading has a significant effect on pavement design and its impact on performance of the pavement. Therefore, an axle load survey has been conducted from 26th July-2024 to 02nd Aug-2024 in compliance with IRC 37 2018 and such survey was conducted for 24 hours in both directions at each of the existing 4 No's toll plaza locations along the project highway from Narsannapeta-Anakapalli.

The type of vehicle considered for axle load survey along with its axle configurations are presented in below. Few of the survey photographs were shown in Photos as below:



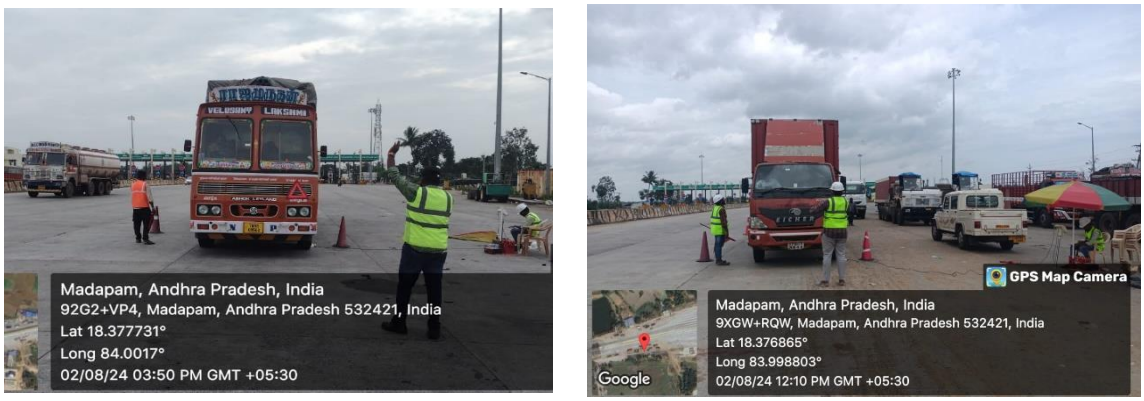


Figure 4-4: Axle Load Survey

The VDF analysis was carried as per procedure given IRC: 37-2018 based on the collected axle load data. The equations for computing equivalency factor for single, tandem and tridem axles given below is used as directed in the IRC:37-2018 for converting different axle load repetitions into equivalent standard axle load repetitions;

- Single axle with single wheel on either side = {axle load in kN / 65}4
- Single axle with dual wheel on either side = {axle load in kN / 80}4
- Tandem axle with single wheel on either side = {axle load in kN /148}4
- Tridem axle with dual wheel on either side = {axle load in kN /224}4

With the stated above procedure, the Vehicle Damage Factor for each class of commercial vehicle on both the directions were calculated separately for empty and loaded vehicles. The Axle load data format and VDF analysis are presented in **Annexure 4.5** and obtained VDF values comparing the values adopted at the time of pavement design during construction summarized in table below.

Table 4-3: Vehicle Damage Factors (VDF)

S. No	Toll plaza	Madapam (km 589+550)	
	Vehicle Type	LHS	RHS
1	Bus	-	-
2	LCV	2.06	1.68
3	2-Axle	3.61	2.61
4	3-Axle	5.79	5.36
5	MAV	10.5	8.09

There is a significant difference between the axle loads of commercial vehicles flying in both directions of traffic, due in inconsistent commodity pattern generating from different locations along the project highway and thus, separate factors have been considered for traffic assessment. Further, 7-day axle load survey has been conducted to validate the above

inconstancy and found that VDF values as obtained from these 7-day survey is less than 24 hours' survey and hence adopted the above values in the present due diligence study.

4.4 Falling Weight Deflectometer (FWD)

The structural evaluation of pavement has been carried out in accordance with IRC: 115-2014, "Guidelines for Structural Evaluation and Strengthening of Flexible Road Pavements Using Falling Weight Deflectometer (FWD) Technique" to determine the remaining life of the pavement structure.

The principle and description of FWD and its methodology is provided in **Annexure 4.6.**

FWD deflection measurement has been carried out for each direction and the measurement has been carried out at a test point along outer wheel path of each direction which is at an offset of 1m from the outer edge of outer lane as specified in section 5.4.5 of IRC: 115-2014. At every measurement location, four drops were made, such that the first drop was the '**seating drop'** and with the remaining three drops deflections were recorded. Field survey photographs is shown below.

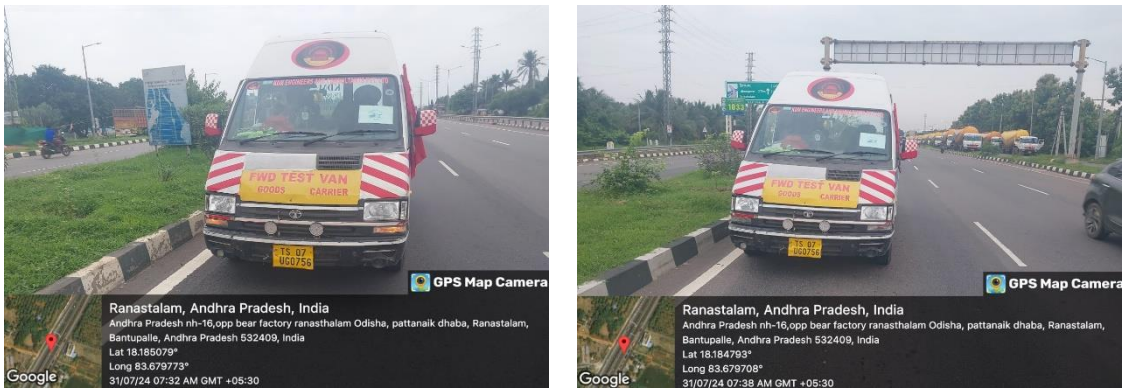
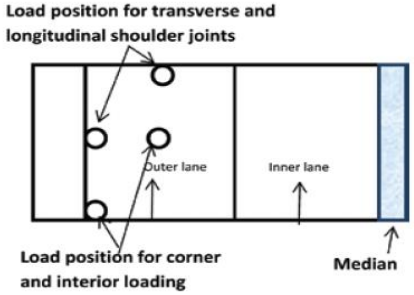


Figure 4-5: FWD Survey at Project Site

The deflection testing has been carried out on the existing pavement as per IRC Codes at the rate of 5 points per km as stipulated in TOR of the Consultant.

Adopted deflection measurement scheme is as under.

Adopted Measurement Scheme	Maximum Spacing(m) for test points along selected wheel path (Flexible Pavement)	Rigid Pavement
(i) measurement along outer wheel paths of outer lanes (3 points)	200	
(ii) measurement along the outer wheel path of inner lane (2 points)	400	

4.4.1 Back-calculation of Layer Moduli for Flexible Pavement

Layer moduli have been back-calculated using KGPBACK program. The pavement has been modelled as a three-layer system with bituminous layer, granular layer and subgrade. The following inputs have been provided for back analysis.

i) Single wheel load 40 kN and contact pressure 0.56 MPa
ii) No. of deflection sensors: 9
iii) Radial Distances of the Geophones i.e., 0,200, 300,450, 600, 900 and 1500mm
iv) Measured Surface Deflections normalized to 40kN in mm
v) Pavement Layer Thicknesses (as measured from Trial Pits)
vi) Poisson's ratio for different layers i.e., 0.35 for bituminous, granular and subgrade
vii) Range of Possible modulus value (Min.- Max.) of bituminous layer, granular layer and subgrade.

Ranges of different layer moduli have been given as input to KGPBACK for back-calculation. These ranges have been selected judiciously by experienced pavement engineering taking into considerations the approximate age of pavement, visual assessment of the condition of bituminous layer, climatic conditions prevailing at the time of deflection measurements and information available from test pits, and laboratory tests conducted as detailed below:

Range of modulus value of existing subgrade:

The range of moduli of existing subgrade is taken based on the subgrade CBR values for the analysis.

Range of modulus value of existing granular layers i.e., base and subbase:

The range of moduli of existing granular layers is based on Appendix III.8.4 of IRC 115-2014.The range for combined (base and sub-base) is taken as 100-500 MPa.

Range of modulus value of existing thick bituminous layers:

The range of moduli of existing thick bituminous layer has been determined on the basis of condition data. If the road condition is good the range is considered as 750 MPa to 3000 MPa, for sections with pavement condition is Fair- Poor, the range specified for thick bituminous layer 400 MPa to 1500 MPa as stipulated in Appendix III.8.4 of IRC: 115-2014 has been taken into consideration.

4.4.1.1 Correction for Temperature

Back-calculated moduli values of the bituminous layers evaluated by FWD survey are influenced by the pavement temperature. The standard pavement temperature for India is recommended as 35°C, hence the back-calculated moduli obtained at temperatures other than the identified standard temperature will have to be corrected using a suitable correction factor using equations 4 and 5 of IRC:115-2014 and the same is extracted below for ready reference.

$$E_{T1} = \lambda E_{T2} \ldots\ldots \textbf{(4)}$$

Where,

λ temperature correction factor, is given as

$$\lambda = \frac{(1-0.238 \ln T_1)}{(1-0.238 \ln T_1)} \ldots\ldots \textbf{(5)}$$

Where,

E_{T1} = Back-calculated modulus (MPa) at temperature $T_1^0\ C$

E_{T2} = Back-calculated modulus (MPa) at temperature $T_2^0\ C$

However, in few sections, after applying the temperature correction the E value of bituminous layers are coming more than 3000MPa. As the project road was constructed with VG-30/VG-40 grade bitumen, it is restricted to keep the maximum E value of 3000MPa, wherever it is exceeding. In these locations, the temperature correction factor was applied as 1.

4.4.1.2 Correction for Seasonal Variation

Moisture content affects the strength of subgrade and granular sub base/base layers. Therefore, the back-calculated moduli of subgrade and granular layers should be taken from field moduli using seasonal corrections. Seasonal correction equations 7 and 8 of IRC: 115-2014 has been extracted below for ready reference.

$$E_{sub_mon=}\ 3.351 * \left(E_{sub_win}\right)^{0.7688} - 28.9 \ldots (6)$$

$$E_{sub_mon} = 0.8554 * (E_{sub_sum}) - 8.461 \ldots (7)$$

where,

E $_{sub_mon}$ = subgrade modulus in monsoon (MPa)

E $_{sub_sum}$ = subgrade modulus in Summer (MPa)

E $_{sub_win}$ = subgrade modulus in Winter (MPa)

$$E_{gran_mon=}\ -0.0003 * \left(E_{gran_sum}\right)^2 + 0.9584 * \left(E_{gran_sum}\right) - 32.989 \ldots (8)$$

$$E_{gran_mon=}\ 10.5523 * \left(E_{gran_win}\right)^{0.624} - 113.857 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

where,

E $_{gran_mon}$ = granular layer modulus in monsoon (MPa)

E $_{gran_sum}$ = granular layer modulus in Summer (MPa)

E $_{gran_win}$ = granular layer modulus in Winter (MPa)

Since the deflection measurements have been carried out in the month of December hence seasonal correction factor is applicable.

The 15th percentile value (as the same has been recommended by IRC: 115-2014 for purpose of design) of back-calculated & corrected layer moduli of each identified homogeneous sub-sections of both directions separately are presented next.

4.4.1.3 Results of Back Calculated Modulii (E) of Pavement Layer

The summary of back calculated E values is presented in **Annexure 4.7**.

4.4.1.4 Remaining Life Estimation for Flexible Pavement

The in-service three-layer pavement system has been analysed with the back-calculated corrected layer moduli and layer thicknesses. The critical strains have been calculated by IITPAVE program. From the performance criteria equations, the residual/remaining rutting and fatigue life have been estimated.

Performance Criteria

The layer moduli of in-service pavement back calculated from FWD deflection data are used to analyse the pavement for critical strains which are indicators of pavement performance in terms of rutting and fatigue cracking. The following approach is proposed for design of bituminous overlays for existing flexible pavements. The mechanistic criteria (fatigue and rutting) adopted in the IRC:37-2018 “Guidelines for the Design of Flexible Pavements”, forms the basis for the overlay design method. Performance models adopted in these guidelines are given below.

a) Fatigue in Bituminous layer:

As it specified in IRC: 115-2014, the fatigue model for 90 percent reliability was used as below

$$N_f = 0.711 * 10^{-04} \times [1/\varepsilon_t]^{3.89} * [1/M_R]^{0.854}$$

As it specified in IRC: 37-2012, the fatigue model for 80 percent reliability was used as below

$$N_f = 2.21 * 10^{-04} \times [1/\varepsilon_t]^{3.89} * [1/M_R]^{0.854}$$

Where,

N_f = fatigue life in number of standard axles,

ε_t = Maximum Tensile strain at the bottom of the bituminous layer

M_R= resilient modulus of the bituminous layer.

b) Rutting in Subgrade:

Rutting model for 90 percent reliability level as specified in IRC: 115-2014 was used as below;

$$N = 1.41 \times 10^{-08} [1/\varepsilon_v]^{4.5337}$$

As it specified in IRC: 37-2012, the rutting model for 80 percent reliability was used as below

$$N = 4.1656 \times 10^{-08} [1/\varepsilon_v]^{4.5337}$$

Where,

N= Number of cumulative standard axles, and

ε_v= Vertical strain in the subgrade

The detailed remaining life analysis is done using 90 percent reliability equation of IRC: 115-2014 is presented in tables below for LHS and RHS carriageway.

Table 4-4: Section-wise Pavement Remaining life

S.No	Homogeneous sections			Existing Thickness, mm		Total Crust	Remaining Life @ 90% Reliability		
	From, km	To, km	Length	BT	Granular		Fatigue	Rutting	Remaining Life, MSA
Narsannapeta - Ranastalam Section (LHS)									
1	580.670	583.500	2.830	170	350	520	174.2	1328.7	174.2
2	583.500	585.500	2.000	170	350	520	171.6	1308.8	171.6
3	585.500	588.500	3.000	170	350	520	146.3	1128.8	146.3
4	588.500	592.500	4.000	170	350	520	142.3	1096.5	142.3
5	592.500	594.500	2.000	170	350	520	146.4	1126.1	146.4
6	594.500	599.200	4.700	170	350	520	148.7	1142.6	148.7
7	599.200	602.600	3.400	170	350	520	155.1	1194.0	155.1
8	602.600	605.000	2.400	170	350	520	152.0	1165.1	152.0
9	605.000	607.000	2.000	170	350	520	158.0	1211.8	158.0
10	607.000	612.200	5.200	170	350	520	156.6	1205.8	156.6
11	616+200	629+680	13.480	170	350	520	143.4	1104.5	143.4
12	629.680	632.000	2.320	130	340	470	52.1	871.0	52.1
13	632.000	634.000	2.000	130	340	470	54.1	895.4	54.1
Narsannapeta - Ranastalam Section (RHS)									
1	634+00	616.200	17.80	170	450	620	133.4	4436.1	133.4
2	612.700	610.400	2.300	170	450	620	135.4	4494.7	135.4
3	610.400	608.400	2.000	170	450	620	158.5	5067.9	158.5
4	608.400	604.200	4.200	170	450	620	156.2	5016.8	156.2
5	604.200	600.000	4.200	170	450	620	158.7	5085.1	158.7
6	600.000	598.200	1.800	170	450	620	164.8	5224.9	164.8
7	598.200	596.200	2.000	170	450	620	156.4	5033.8	156.4
8	596.200	594.400	1.800	170	450	620	160.8	5136.9	160.8
9	594.400	593.200	1.200	170	450	620	166.1	5278.5	166.1
10	593.200	591.600	1.600	170	450	620	159.7	5119.6	159.7
11	591.600	589.200	2.400	170	450	620	165.0	5242.7	165.0
12	589.200	587.000	2.200	170	450	620	188.8	5813.1	188.8
13	587.000	584.000	3.000	170	450	620	175.1	5481.1	175.1
14	584.000	580.671	3.329	170	450	620	168.4	5314.7	168.4

4.4.1.5 FWD data Analysis for Rigid Pavement

As per IRC: 117-2015, the collected FWD data for the rigid pavement has been analysed to determine the following parameters.

- Modulus of subgrade reaction k (MPa/m)
- Elastic modulus of concrete E_c (MPa)

- Flexural Strength of concrete f_{mr} (MPa)
- Load Transfer Efficiency (LTE) of Joints (%)

The detailed analysis of the parameter for PQC and Load Transfer Efficiency is presented in **Annexure 4.7** for both LHS and RHS directions respectively.

From the test results the observations were draw-down. The range of Elastic Modulus, other PQC parameters and their percentage of length and Load Transfer Efficiency (LTE) is presented in table **below**.

Table 4-5: Outcome of FWD Data Analysis for Rigid Pavement

Side		LHS					RHS				
Chainage (Km)		Modulus of subgrade reaction k (MPa/m)	Elastic modulus of concrete Ec (MPa)	Strength of concrete fc (MPa)	Flexural Strength of concrete f_{mr} (MPa)	LTE (%)	Modulus of subgrade reaction k (MPa/m)	Elastic modulus of concrete Ec (MPa)	Strength of concrete fc (MPa)	Flexural Strength of concrete f_{mr} (MPa)	LTE (%)
From	To										
Narsannapeta - Ransastalam Section (km 612+200 to km 616+200)											
612.200	613.000	73.769	28780	33.8	4.0	91.2	61.180	34856	48.7	4.9	96.1
613.000	614.000	58.496	31302	39.3	4.4	93.0	118.370	33314	44.8	4.7	91.7
614.000	615.000	83.520	32732	43.0	4.6	94.2	83.037	34974	49.5	4.9	90.7
615.000	616.000	79.837	33099	44.3	4.6	93.6	114.721	32249	41.7	4.5	92.0
616.000	616.200	108.318	37212	55.6	5.2	89.4	131.174	33198	44.4	4.6	87.6

- The PQC concrete slab has adequate strength with average flexural strength of more than 4.2MPa for the above rigid pavement project sections.
- Load Transfer Efficiency (LTE) for Transverse joints is more than 50% for both LHS & RHS direction and thus, joints are in good condition.
- Load Transfer Efficiency (LTE) for Longitudinal joints is more than 40% for both LHS & RHS direction so, the joint system is adequate in load transfer.

4.5 Mobile Bridge Inspection Unit (MBIU)

4.5.1 Specification

The Mobile Bridge Inspection Unit (referred as (MBIU) is an electro-mechanically driven articulated structure mounted on a vehicle (a truck) as an aid towards proper inspection of bridges or similar infrastructures by enabling an inspection team of 2-3 persons carrying instruments access to the underside of bridge decks overflowing rivers or gorges. The present version is the truck mounted system. As per TOR condition survey of existing structures greater than 60m shall be carried using MBIU.

The overall objective of the condition survey is to identify the need for structural maintenance, rehabilitation and replacement. Signs of distress such as spalling, scaling, cracking, leaching,

excessive deflection, inadequate cover, settlement, exposed reinforcement, corrosion in the reinforcement; shear cracks etc. are identified during this exercise. Special emphasis is given on expansion joints and bearing. Also, the condition of the Approaches, water way and bed protection is examined. The survey identifies the bridges which are more distressed and require testing for their evaluation and rehabilitation measures. Also bridges which require general measures for rehabilitation. Inspection report is prepared in accordance with IRC: SP-35. The report provides recommendation whether a bridge is acceptable to continue in use, whether it can be repaired and/or modified e.g. widened or a new structure.

The structure inventory and condition assessment are given in **Annexure 3.2.** The following structures have been inspected using MBIU machine.

Table 4-6: List of Inspected Structures using MBIU

Sr. No.	Chainage (Km)	Side		Remark
		LHS	RHS	
Narsanpeta – Ransastalam Section				
1	590+750	LHS	RHS	Major Bridge
2	600+172	LHS	RHS	Flyover
3	605+500	LHS	RHS	Major Bridge
4	608+755	LHS	RHS	Flyover
5	623+108	LHS	RHS	Major Bridge

4.5.2 Working Principle

The work of condition survey requires use of Mobile Bridge Inspection Unit at the various bridge sites on the National Highways to overcome the accessibility problems. MBIU increases the accessibility for inspection of underside of high-level bridge decks and helps in continuous inspection of throughout the span of bridge. It has five folded arms. All of them are electro-mechanically operated.

Once the platform is erected by certified person, Inspection and maintenance experts can inspect underside of bridge, note observations as per IRC SP-35 & IRC SP-52 and take photographs for reference.

4.5.3 Advantages

- A large operating range
- A high level of working comfort
- Maximum operational safety
- The shortest possible setting up and dismantling times
- Full mobility in inspection operation without stabilizer supports
- An optimum weight/performance ratio



Figure 4-6: MBIU Survey

4.6 Drone Videography of Entire Stretch

Videography of entire Project Stretch is captured through Drone cameras flown at about 50m above ground. This shall be useful for observing various features of Project Stretch from bird's eye level.



Figure 4-7: Drone Videography

Section 5: Review of Documents

5.1 General

Technical Consultant (TC), since the start of technical due diligence study, has requested for various documents from the Client. A list of documents required were shared with the Client before TC team started the study which was appended with few more queries after the conclusion of the site visit once the project site is appraised. Most of the queries were also discussed with the Client in many meetings. This section of the report deals with the documents requested by TC and its review along with highlighting major issues found during this review.

5.2 Documents Collected and Reviewed

List of documents requested, received and reviewed are given below:

S. No.	List of Documents	Status of Documents	Remarks on Review
DOCUMENTS RELATED TO CURRENT ACQUISITION			
1.	Concession Agreement	Partially Available	Technical Schedules A, B, C and F are made available to the Consultant. These schedules are modified from the standard provisions given in manual as below: Sch A: Existing features Sch B: Scope of Work including facilities to be provided Sch C: Specifications and Standards Sch F: Maintenance Requirements Table 1 of Sch F provides maintenance criteria for pavements which has performance parameter, desirable and acceptable level of service, frequency of inspection and time limit for rectification/repair. Sch F specifies roughness value as 2000 mm/km desirable and 2400mm/km acceptable for flexible pavement. These values are 2200mm/km and 2400 mm/km respectively for rigid pavement. Sch B states that the concessionaire shall carry out the periodic maintenance in full length of the project stretch including main carriageway, service/slip Road, ramps and at facilities etc. either in every sixth year or in the year in which roughness index exceeds the limit as given in schedule F whichever comes earlier. Further, it was clarified in the pre-bid queries reply that periodicity of 6-year overlay will be applicable from O&M handover date. Though draft CA is not available, Consultant has referred the CA of earlier roads wherever required presuming that there shall not be any change in Contract Conditions.
2.	Detailed Project Report/ Technical Due Diligence Report	Available	Report done by M/s Chaitanya Projects Consultancy Pvt Ltd for NHAI in October – 2024 is made available.

S. No.	List of Documents	Status of Documents	Remarks on Review
			Report is used as reference for inventory & condition of the assets and improvement proposals. Cost estimates are provided for immediate maintenance which are under the obligation of existing HAM Concessionaires. The report also provides for the O&M cost during the concession period starting from the O&M handover date. However, Invit Concessionaire must do toll plaza maintenance and accordingly TMS maintenance cost should be there from the Appointed Date which is not shown in this report.
3.	FWD data	Available	The reports of FWD were available as a reference document for TC.
4.	Latest MPRs	Available	Consultant collected the IE-MPRs for April, May & June – 24 from the NHAI – PIU during the site visit. Reports provide details about the Project Road and key maintenance activities undertaken by the HAM Concessionaires during that period.
5.	Maintenance History	Not available	There is no maintenance history available for the Project Road.
6.	NSV data	Available	The reports of NSV are available as a reference documents for TC.
7.	AADT for each section and Growth rate	Available	AADT along with traffic projections for the project roads have been provided by Client.
8.	Concession Period	Not available	TC has adopted 20 years concession period with reference to the CA of earlier roads.
9.	Projected Escalation factor	Not available	In absence of projected escalation factor, all cost are given at the present rate as per the direction of the Client.

5.3 Key Technical Issues

5.3.1 Reinforced Earth Wall (RE Wall)

Bulging and cracks are observed in RE wall panels in Narsannapeta – Ranasatalam section at the approaches of flyovers and underpasses. Affected approximate number of panels are provided below:

- VUP @ 581+330: 20 panels
- LVUP @ 582+478: 11 panels
- VUP @ 588+620: 35 panels
- VUP @ 597+725: 05 panels
- Flyover @ 608+780: 08 panels

The Project is under HAM till 15th February 2038. Existing HAM Concessionaire has done nailings to address these bulging. It may be safely assumed that if the stability of RE wall sustains till the end of existing concession terms, wall shall be further stabilised. However, a detailed study may be done to ascertain the reasons for these bulging and its remedial measures.



Bulging of RE wall panel



Nailing in RE wall panel

5.3.2 Damaged Bearings

Problems with the bearings are observed in the form of tilting, cracking, not properly placed and compressed. Affected structures are

MJBR: @ 590+750, @ 605+523



Tilting of Bearing RHS_MCW_A1 of MJBR@ 590+ 750.



Cracks on sealing material of bearing

It is presumed that existing HAM Concessionaires will fix all these bearings before handing over.

Section 6: Capital Expenditure Requirement

6.1 Improvement Works as per Schedule B

Schedule B of each stretch specifies the requirements of improvement works which the concessionaire has to construct as per the completion schedule specified in Schedule B during O&M. Major works and reference used to quantify these construction requirements are listed below:

- Approach slabs reconstruction: Ref Cl 3.2 III of Sch B.
- Junction improvement: Ref Cl 4 of Sch B.
- Curve improvement/ Minor Jn improvement: Additional signages and studs are considered as per Cl 6 of Sch-B.
- Truck lay bye: Sewage disposal system as per Cl 9.2 of Sch B
- Landscaping and median plantation: Cl 9.4 of Sch B
- Transverse bar marking: Cl 10.3 of Sch B
- Antiglare: Cl 10.7 of Sch B
- Kerb stones: Cl 10.9 of Sch B

Improvement Scope specified for each stretch is tabulated below:

Table 6-1: Schedule B improvement requirements

S. No.	Description	Unit	Quantum
1	Approach slabs reconstructed	Nos.	17
2	Junction improvement	Nos.	30
3	Curve improvement: Additional signages and studs are considered as per Sch-B.	Nos.	50
4	Truck lay bye: Sewage disposal system	Nos.	3
5	Landscaping and median plantation	km	16.2
6	Transverse Bar Marking	Nos.	17
7	Antiglare	Km	2.51
8	Kerb stone	Lm.	10,760

Time to complete above construction works in within 3/6 months from the Handover Date based on completion schedule for improvement proposals given in Schedule B.

6.2 Immediate Maintenance Requirements

Thes section is under HAM (Annuity) concession up to 2037. So, obligation for immediate repair requirements do not lie with InvIT Concessionaire. However, toll plaza renovation cost and TMS replacement cost has been considered for existing toll plaza.

6.3 Capital Expenditure (CapEx)

Cost of capital expenditure (CapEx), worked out as explained above, are presented below.

Table 6-2: Immediate Maintenance

Description	Cost in Crore (INR)
Toll plaza improvement	1.82
TCMS	5.63
Total	**7.45**

Table 6-3: Improvement Works as per Schedule – B

Description	Cost in Crore (INR)
Initial Improvement as per Schedule B	4.12

Section 7: Operation & Maintenance

7.1 General

The O & M requirements for the project facilities are normally specified in the Concession Agreement (CA). Though Schedule F is made available to the Consultant, CA is not yet available. Hence Consultant has taken reference from the CA of Round 3 roads presuming there is no change in the Contract conditions. Maintenance requirements are referred mainly under following Articles/ Schedules:

- Article 15 - Operation and Maintenance
- Article 16 - Monitoring and supervising during Operations
- Article 17 – Traffic Regulation
- Article 18 and Schedule H – Safety Requirements
- Schedule F- Maintenance Requirements

7.2 Requirement as per Concession Agreement

Schedule F of the Concession Agreement sets out the Operation and Maintenance requirements for the Project. As per this schedule, scope for Operation and Maintenance includes but not limited to following obligations:

- ✓ **Improvement** – This includes improvement of the existing assets as per requirement of this Agreement and safety audit.
- ✓ **Maintenance of Civil Works and Assets**- this includes maintenance of civil works and all assets as per requirement of this agreement.
- ✓ **Road Maintenance** –This includes routine maintenance, preventive maintenance, periodic maintenance as per IRC:82-2015, Design overlay as per Manual of 4-laning/6-laning, disaster maintenance, exigencies, and inspections.
- ✓ **Traffic Management** – This includes enforcement of regulations together with the relevant authorities. This also includes hazard response, information gathering and dissemination, Road patrols and ATMS surveillance etc.
- ✓ **Safety**– This includes accident prevention, after care, user education, enforcement, data collection and analysis.
- ✓ **Facility Management** – This includes periodic inspections, routine maintenance, Rehabilitation, and expansion planning.
- ✓ **Road property management** –This includes management of access, encroachment, and ribbon development.
- ✓ **General responsibilities** –This includes budgeting, compliance with legal and accounting requirements, and public relations.
- ✓ Maintaining public relations unit to interface with and attend to suggestions from users of the highway, the media, Govt. agencies and other external agencies.

Routine Maintenance: These are maintenance needs required on daily, weekly, monthly and annual basis for the smooth and efficient running of traffic and includes the activities of minor repairs of all project elements, cleaning of road furniture, replacement of consumables,

horticulture maintenance, keeping the project site /project facilities clean, tidy and orderly condition free of litters and debris, preventing unauthorized entry and exit including any encroachment etc.

Preventive Maintenance: Preventive maintenance shall include the activities related to each element and the system as a whole of the Project Highway to ensure that during the Concession Period and at its end is in sound, durable and functional condition. In other words Preventive maintenance are a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without significantly increasing the structural capacity).

Periodic Maintenance: These are maintenance needs required on periodic annual basis. The periodic maintenance can be further divided into two sub heads namely (i) functional overlay to improve the riding quality and (ii) structural overlay to improve the structural strength of the pavement.

Factor influencing periodic maintenance: performance parameter for flexible pavement in terms of roughness as given in Schedule F is 2000 mm/km as desirable and 2400 mm/km as acceptable. Clause 4 (III) of Schedule B states that periodic maintenance shall be carried out in full length of the project stretch including main carriageway, service/slip road and at facilities etc. either in every six years or in the year in which roughness index exceeds the limit given in schedule F, whichever comes earlier.

7.3 O&M Cost Estimation

7.3.1 Routine maintenance

This is a day-to-day work that is necessary to preserve and keep a pavement as close to as constructed condition and to ensure smooth and functional conditions all the times. The item in this subhead includes maintenance of earthen shoulder, restoration of rain cuts, maintenance of slope protection works, cleaning of road side drains, cleaning of carriageway, maintenance of structures, repairs of road surface such as filling of potholes, repairing of cracks and patch works, carrying out of Road roughness survey, FWD test etc.

7.3.2 Repair/Maintenance

Repair/maintenance covers the minor repair which are required on day-to-day maintenance to maintain the assets in good condition. This is sub-divided in two categories as below:

a) **Preventive Maintenance:** The preventive maintenance is required to be done for further improve or extend the functional life of pavement surface whist in fair to good condition. Any of the treatment under preventive maintenance does not significantly increasing the structural capacity of pavement rather which decreases rate of surface deterioration, which may result in saving of pavement from leading to poor condition where major maintenance could be inevitable.

Future preventive maintenance on the project road depends largely on routine inspection of the pavement with careful observation of specific distress and to take a decision at that time and suitable type of preventive maintenance treatment and its timing. All the narrow and wide surface cracks must be arrested immediately after identification with fog/slurry seals as the most recommend preventive type maintenance measure for the in-service flexible pavement.

Based on the condition and distress identification survey as explained above paragraph, preventive maintenance treatments have to be taken up immediately to reduce rate of further damage to the surface and for enhance the pavement performance to the condition similar to non-distressed surface condition.

b) **Road Property Maintenance:** The item in this subhead covers the plantation/ maintenance of shrubs, turfing, replacement/ repair of damaged railing, crash barrier, kerbs, road delineators, signage, Road marking and painting etc.

7.3.3 Toll Management System

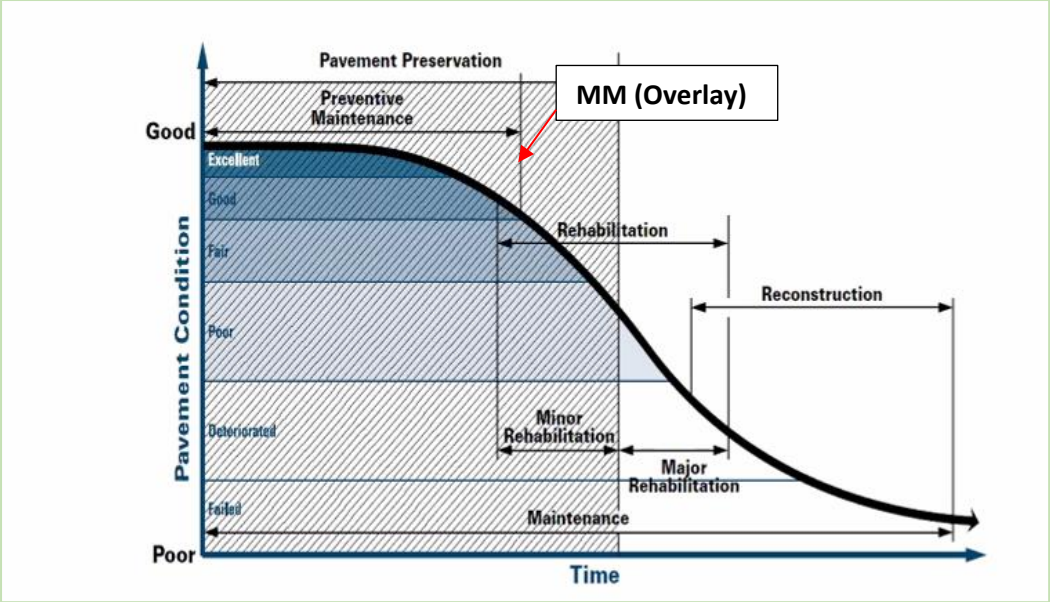
Cost estimate for Toll Management System was worked out by TC. Same was presented and deliberated during the investor meet, after that it was decided to adopt the rationalised cost finalized by IM.

7.3.4 Corridor Management

Incident Management: The items in this subhead include minimize the effects of incident and restore normal capacity and safety levels to all affected road facilities as efficiently as possible and. repair/ replacement of removing the dead animals & broken-down vehicles etc.

7.4 Major Maintenance

The pavement deteriorates with time caused by traffic movement and weather conditions. The rate of deterioration depends on the original design, type of maintenance being done/undertaken and time of application. Therefore, timely and appropriate maintenance of bituminous surface using suitable materials is essential to increase the pavement service life to a greater extent. Any delay in maintenance of the pavement substantially increases severity of the distresses, which results into poor condition of pavement as depicted in figure below and thereby increase in maintenance costs to bring the surface to a good condition.



Therefore, timely maintenance of the pavement is required for its satisfactory performance both in terms of functionally and structurally during the pavement service life.

Schedule F of the Concession Agreement set out the maintenance requirements in the Project. The performance parameters are indicated in schedule F descripting the nature of defect/deficiency along with time limits for repair/rectification for roads and bridges.

Schedule F, Pavement Roughness Value (Functional Overlay): The Periodic maintenance is required to be provided as and when performance parameters in terms of cracking, roughness and rutting etc. exceeded the limits as indicated in the schedule F anytime during the service life of the pavement. As per the provisions of Concession agreement, Surface roughness value is the major governing factor for selection of an appropriate pavement maintenance treatment required to bring the roughness value below the prescribed limit of 2000mm/km.

Pavement Strengthening (Structural Overlay): When the pavement is structurally deficient having high severity alligator/fatigue cracks, rutting and other associated distresses, then the structural overlay is required to be provided for strengthening of the pavement to cater for the anticipated design traffic. The pavement strengthening may be required when the

- Remaining life of the in-service pavement as evaluated using Falling Weight Deflectometer (FWD) is less the design traffic as calculated till end of the concession.
- Before expiry of initial design traffic as adopted at the time of asset construction.

7.4.1.1 Review of Major Maintenance History

As per the review of available reports and discussions with IE during O&M that no major maintenance/rehabilitation that has been carried out in the project being the 6-construction works were completed recently. The routine maintenance consists of rectification of rutting and repair of cracked concrete panels in progress by the existing HAM Concessionaire.

7.4.1.2 Design Traffic during the Concession Period

The design traffic in terms of MSA during the concession period has been calculated based on the current traffic pattern and data shared by the NHIIPL. The Vehicle Damage Factors (VDF) has been adopted as obtained from the present survey. The summary of design traffic during the concession period is as under.

Table 7-1: Summary of Design Traffic during Concession Period

Project Stretch	Direction	Design Traffic in MSA	
		10 years (FY35)	20 years (FY45)
Narasenpetta to Ranasthalam Section	LHS	62	159
	RHS	49	125

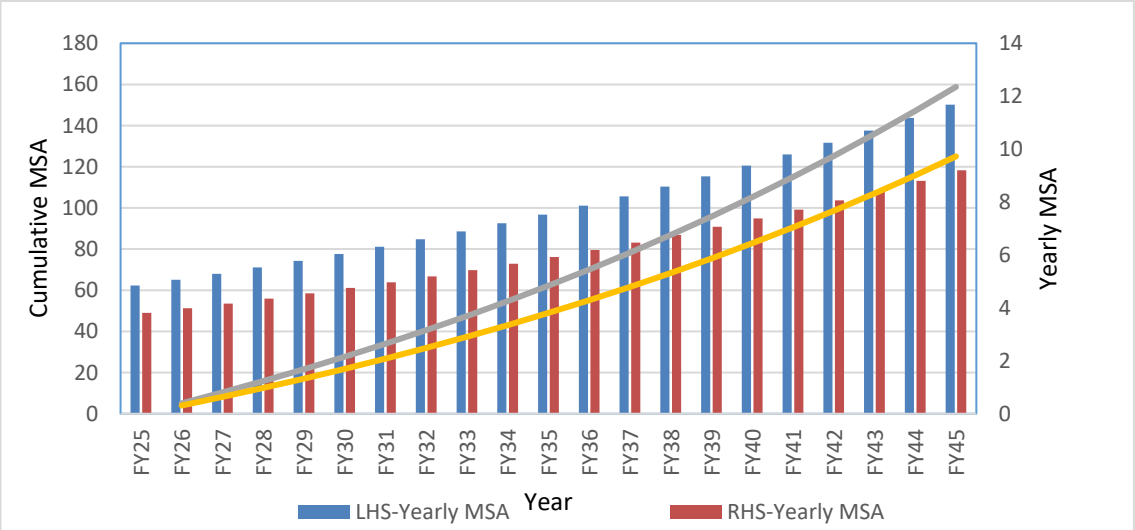


Figure 7-1: Design Traffic in MSA (Narasenpetta to Ranasthalam Section)

In combination of above anticipated design traffic patterns, remaining life of the existing pavement as explained under surveys and investigation chapter, the pavement condition for distresses and roughness, the existing pavement is requiring repair and rehabilitation to be carried out by the TOT concessionaire to bring the pavement surface to the desired level of serviceability.

From the remaining life analysis as explained under surveys and investigation chapter, it is found that most of the pavement sections having remaining life more than the projected design traffic on LHS & RHS. Hence functional overlay in terms of bituminous overlay of 40mm BC at the end of every 6th year from the date of O&M handover date for the Main Carriageway and 40mm BC for service roads to extend the life of the pavement and improve and maintain the road roughness levels during O&M phase of the InvIT Concessionaire.

7.4.1.3 Immediate and Future Major Maintenance Requirement

Major maintenance is required to comply with provisions of concession agreement and to maintain performance levels as defined in schedule F throughout the operation and maintenance period.

As per schedule B, the TOT concessionaire shall carryout the periodic maintenance in full length of the project stretch including main carriageway, service roads and facilities in every 6th year or the year in which roughness index exceeds the limits given in schedule F, whichever comes earlier.

Therefore, considering the initial pavement design period and crust, remaining life data, anticipated traffic loading during the concession period, and in compliance to the provisions of schedule B, the following cycle of Major maintenance is proposed for satisfactory performance of the pavement during operation period for both functionally and structurally.

Table 7-2: Proposed Major Maintenance Cycles for Balance Concession period

Name of Stretch	InvIT Concession (20 years)				
	CAPEX	Routine Maintenance	Periodic Maintenance	ATMS & TMS Replacement	Toll Operation & Admin Cost
Narsannapeta-Ranastalam	Toll plaza renovation cost TMS (all the existing defects to be rectified by HAM Concessionaire)	**Till O&M Handover**: Manpower cost for clearing considered **After Handing Over**: Regular	**FY37-** Revalidation of Survey **FY38**- Improvement works as per Sch.-B & road marking **FY42-** ***MCW:*** 40BC, 50DBM for 10% length ***SR:*** 40BC, 50DBM for 10% length ***Rigid***: Retexturing, replacement of joint sealant and 2.0% of panel ***Structure***: Replacement of wearing coat, expansion Joint, Bearing replacement for 40% of total number **FY45**-Road marking, Micro surfacing	**FY33** 50% TMS **FY40**- 100%TMS 40% ATMS	01.04.2025

7.4.1.4 Cost of Operation & Routine Maintenance

Cost of Operation & Routine Maintenance per annum are presented below.

Table 7-3: Cost of Operation & Routine Maintenance (per annum)

Description	Cost (Crore INR)
Tolling & TMS Operations (Varies) Min-Max	5.07-6.30
ATMS Operation	2.27
Incident Management	4.73
Admin Expenses (Varies) Min-Max	3.99-6.69
Insurance (Varies) Min-Max	0.11-1.76
Power cost excl. Toll Plaza	2.13
RAMS, BMS & Survey	1.36-2.30

7.4.1.5 Cost Estimate (Initial Improvement, MMR and O&M)

Year-wise Cost estimate of Initial Improvement, MMR and O&M are given below

Table 7-4: Cost Estimate (Initial Improvement, MMR and O&M)

Sl.No.	FY	Initial Improvement Cost (in INR Cr.)	Major Maintenance Cost (in INR Cr.)				Operation & Maintenance Cost (in INR Cr.)								
			Road (MCW,SR, Toll Plaza)	Structure	ATMS	TMS	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026	7.45					0.60					6.30	0.11		3.99
2	2026-2027						0.60					6.30	0.11		4.67
3	2027-2028						0.60					6.30	0.11		4.77
4	2028-2029						0.60					6.13	0.11		4.69
5	2029-2030						0.60					6.13	0.11		5.83
6	2030-2031						0.60					5.71	0.11		5.84
7	2031-2032						0.60					5.28	0.11		5.73
8	2032-2033					2.82	0.60					5.07	0.11		6.42
9	2033-2034						0.60					5.07	0.11		6.00
10	2034-2035						0.60					5.07	0.11		5.85
11	2035-2036						0.60					5.07	0.11		5.94
12	2036-2037		0.57				4.02	2.40	2.27	4.73	2.13	5.07	1.76	2.30	6.00
13	2037-2038		10.01				4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.36	6.08
14	2038-2039						4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.36	5.95
15	2039-2040				8.26	5.63	4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.36	6.69
16	2040-2041						4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.76	6.18
17	2041-2042		154.99	36.43			4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.36	6.32
18	2042-2043						4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.36	6.26
19	2043-2044						4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.36	6.29
20	2044-2045		32.62				4.02	2.40	2.27	4.73	2.13	5.07	1.76	1.76	6.29
Total		**7.45**	**198.18**	**36.43**	**8.26**	**8.45**	**42.71**	**21.60**	**20.44**	**42.61**	**19.15**	**108.02**	**17.03**	**13.96**	**115.78**

Note: The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

Section 8: Conclusion

The project highway is a partially access controlled consists of 6-lane divided carriageway with service roads on both sides with minimum number of merging and diversion points on the highway for access to service roads. The 6-lane project has been completed on HAM mode and at present toll is being collected by Toll Collection Agency appointed by NHAI. The project highway is also having 4-lane divided carriageway at Ranastalam built-up area (part of project from Narsannapeta-Ranastalam), for which improvement proposals have been undertaken by NHAI in the form of construction of 6-lane elevated corridor. The performance of the pavement, is satisfactory in terms of pavement roughness and quality of the pavement surface without having major distresses. However, few of the locations noted with low severity rutting for which rectification measures in progress for flexible pavement. As part of present study, the required Engineering Investigations along with site visual observations were made for evaluation of the asset condition and accordingly established the required maintenance and rehabilitation measures/decisions for the concession period. The period maintenance by functional/structural overlays are required at every 6th year as per the CA would be sufficient to keep the project stretch in good condition and hence suitable major maintenance strategy has been recommended to improve the service life during the concession period.

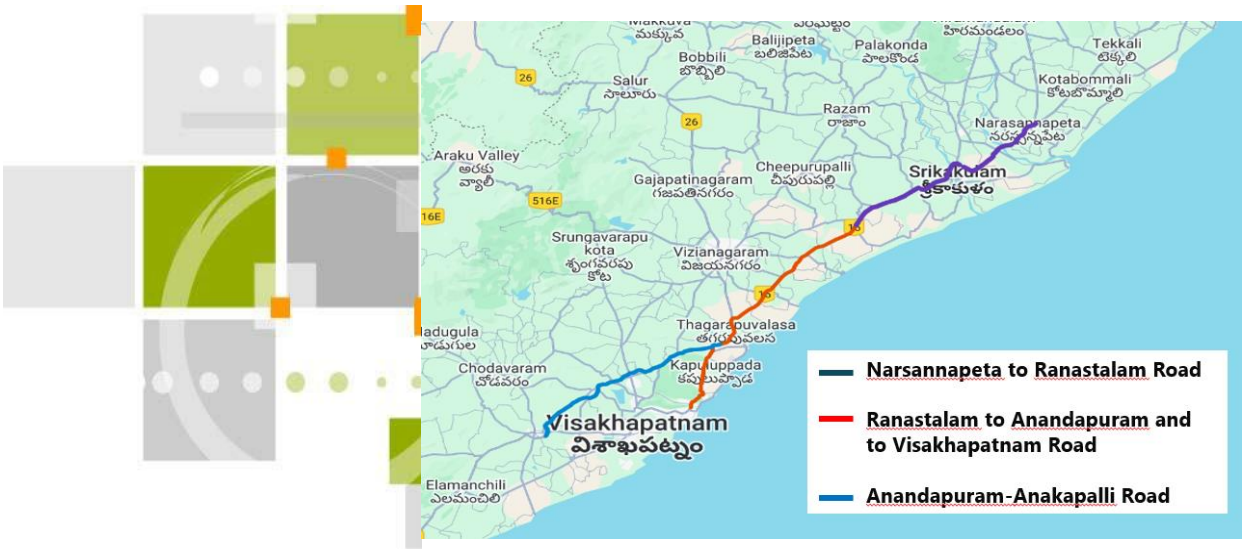
Based upon the site visit for assessment of condition of CD structures including MJB, MNBs, ROB, VUPs, Culverts and toll plaza buildings in the project corridor and observations submitted in various chapters of this report it is concluded that most of the structures are in sound condition and no major repair is required in near future. However, there are issues with the bearings for few structures and bulging in RE wall. As the entire road sections are in HAM, these defects are to be rectified by the existing Concessionaires. It is to be ensured that asset quality assessment is done thoroughly at the time of handing over so that these defects and any other defects occur during the remaining HAM concession period is rectified.

The assessment of estimated cost of such repairs along with the anticipated future repair and rehabilitation cost are considered in the cost estimate of this report.

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FINAL TECHNICAL DUE-DILIGENCE REPORT

Technical Consultant Services for National Highways Infra Trust for Ranasthalam to Anandapuram and Anandapuram to Hanumanthavaka (Visakhapatnam) Sections of NH-16 in the State of Andhra Pradesh



February 2025

egis India
Consulting engineers pvt. ltd.

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Acronyms and Abbreviations

BC	Bituminous Concrete
BOQ	Bill of Quantities
C/W	Carriageway
CA	Concession Agreement
COD	Commercial Operation Date
CVPD	Commercial Vehicles Per Day
DLP	Digital Laser Profile
EGIS	Egis India Consulting Engineers Pvt. Ltd.
EPC	Engineering Procurement and Construction
FWD	Falling Weight Deflectometer
IM	Investment Manager
InvIT	National Highways Infra Trust
IRC	Indian Road Congress
Km	Kilometer (Chainage)
km	Kilometer (Length)
LHS	Left Hand Side
MBIU	Mobile Bridge Inspection Unit
MJB	Major Bridge
MNB	Minor Bridge
MPD	Mean Profile Depth
MSA	Million Standard Axles
NH	National Highway
NHAI	National Highways Authority of India
NHIIMPL	National Highways Infra Investment Managers Private Limited
NSV	Network Survey Vehicle
O&M	Operation and Maintenance
RCC	Reinforced Cement Concrete
RHS	Right Hand Side
ROB	Road over Bridge
SH	Stage Highway
SMTD	Sensor Measured Texture Depth
SPV	Special Purpose Vehicle
TA	Technical Advisor / Consultant
VDF	Vehicle Damage Factor
VUP	Vehicular Underpass

Section 1: Executive Summary

1.1 Introduction

1.1.1 Background

NHAI has set up an Infrastructure Investment Trust namely National Highways Infra Trust ("InvIT") and is acting as its Sponsor to the said InvIT. National Highways Infra Investment Managers Private Limited ("NHIIMPL") has been appointed as the Investment Manager to the InvIT.

NHIIMPL appointed M/s Egis India Consulting Engineers Private Limited, as Technical Consultant to conduct the due diligence on the proposed Assets. The Letter of Empanelment (LOE) was received on 3rd November 2022 and Letter of Award (LoA) for the subject Project was received on 15th July 2024 by Egis India and the services commenced immediately thereafter.

The project stretches detail as per LoA are listed below.

Table 1-1: Detail of Project Stretches

Sr. No.	Stretches	Toll Plaza	NH No.	Lane	Length (km)
1	Narasannapeta to Ranastalam	Madapam	NH-16	4/6 Lane	53.799
2	**Ranastalam to Anandapuram via Kopperla**	**Nathavalasa**	**NH-16**	**6 Lane**	**48.980**
	Anandapuram to Hanumanthavaka	**-**	**Old NH-16**	**4 Lane**	**17.564**
3	Anandapuram to Anakapalle via Pendurthi	Dukkavanipalem & Marripalem	NH-16	6 Lane	48.605
Total					**168.948**

1.1.2 Objectives

The main objective of the present assignment is to

1. review project documents and understanding schedule B and schedule F requirements for improvement works for the assessment of Capex and Opex during the concession period.
2. conduct field investigations to assess the existing asset condition and future deterioration.
3. validate executed works with respect to schedule A and assessment of improvement Works
4. review quality of construction based on available data, design and drawings.
5. undertake designs for rehabilitation requirements of different assets based on field investigation data and available documents.

6. assess operation and maintenance cost including major maintenance expected to be incurred during the concession period.

1.2 Site Visit

The Technical Consultant visited site from 25th July 2024 to 11th August 2024. The important aspects of the project road were noted in the detailed site reconnaissance along with various field investigations. These included general description about the project road, site features, structures, junctions, pavement characteristics, road safety. Field investigation for NSV, FWD test, axle load survey, trail pits, MBIU and drone videography survey were also conducted by Technical Consultant to assess the present condition of the project road.

1.2.1 Salient Features

Table 1-2: Salient Features

Sr. No.	Name of Stretches	Toll Plaza	Chainage (Km)		Length	Lane Configuration	Pavement Type	Date of COD	O&M Handover Date to InVIT	Concessionaire / Remarks
			From	To	(km)					
1	Ranasthalam to Anandapuram	Natavalasa @ 656+704 (14 lanes)	634+000	681+000	47	6-Lane	Flexible except Toll Plaza	30-06-2021	24-09-2035	M/s Asoka Ranasthalam Anandapuram Road Limited (HAM)
	Anandapuram		681+000	682+980	1.980	6-Lane	Flexible	17-12-2021	08-11-2036	M/s DBL Anandapuram Anakapalli Highways Pvt. Ltd. (HAM)
	Anandapuram-Hanumanthavaka		682+980	700+544	17.564	4-Lane	Flexible	01-09-2024	01-09-2029	M/s Shiva Builtech Pvt. Ltd (PBMC)

Asset-wise details of Project assets are given below:

Table 1-3: Detail of Assets

S. No	Description			Ranastalam to Anandapuram Section (from km 634+000 to km 682+980)		Anandapuram to Hanumanthavaka Section (from km 682+980 to km 700+544)	
				Schedule-A	At Site	Schedule-A	At Site
1	Total Project Length (km)			48.980	48.980	17.564	17.564
2	Service Roads/ Slip Roads (km)			74.797	**81.610**[1]	8.334	**7.990**[2]
3	Pavement (km)	Flexible	LHS	48.440	48.450	17.564	17.564
			RHS	48.440	48.450	17.564	17.564

[1] SR for a total length of 5.387 km is not considered in Sch A from km 633+980 to km 635+350 RHS, km 637+800 to km 638+150 BHS, km 655+413 to km 655+870 LHS, km 662+000 to km 662+370 BHS, km 663+350 to km 663+900 BHS and km 669+230 to 669+740 BHS.

[2] SR from km 686+380 to km 686+700 LHS is considered in Sch A which do not exist at site.

S. No	Description			Ranastalam to Anandapuram Section (from km 634+000 to km 682+980)		Anandapuram to Hanumanthavaka Section (from km 682+980 to km 700+544)	
				Schedule-A	At Site	Schedule-A	At Site
		Rigid	LHS	0.540	0.530	-	-
			RHS	0.540	0.530	-	-
4	Bus Shelters (no.)			-	**2$^{\beta}$**	3	**22$^{\beta}$**
	Bus bays with Shelters (no.)			25	**32**$^{\beta}$	5	**6$^{\beta}$**
	Bus bays (no.)			2	2	-	**4$^{\beta}$**
5	Truck Lay-bays/Parking (no.)			3	4	2	2
6	Toll Plaza (no.)			1	1	-	-
7	Rest Area (no.)			-	1	-	-
8	Major Bridges (no.)			3	3	-	-
9	Minor bridges (no.)			6	6	6	6
10	ROB's (no.)			-	-	-	-
11	Flyover (no.)			1	1	-	-
12	Overpass for new Int. Airport (no.)			1	1	-	-
13	VUP's (no.)			8	8	1	1
14	LVUP (no.)			15	**13$^{\#}$**	1	**-**
15	PUP/CUP (no.)			-	**2$^{\#}$**	-	**1$^{\#}$**
16	Foot Over Bridge (no.)			-	-	-	-
17	Culverts (no.)	Pipe Culvert		97	97	22	22
		Slab Culvert		-	-	22	22
		Box Culvert		35	35	-	-

1.3 Surveys and Investigations

1.3.1 Network Survey Vehicle (NSV)

The Network Survey Vehicle, which is the latest survey technique which utilizes Lasers, Global Positioning System and Video image processing tools, is used for automatic data collection pertains to pavement condition and road inventory data. The NSV survey has been carried out along the project corridor from 27/07/2024 to 01/08/2024 for collection of field data pertains to pavement condition and road inventory. Summary of findings of NSV survey is given in preceding sections.

$^{\beta}$There are many bus shelters along the project road which are constructed by local civic bodies. All these shelters within the ROW is considered as existing bus bay/shelters by the Consultant.

$^{\#}$ All underpasses are considered as LVUP however few of them are classified as PUP/CUP depending upon their vertical clearance.

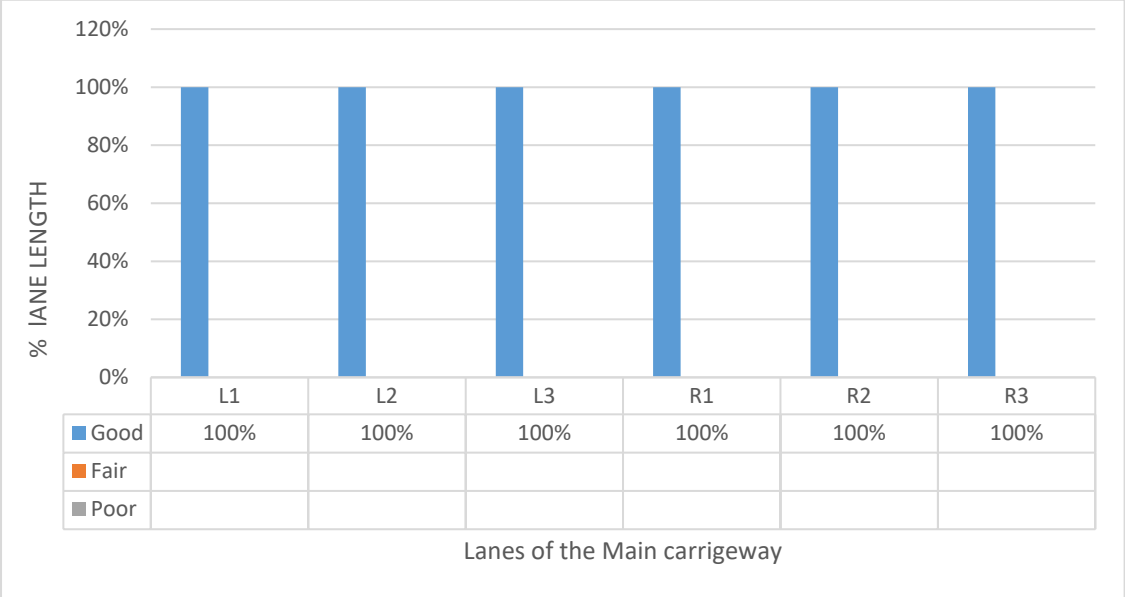
1.3.1.1 Pavement Type

Narsannapeta – Anandapuram and Anandapuram – Hanumanthavaka are having flexible pavement except at toll plaza where it is rigid pavement.

1.3.1.2 Pavement Distresses

The summary of pavement distresses for each lane of main carriageway in terms of percentage length are presented below:

Ranastalam - Anandapuram



Anandapuram – Hanumanthavaka

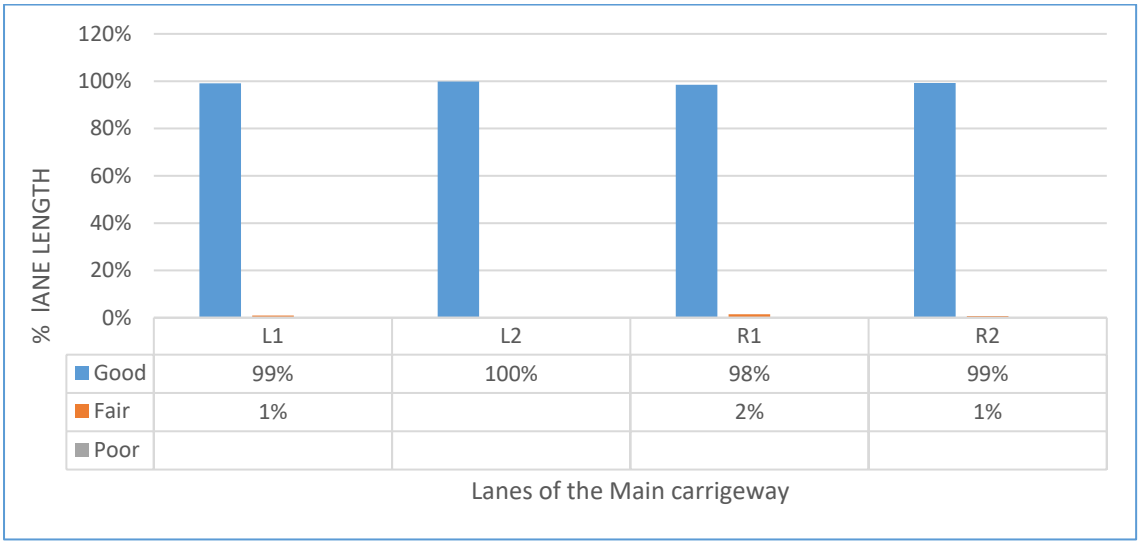
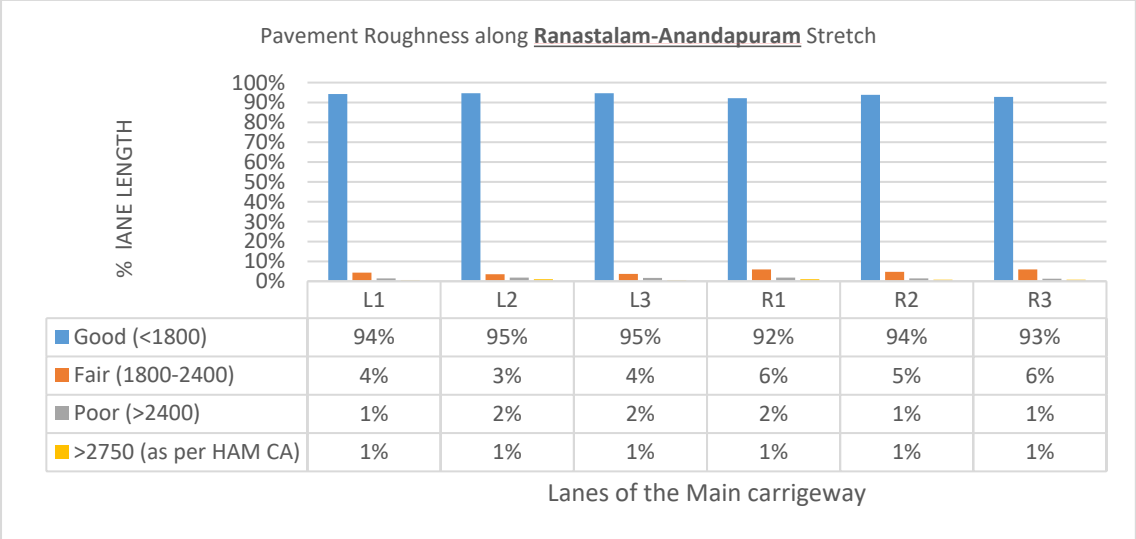


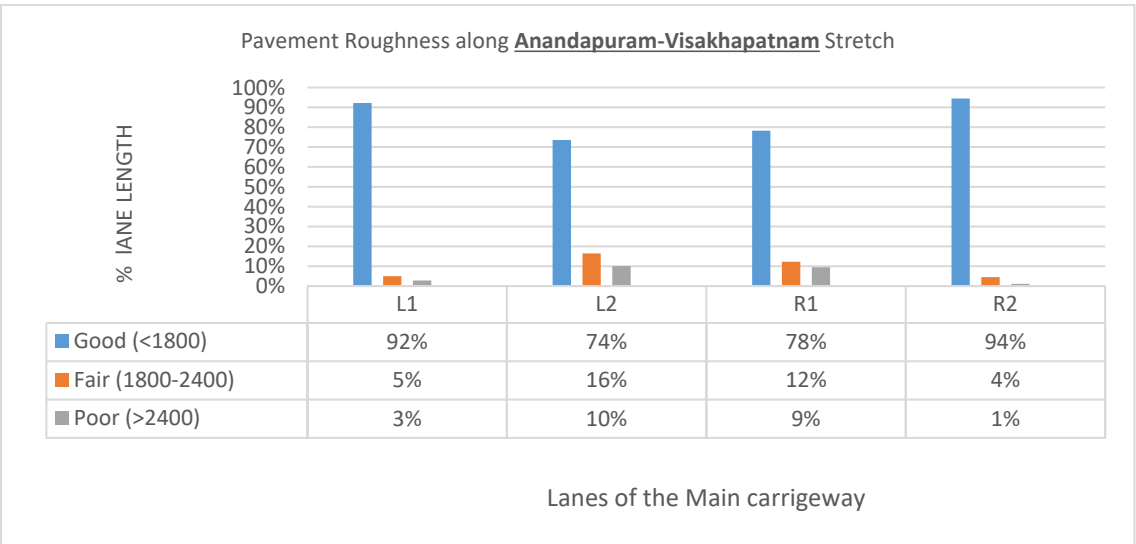
Figure 1-1: Summary of Pavement Distress

1.3.1.3 Pavement Roughness

Roughness value measured for each lane of main carriageway using NSV. The summary of direction-wise roughness distribution for each lane in term of percentage length are presented below.



	L1	L2	L3	R1	R2	R3
Good (<1800)	94%	95%	95%	92%	94%	93%
Fair (1800-2400)	4%	3%	4%	6%	5%	6%
Poor (>2400)	1%	2%	2%	2%	1%	1%
>2750 (as per HAM CA)	1%	1%	1%	1%	1%	1%



	L1	L2	R1	R2
Good (<1800)	92%	74%	78%	94%
Fair (1800-2400)	5%	16%	12%	4%
Poor (>2400)	3%	10%	9%	1%

Figure 1-2:Pavement Roughness Charts

Km-wise pavement condition and distress in the form of strip chart is included in **Annexure - 4.2**.

1.3.2 Test Pit Investigations

Test pit investigations have been planned to conduct at every 5km in a staggered manner ascertain the existing pavement composition (pavement course, material type, and thickness). However, the project is partially access control throughout the length, thereby no earthen shoulder has been found and thus test pits were taken at the locations where feasible to dug at the interface of the paved and earthen shoulder. The summary of existing pavement crust

thickness is presented in table and some of the photographs showing the pavement crust thickness are shown as below.

Table 1-4:Summary of Existing Pavement Crust Thickness

Date of Sampling	Location of Trial Pit	Lanes	Pavement Composition (mm)						
			BT	PQC	DLC	WMM	Cemented layer	GSB	SUBGRADE
Ranastalam-Anandapuram									
05.08.24	659+700LHS	6	180	-	-	100	150	200	500
05.08.24	640+350RHS	6	110	-	-	100	160	200	500
05.08.24	648+700RHS	6	100	-	-	100	155	200	500
Anandapuram-Vishakhapatnam									
08.08.24	694+700LHS	4	130	-	-	150	-	170	500
08.08.24	698+900LHS	4	180	-	-	130	-	150	500
08.08.24	683+700RHS	4	110	-	-	130	-	210	500
08.08.24	690+700RHS	4	180	-	-	160	-	150	500

Observations and Conclusions:

- The project of Ranastalam-Anandapuram has been built with flexible type throughout the length except toll plaza location where it is found with rigid. The thickness as obtained are predominantly matching the design thicknesses.
- The pavement type for service road in all the above project section is flexible type and has been designed for 10MSA traffic.
- Throughout the project road, it is found that consistent bituminous/ cemented/ granular layer thickness.

During the above investigations, the existing subgrade soils samples were collected and tested in the laboratory to understand the properties of these foundation soils. The test results are presented in below sections.

Table 1-5: Test Results: Anandapuram- Hanumanthavaka Section (City Side)

Location of Trial Pit	Nature of Soil (Visual Identification)	Sieve Analysis by % of passing			Sand Content %	Atterberg Limits			FSI %	MDD g/CC	OMC %	FDD g/CC	FMC %	CBR (4Days Soaked) %	Field CBR (DCPT) %	Depth of Water Table below Subgrade
		4.75mm	0.425mm	0.075mm		LL %	PL %	PI %								
686+700LHS	GC (Clayey Gravel)	58.3	41.6	28.1	30.2	34.5	18.3	16.2	10.0	2.03	9.2	1.73	9.0	11.0	17.0	Not found
710+960LHS	GC (Clayey Gravel)	53.9	38.1	25.6	28.3	31.5	15.4	16.1	10.0	2.12	8.0	2.049	7.0	12.9	18.0	Not found
703+520RHS	GC (Clayey Gravel)	45.8	32.1	20.3	25.5	26.9	16.4	10.5	10.0	2.13	8.5	2.073	8.0	13.5	15.0	Not found

Observations and Conclusions

The subgrade soils are generally consistent throughout the project road and CBR values are in compliance with the design CBR as adopted during the 6-lane works. Further, it has been observed during the site visit that most of the soils in the region found to be red soil having CBR values more than 10% and this is one the reason for better performance of the pavement of the project highways.

1.3.3 Axle Load Survey

Axle load survey has been conducted in compliance with IRC 37 2018 for 24 hours in both directions at the existing toll plaza locations. Obtained VDF values comparing the values adopted at the time of pavement design during construction summarized in table below.

Table 1-6: Vehicle Damage Factors (VDF)

Toll Plaza	Direction *	Vehicle Damage factors				
		Bus	LCV	2-Axle	3-Axle	MAV
Natavalasa Toll Plaza (km 656+704)	LHS	1.07	2.11	2.77	1.71	5.15
	RHS	0.92	1.91	3.11	7.66	9.90

** LHS: Srikakulam to Anakapalli RHS: Anakapalli to Srikakulam*

There is a significant difference between the axle loads of commercial vehicles flying in both directions of traffic, due in inconsistent commodity pattern generating from different locations along the project highway and thus, separate factors have been considered for traffic assessment. Further, 7-day axle load survey values are lower than one days and hence adopted the above values in the study.

1.3.4 Falling Weight Deflectometer (FWD)

The structural evaluation of pavement has been carried out in accordance with IRC: 115-2014, “Guidelines for Structural Evaluation and Strengthening of Flexible Road Pavements Using Falling Weight Deflectometer (FWD) Technique” to determine the remaining life of the pavement structure.

The detailed remaining life analysis is done using 90 percent reliability equation of IRC: 115-2014 is presented in tables below for LHS and RHS carriageway.

Table 1-7:Section-wise Pavement Remaining life

S.No	Homogeneous sections			Existing Thickness, mm		Total Crust	Remaining Life @ 90% Reliability		
	From, km	To, km	Length	BT	Granular		Fatigue	Rutting	Remaining Life, MSA
Ranastalam - Anandapuram Section (LHS)									
1	634.000	635.200	1.200	180	500	680	166.3	8706.8	166.3
2	635.200	638.800	3.600	180	500	680	167.4	8773.4	167.4
3	638.800	648.000	9.200	180	500	680	170.3	8874.4	170.3

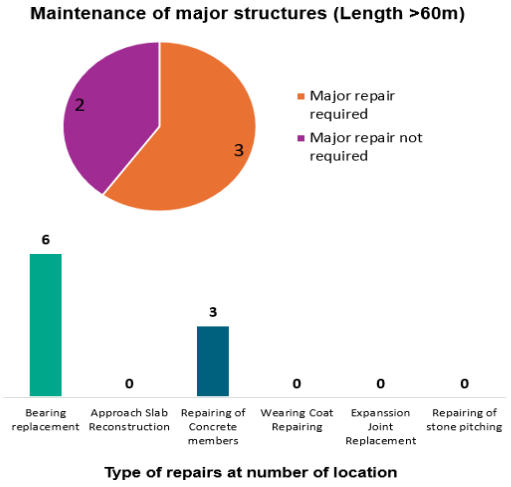
S.No	Homogeneous sections			Existing Thickness, mm		Total Crust	Remaining Life @ 90% Reliability		
	From, km	To, km	Length	BT	Granular		Fatigue	Rutting	Remaining Life, MSA
4	648.000	654.000	6.000	180	500	680	182.2	9293.2	182.2
5	654.000	660.800	6.800	180	500	680	170.7	8874.4	170.7
6	660.800	663.400	2.600	180	500	680	168.6	8806.9	168.6
7	663.400	667.000	3.600	180	500	680	170.8	8840.6	170.8
8	667.000	669.400	2.400	180	500	680	174.9	9011.4	174.9
9	669.400	670.800	1.400	180	500	680	178.3	9186.3	178.3
10	670.800	675.300	4.500	180	500	680	207.8	10245.8	207.8
11	675.300	681.200	5.900	180	500	680	285.5	12904.1	285.5
12	681.200	682.600	1.400	180	500	680	284.0	12850.7	284.0
Ranastalam - Anandapuram Section (RHS)									
1	682.600	681.000	1.600	180	500	680	226.0	10918.3	226.0
2	681.000	676.600	4.400	180	500	680	250.3	11740.6	250.3
3	676.600	670.800	5.800	180	500	680	240.9	11412.1	240.9
4	670.800	669.400	1.400	180	500	680	282.8	12850.7	282.8
5	669.400	660.800	8.600	180	500	680	185.8	9438.1	185.8
6	660.800	656.500	4.300	180	500	680	164.9	8673.7	164.9
7	656.500	651.000	5.500	180	500	680	168.6	8806.9	168.6
8	651.000	644.800	6.200	180	500	680	169.7	8874.4	169.7
9	644.800	641.200	3.600	180	500	680	148.5	8043.5	148.5
10	641.200	638.800	2.400	180	500	680	150.8	8134.4	150.8
11	638.800	638.000	0.800	180	500	680	162.7	8608.0	162.7
12	638.000	634.000	4.000	180	500	680	160.2	8478.5	160.2
Anandapuram – Hanumanthavaka Section (LHS)									
1	682.600	684.500	1.900	160	300	460	109.5	1922.0	109.5
2	684.500	687.000	2.500	160	300	460	127.6	2158.4	127.6
3	687.000	688.400	1.400	160	300	460	117.6	2064.4	117.6
4	688.400	690.600	2.200	160	300	460	122.3	2140.4	122.3
5	690.600	693.600	3.000	160	300	460	125.8	2219.9	125.8
6	693.600	694.700	1.100	160	300	460	125.9	2195.1	125.9
7	694.700	696.600	1.900	160	300	460	121.2	1815.6	121.2
8	696.600	698.400	1.800	160	300	460	123.1	1855.3	123.1
9	698.400	701.000	2.600	160	300	460	124.1	1865.3	124.1
Anandapuram – Hanumanthavaka Section (RHS)									
1	701.000	698.750	2.250	160	320	480	92.1	1739.4	92.1
2	698.750	697.150	1.600	160	320	480	92.2	1730.1	92.2
3	697.150	694.800	2.350	160	320	480	89.5	1684.7	89.5
4	694.800	692.600	2.200	160	320	480	94.3	1767.5	94.3
5	692.600	691.800	0.800	160	320	480	81.0	1541.0	81.0
6	691.800	691.000	0.800	160	320	480	85.5	1615.1	85.5

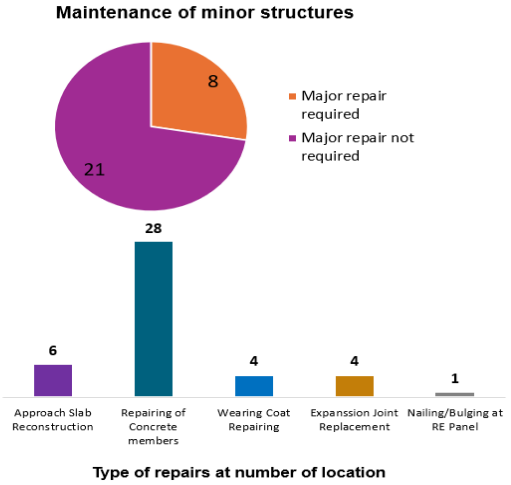
S.No	Homogeneous sections			Existing Thickness, mm		Total Crust	Remaining Life @ 90% Reliability		
	From, km	To, km	Length	BT	Granular		Fatigue	Rutting	Remaining Life, MSA
7	691.000	689.000	2.000	160	320	480	88.6	1662.6	88.6
8	689.000	687.000	2.000	160	320	480	78.1	1493.8	78.1
9	687.000	685.200	1.800	160	320	480	77.0	1474.7	77.0
10	685.200	683.250	1.950	160	320	480	82.2	1573.4	82.2

1.3.5 Structure Inventory and Condition Survey

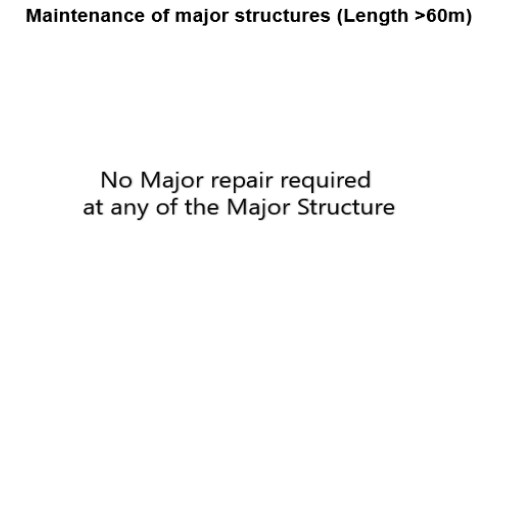
There are deficiencies noted in the structures and relevant repair-rehabilitation measures are suggested. Requirement of immediate repairs for major structures (length > 60m) and minor structures are presented below.

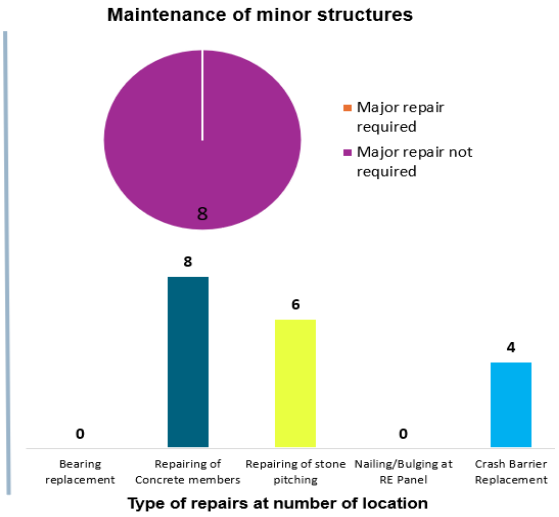
ASSESSMENT OF STRUCTURES (RANASTALAM TO ANANDAPURAM SECTION)





ASSESSMENT OF STRUCTURES (ANANDAPURAM TO VISAKHAPATNAM SECTION)





1.4 Key Technical Issues

1.4.1 Damaged Bearings

Problems with the bearings are observed in the form of tilting, cracking, not properly placed and compressed. Affected structures are

MJBR: @ 655+573 and @ 675+164
Flyover: @ 641+230
It is presumed that existing HAM Concessionaires will fix all these bearings before handing over.

1.4.2 Pavement

Pavement at service road is distressed at many locations, may be due to higher traffic loading. It is also noticed that most of the panels of Rigid Pavement at Natavalasa Toll Plaza got damaged with high severity of longitudinal, transverse, multiple cracks, corner breaks. Joint sealing needs immediate replacement.

1.5 Capital Expenditure Requirement

1.5.1 Improvement Works as Per Schedule B

Schedule B of each stretch specifies the requirements of initial improvement which the concessionaire has to construct within 3/6 months of Handover Date.

Improvement Scope specified for each stretch is tabulated below:

Table 1-8: New Construction Requirements

S. No.	Description	Unit	Ranasatalam-Anandapuram	Ranasatalam-Hanumantvaka
1	Approach slabs reconstructed	Nos.	12	2
2	Junction improvement	Nos.	60	44
3	Curve improvement: Additional signages and studs are considered as per Sch-B.	Nos.	50	25
4	Truck lay bye: Sewage disposal system	Nos.	3	0
5	Landscaping and median plantation	Km	13.2	5,34
6	Transverse Bar Marking	Nos.	4	26
7	Antiglare	Km	5	-
8	Kerb stone	Lm.	17,143	17,564

1.5.2 Immediate Maintenance Requirements

The sections are under HAM (Annuity) concession up to 2036/37 and under PBMC up to 2030. So, obligation for immediate repair requirements do not lie with InvIT Concessionaire. However, toll plaza renovation cost and TMS replacement cost has been considered for existing toll plazas.

1.6 O&M Cost Estimation

1.6.1 Recommended MM Cycles for Pavement

Considering the initial pavement design period and crust, remaining life data, anticipated traffic loading during the concession period, and in compliance to the provisions of schedule B, the following cycles of Major maintenance is proposed for satisfactory performance of the pavement during operation period to serve both functional and structural requirements.

Table 1-9: Proposed Major Maintenance Cycles for Balance Concession period

Name of Stretch	InvIT Concession (20 years)				
	CAPEX	Routine Maintenance	Periodic Maintenance	ATMS & TMS Replacement	Toll Operation & Admin Cost
Ranastalam-Anandapuram	Toll plaza renovation cost TMS (all the existing defects to be rectified by HAM Concessionaire)	**Till O&M Handover**: Manpower cost for clearing considered **After Handing Over**: Regular	**FY36**-Revalid. Survey **FY37**- Improvement as per Sch.-B & road marking **FY42**- ***MCW & SR***: 40BC, 50DBM for 10% length, ***Rigid***: Retexturing, replacement of joint sealant and 0.5% of panel replacement, ***Structure***: Replacement of wearing coat, expansion Joint, Bearing replacement for 40% of total number **FY45**-Road marking+ Micro Surfacing	**FY33** 50% TMS **FY41**- 100%TMS 40%ATMS	01.04.2025
Anandapuram-Hanumantvaka	NIL (all the defects to be rectified by Existing Performance based contractor)	After Handing Over	**FY30**-Revalid. Survey, Improvement as per Sch.-B & road marking **FY32**- **MCW & SR**: 40BC, 50DBM for 10% length, ***Structure***: Replacement of wearing coat, 50% of expansion Joint and Bearing replacement for 50% of total number **FY35**-Road marking **FY38**- ***MCW & SR***: 40BC, 50DBM for 10% length, ***Structure***: Replacement of wearing coat, 50% of expansion Joint and Bearing replacement for 50% of total number **FY41**-Road marking **FY44**- ***MCW & SR***: 40BC, 50DBM for 10% length, ***Structure***: Replacement of wearing coat & painting	**FY36** – 40% ATMS **FY43**- 60% ATMS	No toll Operations as there is no toll plaza.

1.6.2 Estimate (Initial Improvement, MMR and O&M)

Cost of capital expenditure (Initial Improvement, MMR and O&M) are presented below.

Table 1-10: Cost Estimate (Initial Improvement, MMR and O&M) Ranastalam-Anandapuram and Anandapuram - Visakhapatnam

Sl.No.	FY	Initial Improvement Cost (in INR Cr.)	Major Maintenance Cost (in INR Cr.)				Operation & Maintenance Cost (in INR Cr.)								
			Road (MCW,SR, Toll Plaza)	Structure	ATMS	TMS	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026	7.96					0.60					5.74	0.13		4.27
2	2026-2027						0.60					5.74	0.13		4.99
3	2027-2028						0.60					5.74	0.13		5.10
4	2028-2029						0.60					5.58	0.13		5.00
5	2029-2030		5.49				1.62	0.99	1.24	3.03	0.65	5.58	0.38	0.78	5.09
6	2030-2031						1.62	0.99	1.24	3.03	0.65	5.19	0.38	0.64	5.11
7	2031-2032		33.09	2.42			1.62	0.99	1.24	3.03	0.65	4.81	0.38	0.64	4.97
8	2032-2033					2.50	1.62	0.99	1.24	3.03	0.65	4.62	0.38	0.64	5.75
9	2033-2034						1.62	0.99	1.24	3.03	0.65	4.62	0.38	0.69	5.27
10	2034-2035		1.35				1.62	0.99	1.24	3.03	0.65	4.62	0.38	0.64	5.10
11	2035-2036		0.45		4.52		4.52	3.14	2.62	6.30	2.76	4.62	1.85	2.29	5.21
12	2036-2037		10.06				4.52	3.14	2.62	6.30	2.76	4.62	1.85	1.81	5.27
13	2037-2038		33.44	2.42			4.52	3.14	2.62	6.30	2.76	4.62	1.85	1.86	5.36
14	2038-2039						4.52	3.14	2.62	6.30	2.76	4.62	1.85	1.81	5.22
15	2039-2040						4.52	3.14	2.62	6.30	2.76	4.62	1.85	2.02	6.05
16	2040-2041		1.35		5.01	5.01	4.52	3.14	2.62	6.30	2.76	4.62	1.85	1.81	5.47
17	2041-2042		128.27	18.57			4.52	3.14	2.62	6.30	2.76	4.62	1.85	1.86	5.62
18	2042-2043				6.78		4.52	3.14	2.62	6.30	2.76	4.62	1.85	1.81	5.55
19	2043-2044		34.43	0.49			4.52	3.14	2.62	6.30	2.76	4.62	1.85	2.02	5.59
20	2044-2045		33.11				4.52	3.14	2.62	6.30	2.76	4.62	1.85	1.81	5.59
Total		**7.96**	**281.04**	**23.90**	**16.31**	**7.51**	**57.27**	**37.36**	**33.66**	**81.14**	**31.56**	**98.45**	**21.30**	**23.14**	**105.56**

Note: The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

1.7 Conclusion

The project highway is a partially access controlled consists of 6-lane divided carriageway with service roads on both sides with minimum number of merging and diversion points on the highway for access to service roads. The 6-lane project has been completed on HAM mode and at present toll is being collected by Toll Collection Agency appointed by NHAI. The project highway is also having 4-lane divided carriageway from Anandapuram - Hanumanthavaka (Towards Visakhapatnam city), for which Performance based Contract for maintenance of city side section. The performance of the pavement is satisfactory in terms of pavement roughness and quality of the pavement surface without having major distresses. As part of present study, the required Engineering Investigations along with site visual observations were made for evaluation of the asset condition and accordingly established the required maintenance and rehabilitation measures/decisions for the concession period. The periodic maintenance by functional/structural overlays are required at every 6th year as per the CA would be sufficient to keep the project stretch in good condition and hence suitable major maintenance strategy has been recommended to improve the service life during the concession period.

Based upon the site visit for assessment of condition of CD structures including MJB, MNBs, ROB, VUPs, Culverts and toll plaza buildings in the project corridor and observations submitted in various chapters of this report, it is concluded that most of the structures are in sound condition and no major repair is required in near future. As the entire road sections are in HAM/PBMC, the defects identified during this study and future defects occur during the remaining HAM/PBMC concession/contract are to be rectified by the existing Concessionaire. It is to be ensured that asset quality assessment is done thoroughly at the time of handing over so that these defects and any other defects occur during the remaining HAM/PBMC concession period is rectified.

The assessment of estimated cost of such repairs along with the anticipated future repair and rehabilitation cost are considered in the cost estimate of this report.

Section 2: Introduction

2.1 Background

NHAI has set up an Infrastructure Investment Trust namely National Highways Infra Trust ("InvIT") and is acting as its Sponsor to the said InvIT. National Highways Infra Investment Managers Private Limited ("NHIIMPL") has been appointed as the Investment Manager to the InvIT.

NHIIMPL appointed M/s Egis India Consulting Engineers Private Limited, as Technical Consultant to conduct the due diligence on the proposed Assets. The Letter of Empanelment (LOE) was received on 3rd November 2022 and Letter of Award (LoA) for the subject Project was received on 15th July 2024 by Egis India and the services commenced immediately thereafter.

The project stretches detail as per LoA are listed below.

Table 2-1: Detail of Project Stretches

Sr. No.	Stretches	Toll Plaza	NH No.	Lane	Length (km)
1	Narasannapeta to Ranastalam	Madapam	NH-16	4/6 Lane	53.799
2	**Ranastalam to Anandapuram via Kopperla**	**Nathavalasa**	**NH-16**	**6 Lane**	**48.980**
	Anandapuram to Hanumantavaka	**-**	**Old NH-16**	**4 Lane**	**17.564**
3	Anandapuram to Anakapalle via Pendurthi	Dukkavanipalem & Marripalem	NH-16	6 Lane	48.605
Total					**168.9488**

This report pertains to Ranastalam to Anandapuram via Kopperla and Anandapuram to Hanumantvaka sections.

2.2 Objectives

The main objective of the present assignment is to

review project documents and understanding schedule B requirements for improvement works for the assessment of Capex and Opex during the concession period.

1. conduct field investigations to assess the existing asset condition and future deterioration.
2. validate executed works with respect to schedule A and assessment of improvement works
3. review quality of construction based on available data, design and drawings.
4. undertake designs for rehabilitation requirements of different assets based on field investigation data and available documents.

5. assess operation and maintenance cost including major maintenance expected to be incurred during the concession period.

2.3 Technical Consultant Team

The Technical Consultant commenced its services from 15th July 2024 and the team comprising of Highway, Pavement & Structure Engineers and Experts have conducted site visit from 25th July 2024 to 11th August 2024 to appreciate the project corridor characteristics. This report highlights the findings from visual assessment, available documents shared with the consultant, discussion with NHAI officials involved with the maintenance and operation of project road at site and other local enquiries. Analysis of data as obtained from various survey and investigations conducted at site are present in this report.

Date-wise various field activities at site are shown below in bar chart form in **Figure 2.1.**

PROJECT STRETCHES	25-Jul	26-Jul	27-Jul	28-Jul	29-Jul	30-Jul	31-Jul	01-Aug	02-Aug	03-Aug	04-Aug	05-Aug	06-Aug	07-Aug	08-Aug	09-Aug	10-Aug	11-Aug
Ranastalam – Anandapuram and Anandapuram – Hanumantvaka Sections																		
FWD Survey																		
NSV Survey																		
Inventory and Condition Survey																		
Axle Load Survey																		
Drone Survey																		
Test Pits																		
MBIU for Major Structures (Length > 60m)																		

Figure 2-1: Project Activities Schedule

2.4 Disclaimer

The information and documents received from the Client are being reviewed by the Consultant and have been used for preparing this report. Due care has been taken while reproduction of the information where required to avoid typographical or other errors.

2.5 Structure of the Report

The report has been structured into nine sections as follows:

Section 1: Executive Summary
Section 2: Introduction
Section 3: Inventory and Condition Assessment

Section 4: Surveys and Investigations
Section 5: Review of Documents
Section 6: Capital Expenditure (CapEx) Requirement
Section 7: Operation & Maintenance
Section 8: Analysis & Comparisons with Seller Data
Section 9: Conclusions

Section 3: Inventory and Condition Assessment

3.1 General

The Technical Consultant visited site from 25th July 2024 to 11th August 2024. The important aspects of the project road were noted in the detailed site reconnaissance along with various field investigations. These included general description about the project road, site features, structures, junctions, pavement characteristics, road safety. Field investigation for NSV, FWD test, axle load survey, trail pits, MBIU and drone videography survey were also conducted by Technical Consultant to assess the present condition of the project road. This chapter elaborates various findings of these surveys and studies conducted by the Technical Consultant team in different sections.

3.2 Project Corridor

The project stretches details are listed below:

Table 3-1: Detail of Project Stretches

Sr. No.	Name of Stretches	Toll Plaza	Chainage (Km)		Length (km)
			From	To	
1	Ranastalam to Anandapuram via Kopperla	Nathavalasa	634+000	682+980	48.980
	Anandapuram to Hanumantvaka	-	682+980	700+544	17.564



Figure 3-1: Project Location Map

3.3 Project Brief

3.3.1 Salient Features

Sr. No.	Name of Stretches	Toll Plaza	Chainage (Km)		Length (km)	Lane Configuration	Pavement Type	Date of COD	O&M Handover Date to InVIT	Concessionaire / Remarks
			From	To						
1	Ranasthalam to Anandapuram	Natavalasa @ 656+704 (14 lanes)	634+000	681+000	47	6-Lane	Flexible except Toll Plaza	30-06-2021	24-09-2035	M/s Asoka Ranasthalam Anandapuram Road Limited (HAM)
	Anandapuram		681+000	682+980	1.980	6-Lane	Flexible	17-12-2021	08-11-2036	M/s DBL Anandapuram Anakapalli Highways Pvt. Ltd. (HAM)
	Anandapuram-Hanumantvaka		682+980	700+544	17.564	4-Lane	Flexible	01-09-2024	01-09-2029	M/s Shiva Builtech Pvt. Ltd (PBMC)

Details of Assets:

Table below provides the quantum of the assets and compare the same with the Schedule A stipulations:

S. No	Description			Ranastalam to Anandapuram Section (from km 634+000 to km 682+980)		Anandapuram to Hanumanthavaka Section (from km 682+980 to km 700+544)	
				Schedule-A	At Site	Schedule-A	At Site
1	Total Project Length (km)			48.980	48.980	17.564	17.564
2	Service Roads/ Slip Roads (km)			74.797	**81.610**[3]	8.334	**7.990**[4]
3	Pavement (km)	Flexible	LHS	48.440	48.450	17.564	17.564
			RHS	48.440	48.450	17.564	17.564
		Rigid	LHS	0.540	0.530	-	-
			RHS	0.540	0.530	-	-
4	Bus Shelters (no.)			-	**2**[β]	3	**22**[β]
	Bus bays with Shelters (no.)			25	**32**[β]	5	**6**[β]
	Bus bays (no.)			2	2	-	**4**[β]
5	Truck Lay-bays/Parking (no.)			3	4	2	2
6	Toll Plaza (no.)			1	1	-	-
7	Rest Area (no.)			-	1	-	-
8	Major Bridges (no.)			3	3	-	-

[3] SR for a total length of 5.387 km is not considered in Sch A from km 633+980 to km 635+350 RHS, km 637+800 to km 638+150 BHS, km 655+413 to km 655+870 LHS, km 662+000 to km 662+370 BHS, km 663+350 to km 663+900 BHS and km 669+230 to 669+740 BHS.

[4] SR from km 686+380 to km 686+700 LHS is considered in Sch A which do not exist at site.

[β]There are many bus shelters along the project road which are constructed by local civic bodies. All these shelters within the ROW is considered as existing bus bay/shelters by the Consultant.

S. No	Description		Ranastalam to Anandapuram Section (from km 634+000 to km 682+980)		Anandapuram to Hanumanthavaka Section (from km 682+980 to km 700+544)	
			Schedule-A	At Site	Schedule-A	At Site
9	Minor bridges (no.)		6	6	6	6
10	ROB's (no.)		-	-	-	-
11	Flyover (no.)		1	1	-	-
12	Overpass for new Int. Airport (no.)		1	1	-	-
13	VUP's (no.)		8	8	1	1
14	LVUP (no.)		15	**13#**	1	**-**
15	PUP/CUP (no.)		-	**2#**	-	**1#**
16	Foot Over Bridge (no.)		-	-	-	-
17	Culverts (no.)	Pipe Culvert	97	97	22	22
		Slab Culvert	-	-	22	22
		Box Culvert	35	35	-	-

3.4 Road Inventory and Condition Survey

3.4.1 Road Inventory

The Road Inventory is conducted to assess and list out the existing features of the project corridor and to validate that project road is conforming to the requirements of CA. It covers all the existing physical features such as terrain, land use, carriageway surfacing type, shoulder width, junctions, water bodies, roadside arboriculture, general drainage conditions, etc. It was carried out in accordance with the guidelines given in IRC: SP 19-2001, generally by visual means, and supplemented by simple tape measurement.

The road inventory data collected for the project highway is presented in the **Annexure 3.1.**

3.4.2 Terrain

The project highway falls in plain terrain.

3.4.3 Land Use

The land along the project highway is predominantly agricultural followed by built up, barren, forest, residential and commercial areas. Details of land use are given in the **Table 3.2**.

All underpasses are considered as LVUP however few of them are classified as PUP/CUP depending upon their vertical clearance.

Table 3-2: Land Use

Description	Ranastalam to Anandapuram				Anandapuram to Hanumantvaka			
	Length (km)		%age		Length (km)		%age	
	LHS	RHS	LHS	RHS	LHS	RHS	LHS	RHS
Agriculture	20.705	22.530	42.27%	46.00%	3.370	2.683	19.19%	15.28%
Built-Up Area (Residential/Commercial/ Industrial)	26.985	25.190	55.09%	51.43%	11.184	9.327	63.68%	53.10%
Others (Water Bodies/ Forest etc.)	1.290	1.260	2.63%	2.57%	3.010	5.554	17.14%	31.62%
Total	**48.980**	**48.980**	**100%**	**100%**	**17.564**	**17.564**	**100%**	**100%**

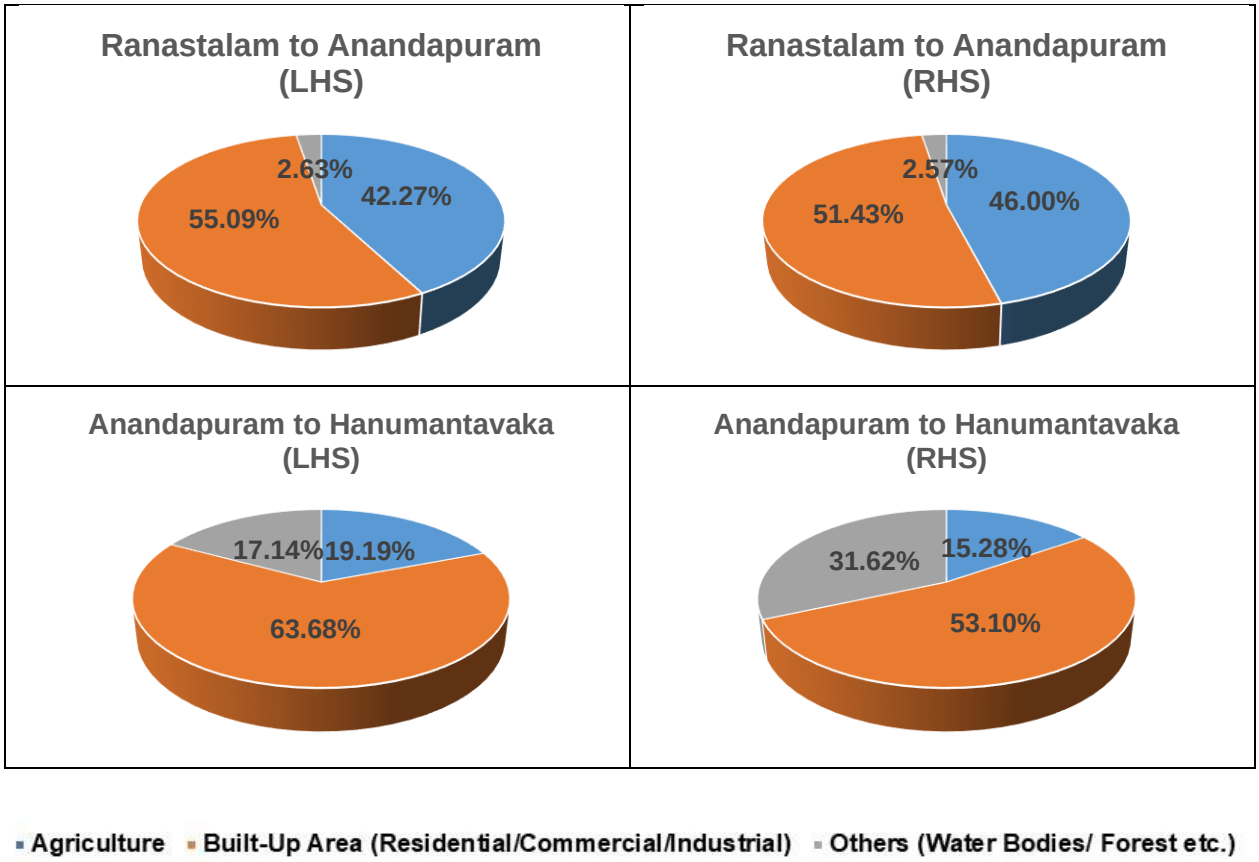


Figure 3-2: Land Use

3.4.4 Main Carriageway

Most of the length of the project highway is a 6-lane divided carriageway with paved shoulder configuration. The carriageway width is 11.0m (with kerb shyness) with 1.5m wide paved shoulder at rural area, 11.0m (with kerb shyness) with 2.0m wide paved shoulder at urban area and 11.0m (with kerb shyness) with 2.5m wide paved shoulder at underpasses location all along the project corridor except at toll plaza and bridges.

There are four lanes with paved shoulder configuration for Anandapuram – Hanumantvaka section. Carriageway width for these sections is 7.25m (including kerb shyness) with 1.5m wide paved shoulder on either side on main carriageway.

Details are show in **Table 3.3** and **Figure 3.3** below.

Table 3-3: Main Carriageway

S. No.	Section	Chainage (km)		Length (km)	Lane	Type of Pavement	Remarks
		From	To				
1	Ranastalam – Anandapuram	634+000	656+495	22.495	6-lane with Paved Shoulder	Flexible	
		656+495	657+035	0.540		Rigid	Nathavalasa @656+760
		657+035	681+000	23.965		Flexible	
	Anandapuram	681+000	682+980	1.980		Flexible	
				48.980			
	Anandapuram-Hanumantvaka	682+980	700+544	17.564	4-lane with Paved Shoulder	Flexible	
				17.564			



6 lane Flexible Carriageway (Typ)



4 lane Flexible Carriageway (Typ)

Figure 3-3: Main Carriageway

3.4.5 Service Road/Slip Roads

Total linear length (both side length) of service/slip road length for the project road is 81.750 km in Ranastalam to Anandapuram section and 7.990 km in Anandapuram to Hanumantava section. Flexible pavement is there for the service roads at all the locations. Details of service road are given below.

Table 3-4: Service Road

Service Road (LHS)			Service Road (RHS)		
Chainage (km)		Length (km)	Chainage (km)		Length (km)
From	To		From	To	
Ranastalam to Anandapuram Section					
635+365	635+730	0.365	633+980	639+335	5.355
635+730	635+830	0.100	640+750	642+700	1.950
635+830	639+340	3.510	643+180	648+070	4.890
640+190	642+690	2.500	648+900	650+880	1.980
643+200	648+065	4.865	650+880	651+400	0.520
648+900	650+900	2.000	651+400	655+100	3.700
650+900	651+400	0.500	655+830	656+440	0.610
651+400	656+445	5.045	657+335	658+390	1.055

Service Road (LHS)			Service Road (RHS)		
Chainage (km)		Length (km)	Chainage (km)		Length (km)
From	To		From	To	
657+340	658+410	1.070	659+970	671+230	11.260
659+970	672+440	12.470	671+420	672+160	0.740
673+260	674+670	1.410	672+540	681+120	8.580
675+535	675+575	0.040	681+120	681+260	0.140
675+575	681+120	5.545	681+260	681+890	0.630
681+120	681+260	0.140			
681+260	681+900	0.640			
Total		**40.200**	**Total**		**41.410**
Anandapuram to Hanumantvaka Section					
686+100	686+380	0.280	686+100	686+380	0.280
689+865	690+125	0.260	691+380	694+650	3.270
691+380	694+640	3.260	694+650	694+820	0.170
695+140	695+250	0.110	699+980	700+340	0.360
Total		**3.910**	**Total**		**4.080**



Slip Road at Km 635+365 LHS



Slip Road at Km 692+200 LHS

Figure 3-4: Service/Slip Road Carriageway

3.4.6 Towns and Built-Up-Areas

Chainage-wise details of towns and built-up areas are given below:

Table 3-5: Built Up Areas

S. No.	Chainage (km)		Length (km)	Side	Name of Settlement
	From	To			
Ranastalam to Anandapuram Section					
1	635+500	636+000	0.500	Both Side	Kosta
2	636+300	636+700	0.400	RHS	Pydipeta
3	637+100	637+400	0.300	Both Side	Pativadapalem
4	640+900	642+800	1.900	Both Side	PydiBhimavaram
5	643+200	643+800	0.600	Both Side	Alladupalem
6	644+750	645+000	0.250	LHS	Gunapa Reddypeta
7	646+000	646+250	0.250	LHS	Kanimetta

S. No.	Chainage (km)		Length (km)	Side	Name of Settlement
	From	To			
8	646+650	646+900	0.250	Both Side	Chodavaram
9	649+000	649+500	0.500	Both Side	Chodamma Agraharam
10	650+300	650+500	0.200	Both Side	Gollapeta
11	650+600	651+000	0.400	Both Side	Gollapeta
12	651+250	651+700	0.450	Both Side	Pusapatirega
13	652+600	652+900	0.300	LHS	Pusapatirega
14	652+200	652+700	0.500	Both Side	Pusapatirega
15	654+700	654+900	0.200	RHS	Kopperla
16	655+000	655+200	0.200	Both Side	Rellivalasa
17	657+700	657+900	0.200	Both Side	Sundarpeta
18	660+300	661+300	1.000	Both Side	Bhogapuram
19	664+100	664+350	0.250	Both Side	Narupeta
20	665+000	665+750	0.750	LHS	A.Ravi Valasa
21	667+000	667+300	0.300	Both Side	Savaravilli
22	670+400	670+600	0.200	Both Side	Polipallypalli
23	673+300	673+600	0.300	Both Side	Maharajpeta
24	675+600	676+500	0.900	Both Side	TagarapuValasa
Anandapuram to Hanumantvaka Section					
1	687+500	695+600	8.100	Both Side	Urban Section (Visakhapatnam)
2	696+000	697+200	1.200	LHS	Urban Section (Visakhapatnam)
3	699+500	700+544	1.044	Both Side	Urban Section (Visakhapatnam)

3.4.7 Major and Minor Junctions

3.4.7.1 Major Junction

Provision of grade separation in the form of underpasses (CUPs, PUPs, LVUPs, VUPs and Flyovers) are there at all major junctions for the entire project road except for the 4-lane sections for Anandapuram- Hanumantvaka stretch. All access to the project highway is through the Service/Slip Road.

There are 8 nos. of Major Junction. Details of the major junction are given in the **Table 3.6** below:

Table 3-6: List of Major Junction

Sr. No.	Chainage (Km)	Type of Junction	Cross Road leads to	
			LHS	RHS
Ranastalam to Anandapuram Section				
1	635+780	Y	Kosta Koyyam Road	-
2	647+615	T	Chintapally Vizianagram Road	
3	656+020	T	-	Vizianagram Nathavalasa Road
4	660+340	X	Vizianagram Mukkam Road	Bhogapuram Village
5	672+420	Y	-	Vizianagaram
Anandapuram to Hanumantvaka Section				
1	628+980	X	Vemulavalasa	Anandapuram
2	684+490	T	Bheemunipatnam	-
3	686+080	T	Chepalappada	-

3.4.7.2 Minor Junction

There are 26 nos. minor junctions all along the project road. Other village or town road are connected with service / slip road and the road users are coming through service / slip road to connect with main carriageway. Summary of the minor junctions are given in the **Table 3.7** below:

Table 3-7: Summary of Minor Junction

Sr. No.	Type of Junction	Ranastalam to Anandapuram Section	Anandapuram to Hanumantvaka Section
1	T Junction	6	4
2	Y Junction	4	6
3	X Junction	6	-

3.4.8 Median

Median width is predominantly 4.0m-4.5m (excluding shyness). However, narrow median is observed at few locations due to ROW constraints or in built-up stretches. Details of sections with narrow median width are given in the **Table 3.8** below:

Table 3-8: Details of Narrow Median (Width < 4.5m)

Chainage (km)		Width (m)	Section	Remarks
From	To			
650+800	651+900	1.2 - 1.5	Ranastalam to Anandapuram	ROW constraints
691+200	700+544	1.2 - 1.5	Anandapuram to Hanumantvaka	Kambalakonda Wildlife Sanctuary /Built-up Area

3.4.9 Earthen / Hard Shoulder

Earthen shoulders are provided on the outer side of the main carriageway. The width of these shoulders is 1.5m to 2.5m.

3.4.10 Drainage

Cover Drains are provided with service and slip road in entire of project road. Median cut drains are provided at super-elevated portion for efficiently draining out rainwater. Package wise details of Drainage are given in the **Table 3.9** and shown in **Figure 3.5.**

Table 3-9: Drainage System

Description	Ranastalam to Anandapuram Section	Anandapuram to Hanumantvaka Section
Covered lined Drain (km)	75.515	7.195
Open Lined Drain (km)	5.360	8.095

General observation of drainage conditions during the site reconnaissance are:

- Cleaning and maintenance of roadside drainage needs improvement. Cover at drain is missing at few locations.
- Provision of chute drain at high embankment location is observed. Water is draining off from the main carriageway to drain through the service road. This will adversely affect the pavement of service road.
- Though there were considerable rains during the time of inventory survey, no overtopping of road was observed at any location. It was further confirmed by the locals also.



Cover Drain at Service Road Location



Drain at separator near RE Wall

Figure 3-5: Drainage System

3.4.11 Road Furniture

3.4.11.1 W-Beam Crash Barrier, Concrete Crash Barrier and Pedestrian Guardrail

W-Beam Crash Barrier

W-beam Crash Barrier is provided at high embankment location, Separator (in between main carriageway and service road), near major structures and at outer side of sharp curves in the entire project road. Package wise length of W-Beam Crash Barrier are given in the **Table 3.10** and shown in **Figure 3.6.**

Table 3-10: W-Beam Crash Barrier

Description	Ranastalam to Anandapuram Section	Anandapuram to Hanumantvaka Section
W-Beam Crash Barrier (km)	75.515	7.195



Figure 3-6: W-Beam Crash Barrier near High Embankment and Separator

Concrete Crash Barrier

Concrete Crash Barrier is provided at approaches of ROBs, Flyovers and Underpasses almost all through the project road. Length of CC barrier are given in the **Table 3.11** and shown in **Figure 3.7.**

Table 3-11: Concrete Crash Barrier

Description	Ranastalam to Anandapuram Section	Anandapuram to Visakhapatnam Section
Concrete Crash Barrier (km)	32.180	1.215



Figure 3-7: Concrete Crash Barrier

Pedestrian Guardrails

Pedestrian guard rail is there between main carriageway and service road. Length of Pedestrian Guardrails are given in the Table 3.12 and shown in Figure 3.8.

Table 3-12: Pedestrian Guardrails

Description	Ranastalam to Anandapuram Section	Anandapuram to Visakhapatnam Section
Pedestrian Guardrail (km)	1.780	3.833





Figure 3-8: Pedestrian Guardrails

Wire Rope Safety Barrier

Wire Rope Safety Barrier is provided at separator (in between MCW & S/R) in the section of Ransatalam to Anandapuram. Length of Wire Rope Safety Barrier are given in the **Table 3.13** and shown in **Figure 3.9.**

Table 3-13: Wire Rope Safety Barrier

Description	Ranastalam to Anandapuram Section	Anandapuram to Visakhapatnam Section
Wire Rope Safety Barrier (km)	17.400	-





Figure 3-9: Wire Rope Safety Barrier

3.4.11.2 Sign Boards and Gantry

There are adequate number of signboards along the project road and most of them are in good condition. There are many variable message signs (VMS), overhead and cantilever gantry signs as well. Location of gantry signs are shown in **Table 3.14** and **Figure 3.10** below.

Table 3-14: Variable Message Signs (VMS) / Cantilever & Overhead Gantry

S. No.	Chainage (km)	Side	Type	S. No.	Chainage (km)	Side	Type
Ranastalam to Anandapuram Section							
1	634+000	LHS	Portal	17	663+310	LHS	Cantilever

S. No.	Chainage (km)	Side	Type	S. No.	Chainage (km)	Side	Type
2	635+070	LHS	Cantilever	18	663+900	RHS	Cantilever
3	639+550	RHS	Cantilever	19	672+630	LHS	Portal
4	639+940	LHS	Portal	20	673+230	RHS	Cantilever
5	643+200	RHS	Portal	21	673+420	RHS	Cantilever
6	646+890	LHS	Portal	22	674+990	LHS	Cantilever
7	650+700	LHS	Cantilever	23	677+020	RHS	Cantilever
8	652+300	RHS	Cantilever	24	677+520	LHS	Cantilever
9	653+100	LHS	Cantilever	25	677+530	RHS	Cantilever
10	654+890	LHS	Cantilever	26	681+020	BHS	Portal
11	655+090	LHS	Cantilever	27	681+880	LHS	VMS
12	655+760	LHS	Cantilever	28	682+070	RHS	Cantilever
13	656+360	LHS	Cantilever	29	682+400	LHS	Cantilever
14	657+260	RHS	Cantilever	30	683+540	LHS	Portal
15	658+270	RHS	Cantilever	31	683+600	RHS	Portal
16	662+220	RHS	Portal	32	691+100	LHS	Portal
Anandapuram to Hanumantvaka Section							
1	683+540	LHS	Portal				
2	683+600	RHS	Portal				
3	691+100	LHS	Portal				





Figure 3-10: VMS and Gantry Signboards

In general, these appurtenances are in good condition.

3.4.11.3 5 km / Km / Hectometer Stones

5Km, Km & Hectometer stones are observed at shoulder & median. Most of stones are in good condition.



Figure 3-11: Kilometer & Hectometer Stones

3.4.12 Project Facilities

3.4.12.1 Bus Bays and Shelters

As main carriageway is access controlled, Bus bays/shelters are at service/slip roads. It is observed that few shelters are of tin shade and are in poor condition. There are three types of facilities for boarding the bus by the road users. There are bus bay with shelters, only bus bay without shelters and only shelters without bays. Package-wise number of these facilities are given in **Table 3.15** and shown in **Figure 3.12** below.

Table 3-15: Bus Bays and Shelters

Description	Unit	Ranastalam to Anandapuram Section	Anandapuram to Hanumantvaka Section
Bus bay	Nos	2	4
Bus bay with Shelter	Nos	32	6
Bus Shelter	Nos	2	22



Figure 3-12: Bus Bay and Shelters

3.4.12.2 Truck Lay bye

There is only parking facility at the truck lay bye in section Ransastalam to Anandapuram to Anandapuram to Hanumantvaka though rest area with toilet facilities are also not far away.

Table 3-16: Truck Lat Bye and Rest Area

Description	Unit	Ranastalam to Anandapuram section	Anandapuram to Hanumantvaka Section
Truck Lay Bye	Nos	4	2
Rest Area	Nos	1	-



Truck parking at Km 663+500 LHS



Rest Area at Km 663+600 LHS

Figure 3-13: Truck Lay bye and Rest Area

3.4.12.3 Streetlight

Street light in the form of single/double arm poles are provided in toll plaza, underpasses and built-up area along the project road. Package-wise length provided for street lighting is give in **Table 3.17** and few examples are shown in **Figure 3.14.**

Table 3-17: Highway Lighting

S. No.	Section	Double Arm Light		Single Arm Light	
		Kms	Nos	Kms	Nos
2	Ranastalam to Anandapuram	55.03	1975	4.77	181
3	Anandapuram to Hanumantvaka	14.414	481	-	-



Highway lighting at Flyover



Highway lighting at Built-up area

Figure 3-14: Street Light

3.4.12.4 High Mast Light

High mast lights are provided at toll plazas and few major junctions. Details are show in **Table 3.18** below.

Table 3-18: High Mast Light

S. No.	Chainage (km)	Numbers	Side	Location
Ranastalam to Anandapuram Section				
1	644+030	1	Median	
2	648+800	1	Median	
3	656+020	1	RHS	At Junction
4	656+550	1	LHS	At Toll Plaza
5	656+685	1	LHS	At Toll Plaza
6	656+825	1	RHS	At Toll Plaza
7	656+970	1	RHS	At Median
8	658+940	1	Median	
9	659+750	1	Median	At Separator
10	663+500	1	LHS	At Truck parking
Anandapuram to Hanumantvaka Section				
1	686+065	1	Median	At Junction
2	690+050	1	Median	At Junction
3	691+490	1	Median	At Junction
4	693+645	1	Median	At Separator
5	693+850	1	Median	At Junction
6	693+900	1	Median	At Separator
7	694+660	1	Median	At Junction
8	696+475	1	Median	At Junction
9	697+200	1	LHS	At Junction
10	698+770	1	Median	At Junction
11	699+550	1	LHS	At Junction
12	700+240	1	Median	At Junction
13	700+245	1	RHS	At Junction

3.5 Toll Plaza

The purpose of the Toll Plaza is to collect toll from road users of the Project highway with transparency in the system. There are four toll plazas along the project road. Booths are available for all lanes. Administrative buildings are there at all four Toll Plazas.

3.5.1 Nathavalasa Toll Plaza (TP-2)

Nathavalasa Toll Plaza (TP-2) is located at km 656+760, Ranastalam - Anandapuram stretch which has 14 lanes (7 + 7 lanes).



Figure 3-15: Nathavalasa Toll Plaza

Table 3-19: Toll Equipment Status at Natavalasa Toll Plaza

Sr. No.	Particulars	Details
1	Toll Plaza Chainage and name	656+760 Nathavalasa Toll Plaza
2	Road Configuration	14 Lanes & 2 Reversible
3	Number of Toll Lanes	14
4	No of ETC system	14 (2 reversable)
5	No of Toll Booths	14
6	Canopy	Available
7	Admin Building	Available
8	Control Room	Available
9	Server Room	Available
10	UPS & Battery Room	Available
11	Point of Sale Room	Available
12	Plaza Manager Room	Available
13	Cash up Room	Available
14	Cashier Room	Available
15	Cash Van Garage	Available
16	Availability of Tunnel	Available
17	PRO Office	Available
18	Meeting Room	Available
19	Changing Room	Available
20	Toilets (Gents & Ladies)	Available
21	Weigh In Motion Facility	Available (not Working)
22	Availability of Static Weigh Bridge	Available
23	Availability of loading/unloading facilities	Not Available
24	Storage facility of overloaded material	Not Available
25	Diesel Generator	Available
26	High Mast Light	Available

Sr. No.	Particulars	Details
27	Streetlights	Available
28	Type of Pavement at Toll Lanes	Rigid
29	Highway Mini Nest	Available
30	Low mast Light	Not Available



Lane Equipment


Boom Barrier


Diesel Genrator


Weigh In Motion

Figure 3-16: Toll Equipment, Natavalasa Toll Plaza

3.5.2 Toll Plaza Administration Building

The Plaza administration building serves as the support structure for the operation and maintenance of the toll plaza. It is from here that utilities are distributed and controlled, employee amenities are maintained, the toll collection process overseen, revenues are processed & audited. Sale of local passes and recharge is done at Plaza building. Transfer of funds from toll booth to plaza building and from plaza building to bank are being facilitated/managed by administration and financial management functions are also conducted in the building.




Figure 3-17: Toll Plaza Administration Buildings

3.6 Structure Inventory and Condition Survey

This section mainly presents the Site Inventory and Condition Survey of all existing Structures likes Culverts, Minor bridges & Major bridges, Flyovers/ Viaducts, VUP, LVUP, PUP, RUB and ROBs along the project roads. The aim of the section is to present the details of existing structures condition of existing structures and functioning of structures. The structure inventory has been done on the basis of visual assessment of each structure. MBIU has been used for visual assessment inspection of major structures having length greater than 60m.

Number of existing structures along the Project roads are given in the following table. Detailed inventory and condition data is presented in **Annexures – 3.2 .**

Table 3-20: Number of Structures

S. No.	Description		Ranastalam to Anandapuram	Anandapuram to Hanumantvaka
1	Major Bridge (no.)		3	-
2	Minor Bridge (no.)		6	6
3	ROB/RUB (no.)		-	-
4	Flyover (no.)		1	-
5	Overpass for new international airport(no.)		1	-
6	VUP (no.)		8	1
7	LVUP (no.)		13	-
8	PUP/CUP (no.)		2	1
9	Foot Over Bridge (no.)		-	-
10	Culverts (no.)	Box	35	-
		Slab	-	22
		Pipe	97	22

Section 4: Surveys and Investigations

4.1 Visual Condition Assessment

i) In general, pavement condition is good throughout the length of main carriageway. However, condition of service road is poor in urban section.

ii) It is noted that few of the sections got rectified the rutting by HAM concessionaire about 5 lane km (2% of the lane length)

iii) Cement treated base (CTB) layer executed in 6-lane widening works.

iv) Condition of Rigid Pavement at Toll Plaza is very poor with high severity of longitudinal, transverse, multiple cracks, corner breaks. Joint sealing needs immediate replacement.

v) Wire roping has got damaged. Upon enquiry with IE team, repairs will be getting delayed due to non-availability of vendors to repair these short length



Poor condition of SR in Urban Section



Rigid Pavement Condition at Natavalasa toll plaza

Figure 4-1: Existing Distresses

4.2 Network Survey Vehicle (NSV)

The Network Survey Vehicle is the latest survey technique which utilizes Lasers, Global Positioning System and Video image processing tools. The survey vehicle is used for automatic data collection pertains to pavement condition and road inventory data, required for preparation of pavement maintenance and management proposals. It allows all the data to be collected in a single pass consequently minimising the time needed to complete the data collection. The measurement of surface distresses like cracking, ravelling, patching and potholes etc. is done using the calibrated image processing methods. The description of NSV and the methodology adopted is provided in **Annexure-4.1.**

The NSV survey has been carried out along the project corridor from 27/07/2024 to 01/08/2024 for collection of field data pertains to pavement condition and road inventory. The data has been collected separately for each lane of the Carriageway. NSV Vehicle at the site is shown below.



Figure 4-2: NSV survey

4.2.1 Evaluation of Pavement Condition

NSV survey has been conducted for assessment of pavement condition and its distresses. The pavement surface images captured by NSV were processed in Survey board and all the images are geotagged with corresponding co-ordinates and chainage. By manual intervention with Survey Board, it was mapped/ identified various distresses showing distress type, location, magnitude and severity.

Flexible Pavement Distresses

The following Pavement distresses are considered for assessing the flexible pavement condition as per IRC: 82-2015 “Code of Practice for Maintenance of Bituminous Road Surfaces”.

- Cracking
  - Longitudinal cracks
  - Transverse cracks
  - Alligator cracks/ Crocodile cracks
  - Multiple cracks
- Ravelling
- Shoving
- Bleeding
- Slippage/ Delamination
- Potholes
  - Area: Surface Area of the Pothole;
  - Numbers
- Edge break
- Patching

- Settlements, Depressions

Strip chart showing the observed pavement distresses is provided in **Annexure 4.2** separately for LHS and RHS directions along with roughness. Based on the pavement condition, suitable repair and rehabilitation strategy has been suggested and same shall be presented under the section of Major Maintenance of this report.

4.2.2 Pavement Roughness

The roughness data was collected at 100m interval using NSV on each lane in-terms of IRI (International Roughness Index) value. In Indian context, the IRI values were converted to BI as per IRC: SP:16-2019 "Guidelines on Measuring Road Roughness and Norms" with the following equation;

$BI = 630*(IRI)^{\wedge 1.12}$

Where

BI = Bump Integrator Roughness in mm/km

IRI = International Roughness Index.

Roughness data of Flexible & Rigid Pavement (Toll Plaza Section) was collected through Digital Laser Profilers System (DLP) and the same is presented in **Annexure 4.3**. The summary of Roughness values is presented in tables below

Table 4-1: Ranastalam-Anandapuram Section: Summary of Pavement Roughness

Condition as per IRC:82-2023, Table 5.1	Unevenness (mm/Km)	LHS						RHS					
		L1		L2		L3		R1		R2		R3	
		Length (Km)	Length (%)	Length (Km)	Length (%)	Length (Km)	Length (%)	Length (Km)	Length (%)	Length (Km)	Length (%)	Length (Km)	Length (%)
Flexible Pavement													
Good	<1800	45.1	94.0	45.3	94.4	45.5	94.8	43.8	91.3	45.4	94.6	44.9	93.5
Fair	1800-2400	2.3	4.8	1.9	4.0	1.7	3.5	3.6	7.5	2.3	4.8	2.8	5.8
Poor	>2400	0.6	1.3	0.8	1.7	0.8	1.7	0.6	1.3	0.3	0.6	0.3	0.6
Length (Km)		48.0	100.0	48.0	100.0	48.0	100.0	48.0	100.0	48.0	100.0	48.0	100.0

Table 4-2: Anandapuram-Hanumantvaka Section: Summary of Pavement Roughness

Condition as per IRC:82-2023, Table 5.1	Unevenness (mm/Km)	LHS				RHS			
		L1		L2		R1		R2	
		Length (Km)	Length (%)	Length (Km)	Length (%)	Length (Km)	Length (%)	Length (Km)	Length (%)
Flexible Pavement									
Good	<1800	16.444	91.6	13.200	73.6	13.744	76.6	16.944	94.4
Fair	1800-2400	1.000	5.6	2.944	16.4	2.500	13.9	0.800	4.5
Poor	>2400	0.500	2.8	1.800	10.0	1.700	9.5	0.200	1.1
Length (Km)		17.944	100.000	17.944	100.000	17.944	100.000	17.944	100.000

4.2.3 Rutting

Rutting data of Flexible Pavement has been collected through Digital Laser Profilers System (DLP) of NSV and the same is presented in **Annexure 4.4**. Some of the sections of the project highway has been noted with low-medium severity rutting for which, the existing HAM concessionaire has already done the repair works in removal of such observed wheel path ruts. The section wise observations are as under.

Project section is in good condition with low severity rutting of less than 10mm as noticed earlier by IE and the same has been repaired. At the time of consultant site visit no such rutting failures noted.

4.2.4 Test Pit Investigations

Test pit investigations have been planned to conduct at every 5km in a staggered manner ascertain the existing pavement composition (pavement course, material type, and thickness). However, the project is partially access control throughout the length, thereby no earthen shoulder has been found and thus test pits were taken at the locations where feasible to dug at the edge of the paved and earthen shoulder. The summary of existing pavement crust thickness is presented in table and some of the photographs showing the pavement crust thickness are shown as below.

Table 4-3: Summary of Existing Pavement Crust Thickness

Date of Sampling	Location of Trial Pit	Lanes	Pavement Composition (mm)						
			BT	PQC	DLC	WMM	Cemented layer	GSB	SUBGRADE
Ranastalam-Anandapuram									
05.08.24	659+700LHS	6	180	-	-	100	150	200	500
05.08.24	640+350RHS	6	110	-	-	100	160	200	500
05.08.24	648+700RHS	6	100	-	-	100	155	200	500

Date of Sampling	Location of Trial Pit	Lanes	Pavement Composition (mm)						
			BT	PQC	DLC	WMM	Cemented layer	GSB	SUBGRADE
Anandapuram- Hanumantvaka (Vizag city side)									
08.08.24	694+700LHS	4	130	-	-	150	-	170	500
08.08.24	698+900LHS	4	180	-	-	130	-	150	500
08.08.24	683+700RHS	4	110	-	-	130	-	210	500
08.08.24	690+700RHS	4	180	-	-	160	-	150	500



Figure 4-3: Pavement Composition & Thickness Measurement

Observations and Conclusions:

- The project section of Ranastalam to Anandapuram has been built with flexible type throughout the length except toll plaza location where it is found with rigid. The thickness as obtained are predominantly matching the design thicknesses.
- The pavement type for service road is flexible type and has been designed for 10MSA traffic.
- Throughout the project road, it is found that consistent bituminous/ Cemented/granular layer thickness.

During the above investigations, the existing subgrade soils samples were collected and tested in the laboratory to understand the properties of these foundation soils. The test results are presented in below sections.

Test Results: Ranastalam-Anandapuram Section

Location of Trial Pit	Nature of Soil (Visual Identification)	Sieve Analysis by % of passing			Sand Content %	Atterberg Limits			FSI %	MDD g/CC	OMC %	FDD g/CC	FMC %	CBR (4Days Soaked) %	Field CBR (DCPT) %	Depth of Water Table below Subgrade
		4.75mm	0.425mm	0.075mm		LL%	PL %	PI %								
659+700LHS	GC (Clayey Gravel)	59.6	38.3	20.5	39.1	33.4	17.1	16.3	10.0	2.00	9.0	1.74	9.0	10.5	15.0	Not found
640+350RHS	GC (Clayey Gravel)	53.5	39.6	25.6	27.9	31.4	16.3	15.1	10.0	2.02	8.5	1.67	8.0	10.8	16.0	Not found
648+700RHS	SC (Clayey Sand)	64.5	58.3	30.1	34.4	34.2	16.7	17.5	20.0	1.98	9.4	1.86	7.0	10.3	16.0	Not found

Test Results: Anandapuram- Hanumantvaka Section (City Side)

Location of Trial Pit	Nature of Soil (Visual Identification)	Sieve Analysis by % of passing			Sand Content %	Atterberg Limits			FSI %	MDD g/CC	OMC %	FDD g/CC	FMC %	CBR (4Days Soaked) %	Field CBR (DCPT) %	Depth of Water Table below Subgrade
		4.75mm	0.425mm	0.075mm		LL%	PL %	PI %								
686+700LHS	GC (Clayey Gravel)	58.3	41.6	28.1	30.2	34.5	18.3	16.2	10.0	2.03	9.2	1.73	9.0	11.0	17.0	Not found
710+960LHS	GC (Clayey Gravel)	53.9	38.1	25.6	28.3	31.5	15.4	16.1	10.0	2.12	8.0	2.049	7.0	12.9	18.0	Not found
703+520RHS	GC (Clayey Gravel)	45.8	32.1	20.3	25.5	26.9	16.4	10.5	10.0	2.13	8.5	2.073	8.0	13.5	15.0	Not found

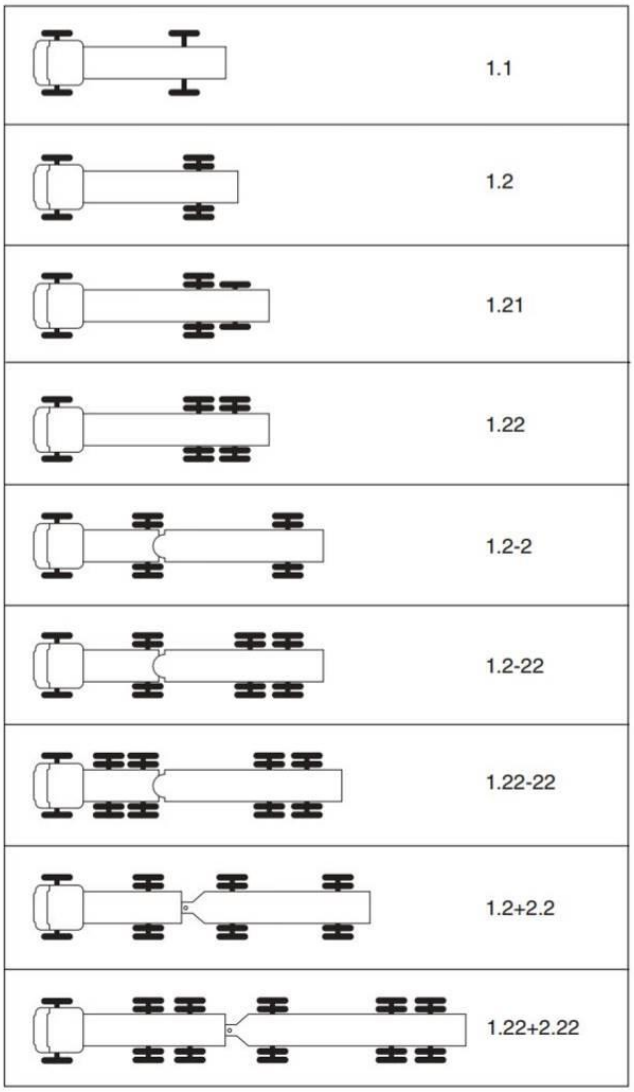
Observations and Conclusions

The subgrade soils are generally consistent throughout the project road and CBR values are in compliance with the design CBR as adopted during the 6-lane works. Further, it has been observed during the site visit that most of the soils in the region found to be red soil having CBR values more than 10% and this is one the reason for better performance of the pavement of the project highways.

4.3 Axle Load Survey

Vehicle axle loading has a significant effect on pavement design and its impact on performance of the pavement. Therefore, an axle load survey has been conducted from 26th July-2024 to 02nd Aug-2024 in compliance with IRC 37 2018 and such survey was conducted for 24 hours in both directions at each of the existing 4 No's toll plaza locations along the project highway from Narsannapeta-Anakapalli.

The type of vehicle considered for axle load survey along with its axle configurations are presented in below. Few of the survey photographs were shown in Photos as below:



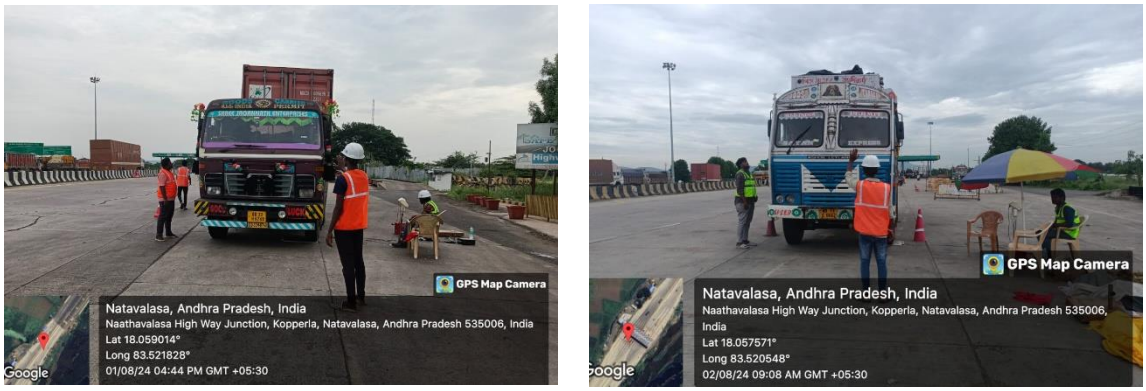


Figure 4-4: Axle Load Survey

The VDF analysis was carried as per procedure given IRC: 37-2018 based on the collected axle load data. The equations for computing equivalency factor for single, tandem and tridem axles given below is used as directed in the IRC:37-2018 for converting different axle load repetitions into equivalent standard axle load repetitions.

- Single axle with single wheel on either side = {axle load in kN / 65}4
- Single axle with dual wheel on either side = {axle load in kN / 80}4
- Tandem axle with single wheel on either side = {axle load in kN /148}4
- Tridem axle with dual wheel on either side = {axle load in kN /224}4

With the stated above procedure, the Vehicle Damage Factor for each class of commercial vehicle on both the directions were calculated separately for empty and loaded vehicles. The Axle load data format and VDF analysis are presented in **Annexure 4.5** and obtained VDF values comparing the values adopted at the time of pavement design during construction summarized in table below.

Table 4-4: Vehicle Damage Factors (VDF)

S. No	Toll plaza	Nathavalasa	
		Km 656.704	
	Vehicle Type	LHS	RHS
1	Bus	1.07	0.92
2	LCV	2.11	1.91
3	2-Axle	2.77	3.11
4	3-Axle	1.71	7.66
5	MAV	5.15	9.9

There is a significant difference between the axle loads of commercial vehicles flying in both directions of traffic, due in inconsistent commodity pattern generating from different locations along the project highway and thus, separate factors have been considered for traffic assessment. Further, 7-day axle load survey has been conducted to validate the above inconstancy and found that VDF values as obtained from these 7-day survey is less than 24 hours' survey and hence adopted the above values in the present due diligence study.

4.4 Falling Weight Deflectometer (FWD)

The structural evaluation of pavement has been carried out in accordance with IRC: 115-2014, "Guidelines for Structural Evaluation and Strengthening of Flexible Road Pavements Using Falling Weight Deflectometer (FWD) Technique" to determine the remaining life of the pavement structure.

The principle and description of FWD and its methodology is provided in **Annexure 4.6.**

FWD deflection measurement has been carried out for each direction and the measurement has been carried out at a test point along outer wheel path of each direction which is at an offset of 1m from the outer edge of outer lane as specified in section 5.4.5 of IRC: 115-2014. At every measurement location, four drops were made, such that the first drop was the '**seating drop'** and with the remaining three drops deflections were recorded. Field survey photographs is shown below.

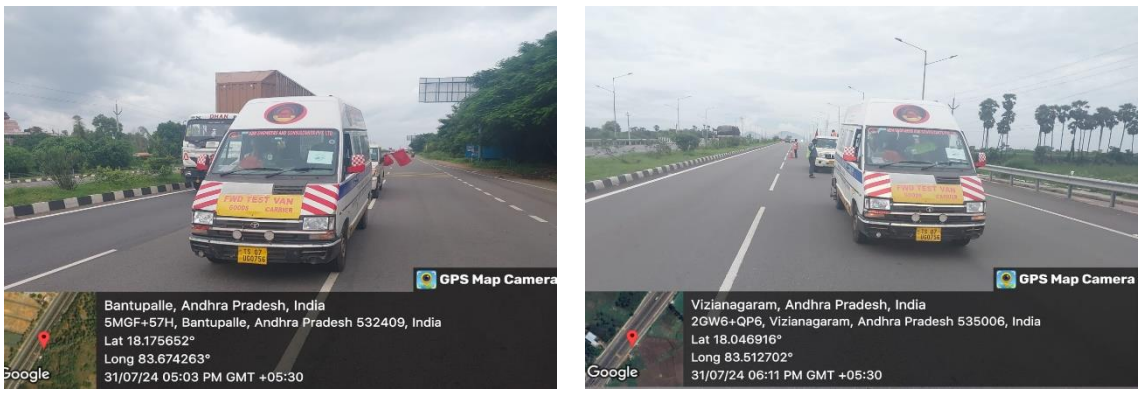
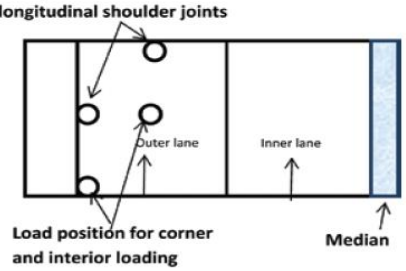


Figure 4-5: FWD Survey at Project Site

The deflection testing has been carried out on the existing pavement as per IRC Codes at the rate of 5 points per km as stipulated in TOR of the Consultant.

Adopted deflection measurement scheme is as under.

Adopted Measurement Scheme	Maximum Spacing(m) for test points along selected wheel path (Flexible Pavement)	Rigid Pavement
(i) measurement along outer wheel paths of outer lanes (3 points)	200	Load position for transverse and longitudinal shoulder joints 
(ii) measurement along the outer wheel path of inner lane (2 points)	400	

4.4.1 Back-calculation of Layer Moduli for Flexible Pavement

Layer moduli have been back-calculated using KGPBACK program. The pavement has been modelled as a three-layer system with bituminous layer, granular layer and subgrade. The following inputs have been provided for back analysis.

i) Single wheel load 40 kN and contact pressure 0.56 MPa
ii) No. of deflection sensors: 9
iii) Radial Distances of the Geophones i.e., 0,200, 300,450, 600, 900 and 1500mm
iv) Measured Surface Deflections normalized to 40kN in mm
v) Pavement Layer Thicknesses (as measured from Trial Pits)
vi) Poisson's ratio for different layers i.e., 0.35 for bituminous, granular and subgrade
vii) Range of Possible modulus value (Min.- Max.) of bituminous layer, granular layer and subgrade.

Ranges of different layer moduli have been given as input to KGPBACK for back-calculation. These ranges have been selected judiciously by experienced pavement engineering taking into considerations the approximate age of pavement, visual assessment of the condition of bituminous layer, climatic conditions prevailing at the time of deflection measurements and information available from test pits, and laboratory tests conducted as detailed below:

Range of modulus value of existing subgrade:

The range of moduli of existing subgrade is taken based on the subgrade CBR values for the analysis.

Range of modulus value of existing granular layers i.e., base and subbase:

The range of moduli of existing granular layers is based on Appendix III.8.4 of IRC 115-2014.The range for combined (base and sub-base) is taken as 100-500 MPa.

Range of modulus value of existing thick bituminous layers:

The range of moduli of existing thick bituminous layer has been determined on the basis of condition data. If the road condition is good the range is considered as 750 MPa to 3000 MPa, for sections with pavement condition is Fair- Poor, the range specified for thick bituminous layer 400 MPa to 1500 MPa as stipulated in Appendix III.8.4 of IRC: 115-2014 has been taken into consideration.

4.4.1.1 Correction for Temperature

Back-calculated moduli values of the bituminous layers evaluated by FWD survey are influenced by the pavement temperature. The standard pavement temperature for India is recommended as 35°C, hence the back-calculated moduli obtained at temperatures other than the identified standard temperature will have to be corrected using a suitable correction factor using equations 4 and 5 of IRC:115-2014 and the same is extracted below for ready reference.

$$E_{T1} = \lambda E_{T2} \ldots\ldots \textbf{(4)}$$

Where,

λ temperature correction factor, is given as

$$\lambda = \frac{(1-0.238 \ln T_1)}{(1-0.238 \ln T_1)} \ldots\ldots \textbf{(5)}$$

Where,

E_{T1} = Back-calculated modulus (MPa) at temperature $T_1^0\ C$

E_{T2} = Back-calculated modulus (MPa) at temperature $T_2^0\ C$

However, in few sections, after applying the temperature correction the E value of bituminous layers are coming more than 3000MPa. As the project road was constructed with VG-30/VG-40 grade bitumen, it is restricted to keep the maximum E value of 3000MPa, wherever it is exceeding. In these locations, the temperature correction factor was applied as 1.

4.4.1.2 Correction for Seasonal Variation

Moisture content affects the strength of subgrade and granular sub base/base layers. Therefore, the back-calculated moduli of subgrade and granular layers should be taken from field moduli using seasonal corrections. Seasonal correction equations 7 and 8 of IRC: 115-2014 has been extracted below for ready reference.

$$E_{sub_mon=}\ 3.351 * \left(E_{sub_win}\right)^{0.7688} - 28.9 \ldots (6)$$

$$E_{sub_mon} = 0.8554 * (E_{sub_sum}) - 8.461 \ldots (7)$$

where,

E $_{sub_mon}$ = subgrade modulus in monsoon (MPa)

E $_{sub_sum}$ = subgrade modulus in Summer (MPa)

E $_{sub_win}$ = subgrade modulus in Winter (MPa)

$$E_{gran_mon=}\ -0.0003 * \left(E_{gran_sum}\right)^2 + 0.9584 * \left(E_{gran_sum}\right) - 32.989 \ldots (8)$$

$$E_{gran_mon=}\ 10.5523 * \left(E_{gran_win}\right)^{0.624} - 113.857 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

where,

E $_{gran_mon}$ = granular layer modulus in monsoon (MPa)

E $_{gran_sum}$ = granular layer modulus in Summer (MPa)

E $_{gran_win}$ = granular layer modulus in Winter (MPa)

Since the deflection measurements have been carried out in the month of December hence seasonal correction factor is applicable.

The 15th percentile value (as the same has been recommended by IRC: 115-2014 for purpose of design) of back-calculated & corrected layer moduli of each identified homogeneous sub-sections of both directions separately are presented next.

4.4.1.3 Results of Back Calculated Modulii (E) of Pavement Layer

The summary of back calculated E values is presented in **Annexure 4.7**.

4.4.1.4 Remaining Life Estimation for Flexible Pavement

The in-service three-layer pavement system has been analysed with the back-calculated corrected layer moduli and layer thicknesses. The critical strains have been calculated by IITPAVE program. From the performance criteria equations, the residual/remaining rutting and fatigue life have been estimated.

Performance Criteria

The layer moduli of in-service pavement back calculated from FWD deflection data are used to analyse the pavement for critical strains which are indicators of pavement performance in terms of rutting and fatigue cracking. The following approach is proposed for design of bituminous overlays for existing flexible pavements. The mechanistic criteria (fatigue and rutting) adopted in the IRC:37-2018 “Guidelines for the Design of Flexible Pavements”, forms the basis for the overlay design method. Performance models adopted in these guidelines are given below.

a) Fatigue in Bituminous layer:

As it specified in IRC: 115-2014, the fatigue model for 90 percent reliability was used as below

$$N_f = 0.711 * 10^{-04} \times [1/\varepsilon_t]^{3.89} * [1/M_R]^{0.854}$$

As it specified in IRC: 37-2012, the fatigue model for 80 percent reliability was used as below

$$N_f = 2.21 * 10^{-04} \times [1/\varepsilon_t]^{3.89} * [1/M_R]^{0.854}$$

Where,

N_f = fatigue life in number of standard axles,

ε_t = Maximum Tensile strain at the bottom of the bituminous layer

M_R= resilient modulus of the bituminous layer.

b) Rutting in Subgrade:

Rutting model for 90 percent reliability level as specified in IRC: 115-2014 was used as below;

$$N = 1.41 \times 10^{-08} [1/\varepsilon_v]^{4.5337}$$

As it specified in IRC: 37-2012, the rutting model for 80 percent reliability was used as below

$$N = 4.1656 \times 10^{-08} [1/\varepsilon_v]^{4.5337}$$

Where,

N= Number of cumulative standard axles, and

ε_v= Vertical strain in the subgrade

The detailed remaining life analysis is done using 90 percent reliability equation of IRC: 115-2014 is presented in tables below for LHS and RHS carriageway.

Table 4-5: Section-wise Pavement Remaining life

S.No	Homogeneous sections			Existing Thickness, mm		Total Crust	Remaining Life @ 90% Reliability		
	From, km	To, km	Length	BT	Granular		Fatigue	Rutting	Remaining Life, MSA
Ranastalam - Anandapuram Section (LHS)									
1	634.000	635.200	1.200	180	500	680	166.3	8706.8	166.3
2	635.200	638.800	3.600	180	500	680	167.4	8773.4	167.4
3	638.800	648.000	9.200	180	500	680	170.3	8874.4	170.3
4	648.000	654.000	6.000	180	500	680	182.2	9293.2	182.2
5	654.000	660.800	6.800	180	500	680	170.7	8874.4	170.7
6	660.800	663.400	2.600	180	500	680	168.6	8806.9	168.6
7	663.400	667.000	3.600	180	500	680	170.8	8840.6	170.8
8	667.000	669.400	2.400	180	500	680	174.9	9011.4	174.9
9	669.400	670.800	1.400	180	500	680	178.3	9186.3	178.3
10	670.800	675.300	4.500	180	500	680	207.8	10245.8	207.8
11	675.300	681.200	5.900	180	500	680	285.5	12904.1	285.5
12	681.200	682.600	1.400	180	500	680	284.0	12850.7	284.0
Ranastalam - Anandapuram Section (RHS)									
1	682.600	681.000	1.600	180	500	680	226.0	10918.3	226.0
2	681.000	676.600	4.400	180	500	680	250.3	11740.6	250.3
3	676.600	670.800	5.800	180	500	680	240.9	11412.1	240.9
4	670.800	669.400	1.400	180	500	680	282.8	12850.7	282.8
5	669.400	660.800	8.600	180	500	680	185.8	9438.1	185.8
6	660.800	656.500	4.300	180	500	680	164.9	8673.7	164.9
7	656.500	651.000	5.500	180	500	680	168.6	8806.9	168.6
8	651.000	644.800	6.200	180	500	680	169.7	8874.4	169.7
9	644.800	641.200	3.600	180	500	680	148.5	8043.5	148.5
10	641.200	638.800	2.400	180	500	680	150.8	8134.4	150.8
11	638.800	638.000	0.800	180	500	680	162.7	8608.0	162.7
12	638.000	634.000	4.000	180	500	680	160.2	8478.5	160.2
Anandapuram – Hanumantvaka Section (LHS)									
1	682.600	684.500	1.900	160	300	460	109.5	1922.0	109.5
2	684.500	687.000	2.500	160	300	460	127.6	2158.4	127.6
3	687.000	688.400	1.400	160	300	460	117.6	2064.4	117.6
4	688.400	690.600	2.200	160	300	460	122.3	2140.4	122.3
5	690.600	693.600	3.000	160	300	460	125.8	2219.9	125.8
6	693.600	694.700	1.100	160	300	460	125.9	2195.1	125.9
7	694.700	696.600	1.900	160	300	460	121.2	1815.6	121.2
8	696.600	698.400	1.800	160	300	460	123.1	1855.3	123.1
9	698.400	701.000	2.600	160	300	460	124.1	1865.3	124.1
Anandapuram Hanumantvaka Section (RHS)									

S.No	Homogeneous sections			Existing Thickness, mm		Total Crust	Remaining Life @ 90% Reliability		
	From, km	To, km	Length	BT	Granular		Fatigue	Rutting	Remaining Life, MSA
1	701.000	698.750	2.250	160	320	480	92.1	1739.4	92.1
2	698.750	697.150	1.600	160	320	480	92.2	1730.1	92.2
3	697.150	694.800	2.350	160	320	480	89.5	1684.7	89.5
4	694.800	692.600	2.200	160	320	480	94.3	1767.5	94.3
5	692.600	691.800	0.800	160	320	480	81.0	1541.0	81.0
6	691.800	691.000	0.800	160	320	480	85.5	1615.1	85.5
7	691.000	689.000	2.000	160	320	480	88.6	1662.6	88.6
8	689.000	687.000	2.000	160	320	480	78.1	1493.8	78.1
9	687.000	685.200	1.800	160	320	480	77.0	1474.7	77.0
10	685.200	683.250	1.950	160	320	480	82.2	1573.4	82.2

4.5 Mobile Bridge Inspection Unit (MBIU)

4.5.1 Specification

The Mobile Bridge Inspection Unit (referred as (MBIU) is an electro-mechanically driven articulated structure mounted on a vehicle (a truck) as an aid towards proper inspection of bridges or similar infrastructures by enabling an inspection team of 2-3 persons carrying instruments access to the underside of bridge decks overflowing rivers or gorges. The present version is the truck mounted system. As per TOR condition survey of existing structures greater than 60m shall be carried using MBIU.

The overall objective of the condition survey is to identify the need for structural maintenance, rehabilitation and replacement. Signs of distress such as spalling, scaling, cracking, leaching, excessive deflection, inadequate cover, settlement, exposed reinforcement, corrosion in the reinforcement; shear cracks etc. are identified during this exercise. Special emphasis is given on expansion joints and bearing. Also, the condition of the Approaches, water way and bed protection is examined. The survey identifies the bridges which are more distressed and require testing for their evaluation and rehabilitation measures. Also bridges which require general measures for rehabilitation. Inspection report is prepared in accordance with IRC: SP-35. The report provides recommendation whether a bridge is acceptable to continue in use, whether it can be repaired and/or modified e.g. widened or a new structure.

The structure inventory and condition assessment are given in **Annexure 3.2.** The following structures have been inspected using MBIU machine.

Table 4-6: List of Inspected Structures using MBIU

Sr. No.	Chainage (Km)	Side		Remark
		LHS	RHS	
Ransastalam – Anandapuram Section				
1	641+230	LHS	RHS	Flyover
2	643+017	LHS	RHS	Major Bridge

Sr. No.	Chainage (Km)	Side		Remark
		LHS	RHS	
3	655+573	LHS	RHS	Major Bridge
4	675+164	LHS	RHS	Major Bridge

4.5.2 Working Principle

The work of condition survey requires use of Mobile Bridge Inspection Unit at the various bridge sites on the National Highways to overcome the accessibility problems. MBIU increases the accessibility for inspection of underside of high-level bridge decks and helps in continuous inspection of throughout the span of bridge. It has five folded arms. All of them are electro-mechanically operated.

Once the platform is erected by certified person, Inspection and maintenance experts can inspect underside of bridge, note observations as per IRC SP-35 & IRC SP-52 and take photographs for reference.

4.5.3 Advantages

- A large operating range
- A high level of working comfort
- Maximum operational safety
- The shortest possible setting up and dismantling times
- Full mobility in inspection operation without stabilizer supports
- An optimum weight/performance ratio



Figure 4-6: MBIU Survey

4.6 Drone Videography of Entire Stretch

Videography of entire Project Stretch is captured through Drone cameras flown at about 50m above ground. This shall be useful for observing various features of Project Stretch from bird's eye level.



Figure 4-7: Drone Videography

Section 5: Review of Documents

5.1 General

Technical Consultant (TC), since the start of technical due diligence study, has requested for various documents from the Client. A list of documents required were shared with the Client before TC team started the study which was appended with few more queries after the conclusion of the site visit once the project site is appraised. Most of the queries were also discussed with the Client in many meetings. This section of the report deals with the documents requested by TC and its review along with highlighting major issues found during this review.

5.2 Documents Collected and Reviewed

List of documents requested, received and reviewed are given below:

S. No.	List of Documents	Status of Documents	Remarks on Review
DOCUMENTS RELATED TO CURRENT ACQUISITION			
1.	Concession Agreement	Partially Available	Technical Schedules A, B, C and F are made available to the Consultant. These schedules are modified from the standard provisions given in manual as below: Sch A: Existing features Sch B: Scope of Work including facilities to be provided Sch C: Specifications and Standards Sch F: Maintenance Requirements Table 1 of Sch F provides maintenance criteria for pavements which has performance parameter, desirable and acceptable level of service, frequency of inspection and time limit for rectification/repair. Sch F specifies roughness value as 2000 mm/km desirable and 2400mm/km acceptable for flexible pavement. These values are 2200mm/km and 2400 mm/km respectively for rigid pavement. Sch B states that the concessionaire shall carry out the periodic maintenance in full length of the project stretch including main carriageway, service/slip Road, ramps and at facilities etc. either in every sixth year or in the year in which roughness index exceeds the limit as given in schedule F whichever comes earlier. Further, it was clarified in the pre-bid queries reply that periodicity of 6-year overlay will be applicable from O&M handover date. Though draft CA is not available, Consultant has referred the CA of earlier roads wherever required presuming that there shall not be any change in Contract Conditions.
2.	Detailed Project Report/ Technical Due Diligence Report	Available	This report is used as reference for inventory & condition of the assets and improvement proposals. Estimated cost of engineering and

S. No.	List of Documents	Status of Documents	Remarks on Review
			safety improvements in this report does not assign any cost for Invit Concessionaire. O&M cost estimated in this report is 197.94 Cr for operation expenses, 49.74 Cr for routine maintenance expenses and 260.48 Cr for periodic maintenance for the entire concession period at 2024 prices.
3.	FWD data	Available	The reports of FWD were available as a reference document for TC.
4.	Latest MPRs	Available	Consultant collected the IE-MPRs for April, May & June – 24 from the NHAI – PIU during the site visit. Reports provide details about the Project Road and key maintenance activities undertaken by the HAM Concessionaires during that period.
5.	Maintenance History	Not available	There is no maintenance history available for the Project Road.
6.	NSV data	Available	The reports of NSV are available as a reference documents for TC.
7.	AADT for each section and Growth rate	Available	AADT along with traffic projections for the project roads have been provided by Client.
8.	Concession Period	Not available	TC has adopted 20 years concession period with reference to the CA of earlier roads.
9.	Projected Escalation factor	Not available	In absence of projected escalation factor, all cost are given at the present rate as per the direction of the Client.

5.3 Key Technical Issues

5.3.1 Damaged Bearings

Problems with the bearings are observed in the form of tilting, cracking, not properly placed and compressed. Affected structures are

MJBR: @ 655+573 and @ 675+164

Flyover: @ 641+230

It is presumed that existing HAM Concessionaires will fix all these bearings before handing over.

5.3.2 Pavement

Pavement at service road is distressed at many locations, may be due to higher traffic loading. It is also noticed that most of the panels of Rigid Pavement at Natavalasa Toll Plaza got damaged with high severity of longitudinal, transverse, multiple cracks, corner breaks. Joint sealing needs immediate replacement.



Natavalasa Toll Plaza-Rigid Pavement Distresses.



Poor Condition of SR in Urban Section

Section 6: Capital Expenditure Requirement

6.1 Improvement Works as per Schedule B

Schedule B of each stretch specifies the requirements of improvement which the concessionaire has to construct as per the completion schedule specified in Schedule B. Major works and reference used to quantify these construction requirements are listed below:

- Approach slabs reconstruction: Ref Cl 3.2 III of Sch B.
- Junction improvement: Ref Cl 4 of Sch B.
- Curve improvement/ Minor Jn improvement: Additional signages and studs are considered as per Cl 4 of Sch-B.
- Truck lay bye: Sewage disposal system as per Cl 8.2 of Sch B
- Landscaping and median plantation: Cl 8.4 of Sch B
- Transverse bar marking: Cl 9.3 of Sch B
- Antiglare: Cl 9.5 of Sch B
- Kerb stones: Cl 9.6 of Sch B

Improvement Scope specified for each stretch is tabulated below:

Table 6-1: New Construction Requirements

S. No.	Description	Unit	RA	AH
1	Approach slabs reconstructed	Nos.	12	2
2	Junction improvement	Nos.	60	44
3	Curve improvement: Additional signages and studs are considered as per Sch-B.	Nos.	50	25
4	Truck lay bye: Sewage disposal system	Nos.	3	0
5	Landscaping and median plantation	km	13.2	5,34
6	Transverse Bar Marking	Nos.	4	26
7	Antiglare	Km	5	-
8	Kerb stone	Lm.	17,143	17,564

RA: Ranastalam – Anandapuram

AH: Anandapuram - Hanumantvaka

Time to complete above construction works in within 3/6 months from the Handover Date based on completion schedule for improvement proposals given in Schedule B.

6.2 Immediate Maintenance Requirements

The sections are under HAM (Annuity) concession up to 2035/36 and under PBMC up to 2030. So, obligation for immediate repair requirements do not lie with InvIT Concessionaire. However, toll plaza renovation cost and TMS replacement cost has been considered for existing toll plaza.

6.3 Capital Expenditure (CapEx)

Cost of capital expenditure (CapEx), worked out as explained above, are presented below.

Table 6-2: Immediate Maintenance

Description	Ranastalam-Anandapuram
Toll plaza improvement	2.95
TCMS	5.01
Total	**7.96**

Table 6-3: Improvement Works as per Schedule – B

Description	Ranastalam-Anandapuram	Ranastalam-Hanumanthavaka
Initial Improvement as per Schedule B	3.91	3.97

Section 7: Operation & Maintenance

7.1 General

The O & M requirements for the project facilities are normally specified in the Concession Agreement (CA). Though Schedule F is made available to the Consultant, CA is not yet available. Hence Consultant has taken reference from the CA of Round 3 roads presuming there is no change in the Contract conditions. Maintenance requirements are referred mainly under following Articles/ Schedules:

- Article 15 - Operation and Maintenance
- Article 16 - Monitoring and supervising during Operations
- Article 17 – Traffic Regulation
- Article 18 and Schedule H – Safety Requirements
- Schedule F- Maintenance Requirements

7.2 Requirement as per Concession Agreement

Schedule F of the Concession Agreement sets out the Operation and Maintenance requirements for the Project. As per this schedule, scope for Operation and Maintenance includes but not limited to following obligations:

- ✓ **Improvement** – This includes improvement of the existing assets as per requirement of this Agreement and safety audit.
- ✓ **Maintenance of Civil Works and Assets**- this includes maintenance of civil works and all assets as per requirement of this agreement.
- ✓ **Road Maintenance** –This includes routine maintenance, preventive maintenance, periodic maintenance as per IRC:82-2015, Design overlay as per Manual of 4-laning/6-laning, disaster maintenance, exigencies, and inspections.
- ✓ **Traffic Management** – This includes enforcement of regulations together with the relevant authorities. This also includes hazard response, information gathering and dissemination, Road patrols and ATMS surveillance etc.
- ✓ **Safety**– This includes accident prevention, after care, user education, enforcement, data collection and analysis.
- ✓ **Facility Management** – This includes periodic inspections, routine maintenance, Rehabilitation, and expansion planning.
- ✓ **Road property management** –This includes management of access, encroachment, and ribbon development.
- ✓ **General responsibilities** –This includes budgeting, compliance with legal and accounting requirements, and public relations.
- ✓ Maintaining public relations unit to interface with and attend to suggestions from users of the highway, the media, Govt. agencies and other external agencies.

Routine Maintenance: These are maintenance needs required on daily, weekly, monthly and annual basis for the smooth and efficient running of traffic and includes the activities of minor repairs of all project elements, cleaning of road furniture, replacement of consumables,

horticulture maintenance, keeping the project site /project facilities clean, tidy and orderly condition free of litters and debris, preventing unauthorized entry and exit including any encroachment etc.

Preventive Maintenance: Preventive maintenance shall include the activities related to each element and the system as a whole of the Project Highway to ensure that during the Concession Period and at its end is in sound, durable and functional condition. In other words Preventive maintenance are a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without significantly increasing the structural capacity).

Periodic Maintenance: These are maintenance needs required on periodic annual basis. The periodic maintenance can be further divided into two sub heads namely (i) functional overlay to improve the riding quality and (ii) structural overlay to improve the structural strength of the pavement.

Factor influencing periodic maintenance: performance parameter for flexible pavement in terms of roughness as given in Schedule F is 2000 mm/km as desirable and 2400 mm/km as acceptable. Clause 4 (III) of Schedule B states that periodic maintenance shall be carried out in full length of the project stretch including main carriageway, service/slip road and at facilities etc. either in every six years or in the year in which roughness index exceeds the limit given in schedule F, whichever comes earlier.

7.3 O&M Cost Estimation

7.3.1 Routine maintenance

This is a day-to-day work that is necessary to preserve and keep a pavement as close to as constructed condition and to ensure smooth and functional conditions all the times. The item in this subhead includes maintenance of earthen shoulder, restoration of rain cuts, maintenance of slope protection works, cleaning of road side drains, cleaning of carriageway, maintenance of structures, repairs of road surface such as filling of potholes, repairing of cracks and patch works, carrying out of Road roughness survey, FWD test etc.

7.3.2 Repair/Maintenance

Repair/maintenance covers the minor repair which are required on day-to-day maintenance to maintain the assets in good condition. This is sub-divided in two categories as below:

a) **Preventive Maintenance:** The preventive maintenance is required to be done for further improve or extend the functional life of pavement surface whist in fair to good condition. Any of the treatment under preventive maintenance does not significantly increasing the structural capacity of pavement rather which decreases rate of surface deterioration, which may result in saving of pavement from leading to poor condition where major maintenance could be inevitable.

Future preventive maintenance on the project road depends largely on routine inspection of the pavement with careful observation of specific distress and to take a decision at that time and suitable type of preventive maintenance treatment and its timing. All the narrow and wide surface cracks must be arrested immediately after identification with fog/slurry seals as the most recommend preventive type maintenance measure for the in-service flexible pavement.

Based on the condition and distress identification survey as explained above paragraph, preventive maintenance treatments have to be taken up immediately to reduce rate of further damage to the surface and for enhance the pavement performance to the condition similar to non-distressed surface condition.

b) **Road Property Maintenance:** The item in this subhead covers the plantation/ maintenance of shrubs, turfing, replacement/ repair of damaged railing, crash barrier, kerbs, road delineators, signage, Road marking and painting etc.

7.3.3 Toll Management System

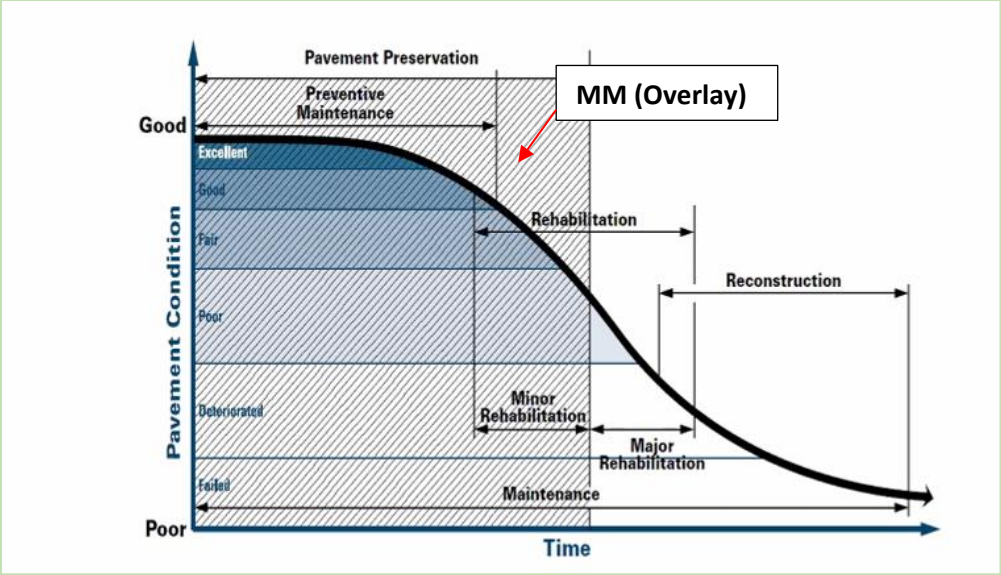
Cost estimate for Toll Management System was worked out by TC. Same was presented and deliberated during the investor meet, after that it was decided to adopt the rationalised cost finalized by IM.

7.3.4 Corridor Management

Incident Management: The items in this subhead include minimize the effects of incident and restore normal capacity and safety levels to all affected road facilities as efficiently as possible and. repair/ replacement of removing the dead animals & broken-down vehicles etc.

7.4 Major Maintenance

The pavement deteriorates with time caused by traffic movement and weather conditions. The rate of deterioration depends on the original design, type of maintenance being done/undertaken and time of application. Therefore, timely and appropriate maintenance of bituminous surface using suitable materials is essential to increase the pavement service life to a greater extent. Any delay in maintenance of the pavement substantially increases severity of the distresses, which results into poor condition of pavement as depicted in figure below and thereby increase in maintenance costs to bring the surface to a good condition.



Therefore, timely maintenance of the pavement is required for its satisfactory performance both in terms of functionally and structurally during the pavement service life.

Schedule F of the Concession Agreement set out the maintenance requirements in the Project. The performance parameters are indicated in schedule F descripting the nature of defect/deficiency along with time limits for repair/rectification for roads and bridges.

Schedule F, Pavement Roughness Value (Functional Overlay): The Periodic maintenance is required to be provided as and when performance parameters in terms of cracking, roughness and rutting etc. exceeded the limits as indicated in the schedule F anytime during the service life of the pavement. As per the provisions of Concession agreement, Surface roughness value is the major governing factor for selection of an appropriate pavement maintenance treatment required to bring the roughness value below the prescribed limit of 2000mm/km.

Pavement Strengthening (Structural Overlay): When the pavement is structurally deficient having high severity alligator/fatigue cracks, rutting and other associated distresses, then the structural overlay is required to be provided for strengthening of the pavement to cater for the anticipated design traffic. The pavement strengthening may be required when the

- Remaining life of the in-service pavement as evaluated using Falling Weight Deflectometer (FWD) is less the design traffic as calculated till end of the concession.
- Before expiry of initial design traffic as adopted at the time of asset construction.

7.4.1.1 Review of Major Maintenance History

As per the review of available reports and discussions with IE during O&M that no major maintenance/rehabilitation that has been carried out in the project being the 6-construction works were completed recently. The routine maintenance consists of rectification of rutting and repair of cracked concrete panels in progress by the existing HAM Concessionaire.

7.4.1.2 Design Traffic during the Concession Period

The design traffic in terms of MSA during the concession period has been calculated based on the current traffic pattern and data shared by the NHIIPL. The Vehicle Damage Factors (VDF) has been adopted as obtained from the present survey. The summary of design traffic during the concession period is as under.

Table 7-1: Summary of Design Traffic during Concession Period

Project Stretch	Direction	Design Traffic in MSA	
		10 years (FY35)	20 years (FY45)
Ranasthalam to Anandpuram Section	LHS	40	103
	RHS	76	195

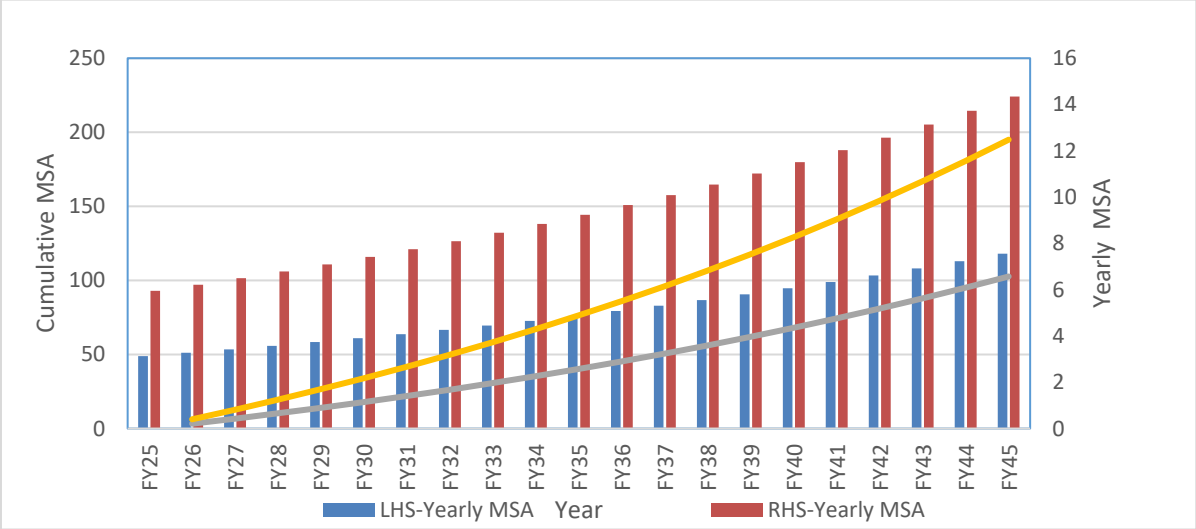


Figure 7-1: Design Traffic in MSA (Ranasthalam to Anandpuram Section)

In combination of above anticipated design traffic patterns, remaining life of the existing pavement as explained under surveys and investigation chapter, the pavement condition for distresses and roughness, the existing pavement is requiring repair and rehabilitation to be carried out by the TOT concessionaire to bring the pavement surface to the desired level of serviceability.

From the remaining life analysis as explained under surveys and investigation chapter, it is found that most of the pavement sections having remaining life more than the projected design traffic on LHS & RHS. Hence functional overlay in terms of bituminous overlay of 40mm BC at the end of every 6th year from the date of O&M handover date for the Main Carriageway and 40mm BC for service roads to extend the life of the pavement and improve and maintain the road roughness levels during O&M phase of the InvIT Concessionaire.

7.4.1.3 Immediate and Future Major Maintenance Requirement

Major maintenance is required to comply with provisions of concession agreement and to maintain performance levels as defined in schedule F throughout the operation and maintenance period.

As per schedule B, the TOT concessionaire shall carryout the periodic maintenance in full length of the project stretch including main carriageway, service roads and facilities in every 6th year or the year in which roughness index exceeds the limits given in schedule F, whichever comes earlier.

Therefore, considering the initial pavement design period and crust, remaining life data, anticipated traffic loading during the concession period, and in compliance to the provisions of schedule B, the following cycle of Major maintenance is proposed for satisfactory performance of the pavement during operation period for both functionally and structurally.

Table 7-2: Proposed Major Maintenance Cycles for Balance Concession period

Name of Stretch	InvIT Concession (20 years)				
	CAPEX	Routine Maintenance	Periodic Maintenance	ATMS & TMS Replacement	Toll Operation & Admin Cost
Ranastalam-Anandapuram	Toll plaza renovation cost TMS (all the existing defects to be rectified by HAM Concessionaire)	**Till O&M Handover**: Manpower cost for clearing considered **After Handing Over**: Regular	**FY36**-Revalid. Survey **FY37**- Improvement works as per Sch.-B & road marking **FY42**- ***MCW & SR***: 40BC, 50DBM for 10% length, ***Rigid***: Retexturing, replacement of joint sealant and 2% of panel replacement, ***Structure***: Replacement of wearing coat, expansion Joint, Bearing replacement for 40% of total number **FY45**-Road marking + Micro Surfacing	**FY33** 50% TMS **FY41**- 100%TMS 40%ATMS	01.04.2025
Anandapuram-Visakhapatnam	NIL (all the defects to be rectified by Existing Performance based contractor)	After Handing Over	**FY30**-Revalid. Survey, Improvement works as per Sch.-B & road marking **FY32**- **MCW & SR**: 40BC, 50DBM for 10% length, ***Structure***: Replacement of wearing coat, 50% of expansion Joint and Bearing replacement for 50% of total number **FY35**-Road marking **FY38**- ***MCW & SR***: 40BC, 50DBM for 10% length, ***Structure***: Replacement of wearing coat, 50% of expansion Joint and Bearing replacement for 50% of total number **FY41**-Road marking **FY44**- ***MCW & SR***: 40BC, 50DBM for 10% length, ***Structure***: Replacement of wearing coat & painting	**FY36** – 40% ATMS **FY43**- 60% ATMS	No toll Operations as there is no toll plaza.

7.4.1.4 Cost of Operation & Routine Maintenance

Cost of Operation & Routine Maintenance per annum are presented below.

Table 7-3: Cost of Operation & Routine Maintenance (per annum)

Description	Cost (Crore INR)	
	R-A	A-H
Tolling & TMS Operations (Varies) Min-Max	4.62-5.74	-
ATMS Operation	1.38	1.24
Incident Management	3.27	3.03
Admin Expenses (Varies) Min-Max	4.27-6.05	
Insurance (Varies) Min-Max	0.11-1.58	0.02-0.27
Power cost excl. Toll Plaza	2.11	0.65
RAMS, BMS & Survey	1.17-1.65	0.64-0.78

7.4.1.5 Cost Estimate (Initial Improvement, MMR and O&M)

Year-wise cost estimate of Initial Improvement, MMR and O&M are given below

Table 7-4: Cost Estimate (Initial Improvement, MMR and O&M) - Ranastalam-Anandapuram

Sl.No.	FY	Initial Improvement Cost (in INR Cr.)	Major Maintenance Cost (in INR Cr.)				Operation & Maintenace Cost (in INR Cr.)								
			Road (MCW,SR, Toll Plaza)	Structure	ATMS	TMS	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026	7.96					0.60					5.74	0.11		4.27
2	2026-2027						0.60					5.74	0.11		4.99
3	2027-2028						0.60					5.74	0.11		5.10
4	2028-2029						0.60					5.58	0.11		5.00
5	2029-2030						0.60					5.58	0.11		5.09
6	2030-2031						0.60					5.19	0.11		5.11
7	2031-2032						0.60					4.81	0.11		4.97
8	2032-2033					2.50	0.60					4.62	0.11		5.75
9	2033-2034						0.60					4.62	0.11		5.27
10	2034-2035						0.60					4.62	0.11		5.10
11	2035-2036		0.45				3.49	2.15	1.38	3.27	2.11	4.62	1.58	1.65	5.21
12	2036-2037		10.06				3.49	2.15	1.38	3.27	2.11	4.62	1.58	1.17	5.27
13	2037-2038						3.49	2.15	1.38	3.27	2.11	4.62	1.58	1.17	5.36
14	2038-2039						3.49	2.15	1.38	3.27	2.11	4.62	1.58	1.17	5.22
15	2039-2040						3.49	2.15	1.38	3.27	2.11	4.62	1.58	1.38	6.05
16	2040-2041				5.01	5.01	3.49	2.15	1.38	3.27	2.11	4.62	1.58	1.17	5.47
17	2041-2042		128.27	18.57			3.49	2.15	1.38	3.27	2.11	4.62	1.58	1.17	5.62
18	2042-2043						3.49	2.15	1.38	3.27	2.11	4.62	1.58	1.17	5.55
19	2043-2044						3.49	2.15	1.38	3.27	2.11	4.62	1.58	1.38	5.59
20	2044-2045		33.11				3.49	2.15	1.38	3.27	2.11	4.62	1.58	1.17	5.59
Total		**7.96**	**171.89**	**18.57**	**5.01**	**7.51**	**40.91**	**21.53**	**13.79**	**32.72**	**21.14**	**98.45**	**16.91**	**12.60**	**105.56**

Note: The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

Table 7-5: Cost Estimate ((Initial Improvement, MMR and O&M)- Anandapuram-Hanumantvaka

Sl.No.	FY	Initial Improvement Cost (in INR Cr.)	Major Maintenance Cost (in INR Cr.)				Operation & Maintenace Cost (in INR Cr.)								
			Road (MCW,SR, Toll Plaza)	Structure	ATMS	TMS	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026												0.02		
2	2026-2027												0.02		
3	2027-2028												0.02		
4	2028-2029												0.02		
5	2029-2030		5.49				1.02	0.99	1.24	3.03	0.65		0.27	0.78	
6	2030-2031						1.02	0.99	1.24	3.03	0.65		0.27	0.64	
7	2031-2032		33.09	2.42			1.02	0.99	1.24	3.03	0.65		0.27	0.64	
8	2032-2033						1.02	0.99	1.24	3.03	0.65		0.27	0.64	
9	2033-2034						1.02	0.99	1.24	3.03	0.65		0.27	0.69	
10	2034-2035		1.35				1.02	0.99	1.24	3.03	0.65		0.27	0.64	
11	2035-2036				4.52		1.02	0.99	1.24	3.03	0.65		0.27	0.64	
12	2036-2037						1.02	0.99	1.24	3.03	0.65		0.27	0.64	
13	2037-2038		33.44	2.42			1.02	0.99	1.24	3.03	0.65		0.27	0.69	
14	2038-2039						1.02	0.99	1.24	3.03	0.65		0.27	0.64	
15	2039-2040						1.02	0.99	1.24	3.03	0.65		0.27	0.64	
16	2040-2041		1.35				1.02	0.99	1.24	3.03	0.65		0.27	0.64	
17	2041-2042						1.02	0.99	1.24	3.03	0.65		0.27	0.69	
18	2042-2043				6.78		1.02	0.99	1.24	3.03	0.65		0.27	0.64	
19	2043-2044		34.43	0.49			1.02	0.99	1.24	3.03	0.65		0.27	0.64	
20	2044-2045						1.02	0.99	1.24	3.03	0.65		0.27	0.64	
Total		**0.00**	**109.15**	**5.33**	**11.29**	**0.00**	**16.36**	**15.83**	**19.87**	**48.42**	**10.42**	**0.00**	**4.39**	**10.54**	

Note: The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

Table 7-6: Cost Estimate (Initial Improvement, MMR and O&M)- Ranastalam-Anandapuram and Anandapuram-Hanumantvaka

Sl.No.	FY	Initial Improvement Cost (in INR Cr.)	Major Maintenance Cost (in INR Cr.)				Operation & Maintenance Cost (in INR Cr.)								
			Road (MCW,SR, Toll Plaza)	Structure	ATMS	TMS	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026	7.96					0.60					5.74	0.13		4.27
2	2026-2027						0.60					5.74	0.13		4.99
3	2027-2028						0.60					5.74	0.13		5.10
4	2028-2029						0.60					5.58	0.13		5.00
5	2029-2030		5.49				1.62	0.99	1.24	3.03	0.65	5.58	0.38	0.78	5.09
6	2030-2031						1.62	0.99	1.24	3.03	0.65	5.19	0.38	0.64	5.11
7	2031-2032		33.09	2.42			1.62	0.99	1.24	3.03	0.65	4.81	0.38	0.64	4.97
8	2032-2033					2.50	1.62	0.99	1.24	3.03	0.65	4.62	0.38	0.64	5.75
9	2033-2034						1.62	0.99	1.24	3.03	0.65	4.62	0.38	0.69	5.27
10	2034-2035		1.35				1.62	0.99	1.24	3.03	0.65	4.62	0.38	0.64	5.10
11	2035-2036		0.45		4.52		4.52	3.14	2.62	6.30	2.76	4.62	1.85	2.29	5.21
12	2036-2037		10.06				4.52	3.14	2.62	6.30	2.76	4.62	1.85	1.81	5.27
13	2037-2038		33.44	2.42			4.52	3.14	2.62	6.30	2.76	4.62	1.85	1.86	5.36
14	2038-2039						4.52	3.14	2.62	6.30	2.76	4.62	1.85	1.81	5.22
15	2039-2040						4.52	3.14	2.62	6.30	2.76	4.62	1.85	2.02	6.05
16	2040-2041		1.35		5.01	5.01	4.52	3.14	2.62	6.30	2.76	4.62	1.85	1.81	5.47
17	2041-2042		128.27	18.57			4.52	3.14	2.62	6.30	2.76	4.62	1.85	1.86	5.62
18	2042-2043				6.78		4.52	3.14	2.62	6.30	2.76	4.62	1.85	1.81	5.55
19	2043-2044		34.43	0.49			4.52	3.14	2.62	6.30	2.76	4.62	1.85	2.02	5.59
20	2044-2045		33.11				4.52	3.14	2.62	6.30	2.76	4.62	1.85	1.81	5.59
Total		**7.96**	**281.04**	**23.90**	**16.31**	**7.51**	**57.27**	**37.36**	**33.66**	**81.14**	**31.56**	**98.45**	**21.30**	**23.14**	**105.56**

Note: The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

Section 8: Conclusion

The project highway is a partially access controlled consists of 6-lane divided carriageway with service roads on both sides with minimum number of merging and diversion points on the highway for access to service roads. The 6-lane project has been completed on HAM mode and at present toll is being collected by Toll Collection Agency appointed by NHAI. The project highway is also having 4-lane divided carriageway from Anandapuram - Hanumanthavaka (Towards Visakhapatnam city), for which Performance based Contract for maintenance of city side section. The performance of the pavement is satisfactory in terms of pavement roughness and quality of the pavement surface without having major distresses. As part of present study, the required Engineering Investigations along with site visual observations were made for evaluation of the asset condition and accordingly established the required maintenance and rehabilitation measures/decisions for the concession period. The periodic maintenance by functional/structural overlays are required at every 6th year as per the CA would be sufficient to keep the project stretch in good condition and hence suitable major maintenance strategy has been recommended to improve the service life during the concession period.

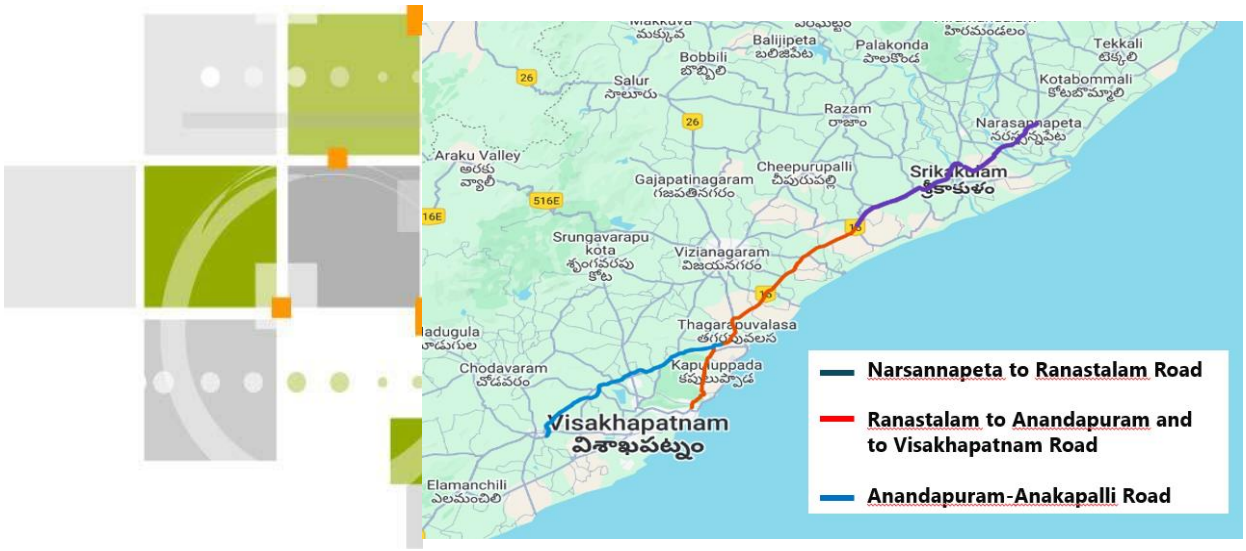
Based upon the site visit for assessment of condition of CD structures including MJB, MNBs, ROB, VUPs, Culverts and toll plaza buildings in the project corridor and observations submitted in various chapters of this report, it is concluded that most of the structures are in sound condition and no major repair is required in near future. As the entire road sections are in HAM/PBMC, the defects identified during this study and future defects occur during the remaining HAM/PBMC concession/contract are to be rectified by the existing Concessionaire. It is to be ensured that asset quality assessment is done thoroughly at the time of handing over so that these defects and any other defects occur during the remaining HAM/PBMC concession period is rectified.

The assessment of estimated cost of such repairs along with the anticipated future repair and rehabilitation cost are considered in the cost estimate of this report.

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FINAL TECHNICAL DUE-DILIGENCE REPORT

Technical Consultant Services for National Highways Infra Trust for Anandapuram-Pendurthi-Anakapalle of NH-16in the State of Andhra Pradesh



February 2025

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Consulting engineers pvt. ltd.

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Acronyms and Abbreviations

BC	Bituminous Concrete
BOQ	Bill of Quantities
C/W	Carriageway
CA	Concession Agreement
COD	Commercial Operation Date
CVPD	Commercial Vehicles Per Day
DLP	Digital Laser Profile
EGIS	Egis India Consulting Engineers Pvt. Ltd.
EPC	Engineering Procurement and Construction
FWD	Falling Weight Deflectometer
IM	Investment Manager
InvIT	National Highways Infra Trust
IRC	Indian Road Congress
Km	Kilometer (Chainage)
km	Kilometer (Length)
LHS	Left Hand Side
MBIU	Mobile Bridge Inspection Unit
MJB	Major Bridge
MNB	Minor Bridge
MPD	Mean Profile Depth
MSA	Million Standard Axles
NH	National Highway
NHAI	National Highways Authority of India
NHIIMPL	National Highways Infra Investment Managers Private Limited
NSV	Network Survey Vehicle
O&M	Operation and Maintenance
RCC	Reinforced Cement Concrete
RHS	Right Hand Side
ROB	Road over Bridge
SH	Stage Highway
SMTD	Sensor Measured Texture Depth
SPV	Special Purpose Vehicle
TA	Technical Advisor / Consultant
VDF	Vehicle Damage Factor
VUP	Vehicular Underpass

Section 1: Executive Summary

1.1 Introduction

1.1.1 Background

NHAI has set up an Infrastructure Investment Trust namely National Highways Infra Trust ("InvIT") and is acting as its Sponsor to the said InvIT. National Highways Infra Investment Managers Private Limited ("NHIIMPL") has been appointed as the Investment Manager to the InvIT.

NHIIMPL appointed M/s Egis India Consulting Engineers Private Limited, as Technical Consultant to conduct the due diligence on the proposed Assets. The Letter of Empanelment (LOE) was received on 3rd November 2022 and Letter of Award (LoA) for the subject Project was received on 15th July 2024 by Egis India and the services commenced immediately thereafter.

The project stretches detail as per LoA are listed below.

Table 1-1: Detail of Project Stretches

Sr. No.	Stretches	Toll Plaza	NH No.	Lane	Length (km)
1	Narasannapeta to Ranastalam	Madapam	NH-16	4/6 Lane	53.799
2	Ranastalam to Anandapuram via Kopperla	Nathavalasa	NH-16	6 Lane	48.980
	Anandapuram to Visakhapatnam	-	Old NH-16	4 Lane	17.564
3	**Anandapuram to Anakapalle via Pendurthi**	**Dukkavanipalem & Marripalem**	**NH-16**	**6 Lane**	**48.605**
Total					**168.948**

This report pertains to the stretch Anandapuram to Anakapalle via Pendurthi.

1.1.2 Objectives

The main objective of the present assignment is to

1. review project documents and understanding schedule B and schedule F requirements for improvement works for the assessment of Capex and Opex during the concession period.
2. conduct field investigations to assess the existing asset condition and future deterioration.
3. validate executed works with respect to schedule A and assessment of improvement Works

4. review quality of construction based on available data, design and drawings.
5. undertake designs for rehabilitation requirements of different assets based on field investigation data and available documents.
6. assess operation and maintenance cost including major maintenance expected to be incurred during the concession period.

1.2 Site Visit

The Technical Consultant visited site from 25th July 2024 to 11th August 2024. The important aspects of the project road were noted in the detailed site reconnaissance along with various field investigations. These included general description about the project road, site features, structures, junctions, pavement characteristics, road safety. Field investigation for NSV, FWD test, axle load survey, trail pits, MBIU and drone videography survey were also conducted by Technical Consultant to assess the present condition of the project road.

1.2.1 Salient Features

Table 1-2: Salient Features

Sr. No.	Name of Stretches	Toll Plaza	Chainage (Km)		Length	Lane Configu-ration	Pavement Type	Date of COD	O&M Handover Date to InVIT	Concessionaire / Remarks
			From	To	(km)					
1	Anandapuram-Anakapalli	Dukkavanipalem @ 686+540 (11 lanes) & Marripalem @ 722+170 (11 lanes)	682+980	731+585	48.605	6-Lane	Rigid	17-12-2021	08-11-2036	M/s DBL Anandapuram Anakapalli Highways Pvt. Ltd. (HAM)

Asset-wise details of Project assets are given below:

Table 1-3: Detail of Assets

S. No	Description			Anandapuram to Anakapalle Section (from km 682+980 to km 731+585)	
				Schedule-A	At Site
1	Total Project Length (km)			48.605	48.605
2	Service Roads/ Slip Roads (km)			92.220	**92.765**[1]
3	Pavement (km)	Flexible	LHS	0.000	0.000
			RHS	0.000	0.000
		Rigid	LHS	48.605	48.605
			RHS	48.605	48.605
4	Bus Shelters (no.)			2	2
	Bus bays with Shelters (no.)			29	29
	Bus bays (no.)			2	2
5	Truck Lay-bays/Parking (no.)			2	2

[1] SR from km 731+360 to km 731+480 RHS, km 731+360 to km 731+705 LHS and km 713+200 to 713+280 LHS are not there in Sch A whereas existing SR is there at these locations.

S. No	Description		Anandapuram to Anakapalle Section (from km 682+980 to km 731+585)	
			Schedule-A	At Site
6	Toll Plaza (no.)		2	2
7	Rest Area (no.)		-	-
8	Major Bridges (no.)		4	4
9	Minor bridges (no.)		23	23
10	ROB's (no.)		2	2
11	Flyover (no.)		8	**9**[2]
12	Overpass for new Int. Airport (no.)		-	-
13	VUP's (no.)		9	9
14	LVUP (no.)		12	12
15	PUP/CUP (no.)		-	-
16	Foot Over Bridge (no.)		1	1
17	Culverts (no.)	Pipe Culvert	44	44
		Slab Culvert	-	-
		Box Culvert	51	51

1.3 Surveys and Investigations

1.3.1 Network Survey Vehicle (NSV)

The Network Survey Vehicle, which is the latest survey technique which utilizes Lasers, Global Positioning System and Video image processing tools, is used for automatic data collection pertains to pavement condition and road inventory data. The NSV survey has been carried out along the project corridor from 27/07/2024 to 01/08/2024 for collection of field data pertains to pavement condition and road inventory. Summary of findings of NSV survey is given in preceding sections.

1.3.1.1 Pavement Type

Anandapuram – Anakapalli stretch is having rigid pavement.

1.3.1.2 Pavement Roughness

Roughness value measured for each lane of main carriageway using NSV. The summary of direction-wise roughness distribution for each lane in term of percentage length are presented below.

[2] Flyover on one of the proposed loop at Sabbhaabaram interchange is already constructed which is not mentioned in Sch A.

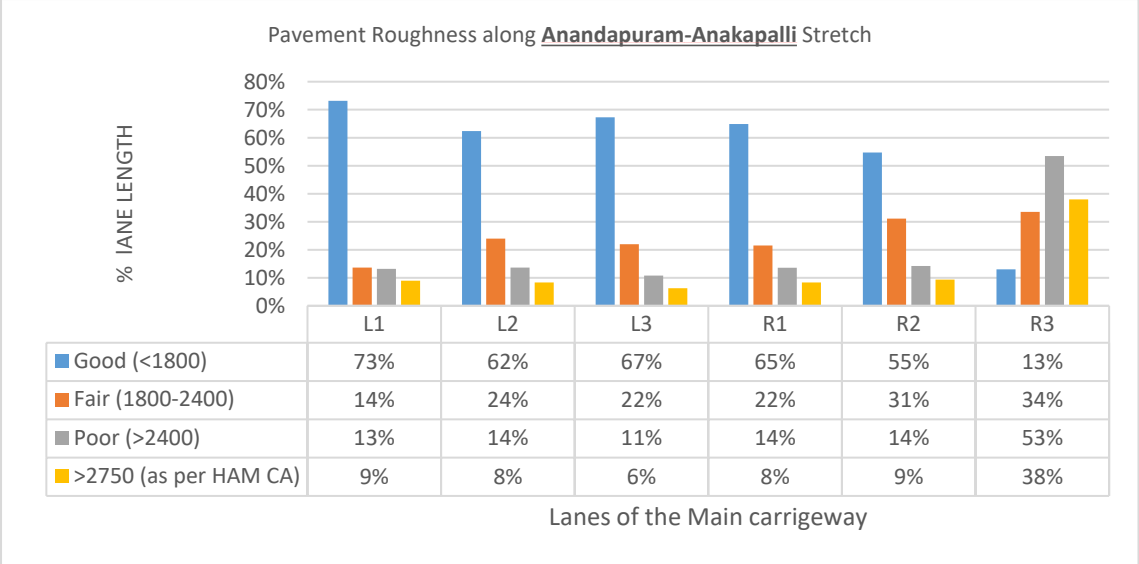


Figure 1-1:Pavement Roughness Charts

Km-wise pavement condition and distress in the form of strip chart is included in **Annexure - 4.2**.

1.3.2 Test Pit Investigations

Test pit investigations have been planned to conduct at every 5km in a staggered manner ascertain the existing pavement composition (pavement course, material type, and thickness). However, the project is partially access control throughout the length, thereby no earthen shoulder has been found and thus test pits were taken at the locations where feasible to dug at the interface of the paved and earthen shoulder. The summary of existing pavement crust thickness is presented in table and some of the photographs showing the pavement crust thickness are shown as below.

Table 1-4:Summary of Existing Pavement Crust Thickness

Date of Sampling	Location of Trial Pit	Lanes	Pavement Composition (mm)						
			BT	PQC	DLC	WMM	Cemented layer	GSB	SUBGRADE
Anandapuram-Anakapalli Section									
04.08.24	686+700LHS	6	-	290	110	-	-	170	500
04.08.24	710+960LHS	6	-	290	130	-	-	140	500
04.08.24	703+520RHS	6	-	250	110	-	-	170	500

Observations and Conclusions:

- The project from Anandapuram - Anakapalli has been found with Rigid type for the total length.

- The pavement type for service road is flexible type and has been designed for 10MSA traffic.
- Throughout the project section, rigid pavement thickness of PQC is 290mm. Since these test pits locations were taken at a larger intervals and thus it can be considered as indicative thicknesses for the composition as found from the trial pits.

During the above investigations, the existing subgrade soils samples were collected and tested in the laboratory to understand the properties of these foundation soils. The test results are presented in below sections.

Test Results: Anandapuram - Anakapalli Section

Location of Trial Pit	Nature of Soil (Visual Identification)	Sieve Analysis by % of passing			Sand Content %	Atterberg Limits			FSI %	MDD g/CC	OMC %	FDD g/CC	FMC %	CBR (4Days Soaked) %	Field CBR (DCPT) %	Depth of Water Table below Subgrade
		4.75mm	0.425mm	0.075mm		LL%	PL %	PI %								
694+700LHS	GP-GM (Poorly Graded Gravel Mixed with Silty Gravel)	38.0	26.0	10.8	27.2	22.1	13.5	8.6	Nil	2.12	7.8	1.86	8.0	15.0	21.0	Not found
698+900LHS	GC (Clayey Gravel)	43.5	25.1	15.3	28.2	25.6	13.6	12.0	10.0	2.11	8.2	1.68	8.0	15.0	21.0	Not found
683+700RHS	GC (Clayey Gravel)	42.5	29.5	14.8	27.7	24.3	14.8	9.5	10.0	2.13	8.1	1.82	9.0	14.5	22.0	Not found
690+700RHS	GC (Clayey Gravel)	37.0	22.8	12.9	24.1	23.9	12.8	11.1	10.0	2.10	8.0	1.78	7.0	13.5	21.0	Not found

Observations and Conclusions

The subgrade soils are generally consistent throughout the project road and CBR values are in compliance with the design CBR as adopted during the 6-lane works. Further, it has been observed during the site visit that most of the soils in the region found to be red soil having CBR values more than 10% and this is one the reason for better performance of the pavement of the project highways.

1.3.3 Axle Load Survey

Axle load survey has been conducted in compliance with IRC 37 2018 for 24 hours in both directions at the existing toll plaza locations. Obtained VDF values comparing the values adopted at the time of pavement design during construction summarized in table below.

Table 1-5: Vehicle Damage Factors (VDF)

Toll Plaza	Direction *	Vehicle Damage factors				
		Bus	LCV	2-Axle	3-Axle	MAV
Dukkavanaipalem Toll Plaza (Km 686+540)	LHS	-	1.59	2.39	3.80	4.67
	RHS	-	2.27	2.95	5.43	9.48
Marripalem Toll Plaza (Km 722+154)	LHS	-	2.45	3.56	2.14	6.15
	RHS	-	1.64	2.61	4.41	8.03

** LHS: Srikakulam to Anakapalli RHS: Anakapalli to Srikakulam*

There is a significant difference between the axle loads of commercial vehicles flying in both directions of traffic, due in inconsistent commodity pattern generating from different locations along the project highway and thus, separate factors have been considered for traffic assessment. Further, 7-day axle load survey values are lower than one days and hence adopted the above values in the study.

1.3.4 Falling Weight Deflectometer (FWD)

As per IRC: 117-2015, the collected FWD data for the rigid pavement has been analysed to determine the following parameters.

- Modulus of subgrade reaction k (MPa/m)
- Elastic modulus of concrete E_c (MPa)
- Flexural Strength of concrete f_{mr} (MPa)
- Load Transfer Efficiency (LTE) of Joints (%)

The detailed analysis of the parameter for PQC and Load Transfer Efficiency is presented in **Annexure 4.7** for both LHS and RHS directions respectively.

From the test results the observations were draw-down. The range of Elastic Modulus, other PQC parameters and their percentage of length and Load Transfer Efficiency (LTE) is presented in table below.

Table 1-6: Outcome of FWD Data Analysis for Rigid Pavement

Side		LHS					RHS				
Chainage (Km)		Modulus of subgrade reaction k (MPa/m)	Elastic modulus of concrete Ec (MPa)	Strength of concrete fc (MPa)	Flexural Strength of concrete f_{mr} (MPa)	LTE (%)	Modulus of subgrade reaction k (MPa/m)	Elastic modulus of concrete Ec (MPa)	Strength of concrete fc (MPa)	Flexural Strength of concrete f_{mr} (MPa)	LTE (%)
From	To										
Anandapuram - Anakapalli Section											
682.600	683.500	186.027	31419	39.9	4.4	83.8	305.580	34405	47.6	4.8	83.6
683.500	684.500	100.385	30155	36.6	4.2	85.6	101.645	31648	40.6	4.4	91.9
684.500	685.500	133.782	28197	32.0	3.9	88.4	130.304	34086	46.5	4.8	83.2
685.500	686.500	134.446	29999	36.8	4.2	87.0	130.555	32942	43.7	4.6	89.1
686.500	687.500	112.406	35538	51.5	5.0	87.6	112.474	32537	43.2	4.6	91.0
687.500	688.500	96.680	34411	49.4	4.8	84.8	81.418	42721	73.5	6.0	89.4
688.500	689.500	136.209	35809	52.4	5.0	82.5	193.259	31173	39.9	4.4	83.6
689.500	690.500	77.661	33558	47.4	4.7	88.4	151.593	35955	52.5	5.0	88.4
690.500	691.500	92.881	27561	30.9	3.9	88.2	82.614	32435	42.3	4.5	83.0
691.500	692.500	185.411	31982	41.9	4.5	83.5	226.563	35779	51.4	5.0	82.1
692.500	693.500	87.334	33105	44.2	4.6	86.2	86.691	30977	39.4	4.3	87.5
693.500	694.500	91.736	32767	43.8	4.6	88.3	105.783	31710	40.4	4.4	84.3
694.500	695.500	99.471	36485	55.4	5.1	83.0	108.946	32713	43.2	4.6	86.4
695.500	696.500	100.622	38116	59.4	5.3	87.5	97.759	33495	45.7	4.7	81.4
696.500	697.500	97.546	34550	48.0	4.8	86.3	81.577	35755	51.4	5.0	86.1
697.500	698.500	126.185	39471	62.4	5.5	87.0	127.861	36006	52.4	5.0	82.6
698.500	699.500	129.061	34290	47.2	4.8	85.1	122.733	35009	49.3	4.9	84.7
699.500	700.500	109.629	30861	39.4	4.3	85.5	177.443	31890	40.7	4.5	82.0
700.500	701.500	189.168	36129	53.3	5.1	85.7	189.258	34225	47.0	4.8	83.2
701.500	702.500	157.419	35820	52.2	5.0	88.8	232.348	32365	42.3	4.5	84.9
702.500	703.500	118.633	38981	61.0	5.5	87.1	195.865	37488	56.5	5.2	85.6
703.500	704.500	105.256	33033	44.1	4.6	85.1	103.737	32743	43.3	4.6	85.3
704.500	705.500	114.483	32969	43.7	4.6	85.1	172.335	32639	43.1	4.6	82.0
705.500	706.500	180.928	34165	47.5	4.8	84.3	250.321	35666	51.3	5.0	84.7
706.500	707.500	119.188	38118	58.6	5.3	84.8	116.863	32054	41.7	4.5	85.5

Side		LHS					RHS				
Chainage (Km)		Modulus of subgrade reaction k (MPa/m)	Elastic modulus of concrete Ec (MPa)	Strength of concrete fc (MPa)	Flexural Strength of concrete f_{mr} (MPa)	LTE (%)	Modulus of subgrade reaction k (MPa/m)	Elastic modulus of concrete Ec (MPa)	Strength of concrete fc (MPa)	Flexural Strength of concrete f_{mr} (MPa)	LTE (%)
From	To										
707.500	708.500	133.942	34579	49.1	4.8	84.1	93.461	34686	48.2	4.9	83.0
708.500	709.500	147.015	33811	46.8	4.7	82.6	189.393	36563	53.7	5.1	82.1
709.500	710.500	187.042	34750	48.9	4.9	83.2	198.082	34587	48.3	4.8	81.8
710.500	711.500	79.158	41139	67.8	5.8	89.6	134.646	32468	42.9	4.5	81.2
711.500	712.500	105.629	35191	50.1	4.9	86.5	112.840	32047	41.9	4.5	84.0
712.500	713.500	115.166	36064	52.4	5.0	88.8	128.585	30970	39.7	4.3	84.6
713.500	714.500	115.119	30385	38.6	4.3	82.2	97.532	35327	50.1	4.9	83.4
714.500	715.500	144.180	34516	48.0	4.8	85.1	79.167	30481	38.3	4.3	84.8
715.500	716.500	269.022	32359	42.7	4.5	79.7	105.125	34987	49.1	4.9	81.7
716.500	717.500	83.814	30400	37.8	4.3	83.6	127.766	35959	52.7	5.0	84.5
717.500	718.500	133.050	40074	64.7	5.6	83.1	103.527	33171	44.5	4.6	86.5
718.500	719.500	98.867	31890	41.4	4.5	88.0	119.109	33420	45.0	4.7	81.3
719.500	720.500	150.595	35470	51.3	5.0	83.7	94.258	32046	41.5	4.5	85.5
720.500	721.500	110.170	30347	37.0	4.2	87.1	184.849	32995	43.7	4.6	85.1
721.500	722.500	80.711	30732	38.4	4.3	88.7	87.832	31037	42.4	4.3	81.9
722.500	723.500	91.094	31693	40.6	4.4	89.5	105.366	26147	27.9	3.7	83.2
723.500	724.500	130.406	33597	45.6	4.7	87.0	110.265	31789	41.1	4.5	82.9
724.500	725.500	84.982	31935	41.2	4.5	89.7	77.371	36469	53.7	5.1	92.1
725.500	726.500	30.066	30147	36.5	4.2	96.3	95.320	32776	43.0	4.6	86.6
726.500	727.500	121.996	30734	38.7	4.3	90.1	115.213	36577	53.8	5.1	89.1
727.500	728.500	126.123	34932	49.0	4.9	89.0	93.912	34624	48.8	4.8	86.2
728.500	729.500	94.852	26445	28.5	3.7	83.1	128.372	31325	40.3	4.4	84.2
729.500	730.500	182.996	34009	46.5	4.8	84.4	95.863	33208	44.2	4.6	83.7
730.500	731.500	102.964	36032	52.3	5.0	90.5	118.962	35193	50.6	4.9	83.7
731.500	732.500	105.530	33648	46.0	4.7	85.8	124.041	34402.574	47.5	4.8	86.8

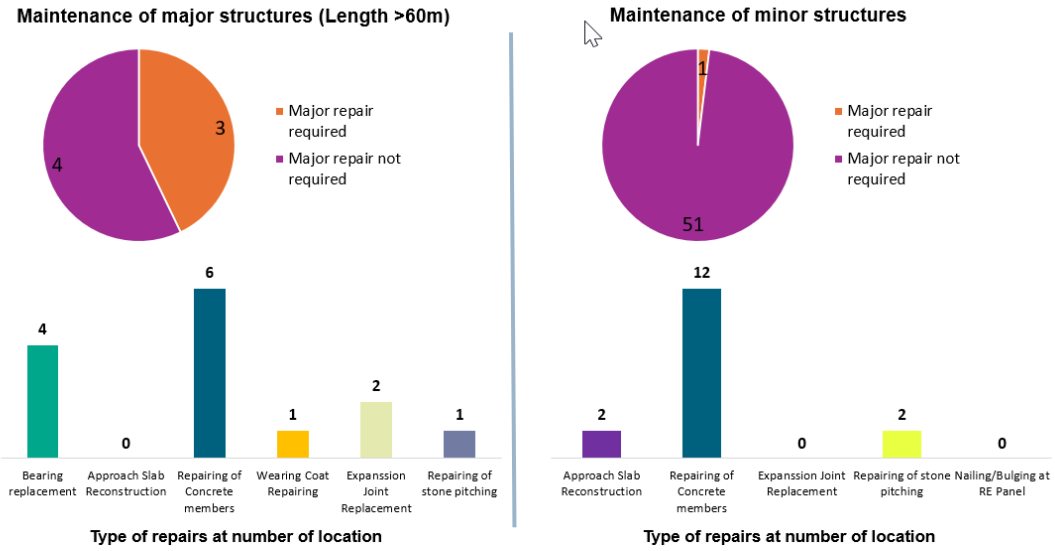
- The PQC concrete slab has adequate strength with average flexural strength of more than 4.2MPa for the above rigid pavement project sections.

- Load Transfer Efficiency (LTE) for Transverse joints is more than 50% for both LHS & RHS direction and thus, joints are in good condition.
- Load Transfer Efficiency (LTE) for Longitudinal joints is more than 40% for both LHS & RHS direction so, the joint system is adequate in load transfer.

1.3.5 Structure Inventory and Condition Survey

There are deficiencies noted in the structures and relevant repair-rehabilitation measures are suggested. Requirement of immediate repairs for major structures (length > 60m) and minor structures are presented below.

ASSESSMENT OF STRUCTURES (ANANDAPURAM TO ANAKAPALLE SECTION)



1.4 Key Technical Issues

1.4.1 Damaged Bearings

Problems with the bearings are observed in the form of tilting, cracking, not properly placed and compressed. Affected structures are

MJBR: @ 709+692
Flyover: @ 683+063
ROB @ 730+272
It is presumed that existing HAM Concessionaires will fix all these bearings before handing over.

1.4.2 Pavement

Pavement at service road is distressed at many locations may be due to higher traffic loading. Rigid pavement has lost texturing in most of the locations in this section and requires retexturing.

1.4.3 Incomplete Construction

It is noticed that constructions are not completed for main carriageway of 3-lanes on RHS from km 703+400 to km 704+300, may be due to LA issues. It is also noticed that construction of interchanges at Pendurthi and Sabbavaram are not done though same was in the scope of the HAM concessionaire.

1.5 Capital Expenditure Requirement

1.5.1 Improvement Works as Per Schedule B

Schedule B of each stretch specifies the requirements of initial improvement which the concessionaire has to construct within 3/6 months of Handover Date.

Improvement Scope specified for each stretch is tabulated below:

Table 1-7: Improvement works as per Schedule B

S. No.	Description	Unit	Quantities
1	Approach slabs reconstructed	Nos.	4
2	Junction improvement	Nos.	29
3	Curve improvement	Nos.	50
4	Truck lay bye: Sewage disposal system	Nos.	2
5	Landscaping and median plantation	Km	14.4
6	Transverse Bar Marking	Nos.	22
7	Antiglare	Km	4
8	Kerb stone	Lm.	14,581

1.5.2 Immediate Maintenance Requirements

This section is under HAM (Annuity) concession up to 2036. So, obligation for immediate repair requirements does not lie with InvIT Concessionaire. However, toll plaza renovation cost and TMS replacement cost has been considered for existing toll plaza.

1.6 O&M Cost Estimation

1.6.1 Recommended MM Cycles for Pavement

Considering the initial pavement design period and crust, remaining life data, anticipated traffic loading during the concession period, and in compliance to the provisions of schedule B, the following cycles of Major maintenance is proposed for satisfactory performance of the pavement during operation period to serve both functional and structural requirements.

Table 1-8: Proposed Major Maintenance Cycles for Balance Concession period

Name of Stretch	InvIT Concession (20 years)				
	CAPEX	Routine Maintenance	Periodic Maintenance	ATMS & TMS Replacement	Toll Operation & Admin Cost
Anandapuram-Anakapalli	Toll plaza renovation cost TMS (all the existing defects to be rectified by HAM Concessionaire)	**Till O&M Handover**: Manpower cost for clearing considered **After Handing Over**: Regular	**FY37**- Revalid. Survey, Improvement works as per Sch.-B & road marking **FY38**- ***Structure***: Replacement of Wearing coat, expansion Joint and 40% of total Bearings **FY41**- ***MCW***: 40BC on flexible portion of proposed interchange to be constructed by NHAI ***SR***: 40BC, 50DBM for 10% length, ***Rigid***: Retexturing, replacement of joint sealant and 2.0% of panel. **FY45**- Road Marking ***Structure***: Replacement of wearing coat & painting	**FY30**-New TMS for interchange **FY33-** 50% TMS **FY37-** 50% TMS interchange **FY41-** 100% TMS 40% ATMS **FY44-** 100% TMS interchange	01.04.2025

1.6.2 Estimate (Initial Improvement, MMR and O&M)

Year-wise estimate of Initial Improvement, MMR and O&M are given below

Table 1-9: Cost Estimate (Initial Improvement, MMR and O&M)

Sl.No.	FY	Initial Improvement Cost (in INR Cr.)	Major Maintenance Cost (in INR Cr.)				Operation & Maintenace Cost (in INR Cr.)								
			Road (MCW,SR, Toll Plaza)	Structure	ATMS	TMS	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026	14.04					0.60					11.98	0.10		3.56
2	2026-2027						0.60					11.98	0.10		4.18
3	2027-2028						0.60					11.98	0.10		4.27
4	2028-2029						0.60					11.65	0.10		4.20
5	2029-2030					7.51	0.60					21.92	0.10		4.27
6	2030-2031						0.60					20.43	0.10		4.28
7	2031-2032						0.60					18.94	0.10		4.17
8	2032-2033					4.07	0.60					18.20	0.10		4.80
9	2033-2034						0.60					18.20	0.10		4.42
10	2034-2035						0.60					18.20	0.10		4.28
11	2035-2036						0.60					18.20	0.10		4.37
12	2036-2037		4.71			3.76	3.73	2.38	2.12	5.05	2.48	18.20	1.86	2.49	4.42
13	2037-2038			24.28			3.73	2.38	2.12	5.05	2.48	18.20	1.86	1.25	4.49
14	2038-2039						3.73	2.38	2.12	5.05	2.48	18.20	1.86	1.25	4.38
15	2039-2040						4.04	2.57	2.12	5.05	2.82	18.20	1.86	1.25	5.05
16	2040-2041		131.17		7.73	8.14	4.04	2.57	2.12	5.05	2.82	18.20	1.86	1.83	4.59
17	2041-2042						4.04	2.57	2.12	5.05	2.82	18.20	1.86	1.25	4.72
18	2042-2043						4.04	2.57	2.12	5.05	2.82	18.20	1.86	1.25	4.66
19	2043-2044					7.51	4.04	2.57	2.12	5.05	2.82	18.20	1.86	1.25	4.69
20	2044-2045		5.60	7.55			4.04	2.57	2.12	5.05	2.82	18.20	1.86	1.83	4.69
Total		**14.04**	**141.48**	**31.83**	**7.73**	**30.98**	**42.01**	**22.57**	**19.12**	**45.42**	**24.39**	**345.43**	**17.87**	**13.64**	**88.49**

Note: The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

1.7 Conclusion

The project highway is a partially access controlled consists of 6-lane divided carriageway with service roads on both sides with minimum number of merging and diversion points on the highway for access to service roads. The 6-lane project has been completed on HAM mode and at present toll is being collected by Toll Collection Agency appointed by NHAI.

The pavement type as adopted in the project are rigid and flexible for main carriageway and service roads respectively. The performance of the pavement is satisfactory in terms of pavement roughness and surface quality without having major distresses. However, low severity shoving/corrugations has been observed on the surface of flexible type along the service roads, whereas low-medium severity cracks were observed on the PQC for which rectification works are in progress by the existing HAM Concessionaire in the form of cross stitching, sealant repairs etc. Some of the location observed with faulting and loss of texture for which rectification to be done as part of programmed maintenance works for rigid pavement to improve the serviceability. As part of present study, the required Engineering Investigations along with site visual observations were made for evaluation of the asset condition and accordingly established the required maintenance and rehabilitation measures/decisions for the concession period. The periodic maintenance by functional/structural overlays for flexible type are required at every 6th year as per the CA would be sufficient to keep the project stretch in good condition and suitable number of high severities PQC panels may be replaced along with joint rectification etc. Considering the asset visual assessment, condition and evaluation studies, the suitable major maintenance strategy has been recommended to improve the service life during the concession period.

Based upon the site visit for assessment of condition of CD structures including MJB, MNBs, ROB, VUPs, Culverts and toll plaza buildings in the project corridor and observations submitted in various chapters of this report it is concluded that most of the structures are in sound condition and no major repair is required in near future. However, there are issues with the bearings for few structures. As the entire road sections are in HAM, these defects are to be rectified by the existing Concessionaires. It is to be ensured that asset quality assessment is done thoroughly at the time of taking over so that these defects and any other defects occur during the remaining HAM concession period is rectified.

The assessment of estimated cost of such repairs along with the anticipated future repair and rehabilitation cost are considered in the cost estimate of this report.

Section 2: Introduction

2.1 Background

NHAI has set up an Infrastructure Investment Trust namely National Highways Infra Trust ("InvIT") and is acting as its Sponsor to the said InvIT. National Highways Infra Investment Managers Private Limited ("NHIIMPL") has been appointed as the Investment Manager to the InvIT.

NHIIMPL appointed M/s Egis India Consulting Engineers Private Limited, as Technical Consultant to conduct the due diligence on the proposed Assets. The Letter of Empanelment (LOE) was received on 3rd November 2022 and Letter of Award (LoA) for the subject Project was received on 15th July 2024 by Egis India and the services commenced immediately thereafter.

The project stretches detail as per LoA are listed below.

Table 2-1: Detail of Project Stretches

Sr. No.	Stretches	Toll Plaza	NH No.	Lane	Length (km)
1	Narasannapeta to Ranastalam	Madapam	NH-16	4/6 Lane	53.799
2	Ranastalam to Anandapuram via Kopperla	Nathavalasa	NH-16	6 Lane	48.980
	Anandapuram to Visakhapatnam	-	Old NH-16	4 Lane	17.564
3	**Anandapuram to Anakapalle via Pendurthi**	**Dukkavanipalem & Marripalem**	**NH-16**	**6 Lane**	**48.605**
Total					**168.948**

This report pertains to the stretch Anandapuram to Anakapalle via Pendurthi.

2.2 Objectives

The main objective of the present assignment is to

review project documents and understanding schedule B requirements for improvement works for the assessment of Capex and Opex during the concession period.

1. conduct field investigations to assess the existing asset condition and future deterioration.
2. validate executed works with respect to schedule A and assessment of improvement works
3. review quality of construction based on available data, design and drawings.
4. undertake designs for rehabilitation requirements of different assets based on field investigation data and available documents.
5. assess operation and maintenance cost including major maintenance expected to be incurred during the concession period.

2.3 Technical Consultant Team

The Technical Consultant commenced its services from 15th July 2024 and the team comprising of Highway, Pavement & Structure Engineers and Experts have conducted site visit from 25th July 2024 to 11th August 2024 to appreciate the project corridor characteristics. This report highlights the findings from visual assessment, available documents shared with the consultant, discussion with NHAI officials involved with the maintenance and operation of project road at site and other local enquiries. Analysis of data as obtained from various survey and investigations conducted at site are present in this report.

Date-wise various field activities at site are shown below in bar chart form in **Figure 2.1.**

PROJECT STRETCHES	25-Jul	26-Jul	27-Jul	28-Jul	29-Jul	30-Jul	31-Jul	01-Aug	02-Aug	03-Aug	04-Aug	05-Aug	06-Aug	07-Aug	08-Aug	09-Aug	10-Aug	11-Aug
Anandapuram - Anakapalle via Pendurthi																		
FWD Survey																		
NSV Survey																		
Inventory and Condition Survey																		
Axle Load Survey																		
Drone Survey																		
Test Pits																		
MBIU for Major Structures (Length > 60m)																		

Figure 2-1: Project Activities Schedule

2.4 Disclaimer

The information and documents received from the Client are being reviewed by the Consultant and have been used for preparing this report. Due care has been taken while reproduction of the information where required to avoid typographical or other errors.

2.5 Structure of the Report

The report has been structured into nine sections as follows:

Section 1: Executive Summary
Section 2: Introduction
Section 3: Inventory and Condition Assessment
Section 4: Surveys and Investigations
Section 5: Review of Documents
Section 6: Capital Expenditure (CapEx) Requirement

Section 7: Operation & Maintenance

Section 8: Analysis & Comparisons with Seller Data

Section 9: Conclusions

Section 3: Inventory and Condition Assessment

3.1 General

The Technical Consultant visited site from 25th July 2024 to 11th August 2024. The important aspects of the project road were noted in the detailed site reconnaissance along with various field investigations. These included general description about the project road, site features, structures, junctions, pavement characteristics, road safety. Field investigation for NSV, FWD test, axle load survey, trail pits, MBIU and drone videography survey were also conducted by Technical Consultant to assess the present condition of the project road. This chapter elaborates various findings of these surveys and studies conducted by the Technical Consultant team in different sections.

3.2 Project Corridor

The project stretche details are listed below:

Table 3-1: Detail of Project Stretches

Sr. No.	Name of Stretches	Toll Plaza	Chainage (Km)		Length (km)
			From	To	
1	Anandapuram to Anakapalle via Pendurthi	Dukkavanipalem & Marripalem	682+980	731+585	48.605

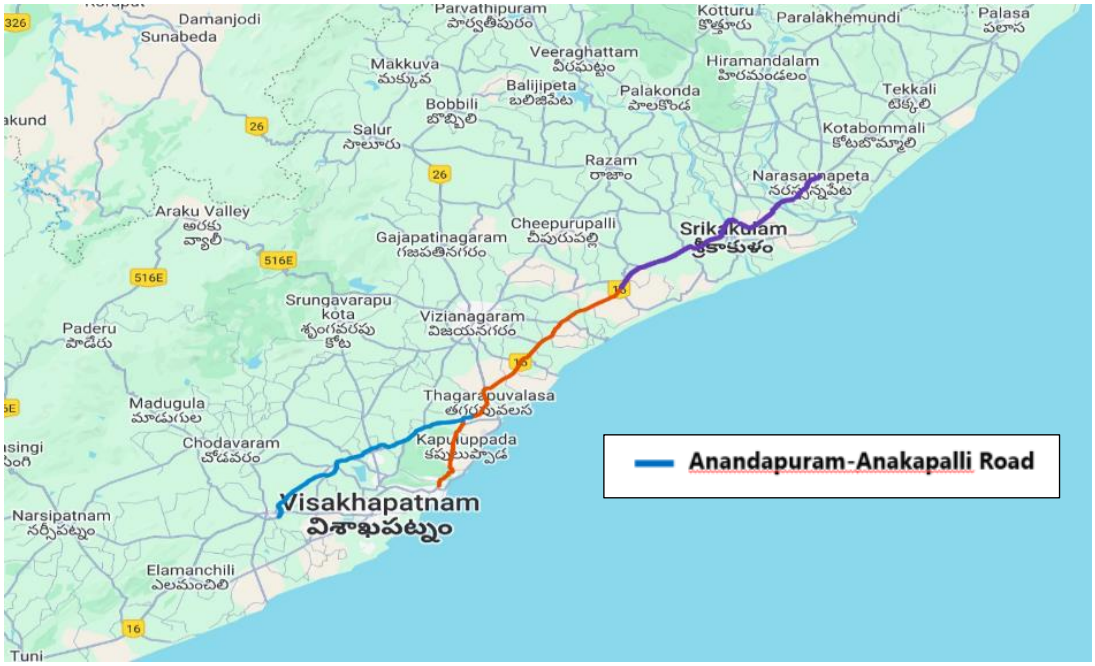


Figure 3-1: Project Location Map

3.3 Project Brief

3.3.1 Salient Features

Sr. No.	Name of Stretch	Toll Plaza	Chainage (Km)		Length	Lane Config-uration	Paveme-nt Type	Date of COD	O&M Handove-r Date to InVIT	Concessionaire / Remarks
			From	To	(km)					
1	Anandapuram - Anakapalli	Dukkavanipalem @ 686+540 (11 lanes) & Marripalem @ 722+170 (11 lanes)	682+980	731+585	48.605	6-Lane	Rigid	17-12-2021	08-11-2036	M/s DBL Anandapuram Anakapalli Highways Pvt. Ltd. (HAM)

Details of Assets:

Table below provides the quantum of the assets and compare the same with the Schedule A stipulations:

S. No	Description			Anandapuram to Anakapalle Section (from km 682+980 to km 731+585)	
				Schedule-A	At Site
1	Total Project Length (km)			48.605	48.605
2	Service Roads/ Slip Roads (km)			92.220	**92.765**[3]
3	Pavement (km)	Flexible	LHS	0.000	0.000
			RHS	0.000	0.000
		Rigid	LHS	48.605	48.605
			RHS	48.605	48.605
4	Bus Shelters (no.)			2	2
	Bus bays with Shelters (no.)			29	29
	Bus bays (no.)			2	2
5	Truck Lay-bays/Parking (no.)			2	2
6	Toll Plaza (no.)			2	2
7	Rest Area (no.)			-	-
8	Major Bridges (no.)			4	4
9	Minor bridges (no.)			23	23
10	ROB's (no.)			2	2
11	Flyover (no.)			8	**9**[4]
12	Overpass for new Int. Airport (no.)			-	-
13	VUP's (no.)			9	9
14	LVUP (no.)			12	12
15	PUP/CUP (no.)			-	-
16	Foot Over Bridge (no.)			1	1
17	Culverts (no.)	Pipe Culvert		44	44
		Slab Culvert		-	-

[3] SR from km 731+360 to km 731+480 RHS, km 731+360 to km 731+705 LHS and km 713+200 to 713+280 LHS are not there in Sch A whereas existing SR is there at these locations.

[4] Flyover on one of the proposed loop at Sabbhaabaram interchange is already constructed which is not mentioned in Sch A.

S. No	Description		Anandapuram to Anakapalle Section (from km 682+980 to km 731+585)	
			Schedule-A	At Site
		Box Culvert	51	51

3.4 Road Inventory and Condition Survey

3.4.1 Road Inventory

The Road Inventory is conducted to assess and list out the existing features of the project corridor and to validate that project road is conforming to the requirements of CA. It covers all the existing physical features such as terrain, land use, carriageway surfacing type, shoulder width, junctions, water bodies, roadside arboriculture, general drainage conditions, etc. It was carried out in accordance with the guidelines given in IRC: SP 19-2001, generally by visual means, and supplemented by simple tape measurement.

The road inventory data collected for the project highway is presented in the **Annexure 3.1.**

3.4.2 Terrain

The project highway falls in plain terrain.

3.4.3 Land Use

The land along the project highway is predominantly agricultural followed by built up, barren, forest, residential and commercial areas. Details of land use are given in the Table 3.2.

Table 3-2: Land Use

Description	Anandapuram to Anakapalle			
	Length (km)		%age	
	LHS	RHS	LHS	RHS
Agriculture	30.62	30.876	63.00%	63.52%
Built-Up Area (Residential/Commercial/ Industrial)	17.315	17.379	35.62%	35.76%
Others (Water Bodies/ Forest etc.)	0.67	0.35	1.38%	0.72%
Total	**48.605**	**48.605**	**100%**	**100%**

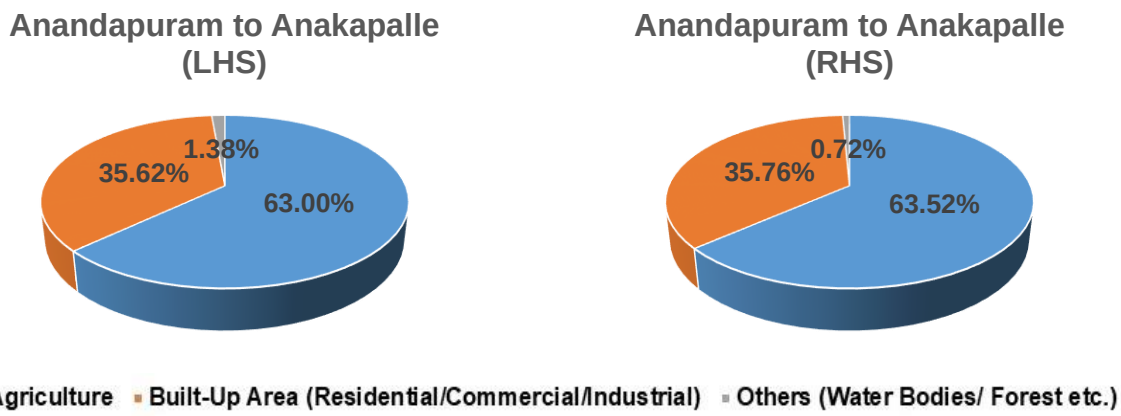


Figure 3-2: Land Use

3.4.4 Main Carriageway

Most of the length of the project highway is a 6-lane divided carriageway with paved shoulder configuration. The carriageway width is 11.0m (with kerb shyness) with 1.5m wide paved shoulder at rural area, 11.0m (with kerb shyness) with 2.0m wide paved shoulder at urban area and 11.0m (with kerb shyness) with 2.5m wide paved shoulder at underpasses location all along the project corridor except at toll plaza, bridges and ROBs.

Details are show in **Table 3.3** and **Figure 3.3** below.

Table 3-3: Main Carriageway

S. No.	Section	Chainage (km)		Length (km)	Lane	Type of Pavement	Remarks
		From	To				
1	Anandapuram-Anakapalle	682+980	703+460	20.480	6-lane with Paved Shoulder	Rigid	Dukkavanipalem @686+530
		703+460	704+320	0.860	3-lane with Paved Shoulder in LHS	Rigid	
		704+320	731+585	27.265	6-lane with Paved Shoulder	Rigid	Marripalem @722+160
				48.605			



6 lane Rigid Carriageway (Typ)



6 lane Rigid Carriageway at Flyover (Typ)

Figure 3-3: Main Carriageway

3.4.5 Service Road/Slip Roads

Total linear length (both side length) of service/slip road length for the project section 92.765 km. Flexible pavement is there for the service roads at all the locations. Details of service road are given below.

Table 3-4: Service Road

Service Road (LHS)			Service Road (RHS)		
Chainage (km)		Length (km)	Chainage (km)		Length (km)
From	To		From	To	
Anandapuram to Anakapalle Section					
683+100	713+080	29.980	683+100	703+450	20.350

Service Road (LHS)			Service Road (RHS)		
Chainage (km)		Length (km)	Chainage (km)		Length (km)
From	To		From	To	
713+080	713+280	0.200	704+450	729+010	24.560
714+000	729+010	15.010	729+010	730+110	1.100
729+010	730+110	1.100	731+360	731+480	0.120
731+360	731+705	0.345			
Total		**46.635**	**Total**		**46.13**



Service Road at Km 689+800 LHS



Slip Road at Km 711+800 RHS

Figure 3-4: Service/Slip Road Carriageway

3.4.6 Towns and Built-Up-Areas

Chainage-wise details of towns and built-up areas are given below:

Table 3-5: Built Up Areas

S. No.	Chainage (km)		Length (km)	Side	Name of Settlement
	From	To			
Anandapuram to Anakapalle Section					
1	682+980	684+683	1.703	RHS	Anandapuram
2	684+683	684+883	0.200	Both Side	Gambheeram
3	690+400	692+700	2.300	LHS	Mindivanipalem
4	691+000	692+083	1.083	Both Side	Sontyam
5	693+803	693+983	0.180	LHS	Narayana Gajapathipuram-1
6	695+733	696+183	0.450	Both Side	Narayana Gajapathipuram-2
7	696+883	697+783	0.900	Both Side	Gandigudem-2
8	699+200	700+800	1.600	Both Side	Akkireddy Palem
9	706+683	707+123	0.440	Both Side	Ramapuram
10	707+983	708+483	0.500	Both Side	Pinagadi
11	710+183	710+483	0.300	Both Side	Anmruthapuram
12	710+483	710+800	0.317	LHS	Anmruthapuram
13	717+254	717+754	0.500	Both Side	Askapalli-2
14	721+054	721+954	0.900	Both Side	Bata Jangalapalem
15	725+354	727+054	1.700	Both Side	Rebaka
16	727+054	728+854	1.800	Both Side	Sankaram

3.4.7 Major and Minor Junctions

3.4.7.1 Major Junction

Provision of grade separation in the form of underpasses (CUPs, PUPs, LVUPs, VUPs and Flyovers) are there at all major junctions for the entire project section. All access to the project highway is through the Service/Slip Road.

There are 11 nos. of Major Junction. Details of the major junction are given in the **Table 3.6** below:

Table 3-6: List of Major Junction

Sr. No.	Chainage (Km)	Type of Junction	Cross Road leads to	
			LHS	RHS
Anandapuram to Anakapalle Section				
1	683+080	X	Anakapalle	Anandapuram
2	691+115	Y	-	Vizianagaram
3	696+260	Y	Simhachalam	-
4	699+670	Y	Pendurthi	
5	703+900	X	Pendurthi	Srungavarapu kota
6	706+360	Y	Pendurthi	-
7	708+070	X	Vepagunta	Mallinaidu Palem
8	711+645	Y	-	Sabbavaram
9	716+430	X	Lankelapalem	Sabbavaram
10	729+000	Y	-	Anakapalli
11	730+820	X	Vishakapatnam	Anakapalli

3.4.7.2 Minor Junction

There are 13 nos. minor junctions all along the project road. Other village or town road are connected with service / slip road and the road users are coming through service / slip road to connect with main carriageway. Summary of the minor junctions are given in the **Table 3.7** below:

Table 3-7: Summary of Minor Junction

Sr. No.	Type of Junction	Anandapuram to Anakapalle Section
1	T Junction	6
2	Y Junction	3
3	X Junction	4

3.4.8 Median

Median width is predominantly 4.0m-4.5m (excluding shyness). However, narrow median is observed at few locations due to ROW constraints or in built-up stretches. Details of sections with narrow median width are given in the **Table 3.8** below:

Table 3-8: Details of Narrow Median (Width < 4.5m)

Chainage (km)		Width (m)	Section	Remarks
FROM	TO			
691+200	700+544	1.2 - 1.5	Anandapuram to Vishakhapatnam	Kambalakonda Wildlife Sanctuary /Built-up Area

3.4.9 Earthen / Hard Shoulder

Earthen shoulders are provided on the outer side of the main carriageway. The width of these shoulders is 1.5m to 2.5m.

3.4.10 Drainage

Cover Drains are provided with service and slip road in entire of project road. Median cut drains are provided at super-elevated portion for efficiently draining out rainwater. Package wise details of Drainage are given in the **Table 3.9** and shown in **Figure 3.5.**

Table 3-9: Drainage System

Description	Anandapuram to Anakapalle Section
Covered lined Drain (km)	89.505
Open Lined Drain (km)	0.260

General observation of drainage conditions during the site reconnaissance are:

- Cleaning and maintenance of roadside drainage needs improvement. Cover at drain is missing at few locations.
- Provision of chute drain at high embankment location is observed. Water is draining off from the main carriageway to drain through the service road. This will adversely affect the pavement of service road.
- Though there were considerable rains during the time of inventory survey, no overtopping of road was observed at any location. It was further confirmed by the locals also.



Cover Drain at Service Road Location



Cut Drain from Main Carriageway to Service Road

Figure 3-5: Drainage System

3.4.11 Road Furniture

3.4.11.1 W-Beam Crash Barrier, Concrete Crash Barrier and Pedestrian Guardrail

W-Beam Crash Barrier

W-beam Crash Barrier is provided at high embankment location, Separator (in between main carriageway and service road), near major structures and at outer side of sharp curves in the entire project road. Package wise length of W-Beam Crash Barrier are given in the **Table 3.10** and shown in **Figure 3.6.**

Table 3-10: W-Beam Crash Barrier

Description	Anandapuram to Anakapalle Section
W-Beam Crash Barrier (km)	89.505



Figure 3-6: W-Beam Crash Barrier near High Embankment and Separator

Concrete Crash Barrier

Concrete Crash Barrier is provided at approaches of ROBs, Flyovers and Underpasses almost all through the project road. Length of CC barrier are given in Table **3.11** and shown in **Figure 3.7.**

Table 3-11: Concrete Crash Barrier

Description	Anandapuram to Anakapalle Section
Concrete Crash Barrier (km)	39.025



Figure 3-7: Concrete Crash Barrier

Pedestrian Guardrails

Pedestrian guard rail is there between main carriageway and service road. Length of Pedestrian Guardrails are given in the Table 3.12 and shown in Figure 3.8.

Table 3-12: Pedestrian Guardrails

Description	Anandapuram to Anakapalle Section
Pedestrian Guardrail (km)	44.895



Figure 3-8: Pedestrian Guardrails

3.4.11.2 Sign Boards and Gantry

There are adequate number of signboards along the project road and most of them are in good condition. There are many variable message signs (VMS), overhead and cantilever gantry signs as well. Location of gantry signs are shown in **Table 3.14** and **Figure 3.10** below.

Table 3-13: Variable Message Signs (VMS) / Cantilever & Overhead Gantry

S. No.	Chainage (km)	Side	Type	S. No.	Chainage (km)	Side	Type
Anandapuram to Anakapalle Section							
1	593+330	RHS	VMS	30	708+300	RHS S/R	Cantilever
2	599+300	RHS	VMS	31	711+010	LHS	Cantilever
3	600+040	RHS	Cantilever	32	711+180	LHS	Portal
4	606+605	RHS	VMS	33	711+400	LHS S/R	Cantilever
5	612+260	RHS	VMS	34	711+790	RHS S/R	Cantilever
6	685+390	LHS	Cantilever	35	712+120	LHS S/R	Cantilever
7	685+550	LHS S/R	Cantilever	36	712+235	LHS S/R	Cantilever
8	686+130	LHS	Cantilever	37	712+630	RHS S/R	Cantilever
9	686+990	RHS	Cantilever	38	713+210	RHS S/R	Cantilever
10	687+535	RHS	Cantilever	39	714+580	RHS	Portal
11	690+940	LHS S/R	Cantilever	40	715+910	RHS S/R	Cantilever
12	691+385	RHS S/R	Cantilever	41	716+290	LHS S/R	Cantilever
13	693+050	LHS S/R	Cantilever	42	716+680	RHS S/R	Cantilever
14	695+580	LHS S/R	Cantilever	43	719+100	LHS S/R	Cantilever
15	695+980	LHS S/R	Cantilever	44	719+560	RHS S/R	Cantilever
16	696+400	RHS S/R	Cantilever	45	721+160	LHS	Cantilever
17	698+080	RHS S/R	Cantilever	46	721+665	LHS	Cantilever
18	699+040	RHS	VMS	47	722+660	RHS	Cantilever
19	699+500	LHS S/R	Cantilever	48	723+160	RHS	Cantilever
20	700+580	LHS S/R	Cantilever	49	723+790	LHS	Cantilever
21	700+960	RHS S/R	Cantilever	50	724+175	RHS S/R	Cantilever
22	701+660	LHS S/R	Cantilever	51	726+710	LHS	Cantilever
23	702+090	RHS S/R	Cantilever	52	727+055	RHS	Cantilever

S. No.	Chainage (km)	Side	Type	S. No.	Chainage (km)	Side	Type
24	702+480	LHS S/R	Cantilever	53	728+565	LHS	Portal
25	702+820	RHS S/R	Cantilever	54	728+750	LHS S/R	Cantilever
26	703+375	LHS	VMS	55	728+780	LHS	Cantilever
27	706+110	LHS S/R	Cantilever	56	729+785	Median	Cantilever
28	706+520	RHS S/R	Cantilever	57	731+450	RHS	VMS
29	707+880	LHS S/R	Cantilever	58	731+780	RHS	VMS



Figure 3-9: VMS and Gantry Signboards

In general, these appurtenances are in good condition.

3.4.11.3 5 km / Km / Hectometer Stones

5Km, Km & Hectometer stones are observed at shoulder & median. Most of the stones are in good condition.



Figure 3-10: Kilometer & Hectometer Stones

3.4.12 Project Facilities

3.4.12.1 Bus Bays and Shelters

As main carriageway is access controlled, Bus bays/shelters are at service/slip roads. It is observed that few shelters are of tin shade and are in poor condition. There are three types of facilities for boarding the bus by the road users. There are bus bay with shelters,

only bus bay without shelters and only shelters without bays. Package-wise number of these facilities are given in **Table 3.15** and shown in **Figure 3.12** below.

Table 3-14: Bus Bays and Shelters

Description	Unit	Anandapuram to Anakapalle Section
Bus bay	Nos	2
Bus bay with Shelter	Nos	29
Bus Shelter	Nos	2



Figure 3-11: Bus Bay and Shelters

3.4.12.2 Truck Lay bye

Tuck lay bye are adjacent to the rest areas.

Table 3-15: Truck Lat Bye and Rest Area

Description	Unit	Anandapuram to Anakapalle via Pendurthi Section
Truck Lay Bye	Nos	2
Rest Area	Nos	2



Figure 3-12: Truck lay bye & Rest Area at Km 715+200 Both Side

3.4.12.3 Streetlight

Street light in the form of single/double arm poles are provided in toll plaza, underpasses and built-up area along the project road. Package-wise length provided for street lighting is give in **Table 3.17** and few examples are shown in **Figure 3.14.**

Table 3-16: Highway Lighting

S. No.	Section	Double Arm Light		Single Arm Light	
		Kms	Nos	Kms	Nos
4	Anandapuram to Anakapalle	65.527	2186	4.695	196



Highway lighting at Flyover



Highway lighting at Built-up area

Figure 3-13: Street Light

3.4.12.4 High Mast Light

High mast lights are provided at toll plazas and few major junctions. Details are show in **Table 3.18** below.

Table 3-17: High Mast Light

S. No.	Chainage (km)	Numbers	Side	Location
Anandapuram to Anakapalle Section				
1	686+375	1	RHS	Toll Plaza
2	686+475	1	RHS	Toll Plaza
3	686+580	1	LHS	Toll Plaza
4	686+680	1	LHS	Toll Plaza
5	721+994	1	RHS	Toll Plaza
6	722+010	1	RHS	Toll Plaza
7	722+090	1	LHS	Toll Plaza
8	722+210	1	RHS	Toll Plaza
9	722+300	1	LHS	Toll Plaza
10	730+820	1	LHS	Junction
11	731+530	1	Median	College

3.5 Toll Plaza

The purpose of the Toll Plaza is to collect toll from road users of the Project highway with transparency in the system. There are two toll plazas along the project road. Booths are available for all lanes. Administrative buildings are there at both Toll Plazas.

3.5.1 Dukkavanipalem Toll Plaza (TP-3)

Dukkavanipalem Toll Plaza (TP-3) is located at km 686+530, Anandapuram to Anakapalle stretch which has 11 lanes (5 LHS & 6 RHS). Outermost lanes are the extra wide lanes in both direction.



Figure 3-14: Dukkavanipalem Toll Plaza

3.5.2 Marripalem Toll Plaza (TP-4)

Marripalem Toll Plaza (TP-4) is located at km 722+160, Anandapuram to Anakapalle stretch which also has 11 lanes (6 LHS & 5 RHS). Extra wide lanes are the outermost lanes in both the direction.



Figure 3-15: Marripalem Toll Plaza

Table 3-18: Toll Equipment Status, Dukkavanipalem & Marripalem Toll Plazas

Sr. No.	Particulars	Details	Details
1	Toll Plaza Chainage and name	686+530 Dukkavanipalem Toll Plaza	722+160 Marripalem Toll Plaza
2	Road Configuration	11 Lanes	11 Lanes
3	Number of Toll Lanes	13	13
4	No of ETC system	13	13
5	No of Toll Booths	13	13
6	Canopy	Available	Available
7	Admin Building	Available	Available

Sr. No.	Particulars	Details	Details
8	Control Room	Available	Available
9	Server Room	Available	Available
10	UPS & Battery Room	Available	Available
11	Point of Sale Room	Available	Available
12	Plaza Manager Room	Available	Available
13	Cash up Room	Available	Available
14	Cashier Room	Available	Available
15	Cash Van Garage	Not Available	Not Available
16	Availability of Tunnel	Available	Available
17	PRO Office	Not Available	Not Available
18	Changing Room	Available	Available
19	Toilets (Gents & Ladies)	Available	Available
20	Weigh In Motion Facility	Available	Available
21	Availability of Static Weigh Bridge	Available	Available
22	Availability of loading/unloading facilities	Not Available	Not Available
23	Storage facility of overloaded material	Not Available	Not Available
24	Diesel Generator	Available	Available
25	High Mast Light	Available	Available
26	Streetlights	Available	Available
27	Type of Pavement at Toll Lanes	Rigid	Rigid
28	Highway Mini Nest	Available	Available
29	Low mast Light	Not Available	Not Available



Lane Equipment



Lane Equipment



TMS Equipment



Weigh In Motion

Figure 3-16: Toll Equipment at Dukkavanipalem & Marripalem Toll Plazas

3.5.3 Toll Plaza Administration Building

The Plaza administration building serves as the support structure for the operation and maintenance of the toll plaza. It is from here that utilities are distributed and controlled,

employee amenities are maintained, the toll collection process overseen, revenues are processed & audited. Sale of local passes and recharge is done at Plaza building. Transfer of funds from toll booth to plaza building and from plaza building to bank are being facilitated/managed by administration and financial management functions are also conducted in the building.





Administration Buildings at Dukkavanipalem Toll Plazas





Administration Buildings at Marripalem Toll Plazas

Figure 3-17: Toll Plaza Administration Buildings

3.6 Structure Inventory and Condition Survey

This section mainly presents the Site Inventory and Condition Survey of all existing Structures likes Culverts, Minor bridges & Major bridges, Flyovers/ Viaducts, VUP, LVUP, PUP, RUB and ROBs along the project roads. The aim of the section is to present the details of existing structures condition of existing structures and functioning of structures. The structure inventory has been done on the basis of visual assessment of each structure. MBIU has been used for visual assessment inspection of major structures having length greater than 60m.

Number of existing structures along the Project roads are given in the following table. Detailed inventory and condition data is presented in **Annexures – 3.2** and **3.3**.

Table 3-19: Number of Structures

S. No.	Description	Anandapuram to Anakapalle
1	Major Bridge (no.)	4

S. No.	Description		Anandapuram to Anakapalle
2	Minor Bridge (no.)		23
3	ROB/RUB (no.)		2
4	Flyover (no.)		9
5	Overpass for new international airport(no.)		-
6	VUP (no.)		9
7	LVUP (no.)		12
8	PUP/CUP (no.)		-
9	Foot Over Bridge (no.)		1
10	Culverts (no.)	Box	51
		Slab	-
		Pipe	44

Section 4: Surveys and Investigations

4.1 Visual Observation

i) In general, pavement condition is good to fair.

ii) The rigid pavement has got lost the surface texture in most of the locations

iii) Few of the locations found with high severity longitudinal and transverse cracks, widened joints and level difference among the panels

iv) Rectification measures such as stitching was in progress in some of the locations towards Anakapalli..

v) The service road condition is fair to poor. The distresses like shoving, corrugations are observed in significant length.

vi) The Main Carriageway of 3-lanes on RHS from km 703+400 to km 704+300 has not been constructed due to LA issues. The 3-lanes, which are constructed on LHS is being used for both directional traffic at the moment..



Availability of 3L & LHS SR only from 703+400 to 704+300



Stitching in progress



Rigid Pavement Distress



Rigid Pavement Distress

Figure 4-1: Visual Observations

4.2 Network Survey Vehicle (NSV)

The Network Survey Vehicle is the latest survey technique which utilizes Lasers, Global Positioning System and Video image processing tools. The survey vehicle is used for automatic data collection pertains to pavement condition and road inventory data, required for preparation of pavement maintenance and management proposals. It allows

all the data to be collected in a single pass consequently minimising the time needed to complete the data collection. The measurement of surface distresses like cracking, ravelling, patching and potholes etc. is done using the calibrated image processing methods. The description of NSV and the methodology adopted is provided in **Annexure-4.1.**

The NSV survey has been carried out along the project corridor from 27/07/2024 to 01/08/2024 for collection of field data pertains to pavement condition and road inventory. The data has been collected separately for each lane of the Carriageway. NSV Vehicle at the site is shown below.



Figure 4-2: NSV survey

4.2.1 Evaluation of Pavement Condition

NSV survey has been conducted for assessment of pavement condition and its distresses. The pavement surface images captured by NSV were processed in Survey board and all the images are geotagged with corresponding co-ordinates and chainage. By manual intervention with Survey Board, it was mapped/ identified various distresses showing distress type, location, magnitude and severity.

Flexible Pavement Distresses

The following Pavement distresses are considered for assessing the flexible pavement condition as per IRC: 82-2015 “Code of Practice for Maintenance of Bituminous Road Surfaces”.

- Cracking
  - Longitudinal cracks
  - Transverse cracks
  - Alligator cracks/ Crocodile cracks
  - Multiple cracks
- Ravelling

- Shoving
- Bleeding
- Slippage/ Delamination
- Potholes
  - Area: Surface Area of the Pothole;
  - Numbers
- Edge break
- Patching
- Settlements, Depressions

Strip chart showing the observed pavement distresses is provided in **Annexure 4.2** separately for LHS and RHS directions along with roughness. Based on the pavement condition, suitable repair and rehabilitation strategy has been suggested and same shall be presented under the section of Major Maintenance of this report.

4.2.2 Pavement Roughness

The roughness data was collected at 100m interval using NSV on each lane in-terms of IRI (International Roughness Index) value. In Indian context, the IRI values were converted to BI as per IRC: SP:16-2019 “Guidelines on Measuring Road Roughness and Norms” with the following equation;

$BI = 630*(IRI)^{1.12}$

Where

BI = Bump Integrator Roughness in mm/km

IRI = International Roughness Index.

Roughness data of Flexible & Rigid Pavement (Toll Plaza Section) was collected through Digital Laser Profilers System (DLP) and the same is presented in **Annexure 4.3**. The summary of Roughness values is presented in tables below

Table 4-1: Anandapuram - Anakapalli Section: Summary of Pavement Roughness

Condition as per IRC SP:83-2018 Table 4.2	Unevenness (mm/Km)	LHS						RHS					
		L1		L2		L3		R1		R2		R3	
		Length (Km)	Length (%)	Length (Km)	Length (%)	Length (Km)	Length (%)	Length (Km)	Length (%)	Length (Km)	Length (%)	Length (Km)	Length (%)
Rigid Pavement													
Good	<2000	40.48	82.3	38.88	79.1	40.08	81.5	38.2	79.3	37.8	78.5	15	31.1
Fair	1800-2400	6.2	12.6	7.5	15.3	6.9	14.0	7.58	15.7	7.28	15.1	19.3	40.1
Poor	>2400	2.5	5.1	2.8	5.7	2.2	4.5	2.4	5.0	3.1	6.4	13.88	28.8
Length (Km)		49.2	100.0	49.2	100.0	49.2	100.0	48.2	100.0	48.2	100.0	48.2	100.0

4.2.3 Test Pit Investigations

Test pit investigations have been planned to conduct at every 5km in a staggered manner ascertain the existing pavement composition (pavement course, material type, and thickness). However, the project is partially access control throughout the length, thereby no earthen shoulder has been found and thus test pits were taken at the locations where feasible to dug at the edge of the paved and earthen shoulder. The summary of existing pavement crust thickness is presented in table and some of the photographs showing the pavement crust thickness are shown as below.

Table 4-2: Summary of Existing Pavement Crust Thickness

Date of Sampling	Location of Trial Pit	Lanes	Pavement Composition (mm)						
			BT	PQC	DLC	WMM	Cemented layer	GSB	SUBGRADE
Anandapuram-Anakapalli Section									
04.08.24	686+700LHS	6	-	290	110	-	-	170	500
04.08.24	710+960LHS	6	-	290	130	-	-	140	500
04.08.24	703+520RHS	6	-	250	110	-	-	170	500

Observations and Conclusions:

- Anandapuram-Anakapalli has been found with Rigid type for the total length.
- The pavement type for service road is flexible type and has been designed for 10MSA traffic.
- Throughout the project road, rigid pavement thickness of PQC as 290mm. Since these test pits locations were taken at a larger intervals and thus it can be considered as indicate thicknesses for the compistion as found from the trail pits. .

During the above investigations, the existing subgrade soils samples were collected and tested in the laboratory to understand the properties of these foundation soils. The test results are presented in below sections.

Test Results: Anandapuram-Anakapalli Section

Location of Trial Pit	Nature of Soil (Visual Identification)	Sieve Analysis by % of passing			Sand Content %	Atterberg Limits			FSI %	MDD g/CC	OMC %	FDD g/CC	FMC %	CBR (4Days Soaked) %	Field CBR (DCPT) %	Depth of Water Table below Subgrade
		4.75mm	0.425mm	0.075mm		LL%	PL %	PI %								
694+700LHS	GP-GM (Poorly Graded Gravel Mixed with Silty Gravel)	38.0	26.0	10.8	27.2	22.1	13.5	8.6	Nil	2.12	7.8	1.86	8.0	15.0	21.0	Not found
698+900LHS	GC (Clayey Gravel)	43.5	25.1	15.3	28.2	25.6	13.6	12.0	10.0	2.11	8.2	1.68	8.0	15.0	21.0	Not found
683+700RHS	GC (Clayey Gravel)	42.5	29.5	14.8	27.7	24.3	14.8	9.5	10.0	2.13	8.1	1.82	9.0	14.5	22.0	Not found
690+700RHS	GC (Clayey Gravel)	37.0	22.8	12.9	24.1	23.9	12.8	11.1	10.0	2.10	8.0	1.78	7.0	13.5	21.0	Not found

Observations and Conclusions

The subgrade soils are generally consistent throughout the project road and CBR values are in compliance with the design CBR as adopted during the 6-lane works. Further, it has been observed during the site visit that most of the soils in the region found to be red soil having CBR values more than 10% and this is one the reason for better performance of the pavement of the project highways.

4.3 Axle Load Survey

Vehicle axle loading has a significant effect on pavement design and its impact on performance of the pavement. Therefore, an axle load survey has been conducted from 26th July-2024 to 02nd Aug-2024 in compliance with IRC 37 2018 and such survey was conducted for 24 hours in both directions at each of the existing 4 No's toll plaza locations along the project highway from Narsannapeta-Anakapalli.

The type of vehicle considered for axle load survey along with its axle configurations are presented in below. Few of the survey photographs were shown in Photos as below:

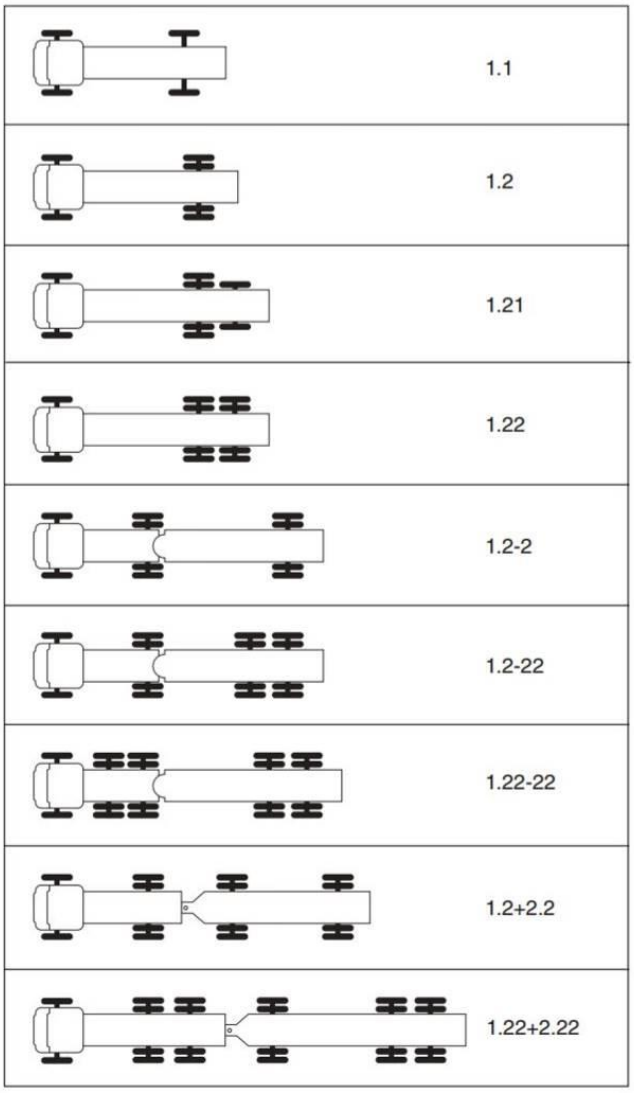




Figure 4-3: Axle Load Survey

The VDF analysis was carried as per procedure given IRC: 37-2018 based on the collected axle load data. The equations for computing equivalency factor for single, tandem and tridem axles given below is used as directed in the IRC:37-2018 for converting different axle load repetitions into equivalent standard axle load repetitions;

- Single axle with single wheel on either side = {axle load in kN / 65}4
- Single axle with dual wheel on either side = {axle load in kN / 80}4
- Tandem axle with single wheel on either side = {axle load in kN /148}4
- Tridem axle with dual wheel on either side = {axle load in kN /224}4

With the stated above procedure, the Vehicle Damage Factor for each class of commercial vehicle on both the directions were calculated separately for empty and loaded vehicles. The Axle load data format and VDF analysis are presented in **Annexure 4.5** and obtained VDF values comparing the values adopted at the time of pavement design during construction summarized in table below.

Table 4-3: Vehicle Damage Factors (VDF)

S. No	Toll plaza	Dukkavanaipalem		Marripalem	
		Km 686+540		Km 722+154	
	Vehicle Type	LHS	RHS	LHS	RHS
1	Bus	-	-	-	-
2	LCV	1.59	2.27	2.45	1.64
3	2-Axle	2.39	2.95	3.56	2.61
4	3-Axle	3.8	5.43	2.14	4.41
5	MAV	4.67	9.48	6.15	8.03

There is a significant difference between the axle loads of commercial vehicles flying in both directions of traffic, due in inconsistent commodity pattern generating from different locations along the project highway and thus, separate factors have been considered for traffic assessment. Further, 7-day axle load survey has been conducted to validate the above inconstancy and found that VDF values as obtained from these 7-day survey is less than 24 hours' survey and hence adopted the above values in the present due diligence study.

4.4 Falling Weight Deflectometer (FWD)

The structural evaluation of pavement has been carried out in accordance with IRC: 115-2014, "Guidelines for Structural Evaluation and Strengthening of Flexible Road Pavements Using Falling Weight Deflectometer (FWD) Technique" to determine the remaining life of the pavement structure.

The principle and description of FWD and its methodology is provided in **Annexure 4.6.**

FWD deflection measurement has been carried out for each direction and the measurement has been carried out at a test point along outer wheel path of each direction which is at an offset of 1m from the outer edge of outer lane as specified in section 5.4.5 of IRC: 115-2014. At every measurement location, four drops were made, such that the first drop was the '**seating drop'** and with the remaining three drops deflections were recorded. Field survey photographs is shown below.



Figure 4-4: FWD Survey at Project Site

The deflection testing has been carried out on the existing pavement as per IRC Codes at the rate of 5 points per km as stipulated in TOR of the Consultant.

Adopted deflection measurement scheme is as under.

Adopted Measurement Scheme	Maximum Spacing(m) for test points along selected wheel path (Flexible Pavement)	Rigid Pavement
(i) measurement along outer wheel paths of outer lanes (3 points)	200	Load position for transverse and longitudinal shoulder joints Outer lane Inner lane Load position for corner and interior loading Median
(ii) measurement along the outer wheel path of inner lane (2 points)	400	

4.4.1 Back-calculation of Layer Moduli for Flexible Pavement

Layer moduli have been back calculated using KGPBACK program. The pavement has been modelled as a three-layer system with bituminous layer, granular layer and subgrade. The following inputs have been provided for back analysis.

i) Single wheel load 40 kN and contact pressure 0.56 MPa
ii) No. of deflection sensors: 9
iii) Radial Distances of the Geophones i.e., 0,200, 300,450, 600, 900 and 1500mm
iv) Measured Surface Deflections normalized to 40kN in mm
v) Pavement Layer Thicknesses (as measured from Trial Pits)
vi) Poisson's ratio for different layers i.e., 0.35 for bituminous, granular and subgrade
vii) Range of Possible modulus value (Min.- Max.) of bituminous layer, granular layer and subgrade.

Ranges of different layer moduli have been given as input to KGPBACK for back-calculation. These ranges have been selected judiciously by experienced pavement engineering taking into considerations the approximate age of pavement, visual assessment of the condition of bituminous layer, climatic conditions prevailing at the time of deflection measurements and information available from test pits, and laboratory tests conducted as detailed below:

Range of modulus value of existing subgrade:

The range of moduli of existing subgrade is taken based on the subgrade CBR values for the analysis.

Range of modulus value of existing granular layers i.e., base and subbase:

The range of moduli of existing granular layers is based on Appendix III.8.4 of IRC 115-2014.The range for combined (base and sub-base) is taken as 100-500 MPa.

Range of modulus value of existing thick bituminous layers:

The range of moduli of existing thick bituminous layer has been determined on the basis of condition data. If the road condition is good the range is considered as 750 MPa to 3000 MPa, for sections with pavement condition is Fair- Poor, the range specified for thick bituminous layer 400 MPa to 1500 MPa as stipulated in Appendix III.8.4 of IRC: 115-2014 has been taken into consideration.

4.4.1.1 Correction for Temperature

Back-calculated moduli values of the bituminous layers evaluated by FWD survey are influenced by the pavement temperature. The standard pavement temperature for India is recommended as 35°C, hence the back-calculated moduli obtained at temperatures other than the identified standard temperature will have to be corrected using a suitable correction factor using equations 4 and 5 of IRC:115-2014 and the same is extracted below for ready reference.

$$E_{T1} = \lambda E_{T2} \ldots\ldots \textbf{(4)}$$

Where,

λ temperature correction factor, is given as

$$\lambda = \frac{(1-0.238 \ln T_1)}{(1-0.238 \ln T_1)} \ldots\ldots \textbf{(5)}$$

Where,

E_{T1} = Back-calculated modulus (MPa) at temperature $T_1^0\ C$

E_{T2} = Back-calculated modulus (MPa) at temperature $T_2^0\ C$

However, in few sections, after applying the temperature correction the E value of bituminous layers are coming more than 3000MPa. As the project road was constructed with VG-30/VG-40 grade bitumen, it is restricted to keep the maximum E value of 3000MPa, wherever it is exceeding. In these locations, the temperature correction factor was applied as 1.

4.4.1.2 Correction for Seasonal Variation

Moisture content affects the strength of subgrade and granular sub base/base layers. Therefore, the back-calculated moduli of subgrade and granular layers should be taken from field moduli using seasonal corrections. Seasonal correction equations 7 and 8 of IRC: 115-2014 has been extracted below for ready reference.

$$E_{sub_mon=}\ 3.351 * \left(E_{sub_win}\right)^{0.7688} - 28.9 \ldots (6)$$

$$E_{sub_mon} = 0.8554 * (E_{sub_sum}) - 8.461 \ldots (7)$$

where,

E $_{sub_mon}$ = subgrade modulus in monsoon (MPa)

E $_{sub_sum}$ = subgrade modulus in Summer (MPa)

E $_{sub_win}$ = subgrade modulus in Winter (MPa)

$$E_{gran_mon=}\ -0.0003 * \left(E_{gran_sum}\right)^2 + 0.9584 * \left(E_{gran_sum}\right) - 32.989 \ldots (8)$$

$$E_{gran_mon=}\ 10.5523 * \left(E_{gran_win}\right)^{0.624} - 113.857 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

where,

E $_{gran_mon}$ = granular layer modulus in monsoon (MPa)

E $_{gran_sum}$ = granular layer modulus in Summer (MPa)

E $_{gran_win}$ = granular layer modulus in Winter (MPa)

Since the deflection measurements have been carried out in the month of December hence seasonal correction factor is applicable.

The 15th percentile value (as the same has been recommended by IRC: 115-2014 for purpose of design) of back-calculated & corrected layer moduli of each identified homogeneous sub-sections of both directions separately are presented next.

4.4.1.3 FWD data Analysis for Rigid Pavement

As per IRC: 117-2015, the collected FWD data for the rigid pavement has been analysed to determine the following parameters.

- Modulus of subgrade reaction k (MPa/m)
- Elastic modulus of concrete E_c (MPa)
- Flexural Strength of concrete f_{mr} (MPa)
- Load Transfer Efficiency (LTE) of Joints (%)

The detailed analysis of the parameter for PQC and Load Transfer Efficiency is presented in **Annexure 4.7** for both LHS and RHS directions respectively.

From the test results the observations were draw-down. The range of Elastic Modulus, other PQC parameters and their percentage of length and Load Transfer Efficiency (LTE) is presented in table **below**.

Table 4-4: Outcome of FWD Data Analysis for Rigid Pavement

Side		LHS					RHS				
Chainage (Km)		Modulus of subgrade reaction k (MPa/m)	Elastic modulus of concrete Ec (MPa)	Strength of concrete fc (MPa)	Flexural Strength of concrete f_{mr} (MPa)	LTE (%)	Modulus of subgrade reaction k (MPa/m)	Elastic modulus of concrete Ec (MPa)	Strength of concrete fc (MPa)	Flexural Strength of concrete f_{mr} (MPa)	LTE (%)
From	To										
Anandapuram - Anakapalli Section											
682.600	683.500	186.027	31419	39.9	4.4	83.8	305.580	34405	47.6	4.8	83.6
683.500	684.500	100.385	30155	36.6	4.2	85.6	101.645	31648	40.6	4.4	91.9
684.500	685.500	133.782	28197	32.0	3.9	88.4	130.304	34086	46.5	4.8	83.2
685.500	686.500	134.446	29999	36.8	4.2	87.0	130.555	32942	43.7	4.6	89.1
686.500	687.500	112.406	35538	51.5	5.0	87.6	112.474	32537	43.2	4.6	91.0
687.500	688.500	96.680	34411	49.4	4.8	84.8	81.418	42721	73.5	6.0	89.4
688.500	689.500	136.209	35809	52.4	5.0	82.5	193.259	31173	39.9	4.4	83.6
689.500	690.500	77.661	33558	47.4	4.7	88.4	151.593	35955	52.5	5.0	88.4
690.500	691.500	92.881	27561	30.9	3.9	88.2	82.614	32435	42.3	4.5	83.0
691.500	692.500	185.411	31982	41.9	4.5	83.5	226.563	35779	51.4	5.0	82.1
692.500	693.500	87.334	33105	44.2	4.6	86.2	86.691	30977	39.4	4.3	87.5
693.500	694.500	91.736	32767	43.8	4.6	88.3	105.783	31710	40.4	4.4	84.3
694.500	695.500	99.471	36485	55.4	5.1	83.0	108.946	32713	43.2	4.6	86.4
695.500	696.500	100.622	38116	59.4	5.3	87.5	97.759	33495	45.7	4.7	81.4
696.500	697.500	97.546	34550	48.0	4.8	86.3	81.577	35755	51.4	5.0	86.1
697.500	698.500	126.185	39471	62.4	5.5	87.0	127.861	36006	52.4	5.0	82.6
698.500	699.500	129.061	34290	47.2	4.8	85.1	122.733	35009	49.3	4.9	84.7
699.500	700.500	109.629	30861	39.4	4.3	85.5	177.443	31890	40.7	4.5	82.0
700.500	701.500	189.168	36129	53.3	5.1	85.7	189.258	34225	47.0	4.8	83.2
701.500	702.500	157.419	35820	52.2	5.0	88.8	232.348	32365	42.3	4.5	84.9

Side		LHS					RHS				
Chainage (Km)		Modulus of subgrade reaction k (MPa/m)	Elastic modulus of concrete Ec (MPa)	Strength of concrete fc (MPa)	Flexural Strength of concrete f_{mr} (MPa)	LTE (%)	Modulus of subgrade reaction k (MPa/m)	Elastic modulus of concrete Ec (MPa)	Strength of concrete fc (MPa)	Flexural Strength of concrete f_{mr} (MPa)	LTE (%)
From	To										
702.500	703.500	118.633	38981	61.0	5.5	87.1	195.865	37488	56.5	5.2	85.6
703.500	704.500	105.256	33033	44.1	4.6	85.1	103.737	32743	43.3	4.6	85.3
704.500	705.500	114.483	32969	43.7	4.6	85.1	172.335	32639	43.1	4.6	82.0
705.500	706.500	180.928	34165	47.5	4.8	84.3	250.321	35666	51.3	5.0	84.7
706.500	707.500	119.188	38118	58.6	5.3	84.8	116.863	32054	41.7	4.5	85.5
707.500	708.500	133.942	34579	49.1	4.8	84.1	93.461	34686	48.2	4.9	83.0
708.500	709.500	147.015	33811	46.8	4.7	82.6	189.393	36563	53.7	5.1	82.1
709.500	710.500	187.042	34750	48.9	4.9	83.2	198.082	34587	48.3	4.8	81.8
710.500	711.500	79.158	41139	67.8	5.8	89.6	134.646	32468	42.9	4.5	81.2
711.500	712.500	105.629	35191	50.1	4.9	86.5	112.840	32047	41.9	4.5	84.0
712.500	713.500	115.166	36064	52.4	5.0	88.8	128.585	30970	39.7	4.3	84.6
713.500	714.500	115.119	30385	38.6	4.3	82.2	97.532	35327	50.1	4.9	83.4
714.500	715.500	144.180	34516	48.0	4.8	85.1	79.167	30481	38.3	4.3	84.8
715.500	716.500	269.022	32359	42.7	4.5	79.7	105.125	34987	49.1	4.9	81.7
716.500	717.500	83.814	30400	37.8	4.3	83.6	127.766	35959	52.7	5.0	84.5
717.500	718.500	133.050	40074	64.7	5.6	83.1	103.527	33171	44.5	4.6	86.5
718.500	719.500	98.867	31890	41.4	4.5	88.0	119.109	33420	45.0	4.7	81.3
719.500	720.500	150.595	35470	51.3	5.0	83.7	94.258	32046	41.5	4.5	85.5
720.500	721.500	110.170	30347	37.0	4.2	87.1	184.849	32995	43.7	4.6	85.1
721.500	722.500	80.711	30732	38.4	4.3	88.7	87.832	31037	42.4	4.3	81.9
722.500	723.500	91.094	31693	40.6	4.4	89.5	105.366	26147	27.9	3.7	83.2
723.500	724.500	130.406	33597	45.6	4.7	87.0	110.265	31789	41.1	4.5	82.9
724.500	725.500	84.982	31935	41.2	4.5	89.7	77.371	36469	53.7	5.1	92.1
725.500	726.500	30.066	30147	36.5	4.2	96.3	95.320	32776	43.0	4.6	86.6
726.500	727.500	121.996	30734	38.7	4.3	90.1	115.213	36577	53.8	5.1	89.1
727.500	728.500	126.123	34932	49.0	4.9	89.0	93.912	34624	48.8	4.8	86.2
728.500	729.500	94.852	26445	28.5	3.7	83.1	128.372	31325	40.3	4.4	84.2
729.500	730.500	182.996	34009	46.5	4.8	84.4	95.863	33208	44.2	4.6	83.7
730.500	731.500	102.964	36032	52.3	5.0	90.5	118.962	35193	50.6	4.9	83.7
731.500	732.500	105.530	33648	46.0	4.7	85.8	124.041	34402.574	47.5	4.8	86.8

- The PQC concrete slab has adequate strength with average flexural strength of more than 4.2MPa for the above rigid pavement project sections.

- Load Transfer Efficiency (LTE) for Transverse joints is more than 50% for both LHS & RHS direction and thus, joints are in good condition.
- Load Transfer Efficiency (LTE) for Longitudinal joints is more than 40% for both LHS & RHS direction so, the joint system is adequate in load transfer.

4.5 Mobile Bridge Inspection Unit (MBIU)

4.5.1 Specification

The Mobile Bridge Inspection Unit (referred as (MBIU) is an electro-mechanically driven articulated structure mounted on a vehicle (a truck) as an aid towards proper inspection of bridges or similar infrastructures by enabling an inspection team of 2-3 persons carrying instruments access to the underside of bridge decks overflowing rivers or gorges. The present version is the truck mounted system. As per TOR condition survey of existing structures greater than 60m shall be carried using MBIU.

The overall objective of the condition survey is to identify the need for structural maintenance, rehabilitation and replacement. Signs of distress such as spalling, scaling, cracking, leaching, excessive deflection, inadequate cover, settlement, exposed reinforcement, corrosion in the reinforcement; shear cracks etc. are identified during this exercise. Special emphasis is given on expansion joints and bearing. Also the condition of the Approaches, water way and bed protection is examined. The survey identify the bridges which are more distressed and require testing for their evaluation and rehabilitation measures. Also bridges which require general measures for rehabilitation. Inspection report is prepared in accordance with IRC: SP-35. The report provides recommendation whether a bridge is acceptable to continue in use, whether it can be repaired and/or modified e.g. widened or a new structure.

The structure inventory and condition assessment are given in **Annexure 3.2.** The following structures have been inspected using MBIU machine.

Table 4-5: List of Inspected Structures using MBIU

Sr. No.	Chainage (Km)	Side		Remark
		LHS	RHS	
Anandapuram – Anakappali Section				
1	683+067	LHS	RHS	Flyover
2	701+783	LHS	RHS	Major Bridge
3	705+290	LHS	RHS	Major Bridge
4	709+692	LHS	RHS	Major Bridge
5	709+692	LHS (SR)	-	Major Bridge
6	712+544	LHS	RHS	Major Bridge
7	730+212	LHS	RHS	ROB

4.5.2 Working Principle

The work of condition survey requires use of Mobile Bridge Inspection Unit at the various bridge sites on the National Highways to overcome the accessibility problems. MBIU increases the accessibility for inspection of underside of high-level bridge decks and helps in continuous

inspection of throughout the span of bridge. It has five folded arms. All of them are electro-mechanically operated.

Once the platform is erected by certified person, Inspection and maintenance experts can inspect underside of bridge, note observations as per IRC SP-35 & IRC SP-52 and take photographs for reference.

4.5.3 Advantages

- A large operating range
- A high level of working comfort
- Maximum operational safety
- The shortest possible setting up and dismantling times
- Full mobility in inspection operation without stabilizer supports
- An optimum weight/performance ratio



Figure 4-5: MBIU Survey

4.6 Drone Videography of Entire Stretch

Videography of entire Project Stretch is captured through Drone cameras flown at about 50m above ground. This shall be useful for observing various features of Project Stretch from bird's eye level.



Figure 4-6: Drone Videography

Section 5: Review of Documents

5.1 General

Technical Consultant (TC), since the start of technical due diligence study, has requested for various documents from the Client. A list of documents required were shared with the Client before TC team started the study which was appended with few more queries after the conclusion of the site visit once the project site is appraised. Most of the queries were also discussed with the Client in many meetings. This section of the report deals with the documents requested by TC and its review along with highlighting major issues found during this review.

5.2 Documents Collected and Reviewed

List of documents requested, received and reviewed are given below:

S. No.	List of Documents	Status of Documents	Remarks on Review
DOCUMENTS RELATED TO CURRENT ACQUISITION			
1.	Concession Agreement	Partially Available	Technical Schedules A, B, C and F are made available to the Consultant. These schedules are modified from the standard provisions given in manual as below: Sch A: Existing features Sch B: Scope of Work including facilities to be provided Sch C: Specifications and Standards Sch F: Maintenance Requirements Table 1 of Sch F provides maintenance criteria for pavements which has performance parameter, desirable and acceptable level of service, frequency of inspection and time limit for rectification/repair. Sch F specifies roughness value as 2000 mm/km desirable and 2400mm/km acceptable for flexible pavement. These values are 2200mm/km and 2400 mm/km respectively for rigid pavement. Sch B states that the concessionaire shall carry out the periodic maintenance in full length of the project stretch including main carriageway, service/slip Road, ramps and at facilities etc. either in every sixth year or in the year in which roughness index exceeds the limit as given in schedule F whichever comes earlier. Further, it was clarified in the pre-bid queries reply that periodicity of 6-year overlay will be applicable from O&M handover date. Though draft CA is not available, Consultant has referred the CA of earlier roads wherever required presuming that there shall not be any change in Contract Conditions.
2.	Detailed Project Report/ Technical Due Diligence Report	Available	Report done by M/s Chaitanya Projects Consultancy Pvt Ltd for NHAI in October – 2024.

S. No.	List of Documents	Status of Documents	Remarks on Review
			Report is used as reference for inventory & condition of the assets and improvement proposals. Cost estimates are provided for immediate maintenance which are under the obligation of existing HAM Concessionaires. The report also provides for the O&M cost during the concession period starting from the O&M handover date. However, Invit Concessionaire has to do toll plaza maintenance and accordingly TMS maintenance cost should be there from the Appointed Date which is not shown in this report.
3.	FWD data	Available	The reports of FWD were available as a reference document for TC.
4.	Latest MPRs	Available	Consultant collected the IE-MPRs for April, May & June – 24 from the NHAI – PIU during the site visit. Reports provide details about the Project Road and key maintenance activities undertaken by the HAM Concessionaires during that period.
5.	Maintenance History	Not available	There is no maintenance history available for the Project Road.
6.	NSV data	Available	The reports of NSV are available as a reference documents for TC.
7.	AADT for each section and Growth rate	Available	AADT along with traffic projections for the project roads have been provided by Client.
8.	Concession Period	Not available	TC has adopted 20 years concession period with reference to the CA of earlier roads.
9.	Projected Escalation factor	Not available	In absence of projected escalation factor, all cost are given at the present rate as per the direction of the Client.

5.3 Key Technical Issues

5.3.1 Damaged Bearings

Problems with the bearings are observed in the form of tilting, cracking, not properly placed and compressed. Affected structures are

MJBR: @ 709+692
Flyover: @ 683+063
ROB @ 730+272
It is presumed that existing HAM Concessionaires will fix all these bearings before handing over.

5.3.2 Pavement

The service road pavement is distressed at many locations, may be due to higher traffic loading being the project partially access control with limited number of entry and exit to main carriageway from the service and hence the locally generated commercial traffic using service roads predominantly to access the main carriageway. Rigid pavement on the main carriageway has also been observed with cracks, joint operation in few of the locations and texture loss in most of the locations which may requires retexturing.



Longitudinal cracking filled with epoxy



Poor Condition of SR

5.3.3 Incomplete Construction

It is noticed that constructions are not completed for main carriageway of 3-lanes on RHS from km 703+400 to km 704+300, may be due to LA issues. It is also noticed that construction of interchanges at Pendurthi and Sabbavaram are not done though same was in the scope of the HAM concessionaire.



Availability of 3L & LHS SR only, from 703+400 to 704+300



Incomplete Pendurthi Interchange

Section 6: Capital Expenditure Requirement

6.1 Improvement Works as per Schedule B

Schedule B of each stretch specifies the requirements of improvement works which the concessionaire has to construct as per the completion schedule specified in Schedule B. Major works and reference used to quantify these construction requirements are listed below:

- Approach slabs reconstruction: Ref Cl 3.2 III of Sch B.
- Junction improvement: Ref Cl 4 of Sch B.
- Curve improvement/ Minor Jn improvement: Additional signages and studs are considered as per Cl 6 of Sch-B.
- Truck lay bye: Sewage disposal system as per Cl 9.2 of Sch B
- Landscaping and median plantation: Cl 9.4 of Sch B
- Transverse bar marking: Cl 10.3 of Sch B
- Antiglare: Cl 10.7 of Sch B
- Kerb stones: Cl 10.9 of Sch B

Improvement Scope specified for each stretch is tabulated below:

Table 6-1: Schedule B improvement requirements

S. No.	Description	Unit	Quantum
1	Approach slabs reconstructed	Nos.	4
2	Junction improvement	Nos.	29
3	Curve improvement: Additional signages and studs are considered as per Sch-B.	Nos.	50
4	Truck lay bye: Sewage disposal system	Nos.	2
5	Landscaping and median plantation	km	14.4
6	Transverse Bar Marking	Nos.	22
7	Antiglare	Km	4
8	Kerb stone	Lm.	14,581

Time to complete above construction works in within 3/6 months from the Handover Date based on completion schedule for improvement proposals given in Schedule B.

6.2 Immediate Maintenance Requirements

Thes section is under HAM (Annuity) concession up to 2037. So, obligation for immediate repair requirements do not lie with InvIT Concessionaire. However, toll plaza renovation cost and TMS replacement cost has been considered for existing toll plaza.

6.3 Capital Expenditure (CapEx)

Cost of capital expenditure (CapEx), worked out as explained above, are presented below.

Table 6-2: Immediate Maintenance

Description	Cost in Crore (INR)
Toll plaza improvement	5.90
TCMS	8.14
Total	**14.04**

Table 6-3: Improvement Works as per Schedule – B

Description	Cost in Crore (INR)
Initial Improvement as per Schedule B	4.06

Section 7: Operation & Maintenance

7.1 General

The O & M requirements for the project facilities are normally specified in the Concession Agreement (CA). Though Schedule F is made available to the Consultant, CA is not yet available. Hence Consultant has taken reference from the CA of Round 3 roads presuming there is no change in the Contract conditions. Maintenance requirements are referred mainly under following Articles/ Schedules:

- Article 15 - Operation and Maintenance
- Article 16 - Monitoring and supervising during Operations
- Article 17 – Traffic Regulation
- Article 18 and Schedule H – Safety Requirements
- Schedule F- Maintenance Requirements

7.2 Requirement as per Concession Agreement

Schedule F of the Concession Agreement sets out the Operation and Maintenance requirements for the Project. As per this schedule, scope for Operation and Maintenance includes but not limited to following obligations:

- ✓ **Improvement** – This includes improvement of the existing assets as per requirement of this Agreement and safety audit.
- ✓ **Maintenance of Civil Works and Assets**- this includes maintenance of civil works and all assets as per requirement of this agreement.
- ✓ **Road Maintenance** –This includes routine maintenance, preventive maintenance, periodic maintenance as per IRC:82-2015, Design overlay as per Manual of 4-laning/6-laning, disaster maintenance, exigencies, and inspections.
- ✓ **Traffic Management** – This includes enforcement of regulations together with the relevant authorities. This also includes hazard response, information gathering and dissemination, Road patrols and ATMS surveillance etc.
- ✓ **Safety**– This includes accident prevention, after care, user education, enforcement, data collection and analysis.
- ✓ **Facility Management** – This includes periodic inspections, routine maintenance, Rehabilitation, and expansion planning.
- ✓ **Road property management** –This includes management of access, encroachment, and ribbon development.
- ✓ **General responsibilities** –This includes budgeting, compliance with legal and accounting requirements, and public relations.
- ✓ Maintaining public relations unit to interface with and attend to suggestions from users of the highway, the media, Govt. agencies and other external agencies.

Routine Maintenance: These are maintenance needs required on daily, weekly, monthly and annual basis for the smooth and efficient running of traffic and includes the activities of minor repairs of all project elements, cleaning of road furniture, replacement of consumables,

horticulture maintenance, keeping the project site /project facilities clean, tidy and orderly condition free of litters and debris, preventing unauthorized entry and exit including any encroachment etc.

Preventive Maintenance: Preventive maintenance shall include the activities related to each element and the system as a whole of the Project Highway to ensure that during the Concession Period and at its end is in sound, durable and functional condition. In other words Preventive maintenance are a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without significantly increasing the structural capacity).

Periodic Maintenance/Programmed Maintenance: These are maintenance needs required on periodic basis. The periodic maintenance can be further divided into two sub heads namely (i) functional overlay to improve the riding quality and (ii) structural overlay to improve the structural strength of the pavement in the case of flexible pavement and programmed maintenance involving work activities such as resealing the defective joint, cross stitching, full depth slab replacement repairs and diamond grinding to remove the faults in the rigid pavement and grooving for restoring surface texture.

Factor influencing periodic maintenance: performance parameter for flexible pavement in terms of roughness as given in Schedule F is 2000 mm/km and 2400 mm/km respectively as desirable and acceptable limits whereas for rigid pavement the range would be 2200-2400mm/km. the specified roughness ranges applicable after a functional overlay when the roughness exceeds the value of 2750mm/km. Schedule B also specified that this roughness value of 2750mm'km to be maintained by existing HAM concessionaire before handing over to InVIT concessionaire and after handing over the InVIT concessionaire shall maintain highway within 2750mm/km during the operation phase. Clause 4 (III) of Schedule B states that periodic maintenance/Programmed maintenance shall be carried out in full length of the project stretch including main carriageway, service/slip road and at facilities etc. either in every six years or in the year in which roughness index exceeds the limit given in schedule F, whichever comes earlier. It is also

7.3 O&M Cost Estimation

7.3.1 Routine maintenance

This is a day-to-day work that is necessary to preserve and keep a pavement as close to as constructed condition and to ensure smooth and functional conditions all the times. The item in this subhead includes maintenance of earthen shoulder, restoration of rain cuts, maintenance of slope protection works, cleaning of road side drains, cleaning of carriageway, maintenance of structures, repairs of road surface such as filling of potholes, repairing of cracks, sealing and patch works, carrying out of Road roughness survey, FWD test etc.

7.3.2 Repair/Maintenance

Repair/maintenance covers the minor repair which are required on day-to-day maintenance to maintain the assets in good condition. This is sub-divided in two categories as below:

a) **Preventive Maintenance:** The preventive maintenance is required to be done for further improve or extend the functional life of pavement surface whist in fair to good condition. Any of the treatment under preventive maintenance does not significantly increasing the structural capacity of pavement rather which decreases rate of surface deterioration, which may result in saving of pavement from leading to poor condition where major maintenance could be inevitable.

   Future preventive maintenance on the project road depends largely on routine inspection of the pavement with careful observation of specific distress and to take a decision at that time and suitable type of preventive maintenance treatment and its timing. All the narrow and wide surface cracks must be arrested immediately after identification with fog/slurry seals as the most recommend preventive type maintenance measure for the in-service flexible pavement.

   Based on the condition and distress identification survey as explained above paragraph, preventive maintenance treatments have to be taken up immediately to reduce rate of further damage to the surface and for enhance the pavement performance to the condition similar to non-distressed surface condition.

b) **Road Property Maintenance:** The item in this subhead covers the plantation/ maintenance of shrubs, turfing, replacement/ repair of damaged railing, crash barrier, kerbs, road delineators, signage, Road marking and painting etc.

7.3.3 Toll Management System

Cost estimate for Toll Management System was worked out by TC. Same was presented and deliberated during the investor meet, after that it was decided to adopt the rationalised cost finalized by IM.

7.3.4 Corridor Management

Incident Management: The items in this subhead include minimize the effects of incident and restore normal capacity and safety levels to all affected road facilities as efficiently as possible and repair/ replacement of removing the dead animals & broken-down vehicles etc.

7.4 Major Maintenance

The pavement deteriorates with time caused by traffic movement and weather conditions. The rate of deterioration depends on the original design, type of maintenance being done/undertaken and time of application. Therefore, timely and appropriate maintenance involving replacement of PQC panels, joint repairs and rectification surface defects in the case of rigid pavement and bituminous surface using suitable materials for flexible pavement, is essential to increase the pavement service life to a greater extent. Any delay in maintenance of the pavement substantially increases severity of the distresses, which results into poor condition of pavement, leads to increased maintenance costs due to requirements of major rehabilitation for the poorly rated pavement. Therefore, timely maintenance of the pavement is

required for its satisfactory performance both in terms of functionally and structurally during the pavement service life.

Schedule F of the Concession Agreement set out the maintenance requirements in the Project. The performance parameters are indicated in schedule F descripting the nature of defect/deficiency along with time limits for repair/rectification for roads and bridges.

Schedule F, Pavement Roughness Value: As per schedule B, the roughness value of <2750mm/km shall be maintained by the existing HAM concessionaire prior to handing over to INVIT and after taking over of the asset by InVIT concessionaire, the same level of roughness<2750mm/km should be maintained and when it exceeds, then periodic maintenance is required to be provided during the service life of the pavement to bring the roughness value below the prescribed limit of 2000mm/km for flexible pavement and 2200mm/km for rigid pavement as per schedule F of the concession agreement. .

Pavement Strengthening (Structural Overlay): When the pavement is structurally deficient having high severity alligator/fatigue cracks, rutting and other associated distresses, then the strengthening treatments may be required to be provided to enhance the service life of the pavement/survivability to cater for the anticipated design traffic. The pavement strengthening may be required when the

- Remaining life of the in-service pavement as evaluated using Falling Weight Deflectometer (FWD) is less the design traffic as calculated till end of the concession in the case of flexible pavement and load transfer efficiency for joints and strength of PQC is found to be inadequate

7.4.1.1 Review of Major Maintenance History

As per the review of available reports and discussions with IE during O&M that no major maintenance/rehabilitation that has been carried out in the project being the 6-construction works were completed recently. The routine maintenance consists of rectification of surface defects and repair of cracked concrete panels in progress by the existing HAM Concessionaire.

7.4.1.2 Design Traffic during the Concession Period

The design traffic in terms of MSA during the concession period has been calculated based on the current traffic pattern and data shared by the NHIIPL. The Vehicle Damage Factors (VDF) has been adopted as obtained from the present survey. The summary of design traffic during the concession period is as under.

Table 7-1: Summary of Design Traffic during Concession Period

Project Stretch	Direction	Design Traffic in MSA	
		10 years (FY35)	20 years (FY45)
Anandpuram to Anakapalli-Dukkavanipalem Plaza	LHS	32	82
	RHS	58	148
Anandpuram to Anakapalli Marripalem Plaza	LHS	37	95
	RHS	46	116

Figure 7-1: Design Traffic in MSA (Ranasthalam to Anandpuram Section)

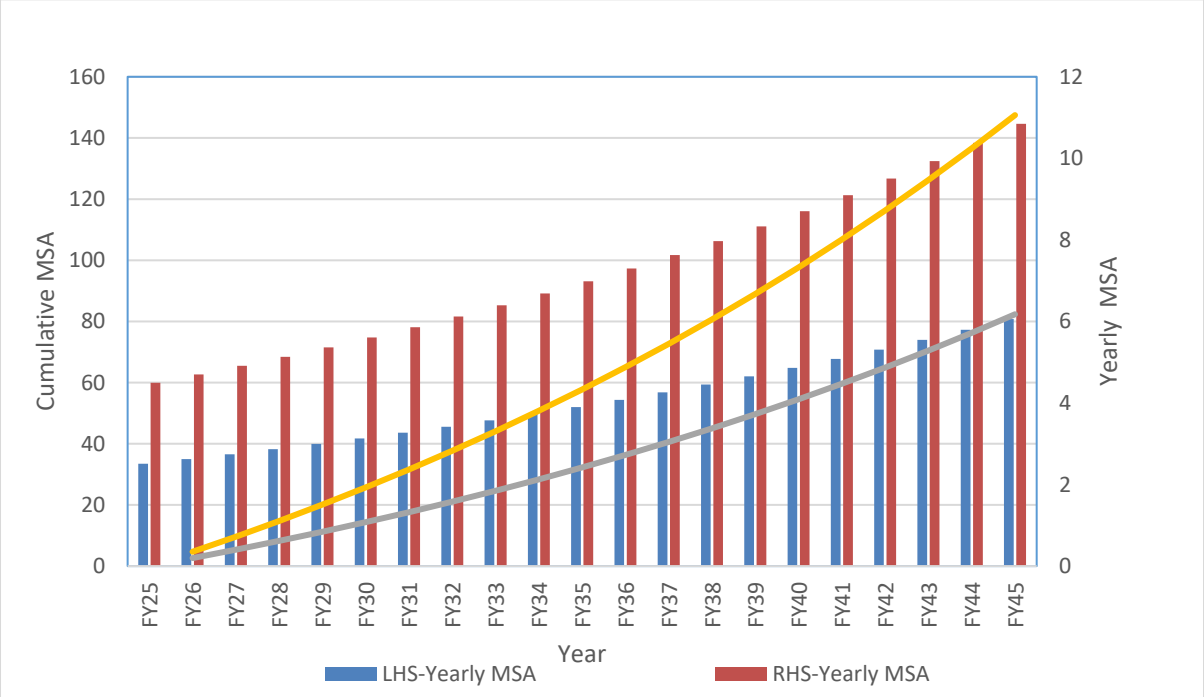


Figure 7-2: Design Traffic in MSA (Anandpuram to Anakapalli section- Dukkavanipalem Plaza)

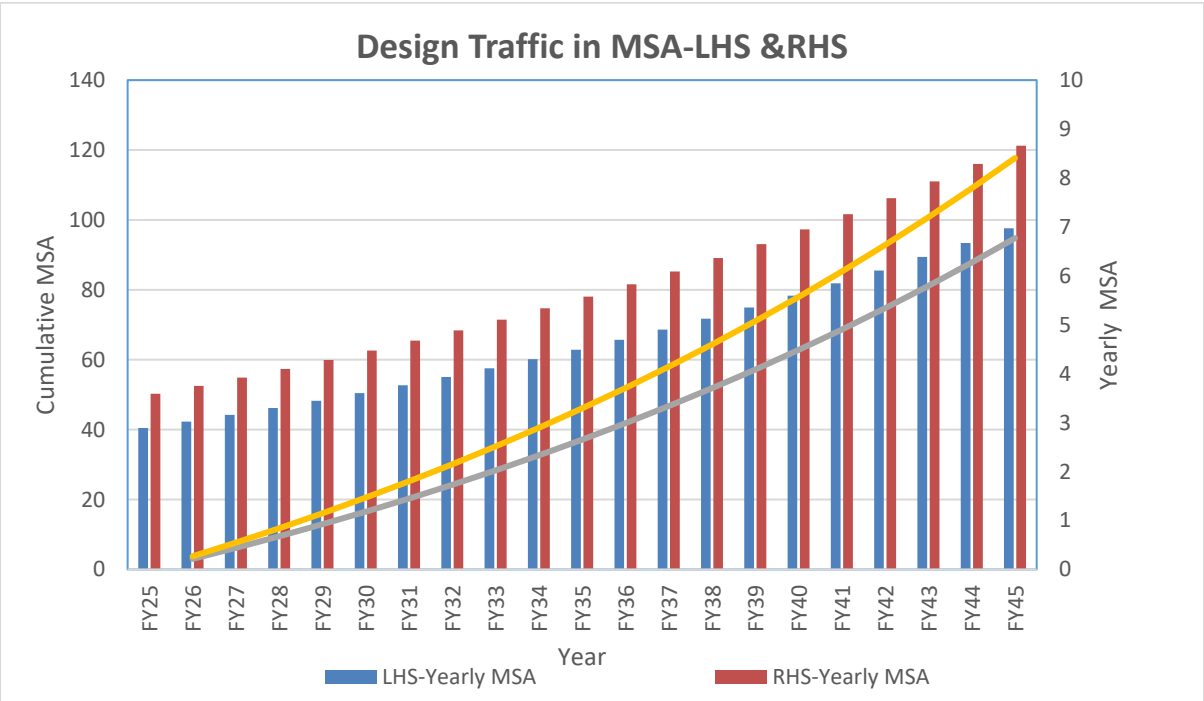


Figure 7-3: Design Traffic in MSA (Anandpuram to Anakapalli section- Marripalem Plaza)

In combination of above anticipated design traffic patterns, remaining life of the existing pavement as explained under surveys and investigation chapter, the pavement condition for distresses and roughness, the existing pavement is requiring repair and rehabilitation to be carried out by the TOT concessionaire to bring the pavement surface to the desired level of serviceability.

From the remaining life analysis as explained under surveys and investigation chapter, it is found that most of the pavement sections having remaining life more than the projected design traffic on LHS & RHS. Hence functional repair in terms of retexturing, replacement of joint and 2% of panel replacement at the end of every 6th year from the date of O&M handover date for the Main Carriageway and 40mm BC for service roads to extend the life of the pavement and improve and maintain the road roughness levels during O&M phase of the InvIT Concessionaire.

7.4.1.3 Immediate and Future Major Maintenance Requirement

Major maintenance is required to comply with provisions of concession agreement and to maintain performance levels as defined in schedule F throughout the operation and maintenance period.

As per schedule B, the TOT concessionaire shall carryout the periodic maintenance in full length of the project stretch including main carriageway, service roads and facilities in every 6th year or the year in which roughness index exceeds the limits given in schedule F, whichever comes earlier.

Therefore, considering the initial pavement design period and crust, remaining life data, anticipated traffic loading during the concession period, and in compliance to the provisions of schedule B, the following cycle of Major maintenance is proposed for satisfactory performance of the pavement during operation period for both functionally and structurally.

Table 7-2: Proposed Major Maintenance Cycles for Balance Concession period

Name of Stretch	InvIT Concession (20 years)				
	CAPEX	Routine Maintenance	Periodic Maintenance	ATMS & TMS Replacement	Toll Operation & Admin Cost
Anandapuram-Anakapalli	Toll plaza renovation cost TMS (all the existing defects to be rectified by HAM Concessionaire)	**Till O&M Handover**: Manpower cost for clearing considered **After Handing Over**: Regular	**FY37-** Revalid. Survey, Improvement works as per Sch.-B & road marking **FY38-** ***Structure***: Replacement of Wearing coat, expansion Joint and 40% of total Bearings **FY41-** ***MCW***: 40BC on flexible portion of proposed interchange to be constructed by NHAI ***SR***: 40BC, 50DBM for 10% length, ***Rigid***: Retexturing, replacement of joint sealant and 2.0% of panel. **FY45**- Road Marking ***Structure***: Replacement of wearing coat & painting	**FY30**-New TMS for interchange **FY33-** 50% TMS **FY37-** 50% TMS interchange **FY41-** 100% TMS 40% ATMS **FY44-** 100% TMS interchange	01.04.2025

7.4.1.4 Cost of Operation & Routine Maintenance

Cost of Operation & Routine Maintenance per annum are presented below.

Table 7-3: Cost of Operation & Routine Maintenance (per annum)

Description	Cost (Crore INR)
Tolling & TMS Operations (Varies) Min-Max	11.65-21.92
ATMS Operation	2.12
Incident Management	5.05
Admin Expenses (Varies) Min-Max	3.56-5.05
Insurance (Varies) Min-Max	0.10-1.86
Power cost excl. Toll Plaza	2.48
RAMS, BMS & Survey	1.25-2.49

7.4.2 Cost Estimate (Initial Improvement, MMR and O&M)

Year-wise estimate of Initial Improvement, MMR and O&M are given below

Table 7-4 : Cost Estimate (Initial Improvement, MMR and O&M)

Sl.No.	FY	Initial Improvement Cost (in INR Cr.)	Major Maintenance Cost (in INR Cr.)				Operation & Maintenace Cost (in INR Cr.)								
			Road (MCW,SR, Toll Plaza)	Structure	ATMS	TMS	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026	14.04					0.60					11.98	0.10		3.56
2	2026-2027						0.60					11.98	0.10		4.18
3	2027-2028						0.60					11.98	0.10		4.27
4	2028-2029						0.60					11.65	0.10		4.20
5	2029-2030					7.51	0.60					21.92	0.10		4.27
6	2030-2031						0.60					20.43	0.10		4.28
7	2031-2032						0.60					18.94	0.10		4.17
8	2032-2033					4.07	0.60					18.20	0.10		4.80
9	2033-2034						0.60					18.20	0.10		4.42
10	2034-2035						0.60					18.20	0.10		4.28
11	2035-2036						0.60					18.20	0.10		4.37
12	2036-2037		4.71			3.76	3.73	2.38	2.12	5.05	2.48	18.20	1.86	2.49	4.42
13	2037-2038			24.28			3.73	2.38	2.12	5.05	2.48	18.20	1.86	1.25	4.49
14	2038-2039						3.73	2.38	2.12	5.05	2.48	18.20	1.86	1.25	4.38
15	2039-2040						4.04	2.57	2.12	5.05	2.82	18.20	1.86	1.25	5.05
16	2040-2041		131.17		7.73	8.14	4.04	2.57	2.12	5.05	2.82	18.20	1.86	1.83	4.59
17	2041-2042						4.04	2.57	2.12	5.05	2.82	18.20	1.86	1.25	4.72
18	2042-2043						4.04	2.57	2.12	5.05	2.82	18.20	1.86	1.25	4.66
19	2043-2044					7.51	4.04	2.57	2.12	5.05	2.82	18.20	1.86	1.25	4.69
20	2044-2045		5.60	7.55			4.04	2.57	2.12	5.05	2.82	18.20	1.86	1.83	4.69
Total		**14.04**	**141.48**	**31.83**	**7.73**	**30.98**	**42.01**	**22.57**	**19.12**	**45.42**	**24.39**	**345.43**	**17.87**	**13.64**	**88.49**

Note: The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

Section 8: Conclusion

The project highway is a partially access controlled consists of 6-lane divided carriageway with service roads on both sides with minimum number of merging and diversion points on the highway for access to service roads. The 6-lane project has been completed on HAM mode and at present toll is being collected by Toll Collection Agency appointed by NHAI.

The pavement type as adopted in the project are rigid and flexible for main carriageway and service roads respectively. The performance of the pavement is satisfactory in terms of pavement roughness and surface quality without having major distresses. However, low severity shoving/corrugations has been observed on the surface of flexible type along the service roads, whereas low-medium severity cracks were observed on the PQC for which rectification works are in progress by the existing HAM Concessionaire in the form of cross stitching, sealant repairs etc. Some of the location observed with faulting and loss of texture for which rectification to be done as part of programmed maintenance works for rigid pavement to improve the serviceability. As part of present study, the required Engineering Investigations along with site visual observations were made for evaluation of the asset condition and accordingly established the required maintenance and rehabilitation measures/decisions for the concession period. The periodic maintenance by functional/structural overlays for flexible type are required at every 6th year as per the CA would be sufficient to keep the project stretch in good condition and suitable number of high severities PQC panels may be replaced along with joint rectification etc. Considering the asset visual assessment, condition and evaluation studies, the suitable major maintenance strategy has been recommended to improve the service life during the concession period.

Based upon the site visit for assessment of condition of CD structures including MJB, MNBs, ROB, VUPs, Culverts and toll plaza buildings in the project corridor and observations submitted in various chapters of this report it is concluded that most of the structures are in sound condition and no major repair is required in near future. However, there are issues with the bearings for few structures. As the entire road sections are in HAM, these defects are to be rectified by the existing Concessionaires. It is to be ensured that asset quality assessment is done thoroughly at the time of taking over so that these defects and any other defects occur during the remaining HAM concession period is rectified.

The assessment of estimated cost of such repairs along with the anticipated future repair and rehabilitation cost are considered in the cost estimate of this report.

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NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED

FINAL REPORT

Tolling, Operation, Maintenance & Transfer of Four Lane Gundugolanu – Kovvuru Section (km 15.320 to km 85.204 of NH 16) in the State of Andhra Pradesh

SAMARTH INFRAENGG Technocrats Private Limited

FEBRUARY 2025

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LIST OF ABBREVIATIONS AND SYMBOLS

AADT	-Average Annual Daily Traffic
AE	-Authority Engineer
AMC	-Annual Maintenance Contract
ATMS	-Advanced Traffic Management System
BC	-Bituminous Concrete
BOQ	-Bill of Quantities
BOT	-Build, Operate & Transfer
CA	-Concession Agreement
CBR	-California Bearing Ratio
CCB	-Concrete Crash Barrier
CCR	-Cement Concrete Railing
COD	-Commercial Operation Date
COS	-Change of Scope
CPI	-Consumer Price Index
CUP	-Cattle Underpass
CVC	-Classified Volume Count
CVPD	-Commercial Vehicles per Day
DBM	-Dense Bituminous Concrete
DPR	-Detailed Project Report
ECB	-Emergency Call Box
EPC	-Engineering, Procurement and Construction
ESI	- Employees' State Insurance
FDD	-Filed Dry Density
FOB	-Foot Over Bridge
FRL	-Finished Road Level
FSI	-Free Swell Index
FWD	-Falling Weight Deflectometer
FY	-Financial Year
GOI	- Government of India
GR	-Growth Rates
GS	-Grade Separated
GSB	-Granular Sub Base
GST	-Goods and Services Tax
HCPT	-Half cell Potential Test
HPC	-Hume Pipe Culvert
HR	- Human Resources
HTMS	-Highway Traffic Management Systems
IE	-Independent Engineer
IRC	- Indian Roads Congress
IRC SP	- Indian Roads Congress Special Publications

IRI	-International Roughness Index
Km	-kilometer
LHS	-Left Hand Side
LL	-Liquid Limit
LS	-Lumpsum
m	-Meter
MBIU	-Mobile Bridge Inspection Unit
MCB	-Metal Beam Crash Barrier
MCS	-Micro Surfacing
MCW	-Main Carriageway
MDD	-Maximum Dry Density
MHR	-Metallic Hand Rail
MJB	-Major Bridge
mm	-Millimeter
MM	-Major Maintenance
MNB	-Minor Bridge
MoRTH	- Ministry of Road Transport & Highways
Mpa	-Mega Pascal
MR	-Resilient Modulus
MSA	-Million Standard Axle
NDT	-Non-Destructive Testing
NHAI	- National Highways Authority of India
NSV	-Network survey Vehicle
O&M	- Operation and Maintenance
OL	-Overlay
PF	-Provident Fund
PGR	-Pedestrian Guard Rail
PI	-Plasticity Index
PL	-Plastic Limit
PM	-Periodic Maintenance
PUP	-Pedestrian Under pass
R&R	-Repair and Rehabilitation
RCC	-Reinforced Cement Concrete
RE Wall	-Reinforced Earth Wall
RHS	-Right Hand Side
RHT	-Rebound Hammer Test
RI	-Roughness Index
RM	-Routine Maintenance
ROB	-Road Over Bridge
RPO	-Route Patrol Officer
RUB	-Road Under Bridge
SDBC	-Semi-Dense Bituminous Concrete

SPV	-Special Purpose Vehicle
SR	-Service Road
SWB	-Static Weigh Bridge
TCS	-Typical cross Section
TDRT	-Transient Dynamic Response test
TMS	-Toll Management System
UPVT	-Ultra Pulse Velocity test
VDF	-Vehicle Damage Factor
VG	-Viscosity Grade
VUP	-Vehicular Underpass
WBM	-Water Bound Macadam
WMM	-Wet Mix Macadam
WPI	-Wholesale Price Index

CHAPTER 1. INTRODUCTION

1.1 INTRODUCTION

National Highways Authority of India ("NHAI"/ "Authority") is an autonomous body of the Government of India ("GoI") under the Ministry of Road Transport and Highways ("MoRTH") and was constituted on June 15, 1989 by an Act of Parliament titled - The National Highways Authority of India Act, 1988 ("NHAI Act"). NHAI was operationalized in February 1995 with the appointment of full time Chairman and other Members. The functioning of NHAI is governed by NHAI Act and rules, and regulations framed thereunder.

NHAI has set up an Infrastructure Investment Trust Namely **National Highways Infra Trust ("InvIT")** and is acting as its Sponsor to the said InvIT.

National Highways Infra Investment Managers Private Limited ("NHIIMPL") has been appointed as the Investment Manager to the InvIT. Accordingly, Investment Manager has awarded the following works to M/s SAMARTH INFRAENGG Technocrats Pvt Ltd vide their letter ref: NHIIMPL/FY2024-25/RFP/Technical Consultant/LOA/02 dated 15.07.2024.

Project	Length (km)	No. of Plazas	Lane km
Gandhidham (Kandla) Mundra Port (Gujarat)	71.400	1	285.600
Gundugolanu-Devarapalli-Kovvuru (Andhra Pradesh)	**69.884**	**1**	**356.800**

Presently, the project stretch, "Gundugolanu-Devarapalli-Kovvuru" is under Operation and Maintenance period maintained by HAM Concessionaire. The fee is being collected from Toll Plaza at Km 53+700 near Veravalli village for a length of 69.884 km.

The concession period is 20 years commencing from Appointed Date for TOT Concessionaire to demand and collect appropriate Fee, operate, manage and maintain the Project Highway.

M/s SAMARTH INFRAENGG Technocrats Pvt Ltd has undertaken Technical Due Diligence study for the said project to estimate initial capex including improvements and immediate requirements for repair & rehabilitation of various elements of project highway and also to make an assessment of Major maintenance requirements and Operation & Maintenance costs for entire concession period.

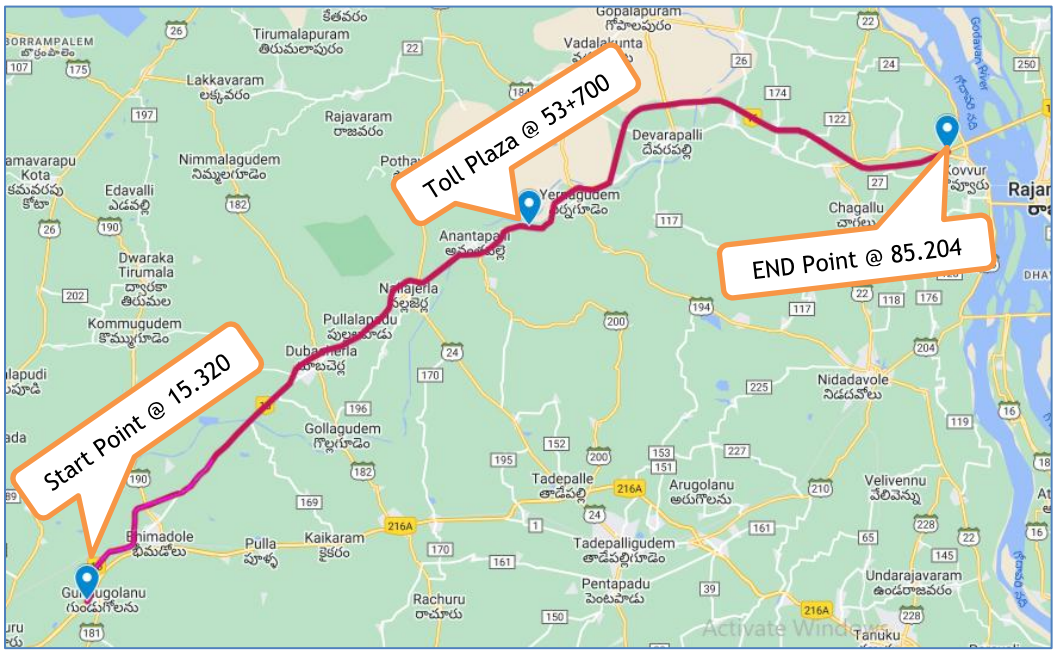
This report highlights the findings of "Technical Due Diligence Services of Four Lane Gundagolanu – Kovvuru Section (Km 15.320 to Km 85.204 of NH 16) in the State of Andhra Pradesh.

1.2 PROJECT AT A GLANCE

Project road is a four-lane divided Project Highway starts at Km 15+320 and ends at Km 85+204 of NH-16. The total length of the project highway is 69.884Km.

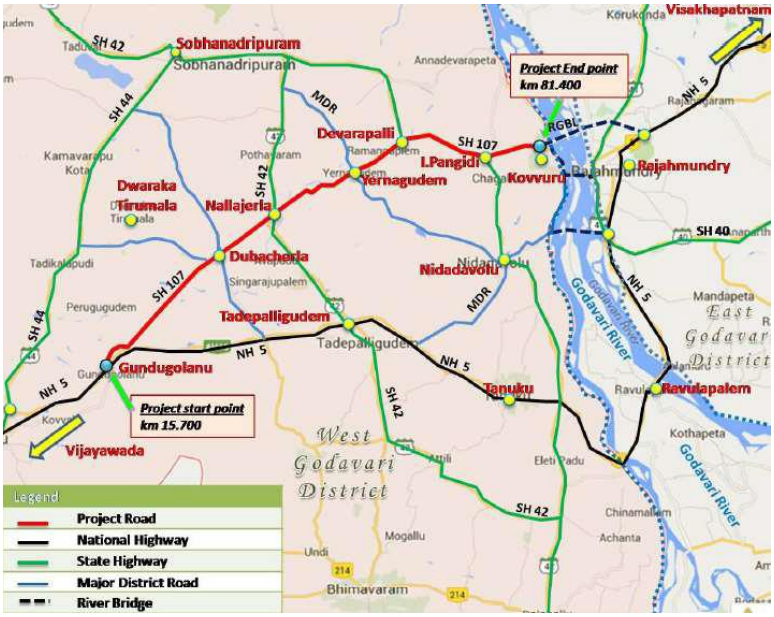
National Highway 16 (NH 16) also known as Kolkata - Chennai Highway and runs along east coast of West Bengal, Odisha, Andhra Pradesh, and Tamil Nadu. The Project Road is a part NH-16 falling in Andhra Pradesh State.

The Highway connects several cities and town such as Bhimadole, Ghanatavari Gudem, Nallajerla, Ananthapalli, Yernagudem, Devarapalli in the state of Andhra Pradesh.



Map Showing the Project Corridor

This route is considered to Shortest Route between two major cities i.e., Vijayawada & Rajahmundry



The start and end of the project chainage system with respect to CA and Site are as presented below.

Table 1: Project Corridor Chainage System

Referencing system	Start Point (km)	End Point (km)	Length (km)	Remarks
As per CA Chainage	15.320	85.204	69.884	NH-16
As per Site	15.320	85.204	69.884	NH-16

Photograph showing the start and end point of the project road are presented below:



A view of the Start Point of Project Road at km 15.320



A view of the End Point of Project Road at km 85.204

1.3 OBJECTIVE AND SCOPE OF SERVICES

The main objective of the study is to review the current status of project corridor including details pertaining to its construction and maintenance and to provide requisite technical information for processing the acquisition of said project by client. Objective of the study can be broadly defined with following tasks:

A) Review of Project Document

- ✓ Review of DPRs/ draft CA/ Schedules pertaining to the scope of work and understand the Sch-B requirements for improvement works for the assessment of capex and Opex during the concession period.
- ✓ Review of Asbuilt drawings and Designs
- ✓ Collection of relevant records and documents and review of same
- ✓ Review of correspondences with IE, if any, on technical issues.
- ✓ Review of EPC, Operation, Maintenance and Systems Contracts
- ✓ Review of Progress Reports, if any Prepare head of terms (highlight the key commercial, technical terms of the contracts) for the reviewed Contracts - EPC, O&M, Asset Management, Operational Agreements (if any), CAs (key technical items) etc.

- ✓ Review of Asset Management Contracts to understand the maintenance of asset from the Concession agreement perspective
- ✓ Review the technical approvals / consents from IE or another agency required under the CA

B) Field Investigations

- ✓ Undertake detailed reconnaissance to appreciate the project corridor characteristics
- ✓ Undertake field investigations to collect first-hand information on present condition of project road and establish the requirements for rehabilitation and up gradation
- ✓ Carrying out inventory and condition surveys for Project Road;
- ✓ Carrying out Inventory and detailed condition surveys for bridges & cross drainage structures (along with Photographs thereof) including recommendation for either strengthening/rehabilitation or reconstruction; Identify requirements of NDT tests if any (to be executed if required and commissioned by client with separate mutually agreed payments).
- ✓ For Major Structures (length of structure>60m), detailed Visual inspection shall be undertaken with MBIU.
- ✓ Video-graphic survey of the entire Project corridor/s.
- ✓ Axle load survey for 7 days in both directions of traffic at toll plaza location (7-day traffic count to be provided by client).
- ✓ Test pits required @ every 5 km interval (staggered) along the Project corridor to record pavement thicknesses and carry out necessary laboratory tests to determine the CBR value of the subgrade materials.
- ✓ Carrying out deflection test by Falling Weight Deflect meter (FWD) for existing pavement as per relevant IRC code at the rate of 5 points in km in each direction making it 10 points for both directions.
- ✓ Carrying out Roughness Survey on each lane of Project Corridors using NSV. S Availability of construction materials.
- ✓ Assess drainage adequacy: Review of available hydrological reports and assess the availability and condition of existing road side drainage along the corridors.
- ✓ The outputs of investigations are basically used to identify the strengthening requirements for project sections and also used to form the inputs for deterioration modelling.

C) Validation of Executed Works and Assessment of Improvement Works

- ✓ Validation of executed works with respect to Schedule A of the CA by physical verification at site
- ✓ Assess the present status of the projects with relevant standards and confirm that works are meeting the requirements and have been accepted by the authorities.

- ✓ Understand the scope requirements for Improvement works from the Sch-B of the [draft] CA
- ✓ Where project stretch / structures / service roads / ancillary works are pending and if not covered in the Sch-B scope of the draft CA, then assessment of details relating to land acquisition, approvals, timelines for completion, etc. along with cost forecast
- ✓ Cost estimates for any missing items and all works included in the Sch-B of the draft CA
- ✓ Make an assessment of any risks associated with already executed works

D) Quality Audit

- ✓ Review quality of construction based on available data, available design and drawings.
- ✓ Review of Quality of materials from Laboratory testing for aggregates & soil
- ✓ Check compaction and quality of subgrade material used vide test pits
- ✓ Visual inspection of bridges for any visible distress and anomalies. Identify requirements of NDT testing based on same.
- ✓ Examine Expansion joints and bridge bearings condition and assess requirements for replacements
- ✓ Shall be examining expansion joints visually to the extent possible. Shall use high binoculars/ pictures from accessible points. Shall review all photographs closely and come to a conclusion on same.
- ✓ Identify any critical issues / red flags in relation to the quality or condition of the projects; Identify any structural integrity issues that require rectification / re-mediation;

E) Rehabilitation Plans & Designs

- ✓ Check the adequacy of designs carried out for execution based on available reports
- ✓ Undertake designs for immediate rehabilitation requirements based on CA specifications using FWD data and condition assessment surveys
- ✓ Assess the requirements of rehabilitation to bridges/CD structures by structure based on visual inspections and compare with Sch-B requirements of the draft CA
- ✓ Assess the requirements including BOQ and cost estimates of repair and replacements for various elements and ancillary works

F) Major Maintenance

- ✓ Review of current maintenance system.
- ✓ Preparation of the maintenance costs to be incurred over the period of the concession keeping in mind the maintenance requirements of the Concession Agreement.
- ✓ Detailed assessment of maintenance cycles for pavements using HDM4 analysis and estimation of maintenance cost for the concession period

- ✓ To understand the current maintenance strategy for each of the project and review the BOQ to be provided by the DPR consultant for adequacy in relation to Major Maintenance work of Highways, structures, Road Furniture and other site-specific requirements as per respective CA
- ✓ Minor maintenance will be included in routine maintenance and estimated year wise based on assumed percentages based on present condition.
- ✓ Identify any impacts on revenue due to Major Maintenance.
- ✓ Maintenance requirements for approachesA/OP/Underpass forming part of CA would also be assessed.

G) Cost of Improvement Works and Operations

- ✓ Preparation of O&M cost for the concession period.
- ✓ Assess the adequacy of costs assumed in the vendor model are adequate to meet the major maintenance, stage construction and routine maintenance requirements.
- ✓ Independently develop a bottom-up forecast of Operating expenses for project, with detailed break-up of each type of operating expense, along with underlying assumptions

H) BOQ and Cost Estimates

- ✓ Preparation of BOQ & Cost for Improvement works as per Sch-B of the CA
- ✓ Preparation of BOQ and Costs for Major Maintenance
- ✓ Preparation of BOQ and cost for Routine maintenance and Route Patrolling
- ✓ Preparation of BOQ and Cost for Operations
- ✓ Preparation of year-by-year O&M cost
- ✓ The costs would be provided till the end of the concession period including any expected extension of Concession periods as informed by the Client.
- ✓ Benchmarking of costs against other similar Indian toll roads where available (using available data)
- ✓ Historical trend analysis on the maintenance program based on the existing pavement condition and review of all relevant maintenance plans/ documents of NHAI or its concessionaires or contractors.

Review and comment on the current organizational structure from an O&M perspective at each asset. Also suggest an indicative organization structure based on project / CA requirements

1.4 DATA COLLECTION AND REVIEW

In brief, following were covered

- ✓ Review of Concession Agreement & Schedules,
- ✓ Review of Detailed Project Report prepared by NHAI
- ✓ Review of As-built drawings, Plan and profiles, Structural drawings & Detailed Project Reports and Designs where available
- ✓ Review of O&M costs as presented in DPR reports
- ✓ Review of MPR provided by NHAI
- ✓ Review of Latest NSV and FWD data provided by PIU, NHAI

1.5 KEY PROJECT DETAILS

Following Table highlights the important timelines of the project corridor at a glance:

Name of Project:	Four Lanning of Gundugolanu - Devarapalli- Kovvuru Section of NH-16 (old SH- 108) from Design Ch:15+320 (Existing Km 15.700) to Design Ch.85+204 (Existing Km 81.400) in the state of Andhra Pradesh
NH No	NH-16
Mode	Hybrid Annuity Mode (HAM)
Length	69.884 Km
HAM Concessionaire	M/s. GR Gundugolanu Devarapalli Highway Pvt.Ltd.
EPC Contractor	GR INFRAPROJECTS LIMITED
Appointment Date	22.10.2018
Scheduled Project Completion Date	910 days from Appointed Date, 18.04.2021
Concession Period in Years	Construction Period plus a fixed period of 15 years of Operation & Maintenance Period from the COD
Provisional Completion/ Completion Certificate	10-07-2021 For 64 kms 30.09.2022 for 69.884 km
End of HAM Concession (OR) O&M Handover Date to InVIT	10.07.2036 i.e., FY 2037

The project stretches will be handed over to the InVIT Concessionaire from the date of appointment for Toll Collection, TMS and works mentioned as per Clause11 of Schedule-B. InVIT Concessionaire shall be responsible for carrying out smooth toll operations (w.e.f. Appointed Date), without attracting any financial/ contractual obligation towards NHAI.

After completion of the concession period of existing HAM Annuity concessionaires/ DLP of EPC Contractor, the Project stretch shall be handed over to the InVIT Concessionaire to operate and maintain until the end of INVIT concession period.

1.6 O&M REQUIREMENTS

Few important O&M requirements as per schedules/manuals are described as below.

- ✓ Applicable Manual is IRC: SP:84-2019
- ✓ Applicable Schedule for O&M period is Schedule-F.
- ✓ As per clause 3.1 (iii) of Schedule-B, the periodic maintenance in every **six years** in full length of the project stretch including main carriageway, service/slip Road, ramps and at facilities etc
- ✓ As per clause 3.1 (iii), under Note of Schedule-B, Roughness of <2750 mm/Km shall be maintained by the existing HAM concessionaire prior to handing over to InVIT Concessionaire. After handover of project stretch to InVIT, the InVIT concessionaire shall maintain the roughness level at <2750mm/Km, however after a functional overlay or structural overlay provided in any particular stretch length then that particular length shall be maintained at a roughness level as per Schedule-F (2400 mm/Km) after that overlay.
- ✓ Schedule-F, performance parameters indicate the desirable limit of Roughness values should not exceed 2000 mm/km, whereas its acceptable limits Is 2400 mm/km and needs to be corrected within 180 days. Roughness Surveys shall be carried out Bi-Annually.
- ✓ Schedule-F, performance parameters indicate the desirable limit of Pavement Condition Index (PCI) values should be above 85, whereas its acceptable limits is 70 and needs to be corrected within 180 days. Condition Surveys shall be carried out Bi-Annually.
- ✓ Schedule-F, performance parameters indicate the FWD survey shall be carried out Annually as per IRC: 115-2014 for flexible pavement and needs to be corrected within 180 days
- ✓ No specific Handing Over (Divestment) requirements are mentioned under CA. It shall be same as Schedule-F.

1.7 REVIEW OF REPORTS

The Concessionaire's made available report for the month of July 2024 has reviewed and some critical issues found are as presented below.

s. No.	Description of Claim	Letter Ref. No.	Amount submitted in claim (in Rs.)	Remarks
1	Additional costs incurred by the Concessionaire on royalty payments of aggregate & earth due to enhanced rates Consideration rates & premier amount of Seigniors Fee w.e|.f 11.02.2020 & 07.06.2021 under Article 35 (Change in Law)	GRGDHPL /2022/GU-DP/2003 dated 29.11.2022	5,25,34,859	(for 2020-21 FY & 2021-22 FY)
2	Additional costs incurred by the Concessionaire towards procurement of sand under Article 35 (Change in Law)	GRGDHPL /2022/GU-DP/2003 dated 29.11.2022	9,21,94,163	(for 2020-21 FY & 2021-22 FY)
	Total		14,47,29,022	Rs 14.47 Crores
3	Withheld/pending payment against GST, etc.	GRGDHLP/2023/GUDP/ 2362 dated 10.01.2024	18,59,07,789/-	GST Change As per NHAI Circular 3.3.27/2022 dated 03 Dec 2022, Annexure -IV

Further it is noted that there are no issues related to Land acquisition and Encroachments.

1.8 KEY FINDINGS

The key finding of the Project are as follows

- The capacity augmentation is envisaged in FY 2035& FY2036 for the project on EPC mode with DLP of 5 years until FY2041
- Bulging is observed in RE walls
- Submergence of LHS side Carriageway at Km 34+850 at Unidirectional Flyover for a small length in 2023, Requirement of additional culvert for Main Carriageway at this location
- Insufficient Freeboard observed for Major Bridges on Pond & River at couple of locations.
- Safety Hazards at 10 Uni-directional flyover Approaches, Requirement of Traffic Impact Attenuators
- Safety Hazard at a Culvert Location on exit ramp deceleration lane at Km 60+800, Required to Construct gap in Culvert left before
- Safety at Sharp Entry Exit at few locations, Requirement of improved safety measures
- Approach Slab settlements observed at many of structures, already overlaid
- Outfall for Open Lined Drains required to be provided to avoid ponding of water on Carriageway
- Stagnation of Water on Structures Observed. Requires improved drainage measures
- Lighting Requirement at Approaches of Underpasses
- Improved Cleaning and Routine Maintenance is required to avoid vegetation growth in Drains and RE Walls

- General Condition of Structures: Debris observed on Abutment & pier cap, Expansion joints are filled with debris, wearing coat, Drainage spouts are clogged at couple of locations.
- General Condition of Structures: Structural distress is observed at couple of locations viz. Cracks, Honeycombs, spalling of concrete, Reinforcement exposed etc.
- Retained Major Bridges: The Condition of the Retained Major bridges is fair. Only Minor distresses observed

Sl. No.	Site Chainage (Km)	Type of Str.	Side	Structure on	Age of Structure	Span Arrangement (No x Length)	Remarks
1	31+658	MJB	RHS	MCW	Old	6 x 21	Retain structure
2	48+194	MJB	RHS	MCW	Old	10 x 15.5	Retain structure
3	59+770	MJB	RHS	MCW	Old	8 x 15.5	Retain structure

- Bulging is observed in RE wall approaches. It is observed only at 3 out of 20 plus approaches Soil Nailing has been done to rectify the same. Additional soil nailing would be required at those locations to avoid further bulging of RE Panels.
    - ROB at 18+750 Major Bulging observed on Cross wall behind A2 abutment
    - Flyover approach at Km 15.5 minor Bulging On LHS RE Wall
    - Flyover Approach at Km 27+800, Bulging on A2 side RHS
    - Near Km 79+300 A2 side on Both Sides
- Back fill material erosion occurred on RE panel behind abutment A1 side at km 79+277 Flyover LHS.
- Submergence at Km 34+850: From the local enquiry and discussions with NHAI Team, it is understood that, Flooding on LHS Carriageway near Km 34+850 occurred in the last year during heavy rains. At This location, Unidirectional Carriageway exists for Traffic moving from Kovvuru towards Gundugolanu side. Additional Pipe or Box Culvert may be required at this location to avoid the submergence of the LHA Carriageway at this location
- There are 10 Uni Directional Flyovers along the project corridor, In LHS 2 Uni Directional Flyovers and in RHS 8 Uni Directional Flyovers.
- Undivided 4 Lane Carriageway exists below for one direction. Median for separation is indicated with Road Marking
- At all the Unidirectional flyover locations, Traffic Impact Attenuators along with two-way hazard markers would be required
- There is severe safety Hazard Issue near exit at K 60+800 on RHS (Most of exit lane width is occupied by Culvert and all of a sudden creating a bottle neck). The Exit location shall be shifted to suit the site condition or the culvert required to be widened.
- At Couple of Locations, the Exist and Entry are very narrow, Total 30 No of Sharp Entry & Exits are present along the project corridor in that 16 No's in LHS and 14 No's in RHS Direction.

- At couple of locations, Approach slab settled an the same has been rectified by providing the BC Overlays, at such locations, additional maintenance may be required during O&M Period
- At couple of locations, the outfall for Open lined drain built between the Main Carriageway and Service Road are missing, because of this water stagnating in the drain and even the excess water is standing near the earthen drain portion.

- In Approaches locations Highway lighting brackets are provided but the light poles are not installed in many locations along the project corridor.
- Huge Amount of street lighting would be required at approaches since the availability of lighting on site is very minimal. (At underpasses, lighting is not provided in approaches).

- Regular Cleaning of Median, Median Plantation, Carriageway and importantly Drain cleaning is required (at few locations even grass is seen on the deposited soil in the Open lined drain portion)
- Cracks and damages observed on pedestals at couple of locations
- Excessive vibrations observed & No gap between pedestals and seismic arrestors at km 31+658 MJB
- Cracks & leaching observed on soffit of deck slab at km 68+742 & km 61+933

CHAPTER 2. SURVEYS AND INVESTIGATIONS

2.1 INTRODUCTION

The main objective of undertaking Surveys and Investigations is to appreciate the existing engineering features along the project corridor and to understand the present condition of the various elements of the project road and to prepare required inputs for various rehabilitation and maintenance strategies.

Following Survey and Investigations have been undertaken as a part of study with an objective to understand the present condition of the road and there by access the quality of construction and as well to prepare requisite rehabilitation/corrective designs where necessary.

- Road Inventory Surveys
- Pavement Condition using NSV
- FWD Surveys
- Roughness Surveys using NSV
- Pavement Composition surveys (Test Pits)
- Subgrade Investigations & Laboratory testing
- Material Investigations
- Axle Load Survey
- Structure Inventory and Condition Surveys

2.2 ROAD INVENTORY

The project corridor features a 4-lane/6lane divided carriageway for most of its length. Generally, the carriageway width of flexible pavement is 7.25m/10.75m wide, including shyness, and is flanked by 1.5m paved shoulders and 0 to 2 meters of earthen shoulders on each side of the median. These widths vary at structure locations and approaches to major junctions. At Toll Plaza location rigid pavement is provided. The 4lane/6-lane lengths as available.

Lane		LHS, km	RHS, km	LHS+RHS, km
2-Lane	Actual Length	34.95	34.83	69.78
	Lane length	69.9	69.66	139.56
3-Lane	Actual Length	27.084	32.564	59.648
	Lane length	81.25	97.69	178.94
4-lane	Actual Length	7.08	1.72	8.8
	Lane length	28.32	6.88	35.2
Toll Plaza	Actual Length	0.77	0.77	1.54
	Lane length	1.54	1.54	3.08
Total lane Kms		181.012	175.772	356.8

In general, the median width is 4m all along the project road except at median openings associated with storage lane (median width is 1m).

The project corridor generally runs in plain to rolling terrain. The land use along the project road is mostly Agricultural. It passes through urban settlements like Bhimadole, Ghanatavari Gudem, Nallajerla, Ananthapalli, Yernagudem, Devarapalli.

In general, road embankments are in the range of 0.5m-2.5m height. Embankment heights higher than 2.5m are observed mainly in the approaches of CD-Structures and Underpass locations.

Typical View of Project Road is shown below:



A view of the Project Road at km 24.000



A view of the Project Road at km 22.000



A view of the Project Road at km 51.600



A view of the Project Road at km 20.400

The Project Road has 70 Nos. of junctions. Photographs showing the Major Junctions and minor junctions are presented below:



Major Junction at km 60.150 RHS



Major Junction at km 51.500 LHS

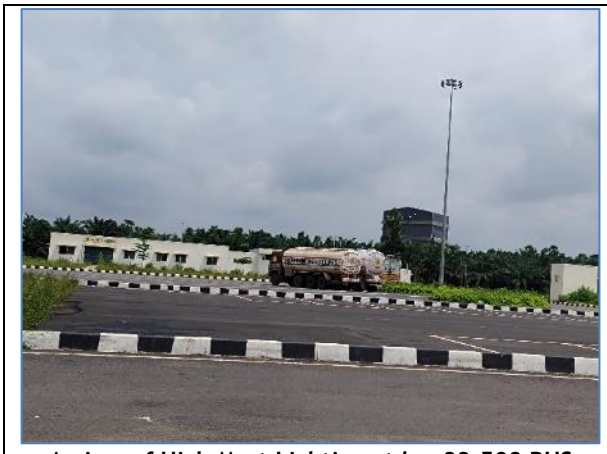


Junction at km 15.780 RHS



Junction at km 36.400-LHS

There are 18 Nos. of High masts provided near Rest Area and Toll Plaza locations. Whereas, Highway lighting is provided for length of 21.860 kms near built-up sections, Bus bays and Truck lay-bye location. Few photos showing High mast and highway lighting are presented below:



A view of High Mast Lighting at km 33.500 RHS



A view of Double arm Lighting at Km 54.400 Median



A view of Lights not installed at approach location at Km 61.900



A view of Single arm lighting @ Km 18.500 BHS

Project Road consists of 19 Nos. of Bus bays with shelters, 33 Nos. of Bus shelter. Few photos taken at the Bus Bays and Bus Shelters are presented below:



Bus Bay with Shelter at km 26.000



Bus Shelter with toilet block @ Km 54.750 LHS-SR

There are 4 Nos. of Truck lay byes provided along the project corridor with Flexible pavement. The condition of the pavement appears to be fair. A Separator is provided in between main carriageway and Truck lay-bye portion.

Few photos depicting the Truck lay-bye portion are presented below:



A view Truck Lay bye at Km 40.000 RHS



A view Truck Layby at Km 16.500 LHS

The Project Road has 1 No. of Toll Plaza at Km 53+700(Veravalli plaza). Rigid pavement exists at toll plaza location and condition appears to be fair. It has 7+1 lanes on each side at Varavalli plaza 4 Nos. of High mast lighting have been provided at location.



A view of the Toll Plaza near km 53.700



A view of the Toll Plaza near km 53.700



A view of the admin building at km 53.700



A view of Weigh bridge at km 53.700

Service/slip roads are provided with varying carriageway widths from 5.5m to 8.75m with Flexible pavement for a length of 103.538km (including tapers) along the Project Corridor. Photos depicting

the service road pavement surface type, Condition and the other associated features like drain. Few photos taken at service/slip road locations are presented below.



Slip Road 7 m width @ km 27.800 RHS



Slip Road 5.5 m width @ km 18.800 LHS



Slip Road 8.5m width @ km 15.800 LHS



Service Road 7 m width @ km 28.300 LHS

The collected Road Inventory Data is presented in **Appendix 1** of this Report

2.3 PAVEMENT CONDITION SURVEYS

The collected Pavement Condition Data using NSV surveys for main carriageway is presented in **Appendix 2** of this Report.

The photographs showing the pavement condition of the Project Road is presented below.

 Fair condition @ km 52.700 LHS	 Potholes @ km 31.800 LHS	 Fair condition @ km 62.700 BHS
 Delamination @ Km-101.800 RHS	 Bleeding at Km-102.400 RHS	 Full Damage Km 103.700 LHS
 Fair condition @ km 36.000 LHS	 Raveling @ km 71.700 RHS	 Fair condition @ km 32.000 RHS
 Fair condition @ km 41.900 LHS	 Delamination @ Km 72.400 LHS	 Rutting @ Km 40.500 RHS

2.4 FALLING WEIGHT DEFLECTOMETER (FWD) SURVEYS

2.4.1 Falling Weight Deflectometer Survey (Flexible Pavement)

In order to evaluate the structural strength of the existing pavement, Falling Weight Deflectometer (FWD) survey has been carried out along the project road in line with IRC: 115-2014.

- ✓ Prior to the start the surveys, Load repeatability tests are performed on each day
- ✓ The target Peak Load of 40 KN (+/- 4 KN) is maintained during survey.
- ✓ At Regular intervals of time Pavement temperature is noted.
- ✓ For every 1 Km of stretch 5 test Points (2 pts- Outer, 3 pts-inner) were taken on Main Carriageway in each direction. Further at extra-lane observed locations additional FWD points were also considered.
- ✓ Temperature correction equation is applied for back calculated modulus of BT and no seasonal correction factor is applied as test performed in monsoon season (July month) for the back calculated modulus of granular and Subgrade.

The collected FWD Data and Analysis is presented in **Appendix 3** of this Report.

Few photos taken during the progress of FWD Surveys are presented below:



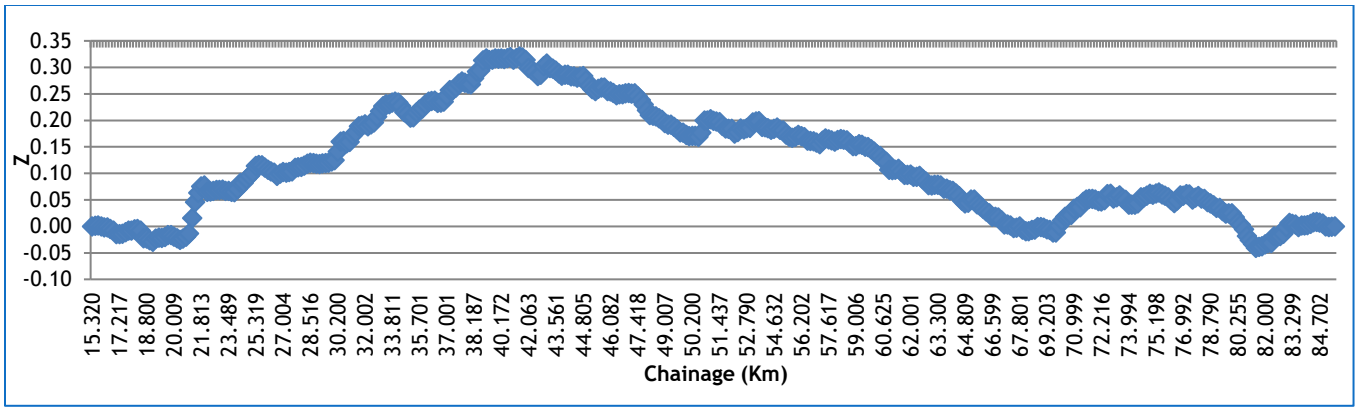
FWD Survey



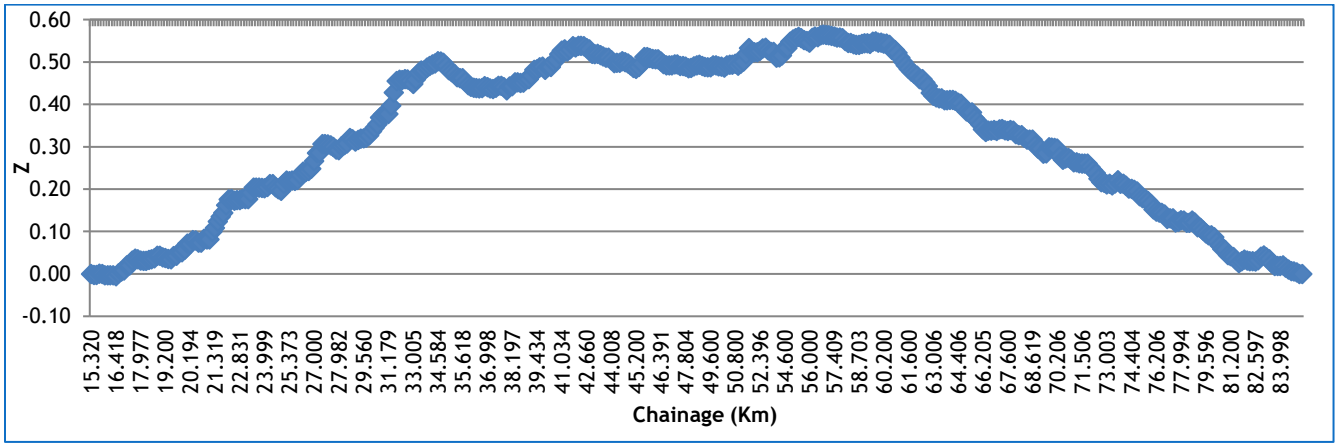
FWD Survey

Cumulative Difference Approach (CDA) has been used for the identification of homogeneous sections on the basis of Surface Curvature Index (SCI). SCI is calculated as the difference between D_0 and D_{300}, where D_0 and D_{300} are the peak deflections (mm) measured at the center of loading plate and at a radial distance of 300mm

The homogenous sections in each direction of traffic (i.e., LHS & RHS) for the project stretch have been identified for Main carriageway and service Road are presented in graphical representation of followed by tables.



Delineation of Homogeneous Section – LHS



Delineation of Homogeneous Section - RHS

Based on the above graphs, the flexible pavement section has been sub-divided into homogeneous section for LHS and RHS direction as given below.

Table 2: FWD Data - Summary of Homogenous Section of Main Carriageway – LHS

S.No	From (km)	To (km)	Length (Km)	Remarks
1	15.320	18.225	2.91	
2	18.225	20.357	2.13	
3	20.357	23.646	3.29	
4	23.646	26.621	2.98	
5	26.621	29.199	2.58	
6	29.199	32.002	2.80	
7	32.002	34.680	2.68	
8	34.680	37.197	2.52	
9	37.197	39.622	2.43	
10	39.622	42.660	3.04	
11	42.660	44.592	1.93	
12	44.592	46.624	2.03	
13	46.624	48.800	2.18	
14	48.800	50.495	1.70	
15	50.495	53.300	2.81	
16	53.300	54.070	0.77	Toll Plaza
17	54.070	57.016	2.95	

S.No	From (km)	To (km)	Length (Km)	Remarks
18	57.016	59.890	2.87	
19	59.890	62.201	2.31	
20	62.201	64.200	2.00	
21	64.200	67.554	3.35	
22	67.554	69.614	2.06	
23	69.614	72.216	2.60	
24	72.216	74.793	2.58	
25	74.793	77.622	2.83	
26	77.622	80.588	2.97	
27	80.588	83.184	2.60	
28	83.184	85.204	2.02	
Total Length			**69.884**	

Table 3: FWD Data - Summary of Homogenous Section of Main Carriageway - RHS

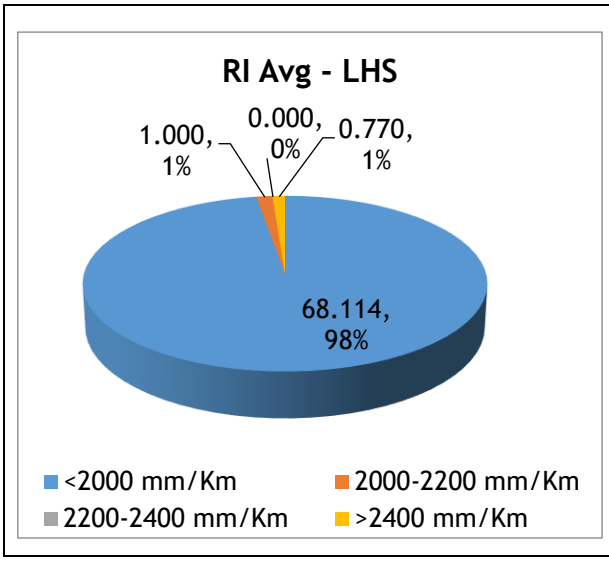
S No	From	To	Length (Km)	Remarks
1	15.320	17.410	2.09	
2	17.410	19.473	2.06	
3	19.473	22.359	2.89	
4	22.359	25.013	2.65	
5	25.013	27.982	2.97	
6	27.982	31.795	3.81	
7	31.795	34.680	2.89	
8	34.680	37.103	2.42	
9	37.103	39.189	2.09	
10	39.189	42.660	3.47	
11	42.660	45.006	2.35	
12	45.006	47.804	2.80	
13	47.804	50.998	3.19	
14	50.998	53.300	2.30	
15	53.300	54.070	0.77	Toll Plaza
16	54.070	56.000	1.93	
17	56.000	58.006	2.01	
18	58.006	59.890	1.88	
19	59.890	62.000	2.11	
20	62.000	64.200	2.20	
21	64.200	66.606	2.41	
22	66.606	69.210	2.60	
23	69.210	72.200	2.99	
24	72.200	75.802	3.60	
25	75.802	78.797	2.99	
26	78.797	81.794	3.00	
27	81.794	85.204	3.41	
	Total Length		**69.884**	

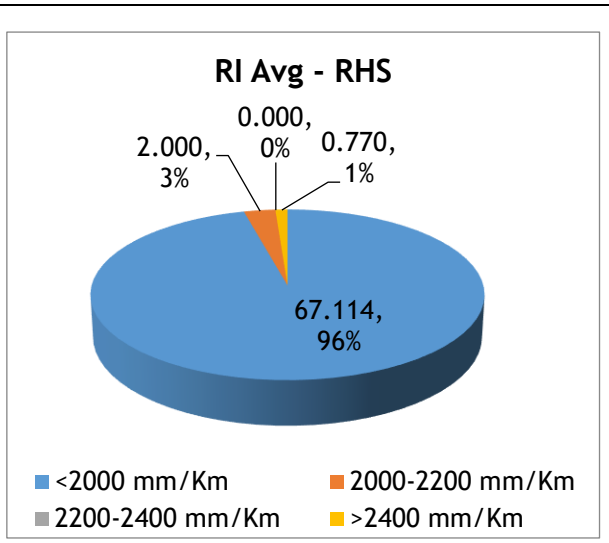
2.5 ROUGHNESS SURVEYS

The Roughness data has been collected using **Network Survey Vehicle** and analyzed in terms of International Roughness Index (IRI), separately for each lane, for both direction of travel. Pavement Roughness data collection and computation of IRI for each km length in each direction is presented in **Appendix 4** of this Report.

As per Schedule-F of TOT, the desirable level of service for Roughness values for bituminous pavement surface is considered to less than 2000 mm/Km and the acceptable limits are less than 2400mm/Km.

Average Roughness Index (RI) values along the corridor were grouped in to four categories, Pie chart showing the range of RI values in each carriageway of the project road have been presented below:





Note: Roughness>2400mm/km is observed is at Toll Plaza Location in a length of 770m.
It can be seen from the above pie charts, that about 98% in LHS & 96% in RHS of the length of the Project Road has good riding quality (RI<2000 mm/km) respectively.

2.6 PAVEMENT COMPOSITION SURVEYS (TEST PITS)

The composition of the existing pavement crust has been noted from test pit surveys. Thus, a total of 18 Nos. of pits have been dug along the corridor and its pavement composition has been noted.

Results of the test pit survey showing average thickness of pavement layers are presented in the Table below.

Table 4: Pavement Composition of Existing Pavement along Project Road

S. No	Test Pit Number	Design Chainage	Direction	BT	WMM	PQC	DLC	GSB	Dust	Total
1	GK-TP-1	16+000	LHS	130	250			200	150	730
2	GK-TP-2	21+600	RHS	150	250			200		600
3	GK-TP-3	26+100	LHS	140	270			170		580
4	GK-TP-4	30+400	RHS	150	250			150		550
5	GK-TP-5	34+400	LHS	130	220			200		550
6	GK-TP-6	40+700	RHS	160	220			250		630
7	GK-TP-7	44+600	LHS	130	200			170		500
8	GK-TP-8	50+860	RHS	160	240			120		520
9	GK-TP-9	55+500	LHS	160	230			200		590

10	GK-TP-10	61+150	RHS	190	220			200		610
11	GK-TP-11	65+850	LHS	200	250			170		620
12	GK-TP-12	70+000	RHS	180	170			240		590
13	GK-TP-13	75+000	LHS	190	300			250		740
14	GK-TP-14	80+850	RHS	190	270			200		660
15	GK-TP-15	84+000	LHS	170	250			200		620
16	GK-SR-TP-1	57+560	LHS	100	200			200		500
17	GK-SR-TP-2	37+000	RHS	100	250			150		500
18	GK Toll-1	53+550	LHS			300	150	150		600

2.7 SUBGRADE INVESTIGATIONS & LABORATORY TESTING

Sub-grade Investigations have been carried out to examine the subgrade soil characteristics along the project road. A total 18 Nos. of test pits have been carefully dug from the pavement surface up to sub-grade level. Out of 18 nos',15 nos are done on main carriageway and remaining 2nos are done in Service Road, 1nos are done in Toll Plaza. Field density tests have been conducted for subgrade samples and a small quantity of sample has also been collected in airtight containers for determining the field moisture content. Upon completion of the field density test, representative sample of sub-grade soil has been collected in bulk, in gunny bags from each test pit for laboratory testing.

The soil samples collected have been tested for the following properties to assess the existing sub-grade soil properties.

- Sieve analysis
- Atterberg limits
- Heavy compaction
- Four (4) days soaked CBR as per IS standards at 97% of MDD as applicable for sub-grade (Heavy Compaction)
- Free swelling index

Few sample photos of the test pit locations where the subgrade samples collected are as presented below.



GK-TP-1



GK-TP-2



GK -TP-3



GK -TP-4



GK-TP-5



GK-TP-6



GK-TP-7



GK-TP-8



GK-TP-9



GK-TP-10



GK-TP-11



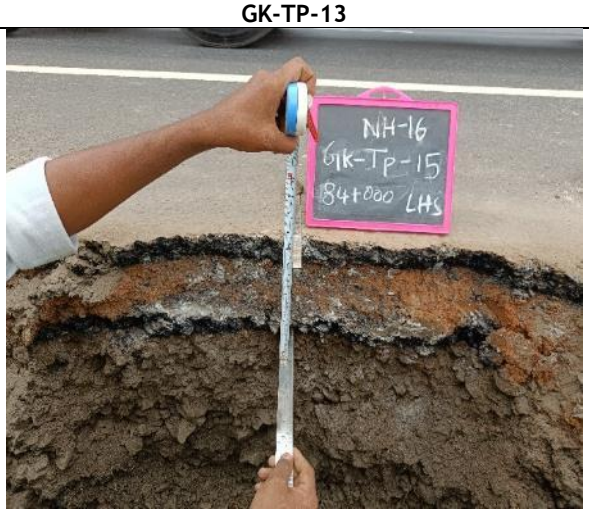
GK-TP-12



GK-TP-13



GK-TP-14



GK-TP-15



GK-SR-TP-1



GK-SR-TP-1



GK -TP- Toll-1

2.8 BORROW AREAS

Potential borrow area identified at 7 Nos. of locations for the use of embankment/subgrade construction works within economic haulage leads. The sources identified as potential borrow areas

along with certain useful information such as distance from the project road, location, village name, etc., have also been presented in this table below.

Table 5: Borrow Area Samples Details

S. No	Borrow Area No	Chainage	Side	Offset	Village and contact person	Quantity	Rate	Remarks	Co-ordinate
1	GK-BP-1	27+600	RHS	1.0 KM	Vill-Gopalapuram Name-Jalaparthi.Raghavulu Mob no.9701223188	10Acres* 5 feet	Not told	Pvt. Land	16.850239 81.292136
2	GK-BP-2	46+020	LHS	3.0 km	Vill- Timmanapalem Name-N.Apparao Mob no- 9515857389	7 Acres* 5 feet	Dumper 4500/- With out transport	Pvt. Land	16.962418 81.417396
3	GK-BP-3	66+700	LHS	13 KM	Vill- Cherukumilli Name- vivek Mob no-9989724536	4 Acres* 8 feet	Not told	Govt. Land	17.075003 81.598834
4	GK-BP-4	74+000	RHS	3.2 km	Vill- Duddukuru Name- Hanumanth rao Mob no. 9398836255	15 Acres* 5 feet	Rs 200/- per unit	Pvt. Land	17.031733 81.596479
5	GK-BP-5	79+300	RHS	6.6 km	Vill- Pangidi Name-seshagiri rao Mob no- 9491059999	15 Acres* 5 feet	Dumper 1200/- With out transport	Pvt. Land	17.012395 81.642121
6	GK-BP-6	56+100	RHS	8.0 km	Vill- Yernagudem Name-Bapi raju Mob no. 9989939714	8 Acres* 5 feet	Not told	Govt. Land	16.972922 81.543075
7	GK-BP-7	37+450	RHS	6.3 km	Vill- Golladudem Name-M.Srinu Mob no.9908066191	5 Acres* 4 feet	Dumper 2500/- with out transport	Pvt. Land	16.863324 81.368492

Soil samples from these borrow sources have been collected in bulk by excavating test pits down up to 1.0m depth from the existing ground surface. The top organic soil layer of approximately 150mm thickness was removed before sampling. The samples collected from these identified borrow pits/ gravel quarries have been tested for the suitability of utilizing them as embankment fill/ sub-grade. Few sample photos of borrow area locations are as presented below.



GK-BP-1



GK-BP-2



GK-BP-3



GK-BP-4



GK-BP-5



GK-BP-6



GK-BP-7

2.9 AGGREGATE SAMPLES

Aggregates samples 4 Nos. from crusher/quarry have identified for the use of sub-base, base, surface courses and concrete works has been collected. The locations, estimated quantity, basic cost of material and the approximate distance from each source to the nearest point on the project corridor are compiled in Tables below.

Table 6: Aggregate Samples Details

SL no	sample No.	Ex.Chainage (Km.)	Left/ Right	Name of Village	Name of Source/ Crusher	Lead from Nearest Ex.Chainage (Km.)	Approximate Quantity (ton)	Basic cost of the material (Rs.)	Remarks	Co-ordinate
1	GK-AQ-1	74+000	RHS	Duddukuru	Crusher-Surya chandra mining crusher Name-ViJay Kumar vill-Duddukuru Mob no.9492645979	3.0 km	Plenty	40mm RS 1800/-per unit 20mm Rs 2000/- per unit 12mm-Rs 1000/- per unit 10mm-Rs 1000/- per unit Dust Rs.1100/- per unit	No GST NO Royalty	17.034531 81.599732
2	GK-AQ-2	74+000	RHS	Gowripatnam	Crusher-SR stone crusher Name-Samudra reddy vill-Gowripatnam Mob no.9493162346	2.1 Km	Plenty	30mm RS 1800/-per unit 20mm Rs 2000/- per unit 12mm-Rs 800/- per unit 10mm-Rs 800/- per unit Dust Rs.900/- per unit WMM Rs.1600/-per unit GSB RS.1100/- per unit	Royalty: Rs 170/- Per unit and Extra: GST 5%	17.031223 81.609607
3	GK-AQ-3	79+300	RHS	Pangidi	Crusher- Gayatri Stone Crusher Name - CH.Naveen vill-Pangidi Mob no.9682445566	4.0 KM	Plenty	30mm RS 1800/-per unit 20mm Rs 1900- per unit 12mm-Rs 900/- per unit 10mm-Rs 900/- per unit Dust Rs.1000/- per unit	Extra GST 5%	17.017698 81.642732
4	GK-AQ-4	79+300	RHS	Pangidi	Crusher- Sri Kanaka Durga stone crusher Name-Satyanarayana Village - Pangidi Mob no.9949823377	4.5 km	Plenty	40mm-Rs 400/- per ton 20mm-Rs 500/- per ton 10mm-Rs 350/- per ton 6mm - Rs 400/- per ton M-Sand - Rs 400/- Per ton WMM - Rs 350/- per ton GSB - Rs 350/- per ton	Royalty: Rs 600/- Per unit and Extra: GST 5%	17.017067 81.634626

Few sample photos of aggregate quarry locations are as presented below.



GK-AQ-1



GK -AQ-2



GK -AQ-3



GK -AQ-4

2.10 SAND SAMPLES

River Sand samples of 2 Nos. have been collected from the source and tested. The location of this sand quarry along with lead to the Project Road is presented in the following table.

Table 7: Sand Samples Details

S.No.	Sand Source	Village & Name	Name of river	Existing Chainage	side	Offset	Rate	Remarks	Coordinates
1	GK-SQ-1	Vill -Arikirevula Name -Prasad Mob-8463917355	Godavari	84+750	RHS	6.9 KM	Rs 420/- Per ton with Loading	No Royalty -	17.041507 81.723664
2	GK-SQ-2	Vill -Aurangabad Name - Appara rao Mob-9490291151	Godavari	84+750	RHS	11 km	Rs 420/- Per ton with Loading	No Royalty -	16.972272 81.744559



GK-SQ-1



GK-SQ-2

2.11 AXLE LOAD SURVEYS

Traffic loading has a significant impact on pavement performance and design. This is because the damage that vehicles create to a road depends very strongly on the axle loads of the vehicles. The exact relationship is influenced by the type of road structure and the way the road deteriorates but a “fourth power” damage law gives a good approximation.

Axle load study has been conducted using portable axle load pads near toll plaza at km 53+700 on date 13.08.2024 for initial 24 hrs. Further, seven more days surveys have been done from 25.09.2024 onwards. The survey has been conducted in both the directions and data captured on random sampling basis. The collected axle load data and analysis is presented in **Appendix 5** of this Report. The vehicle damage factors have been calculated using the standard axle loadings given in IRC: 37-2018. The standard axle loadings adopted have been presented in the following table.

Details of Standard Axles Used

Axle Configuration	Standard Axle load (Tonnes)*/ KN	Remarks
Single Wheel, Single Axle	6.60/65	As per IRC 37-2018
Dual Wheel, Single Axle	8.16/80	As per IRC 37-2018
Dual Wheel, Tandem Axle group	15.10/148	As per IRC 37-2018
Dual Wheel, Tridem Axle group	22.90/224	As per IRC 37-2018

Few photographs illustrating the survey locations and axle load measurements are presented below.



Axle Load Survey



Axle Load Survey



Axle Load Survey



Axle Load Survey

Direction wise VDF for each mode of commercial traffic has been estimated. Results of axle load surveys have been presented in the following table.

Table 8: VDF Values Estimated at the Toll Plaza

Vehicle Type	Veravalli Toll plaza (53+700)	
	UP	DN
BUS	0.76	1.81
2-Axle	2.29	1.81
3-Axle	5.08	4.36
M Axle	15.23	9.10
LCV	1.53	0.53

CHAPTER 3. VALIDATION OF EXECUTED WORKS

3.1 ROAD WORKS

The project road has been closely inspected to verify the executed works on ground. The scope works to be executed by the Concessionaire/Contractor as envisaged in CA is compared with the executed work on the Ground. As a part of the validation, the available as-built drawings and the inventory data received from the Concessionaire were also referred. Each structure has been inspected to note down its structural configuration and condition. The following table highlights the scope comparison of the executed works on ground.

The project corridor appears to have been constructed with the cross-sectional elements matching to those given in the manual at the time of execution. The carriageway width varying from 7.0m to 10.5m plus paved shoulders of 1.5m and a shyness of 0.25m has been provided over the entire length except at structures. Earthen shoulders of 0m to 1m on either side of carriageway have also been provided.

Table 9: Scope Comparison of Executed works

S. No.	Particulars	Length/ Nos	Total for O&M Estimation	As per Sch-A	As per Site	As per Sch-B/DPR	Remarks
1	**Start Chainage (Km)**	Km	15.32	15.320	15.320		
2	**End Chainage (Km)**	Km	85.20	85.204	85.204		
3	Length of the Project Corridor	Kms	69.88	69.884	69.884		
4	Service Road / Slip Road (Including Taper Length)	Kms	104.95	103.218	103.538	1.410	As per DPR (NHAI)
5	ROBs	Nos	1	1	1		
6	Flyovers	Nos	16	16	16		
7	VOP	Nos	1	1	1		
8	VUPs	Nos	2	2	2		
9	LVUP's	Nos	11	11	11		
10	PUP's/CUP's	Nos	5	5	5		
11	Major Bridges	Nos	9	9	9		
12	Minor Bridges	Nos	23	22	23		MNB at km. 59+475 given in Box Culvert in CA (Sch-A Clause 22)
13	Culverts (Pipe)	Nos	22	22	22		
14	Culvert (Box)	Nos	57	117	57		
15	Culvert (Slab)	Nos	67	8	67		
16	Uni Directional Flyover's	Nos	10	10	10		LHS-2, RHS-8
17	Minor junctions	Nos	50	28	50		
18	RE Panels - Full height	Kms	47		47		
19	RE Panels / Blocks Area	Sqm	1,92,000		1,92,000		
20	Stone Masonary Wall	Kms	0.660		0.660		
21	RCC Cover Drain	Kms	7	6.67	6.84		
22	RCC Open Lined Drain	Kms	31	31.23	31.37		
23	Median drain	Kms	12	8.47	11.96		
24	Median Cuts	Nos	1,328		1,328		
25	Toll Plaza	Nos	1	1	1.00		
26	No.of Lanes (Both side)	Nos	16	16	16.00		
27	Varying Message Signs(VMS)	Nos	8	8	6.00		
28	Emergency Call Box	Nos	50	50	42.00		
29	High Mast Lights	Nos	18		18.00		

S. No.	Particulars	Length/ Nos	Total for O&M Estimation	As per Sch-A	As per Site	As per Sch-B/DPR	Remarks
30	Highway Lighting (length only)	Kms	22		21.86		
31	Single Arm Lightings	Nos	545		545		545 No's Erected
32	Double Arm Lightings	Nos	1,767		236	1531	1138 no's As per DPR (NHAI)
33	Lights below underpass/FO	Nos	315		315.00		
34	Solar Blinkers	Nos	72		15.00	57	As per DPR (HAM)
35	Solar Lights with Panel	Nos	36		36.00		
36	Bus Bays with Shelter	Nos	20	21	20.00		
37	Bus Shelters	Nos	36	35	36.00		
38	Truck Lay bye	Nos	4	4	4.00		
39	Rest Areas	Nos	4	4	4.00		
40	Median Opening	Nos	3	3	3.00		
41	Median Plantation_Functional	Kms	52		51.50		
42	Median Plantation_Non Functional	Kms	2		1.90		
43	Road Markings	Kms	70		69.88		
44	Delineators	Nos	1,549		1,468	81	As per DPR (NHAI)
45	Kilometre Stones	Nos	113		113		
46	Hectometre Stones	Nos	562		562		
47	5th Km Stone	Nos	28		28		
48	Road Signs	Nos	1,504		1,504		
49	2-Lane Gantry Sign Boards	Nos	9		9		
50	Cantilever Sign Boards	Nos	14		14		
51	Toll Plaza Sign Boards	Nos	10		10		
52	Single Face W-Beam Safety Barriers	Kms	35		30.10	5.260	As per DPR (NHAI)
53	Rigid Concrete Barriers	Kms	59		58.57		
54	Concrete Railing	Kms	0		0.50		
55	Steel Railing	Kms	2		2.46		
56	Pedestrian Guard Rails	Kms	5		4.86		

In the project stretch, the Service/Slip Roads having 5.5m to 8.75m carriageway width with an overall both side length of 103.538 km has been observed. Location wise details of service roads and slip roads presented in **Appendix 6** are listed as below:

Table 10: Summary of Service Roads/Slip Roads along Project Road

Description	LHS			RHS			Total
	Flexible	Rigid	Earthen	Flexible	Rigid	Earthen	
Units	**Kms**	**Kms**	**Kms**	**Kms**	**Kms**	**Kms**	**Kms**
Service Road	51.244	0	0	52.294	0	0	103.538

RCC Lined Covered drains are provided in a length of 6.840 km at various locations and open lined drains are provided in a length of 31.370 Km and Median drain are provided in a length of 11.960 km respectively along the Project corridor, the location and condition of the same are presented in **Appendix 6**. The summary of the same is tabulated below.

Table 11: Summary of Drains along the project road

Drains	As per Schedule A	LHS	RHS	Median	Total
		As per Site			
	Kms	Kms	Kms	Kms	Kms
RCC Cover Drain	6.67	3.86	2.98	-	6.84
RCC Open Lined Drain	31.23	16.21	15.16	-	31.37
Median Drain	8.47	-	-	11.96	11.96

RE walls and Stone Masonry are found in approaches to the grade separator locations, high embankment locations and at CD-structures locations along the Project Corridor which account for a total length of 48.000 Km the details list are presented in **Appendix 6**. The summary of the slope protection table was presented below:

Table 12: Summary of Slope Protection along Project Road

S.no	Slope Protection Type	LHS	RHS	Total
		Kms	Kms	Kms
1	RE Wall	23.67	23.67	47.34
2	Stone Masonry	0.46	0.20	0.66

A total of 3 median openings were observed on-site, consisting of reserved lanes. For median openings with a reserved lane provision, the 4.5m median width is reduced to 1.0 meter. The location wise details are presented in **Appendix 6**. The summary of the openings is presented below.

Table 13: Summary of Median Openings along Project Road

Median Openings	As per Schedule A	As per site
		Nos
Reserve lane	3	3

The project road has a total of 70 junctions. A comprehensive list of major and minor junctions is provided in **Appendix 6** of this report.

Safety barriers have been provided along the project road at high embankments and at sharp curve locations, at approaches of grade separated and cross drainage Structures. Details of safety barriers provided along the corridor include the following.

- Single face w-barrier is observed for a length of 30.101 Kms along the project corridor. Details of Metal Beam Crash Barrier are provided in the **Appendix 6** of this report.

- Concrete crash barrier (CCB) and Concrete Railing are observed at Structure locations along the project corridor. Length of Concrete crash barrier is about 58.566 Kms and Concrete railing are about 2.87 kms. Details of Metal handle railing (MHR) is about 2.46 Kms are provided in the **Appendix 6** of this report.

- Pedestrian Guard Rails (PGR) are observed for a length of 4.86 Kms on service road and Fencing is observed at MCW Sholder on BHS expect at Str location along the project corridor for a length of 43.49 Kms. Details are presented in the **Annexure-6** of this report.

Table 14: Summary of Safety Barriers

Safety Barriers	Length	Damage
	Kms	m
CCB	58.566	-
Metal Handrail	2.46	-
concrete railing	0.5	-
MCB	30.101	38
Pedestrian Guard Rails	4.86	10
Fencing	**43.49**	**179**

Road furniture in the form of High masts, Highway Lighting and Sign boards have been provided along the project road. The summary of lighting and Signboards presented below and details list are provided in **Appendix 6** of this report.

Table 15: Summary of Highway lighting and High mast

Description	LHS	Median	RHS	Total	Damage / Missing			Not Working Bulbs
					Pole	Arm	Bulb	
	Nos	Nos	Nos	Nos	Nos	Nos	Nos	Nos
Highmast Pole	8	0	10	18	0	-	-	-
Highmast Fixture	120	0	156	276	-	-	0	0
Single Arm Pole	247	66	232	545	2	1	0	55
Double Arm Pole	86	41	109	236	0	1	1	97
Underpass Lighting	-	-	-	315	-	0	25	0
Solar Light	21	0	15	36				

Table 16: Road Signs along Project Road

Description	LHS	RHS	Junctions	Total
Unit	Nos	Nos	Nos	Nos
Overhead Gantry	7	4	0	11
Cantilever Gantry	8	6	0	14
Toll Boards	5	5	0	10
ADS/RAS	0	0	0	0
Rectangular	161	156	46	363
Triangular	70	43	53	166
Circular	72	77	3	152
Octagonal	0	0	43	43
Flag Type	0	0	0	0
Chevron	220	206	0	426
Hazard	142	142	39	323
Route marker	16	15	0	31
Cluster	0	0	0	0
Total	701	654	184	1539

The project road has total 19 Nos. of Bus Bays with shelter, 33 Nos. are bus shelters on both sides of Highway. The details are presented in **Appendix 6** of this report.

Table 17: Bus Bays with Shelters

Description	Units	As per Site		
		LHS	RHS	Total
Bus Bay with Bus Shelter	No	10	9	19
Bus Shelter	No	17	16	33

The Project Road has 4 Nos. of Truck laybys along the Highway. The truck layby has been provided with Flexible pavement and the condition appears to be fair. Separator is provided between main carriageway and truck lay bye portion.

The rest areas are of 4 Nos are provided in the project highway.

3.2 STRUCTURES

List of all Structures found during the inventory surveys along the corridor are as follows:

Table 18: Summary of Structures

S. No.	Type of Str	No. of Structures As per Schedule	As per site					Remarks
			No. of Structures			Total No.of Str's	Total No.of Locations	
			LHS	RHS	BHS			
1	ROB	1	1	1	-	2	1	-
2	MJB	9	10	10	-	20	9	-
3	MNB	22	37	37	-	74	23	> MNB at km. 59+475 given in Box Culvert in CA (Sch-A Clause 22)
4	Flyover	16	8	14	-	22	16	LHS Uni directional: 2 no's RHS Uni directional: 8 no's BHS: 6 no's
5	VUP	2	2	2	-	4	2	-
6	LVUP	11	11	11	-	22	11	-
7	CUP	5	5	5	-	10	5	-
8	VOP	1	-	-	1	1	1	-
9	BC/SC	125	-	-	124	124	124	-
10	PC	22	-	-	22	22	22	-
Total		**214**	**74**	**80**	**147**	**301**	**214**	

Table 19: Age of Structures

S.No	Type of Str	LHS		RHS		BHS		Total (Nos)		Total no. of Str's
		Old	New	Old	New	Old	New	Old	New	
1	ROB	-	1	-	1	-	-	-	2	2
2	MJB	-	10	3	7	-	-	3	17	20
3	MNB	1	37	2	36	-	-	3	73	76
4	Flyover	-	8	-	14	-	-	-	22	22
5	VUP	-	2	-	2	-	-	-	4	4
6	LVUP	-	11	-	11	-	-	-	22	22
7	CUP	-	5	-	5	-	-	-	10	10
8	VOP	-	-	-	-	-	1	-	1	1

Table 20: Summary of Expansion Joints & Bearings

S.No	Type of Str	Expansion joints		Bearings			
				Pot PTFE		Elastomeric	
		Old	New	Old	New	Old	New
1	ROB	-	12	-	136	-	-
2	MJB	27	111	-	64	300	764
3	MNB	-	8	-	24	-	-
4	Flyover	-	69	-	40	-	430
5	VUP	-	8	-	-	-	40
6	LVUP	-	-	-	-	-	-
7	CUP	-	-	-	-	-	-
8	VOP	-	3	-	-	-	12
Total		**27**	**211**	**0**	**264**	**300**	**1246**
		238		**264**		**1546**	
				1810			

Table 21: Summary of Superstructures

S. No	Type of Str	PSC Girder	RCC Box	PSC Girder & RCC Girder	RCC Girder	RCC Solid Slab	RCC Girder & Steel Girder	Total no. of Structures
1	ROB	-	-	-	-	-	2	2
2	MJB	8	-	2	10	-	-	20
3	MNB	4	71	-	-	1	-	76
4	Flyover	7	-	2	13	-	-	22
5	VUP	4	-	-	-	-	-	4
6	LVUP	-	22	-	-	-	-	22
7	CUP	-	10	-	-	-	-	10
8	VOP	1	-	-	-	-	-	1
Total		**24**	**103**	**4**	**23**	**1**	**2**	**157**

Table 22: Summary of Substructures

S.No	Type of Str	ABUTMENT		PIER			
		RCC Wall	Trestle Type	RCC Wall	Trestle Type	RCC Wall & Portal Type Pier	RCC Circular
1	VOP	1	-	1	-	-	-
2	CUP	10	-	-	-	-	-
3	LVUP	22	-	-	-	-	-
4	VUP	-	4	-	-	-	-
5	Flyover	13	9	13	9	-	-
6	MNB	76	-	46	-	-	-
7	MJB	18	2	16	-	2	2
8	ROB	2	-	2	-	-	-
Total		**142**	**15**	**78**	**9**	**2**	**2**
		157		**91**			

Table 23: Summary of structures inspected with MBIU

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Age of Str	Span Arrangement (m)	Type of Superstructure
1	31+658	MJB	LHS	New	6 x 21.6	RCC Girder
2	31+658	MJB	RHS	Old	6 x 21.6	RCC Girder
3	48+194	MJB	LHS	New	10 x 15.5	RCC Girder
4	48+194	MJB	RHS	Old	10 x 15.5	RCC Girder
5	51+920	MJB	LHS	New	6 x 33.33	PSC Girder
6	51+920	MJB	RHS	New	6 x 33.33	PSC Girder
7	59+770	MJB	LHS	New	8 x 15.5	RCC Girder
8	59+770	MJB	RHS	Old	8 x 15.5	RCC Girder
9	68+742	MJB	LHS	New	1 x 15 + 5 x 33 + 1 x 31.5 + 1 x 15	PSC Girder & RCC Girder
10	68+742	MJB	RHS	New	1 x 15 + 4 x 33 + 1 x 30 + 1 x 26 + 1 x 15	PSC Girder & RCC Girder
11	15+800	Flyover	RHS	New	3 x 33	PSC Girder
12	23+175	Flyover	LHS	New	2 x 33	PSC Girder
13	23+175	Flyover	RHS	New	2 x 33	PSC Girder
14	66+702	Flyover	LHS	New	3 x 32.5	PSC Girder
15	66+702	Flyover	RHS	New	3 x 32.5	PSC Girder
16	79+277	Flyover	LHS	New	1 x 23 + 1 x 39.5	PSC Girder & RCC Girder
17	79+277	Flyover	RHS	New	1 x 23 + 1 x 39.5	PSC Girder & RCC Girder
18	84+789	Flyover	LHS	New	2 x 27.7	PSC Girder
19	84+789	Flyover	RHS	New	2 x 27.7	PSC Girder
20	78+343	VOP	BHS	New	2 x 31.5	PSC Girder

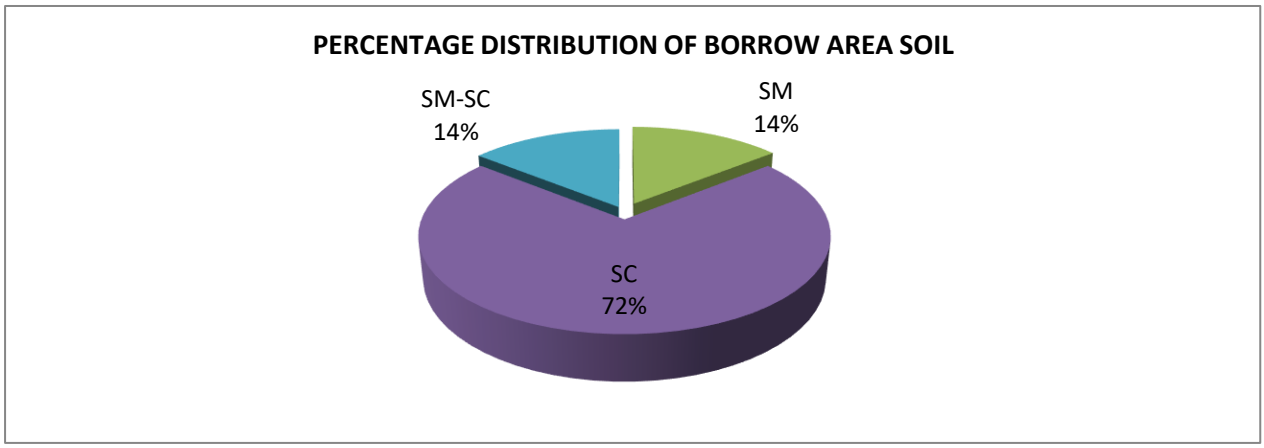
4.1 EMBANKMENT & SUBGRADE

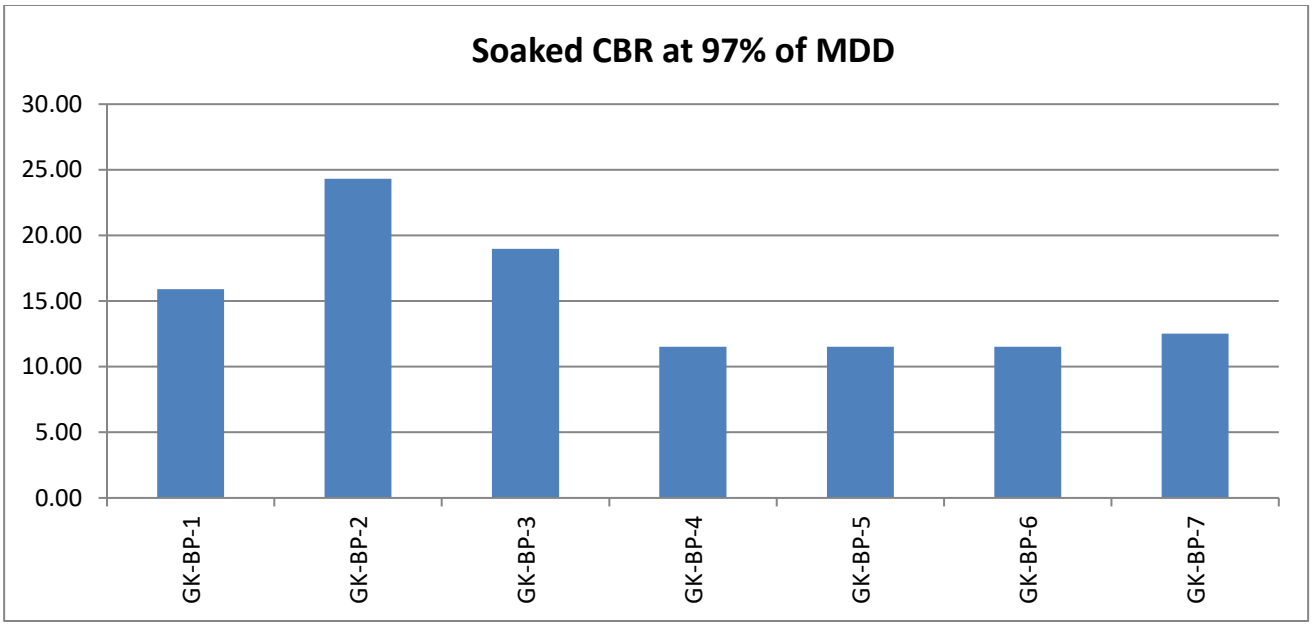
The embankment for project road has been constructed with available soils from nearby areas. The soil appears to be Coarse grained type in nature and embankment appears to be in good condition over the entire length of project. No major settlements or depressions have been noted even at high embankment locations. Out of 7 samples 5 samples belongs to SC type of soil, 1 sample belongs to SM type of soil and 1 sample belongs to SM-SC type of soil.

Summary of the test results carried out on these samples are presented in the following tables whilst the complete details are presented as an **Appendix 7** of this report.

Table 24: Test Results of Borrow area Samples Details

Lab Sample No	Site Identification		Grain Size Analysis					Atterberg Limits (%)			Soil Class	MDD (gm/cc)	OMC (%)	Dry Density at 97% MDD	Soaked CBR 97% MDD	Free Swelling Index (%)
	Location (km)	LHS/RHS	Percentage passing from					LL	PL	PI						
			4.75 mm IS Sieve	425 mic IS Sieve	75 mic IS Sieve	Gravel %	Sand %									
GK-BP-1	27+600	RHS	68.00	31.59	28.33	32	39.67	46	23	23	SC	1.98	12.10	1.92	14.38	20
GK-BP-2	46+020	LHS	89.76	28.72	20.7	10.24	69.06	18	14	4	SM-SC	2.08	8.70	2.02	24.32	10
GK-BP-3	66+700	LHS	99.66	57.95	27.68	0.34	71.98	16	13	3	SM	2.09	7.50	2.03	17.52	15
GK-BP-4	74+000	RHS	69.63	46.98	30.77	30.37	38.86	33	19	14	SC	1.96	12.00	1.90	10.46	40
GK-BP-5	79+300	RHS	71.80	23.84	7.83	28.2	63.97	36	19	17	SC	1.97	11.40	1.91	10.46	38
GK-BP-6	56+100	RHS	77.86	35.90	25.48	22.14	52.38	32	19	13	SC	1.99	11.60	1.93	10.46	27
GK-BP-7	39+450	RHS	78.53	54.44	39.73	21.47	38.8	31	18	13	SC	2.00	10.60	1.94	12.00	19





- **SUBGRADE**

The subgrade samples collected from the test pits taken from project road appears to be in fair condition as revealed by test pit investigations. Soil classification has been done according to IS Classification of Soils (ISC) as detailed in IS 1498 - 1978.

Pie Chart showing the percentage distribution of soil classification of existing subgrade sample is presented below:

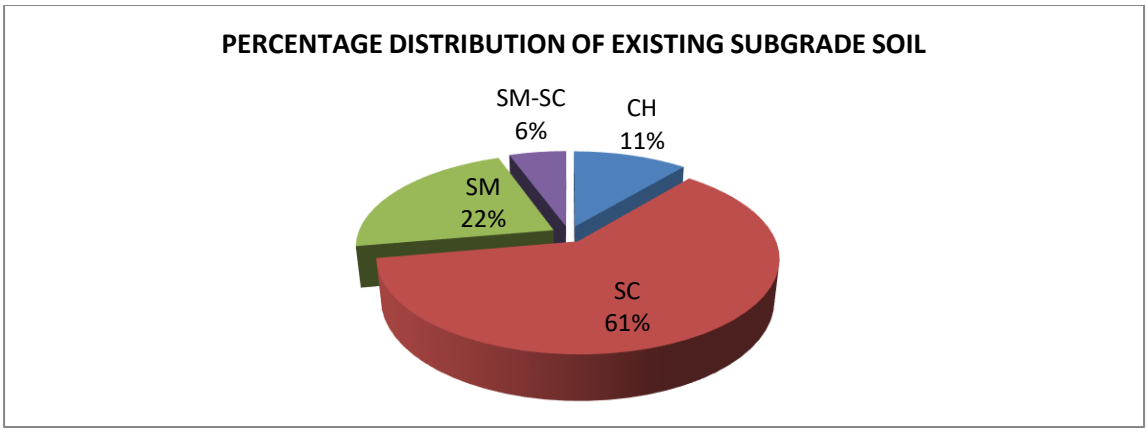
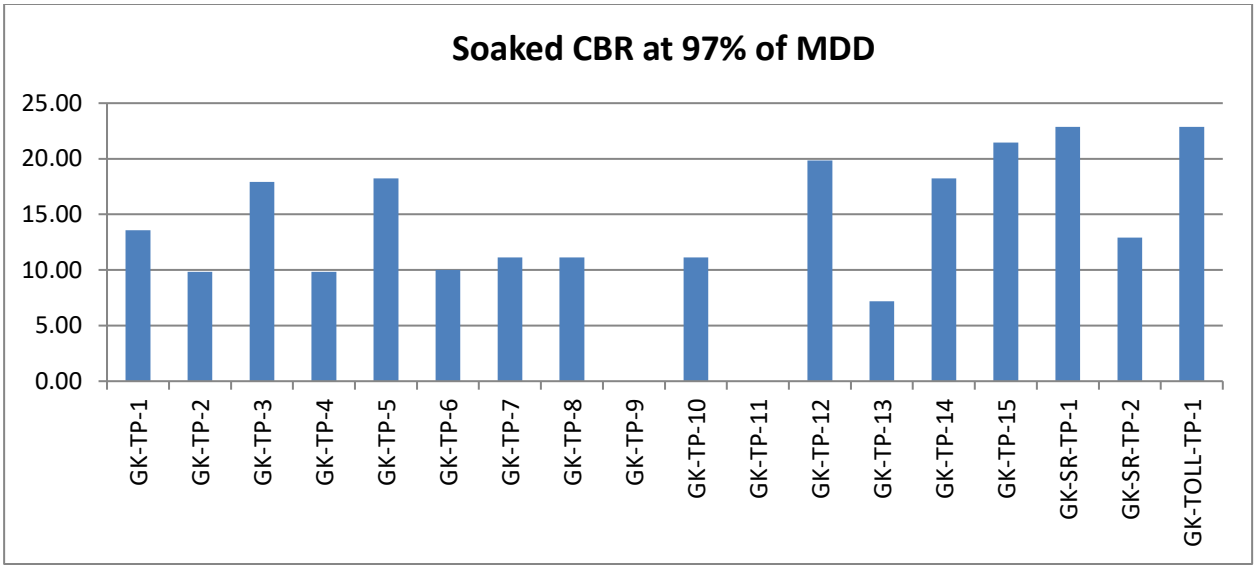


Table 25: Test results of Existing Subgrade Soils

Lab Sample No	Site Identification		Grain Size Analysis					Atterberg Limits (%)			Soil Class	MDD (gm/cc)	OMC (%)	Soaked CBR 97% MDD	Free Swelling Index (%)
	Location (km)	Up/Dn	Percentage passing from					LL	PL	PI					
			4.75 mm IS Sieve	425 mic IS Sieve	75 mic IS Sieve	Gravel %	Sand %								
GK-TP-1	16+00	LHS	78.16	52.07	40.27	21.84	37.89	29	17	12	SC	2.04	12.40	13.58	19
GK-TP-2	21+600	RHS	87.56	54.73	38.71	12.44	48.85	43	24	19	SC	1.96	14.20	7.98	28
GK-TP-3	26+100	LHS	87.56	54.73	38.71	12.44	48.85	39	20	19	SC	2.07	10.80	16.11	29
GK-TP-4	30+400	RHS	75.16	44.93	34.73	24.84	40.43	26	16	10	SC	1.96	12.80	7.98	14
GK-TP-5	34+400	LHS	84.79	37.73	21.29	15.21	63.5	-	NP	NP	SM	2.14	9.30	17.91	20
GK-TP-6	40+700	RHS	76.37	52.27	47.42	23.63	28.95	35	22	13	SC	2.00	13.50	9.83	23
GK-TP-7	44+600	LHS	92.93	60.51	46.69	7.07	46.24	27	16	11	SC	1.98	12.80	11.14	18
GK-TP-8	50+860	RHS	90.41	54.98	14.17	9.59	76.24	35	19	16	SC	1.97	11.70	11.14	25
GK-TP-9	55+500	LHS	96.37	69.04	59.21	3.63	37.16	50	24	26	CH	1.64	21.80	NA	52
GK-TP-10	61+150	RHS	74.78	48.61	40.38	25.22	34.4	39	24	15	SC	1.98	13.30	11.14	36
GK-TP-11	65+850	LHS	100.00	72.05	59.85	0	40.15	55	31	24	CH	1.65	22.00	NA	58
GK-TP-12	70+000	RHS	96.21	38.03	21.76	3.79	74.45	22	14	8	SC	2.08	8.50	19.71	9
GK-TP-13	75+000	LHS	56.84	39.81	35.60	43.16	21.24	44	27	17	SC	1.76	18.80	6.42	33
GK-TP-14	80+850	RHS	92.97	35.28	17.67	7.03	75.3	-	NP	-	SM	2.03	8.60	18.25	0
GK-TP-15	84+000	LHS	91.99	44.17	23.17	8.01	68.82	19	12	7	SM-SC	2.09	10.40	21.46	5
GK-SR-TP-1	57+560	LHS	95.58	49.55	33.27	4.42	62.31	-	NP	-	SM	2.08	8.80	22.87	0
GK-SR-TP-2	37+000	RHS	63.73	31.73	20.55	36.27	43.18	31	19	12	SC	2.21	9.40	12.51	27
GK-TOLL-TP-1	53+550	LHS	97.32	40.33	26.52	2.68	70.8	-	NP	-	SM	2.08	8.80	22.87	5

Laboratory test results indicate that majority of the Subgrade soil samples collected belongs to Coarse Grained Soil out of 18 Nos. of samples 2 Nos. of samples belongs to CH type of soil, 4 Nos. of sample belongs to SM type of soil,11 Nos of samples belongs to SC type and 1 Nos of samples belongs to SM-SC type of soils.



The following observations can be made from the above test results conducted on of existing subgrade samples

- Liquid Limit are in the range of 0% to 44% satisfying LL<50% criteria except 2 sample.
- Liquid Limit are in the range of 0% to 24% satisfying PI<25 criteria except 1 sample.
- Maximum Dry Density for all subgrade samples varies between 1.64 and 2.21 gm/cc. 2 Nos of samples not satisfying the MDD criterion and remaining 16 Nos of samples satisfying MDD criterion (MDD>=1.75 gm/cc).
- OMC for existing subgrade samples varies in between 8.50% to 22.0%.
- Free Swelling Index for existing subgrade samples varies in between 0% to 36%. only 2 Nos of Sample not satisfying the FSI criterion and remaining 16 Nos of samples satisfying the FSI criterion (FSI<=50%)
- CBR Values are varying from 6.42% to 22.87%.

Majority of Subgrade samples are satisfying the MORTH specification criteria.

Material related tests reports are provided in **Appendix-7** of this report.

Aggregates to be used for sub-base, base, surface courses and concrete works have been collected from the crushers under operation from the existing quarries. All samples have been tested for Aggregate Impact Value (AlV), water absorption and specific gravity tests. The Table below represents the test results of the Aggregate and Sand Samples.

Table 26: Test Results of Aggregate Samples

S No	Sample	Location (km)	Up/Dn	A.I. V (%)	Water Absorption (%)	Specific Gravity (%)
1	GK-TP-1	74+000	RHS	16	3.41	2.70
2	GK-TP-2	74+000	RHS	15	3.22	2.67
3	GK-TP-3	79+300	RHS	16	2.88	2.72
4	GK-TP-4	79+300	RHS	14	2.98	2.74

Note: The most the above Aggregates samples are satisfying MoRTH requirements i.e., AIV (max. limit is 24% for BC-layer) and Water Absorption max. limit is 2%, But the above 4 sample results exceeded water absorption limit. The crusher vendors informed that the material source will change for road works and will supply accordingly.

Table 27: Test Results of Sand Samples

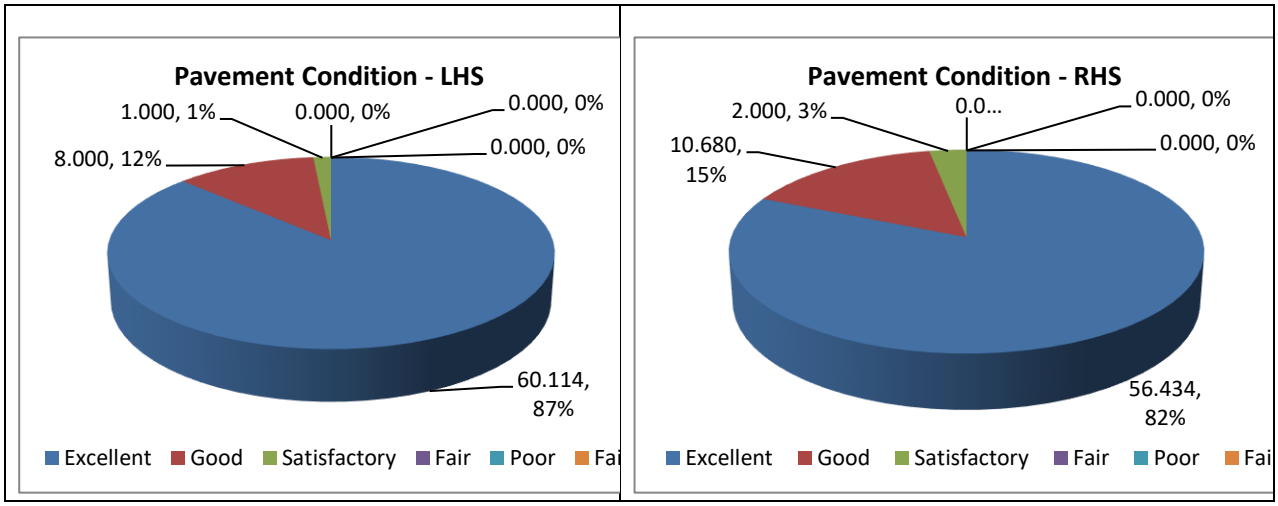
S No	Sample No	CHAINAGE	SIDE	10 mm Passing %	4.75 mm Passing %	2.36 mm Passing %	1.18mm Passing %	600mic Passing %	300mic passing %	150mic Passing %	FM	ZONE
1	GK-SQ-1	84+750	RHS	100	97	93	84	55	13	1	2.57	ZONE -II
2	GK-SQ-2	84+750	RHS	100	98	94	84	55	13	1	2.56	ZONE -II

4.2 PAVEMENT CONDITION

The distresses in bituminous surface have been captured on Main carriageway for each lane separately by NSV survey. Pavement Condition rating (PCI) as per IRC:82-2023 from the data collected for each km length in each direction has been presented in the **Annexure-2** of this report.

The project corridor has been provided with flexible pavement over entire length and even on service roads also. Rigid pavement is only provided at Toll Plaza. The present surface condition appears to be fair and at isolated locations it is fair to poor. The type of distresses observed are cracking, Raveling, Patching, Rutting and Delamination.

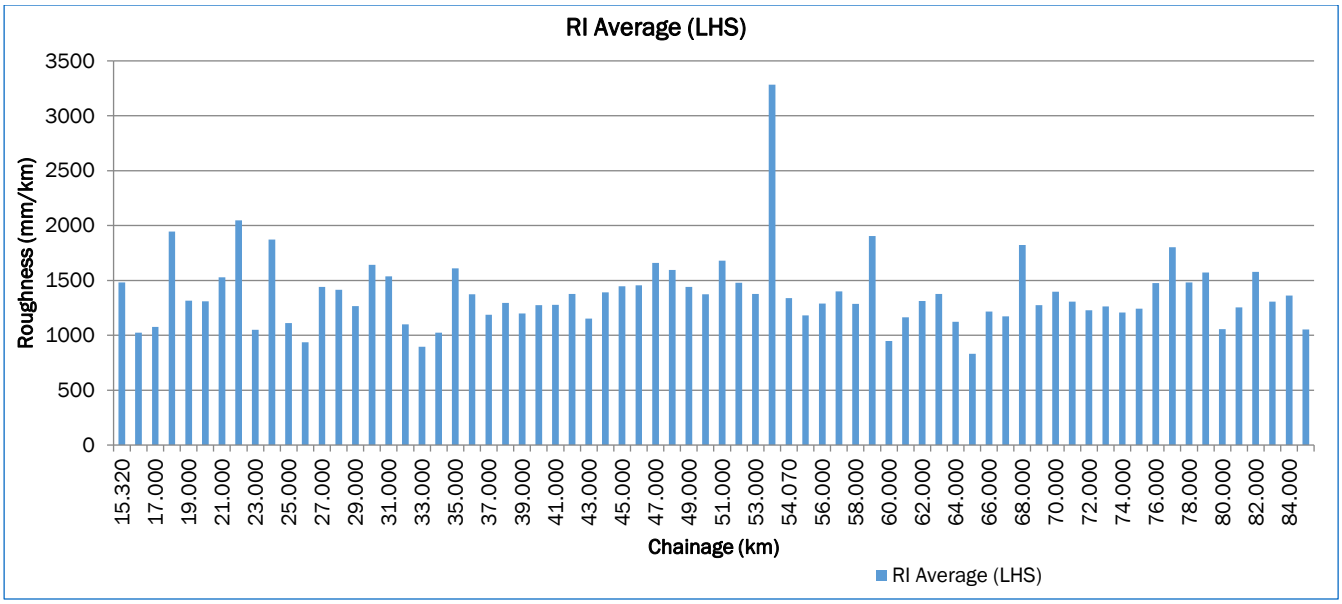
The Pavement condition rating is presented in Pie-chart from Excellent to Fail are as below:



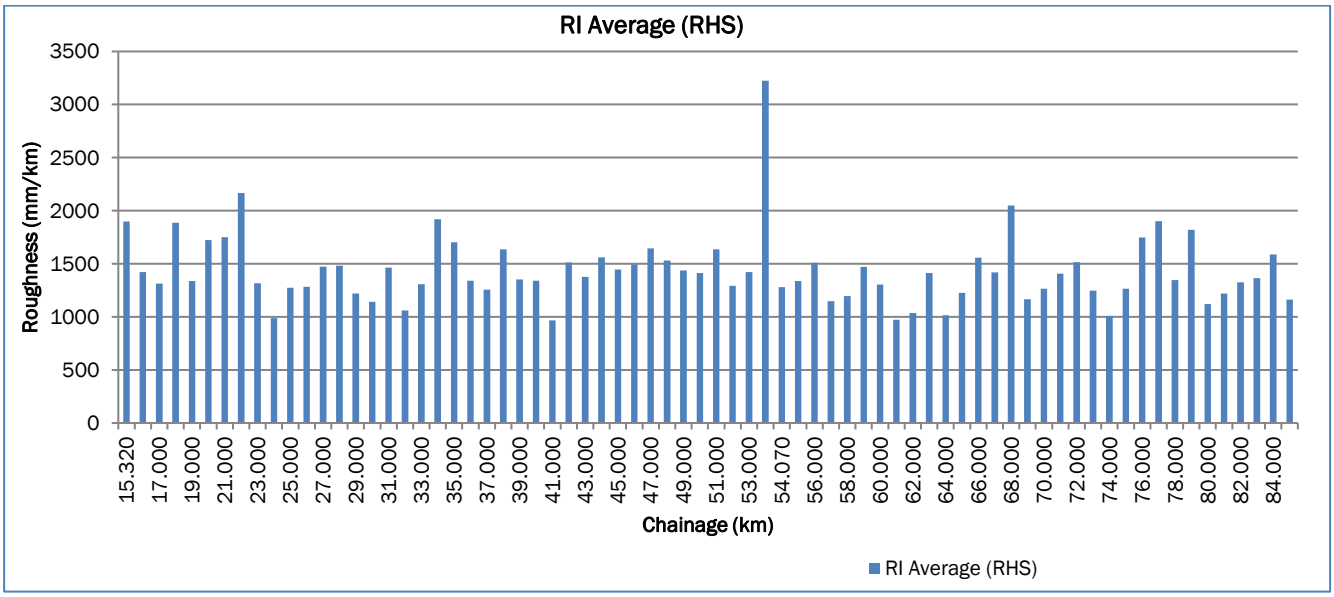
The Pavement condition is rated as Excellent to satisfactor from the above chart.

4.3 ROUGHNESS

The km-wise roughness values are presented in bar chart are as follows



Note: The high-value noted is at Toll Plaza location in Rigid pavement area



Note: The high-value noted is at Toll Plaza location in Rigid Pavement Area

Based on the above, considering the Km-stone reference system the summary of direction-wise km lengths having varying roughness values are as presented below.

>=Roughness (mm/km)	<Roughness (mm/km)	LHS (Km)	RHS (Km)	Remarks
	2000	68.114	67.114	
2000	2200	1.000	2.000	
2200	2400	0.000	0.000	
2400		0.770	0.770	Toll Plaza

It can be noted from the above that, the no roughness values are greater than Schedule-F, specified limit of 2400mm/km and hence no requirement of functional overlay. Sections between 2200-2400 range may also require a roughness correction course within short period of time. Thus, it is imperative to consider roughness correction layer for such sections also. However, no cost has been considered as the HAM Concessionaire shall maintain the project Road until FY2037.

4.4 FWD ANALYSIS

4.4.1 FWD ANALYSIS AND ASSESSMENT OF OVERLAY REQUIREMENT

By looking at the age and condition and performance of the pavement following different set of ranges have been used while finalizing the modulus values:

Layer	Bituminous Layers	Granular Layer Modulus	Subgrade
Modulus Value (MPa)	750-3000	100-500	50-100

Bituminous layer Moduli obtained from back calculations shall be corrected for a standard pavement temperature of 35ºC using given equations. Whereas, for back calculated moduli values obtained for granular and subgrade layer shall be corrected for seasonal variations (using winter and summer equations). For this FWD results, no seasonal correction factor is applied for granular and subgrade layer. The design moduli (15th percentile moduli) of in-service layers for each homogenous section are given in table below.

Table 28: Summary of Design Moduli of different layers – LHS CW

S.No	Side	From (km)	To (km)	Length (Km)	15th Percentile MR values		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)
1	LHS	15.32	18.23	2.91	2493	357	100
2	LHS	18.23	20.36	2.13	2517	487	100
3	LHS	20.36	23.65	3.29	2506	238	100
4	LHS	23.65	26.62	2.98	2830	218	100
5	LHS	26.62	29.20	2.58	2487	191	100
6	LHS	29.20	32.00	2.80	2873	303	100
7	LHS	32.00	34.68	2.68	2915	336	100
8	LHS	34.68	37.20	2.52	1935	251	100
9	LHS	37.20	39.62	2.43	2534	403	100
10	LHS	39.62	42.66	3.04	2955	462	100
11	LHS	42.66	44.59	1.93	2679	197	100
12	LHS	44.59	46.62	2.03	2567	285	100
13	LHS	46.62	48.80	2.18	2679	470	100
14	LHS	48.80	50.50	1.70	2462	377	100
15	LHS	50.50	53.30	2.81	2401	260	100
16	LHS	53.30	54.07	0.77	Toll Plaza		
17	LHS	54.07	57.02	2.95	2501	303	100
18	LHS	57.02	59.89	2.87	2677	256	100
19	LHS	59.89	62.20	2.31	2771	479	100
20	LHS	62.20	64.20	2.00	2403	237	100
21	LHS	64.20	67.55	3.35	2906	299	100
22	LHS	67.55	69.61	2.06	2143	235	100
23	LHS	69.61	72.22	2.60	2311	293	100
24	LHS	72.22	74.79	2.58	2050	132	100
25	LHS	74.79	77.62	2.83	2150	145	100

S.No	Side	From (km)	To (km)	Length (Km)	15th Percentile MR values		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)
26	LHS	77.62	80.59	2.97	2112	244	100
27	LHS	80.59	83.18	2.60	1461	197	100
28	LHS	83.18	85.20	2.02	2089	285	100
Total length, km				69.884			

Table 29: Summary of Design Moduli of different layers – RHS CW

S.No	Side	From (km)	To (km)	Length (Km)	15th Percentile MR values		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)
1	RHS	15.32	17.41	2.09	2661	343	100
2	RHS	17.41	19.47	2.06	2662	269	100
3	RHS	19.47	22.36	2.89	2446	132	100
4	RHS	22.36	25.01	2.65	2649	251	100
5	RHS	25.01	27.98	2.97	2655	275	100
6	RHS	27.98	31.79	3.81	2390	204	100
7	RHS	31.79	34.68	2.89	2233	291	100
8	RHS	34.68	37.10	2.42	2430	306	100
9	RHS	37.10	39.19	2.09	2366	228	100
10	RHS	39.19	42.66	3.47	2368	408	100
11	RHS	42.66	45.01	2.35	3090	265	100
12	RHS	45.01	47.80	2.80	3088	391	100
13	RHS	47.80	51.00	3.19	3088	333	100
14	RHS	51.00	53.30	2.30	2911	227	100
15	RHS	53.30	54.07	0.77	Toll Plaza		
16	RHS	54.07	56.00	1.93	2807	160	100
17	RHS	56.00	58.01	2.01	2052	182	100
18	RHS	58.01	59.89	1.88	3078	342	100
19	RHS	59.89	62.00	2.11	2781	218	100
20	RHS	62.00	64.20	2.20	2890	342	100
21	RHS	64.20	66.61	2.41	2346	275	100
22	RHS	66.61	69.21	2.60	2120	176	100
23	RHS	69.21	72.20	2.99	2046	152	100
24	RHS	72.20	75.80	3.60	2847	184	100
25	RHS	75.80	78.80	2.99	2601	109	100
26	RHS	78.80	81.79	3.00	2624	268	100
27	RHS	81.79	85.20	3.41	2752	392	100
Total Length, km				69.884			

Observations on FWD Results

It can be noticed from the above table that the layer moduli for the three layers are varying along the length and direction. The MR value for BT layer is 2955 MPa to 1461 MPa in LHS Carriageway & 3090 MPa to 2046 MPa in RHS Carriageway. The MR value for Granular Layers is 487 MPa to 132 MPa in LHS Carriageway & 408 MPa to 109 MPa in RHS Carriageway. Similarly, the MR value for Subgrade Layer is 100 MPa in LHS Carriageway and 100 MPa in RHS Carriageway.

4.5 PAVEMENT RATING CHART

Pavement is rated for Roughness/PCI as good, fair and poor based on the following criteria along with strip-chart is presented as below:

Condition		Roughness	Pavement Condition
	Poor	>2400 mm/Km	PCI ≤ 40
	Fair	2000 - 2400 mm/Km	PCI of 40 to 80
	Good	≤ 2000 mm/Km	PCI > 80

LHS	Pavement Condition																									
	Roughness																									
	To	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
RHS	From	15.32	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	Roughness																									
	Pavement Condition																									

LHS	Pavement Condition																									
	Roughness																									
	To	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
RHS	From	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
	Roughness																									
	Pavement Condition																									

LHS	Pavement Condition																									
	Roughness																									
	To	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	85.2				
RHS	From	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85				
	Roughness																									
	Pavement Condition																									

	Good		Fair		Poor

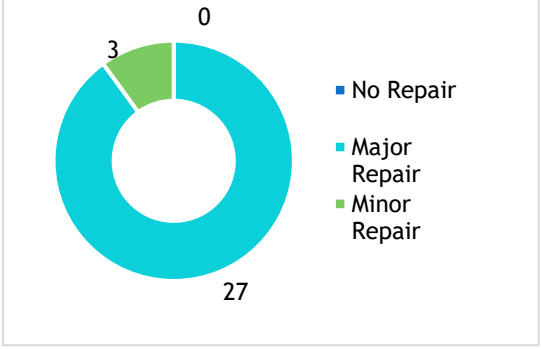
Note: As the present concessionaire is maintain the corridor until FY 2037, No FWD overlay is considered.

4.6 STRUCTURES

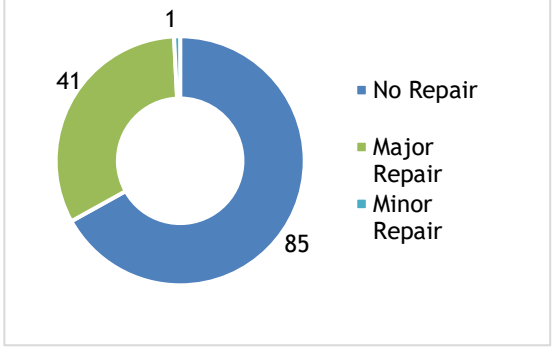
Inventory and asset condition of all the existing structures falling within project road have been verified as per IRC: SP-35 procedures and guidelines with following field surveys

- Inventory of existing highway bridges / structures
- Visual condition survey of existing highway bridges / structures

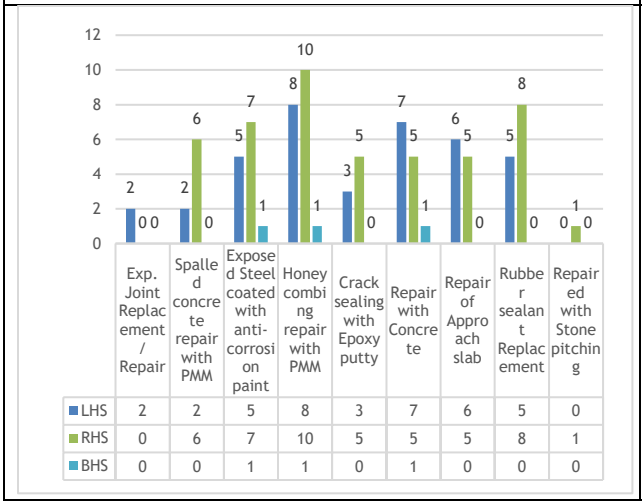
Each and every structure has been verified at site and detailed inventory and condition survey is presented in **Appendix-8** of this report.

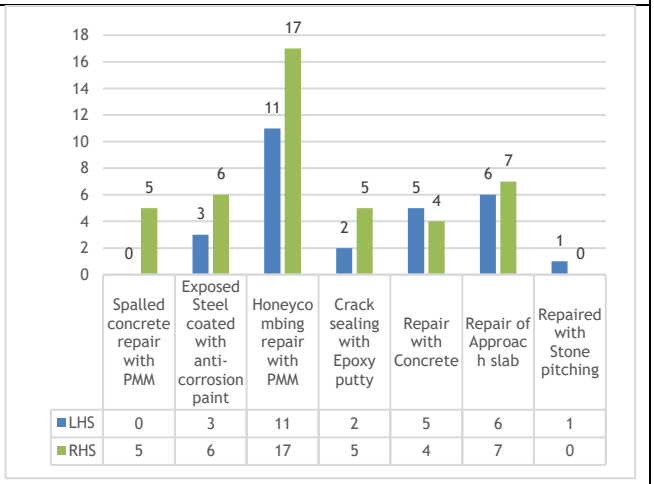


Maintenance of major structures (Length >60m)



Maintenance of minor structures (Length <60m)





Overall condition of few of the major structures are presented on sample basis of below. However, each and every structure details are presented in **Appendix-8** of this report.

Chainage: 18+668
General Description
LHS MCW (New)

- Type of Structure : ROB
- Span Arrangement : 25.10 + 3 x 47.10 + 25.10 m
- Total length of Structure : 191.5 m
- Total deck width of Structure : 16 m
- Type of Foundation : Not Visible
- Type of Substructure (Abutment & Pier) : RCC Wall
- Type of Superstructure : RCC Girder & Steel Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash Barrier & Hand Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- ✓ Concrete portion damage on girder G3 in Span S5.
- ✓ Approach slab settlement observed at A1 & A2 side.
- ✓ RE Panels bulging observed behind abutment A1 & A2 side.
- ✓ Soiling nailing done for RE Panels at A2 side.






Chainage: 18+668
General Description
RHS MCW (New)

- Type of Structure : ROB
- Span Arrangement : 25.10 + 3 x 47.10 + 25.10 m
- Total length of Structure : 191.5 m
- Total deck width of Structure : 16 m
- Type of Foundation : Not Visible
- Type of Substructure (Abutment & Pier) : RCC Wall
- Type of Superstructure : RCC Girder & Steel Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash Barrier & Hand Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- ✓ Approach slab settlement observed at A2 side.
- ✓ Spalling observed on approach slab at A2 side.
- ✓ RE Panels bulging observed behind abutment A2 side.
- ✓ Soiling nailing done for RE Panels at A2 side.






Chainage: 22+520
General Description
LHS MCW (New)

- Type of Structure : MJB
- Span Arrangement : 7 x 30 m
- Total length of Structure : 210 m
- Total deck width of Structure : 16 m
- Type of Foundation : Not Visible
- Type of Substructure (Abutment & Pier) : RCC Wall
- Type of Superstructure : PSC Girder
- Type of Bearing : Elastomeric
- Type of Railing / Crash Barrier : Crash Barrier & Hand Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

✓ Expansion joint Rubber sealant damage on pier P1.






Chainage: 22+520
General Description
RHS MCW (New)

- Type of Structure : MJB
- Span Arrangement : 7 x 30 m
- Total length of Structure : 210 m
- Total deck width of Structure : 16 m
- Type of Foundation : Not Visible
- Type of Substructure (Abutment & Pier) : RCC Wall
- Type of Superstructure : PSC Girder
- Type of Bearing : Elastomeric
- Type of Railing / Crash Barrier : Crash Barrier & Hand Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

✓ Expansion joint Rubber sealant damage on abutment A1.






Table 30 Details of Major Structures

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Str	Span Arrangement (m)	Deck Width (m)	Skew (Y/N)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
										Abutment	Pier		
1	18+668	ROB	LHS	MCW	New	25.10 + 3 x 47.10 + 25.10	16	Yes	Not Visible	RCC Wall	RCC Wall	RCC Girder & Steel Girder	Pot PTFE
2	18+668	ROB	RHS	MCW	New	25.10 + 3 x 47.10 + 25.10	16	Yes	Not Visible	RCC Wall	RCC Wall	RCC Girder & Steel Girder	Pot PTFE
3	22+520	MJB	LHS	MCW	New	7 x 30	16	No	Not Visible	RCC Wall	RCC Wall	PSC Girder	Elastomeric
4	22+520	MJB	RHS	MCW	New	7 x 30	16	No	Not Visible	RCC Wall	RCC Wall	PSC Girder	Elastomeric
5	31+658	MJB	LHS	MCW	New	6 x 21.6	16	No	Not Visible	RCC Wall	RCC Circular	RCC Girder	Elastomeric
6	31+658	MJB	RHS	MCW	Old	6 x 21.6	12	No	Not Visible	RCC Wall	RCC Circular	RCC Girder	Elastomeric
7	48+194	MJB	LHS	MCW	New	10 x 15.5	16	Yes	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
8	48+194	MJB	RHS	MCW	Old	10 x 15.5	12	Yes	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
9	51+920	MJB	LHS	MCW	New	6 x 33.33	16	No	Not Visible	RCC Wall	RCC Wall	PSC Girder	Elastomeric
10	51+920	MJB	RHS	MCW	New	6 x 33.33	16	No	Not Visible	RCC Wall	RCC Wall	PSC Girder	Elastomeric
11	59+770	MJB	LHS	MCW	New	8 x 15.5	16	Yes	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
12	59+770	MJB	RHS	MCW	Old	8 x 15.5	10.5	Yes	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
13	68+742	MJB	LHS	MCW	New	1 x 15 + 5 x 33 + 1 x 31.5 + 1 x 15	16	Yes	Not Visible	Trestle Type	RCC Wall & Portal Type Pier	PSC Girder & RCC Girder	Pot PTFE
14	68+742	MJB	RHS	MCW	New	1 x 15 + 4 x 33 + 1 x 30 + 1 x 26 + 1 x 15	16	Yes	Not Visible	Trestle Type	RCC Wall & Portal Type Pier	PSC Girder & RCC Girder	Pot PTFE
15	76+772	MJB	LHS	MCW	New	4 x 20	16	Yes	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
16	76+772	MJB	RHS	MCW	New	4 x 20	16	Yes	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
17	77+505	MJB	LHS	MCW	New	4 x 20	16	Yes	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
18	77+505	MJB	RHS	MCW	New	4 x 20	16	Yes	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
19	79+071	MJB	LHS	MCW	New	3 x 30	14.5	Yes	Not Visible	RCC Wall	RCC Wall	PSC Girder	Elastomeric
20	79+071	MJB	RHS	MCW	New	3 x 30	14.5	Yes	Not Visible	RCC Wall	RCC Wall	PSC Girder	Elastomeric
21	79+071	MJB	LHS	SR	New	3 x 30	10.8	Yes	Not Visible	RCC Wall	RCC Wall	PSC Girder	Elastomeric
22	79+071	MJB	RHS	SR	New	3 x 30	10.8	Yes	Not Visible	RCC Wall	RCC Wall	PSC Girder	Elastomeric
23	18+434	MNB	LHS	MCW	New	3 x 4.5	16	No	Raft	RCC Wall	RCC Wall	RCC Box	-
24	18+434	MNB	RHS	MCW	New	3 x 4.5	16	No	Raft	RCC Wall	RCC Wall	RCC Box	-
25	18+434	MNB	LHS	SR	New	3 x 4.5	16	No	Raft	RCC Wall	RCC Wall	RCC Box	-
26	18+434	MNB	RHS	SR	New	3 x 4.5	13.5	No	Raft	RCC Wall	RCC Wall	RCC Box	-
27	20+322	MNB	LHS	MCW	New	1 x 16	14.5	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
28	20+322	MNB	RHS	MCW	New	1 x 16	14.5	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
29	20+322	MNB	LHS	SR	New	1 x 16	10.8	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Str	Span Arrangement (m)	Deck Width (m)	Skew (Y/N)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
										Abutment	Pier		
30	20+322	MNB	RHS	SR	New	1 x 16	10.8	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
31	24+415	MNB	LHS	MCW	New	1 x 14.25	16	Yes	Raft	RCC Wall	-	RCC Box	-
32	24+415	MNB	RHS	MCW	New	1 x 14.25	16	Yes	Raft	RCC Wall	-	RCC Box	-
33	24+415	MNB	LHS	SR	New	1 x 14.25	10.8	Yes	Raft	RCC Wall	-	RCC Box	-
34	24+415	MNB	RHS	SR	New	1 x 14.25	10.8	Yes	Raft	RCC Wall	-	RCC Box	-
35	24+581	MNB	LHS	MCW	New	1 x 27.3	16	Yes	Not Visible	RCC Wall	-	PSC Girder	Pot PTFE
36	24+581	MNB	RHS	MCW	New	1 x 27.3	16	Yes	Not Visible	RCC Wall	-	PSC Girder	Pot PTFE
37	24+581	MNB	LHS	SR	New	1 x 27.3	10.8	Yes	Not Visible	RCC Wall	-	PSC Girder	Pot PTFE
38	24+581	MNB	RHS	SR	New	1 x 27.3	10.8	Yes	Not Visible	RCC Wall	-	PSC Girder	Pot PTFE
39	26+850	MNB	LHS	MCW	New	1 x 8	16	No	Raft	RCC Wall	-	RCC Box	-
40	26+850	MNB	RHS	MCW	New	1 x 8	16	No	Raft	RCC Wall	-	RCC Box	-
41	28+542	MNB	LHS	MCW	New	2 x 9.3	16	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
42	28+542	MNB	RHS	MCW	New	2 x 9.3	16	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
43	28+782	MNB	LHS	MCW	New	5 x 10.6	16	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
44	28+782	MNB	RHS	MCW	New	5 x 10.6	16	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
45	29+580	MNB	LHS	MCW	New	4 x 7	16	No	Raft	RCC Wall	RCC Wall	RCC Box	-
46	29+580	MNB	RHS	MCW	New	4 x 7	16	No	Raft	RCC Wall	RCC Wall	RCC Box	-
47	30+775	MNB	LHS	MCW	New	2 x 12.5	16	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
48	30+775	MNB	RHS	MCW	Old	2 x 12.5	16	Yes	Open	RCC Wall	RCC Wall	RCC Solid Slab	-
49	36+665	MNB	LHS	MCW	New	1 x 10	14.5	Yes	Raft	RCC Wall	-	RCC Box	-
50	36+665	MNB	RHS	MCW	New	1 x 10	14.5	Yes	Raft	RCC Wall	-	RCC Box	-
51	36+665	MNB	LHS	SR	New	1 x 10	10.8	Yes	Raft	RCC Wall	-	RCC Box	-
52	36+665	MNB	RHS	SR	New	1 x 10	10.8	Yes	Raft	RCC Wall	-	RCC Box	-
53	38+612	MNB	LHS	MCW	New	1 x 7	14.5	No	Raft	RCC Wall	-	RCC Box	-
54	38+612	MNB	RHS	MCW	New	1 x 7	14.5	No	Raft	RCC Wall	-	RCC Box	-
55	38+612	MNB	LHS	SR	New	1 x 7	10.8	No	Raft	RCC Wall	-	RCC Box	-
56	38+612	MNB	RHS	SR	New	1 x 7	10.8	No	Raft	RCC Wall	-	RCC Box	-
57	44+692	MNB	LHS	MCW	New	2 x 9.05	14.5	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
58	44+692	MNB	RHS	MCW	New	2 x 9.05	14.5	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
59	44+692	MNB	LHS	SR	New	2 x 9.05	10.8	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
60	44+692	MNB	RHS	SR	New	2 x 9.05	10.8	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
61	46+237	MNB	LHS	MCW	Old	3 x 3	14.5	No	Raft	RCC Wall	RCC Wall	RCC Box	-
62	46+237	MNB	RHS	MCW	New	3 x 3	14.5	No	Raft	RCC Wall	RCC Wall	RCC Box	-
63	46+237	MNB	LHS	SR	New	3 x 3	10.5	No	Raft	RCC Wall	RCC Wall	RCC Box	-
64	46+237	MNB	RHS	SR	New	3 x 3	10.5	No	Raft	RCC Wall	RCC Wall	RCC Box	-
65	52+854	MNB	LHS	MCW	New	3 x 10	16	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
66	52+854	MNB	RHS	MCW	Old	3 x 10	12	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
67	56+467	MNB	LHS	MCW	New	2 x 9.38	14.5	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Str	Span Arrangement (m)	Deck Width (m)	Skew (Y/N)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
										Abutment	Pier		
68	56+467	MNB	RHS	MCW	New	2 x 9.38	14.5	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
69	56+467	MNB	LHS	SR	New	2 x 9.38	10.8	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
70	56+467	MNB	RHS	SR	New	2 x 9.38	10.8	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
71	56+860	MNB	LHS	MCW	New	5 x 9.5	16	No	Raft	RCC Wall	RCC Wall	RCC Box	-
72	56+860	MNB	RHS	MCW	New	5 x 9.5	16	No	Raft	RCC Wall	RCC Wall	RCC Box	-
73	56+860	MNB	LHS	SR	New	5 x 9.5	10.8	No	Raft	RCC Wall	RCC Wall	RCC Box	-
74	56+860	MNB	RHS	SR	New	5 x 9.5	10.8	No	Raft	RCC Wall	RCC Wall	RCC Box	-
75	59+475	MNB	LHS	MCW	New	3 x 3	19.25	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
76	59+475	MNB	RHS	MCW	New	3 x 3	19.25	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
77	59+552	MNB	LHS	MCW	New	3 x 10	16	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
78	59+552	MNB	RHS	MCW	New	3 x 10	16	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
79	66+242	MNB	LHS	MCW	New	1 x 20	16	Yes	Raft	RCC Wall	-	RCC Box	-
80	66+242	MNB	RHS	MCW	New	1 x 20	16	Yes	Raft	RCC Wall	-	RCC Box	-
81	66+242	MNB	LHS	SR	New	1 x 20	10.8	Yes	Raft	RCC Wall	-	RCC Box	-
82	66+242	MNB	RHS	SR	New	1 x 20	10.8	Yes	Raft	RCC Wall	-	RCC Box	-
83	70+210	MNB	LHS	MCW	New	2 x 18.6	16	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
84	70+210	MNB	RHS	MCW	New	2 x 18.6	16	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
85	70+210	MNB	LHS	SR	New	2 x 18.6	10.8	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
86	70+210	MNB	RHS	SR	New	2 x 18.6	10.8	Yes	Raft	RCC Wall	RCC Wall	RCC Box	-
87	72+052	MNB	LHS	MCW	New	1 x 7	16	Yes	Raft	RCC Wall	-	RCC Box	-
88	72+052	MNB	RHS	MCW	New	1 x 7	16	Yes	Raft	RCC Wall	-	RCC Box	-
89	72+052	MNB	LHS	SR	New	1 x 7	10.8	Yes	Raft	RCC Wall	-	RCC Box	-
90	72+052	MNB	RHS	SR	New	1 x 7	10.8	Yes	Raft	RCC Wall	-	RCC Box	-
91	75+676	MNB	LHS	MCW	New	1 x 10	16	No	Raft	RCC Wall	-	RCC Box	-
92	75+676	MNB	RHS	MCW	New	1 x 10	16	No	Raft	RCC Wall	-	RCC Box	-
93	75+676	MNB	LHS	SR	New	1 x 10	10.8	No	Raft	RCC Wall	-	RCC Box	-
94	75+676	MNB	RHS	SR	New	1 x 10	10.8	No	Raft	RCC Wall	-	RCC Box	-
95	83+307	MNB	LHS	MCW	New	4 x 3.125	16	No	Raft	RCC Wall	RCC Wall	RCC Box	-
96	83+307	MNB	RHS	MCW	New	4 x 3.125	16	No	Raft	RCC Wall	RCC Wall	RCC Box	-
97	83+307	MNB	LHS	SR	New	4 x 3.125	10.8	No	Raft	RCC Wall	RCC Wall	RCC Box	-
98	83+307	MNB	RHS	SR	New	4 x 3.125	10.8	No	Raft	RCC Wall	RCC Wall	RCC Box	-
99	15+800	Flyover	RHS	MCW	New	3 x 33	14.5	No	Not Visible	Trestle Type	Trestle Type	PSC Girder	Elastomeric
100	20+450	Flyover	RHS	MCW	New	2 x 22	14.5	No	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
101	23+175	Flyover	LHS	MCW	New	2 x 33	14.5	No	Not Visible	Trestle Type	Trestle Type	PSC Girder	Elastomeric
102	23+175	Flyover	RHS	MCW	New	2 x 33	14.5	No	Not Visible	Trestle Type	Trestle Type	PSC Girder	Elastomeric

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Str	Span Arrangement (m)	Deck Width (m)	Skew (Y/N)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
										Abutment	Pier		
103	25+410	Flyover	RHS	MCW	New	2 x 22	14.5	No	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
104	34+915	Flyover	RHS	MCW	New	2 x 22	14.5	No	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
105	38+965	Flyover	RHS	MCW	New	2 x 22	14.5	No	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
106	42+875	Flyover	RHS	MCW	New	2 x 22	14.5	No	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
107	45+645	Flyover	LHS	MCW	New	2 x 22	14.5	No	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
108	45+645	Flyover	RHS	MCW	New	2 x 22	14.5	No	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
109	48+830	Flyover	LHS	MCW	New	2 x 22	14.5	No	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
110	51+477	Flyover	LHS	MCW	New	2 x 22	14.5	No	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
111	56+275	Flyover	LHS	MCW	New	2 x 24	14.5	Yes	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
112	56+275	Flyover	RHS	MCW	New	2 x 24	14.5	Yes	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
113	58+940	Flyover	RHS	MCW	New	2 x 22	14.5	No	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
114	60+160	Flyover	RHS	MCW	New	2 x 22	14.5	No	Not Visible	RCC Wall	RCC Wall	RCC Girder	Elastomeric
115	66+702	Flyover	LHS	MCW	New	3 x 32.5	14.5	No	Not Visible	Trestle Type	Trestle Type	PSC Girder	Elastomeric
116	66+702	Flyover	RHS	MCW	New	3 x 32.5	14.5	No	Not Visible	Trestle Type	Trestle Type	PSC Girder	Elastomeric
117	79+277	Flyover	LHS	MCW	New	1 x 23 + 1 x 39.5	14.5	Yes	Not Visible	Trestle Type	Trestle Type	PSC Girder & RCC Girder	Elastomeric
118	79+277	Flyover	RHS	MCW	New	1 x 23 + 1 x 39.5	14.5	Yes	Not Visible	Trestle Type	Trestle Type	PSC Girder & RCC Girder	Elastomeric
119	84+789	Flyover	LHS	MCW	New	2 x 27.7	14.5	Yes	Not Visible	Trestle Type	Trestle Type	PSC Girder	Pot PTFE
120	84+789	Flyover	RHS	MCW	New	2 x 27.7	14.5	Yes	Not Visible	Trestle Type	Trestle Type	PSC Girder	Pot PTFE
121	63+466	VUP	LHS	MCW	New	1 x 28	14.5	No	Not Visible	Trestle Type	-	PSC Girder	Elastomeric
122	63+466	VUP	RHS	MCW	New	1 x 28	14.5	No	Not Visible	Trestle Type	-	PSC Girder	Elastomeric
123	83+403	VUP	LHS	MCW	New	1 x 28	14.5	No	Not Visible	Trestle Type	-	PSC Girder	Elastomeric
124	83+403	VUP	RHS	MCW	New	1 x 28	14.5	No	Not Visible	Trestle Type	-	PSC Girder	Elastomeric
125	27+790	LVUP	LHS	MCW	New	1 x 13.8	14.5	Yes	Raft	RCC Wall	0	RCC Box	-
126	27+790	LVUP	RHS	MCW	New	1 x 13.8	14.5	Yes	Raft	RCC Wall	0	RCC Box	-
127	36+420	LVUP	LHS	MCW	New	1 x 15.4	14.5	Yes	Raft	RCC Wall	0	RCC Box	-
128	36+420	LVUP	RHS	MCW	New	1 x 15.4	14.5	Yes	Raft	RCC Wall	0	RCC Box	-
129	37+425	LVUP	LHS	MCW	New	1 x 12	14.5	No	Raft	RCC Wall	0	RCC Box	-
130	37+425	LVUP	RHS	MCW	New	1 x 12	14.5	No	Raft	RCC Wall	0	RCC Box	-
131	44+143	LVUP	LHS	MCW	New	1 x 19.8	14.5	Yes	Raft	RCC Wall	0	RCC Box	-

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Str	Span Arrangement (m)	Deck Width (m)	Skew (Y/N)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
										Abutment	Pier		
132	44+143	LVUP	RHS	MCW	New	1 x 19.8	14.5	Yes	Raft	RCC Wall	0	RCC Box	-
133	47+044	LVUP	LHS	MCW	New	1 x 12	14.5	No	Raft	RCC Wall	0	RCC Box	-
134	47+044	LVUP	RHS	MCW	New	1 x 12	14.5	No	Raft	RCC Wall	0	RCC Box	-
135	50+050	LVUP	LHS	MCW	New	1 x 12	14.5	No	Raft	RCC Wall	0	RCC Box	-
136	50+050	LVUP	RHS	MCW	New	1 x 12	14.5	No	Raft	RCC Wall	0	RCC Box	-
137	57+790	LVUP	LHS	MCW	New	1 x 12	14.5	No	Raft	RCC Wall	0	RCC Box	-
138	57+790	LVUP	RHS	MCW	New	1 x 12	14.5	No	Raft	RCC Wall	-	RCC Box	-
139	61+933	LVUP	LHS	MCW	New	1 x 12.3	14.5	Yes	Raft	RCC Wall	-	RCC Box	-
140	61+933	LVUP	RHS	MCW	New	1 x 12.3	14.5	Yes	Raft	RCC Wall	-	RCC Box	-
141	68+029	LVUP	LHS	MCW	New	1 x 15.2	14.5	Yes	Raft	RCC Wall	-	RCC Box	-
142	68+029	LVUP	RHS	MCW	New	1 x 15.2	14.5	Yes	Raft	RCC Wall	-	RCC Box	-
143	71+147	LVUP	LHS	MCW	New	1 x 12	14.5	No	Raft	RCC Wall	-	RCC Box	-
144	71+147	LVUP	RHS	MCW	New	1 x 12	14.5	No	Raft	RCC Wall	-	RCC Box	-
145	74+000	LVUP	LHS	MCW	New	1 x 12	14.5	Yes	Raft	RCC Wall	-	RCC Box	-
146	74+000	LVUP	RHS	MCW	New	1 x 12	14.5	Yes	Raft	RCC Wall	-	RCC Box	-
147	19+636	CUP	LHS	MCW	New	1 x 7 x 2.5	14.5	No	Raft	RCC Wall	-	RCC Box	-
148	19+636	CUP	RHS	MCW	New	1 x 7 x 2.5	14.5	No	Raft	RCC Wall	-	RCC Box	-
149	22+400	CUP	LHS	MCW	New	1 x 7 x 2.5	14.5	No	Raft	RCC Wall	-	RCC Box	-
150	22+400	CUP	RHS	MCW	New	1 x 7 x 2.5	14.5	No	Raft	RCC Wall	-	RCC Box	-
151	35+488	CUP	LHS	MCW	New	1 x 7.25 x 2.5	14.5	No	Raft	RCC Wall	-	RCC Box	-
152	35+488	CUP	RHS	MCW	New	1 x 7.25 x 2.5	14.5	No	Raft	RCC Wall	-	RCC Box	-
153	48+600	CUP	LHS	MCW	New	1 x 7 x 2.5	14.5	No	Raft	RCC Wall	-	RCC Box	-
154	48+600	CUP	RHS	MCW	New	1 x 7 x 2.5	14.5	No	Raft	RCC Wall	-	RCC Box	-
155	82+200	CUP	LHS	MCW	New	1 x 7 x 2.5	14.5	Yes	Raft	RCC Wall	-	RCC Box	-

Photos of Structures Inspected With MBIU



Unidirectional Flyover at Ch.15+800



Flyover at Ch.23+175



Vehicular Overpass at Ch.78+343



Flyover at Ch.79+277

Photos depicting existing Box Culverts/Slab & Pipe Culverts are presented below:



Box Culvert at Km 15+720



Box Culvert at Km 22+960



Slab Culvert at Km 23+200



Slab Culvert at Km 34+867



Pipe Culvert at Km 17+286



Pipe Culvert at Km 17+840

4.7 DRAINAGE AND SLOPE PROTECTION

- ✓ Lined Covered drains observed at urban locations and at service road Locations along the corridor.
- ✓ No major damages observed at covered drain locations.

4.8 TRAFFIC SAFETY AND ROAD FURNITURE

- ✓ Metal beam crash barriers provided along the project road appear to be intact over entire length except for few locations where it got damaged.
- ✓ Pedestrian guard rails installed on the median, Separator & appear to be intact over entire length except for few locations where it got damaged.
- ✓ Median Opening locations appear to be in good condition. The width of the existing standing lane median openings was observed for a width of 1.0m.
- ✓ Solar blinkers in Fair condition observed at median openings in the entire project corridor.
- ✓ Street lightings and High masts are observed at urban locations, Toll Plaza & Junction Locations. At few locations street lightings are got damaged/ not functioning well and those items are addressed in the initial cost.

4.9 ROAD USER FACILITIES

- ✓ The Bus Bay with Shelters and Truck lay byes were provided along the corridor.

CHAPTER 5. REHABILITATION PLANS AND DESIGNS

5.1 DESIGN TRAFFIC LOADING

Design Traffic loading has been estimated by considering the latest traffic numbers (FY2025) as supplied by client, VDFs as estimated from the latest axle load survey data and with 5% growth rates for 10 years, 15 years and 20 years design period as below:

Table 31: Traffic Volume (AADT)

Vehicle/Mode	Toll Plaza-1 Km 53+700	
	LHS (No.)	RHS (No.)
BUS	285	285
2A truck	666	666
3A truck	552	552
MAV truck	1156	1156
LCV	296	296

Note: The given AADT of 2-axle data is combination of buses and 2-axle trucks, thus, it is considered as 30% for buses and the rest for 2axle trucks.

Considering traffic scenario in project corridor, two sections have been considered i.e., Section-1: Gundagolanu to Devarapalli (Km15-km64) and Section-2: Devarapalli to Kovvuru (Km64-km85). Based on the input from the Traffic Consultants, for Section-2, MSAs have been increased to 1.6 times as additional traffic from Devarapalli is coming onto Section-2.

Table 32: Estimated Design traffic loading

Homogeneous Section – 1: (Km15-km64)		
Design Period	Gundugolanu to Kovvuru	Kovvuru to Gundugolanu
10 Years	82	54
15 Years	140	92
20 Years	215	141

Homogeneous Section – 2 (Km64-km85).		
Design Period	Gundugolanu to Kovvuru	Kovvuru to Gundugolanu
10 Years	131	86
15 Years	224	147
20 Years	344	225

The computation of traffic loadings is presented in **Appendix 9** of this Report. Design traffic corresponding to 10 years period has been considered for overlay design.

5.2 PAVEMENT REHABILITATION AND STRENGTHENING

5.2.1 Flexible Pavement Strengthening

For Design the Overlay Thickness the following method as suggested in IRC: 115 has been used

- The existing pavement is considered as a 3-layer system consisting of subgrade, granular and bituminous layer. The remaining life of exiting pavement in terms of Fatigue and Rutting life (MSA) are estimated
- The remaining life is compared with design traffic loading. An overlay with assumed thickness is considered on exiting pavement where required.
- The Total system including the proposed Overlay (Trial thickness) is assumed as a four-layer system and considered the relevant MR values for all the four layers namely New BT layer, existing bituminous surface, total existing Granular layers and Subgrade layers.
- The MR value for the New BT is assumed as 3000 MPA (considering VG40 Bituminous grade) for Main Carriageway and for all the remaining three layers, the MR Values derived and finalized from the FWD Analysis are considered
- Critical Tensile strains and Vertical strains are found out by using the IIT PAVE Software at the bottom of existing bituminous layer and at the top of the subgrade layer respectively.
- The Fatigue and Rutting equations (equation given in the IRC: 115 have been used to estimate the Fatigue and Rutting Life of The Pavement system.
- The Obtained Fatigue and Rutting Life are compared with the required life for the assumed trial overlay thickness.

Remaining life of the existing pavement from the above analysis is presented in the following tables:

Table 33: Remaining life of the existing pavement on LHS Carriageway

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC - 115 Equations for 90% Reliability			Remarks
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tangential strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA	
1	LHS	15.32	18.23	2.91	2493	357	100	150	450	600	2493	0.0002184	0.0001505	66	557	82	Overlay
2	LHS	18.23	20.36	2.13	2517	487	100	150	450	600	2517	0.0001956	0.0001244	138	918	82	No Overlay
3	LHS	20.36	23.65	3.29	2506	238	100	150	450	600	2506	0.0002437	0.0001850	30	339	82	Overlay
4	LHS	23.65	26.62	2.98	2830	218	100	150	437	587	2830	0.0002492	0.0001819	28	306	82	Overlay
5	LHS	26.62	29.20	2.58	2487	191	100	150	400	550	2487	0.0002851	0.0002073	19	166	82	Overlay
6	LHS	29.20	32.00	2.80	2873	303	100	150	400	550	2873	0.0002517	0.0001553	52	293	82	Overlay
7	LHS	32.00	34.68	2.68	2915	336	100	150	400	550	2915	0.0002441	0.0001465	64	336	82	Overlay
8	LHS	34.68	37.20	2.52	1935	251	100	158	456	614	1935	0.0002403	0.0001936	31	361	82	Overlay
9	LHS	37.20	39.62	2.43	2534	403	100	160	470	630	2534	0.0001911	0.0001308	113	1021	82	No Overlay
10	LHS	39.62	42.66	3.04	2955	462	100	160	470	630	2955	0.0001774	0.0001135	171	1430	82	No Overlay
11	LHS	42.66	44.59	1.93	2679	197	100	160	470	630	2679	0.0002272	0.0001835	29	466	82	Overlay
12	LHS	44.59	46.62	2.03	2567	285	100	160	432	592	2567	0.0002309	0.0001584	53	433	82	Overlay
13	LHS	46.62	48.80	2.18	2679	470	100	160	400	560	2679	0.0002134	0.0001186	157	619	82	No Overlay
14	LHS	48.80	50.50	1.70	2462	377	100	160	400	560	2462	0.0002329	0.0001395	90	416	82	No Overlay
15	LHS	50.50	53.30	2.81	2401	260	100	160	400	560	2401	0.0002579	0.0001722	40	262	82	Overlay
16	LHS	53.30	54.07	0.77													Toll plaza
17	LHS	54.07	57.02	2.95	2501	303	100	171	407	578	2501	0.0002303	0.0001473	72	438	82	Overlay
18	LHS	57.02	59.89	2.87	2677	256	100	190	420	610	2677	0.0002087	0.0001389	85	685	82	No Overlay
19	LHS	59.89	62.20	2.31	2771	479	100	190	420	610	2771	0.0001765	0.0000996	301	1463	82	No Overlay
20	LHS	62.20	64.20	2.00	2403	237	100	190	420	610	2403	0.0002174	0.0001520	66	569	82	Overlay
21	LHS	64.20	67.55	3.35	2906	299	100	183	413	596	2906	0.0002080	0.0001293	105	695	131	Overlay
22	LHS	67.55	69.61	2.06	2143	235	100	180	410	590	2143	0.0002398	0.0001710	46	365	131	Overlay
23	LHS	69.61	72.22	2.60	2311	293	100	180	410	590	2311	0.0002251	0.0001481	75	486	131	Overlay
24	LHS	72.22	74.79	2.58	2050	132	100	180	410	590	2050	0.0002583	0.0002222	17	260	131	Overlay
25	LHS	74.79	77.62	2.83	2150	145	100	188	457	645	2150	0.0002220	0.0001983	26	517	131	Overlay

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC - 115 Equations for 90% Reliability			Remarks
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tangential strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA	
26	LHS	77.62	80.59	2.97	2112	244	100	190	470	660	2112	0.0002005	0.0001589	62	821	131	Overlay
27	LHS	80.59	83.18	2.60	1461	197	100	190	470	660	1461	0.0002264	0.0002110	28	473	131	Overlay
28	LHS	83.18	85.20	2.02	2089	285	100	190	470	660	2089	0.0001941	0.0001479	82	951	131	Overlay
Total Length				69.884													

Table 34: Remaining life of the existing pavement on RHS Carriageway

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC - 115 Equations for 90% Reliability			Remarks
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tangential strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA	
1	RHS	15.32	17.41	2.09	2661	343	100	150	450	600	2661	0.0002186	0.0001495	64	555	54	No Overlay
2	RHS	17.41	19.47	2.06	2662	269	100	150	450	600	2662	0.0002340	0.0001693	40	407	54	Overlay
3	RHS	19.47	22.36	2.89	2446	132	100	150	450	600	2446	0.0002673	0.0002425	11	223	54	Overlay
4	RHS	22.36	25.01	2.65	2649	251	100	150	450	600	2649	0.0002381	0.0001754	35	377	54	Overlay
5	RHS	25.01	27.98	2.97	2655	275	100	150	417	567	2655	0.0002515	0.0001686	40	294	54	Overlay
6	RHS	27.98	31.79	3.81	2390	204	100	150	400	550	2390	0.0002847	0.0002053	20	167	54	Overlay
7	RHS	31.79	34.68	2.89	2233	291	100	150	400	550	2233	0.0002674	0.0001781	38	223	54	Overlay
8	RHS	34.68	37.10	2.42	2430	306	100	157	449	606	2430	0.0002232	0.0001585	55	505	54	No Overlay
9	RHS	37.10	39.19	2.09	2366	228	100	160	470	630	2366	0.0002269	0.0001830	32	469	54	Overlay
10	RHS	39.19	42.66	3.47	2368	408	100	160	470	630	2368	0.0001926	0.0001336	110	985	54	No Overlay
11	RHS	42.66	45.01	2.35	3090	265	100	160	470	630	3000	0.0002089	0.0001514	55	682	54	No Overlay
12	RHS	45.01	47.80	2.80	3088	391	100	160	418	578	3000	0.0002119	0.0001253	115	639	54	No Overlay
13	RHS	47.80	51.00	3.19	3088	333	100	160	400	560	3000	0.0002316	0.0001372	81	427	54	No Overlay
14	RHS	51.00	53.30	2.30	2911	227	100	160	400	560	2911	0.0002533	0.0001668	39	284	54	Overlay
15	RHS	53.30	54.07	0.77													Toll Plaza
16	RHS	54.07	56.00	1.93	2807	160	100	160	400	560	2807	0.0002669	0.0001957	22	224	54	Overlay

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC - 115 Equations for 90% Reliability			Remarks
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tangential strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA	
17	RHS	56.00	58.01	2.01	2052	182	100	190	420	610	2052	0.0002350	0.0001849	35	400	54	Overlay
18	RHS	58.01	59.89	1.88	3078	342	100	190	420	610	3000	0.0001907	0.0001150	161	1030	54	No Overlay
19	RHS	59.89	62.00	2.11	2781	218	100	190	420	610	2781	0.0002119	0.0001454	69	639	54	No Overlay
20	RHS	62.00	64.20	2.20	2890	342	100	190	420	610	2890	0.0001925	0.0001171	155	987	54	No Overlay
21	RHS	64.20	66.61	2.41	2346	275	100	185	415	599	2346	0.0002199	0.0001477	75	540	86	Overlay
22	RHS	66.61	69.21	2.60	2120	176	100	180	410	590	2120	0.0002507	0.0001952	28	298	86	Overlay
23	RHS	69.21	72.20	2.99	2046	152	100	186	446	632	2046	0.0002313	0.0002031	24	429	86	Overlay
24	RHS	72.20	75.80	3.60	2847	184	100	188	456	643	2847	0.0002021	0.0001540	54	792	86	Overlay
25	RHS	75.80	78.80	2.99	2601	109	100	190	470	660	2601	0.0002043	0.0001910	25	754	86	Overlay
26	RHS	78.80	81.79	3.00	2624	268	100	190	470	660	2624	0.0001871	0.0001364	93	1123	86	No Overlay
27	RHS	81.79	85.20	3.41	2752	392	100	190	470	660	2752	0.0001679	0.0001105	202	1835	86	No Overlay
Total Length				**69.884**													

From the above, it is to note that if the target MSA (10yr design MSA) is more than obtained remaining life of the existing pavement, then it is required to provide an overlay to ensure the life after over lay should be more than design MSA. Accordingly, based on this criterion, an overlay is warranted for a length of 52.463 km in LHS and 40.191 km in RHS.

The overlay required sections should be analyzed as per IRC: 37 guidelines with assumed overlay thicknesses to obtain the strains (vertical and horizontal) and then fatigue and rutting life in terms of MSAs. In this process, it is to be ensure that the obtained remaining life (MSA) of the existing pavement should be always more than calculated 10yrs design MSA.

Further the proposed overlay thicknesses in LHS and RHS directions, have not been worked out considering the HAM Concessionaire shall maintain the project Road until FY2037.

Input data used and the output from the IIT Pave software has been presented as screen shots for ready reference as **Appendix 10** of this Report.

5.3 STRUCTURAL REHABILITATION

All the structure found to be in fair condition except minor treatment like repair of stone pitching, cleaning of drainage spouts, cleaning of vegetation etc. may be required. Detailed structural rehabilitation quantities have been worked out based on the prevailing condition of existing structures. This methodology describes in detail the procedure for the execution of each item of rehabilitation work of the Existing Bridges of the project.

The scope of this methodology covers the items mentioned below for rehabilitation work of all the existing Bridges.

- Repair/ Replacement of Existing Bearings
- Repair / Replacement of Existing Expansion Joints
- Repair / Replacement of Existing Wearing Coat
- Profile Correction for Existing Deck Slab by Cement Concrete
- Sealing of Cracks for Bridges by Epoxy Resin
- Replacement of Spalled Concrete of ECW by Epoxy Mortar
- Cement Grouting for Repair of Existing Bridges
- Guniting / Shotcrete for Repair of Existing Bridges
- Providing & Fixing of Drainage Spouts
- Repair of Substructure Component
- Repair / Replacement of Railing & Crash Barrier
- Epoxy Bonding between New and Old Concrete.

5.4 EPC COST ITEMS

Even though, project stretch is under HAM until FY2037. The following items are worked out under safety point of view:

- Safety Hazards at 11 Uni-directional flyover Approaches, Requirement of Traffic Impact Attenuators
- Safety at Sharp Entry Exit at few locations, Requirement of improved safety measures
- Safety Hazard at a Culvert Location on exit ramp deceleration lane at Km 60+800, Required to Construct gap in Culvert left before
- Outfall for Open Lined Drains required to be provided to avoid ponding of water on Carriageway
- Submergence of LHS side Carriageway at Km 34+850 at Unidirectional Flyover for a small length in 2023, Requirement of additional culvert for Main Carriageway at this location
- Lighting Requirement at Approaches of Underpasses
- Missing Gantry Signs

Each of the above item is as explained below.

Traffic impact attenuator locations

- There are 10 Uni Directional Flyovers along the project corridor, In LHS 2 Uni Directional Flyovers and in RHS 8 Uni Directional Flyovers.
- Undivided 4 Lane Carriageway exists below for one direction. Median for separation is indicated with Road Marking

At all the Unidirectional flyover locations, Traffic Impact Attenuators along with two-way hazard markers would be required

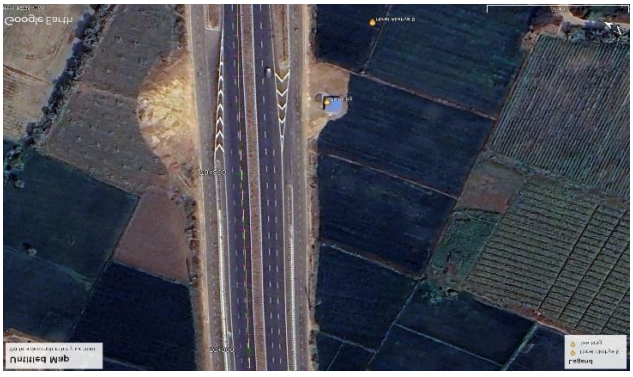




Sharp entry/exit ramps

At Couple of Locations, the Exist and Entry are very narrow, Total 30 No of Sharp Entry & Exits are present along the project corridor in that 16 No's in LHS and 14 No's in RHS Direction





Sharp entry exit at km 70+800 RHS

Box Culvert at 60+800

There is severe safety Hazard Issue near exit at K 60+800 on RHS (Most of exit lane width is occupied by Culvert and all of a sudden creating a bottle neck). The Exit location shall be shifted to suit the site condition or the culvert required to be widened





Submergence at 34+850

From the local enquiry and discussions with NHAI Team, it is understood that, Flooding on LHS Carriageway near Km 34+850 occurred in the last year during heavy rains. At This location, Unidirectional Carriageway exists for Traffic moving from Kovvuru towards Gundugolanu side. Additional Pipe or Box Culvert may be required at this location to avoid the submergence of the LHA Carriageway at this location





Drain Outfalls

At couple of locations, the outfall for Open lined drain built between the Main Carriageway and Service Road are missing, because of this water stagnating in the drain and even the excess water is standing near the earthen drain portion



Water Stagnation in Shoulder Drain at UDF at Km 65.800 BHS

Lighting

In Approaches locations Highway lighting brackets are provided but the light poles are not installed in many locations along the project corridor.

Huge Amount of street lighting would be required at approaches since the availability of lighting on site is very minimal. (At underpasses, lighting is not provided in approaches).



Light Poles were not installed in service road at Km 61.940 LHS

Missing Gantries

About 13 locations there is a requirement of additional overhead gantries as per site condition to guide the traffic.

All these items are quantified in BOQ under EPC cost prior to issuance of Schedules. However, the same are not considered as project is under HAM until FY 2037 and then Capacity augmentation envisaged in FY2035.

CHAPTER 6. OPERATION AND MAINTENANCE

6.1 INTRODUCTION

Looking at the contractual requirements of maintaining project road under specified level of roughness it is felt that roughness is the most important criterion for finalizing the O&M schedule for the project. Accordingly, the methodology adopted by present consultants includes predicting the roughness year by year under the traffic using a well acknowledged HDM-4 model developed for developing countries like India after lot of research by World Bank. The said model is widely prescribed by MORTH and NHAI during the preparation of detailed project reports for several projects in doing economic analysis for the projects. The economic analysis mainly consists of two parts:

1. Predicting the road deterioration and estimating VOC
2. Estimating Benefits

Considering its importance and present use in India, consultants felt prudent to use the first part, i.e estimating road deterioration and predicting roughness in HDM 4 model to finalize the O&M schedule for the project. This approach is more scientific as it does not assume hypothetical deflection values at 10^{th} and 20^{th} year and includes main criterion of maintaining roughness at 2400mm/Km as per Schedule F.

6.2 CA SPECIFICATIONS FOR MAJOR MAINTENANCE

Schedule F prescribe the maintenance standards to be adopted for project. Summary of same is presented below.

- Appliable Manual: Four lane manual IRC SP 84-2019 published by IRC
- Applicable Schedule for O&M: Schedule-F and Manual
- As per clause 3.1 (iii) of Schedule-B, The periodic maintenance in every six years in full length of the project stretch including main carriageway, service/slip Road, ramps and at facilities etc
- As per clause 3.1 (iii), under Note of Schedule-B, Roughness of <2750 mm/Km shall be maintained by the existing HAM concessionaire prior to handing over to InVIT Concessionaire. After handover of project stretch to InVIT, the InVIT concessionaire shall maintain the roughness level at <2750mm/Km, however after a functional overlay or structural overlay provided in any particular stretch length then that particular length shall be maintained at a roughness level as per Schedule-F (2400 mm/Km) after that overlay.
- Maximum Roughness Allowed: 2400mm/km
- Frequency of Roughness Test: 2 times per year
- Frequency of FWD Test: once in a year

6.3 INPUTS FOR M&M SCHEDULE

6.3.1 Project Sections

Considering traffic scenario, project road has been divided into two sections viz.,

Section-1: km15.320 to 64.200
Section-2: km64.200 to 85.204

Further, no Overlay sections and Overlay sections have been considered from the FWD analysis were again sub-divided in to four cases, taking the consideration of roughness values as a key criterion for major maintenance as below:

- Case 1: Roughness value <2000 mm/Km
- Case 2: Roughness values >2000<2200 mm/Km
- Case 3: Roughness>2200<2400 mm/Km
- Case 4: Roughness>2400 mm/Km

Direction wise analysis has been done separately for LHS (UP)/RHS (DN) and each direction length has been divided into sections based on above.

6.3.2 Traffic (AADT)

The following traffic data has been used in the analysis is as below:

Vehicle/Mode	Toll Plaza-1 Secton-1		Toll Plaza-1 Secton-2	
	LHS	RHS	LHS	RHS
BUS	285	285	456	456
2A truck	666	666	1065	1065
3A truck	552	552	883	883
MAV truck	1156	1156	1849	1849
LCV	296	296	473	473

6.3.3 Vehicle Damage Factors (VDF)

VDF values as obtained from axle load surveys are used for various sections are as given below:

Vehicle Type	Toll plaza (53+700)	
	UP	DN
BUS	0.76	1.81
2-Axle	2.29	1.81
3-Axle	5.08	4.36
M Axle	15.23	9.10
LCV	1.53	0.53

6.3.4 HDM Inputs

FWD and Roughness values are used as obtained from surveys and investigations as below:

Section-1: From km 15.320 to km 64.200

No Overlay	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, mts	15.876	0.000	1.545	0.000	22.196	0.000	1.090	0.000
Roughness, mm/km	1363	0	2380	0	1348	0	2399	0
IRI. m/km	1.99	0.00	3.28	0.00	1.97	0.00	3.30	0.00
Deflection, mm	0.39	0.00	0.43	0.00	0.42	0.00	0.36	0.00
Cracking %	0.09	0.00	0.00	0.00	0.30	0.00	0.05	0.00
Raveling %	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Rut Depth, mm	5.37	0.00	4.33	0.00	5.20	0.00	3.12	0.00
Patching, %	0.02	0.00	0.00	0.00	0.15	0.00	0.00	0.00
Potholes, %	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BT Crust, mm	169	0	155	0	167	0	155	0
Granular Crust, mm	433	0	425	0	437	0	400	0

40mm Overlay	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, mts	30.459	1.000	0.000	0.000	25.594	0.000	0.000	0.000
Roughness, mm/km	1293	2047	0	0	1417	0	0	0
IRI. m/km	1.90	2.86	0.00	0.00	2.06	0.00	0.00	0.00
Deflection, mm	0.42	0.42	0.00	0.00	0.48	0.00	0.00	0.00
Cracking %	0.34	0.38	0.00	0.00	0.59	0.00	0.00	0.00
Raveling %	0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.00
Rut Depth, mm	5.95	6.74	0.00	0.00	5.72	0.00	0.00	0.00
Patching, %	0.18	0.64	0.00	0.00	0.31	0.00	0.00	0.00
Potholes, %	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00
BT Crust, mm	157	150	0	0	155	0	0	0
Granular Crust, mm	427	450	0	0	427	0	0	0

Section-2: From km 64.200 to km 85.204

No Overlay	LHS	RHS			
	All 4 cases	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, mts	-	6.407	0.000	0.000	0.000
Roughness, mm/km	-	1359	0	0	0
IRI. m/km	-	1.98	0.00	0.00	0.00
Deflection, mm	-	0.41	0.00	0.00	0.00
Cracking %	-	0.41	0.00	0.00	0.00
Raveling %	-	0.01	0.00	0.00	0.00
Rut Depth, mm	-	5.68	0.00	0.00	0.00
Patching, %	-	0.02	0.00	0.00	0.00
Potholes, %	-	0.00	0.00	0.00	0.00

No Overlay	LHS	RHS			
	All 4 cases	<2000	>=2000 and <2200	>=2200 and <2400	>2400
BT Crust, mm	-	190	0	0	0
Granular Crust, mm	-	470	0	0	0

40mm Overlay	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, mts	21.004	-	0.000	0.000	13.203	1.394	0.000	0.000
Roughness, mm/km	1306	0	0	0	1342	2124	0	0
IRI. m/km	1.91	0.00	0.00	0.00	1.96	2.96	0.00	0.00
Deflection, mm	0.43	0.00	0.00	0.00	0.44	0.41	0.00	0.00
Cracking %	0.51	0.00	0.00	0.00	1.01	0.47	0.00	0.00
Raveling %	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Rut Depth, mm	6.63	0.00	0.00	0.00	6.41	8.16	0.00	0.00
Patching, %	0.24	0.00	0.00	0.00	0.44	0.01	0.00	0.00
Potholes, %	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00
BT Crust, mm	185	0	0	0	183	180	0	0
Granular Crust, mm	439	0	0	0	424	410	0	0

6.3.5 Options for MM Schedule

Based on the requirements of CA, various options have been considered to be used as responsive overlays triggered at specified level of roughness of 2400mm/km. Micro surfacing has also been considered to examine its feasibility for major maintenance.

Following options were considered in the analysis:

- ✓ Base Case: MCS at Roughness of 2400mm/Km with regular maintenance
- ✓ Opt-1: Responsive Mill & Overlay of 40mm BC whenever roughness is >2400mm/KM with regular maintenance
- ✓ Opt-2: Responsive Mill & Overlay of 50mm BC whenever roughness is >2400mm/KM with regular maintenance

6.4 ROUHGNESS PROGRESSION

Roughness progression for each section under each alternative maintenance option has been done using the deterioration models in HDM-4. Following sample graphs represents the roughness progression for each alternative:

H D M - 4
HIGHWAY DEVELOPMENT & MANAGEMENT

Average Roughness by Section (Graph)

Study Name: GDK LHS_Imp
Run Date: 13-12-2024

Section Details:

ID: GDK LHS1<2000_NO OL
Description: GDK LHS1<2000_NO OL
Road Class: Primary or Trunk
Length: 15.88km
Width: 8.75m
Rise + Fall: 1.00m/km
Curvature: 3.00deg/km

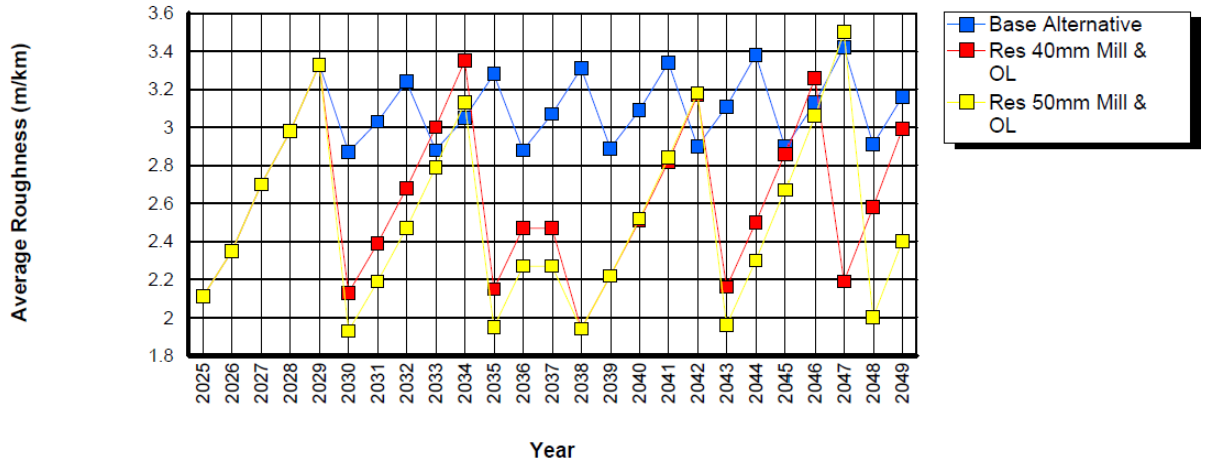


Figure 1: Average Roughness in LHS (UP) Carriageway (Sec-1) No OL<2000

H D M - 4 Average Roughness by Section (Graph)

Section Details:

ID: GDK LHS2<2000_OL
Description: GDK LHS2<2000_OL
Road Class: Primary or Trunk
Length: 21.00km
Width: 8.75m
Rise + Fall: 1.00m/km
Curvature: 3.00deg/km

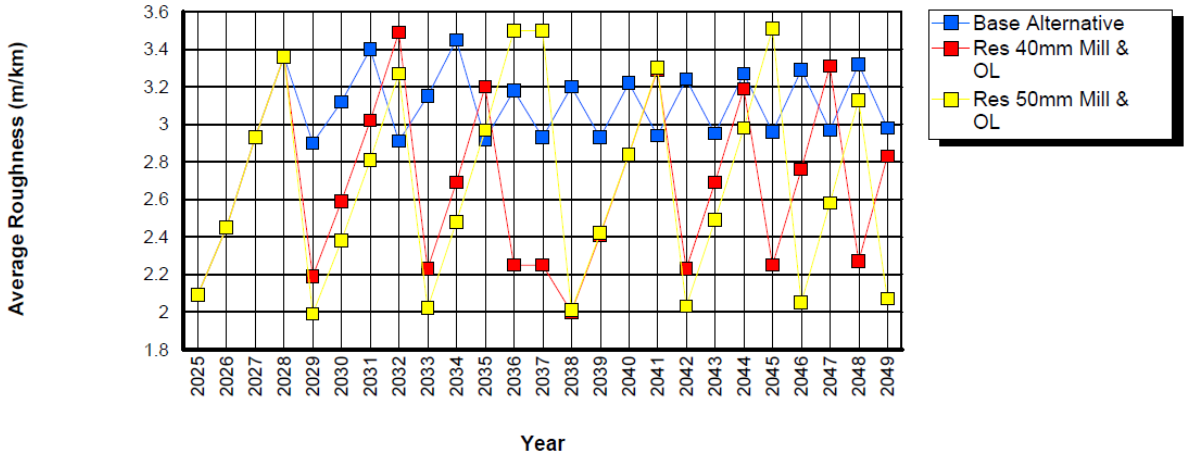


Figure 2: Average Roughness in LHS (UP) Carriageway (Sec-2) Overlay<2000

H D M - 4 **Average Roughness by Section (Graph)**

Section Details:

ID: GDK RHS1<2000_OL
Description: GDK RHS1<2000_OL
Road Class: Primary or Trunk
Length: 25.59km
Width: 8.75m
Rise + Fall: 1.00m/km
Curvature: 3.00deg/km

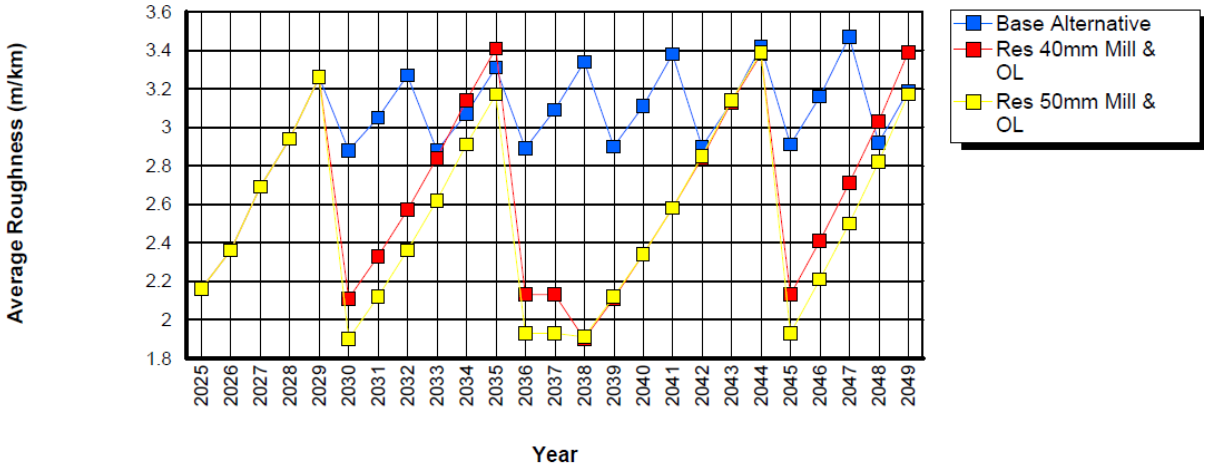


Figure 3: Average Roughness in RHS (DN) Carriageway (Sec-1) No OL<2000

H D M - 4 **Average Roughness by Section (Graph)**

Section Details:

ID: GDK RHS2<2200_OL
Description: GDK RHS2<2200_OL
Road Class: Primary or Trunk
Length: 1.39km
Width: 8.75m
Rise + Fall: 1.00m/km
Curvature: 3.00deg/km

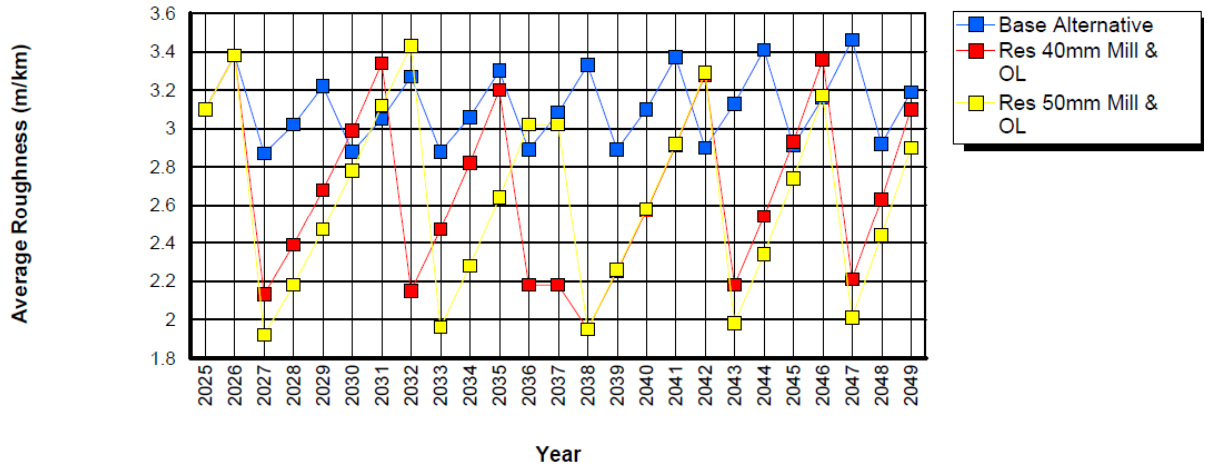


Figure 4: Average Roughness in RHS (DN) Carriageway (Sec-2) OL<2200

6.5 M&M SCHEDULE

The project stretch shall be maintained by existing HAM operator until July,2036 and further considering the traffic projections 6-lane capacity augmentation is envisaged in FY2035, it is felt prudent to consider the 40mm OL as the preferred option, with certain percentage of additional DBM for the balance period after DLP. Adopted MM schedule for the project is as below:

Table 35: Adopted MM schedule for the project for LHS & RHS

Section – 1 From km 15.320 to km 64.200

Criteria:	GDK Sec-1_No Overlay								
	LHS-obtained					LHS-Adjusted			
	Option-1 (Responsive 40mm)					Option-1 (Responsive 40mm)			
	IRI<2000	2000-2200	2200-2400	>=2400		IRI<2000	2000-2200	2200-2400	>=2400
Length:	15.876	0.000	1.545	0.000		15.876	0.000	1.545	0.000
Year	Case-1	Case-2	Case-3	Case-4		Case-1	Case-2	Case-3	Case-4
2025		1							
2026					HAM				
2027					HAM				
2028					HAM				
2029	1				HAM				
2030		1			HAM				
2031					HAM				
2032					HAM				
2033					HAM				
2034	1				HAM				
2035		1			6-Lane				
2036					6-Lane				
2037					DLP				
2038					DLP				
2039					DLP				
2040					DLP				
2041					DLP				
2042	1	1							
2043					5 % DBM	40mm			
2044									
2045									
2046	1	1							
2047									
2048									
2049									

Criteria:	GDK Sec-1_Overlay								
	LHS-obtained					LHS-Adjusted			
	Option-1 (Responsive 40mm)					Option-1 (Responsive 40mm)			
	IRI<2000	2000-2200	2200-2400	>=2400		IRI<2000	2000-2200	2200-2400	>=2400
Length:	30.459	1.000	0.000	0.000		30.459	1.000	0.000	0.000
Year	Case-1	Case-2	Case-3	Case-4		Case-1	Case-2	Case-3	Case-4
2025									
2026		1			HAM				
2027					HAM				
2028					HAM				
2029	1				HAM				
2030					HAM				
2031		1			HAM				
2032					HAM				
2033					HAM				
2034	1				HAM				
2035					6-Lane				
2036					6-Lane				
2037					DLP				
2038					DLP				
2039					DLP				
2040					DLP				
2041					DLP				
2042	1								
2043		1			5 % DBM	40mm			
2044									
2045									
2046	1	1							
2047									
2048									
2049									

Criteria:	GDK Sec-1_No Overlay								
	RHS-obtained					RHS-Adjusted			
	Option-1 (Responsive 40mm)					Option-1 (Responsive 40mm)			
	IRI<2000	2000-2200	2200-2400	>=2400		IRI<2000	2000-2200	2200-2400	>=2400
Length:	22.196	0.000	1.090	0.000		22.196	0.000	1.090	0.000
Year	Case-1	Case-2	Case-3	Case-4		Case-1	Case-2	Case-3	Case-4
2025			1						
2026					HAM				
2027					HAM				
2028					HAM				
2029					HAM				
2030	1				HAM				
2031					HAM				
2032			1		HAM				

Criteria:	GDK Sec-1_No Overlay								
	RHS-obtained					RHS-Adjusted			
	Option-1 (Responsive 40mm)					Option-1 (Responsive 40mm)			
	IRI<2000	2000-2200	2200-2400	>=2400		IRI<2000	2000-2200	2200-2400	>=2400
2033					HAM				
2034					HAM				
2035					6-Lane				
2036					6-Lane				
2037					DLP				
2038					DLP				
2039					DLP				
2040					DLP				
2041					DLP				
2042									
2043									
2044	1		1		5% DBM	40mm			
2045									
2046									
2047									
2048									
2049	1		1						

Criteria:	GDK Sec-1_Overlay								
	RHS-obtained					RHS-Adjusted			
	Option-1 (Responsive 40mm)					Option-1 (Responsive 40mm)			
	IRI<2000	2000-2200	2200-2400	>=2400		IRI<2000	2000-2200	2200-2400	>=2400
Length:	25.594	0.000	0.000	0.000		25.594	0.000	0.000	0.000
Year	Case-1	Case-2	Case-3	Case-4		Case-1	Case-2	Case-3	Case-4
2025									
2026					HAM				
2027					HAM				
2028					HAM				
2029	1				HAM				
2030					HAM				
2031					HAM				
2032					HAM				
2033					HAM				
2034					HAM				
2035	1				6-Lane				
2036					6-Lane				
2037					DLP				
2038					DLP				
2039					DLP				
2040					DLP				
2041					DLP				
2042									
2043									

Criteria:	GDK Sec-1_Overlay								
	RHS-obtained					RHS-Adjusted			
	Option-1 (Responsive 40mm)					Option-1 (Responsive 40mm)			
	IRI<2000	2000-2200	2200-2400	>=2400		IRI<2000	2000-2200	2200-2400	>=2400
Length:	25.594	0.000	0.000	0.000		25.594	0.000	0.000	0.000
Year	Case-1	Case-2	Case-3	Case-4		Case-1	Case-2	Case-3	Case-4
2044	1				5% DBM	40mm			
2045									
2046									
2047									
2048									
2049	1								

Section – 2 From km 64.200 to km 85.204

Criteria:	GDK Sec-2_Overlay								
	LHS-obtained					LHS-Adjusted			
	Option-1 (Responsive 40mm)					Option-1 (Responsive 40mm)			
	IRI<2000	2000-2200	2200-2400	>=2400		IRI<2000	2000-2200	2200-2400	>=2400
Length:	21.004	0.000	0.000	0.000		21.004	0.000	0.000	0.000
Year	Case-1	Case-2	Case-3	Case-4		Case-1	Case-2	Case-3	Case-4
2025									
2026					HAM				
2027					HAM				
2028	1				HAM				
2029					HAM				
2030					HAM				
2031					HAM				
2032	1				HAM				
2033					HAM				
2034					HAM				
2035	1				6-Lane				
2036					6-Lane				
2037					DLP				
2038					DLP				
2039					DLP				
2040					DLP				
2041	1				DLP				
2042									
2043					5% DBM	40 mm			
2044	1								
2045									
2046									
2047	1								
2048									
2049									

Criteria:	GDK Sec-2_No Overlay								
	RHS-obtained					RHS-Adjusted			
	Option-1 (Responsive 40mm)					Option-1 (Responsive 40mm)			
	IRI<2000	2000-2200	2200-2400	>=2400		IRI<2000	2000-2200	2200-2400	>=2400
Length:	6.407	0.000	0.000	0.000		6.407	0.000	0.000	0.000
Year	Case-1	Case-2	Case-3	Case-4		Case-1	Case-2	Case-3	Case-4
2025									
2026					HAM				
2027					HAM				
2028					HAM				
2029	1				HAM				
2030					HAM				
2031					HAM				
2032					HAM				
2033	1				HAM				
2034					HAM				
2035					6-Lane				
2036					6-Lane				
2037					DLP				
2038					DLP				
2039					DLP				
2040					DLP				
2041					DLP				
2042	1								
2043					5% DBM	40 mm			
2044									
2045									
2046	1								
2047									
2048									
2049	1								

Criteria:	GDK Sec-2_Overlay								
	RHS-obtained					RHS-Adjusted			
	Option-1 (Responsive 40mm)					Option-1 (Responsive 40mm)			
	IRI<2000	2000-2200	2200-2400	>=2400		IRI<2000	2000-2200	2200-2400	>=2400
Length:	13.203	1.394	0.000	0.000		13.203	1.394	0.000	0.000
Year	Case-1	Case-2	Case-3	Case-4		Case-1	Case-2	Case-3	Case-4
2025									
2026		1			HAM				
2027					HAM				
2028					HAM				
2029	1				HAM				
2030					HAM				
2031		1			HAM				

Criteria:	GDK Sec-2_Overlay								
	RHS-obtained					RHS-Adjusted			
	Option-1 (Responsive 40mm)					Option-1 (Responsive 40mm)			
	IRI<2000	2000-2200	2200-2400	>=2400		IRI<2000	2000-2200	2200-2400	>=2400
Length:	13.203	1.394	0.000	0.000		13.203	1.394	0.000	0.000
Year	Case-1	Case-2	Case-3	Case-4		Case-1	Case-2	Case-3	Case-4
2032					HAM				
2033	1				HAM				
2034					HAM				
2035		1			6-Lane				
2036					6-Lane				
2037					DLP				
2038					DLP				
2039					DLP				
2040					DLP				
2041					DLP				
2042	1	1							
2043									
2044					5% DBM	40 mm			
2045									
2046	1	1							
2047									
2048									
2049	1	1							

Note: For both LHS & RHS, only 1-cycle has been considered in FY2043(LHS)/FY2044(RHS) with 40mm BC along with 50mm DBM in 5% length in view of 6-laning in FY35 and DLP upto FY2041.

6.6 STRUCTURAL PERIODIC MAINTENANCE STRATEGY

Expansion joints:

- Visual inspection is carried out to check for seal breakages, Armor angle, Weld failures, cracks between deck & Expansion joints concrete and Joints filled with debris. Such joints replaced immediately.
- Joint buried with debris shall be inspected for any distress, if any distress is shown it shall be replays immediately.
- During visual inspection it is seen that some Expansion joints are bad where as some are not showing any defects.
- Due to this it is considered provident to change the Expansion joints which are visibly damaged in initial stage.
- In the absence of records pertaining to Expansion joint replacements it is highly difficult to predict the date of replacement needed for compliance to IRC codal requirements. Balance joints which are not replaced initially will be replaced as on when defects are shown in the joints. This aspect is considered in BOQ.

Bearings:

- In order to identify the bearings requiring immediate replacement, the following strategy is adopted.
- Girder Bridges showing diagonal cracks at support, distress in the Pedestals and any form of distress in support location is regarded as a candidate for replacement. By visual inspection there are only a handful of such situations.
- Wherever pedestals are damaged either by cracking or spalling poisons confinement is proposed by Jacketing/MS plate bonding such procedure is very effective and common.
- All Metallic Bearings need to be taken up for servicing.

Wearing Coat:

It is necessary to replace the wearing coat at every 15years interval, as wearing coat is a very weak component of the bridge structure which is subjected to severe deterioration due to loading, environment etc. As of now, we have considered sealing of cracks by Fog Seal and for which does not show any distress other than cracking by viz. Pot holes, abrading etc. Based on this aspect, this cost has been considered in highway O&M cost.

Periodic Maintenance strategy for Replacement of Bearings & Expansion joint:

Below strategy has been considered for periodic major maintenance of the structures.

S No	Description	Bridge components
1	Old structure	Structures which are older than 15-years as of now
2	New Structure	Structures which are Not older than 15-years as of now

Age	Description	Item	structures-Assumption-MMR
			% of Replacement of Major components
			2044
New	Super structure lifting with Pot bearings	Pot	20%
New	Super structure lifting with Elastomeric bearings	Ela	20%
New	Super structure lifting with Rocker bearings	Rocker	0%
Old	Super structure lifting with Pot bearings	Pot	20%
Old	Super structure lifting with Elastomeric bearings	Ela	20%
Old	Super structure lifting with Rocker bearings	Rocker	0%
New	Pot bearing cost	Pot	20%
New	Elastomeric bearing cost	Ela	20%
New	Rocker bearing cost	0	0%
Old	Pot bearing cost	Pot	20%
Old	Elastomeric bearing cost	Ela	20%
Old	Rocker bearing cost	0	0%
New	Expansion joint Replacement	0	20%
Old	Expansion joint Replacement	0	20%
New	Others	0	20%
Old	Others	0	20%

Cost Component for various items and activities have been worked out by considering the Best Industry practice and most appropriate methods. Detailed quantities for work items have been estimated based on the details presented in previous chapters for various heads.

The gist of the cost components considered are presented below:

- Immediate Repair's Cost
- Routine Maintenance Cost
- Incident Management Cost
- Periodic Maintenance Cost
- Operations Cost
- Year by Year total O&M Costs

7.1 RATE ANALYSIS

Detailed rate analysis has been carried out based on MORTH guidelines to arrive at the unit rates of various items. Material rates and their leads from the project corridor are considered as per the material investigations done on the project road. Summary of unit rates arrived at are presented in table below:

Table 36: Unit Rates of Basic Material

S No	Description	Units	Source	Basic rate excluding Transportation & GST	Lead in Kms
1	VG-40 (CAPEX)	MT	Visakhapatnam	52,960	260
2	VG-40 (MMR) *	MT	Visakhapatnam	47,147	260
3	Good earth	Cu.m	BA	139	9
4	40 mm	Cu.m	Crusher	1,002	33
5	20 mm	Cu.m	Crusher	1,533	33
6	12 mm	Cu.m	Crusher	1,259	33
7	6 mm	Cu.m	Crusher	1,259	33
8	Dust	Cu.m	Crusher	679	33
9	M sand	Cu.m	Crusher	585	33
10	SS1	MT	Visakhapatnam	50,000	260
11	Steel	MT	Rajahmundry	54,000	55
12	HTS Strands	MT	Rajahmundry	75,000	55
13	Cement	MT	Rajahmundry	7,600	55

Note: *For future asphalt pavement rehabilitation works, a normative standardized cost for Bitumen (VG-40) has been determined based on historical bitumen rates from August 2020 to December 2024

Table 37: Unit Rates of Major Material excluding GST

Sl.no	Item	Unit	Rate (INR) Excluding GST
1	Embankment - borrow	Cum	641
2	Embankment - Excavation	Cum	105
3	SG	Cum	663
4	GSB G-2	Cum	3,157
5	WMM	Cum	3,247
6	Prime Coat	Sqm	49
7	Tack coat on granular	Sqm	16
8	DBM G-1-VG-40	Cum	10,595
9	Tack coat on bituminous surface	Sqm	15
10	BC – G2-VG40/CRMB-CAPEX	Cum	13,155
11	Road Marking	Sqm	585
12	RE wall	Sqm	3,930
13	Select Fill	Cum	729
14	Filter Media	Cum	1,322
15	HYSD	MT	78,984
16	HT strand	MT	1,53,240
17	CTSB	Cum	4,097
18	CTB	Cum	4,310
19	PQC	Cum	9,229
20	DLC	Cum	5,146
21	BC - G1-VG40/ CRMB-MMR	Cum	12,242

Note: Item Rates considered for Small Projects

Labour: Central Minimum Wages as on Oct'2024 for "C Area" Category of construction workers

7.2 Initial improvement works (SCHEDULE-B)

Costs associated with initial improvements are estimated based on the detailed asset inventory and condition assessment surveys, Pavement condition and structural condition assessment surveys. Items which are not executed as part of scope or in damaged condition have been considered for immediate costs as a part of 1-year capex. Following items are mainly considered for Initial Improvement costs:

- Scope given in schedule-B
- Scope which is not executed
- Road work items
- Bridge Work Items
- Pavement Rehabilitation works
- Structural Rehabilitation works
- Drainage Works
- Slope Protection works
- Safety Works

On review of the contemporary records and on ground assessment the cost to complete is given below.

Table 38: CAPEX Cost FY26

S.no	Description	Unit	Amount (Rs.)
1	TMS	LS	4,77,35,686
2	Toll plaza renovation cost including replacement of Office Furniture, all building, Canopy, all misc. items etc.	LS	1,53,85,073
Total			6,31,20,759
Total including GST @18%			7,44,82,495
Total EPC Cost including GST in Crores			7.45

Note: The TMS cost arrived are based quotes obtained by NHIT, from different vendors such as Comvision, Devaditya and Efkon.

The cost considered in MMR in the year FY2042 under Flexible Road works.

S.no	Description	Unit	Amount (Rs.)
1	Revalidation surveys	LS	66,38,168
2	Safety improvement cost at handing over as per client	LS	1,50,00,000
Total			2,16,38,168
Total including GST @18%			2,55,33,038
Total EPC Cost including GST in Crores			2.55

7.3 ROUTINE MAINTENANCE & INCIDENT MANAGEMENT COSTS

Routine maintenance costs include general maintenance costs of road elements, bridge elements and road furniture and appurtenances. This can be mainly divided into two parts as:

- ✓ General Maintenance of Works
- ✓ Repairs to Highway & Bridge Elements

7.3.1 General Routine Maintenance

General Routine Maintenance of Roads generally include following items:

- Cleaning of Project facilities
- Structures cleaning,
- Cleaning of ROW
- Cleaning and Maintenance of Toll Plaza
- Unlined Drain Maintenance
- Lined Drain Maintenance
- Maintenance of Highway Lighting at Toll Plaza and other project locations
- Median Plantation maintenance & Avenue plantation maintenance:
- Maintenance of Road Furniture
- Maintenance of Road Safety Items

The above items are estimated by considering the detailed break-up of following items:

- Manpower including Managers/Labour etc.
- Vehicles for Labour Transport/Water Tankers/Sweeping Machines etc.
- Resources/Equipment's such as grass cutters, tools, jet sprayers, hydraulic trimmers etc.

7.3.2 Repairs to Highway & Bridge Works

Repairs to highway and bridge works have been estimated based on the assumed quantities (Percentage basis) of execution for every year.

These items include the following:

1	Providing treatment for sealing of road surface / isolated cracks at scattered locations
	i) Covered with 6.7 mm size stone chipping @ 0.1 cum/ 10 sqm.
	ii) covered with dry coarse sand passing through 2.36 mm sieve and retained on 180 micron sieve @ 0.03 cum/10 sqm heated to 600 C
	iii) filling discrete cracks with slow curing bitumen emulsion as per Technical Specification Clause 3004.3.3
2	Providing treatment to bleeding bituminous surface at scattered locations
3	Providing localized repair to rutted portion and edge breaking of bituminous surface
4	Providing treatment and repair to pot-holes and patch work
5	Providing and laying dense bituminous macadam using bitumen grade VG 40 complete as per Technical Specification Clause 507
6	Proving and laying bituminous concrete (asphaltic concrete)
	(a) Using bitumen (VG-40) as per IRC: SP: 53
7	Road Roughness survey
8	Turfing on embankment slopes and at all other Project Facilities
9	Providing repair to stone pitching/apron at scattered locations
10	Rain Cuts Maintenance: Restoration of rain cuts soil, moorum, gravel or a mixture of these
11	Providing and laying apron/ stone pitching on slopes of guide bunds/ road embankment / other location
12	Providing and laying stone aggregate filter material (150 mm compacted thickness) underneath pitching
13	Unlined drain
14	Filling in median island with approved materials with all leads and lifts complete as per TS Clause No. 407
15	Replacing damaged / broken railing with new pre-cast / cast-in-situ, concrete railing to match with existing design and pattern.
24	Carrying out repair to road signs including strengthening resetting or otherwise repairing signs and delineators
	a) Road sign board mounted on single post
	b) Road sign board mounted on double post
	c) Overhead/ Gantry Sign boards
	d) Delineator
25	Supplying and fixing at site retro-reflectorized type **sign boards/signs**
	90cm Equilateral triangle
	60cm circular
	90 cm circular
	90cm high octagon
	80cm x 60cm rectangle
	Chevron signs 60cm x 45cm
	Place identification signs (Fig 15.7 of IRC 67)

	Providing and fixing Object Markers
	Providing and fixing of retro-reflectorized Route Marker signs (size 450mm x 600mm)
26	**Hazard Marker Sign :**
	a) size 90 x 30 cm
	b) size 30cm triangular side cluster of red reflectors (screen printed)
27	Cats Eyes/Raised pavement marker (NMC Nails Less)
28	Painting two coats on old surface after minor repairs to give an even and smooth surface and printing letters and figures with synthetic enamel paint
	a) Hectometer stones
	b) Kilometer Stone
	c) 5 Kilometer stone
	d) Boundary stone
	e) Guard stone
29	Providing painting lettering and fixing of distance measurement stones including dismantling of old damaged/ broken ones, confirming to TS Clause 804
	a) Hectometer stones
	b) Kilometer Stone
	c) 5 Kilometer stone
	d) Boundary stone
	e) Guard stone
30	Providing and fixing road delineators conforming to TS Clause No. 805 as directed by the Engineer.
31	Repainting the kerb stones and separation barrier with first quality synthetic enamel paint of approved brand
32	Painting all types of pavement markings including lines, dashes, arrows etc. on roads as per relevant IRC/MOST standards after cleaning the surface complete in all respects as directed by the Engineer.
	a) Hot applied Thermoplastic compound
	(i) Lane / Centre Line / Edge Line
	(ii) Direction Arrows
	(iii) Diagonal Chevrons Markings
33	Supplying and laying cast-in-situ cement concrete kerb without channel section
	a) by Manual/machine including formwork
34	Major repair / replacement of metal beam crash barrier (W profile guard rails)
35	Providing and fixing chain link/ welded mesh fencing / square bars fencing
36	Dismantling the old damaged chain link/welded mesh / square bars fencing and replacing it with new chain link/ welded mesh/square bars fencing
37	Provision of rumble strips
38	Shoulder Maintenance:
39	synthetic enamel paint of approved brand on metal pedestrian guard rail
40	Dismantling of wearing course

B. Structures

1. Wearing coat comprising of 50 mm thick BC.
2. Cleaning and adding rubber sealant near expansion joints.
3. Modular Expansion joints.
4. Replacement of Damaged Concrete Railing all complete as per Technical specifications and as directed by the Engineer
5. Provision of an RCC crash barrier (0.35sqm cross sectional area) constructed with M-40 grade concrete including reinforcement
6. Cleaning of rocker & roller bearing using high pressure water jet, free from rust scales, re-setting & greasing the bearings using graphite grease including cost of materials, labour etc., complete.

7. POT PTF Bearings greasing and maintaining (sand plastering).
8. Elastomeric Bearings and maintaining.
9. Cutting of groove of 15 mm x 15 mm along crack and sealing the same with epoxy putty including cost of material, labour etc.
10. Carrying out 50 to 60 mm thick shortsheeting using a mix proportion of 1:2:2 (cement: sand:6 mm down aggregate) added with Polypropylene fibers at a dosage rate of 125 gms/bag of cement including cost of labour, material, scaffolding, equipment etc complete.
11. Repair of Floor Aprons, pitching and other protection works
12. Cleaning of Drainage Spouts
13. M-25 Concrete

7.3.3 Incident Management Cost

Incident Management & Safety items include the following:

- ✓ ATMS control room operations,
- ✓ Regular patrolling & reaching accident/incident site,
- ✓ providing relief to injured persons including taking them to nearest hospital and attending to the safety requirements at the location (putting cones, safely guide & manage the traffic using signs, safety barricades, etc.),
- ✓ removal of accident /breakdown vehicles, removing of dead animals/birds lying on the highway and loading, unloading, transportation & disposal of surplus material left over by accidental vehicle or otherwise lying on road (on carriageway) and
- ✓ Encroachment prevention & removal with all lead & lifts complete with proper communication equipment,
- ✓ consumables, materials, suitable Towing vehicles, Ambulance, patrolling vehicles and manpower like drivers, helpers, para-medical staff, labour including deployment of crane and all works shall be done as per requirement and as directed by Client representative and as per Relevant Specifications as applicable.

7.4 OPERATIONS COSTS

In addition to the above-mentioned General Routine maintenance, Repair & Rehabilitation cost for Road and structures, Incident management cost the following the Cost towards Operations include:

- Electricity Charges
- Toll Plaza Operation cost
- Insurance Charges
- Road Asset Management System (RAMS), Bridge Management System (BMS) & Surveys
- Other Office Expense (Admin, SPV, IE and Other)

Table 39: O&M Cost for various Years in Crores (including GST)

S.No.	FY	Operation & Maintenance Cost (in INR Cr.)								
		Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026	0.60	-	-	-	2.47	6.30	0.11	-	3.46
2	2026-2027	0.60	-	-	-	2.47	6.30	0.11	-	4.04
3	2027-2028	0.60	-	-	-	2.47	6.30	0.11	-	4.12
4	2028-2029	0.60	-	-	-	2.47	6.17	0.11	-	4.06
5	2029-2030	0.60	-	-	-	2.47	6.17	0.11	-	4.12
6	2030-2031	0.60	-	-	-	2.47	5.73	0.11	-	4.13
7	2031-2032	0.60	-	-	-	2.47	5.29	0.11	-	4.03
8	2032-2033	0.60	-	-	-	2.47	5.08	0.11	-	4.63
9	2033-2034	0.60	-	-	-	2.47	5.08	0.11	-	4.26
10	2034-2035	0.60	-	-	-	2.47	5.08	0.11	-	4.13
11	2035-2036	0.60	-	-	-	2.47	5.08	0.11	-	4.22
12	2036-2037	0.60	-	-	-	2.47	5.08	3.61	-	4.27
13	2037-2038	0.60	-	-	-	2.47	5.08	3.61	-	4.33
14	2038-2039	0.60	-	-	-	2.47	5.08	3.61	-	4.22
15	2039-2040	0.60	-	-	-	2.47	5.08	3.61	-	4.86
16	2040-2041	0.60	-	-	-	2.47	5.08	3.61	-	4.42
17	2040-2042	5.14	3.68	3.31	5.27	4.97	5.08	3.61	1.68	5.61
18	2040-2043	5.14	3.68	3.31	5.27	4.97	5.08	3.61	3.56	5.55
19	2040-2044	5.14	3.68	3.31	5.27	4.97	5.08	3.61	1.68	5.58
20	2040-2045	5.14	3.68	3.31	5.27	4.97	5.08	3.61	1.68	5.58
Total		**30.09**	**14.73**	**13.23**	**21.08**	**59.44**	**108.25**	**33.67**	**8.60**	**89.63**

Note: **1)** The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation.

2) All other remaining costs are based on FY 2025 with GST and without escalation.

3) The amount is Crores inclusive of GST and without escalation,

7.5 PERIODIC MAINTENANCE COSTS

Cost towards major maintenance include following:

- ✓ Cost of Periodic maintenance of Pavement based on Finalized MM schedule
- ✓ Cost of Periodic Maintenance of Structures
- ✓ Cost of Periodic replacement of Toll Equipment's & Software

Table 40: Major Maintenance Cost

FY	Road (MCW,SR, Toll Plaza)	Structure	ATMS	TMS
2025-2026	-	-	-	-
2026-2027	-	-	-	-
2027-2028	-	-	-	-
2028-2029	-	-	-	-
2029-2030	-	-	-	-
2030-2031	-	-	-	-
2031-2032	-	-	-	2.82
2032-2033	-	-	-	-
2033-2034	-	-	-	-
2034-2035	-	-	-	-
2035-2036	-	-	-	-
2036-2037	-	-	-	-
2037-2038	-	-	-	-
2038-2039	-	-	-	5.63
2039-2040	-	-	-	-
2040-2041	-	-	-	-
2041-2042	2.55	-	-	-
2042-2043	90.63	-	-	-
2043-2044	86.48	9.26	12.03	-
2044-2045	-	-	-	-
Total	**179.66**	**9.26**	**12.03**	**8.45**

Note: The amount is Crores inclusive of GST and without escalation, considering FY2025 rates

7.6 CAPACITY AUGMENTATION

The capacity augmentation is envisaged in FY 2035& FY2036 for the project on EPC mode with DLP of 5 years until FY2041.

- Only one cycle of MMR has been considered in FY2043 (for LHS) and FY2044 (for RHS) with 40mm BC and 50mm DBM in 5% of the project length for MCW and for Service Road 30mm BC is considered.
- Even though Structural Overlay requirement is there as per FWD test and the same is not considered as the HAM Concessionaire will maintain until FY2037.
- The capacity augmentation is envisaged in FY 2035& FY36 for the project road with DLP of 5 years until FY2041.
- Minimum Central Wages for labour is considered for Category "C" as of OCt'2024 with 0% escalation considered.
- Overheads and Contractor's profits are considered from MORTH Standard data book -2019 for "Small Project" category.
- The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. Whereas, all other remaining costs are based on FY 2025 with GST and without escalation. The Cost is given in Crores inclusive of GST and without escalation, considering FY2025.

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TECHNICAL DUE DILIGENCE REPORT

SIX LANE SECTION OF CHITTOR TO MALLAVARAM OF NH-140, LENGTH 61.128 KM, IN THE STATE OF ANDHRA PRADESH



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TECHNICAL DUE DILIGENCE REPORT

SIX LANE SECTION OF CHITTOR TO MALLAVARAM OF NH-140, LENGTH 61.128 KM, IN THE STATE OF ANDHRA PRADESH

Project name	**Six Lane Section of Chittor to Mallavaram of NH-140, Length 61.128 KM, in the state of Andhra Pradesh**
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Acronyms and Abbreviations

BBD	Benkelman Beam Deflection	LCV	Light Commercial Vehicle
BOQ	Bill of Quantities	LHS	Left hand side
BC	Bituminous Concrete	LIE	Lenders' Independent Engineer
BOT	Build, Operate and Transfer	LT	Low Tension
CA	Concession Agreement	MOEF	Ministry of Environment and Forest
CAPEX	Capital Expenditure	MORT&H	Ministry of Road Transport & Highways
COD	Commercial Operation Date	MPRDC	Madhya Pradesh Road Development Corporation
CRPF	Central Reserve Police Force	MSA	Million Standard Axle
C & G	Clearing and grubbing	NCR	Non-Compliance Report
CRMB	Crumb Rubber Modified Bitumen	NH	National Highways
CUP	Cattle Under Pass	NHAI	National Highways Authority of India
DBM	Dense Bitumen Macadam	NHDP	National Highway Development Programme
DLC	Dense Lean Concrete	NRMB	Natural Rubber Modified Bitumen
DFO	Divisional Forest Office	NOC	No Objection Certificate
DG	Diesel Generator	OFC	Optical Fibre Cable
DLP	Defect liability period	OPEX	Operation Expenditure
DPR	Detailed Project Report	O&M	Operation and Maintenance
EIA	Environment Impact Assessment	PPE	Personal Protection Equipment
EMP	Environment Management Plan	PPP	Public-Private/Public Sector Partnership
EPC	Engineering Procurement & Construction	PQC	Pavement Quality Concrete
FCI	Food Corporation of India	PUP	Pedestrian Under pass
FRL	Formation Road Level	PWD	Public Works Department

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FWD	Falling Weight Deflectometer	PCC	Plain Cement Concrete
GAD	General Arrangement Drawing	PD	Project Director
GFC	Good for Construction	PIU	Project Implementation Unit
GOI	Government of India	PLR	Prime lending rate
GSB	Granular Subbase	PMB	Polymer Modified Bitumen
HT	High Tension	PMC	Project Management Consultant
HMP	Hot Mix Plant	PUP	Pedestrian Under Pass
HDM	Highway Development & Management	QA/QC	Quality Assurance / Quality Control
IC	Independent Consultant	SDBC	Semi-dense Bitumen Concrete
IE	Independent Engineer	SPV	Special Purpose Vehicle
IPC	Interim Payment Certification	VDF	Vehicle Damage Factor
IRC	Indian Road Congress		

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1. EXECUTIVE SUMMARY

1.1 Ramboll Scope

NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED have entrusted Ramboll India Private Limited for technical due diligence study of 61.128 km long National Highway corridor comprising six lane section of NH-140 between Chittor to Mallavaram in the State of Andhra Pradesh. Accordingly, Ramboll team has undertaken the work of preparing advisory report based on study of project related reports and documents, visual inspections, and field investigations.

1.2 Project Introduction

The Government of India had entrusted to National Highways Authority of India (NHAI) the development, maintenance, and management of National Highway No. 140 which includes.

> Six laning of NH-140 from Chittor (Design km 0.000/Existing km 158.000 of NH-4) to Mallavaram (Design km 61.128/Existing km 41.800 of NH-140) (Design Length = 61.128 km) under Bharatmala Pariyojana on Hybrid Annuity Mode.

The Authority had invited proposals by its Request for Proposal for the above package. After evaluation of the bids received, the Authority had accepted the bid of the selected bidder and issued its Letter of Award No. NHAI/Tech/ AP/NH-140/Cht-Mal/2017-18/115166 dated 26.03.2018 for the package.

Provisional Completion Certificate of the project is achieved on 10 May 2021.

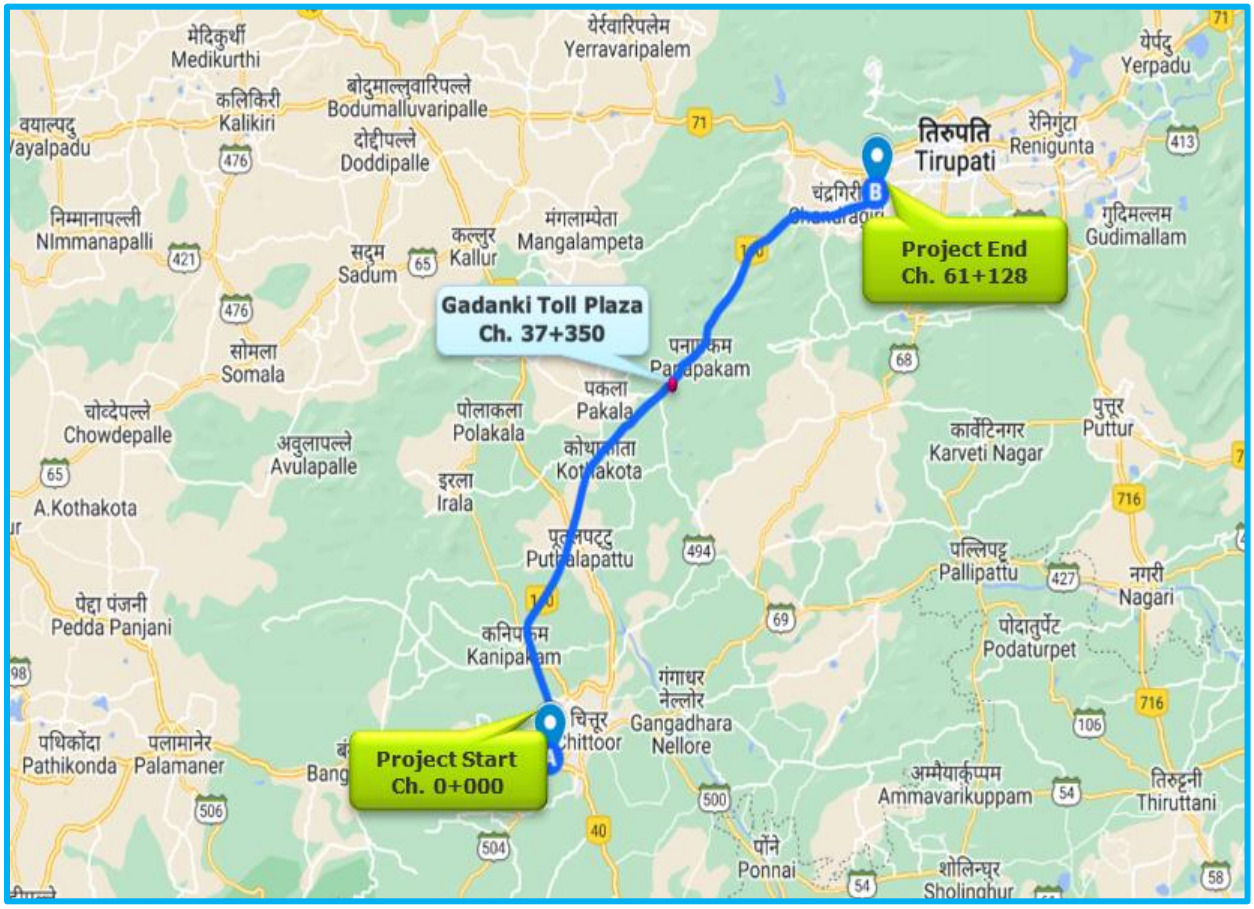
Completion certificate of the project is issued on 08 June 2021.

Project Highway is under Operation and Maintenance as per provisions of the existing HAM Concession Agreement. Existing Concessionaire shall operate and maintain the project up to O&M Handover date, 10 May 2036, pursuant to and in accordance with the existing HAM Concession agreement.

1.3 Project Description

The project road is in the administrative location of Tirupati district in the state of Andhra Pradesh. The project traverse's major settlement areas such as Patnam, Natthapachenu, Chigarapalle, Kothakota, Rangampet, Konapareddypalli, Thotapalli, Nendragunta, Pakalavaripalli, Panapakam, Thurupupalli, Kodandaramapuram, Mattampalli.

Project Location Map



The project starts on NH 140 at Km 0+000 at Chittoor and ends at km 61+128 at Mallavaram intersection.

Particulars	Project
Project Name	Six laning of NH-140 from Chittor (Design km 0.000/ Existing km 158.000 of NH-4) to Mallavaram (Design km 61.128/ Existing km 41.800 of NH-140) (Design Length = 61.128 km)
Mode of the Execution (BOT Toll/ BOT Annuity/ EPC/ HAM/ Others)	Hybrid Annuity Mode under Bharatmala Pariyojana
Project Phase	Tolling, Operation, Maintenance and Transfer
No. of Lanes/ Configuration	6 Lane divided carriageway
Length of the Project (in Km)	61.128 km
Client	NHAI
NHAI NH No.	NH-140

Particulars	Project
EPC Contractor / Concessionaire	KNR Tirumala Infra Private Limited
Total Project Cost	INR 1730.07 Crores
Independent Engineer (O&M Phase)	Lion Engineering Consultants Private Limited in association with Synergy Engineers Group Pvt. Ltd.
LOA	26 March 2018
Date of Signing of CA	09 May 2018
Appointed Date	04 January 2019
PCOD	10 May 2021
Completion Certificate	08 June 2021
End Date of Concession period / Maintenance obligation for Latest EPC Contract	15 Years commencing from COD
O&M Handover date	10 May 2036
No. of Toll Plazas (Number and Location)	Toll Plaza : Gadanki Toll Plaza

1.4 Scope of work

Broadly the Scope of services encompasses the following:

- Review of available documents and site visit
- Field inspection, investigations, and Analysis
- Operations and Maintenance assessment
- Major Maintenance strategy and assessment
- Estimation of Opex and CapEx.
- Preparation of presentation and project report

1.5 Assessment of Project Assets

Projects asset inventory and their condition assessment is prepared through visual inspection during site visits, review and analysing the reports shared by the client, by field investigations validating the findings and by NSV survey. All the elements and components pertaining to project asset are reported in subsequent Chapter 5, 6 & 7 of this report and their assessment is used to prepare the strategy for preventive, routine, and periodic maintenance. The overall condition of the project and its assets are satisfactory. Detailed asset inventory and pavement evaluation is provided separately in Annexure I & II to this main report.

S.No.	Item - Features	Units	Project
1	**Service Road**	km	115.691
2	**Bypasses**	km	24.235

S.No.	Item - Features	Units	Project
3	Major Intersections	Nos.	4
4	Minor Intersection	Nos.	61
5	Bus bay & Bus Shelters	Nos.	26
6	Truck Lay Bye	Nos.	4
7	Rest Area	Nos.	0
8	Toll Plaza	Nos.	1
	Toll Plaza lane	Nos.	12
9	Median Opening	Nos.	5
10	Street Light Poles	Nos.	448
11	High mast Lights	Nos.	15
12	Solar Blinkers	Nos.	13
13	Avenue Plantation	km	9.202
14	Median Plantation	km	52.612
15	Fuel station	Nos.	13
16	Sign Boards	Nos.	911
17	Gantry Sign Board	Nos.	20
18	Pedestrian Guard Rail	km	3.528
19	Rigid Concrete Barrier	km	36.577
20	W Beam Crash Barrier	km	17.684
21	Shoulder/Separator Drain	km	113.448
22	Earthen Drain/ Chute Drain	km	0.437
23	Median Longitudinal Drain	km	8.598
24	CCTV	Nos.	31
25	VMS	Nos.	4
26	Delineators	Nos.	1630
27	Object Hazard Marking	Nos.	898
28	Chevrons	Nos.	165
29	Road Studs	Nos.	14258
30	Foot Path	km	43.911

S.No.	Item - Features	Units	Project
31	**Entry/ Exit**	Nos.	20
32	**5th Kilometer Stones**	Nos.	22
33	**Km Stones/Ordinary KM stones**	Nos.	96
34	**Hectometer Stones**	Nos.	411
35	**Kerb**	km	225.974

1.6 Assessment of Structures

Site data is collected and analysed for condition and inventory of Major bridges, and Grade separators using the Mobile Bridge Inspection Unit (MBIU). Comprehensive visual inspection is carried out for assessing the minor bridges, underpasses, overpasses, and culverts of the entire project stretch of 61.128 kms. During the inspection and condition survey no major failure/Distresses is observed however minor cracks, exposed reinforcement at parapet, honeycombing repairs at structural components, clogged drainage spout, debris found under culvert and waterways and vegetation found on superstructures with unwanted material found around the bearings.

Total nos. of structures on the Project Highway are given in the table below

Sl. No.	Item	Project
1	Major Bridges	6
2	Minor Bridges	23
3	RUB	1
4	ROB	-
5	Overpass	-
6	VUP	10
7	LVUP	5
8	PUP/CUP	-
9	FOB	2
10	HP Culvert	15
11	Box Culvert	100
12	Slab Culvert	-

1.7 Toll Management System (TMS)

The project has one toll plaza comprising of hybrid ETC lane infrastructure of combined 12 lanes. Gadanki TP - is a straight toll plaza and equipped with 12 Hybrid lanes, however 10 lanes are operational. No separate two-wheeler lanes are provided adjacent to the extra-wide lanes in any of these two plazas.

Further it is also found that none of the directions of the toll plaza are equipped with Static Weigh Bridges.

At Gadanki TP Medium Speed Weigh in Motion systems are installed in 10 lanes but were found to be nonfunctional and needs to be refurbished and recalibrated, currently no vehicle weight is being captured in the TMS. Stamping and calibration works are yet to be undertaken by the vendor

At Gadanki toll plaza toll equipment is being maintained in fairly good condition. The AVC systems are functional, and all lane controllers are found working in proper condition.

HTMS hardware is found installed and functional in this section of the highway.

1.8 Soil and Material investigation

Soil and Material investigation are done with the samples collected from pit investigation and the results are narrated in Chapter 9.

Subsoil is generally consistent throughout the project road and is predominantly Silty Sand and Clayey sand soils.

Summary of strength parameters in the soil investigation is shown below.

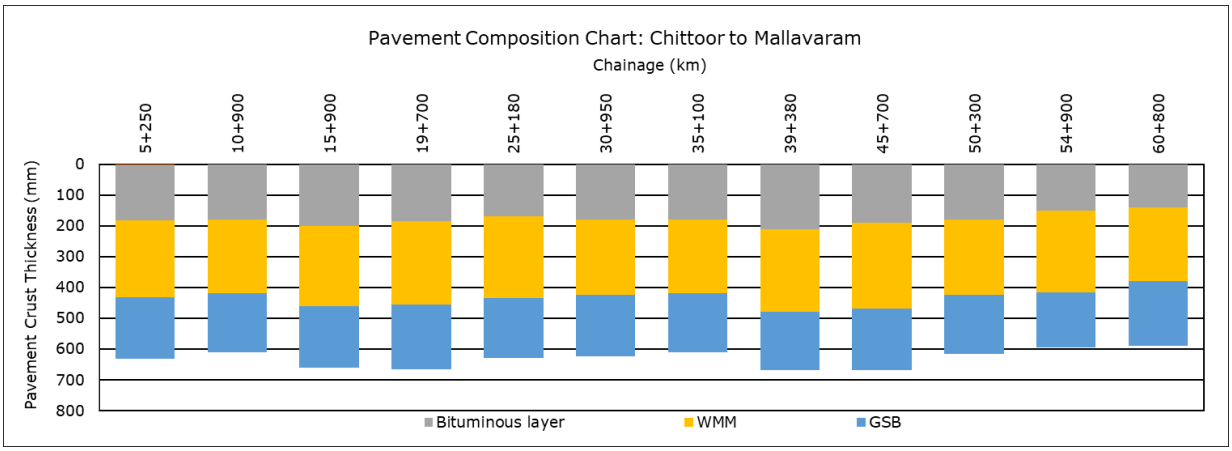
Description	Liquid Limit	Plasticity Index	Free Swell Index	4-days soaked CBR	Degree of compaction
Project - NH-140, Chittor to Mallavaram: Km 0+000 to Km 61+128	17%-29%	Max 9%	Max 20%	12.6%-28.1%	92.3%-96.7%
MoRTH Limits	**<50%**	**<25%**	**<50%**		

*Variance between MDD and FDD is converted in-terms of degree of compaction

All the measured LL, PI and FSI values are within the acceptable limits as per MoRTH guidelines.

The existing pavement along the project corridor is flexible in nature. The pavement

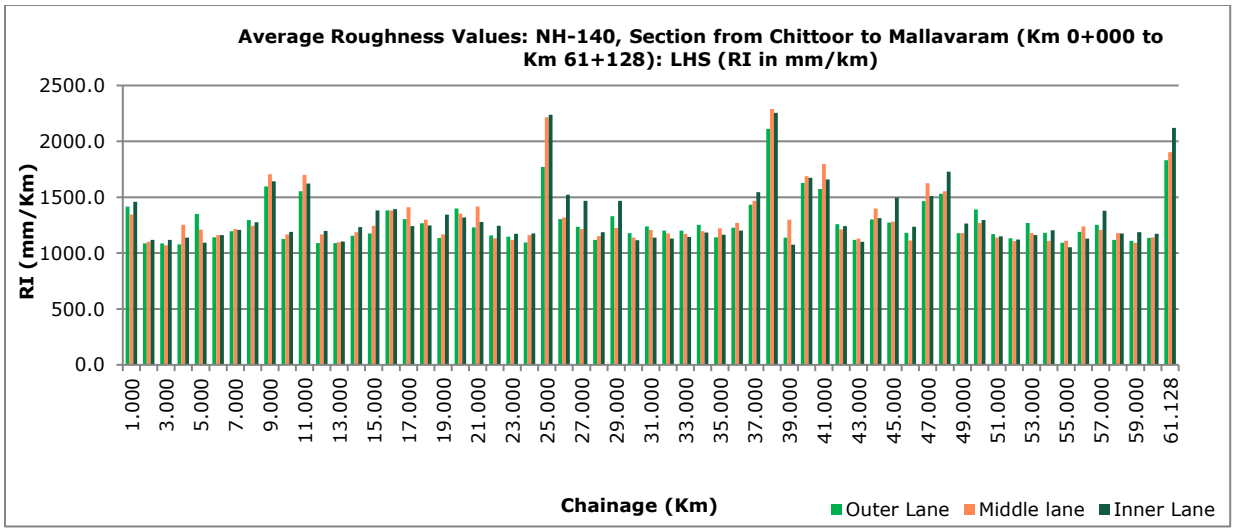
composition comprises of bituminous layer, granular base over the granular sub-base. Summary of existing pavement crust thickness is presented in an illustrative bar graph below.



1.9 Pavement Evaluation

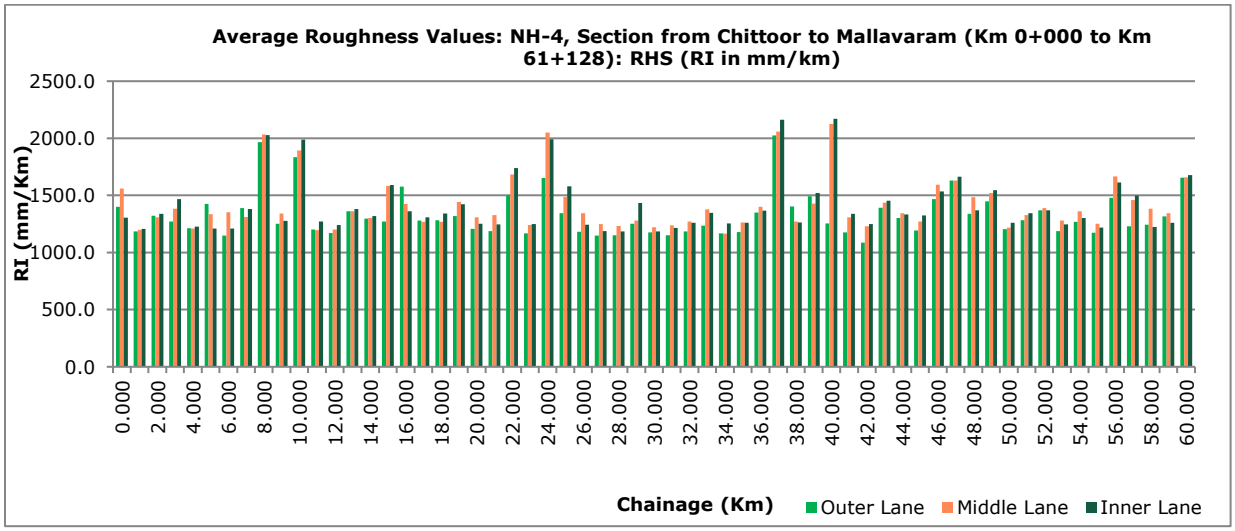
Pavement condition survey was carried out on each lane of each carriage way with NSV. The obtained lane wise Roughness summary in terms of BI (mm/km) is illustrated below and in Chapter 10 for Main carriage way LHS and RHS respectively

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From Km 39+450 to Km 40+700, due to land availability issues survey was not carried out

Illustrative summary of roughness for LHS direction



From Km 39+450 to Km 40+700, due to land availability issues survey was not carried out.

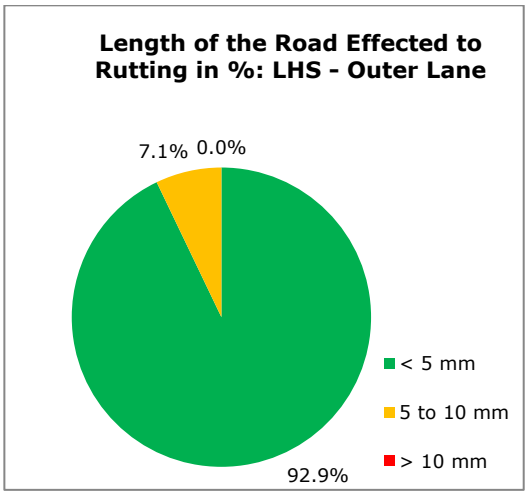
Illustrative summary of roughness for RHS direction

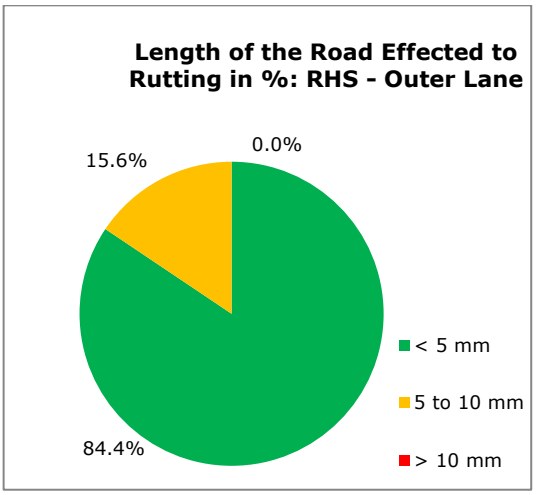
As per Schedule-B of TOT Schedule clause 3.1 (III) Repair and Rehabilitation of Pavement - a Roughness of <2750 mm shall be maintained by the existing HAM Concessionaire prior to handing over to InVIT Concessionaire. After O&M handover of project stretch to InVIT, the InVIT concessionaire shall maintain the roughness level at <2750mm, however after a functional overlay (Roughness exceeding 2750 mm) or structural overlay (FWD Test) is provided in any particular stretch length then that particular length shall be maintained at a roughness level mentioned in Schedule F after that overlay. For clarification, InVIT concessionaire shall maintain a roughness level (mentioned in Schedule F) in a stretch length where overlay (Structural or Functional) has been provided by InVIT concessionaire.

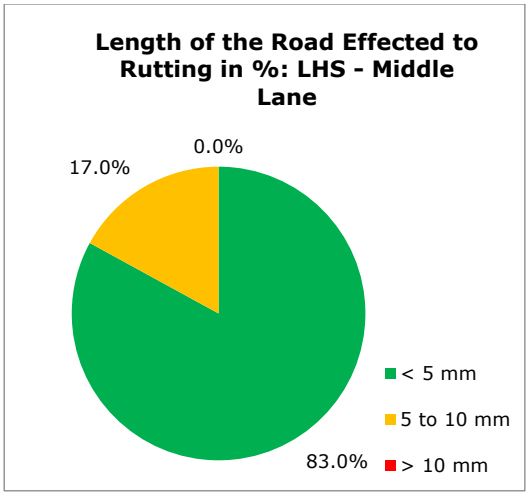
Rutting data of flexible pavement section for MCW is also collected through Digital Laser Profilers System (DLP). The obtained lane wise rutting summary is graphically represented for both LHS & RHS direction

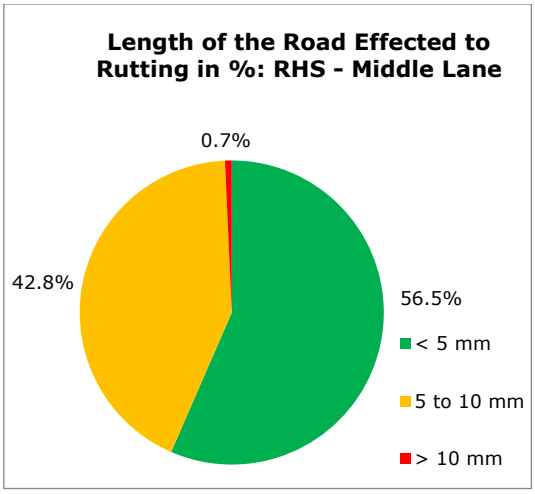
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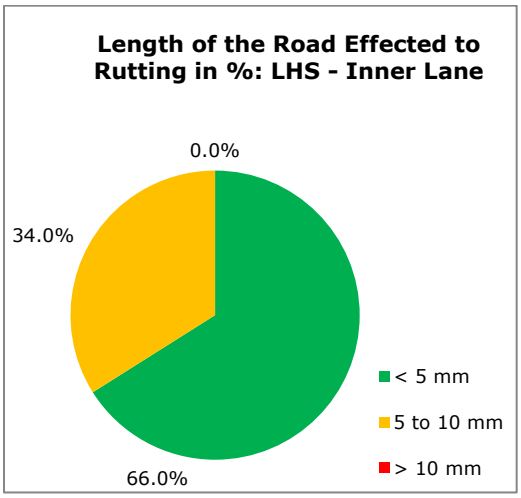
as below and detailed in Chapter 10. In LHS direction rutting value is within desirable limit only (not more than 10mm) and in RHS middle lane direction a length of 0.420km rutting is more than 10mm.

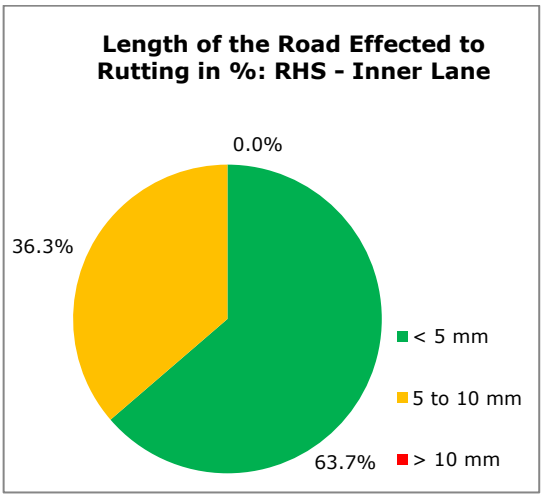












**From Km 39+450 to Km 40+700, due to land availability issues survey was not carried out.*

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Illustrative summary of rutting for Chittoor to Mallavaram

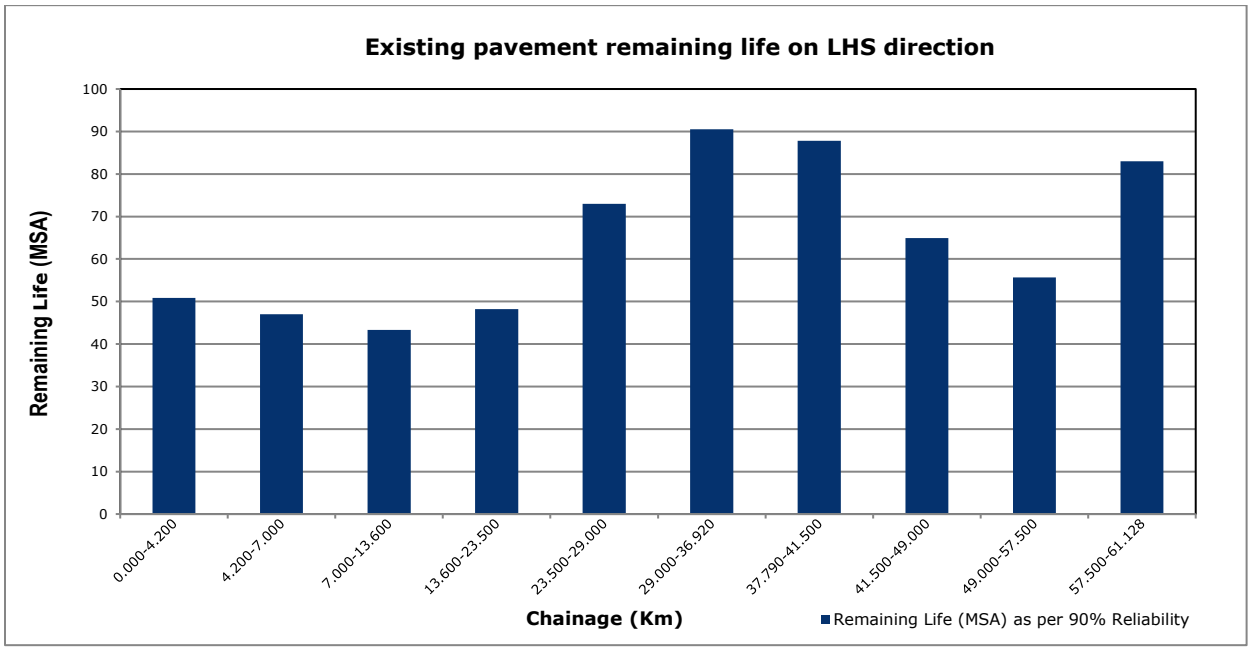
In Main Carriageway, on RHS direction at few location rutting and cracks were observed, apart from this overall section is good. The rigid pavement at RUB and Toll plaza is good, few slabs have cracks and spalling as observed. In Service Road, pavement condition is good in both directions.

FWD deflection measurement has been carried out for each carriageway to evaluate the pavement structural strength and analysis of remaining life of project is carried out in conformity with IRC: 115-2014 and presented in Chapter 10 of this report.

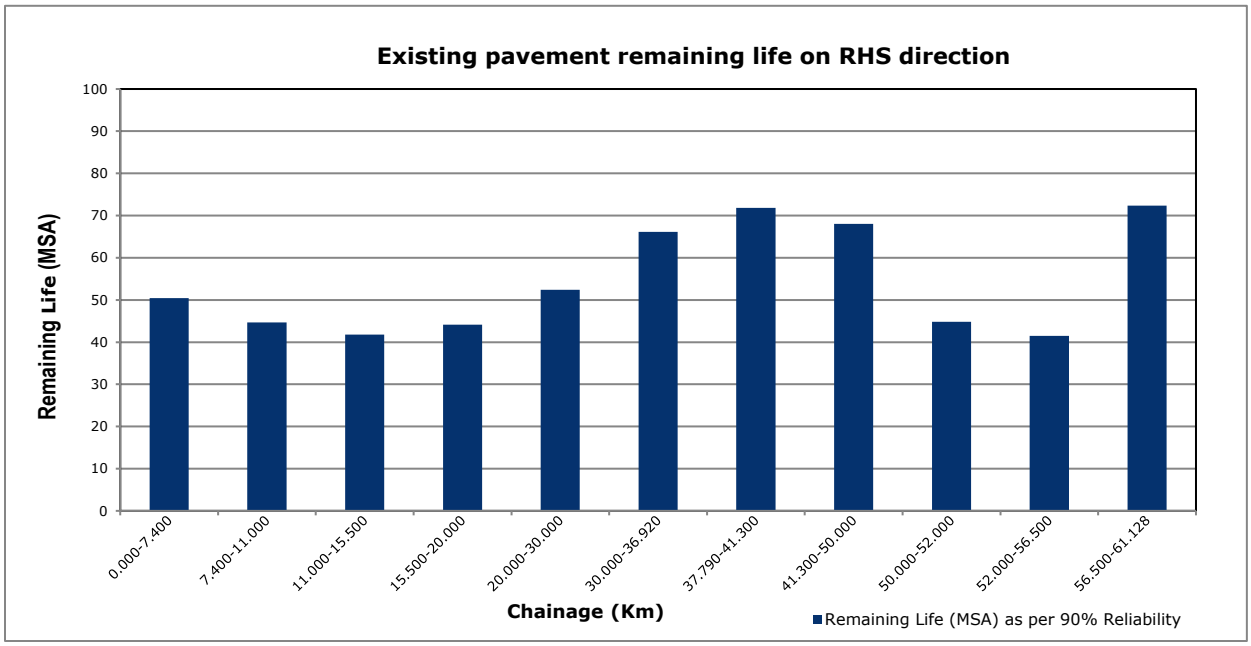
Analysis of Flexible Pavement and graphical presentation:

FWD deflection measurement has been carried out for each carriageway to evaluate the pavement structural strength and analysis of remaining life of project in conformity with IRC: 115-2014. The in-service three-layer pavement system has been analysed with the back-calculated corrected layer moduli and layer thicknesses. From the performance criteria equations, the residual/remaining rutting and fatigue life have been estimated. Remaining life and required overlay are calculated as per 90% reliability.

The detailed analysis is presented direction wise in Chapter 10 and the obtained remaining life are graphically presented below:

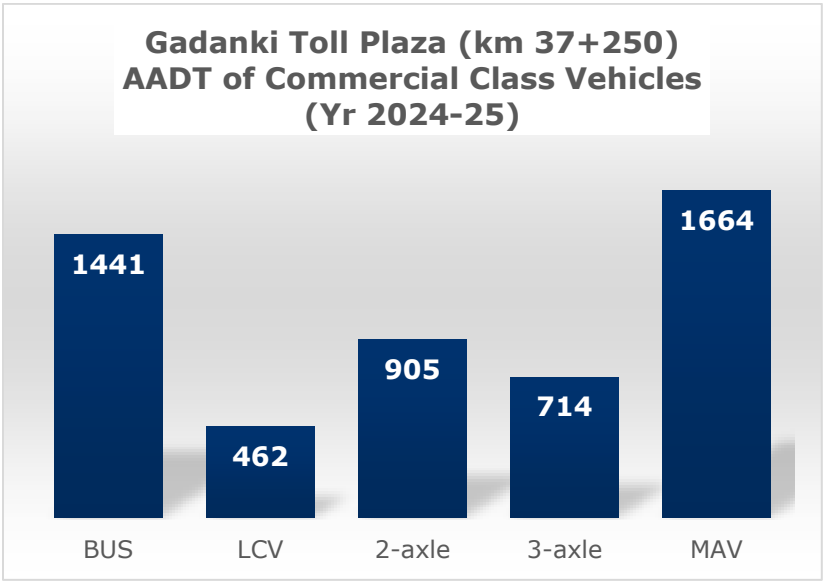


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Illustrative summary of remaining life of 6 lane pavement for Chittoor to Mallavaram

Team for Technical Due Diligence conducted a 7 days axle load survey at the toll plaza location. The Annual Average Daily Traffic (AADT) of all commercial class vehicles as provided by the client is shown below



VDF values are obtained as per the analysis of 7 days axle load survey are presented below:

Location/ Vehicle Type		BUS	LCV	2axle	3axle	MAV
NH-140: (Gadanki Toll Plaza-37+320)	LHS	1.175	0.818	3.343	3.943	8.221
	RHS	1.210	0.629	2.676	6.812	10.620

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AADT was provided by client and 5% growth rates are considered on year, and the design traffic was projected for next 10 years (YR 2035-36). Design traffic for flexible pavement design is computed and shown below

Location	Design Traffic (MSA) up to YR 2035-36	
	LHS	RHS
NH-140: Chittoor to Mallavaram (Km 0+000 to Km 61+128)	31	39

The Remaining life of existing pavement is more than the design traffic hence, overlay is not considered in any flexible pavement section of Chittoor to Mallavaram.

1.10 Operation and Maintenance Requirements and Strategy

The Contractor and concessionaire shall always maintain that during the Operation Period, the Project Highway conforms to the maintenance requirements set forth in Schedule K (the "Maintenance Requirements" of HAM Concession Agreement) and in Schedule F (the "Maintenance Requirements" of TOT Concession Agreement)

A. Schedule K of the HAM CA
B. Schedule F of the TOT CA

Distresses develop in flexible pavements are described with severity index, and repairing measures are given in Chapter 11. All appropriate technical and contractual parameters are careful reviewed to formulate the strategy of immediate repair and rehabilitation for the existing distresses and roughness. The quantities estimated for each lane are presented in Chapter 11.

The Major Maintenance Strategy is assessed in 2 scenarios based on engineering practice and HDM-4 model. The recommended Major Maintenance Strategy till the end of TOT concession period is presented below and also elaborated in Chapter 11.

Major/Periodic Maintenance Strategy

Flexible Pavement

NH-140, Section from Chittoor to Mallavaram (Km 0+000 to Km 61+128)			
Year	**Description**	**Main Carriageway**	**Service Roads**
YR 2036 (10.05.2036 Handover Date)	-	Maintenance by the on-going concessionaire	
YR 2040-2041 & YR 2041-2042	1st Renewal Layer	40mm BC in 100% length in Both direction 50mm DBM in 10% length on both direction with milling.	30mm BC in 100% length and 50mm DBM in 10% length on both direction with milling.
YR 2044-2045	2nd Renewal Layer	Micro surfacing in 100% length in Both direction	

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1. Modified bitumen is recommended for BC overlay works on Main Carriageway.
2. VG-40 grade bitumen is recommended for DBM rehabilitation works on Main Carriageway.
3. VG-40 grade bitumen is recommended for service roads

1.11 Cost Estimate

The cost estimate is worked out for expenses on Immediate Works (CAPEX) and expenses on operations and maintenance (OPEX) at present rates considering 2024-25 as the base year and is detailed in Chapter 12. The costs for Admin, SPV, IE, and other office expenses are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation. Cost Estimate is worked out for expenses on

i. The costs for the restoration / improvement of the Toll Plaza (civil cost) is accounted for Capex (Initial Improvement works). Installation/restoration of Sign Board, Thermoplastic / Transverse Bar Marking on pavement, Installation/restoration of 5th, KM, HM, Boundary Stone, Painting of Kerb Stone, etc. are taken as Preventive Maintenance which is to be executed by TOT Concessionaire
ii. Highway Lighting, Tolling operations, Survey, Insurance Charges, Administrative Expenses, Incident management, AMC cost for TMS & ATMS – is included as Operational cost for TOT Concessionaire.
iii. Routine Maintenance and Repairs – to be done by HAM Concessionaire till their end of HAM concession period, and thereafter by TOT Concessionaire till FY 2044-45 (End of Concession period of TOT Concessionaire).
iv. Periodic Maintenance - to be executed by HAM Concessionaire till their end of HAM Concession, and then by TOT Concessionaire till FY 2044-45 (handing over of the project).
v. Immediate repair of pavement & structures– not included in the cost estimate as it is to be executed by HAM concessionaire as per the maintenance requirements stipulated in their Agreement.
vi. Bitumen has been assumed to be sourced from IOCL Chennai Refinery. The distance (to & fro) from the midpoint of Project Highway is taken as 182 km. Modified Bitumen and VG-40 grade bitumen is considered in cost estimate.

Initial improvement works is estimated as INR 6.55 Crore.

Periodic Maintenance is estimated as INR 251.51 Cr.

Routine maintenance cost is INR 47.69 Cr.

Operational cost till end of concession for this 61.128 km stretch is INR 389.37 Cr.

Capex, Periodic Maintenance and Opex for this 6-lane corridor is estimated till end FY 2044-45 as INR 647.43 Cr.

2. INTRODUCTION, APPROACH AND METHODOLOGY

National Highways Infra Investment Managers Private Limited have entrusted Ramboll India Private Limited for conducting technical due diligence study for 61.128 km long National Highway corridor comprising six lane section of NH-140 between Chittor to Mallavaram in the State of Andhra Pradesh.

Accordingly, Ramboll team has undertaken the work of preparing Technical Due Diligence Report based on study of project related reports and documents, visual inspections, and field investigations.

2.1 Scope of Work and Compliances

The scope of work agreed with National Highways Infra Investment Managers Private Limited for conducting the technical due diligence study is presented in Table 2-1. The table also presents the chapters of the Technical Due Diligence Report where different items of scope of work are covered.

Table 2-1: Scope of Work and Compliances

SN	Scope of Work	Discussed At
1	**Site Visit and Pavement condition Survey – Visual Assessment** Site visit will be undertaken by Highway and Structural Engineers, Pavement Expert, Quantity Survey Experts, TMS & HTMS Expert and engineers to have visual assessment done for the project stretch. Observations will be recorded and critical issues for the Project will be identified and red flagged. Project Structural integrity issues that require rectification / re-mediation will be observed and recorded along with possible risk mitigation strategy & costing thereof. The Consultant shall carry out a detailed reconnaissance of the project area and shall record and highlight important features and point out any issue that may be of importance to the Client in terms of operation and maintenance of the project.	Chapter 3, 5, 6, 7
2	**Conducting inventory, condition surveys and Field Investigations for Project Road** Inventory and detailed condition surveys will be conducted for project highway, bridges & cross drainage structures, project assets, safety appurtenances, TMS & ATMS system including recommendation for either strengthening / rehabilitation or reconstruction / replacement. *Requirements for NDT tests will be identified and informed. Based on the preliminary investigations and walk-through along the stretch, the Consultant shall prepare a project road map indicating the following elements Inventory of existing project assets Existing pavement condition – kilometer-wise (along with Photographs thereof) Intersecting/Crossroads (along with Photographs thereof); Inventory and condition assessment of CD structures (along with Photographs thereof). Condition assessment of pavement.	Chapter 3, 5, 6, 7, 9

SN	Scope of Work	Discussed At
	Condition assessment of structures. Review the extent of balance work. The Consultant should prepare a photo-documentation (Soft copy) of the mentioned areas and any other important findings. The Consultant shall assess the adequacy of Operations &Maintenance, Toll Management System and Advanced Toll Management system. The following field investigations will be carried out for the project stretch. Falling Weight Deflectometer (FWD) Surveys NSV Survey Test Pit investigations. Axle Load Surveys Bridge Inspection by MBIU (For Major Structures - length of structure >60m)	
3	**Review of available Project Documents and Reports** The available reports (Concession Agreements, Approved Pavement design report, Monthly Progress Reports, As-built Drawings, Correspondences of stake holders, Asset Management Contracts, Maintenance Manuals, Maintenance history etc) will be reviewed. The Consultant shall assess the completion status of work Vis-à-vis compared with schedule B, C and Schedule D	Chapter 3, 4, 5, 6, 7, 8
4	**Review of construction material and quality, Rehabilitation Plans by Developing strategy for immediate/periodic maintenance.** The Consultant should review of Quality of construction and compaction based on available data and from Laboratory testing of samples collected from trial pits. The Consultant should conduct visual inspection of expansion joints and bearings etc of the structures to assess the condition and requirements for its repair, replacements and / or rehabilitation. The pavement stretches along with the type of distresses will be identified analysing NSV and FWD data. The Consultant should assess maintenance cycles for pavements using HDM analysis. Repair techniques will be suggested for stretches requiring immediate rehabilitation measures. Pavement maintenance strategy (functional overlay/ structural overlay) will be developed for the entire concession period to bring back riding quality of each lane of the carriageway to maximum permissible as stipulated in the Concession Agreement.	Chapter 5, 6, 7, 9, 10, 11
5	**Preparation of BoQ and Cost Estimate**	Chapter 12

SN	Scope of Work	Discussed At
	Bill of Quantities will be prepared for Immediate repairs, Routine maintenance, Periodic/major maintenance, O&M Cost, and Improvement works as per Schedule B of the CA. O&M cost will involve Routine maintenance and Incident Management, Tolling Operations, Admin Expenses and Preventive Maintenance. The Consultant should provide cost till the end of the concession period including any expected extension of Concession periods as informed by the Client. For assessing the cost, Ramboll will use rates available in the market or from the inhouse data base.	

2.2 Deliverables and Timelines

The deliverables and the timelines for the study are as under:

SN	Deliverables	Time period
1	Submission of Red Flag Report /critical issues	Within 14 days from commencement of site visit.
2	Submission of Draft Report	Within 6-7 Weeks from the date of receipt of LOA or all data whichever is later
3	Submission of Final Report	Within one week from the date of receipt of comments from Client or within two weeks from the date of submission of draft report

The above timelines assume that all project related data are available at the start of work.

2.3 Structure of the Report

In line with the requirements of agreed scope of work, this Technical Due Diligence Report is being submitted. The report is organised in the following fashion.

Chapter 1	**Executive Summary:** The chapter presents an overview of the project after review & study of documents, site investigations and estimates for maintenance.
Chapter 2	**Introduction, Approach and Methodology:** The chapter presents a brief approach and methodology adopted for carrying out the Due Diligence Study.
Chapter 3	**Project Description:** The chapter summarises the project features based on Concession Agreement requirements.

Chapter 4	**Review of Existing HAM Concession Agreement:** This chapter contains a short review of the existing HAM CA of the package.
Chapter 5	**Assessment of Project Assets - Highway:** The chapter presents the details of various essential features of the project highway recorded through reconnaissance survey and data obtained through NSV Survey.
Chapter 6	**Assessment of Project Assets - Structures:** The chapter presents the details of various essential features of the structures recorded through visual inspection and by using MBIU.
Chapter 7	**Assessment of Project Assets – Toll Management Systems:** The chapter presents the details of various essential features of the Toll Plaza Systems and associated facilities recorded through visual inspection.
Chapter 8	**Review of Existing O&M Contracts and Maintenance Manuals:** The chapter contains a short review of the O&M obligations of existing HAM Concessionaire.
Chapter 9	**Soil and Material Investigation:** This chapter discusses the results of soil and material tests carried out for the project stretch.
Chapter 10	**Pavement Evaluation Studies:** This chapter describes the tests carried for pavement evaluation and analyses of the test results.
Chapter 11	**Development of O&M Strategy:** The chapter presents the details of O&M strategy developed based on the Pavement evaluation studies and analysis described in Chapter 10.
Chapter 12	**Cost Estimate:** The chapter outlines the key assumption considered for cost estimate and provides details of cost estimates under various heads viz immediate, O&M and major maintenance for the concession period.

2.4 List of Shared Documents of the project.

Documents shared by National Highways Infra Investment Managers Private Limited for Technical Due Diligence of the project and Ramboll gathered data during site inspection from PIU - Tirupati, IE and contractors site office of this project under guidance of National Highways Infra Investment Managers Private Limited.

- Concession Agreement of the projects
- Technical schedule of Tolling, Operation, Maintenance & Transfer of the projects
- Projects under INVIT Round 4 - Prebid replies.

- Technical Due Diligence Report of the projects for effective implementation of asset Monetization program under TOT & InvIT with BOQ and cost estimate.
- As built drawings
- Letter on COD, PCOD
- Monthly maintenance Reports of IE
- Monthly Progress Report
- Asset Inventory
- MBIU survey Report
- FWD & NSV Report
- Safety Audit Report
- KMZ file
- Black Spot Report

2.5 Approach and Methodology

Our approach and methodology to address the requirements defined in terms of reference are briefly presented below.

- Identification of objectives of Client through detailed study of scope of work and discussions with the Client.
- Identification of Assignment specific team of professionals covering all the skills and specializations required and involving with the assignment from day one.
- A Team Leader is assigned to coordinate various events / activities of various team members.
- Assessment of data / information required is made at the time of Proposal / Engagement letter and the list is shared with the Client.

2.6 Study

The following briefly presents the process followed for the present study.

- The data available for the project are collected from site offices of PIU – NHAI and of respective Independent Engineers of three packages.
- The data is reviewed by the study team and information collated in different categories e.g., asset inventory, contracts, change of scope, communications from NHAI, maintenance strategy and maintenance costs etc.
- Data gaps are identified through the above process and communicated to the Client.
- Detailed review of all the available data is carried out.
- Site visit is made by team of experts to understand the project features and observations are recorded.
- Field tests are carried out as per agreed scope of work.
- The test results are analysed in detail and maintenance strategies are developed.

- Inferences are made on various items of scope of work based on the available data and compared with the requirements of existing concession Agreement. Issues are flagged wherever required.
- The costs associated with the project under various head (immediate, routine operation and maintenance and Major Maintenance) are worked out in accordance with the requirements of existing Concession Agreement under current scenario.
- Finally, a comprehensive report is prepared covering all aspects of the agreed scope of work.

2.7 Delivery

Delivery follows the following flow:

- Formats of agreed deliverables are formalized and shared with Client, wherever required.
- Deliverables are shared with the Client within agreed timelines.

2.8 Feedback

Regular and end-of-the-assignment feedback are obtained from the client for further enhancing the quality of service.

3. PROJECT DESCRIPTION

The Government of India had entrusted to National Highways Authority of India (NHAI) the development, maintenance, and management of National Highway No. 4 and 140 (Old NH-4) which includes.

> Six laning of NH-140 from Chittor (Design km 0.000/Existing km 158.000 of NH-4) to Mallavaram (Design km 61.128/Existing km 41.800 of NH-140) (Design Length = 61.128 km) under Bharatmala Pariyojana on Hybrid Annuity Mode.

The Authority had invited proposals by its Request for Proposal for above package. After evaluation of the bids received, the Authority had accepted the bid of the selected bidder and issued its Letter of Award No. NHAI/Tech/ AP/NH-140/Cht-Mal/2017-18/115166 dated 26.03.2018 for the package.

Provisional Completion Certificate of the project is achieved on 10 May 2021.

Completion certificate of the project is issued on 08 June 2021.

Project Highway is under Operation and Maintenance as per provisions of the existing HAM Concession Agreement. Existing Concessionaire shall operate and maintain the project up to O&M Handover date, 10 May 2036, pursuant to and in accordance with the existing HAM Concession agreement

Further, National Highways Authority of India (NHAI) has setup InvIT to monetize its completed and operational national highways projects with the objective of mobilizing additional resources through capital markets. Accordingly, National Highways Authority of India (NHAI) ("the Sponsor") set up National Highways Infra Trust ("the Trust") as an irrevocable infrastructure trust. The Investment objectives of the Trust are to carry on the activities of, and to make investments, as an Infrastructure Investment Trust. National Highways Infra Investment Managers Private Limited ("NHIIMPL") is a Private Limited Company set up to act as the Investment Manager to the Infrastructure Investment Trust ("InvIT") and is the Investment Manager of the National Highways Infra Trust ("NHIT" or "Trust"). NHIIMPL is, responsible for all the decisions in relation to the day-to-day management and administration of InvIT assets and the investments of the trust as may be incidental or necessary for the advancement or fulfilment of the investment objectives of the trust in accordance with the InvIT Regulations. NHIPMPL or "Project Manager" was incorporated as a private limited company as a wholly owned subsidiary of NHAI. The Project Manager (will undertakes operations and maintenance of the Assets, including making arrangements for maintenance of the assets held by the Trust.

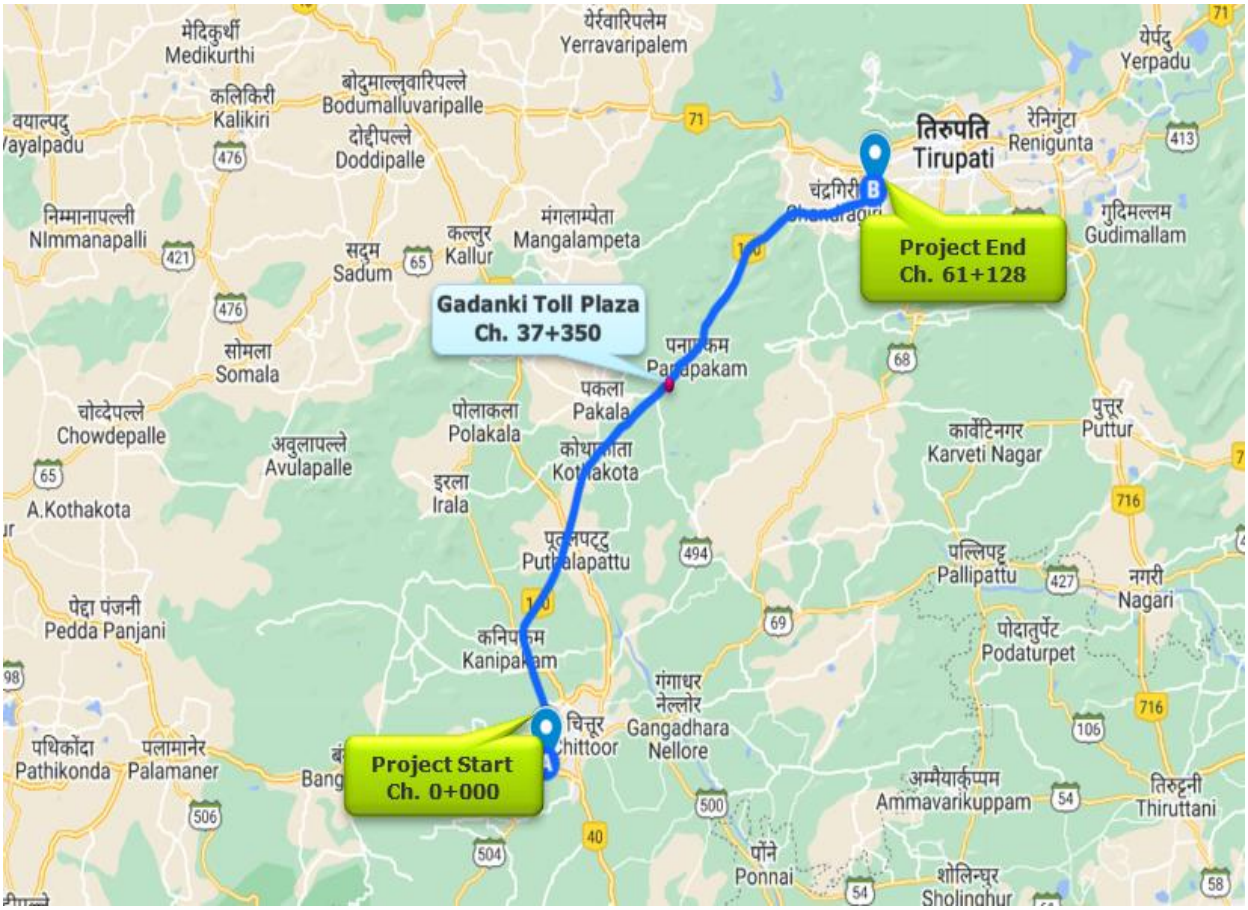


Figure 3-1: Location Map of Project Stretch

3.1 Terrain

The project road generally passes through plain terrain. The land use along the project stretch is mixed type with agricultural land and built up areas having few commercial zones. The project falls under seismic zone 2.

3.2 Right of Way

The right of way (RoW) available in the project is 60m as specified in Schedule A & B of the agreement.

3.3 Administrative Details of the Project

Administrative details of the project are listed below.

Table 3-1: Administrative Details of the Project

Particulars	Project
Project Name	Six laning of NH-140 from Chittor (Design km 0.000/ Existing km 158.000 of NH-4) to Mallavaram (Design km 61.128/ Existing km 41.800 of NH-140) (Design Length = 61.128 km)
Mode of the Execution (BOT Toll/ BOT Annuity/ EPC/ HAM/ Others)	Hybrid Annuity Mode under Bharatmala Pariyojana
Project Phase	Tolling, Operation, Maintenance and Transfer
No. of Lanes/ Configuration	6 Lane divided carriageway
Length of the Project (in Km)	61.128 km
Client	NHAI
NH No.	NH-140
EPC Contractor / Concessionaire	KNR Tirumala Infra Private Limited
Total Project Cost	INR 1730.07 Crores
Independent Engineer (O&M Phase)	Lion Engineering Consultants Private Limited in association with Synergy Engineers Group Pvt. Ltd.
LOA	26 March 2018
Date of Signing of CA	09 May 2018
Appointed Date	04 January 2019
PCOD on	10 May 2021
Completion Certificate	08 June 2021
End Date of Concession period / Maintenance obligation for Latest EPC Contract	15 Years commencing from COD
O&M Handover date	10 May 2036
No. of Toll Plazas (Number and Location)	Toll Plaza: Gadanki Toll Plaza

3.4 Salient Features of the Project and Scope of Work

The salient features of the project and scope of work in accordance with Schedules B and C are presented in Table 3-2.

Table 3-2: Salient Features of the Project and Scope of Work

S.No.	Item - Features	Units	Section
1	Service Road	km	115.691
2	Bypasses	km	24.235
3	Major Intersections	Nos.	4
4	Minor Intersection	Nos.	61
5	Bus bay & Bus Shelters	Nos.	26
6	Truck Lay Bye	Nos.	4
7	Rest Area	Nos.	0
8	Toll Plaza	Nos.	1
	Toll Plaza lane	Nos.	12
9	Median Opening	Nos.	5
10	Street Light Poles	Nos.	448
11	High mast Lights	Nos.	15
12	Solar Blinkers	Nos.	13
13	Avenue Plantation	km	9.202
14	Median Plantation	km	52.612
15	Fuel station	Nos.	13
16	Sign Boards	Nos.	911
17	Gantry Sign Board	Nos.	20
18	Pedestrian Guard Rail	km	3.528
19	Rigid Concrete Barrier	km	36.577
20	W Beam Crash Barrier	km	17.684
21	Shoulder/Separator Drain	km	113.448
22	Earthen Drain/ Chute Drain	km	0.437
23	Median Longitudinal Drain	km	8.598
24	CCTV	Nos.	31
25	VMS	Nos.	4
26	Delineators	Nos.	1630
27	Object Hazard Marking	Nos.	898

S.No.	Item - Features	Units	Section
28	**Chevrons**	Nos.	165
29	**Road Studs**	Nos.	14258
30	**Foot Path**	km	43.911
31	**Entry/ Exit**	Nos.	20
32	**5th Kilometer Stones**	Nos.	22
33	**Km Stones/Ordinary KM stones**	Nos.	96
34	**Hectometer Stones**	Nos.	411
35	**Kerb**	km	225.974

List of structures on the Project Highway

Sl. No.	Structure type	Number of structure in this stretch
1	Major Bridges	6
2	Minor Bridges	23
3	RUB	1
4	ROB	-
5	Overpass	-
6	VUP	10
7	LVUP	5
8	PUP/CUP	-
9	FOB	2
10	HP Culvert	15
11	Box Culvert	100
12	Slab Culvert	-

3.5 Specification and Standards

For 6 lanes on NH 140 from Km 0+000 at Chittoor to km 61+128 at Mallavaram intersection.

Six - Laning of the Project shall conform to the Manual of Specifications and Standards for Six - Laning of Highways through Public Private Partnership published by the IRC (IRC: SP: 87 -2013).

Deviations from the Manual

Notwithstanding anything to the contrary contained in the aforesaid Manual, the following Specifications and Standards shall apply to the construction of the Project Highway, and for purposes of this agreement, the aforesaid manual shall be deemed to be amended to the extent set forth below:

Table 3-3: Deviation and Reference for Package

Sl. No.	Clause as given in the Manual	Description	Provision as per Manual	Deviations / Modified Provision
(i)	2.17	Typical cross section for 6-lane divided highway in open country in plain/ rolling terrain with service roads on both sides and with raised median for a new 6-lane construction	Fig. 2.5	Fig. 2.5A
(ii)	2.17	Typical cross section for 6-lane divided highway in open country in plain/ rolling terrain with service roads on both sides and with raised median for a new 6-lane construction	Fig. 2.5	Fig. 2.5B
(iii)	2.17	Typical cross section for 6-lane divided highway in open country in plain / rolling terrain with service roads on both sides and with raised median for a new 6-lane construction	Fig. 2.5	Fig. 2.5C
(iv)	2.17	Typical cross section for 6-lane divided highway in built-up section in plain and rolling terrair with service roads on both sides and with raised median.	Fig. 2.8	Fig. 2.8A
(v)	7.3(ii)	Cross Section of bridge at deck level	Fig. 7.3 Main Carriageway (2X13.40m): [10.50m carriageway + 1. 5 m paved shoulder + 2x0.25m shyness + 2x0.45m crash barrier] Service Road (2X10.20m): [7.0m carriageway + 2x0.25m shyness + 2x0.45m crass barrier + 1.5m footpath + 0.3m Railing)	Fig. 7.3 A Main Carriageway (2X14.00m): [10.50m carriageway + 1.5 m paved shoulder + 2x0.50m shyness + 2x0.50m crash barrier] Service Road (2X11.00m): [7.0m carriageway + 2x0.50m shyness + 2x0.50m crass barrier + 1.5m footpath + 0. 50m crash barrier)
(vi)	7.3(ii)	Cross section of bridge at deck level	Fig. 7.3 Main Carriageway (2X13.40m): [10.50m carriageway + 1. 5 m paved shoulder + 2x0.25m shyness + 2x0.45m crash barrier] Service Road (2X10.20m): [7.0m carriageway + 2x0.25m shyness + 2x0.45m crass barrier + 1.5m footpath + 0.3m Railing)	Fig. 7.3 A Main Carriageway (2X14.50m): [10.50m carriageway + 2.0 m paved shoulder + 2x0.50m shyness + 2x0.50m crash barrier] Service Road (2X11.00m): [7.0m carriageway + 2x0.50m shyness + 2x0.50m crass barrier + 1.5m footpath + 0. 50m crash barrier)
(vii)	7.3(ii)	Cross section of bridge at deck	Fig. 7.2 Main Carriageway	Fig. 7.2 A Main Carriageway

Sl. No.	Clause as given in the Manual	Description	Provision as per Manual	Deviations / Modified Provision
		level without service road	(2X15.20m): [10.50m carriageway + 1.5 m paved shoulder + 2x0.25m shyness + 2x0.45m crash barrier+ 1.5m footpath + 0.3m Railing]	(2X16.00m): [10.50m carriageway + 1.5 m paved shoulder + 2x0.50m shyness + 2x0.50m crash barrier+ 1.5m footpath + 0.5m crash barrier]
(viii)	7.3 (iv) (d)	Cross section of bridge at deck level with existing 2-lane bridge retained and construction of new 3-lane bridge and new 2-lane bridge	Fig. 7.5 Main Carriageway I (Existing Bridge) Main Carriageway II (11.70m): [7.0m carriageway + 1.5 m + paved shoulder + 2x0.25m shyness + 2x0.45m crash barrier + 1.5m footpath + 0.3m Railing] Main Carriageway III (15.20m): [10. 50m carriageway + 1.5m paved shoulder + 2x0.25m shyness + 2x0.45m crash barrier+ 1. 5m footpath + 0.3m Railing]	Fig. 7.5A Main Carriageway I (Existing Bridge) Main Carriageway II (10.50m): [7.0m carriageway + 1.5 m + paved shoulder + 2x0.50m shyness + 2x0.50m crash barrier] Main Carriageway III (14.00m): [10. 50m carriageway + 1.5m paved shoulder + 2x0.50m shyness + 2x0.50m crash barrier+ 1. 5m footpath + 0. 50m crash barrier] Service Road II (11.00m): [7.00m carriageway + 2x0. 50m shyness + 2x0.50m crash barrier + +1.5m footpath + 0. 50m crash barrier]
(ix)	7.3 (iv) (d)	Cross section of bridge at deck level with existing 2-lane bridge retained and construction of new 3-lane bridge along with Service Road bridges	Fig. 7.5 Main Carriageway I (Existing Bridge) Main Carriageway II (11.70m) [7.0m carriageway + 1.5 m + paved shoulder + 2x0.25m shyness + 2x0.45m crash barrier + 1.5m footpath + 0.3m Railing] Main Carriageway III (15.20m): [10. 50m carriageway + 1.5m paved shoulder + 2x0.25m shyness + 2x0.45m crash barrier+ 1. 5m footpath + 0.3m Railing]	Fig. 7.5B Main Carriageway I (Existing Bridge) Main Carriageway II (14.00m): [10. 50m carriageway + 1.5m paved shoulder + 2x0.50m shyness + 2x0.50m crash barrier+ 1. 5m footpath + 0. 50m crash barrier] Service Road I (11.00m): [7.00m carriageway + 2x0. 50m shyness + 2x0.50m crash barrier + +1.5m footpath + 0. 50m crash barrier] Service Road II (11.00m): [7.00m carriageway + 2x0. 50m shyness + 2x0.50m crash barrier + +1.5m footpath + 0. 50m crash barrier]
(x)	7.19	Cross Section of grade separated structures	Fig. 7.8 Main Carriageway (2X13.40m): [10.50m carriageway + 1.5 m paved shoulder + 2x0.25m shyness +	Fig. 7.8A Main Carriageway (2X14.50m): [10.50m carriageway + 2.0 m paved shoulder + 2x0.50m shyness +

Sl. No.	Clause as given in the Manual	Description	Provision as per Manual	Deviations / Modified Provision
			2x0.45m crash barrier]	2x0.50m crash barrier]
(xi)	7.18	Cross Section of RUB	Fig. 7.7 Main Carriageway (Existing) New Main Carriageway (2X11. 70): [7.0m carriageway + 1.5 m paved shoulder + 2x0.25m shyness + 2x0.45m crash barrier + 1.50m foot path + 0 30m railing]	Fig. 7.7A Main Carriageway (Existing) New Main Carriageway (2X9.80): [7.0m carriageway + 2.0 m paved shoulder + 2x0.40m shyness] New Service Road (2X9.80): [7.0m carriageway + 0.30m kerb stone + 2X0.50m shyness foot path + 1.50m raised walkway]

4. REVIEW OF EXISTING HAM CONCESSION AGREEMENT

SIX LANNING OF NH-140 FROM CHITTOOR (DESIGN KM 0.000/EXISTING KM 158.000 OF NH-4) TO MALLAVARAM (DESIGN KM 61.128/EXISTING KM 41.800 OF NH-140) DESIGN LENGTH = KM 61.128 IN THE STATE OF ANDHRA PRADESH UNDER - BHARATMALA PARIYOJANA ON HYBRID ANNUITY MODE

4.1 Brief Review of Concession Agreement

It may be noted that existing HAM Concession Agreement is primarily divided into Six parts and various Schedules that are available at the end of the CA. Contents of each of the Six parts and the Schedule is briefly mentioned below.

Part I Definitions and Interpretations

Addresses - the Definition and Interpretation, measurements and arithmetic conventions priority of agreements, clauses and schedules.

Part II The Concession

Scope of the Project: Scope of the Project

Grant of Concession: The Concession

Conditions Precedent: Conditions Precedent, damages for delay by the authority, damages for delay by the concessionaire comma commencement of concession period comma deemed termination upon delay.

Obligations of the Concessionaire: Obligations of the Concessionaire, obligations relating to project agreements, obligations relating to change in ownership obligations relating to employment of foreign nationals, obligations relating to employment of trained personnel, facilities or differently abled and elderly persons comma branding of project comma sole purpose of the concessionaire.

Obligations of the Authority: Obligations of the Authority, maintenance obligations prior to appointed date, obligations related to refinancing.

Representations and Warranties: Temptations and warranties of the concessionaire, representations and warranties of the authority, disclosure.

Disclaimer: Disclaimer

Part III Development and Operations

Performance Security: Performance security appropriation of performance security, release of performance security, reference to performance security, additional performance security, appropriation and release of additional performance security.

Right of Way: The site, licenses, access and right of way, procurement of site, site to be free from encumbrances, protection of sight from encumbrances, special temporary right of way, access to authority and independent engineer, geological and archaeological finding, land for wayside amenities.

Utilities, Associated Roads and Trees: existing utilities and roads, shifting of obstructing utilities, new utilities and roads, felling of trees.

Construction of project: Obligations prior to commencement of construction, drawings construction of the project, maintenance during construction.,

Monitoring of Construction: Monthly progress reports, inspection, tests, delays during construction, suspension of unsafe construction works, video recording.

Completion Certificate: Tests, completion certificate, provisional certificate completion of punch list items, withholding of provisional or completion certificate, rescheduling of tests.

Entry into Commercial Service: Commercial operation date, damages for delay.

Change of Scope: Change of scope procedure for change of scope, payment for change of scope, restrictions on certain works, power of authority to undertake works, reduction in scope of work, effect of change in scope on the O&M costs.

Operation and Maintenance: O&M obligations of the concessionaire, maintenance requirements, maintenance manual, maintenance program, safety, breakdowns and accidents, decommissioning due to emergency, project closure, damages for breach of maintenance obligations, authorities right to take remedial measures, overriding powers of the authority, restoration of loss of damage of property, modifications to the project, excused from performance of obligation, installation of operation of CCTV, advertising on the site.

Safety Requirements: Safety Requirements, expenditure on safety requirements.

Monitoring of Operations & Maintenance: monitoring status reports, inspection, tests, remedial measures, reports of unusual occurrence.

Regulation and Management: Traffic regulation by the concessionaire, police assistance, buildings for traffic aid posts, medical aid posts, buildings for medical aid posts, computer systems and network, recurring expenditure on police assistance, recurring expenditure on medical aid post.

Independent Engineer: Aappointment of independent engineer, duties and functions, remuneration, termination of appointment, authorized signatories, dispute resolution, interim arrangement.

Part IV Financial Covenants

Financial Close: Financial close, termination due to failure to achieve financial clause.

Payment of Bid Project Cost: Big project cost, adjust bid project cost, payment of bid project cost, payment during construction., bonus on early completion, annuity payments during operation., O&M payments, mobilization advance, treatment of incomplete works.

Escrow Account: escrow account, deposits into escrow account, withdrawals during concession., withdrawals up to termination.

Insurance: Insurance during concession., insurance cover, notices to the authority, evidence of insurance cover, remedy for failure of to ensure, waiver for subrogation, concessionaires' waiver, application of insurance proceeds, compliance with conditions of insurance policies.

Account and Audit: Audited accounts, appointment of auditors, certification of claims by statutory auditors, set off, dispute resolution.

Part V Force Majeure and Termination

Force Majeure: Force majeure, non-political event, indirect political event, political event, duty to report force measure event, effect of force measure event on the concession, allocation of costs arising out of force measure, termination notice for force measure event, termination payment for false measure event, dispute resolution, excuse from performance of obligations.

Compensation for Breach of Agreement: compensation for default of the concessionaire compensation for default of the authority comma mitigation of costs and damage.

Suspension of Concessionaire's Rights: suspension upon concessionaire default, authority to act on behalf of concessionaire, revocation of suspension, substitution of concessionaire, termination.

Termination: Termination for concessionaire default termination for authority default comma termination payment comma certain limitations on termination payment comma other rights and obligations of the authority comma survival of rights.

Divestment of Rights and Interest: Divestment requirements, inspection and cure, cooperation and assistance on transfer of project, vesting certificate, divestment cost etc.

Defects Liability after Termination: Liability for defects after termination retention in escrow account.

Part VI Other Provisions

Addresses - Assignment and Charges, Change in Law, Liability and Indemnity, Rights and Title Over the Site, Dispute Resolution, Disclosure, Redressal of Public Grievances, Miscellaneous and Definitions.

Schedules

A. Site of the Project,
B. Development of the Project Highway,
C. Project Facilities,
D. Specifications and Standards,
E. Applicable Permits,
F. Performance Security,
G. Project Completion Schedule,
H. Drawings,
I. Tests,
J. Completion Certificate,
K. Maintenance Requirements,
L. Safety Requirements,
M. Selection of Independent Engineer,
N. Terms of Reference for Independent Engineer,
O. Escrow Agreement,
P. Panel of Chartered Accountants,
Q. Vesting Certificate,
R. Substitution Agreement.

4.2 Operation and Maintenance

Operation and Maintenance as described under Article 17 and Schedule K need to be addressed during O&M period.

Article 17 – Operation and Maintenance

O&M obligations of the Concessionaire, Maintenance Requirement, Maintenance Manual, Maintenance Programme, Safety, breakdowns and accidents, De-commissioning due to Emergency, Project closure, Damages for breach of maintenance obligations, Authority's right to take remedial measures, Overriding powers of the Authority, Restoration of loss or damage to Project Highway, Modifications to the Project

Highway, Excuse from performance of obligations, Installation and operation of CCTV , Advertising on the Site.

Schedule K - Maintenance Requirements

Maintenance Requirements, Repairs of Defects and Deficiencies, Other defects and deficiencies, Extension of time limit, Emergency repairs/restoration, Daily inspection by the Concessionaire, Divestment Requirements, Display of Schedule – K, Repair/rectification of Defects and Deficiencies

5. ASSESSMENT OF PROJECT ASSETS – HIGHWAY

5.1 Service Roads/ Slip Roads

At 6-lane section of Chittoor–Mallavaram

The project includes service roads and slip roads constructed as flexible pavements. These roads are generally in good condition. However, there are some locations with pending land acquisition (LA) issues that are hindering the completion of construction work on the service roads.

Pavement markings are present on the service roads, but they are faded in some areas. The total length of service roads within this project package is 115.691 kilometers.

A detailed list of service and slip roads associated with the project highway can be found in Annexure 5.2.



Figure 5-1: Service roads. at 6-lane section of Chittoor–Mallavaram

5.2 Bypass

At 6-lane section of Chittoor–Mallavaram

There are two Bypasses (length 24.235 Km) in this package which are already constructed. Condition of the bypasses are good. Details of bypasses are listed in Annexure 5.3 and some photographs of the bypass are given below.

Confidential



Figure 5-2: Bypass. at 6-lane section of Chittoor–Mallavaram

5.3 Intersections

At 6-lane section of Chittoor–Mallavaram

There are 65 junctions along this package. Out of these, 04 are major junctions and 61 are minor junctions. All the junctions in this package are designed with flexible pavement, ensuring durability, enhanced performance, and reduced maintenance requirements over time. Comprehensive details about the major junctions are provided in Annexure 5.4, while information about the minor junctions is included in Annexure 5.5. Additionally, some photographs showcasing the condition and layout of the junctions are presented below for visual reference. These images help illustrate the status of the junctions along the stretch.



Confidential



Figure 5-3: Major Intersections at 6-lane section of Chittoor–Mallavaram



Figure 5-4: Minor Intersections at 6-lane section of Chittoor–Mallavaram

5.4 Bus bay and Bus Shelter

At 6-lane section of Chittoor–Mallavaram

Along this project stretch, there are a total of 26 bus shelters, which serve as essential infrastructure for public transportation. These shelters provide waiting areas for passengers and are strategically placed to meet the needs of commuters. Out of these 26 bus shelters, only 03 are equipped with dedicated bus bays. The bus bays ensure safe boarding and alighting of passengers while reducing the impact on the flow of traffic. The pavement condition of these bus bays has been observed to be satisfactory. However, it is important to note that none of the bus bay locations are equipped with lighting, which is a significant concern for passenger safety and convenience, especially during nighttime operations. Detailed information regarding the Bus Shelters and Bus Bays is provided in Annexure 5.6. To provide additional clarity, representative photographs showcasing the condition and features of these facilities are presented below.



Figure 5-5: Bus Bay and Bus Shelter at 6-lane section of Chittoor–Mallavaram

5.5 Truck lay bye

At 6-lane section of Chittoor–Mallavaram

There are 04 Truck lay byes, and all are operational on both side in good condition. Only 02 Truck lay byes have the facilities like lighting, Toilet block, water kiosk etc. The remaining 02 Truck Lay-byes lack these essential amenities, which could impact the comfort and utility for truck operators and drivers. Photographs showcasing the current condition of the Truck Lay-byes are included below for reference. The detailed locations of all Truck Lay-byes are provided in Annexure 5.7.



Figure 5-6: Truck Lay bye at 6-lane section of Chittoor–Mallavaram

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5.6 Toll Plaza

At 6-lane section of Chittoor–Mallavaram

As per the Concession Agreement, the project stretch includes 01 Toll Plaza, located at km 37.350, known as the Godanki Toll Plaza. This Toll Plaza is operational and serves as a key facility for revenue collection and traffic management.

The Toll Plaza is equipped with 6+6 lanes, configured as 5 regular lanes + 1 reversible lane on each side, ensuring efficient handling of traffic flow. The presence of reversible lanes provides flexibility to manage traffic volume during peak hours effectively. The Toll Plaza is operational with a Hybrid ETC (Electronic Toll Collection) system, enhancing the convenience of cashless toll transactions and reducing congestion. Facilities available at the Toll Plaza include:

- Canopy lighting for clear visibility.
- High mast lighting to ensure the plaza is well-lit during nighttime.
- Administrative building for operational management.
- Toilet blocks for staff and commuters.
- Tow-away cranes for clearing stranded or broken-down vehicles.
- Corridor management vehicles for quick response to emergencies or maintenance needs.
- Paramedical booth and ambulance services to address medical emergencies promptly.

The overall condition of the Toll Plaza is observed to be good, with all facilities functioning as intended. Detailed information regarding the Toll Plaza is provided in Annexure 5.9 and in Chapter 7 of this report. Some photographs of the Toll Plaza are included below to illustrate its status.



Figure 5-7: Toll Plaza At 6-lane section of Chittoor–Mallavaram

5.7 Median opening

At 6-lane section of Chittoor–Mallavaram

Median openings have been provided along the project highway in accordance with the scope stipulated in the Concession Agreement (CA) and based on the requirements of local authorities and dwellers residing along the corridor. These median openings are strategically placed to ensure accessibility while maintaining the safety and functionality of the highway. Currently, most of the median openings are temporarily closed using Concrete Jersey Barriers to manage traffic effectively and reduce the risk of accidents. This temporary closure may be reviewed and adjusted as per traffic flow and local requirements. A total of 05 median openings have been identified along the project stretch during the inspection. Details of all median openings, including their locations and specifications, are provided in Annexure 5.10. Some photographs illustrating the median openings, and their current status are presented below for reference.



Figure 5-8: Median Opening at 6-lane section of Chittoor–Mallavaram

5.8 Drainage System

At 6-lane section of Chittoor–Mallavaram

Adequate drainage arrangements have been provided along the project corridor to ensure proper water management and prevent waterlogging, which could potentially impact road safety and pavement durability. However, during the inspection, it was observed that at a few locations, the drainage systems—both roadside drains along the highway and lined drains at the median and shoulder—require appropriate maintenance. Specific issues include - accumulation of debris and blockages in the drainage channels, overgrowth of vegetation, obstructing water flow inefficient outlets, which need to be cleared or improved to ensure proper functionality of the drainage system.

Timely cleaning and maintenance of these drainage systems are essential to keep them fully operational and effective. Despite these localized issues, the overall condition of the drainage systems is assessed to be good. A detailed list of the Drainage Systems, including their locations and specific observations,

is provided in Annexure 5.11. Additionally, illustrative photographs showcasing the current status of the drainage arrangements are presented below for reference.



Figure 5-9: Drainage system.at 6-lane section of Chittoor–Mallavaram

5.9 Traffic Signage

At 6-lane section of Chittoor–Mallavaram

Road signs along the project highway are an integral part of traffic management and safety. These include a variety of sign types strategically placed to guide, warn and inform road users. Traffic signs- Installed along the shoulders of the highway for easy visibility. Overhead Gantry Mounted signs- Positioned above the road to convey critical information to all lanes. Kerb-mounted signs- Located at the road edges for local guidance. Median signs- Installed along the median to provide additional information and visibility to drivers.

In total, there are: 911 Sign Boards installed along the stretch, 06 Overhead Gantry Mounted Signs, placed at key locations, 14 Cantilever Gantry Signs, designed for directional and warning purposes. Most of these signs are physically in good condition, effectively serving their purpose. However, periodic inspections and maintenance are essential to ensure their continued effectiveness, especially regarding visibility and structural stability.

Detailed information about the Sign Boards is available in Annexure 5.12, while details of the Overhead Gantry Signs and Cantilever Gantry Signs are provided in Annexure 5.13. Additionally, photographs illustrating the various types of signage along the highway are included below for reference.

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Figure 5-10: Traffic Signs Boards at 6-lane section of Chittoor–Mallavaram

5.10 Highway lighting

At 6-lane section of Chittoor–Mallavaram

Street lighting has been installed at various locations along the project stretch, focusing on built-up areas (urban regions), VUPs (Vehicle Underpasses), Truck Lay-byes, Bus Bays, Toll Plazas, and Major Junctions as stipulated in the concession agreement. This lighting system is crucial for ensuring visibility, safety, and efficient traffic management, particularly during nighttime or adverse weather conditions. The streetlights are mounted on 10-meter high single or double-arm posts, equipped with LED lights, known for their energy efficiency and long lifespan. Additionally, Canopy lighting and High Mast lighting are provided at strategic locations such as Toll Plazas and major junctions to ensure proper illumination across the entire area. These lighting systems have been properly maintained and are currently in good working condition, effectively fulfilling their role in enhancing safety and visibility along the highway. Details of the Highway / Street Lighting system, including locations, are provided in Annexure 5.15 to Annexure 5.16 in tabular form. Photographs of the street lighting installations are also included below for reference.

In addition to the streetlights, Solar Blinker Signals have been installed at Foot Over Bridge (FOB) locations, Railway Underpasses (RUBs), junctions and at the Project Start-End points. These signals are designed to improve visibility and alert drivers to critical locations, ensuring better safety, especially at these high-risk points. A comprehensive list of the Solar Blinker Signals on the project stretch is provided in Annexure 5.17, with detailed information on their locations and operational status. Photographs of the solar blinker signals are included below to illustrate their placement and functionality.



Figure 5-11: Highway Lighting at 6-lane section of Chittoor–Mallavaram

5.11 Plantation (Median/Avenue)

At 6-lane section of Chittoor–Mallavaram

The Avenue Plantation along the project highway has been observed to be inadequate, with plantation found only at a few locations intermittently along the stretch. This may require further development or enhancement in certain areas to improve the aesthetic value, environmental benefits, and overall green cover along the highway. On the other hand, Median Plantation is present along the entire project highway and consists of a variety of plants, providing both functional and aesthetic value. The median plantation serves to enhance the visual appeal of the highway while also contributing to environmental sustainability. The condition of the median plantation across the entire stretch is found to be good, with the plants appearing healthy and well-maintained. A detailed list of the Plantation along the project stretch, including both Avenue and Median Plantation, is provided in Annexure 5.18 (for Avenue Plantation) and Annexure 5.19 (for Median Plantation). Some photographs showcasing the plantation areas are presented below for reference.



Figure 5-12: Plantation (Median/Avenue) at 6-lane section of Chittoor–Mallavaram

5.12 Metal Beam Crash Barriers

At 6-lane section of Chittoor–Mallavaram

Metal Beam Crash Barriers have been installed at various critical locations along the project stretch to enhance road safety and prevent accidents. These barriers are provided at the main carriageway, ensuring protection for vehicles and pedestrians, Underpasses, where there is potential for high-speed traffic and limited visibility, approaches to structures, including intersections to minimize the chances of vehicle collisions, locations with high embankments on the Service Road inner side where vehicles are more likely to veer off course. It is also observed that Thrie-beam Crash Barriers have been installed at built-up locations, providing additional safety features to accommodate higher traffic volumes and ensure better protection for road users.

A detailed list of all the Metal Beam Crash Barriers installed along the project stretch is provided in Annexure 5.20. Below are some photographs of the Metal Beam Crash Barriers, showing their locations and condition along the stretch.



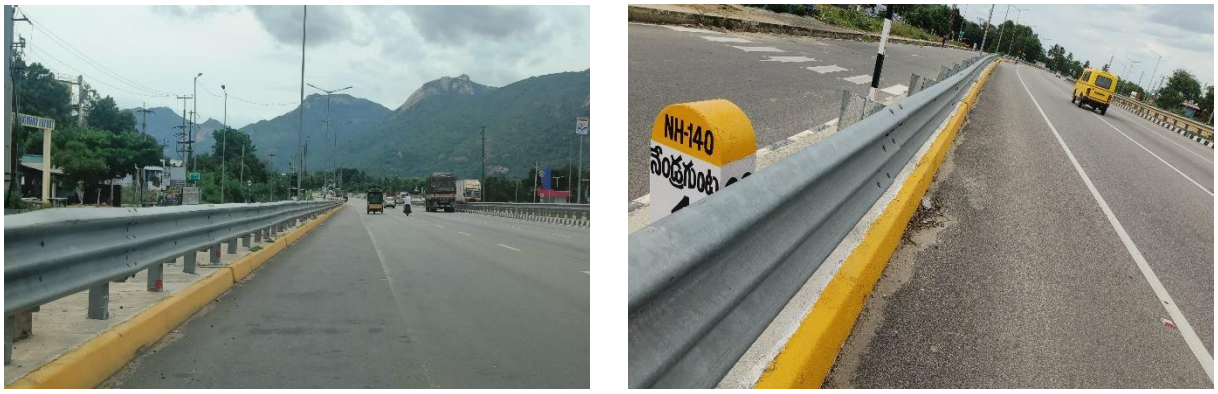


Figure 5-13: Metal Beam Crash Barriers at 6-lane section of Chittoor–Mallavaram

5.13 Fuel Station

At 6-lane section of Chittoor–Mallavaram

Fuel stations along the Project Stretch and access arrangement for the same has been captured during Visual Inspection Inventory survey. The details are listed in Annexure 5.25. Photographs are presented below.



Figure 5-14: Fuel stations at 6-lane section of Chittoor–Mallavaram

5.14 Kilometre stone/Hectometre stones

At 6-lane section of Chittoor–Mallavaram

Kilometre 5th Stones, Kilometre Stone and hectometre stones are visible along the stretch and are in good condition. However, some of the hectometre stones are found uprooted / script is faded which requires repaint. The existing stones obtained from site visit are presented in the Annexure 5.28 and Annexure 5.29 and photographs are shown below.



Figure 5-15: KM & HM Stone at 6-lane section of Chittoor–Mallavaram

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6. ASSESSMENT OF PROJECT ASSETS – STRUCTURES

6.1 General

The project comprises of 61.128 Km of six-lane section of NH-140 between Chittor to Mallavaram in the State of Andhra Pradesh. The various structures comprising the project are given in Table 6-1.

6.2 Structural Inventory

The visual condition survey of all the structures is carried out by Structural Expert/Bridge Engineer of the consultant team with an inspection is aimed at identifying and quantifying deterioration, which may be caused by applied loads and factors such as deadload, live load, wind load and physical (e.g. wear, abrasion) / chemical (e.g. corrosion due to environmental exposure) influences. Apart from inspection of bridge damage caused by unpredictable natural phenomena (e.g. earthquake, flood) or collision by vehicles or vessels, inspection is also needed to identify or follow up the effect of any built-in imperfections. Inspection can also provide insights into the structural condition to address issues proactively, helps in devising necessary remedial measures to enhance safety and performance, contributes to extending the service life of bridges through timely intervention and maintenance strategies.

Table 6-1: Summary of Structures

No.	Item	Package-iii as per site inspection	Qty. as per TOT Technical Schedule
1	Major Bridges	6	6
2	Minor Bridges	23	23
3	VUP	10	10
4	LVUP	5	5
5	VOP	-	-
6	ROB	-	-
7	RUB	1	1
8	FOB	2	2
9	HPC	15	15
10	Box Culvert	100	100
11	Slab culvert	-	-

The collection and analysis of Major bridges, RUBs and Grade separators condition and inventory data is done using the Mobile Bridge Inspection Unit (MBIU) and comprehensive visual inspection is carried out for assessing the minor bridges, underpasses, overpasses, and culverts of the entire project stretch of 61.128 kms. During the inspection and condition survey no major failure/Distresses is observed however minor cracks, exposed reinforcement at parapet, honeycombing repairs at structural components, clogged drainage spout, debris found under culvert and waterways and vegetation found on superstructures with unwanted material found around the bearings. The return walls are inspected to locate any separation of these from the abutment. Any unusual differential settlement which gives rise to cracks in the return or wing walls are inspected along with condition of stone pitching for all the bridges.

Following codes are used for the condition rating of the structural members.

Code	Description
N	NOT APPLICABLE
9	EXCELLENT CONDITION
8	VERY GOOD CONDITION - no problems noted
7	GOOD CONDITION – some minor problems
6	SATISFACTORY CONDITION - structural elements show some minor deterioration
5	FAIR CONDITION - all primary structural elements are sound but may have minor section loss, cracking, spilling or scour
4	POOR CONDITION - advanced section loss, deterioration, Spalling or scour
3	SERIOUS CONDITION - loss of section, deterioration, spelling or scour have seriously affected primary structural components Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present
2	CRITICAL CONDITION - advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken
1	IMMINENT' FAILURE CONDITION - major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic, but corrective action may put back in light service.
0	FAILED CONDITION - out of service - beyond corrective action

6.3 Major Bridges

There are 06 nos. of Major Bridge. These Major Bridge are in sound condition with no distresses with fair state of maintenance. Cleaning of expansion joint, bearings and drainage spouts is required.

Details of major bridge structures on the Project Highway are as per Table 6-2.

Table 6-2: Details of Major Bridges

S.No.	Design Chainage (Km)	Side	Type of Structure	Structure on	Deck Width (m)	Span Arrangement (m)	Steel Bearings (nos)	Elastomeric bearing (nos)	Type of expansion joint	Expansion joint (nos)	Type of Superstructure
1	8+300	LHS	MJB stilt	MCW	16	12 X25	75	0	Strip seal	4	PSC - GIRDER
		RHS		MCW	16	12 X25	75	0	Strip seal	4	PSC - GIRDER
2	8+800	LHS	MJB	MCW	14	8 X 25	50	0	Strip seal	3	PSC - GIRDER
		RHS		MCW	14	8 X 25	50	0	Strip seal	3	PSC - GIRDER
		LHS		SR	11	8 X 25	50	0	Strip seal	3	PSC - GIRDER
		RHS		SR	11	8 X 25	50	0	Strip seal	4	PSC - GIRDER
3	010+250	LHS	MJB stilt	MCW	16	20 X25	125	0	Strip seal	6	PSC - GIRDER
		RHS		MCW	16	20 X25	125	0	Strip seal	6	PSC - GIRDER
4	20+200	LHS	MJB	MCW	14	3 X 26	20	0	Strip seal	2	PSC - GIRDER
		RHS		MCW	14	3 X 26	20	0	Strip seal	2	PSC - GIRDER
		LHS		SR	11	3 X 26	16	0	Strip seal	2	PSC - GIRDER
		RHS		SR	11	3 X 26	16	0	Strip seal	2	PSC - GIRDER
5	49+145	LHS	MJB	MCW	10.5	3 X 21.6	16	0	Strip seal	2	PSC - GIRDER
		LHS (Existing Bridge)		MCW	11	3 X 21.6	0	24	Strip seal	4	PSC - GIRDER
		RHS		MCW	14	3 X 21.6	20	0	Strip seal	2	PSC - GIRDER
		LHS		SR	11	3 X 21.6	16	0	Strip seal	2	PSC - GIRDER
		RHS		SR	11	3 X 21.6	16	0	Strip seal	2	PSC - GIRDER
6	60+400	LHS	MJB	MCW	10.5	8 X 25	40	0	Strip seal	3	PSC - GIRDER

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S.No.	Design Chainage (Km)	Side	Type of Structure	Structure on	Deck Width (m)	Span Arrangement (m)	Steel Bearings (nos)	Elastomeric bearing (nos)	Type of expansion joint	Expansion joint (nos)	Type of Superstructure
		LHS (Existing Bridge)		MCW	11	8 X 25	0	64	Modular Strip seal	9	PSC - GIRDER
		RHS		MCW	14	8 X 25	80	0	Strip seal	9	PSC - GIRDER
		LHS		SR	11	8 X 25	40	0	Strip seal	3	PSC - GIRDER
		RHS		SR	11	8 X 25		0	Strip seal	9	PSC - GIRDER

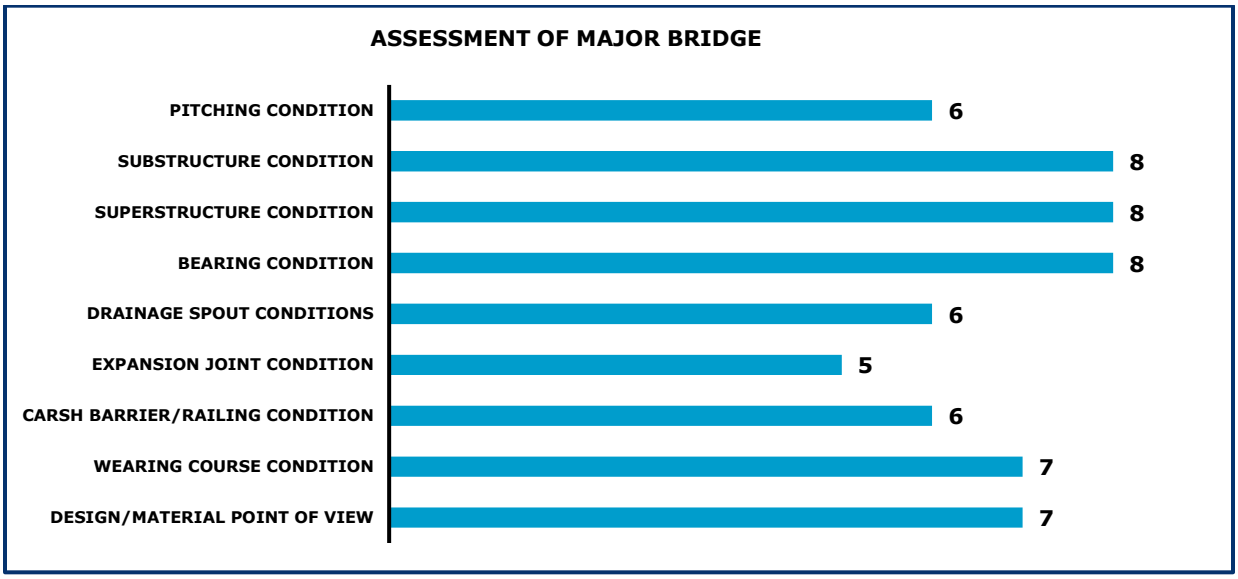


Figure 6-1: Comparative condition assessment of Major Bridges

There are 6 nos of major structures found on this project stretch. These bridges are in sound condition with no major distresses. Routine maintenance like cleaning & repair of expansion joint and drainage spout are required. Some of the Major bridge where sealing material of the expansion joint has been found to be damaged needs to be replaced. Unwanted material like concrete material, silt and debris which are deposited near bearings needs to be removed. Drainage spout not found on Service Road major bridge at Ch. 60+500. Honey combing found on soffit of girder at MJB Ch. 49+145. On major Bridge at Ch. 10+250 minor cracks found at the end of girder near abutment A-2 of RHS Major bridge Ch. 10+250. Major bridge list is mentioned in below table.



MJB at Ch. 8+300



MJB at Ch. 8+300



Expanoion joint damged at MJB Ch. 8+300



unwanted concerete material found around the bearings at MJB Ch. 8+300



MJB on Ch. 8+800



Sealing material damaged at expansion joint at MJB Ch. 8+800



Minor crack found in girder of span S-20 near abutment A-2 RHS at MJB -10 +250



MJB at Ch. 10+250



MJB at ch. 20+200



Sealing material damaged at expansion joint at MJB Ch. 20+200



Unwanted concrete material found between girder and pedestal at RHS main Carriageway structure on MJB Ch. 49+145



Honey combing found in girder soffit on MJB Ch. 49+145



Old Existing Major bridge Ch. 49+145



Old Existing Major bridge Carriageway Ch. 49+145



Expansion joint is in good condition at Ch. 49+145



To clean drainage spout at Ch. 49+145





Modular strip seal expansion joint (E-1) damaged at old existing MJB at Ch. 60+500





Drainage spout not found on RHS service road Major bridge at Ch. 60+500



Unwanted concerete material found around the bearing at Ch. 60+500

Figure 6-2: Site Photographs of Major Bridges

6.4 Minor Bridges

There are 23 nos. of Minor Bridge on project stretch. Maintenance of these minor bridges are in fair condition. Minor repairs are required like cleaning of carriageway, waterway, and repair of leakage in wall and top slab.

Details of minor bridge structures on the Project Highway are as per Table 6-3 given below.

Table 6-3: Details of Minor Bridges

S.No	Design Chainage (Km)	Side	Str On	Deck Width (m)	Span Arrangement (m)	Nos of Steel Bearings	Nos of Elastomeric bearings	Nos of Expansion joint	Type of Superstructure
1	4+200	LHS	MCW	16	3 X 5	0	0	0	Box type MNB
		RHS	MCW	16	3 X 5	0	0	0	
		RHS	SR	11	3 X 5	0	0	0	
		RHS	SR	11	3 X 5	0	0	0	
2	6+600	BHS	MCW	52	2 X3.5	0	0	0	Box type MNB
3	14+578	LHS	MCW	14	2 X 6	0	0	0	Box type MNB
		RHS	MCW	14	2 X 6	0	0	0	
		LHS	SR	11	2 X 6	0	0	0	
		RHS	SR	11	2 X 6	0	0	0	
4	17+955	LHS	MCW	14	2 X 25.475	15	0	2	PSC - GIRDER
		RHS	MCW	14	2 X 25.475	15	0	2	
		LHS	SR	11	2 X 25.475	12	0	2	
		RHS	SR	11	2 X 25.475	12	0	2	
5	18+855	BHS	MCW	55	2 X 3.75	0	0	0	Box type MNB
6	25+460	LHS	MCW	16	2 X 4.5	0	0	0	Box type MNB
		RHS	MCW	16	2 X 4.5	0	0	0	
		LHS	SR	11	2 X 4.5	0	0	0	
		RHS	SR	11	2 X 4.5	0	0	0	
7	27+560	LHS	MCW	16	2 X 4.5	0	0	0	Box type MNB
		RHS	MCW	16	2 X 4.5	0	0	0	
		LHS	SR	11	2 X 4.5	0	0	0	
		RHS	SR	11	2 X 4.5	0	0	0	

S.No	Design Chainage (Km)	Side	Str On	Deck Width (m)	Span Arrangement (m)	Nos of Steel Bearings	Nos of Elastomeric bearings	Nos of Expansion joint	Type of Superstructure
8	28+090	LHS	MCW	10.5	2 X 12.7	0	16	3	T-beam Girder
		LHS	MCW	10.5	2 X 12.7	0	0	0	Solid slab
		RHS	MCW	14	2 X 12.7	0	0	0	Solid slab
		LHS	SR	11	2 X 12.7	0	0	0	Solid slab
		RHS	SR	11	2 X 12.7	0	0	0	Solid slab
9	30+900	BHS	MCW	29.5	4 X 2	0	0	0	Box type MNB
		BHS	SR	23.5	4 X 2	0	0	0	
10	32+815	LHS	MCW	14	2 X 11.591	0	0	0	Solid slab
		RHS	MCW	14	2 X 11.591	0	0	0	
		LHS	SR	11	2 X 11.591	0	0	0	
		RHS	SR	11	2 X 11.591	0	0	0	
11	36+200	LHS	MCW	14	3 X 19	15	0	2	PSC - I GIRDER
		RHS	MCW	14	3 X 19	15	0	2	
		LHS	SR	11	3 X 19	12	0	2	
		RHS	SR	11	3 X 19	12	0	2	
12	39+645	BHS	MCW/SR	50	3 X 19	0	0	0	Box type MNB
13	41+725	LHS	MCW	14	1 x 21.95	10	0	2	PSC - I GIRDER
		RHS	MCW	14	1 x 21.95	10	0	2	
		LHS	SR	11	1 x 21.95	8	0	2	
		RHS	SR	11	1 x 21.95	8	0	2	
14	43+650	LHS	MCW	14	2 x 12.7	0	0	0	Solid slab
		RHS	MCW	14	2 x 12.7	0	0	0	
		LHS	SR	11	2 x 12.7	0	0	0	

S.No	Design Chainage (Km)	Side	Str On	Deck Width (m)	Span Arrangement (m)	Nos of Steel Bearings	Nos of Elastomeric bearings	Nos of Expansion joint	Type of Superstructure
		RHS	SR	11	2 x 12.7	0	0	0	
15	44+327	LHS	MCW	14	1 x 9.816	0	0	0	Solid slab
		RHS	MCW	14	1 x 9.816	0	0	0	
		LHS	SR	11	1 x 9.816	0	0	0	
		RHS	SR	11	1 x 9.816	0	0	0	
16	45+675	LHS	MCW	14.5	2 X 3.5	0	0	0	Box type MNB
		RHS	MCW	14.5	2 X 3.5	0	0	0	
		LHS	SR	11	2 X 3.5	0	0	0	
		RHS	SR	11	2 X 3.5	0	0	0	
17	46+375	LHS	MCW	14	1 x 26.95	12	0	2	PSC I Girder
		RHS	MCW	14	1 x 26.95	12	0	2	
		LHS	SR	11	1 x 26.95	10	0	2	
		RHS	SR	11	1 x 26.95	10	0	2	
18	46+535	LHS	MCW	14	2 x 26.475	15	0	0	PSC I Girder
		RHS	MCW	14	2 x 26.475	15	0	0	
		LHS	SR	11	2 x 26.475	12	0	0	
		RHS	SR	11	2 x 26.475	12	0	0	
19	47+495	LHS	MCW	14	2 x 5	0	0	0	Solid slab
		RHS	MCW	14	2 x 5	0	0	0	
		LHS	SR	11	2 x 5	0	0	0	
		RHS	SR	11	2 x 5	0	0	0	
20	48+555	LHS	MCW	16.5	2 x 5.5	0	0	0	Solid slab
		RHS	MCW	16.5	2 x 5.5	0	0	0	

S.No	Design Chainage (Km)	Side	Str On	Deck Width (m)	Span Arrangement (m)	Nos of Steel Bearings	Nos of Elastomeric bearings	Nos of Expansion joint	Type of Superstructure
		LHS	SR	11	2 x 5.5	0	0	0	
		RHS	SR	11	2 x 5.5	0	0	0	
21	50+520	LHS	MCW	14	1 x 11	0	0	0	Solid slab
		RHS	MCW	14	1 x 11	0	0	0	
		LHS	SR	11	1 x 11	0	0	0	
		RHS	SR	11	1 x 11	0	0	0	
22	51+155	LHS	MCW	16.5	3 x 2.5	0	0	0	Solid slab
		RHS	MCW	16.5	3 x 2.5	0	0	0	
		LHS	SR	11	3 x 2.5	0	0	0	
		RHS	SR	11	3 x 2.5	0	0	0	
23	52+185	LHS	MCW	16.5	4x 2.5	0	0	0	Solid slab
		RHS	MCW	16.5	4x 2.5	0	0	0	
		LHS	SR	11	4x 2.5	0	0	0	
		RHS	SR	11	4x 2.5	0	0	0	

* All expansion joints are strip seal type

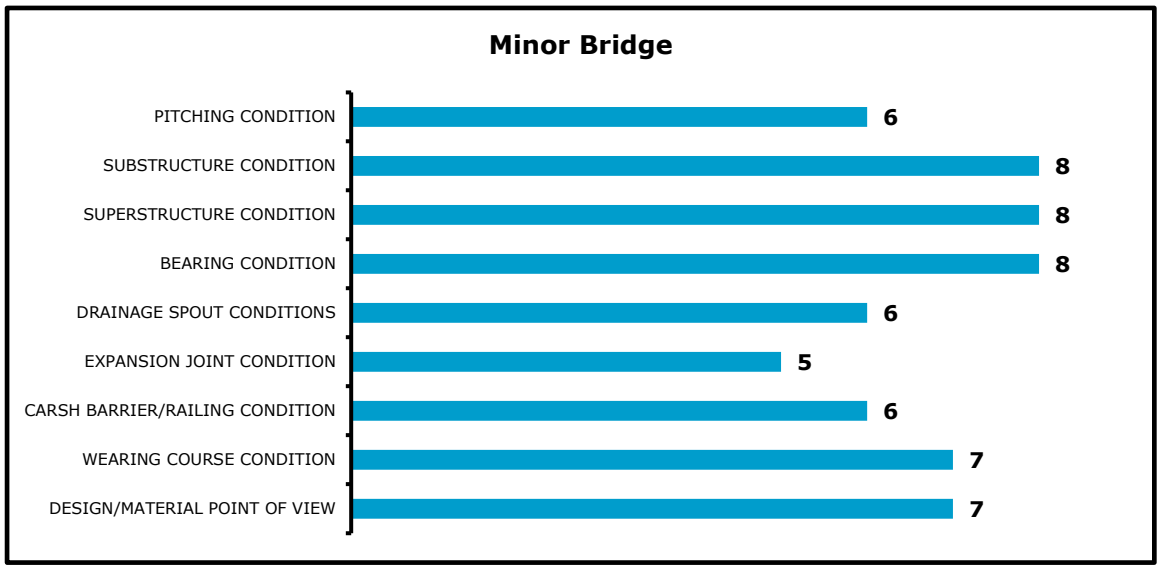


Figure 6-3: Comparative condition assessment of Minor Bridges

There are a total of 23 minor bridges. Upon inspection, it has been observed that all of these bridges are in overall sound structural condition. However, some of them have damaged stone pitching, and erosion of the side slopes has been noted at a few of the Minor Bridges (MNB). Additionally, the access road to the minor bridge at chainage 39+645 (both main and service road) and at chainage 47+495 (service road approach toward Tirupati) has not been constructed due to unresolved land acquisition issues.





MNB at Ch. 4+215





MNB at Ch. 17+955



Stone pitching not found on one side of bridge at Ch. 27+560



Stone pitching not found on one of bridge at Ch. 6+600





Approach was not construct due to land issue at Ch. 39+645





Stone pitching not found on MNB at Ch. 44+327





Approach not constructed due to land issue on RHS service road at Ch. 47+495





Stone pitching not found at Ch. 48+555





Pitching damaged and bank erosion observed at RHS of MNB 50+520





crash barrier on footpath side not yet constructed at LHS service road MNB Ch.51+155



Pitching work not found at ch.52+185



Vegetation present at ch.52+185



MNB at Ch. 28+090

Figure 6-4: Typical Site Photographs of Minor Bridges

6.5 RUB (Railway Under bridge)

There is 1 no. of RUB on project stretch. This RUB is in satisfactory state of maintenance.

Table 6-4: RUB details

S.NO	Type of Structure	Side	Str On	Deck Width (m)	Span Arrangement (m)	Type of Superstructure
1	RUB	LHS	MCW	14.96	1 X 12.5	Box type
		LHS	SR	14.96	1 X 12.5	Box type
		LHS	MCW (existing)	7.5	1 X 8.2	RCC T- Beam Girder
		RHS	MCW	14.96	1 X 12.5	Box type
		LHS	SR	14.96	1 X 12.5	Box type
		RHS	MCW (existing)	7.5	1 X 8.2	RCC T- Beam Girder

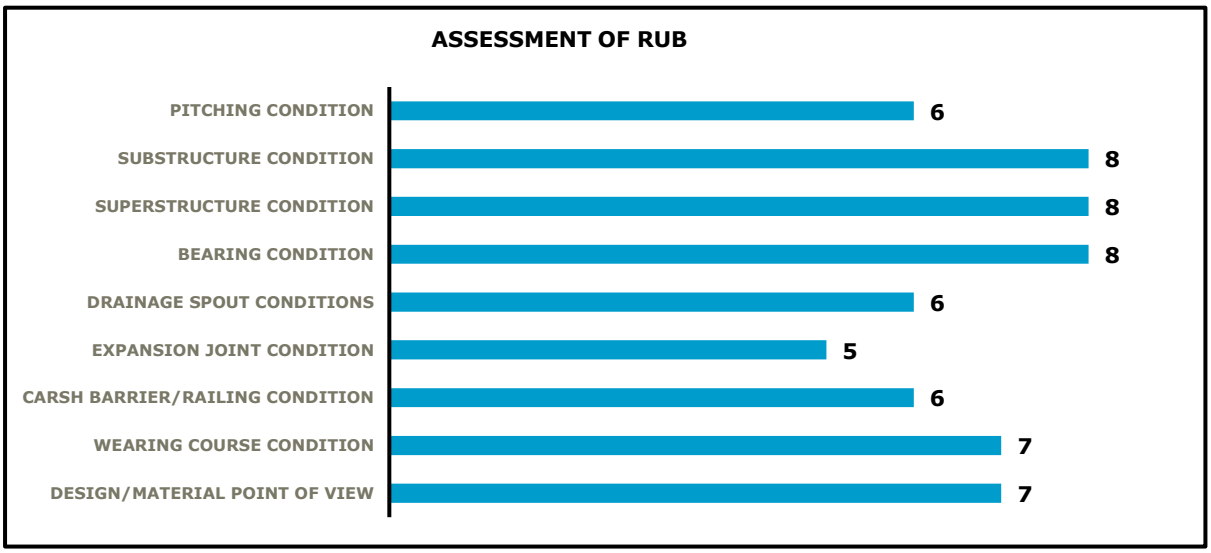


Figure 6-5: Comparative condition assessment of RUB.



RUB at Ch. 24+600 on both side



RUB at Ch. 24+600 Leaching, water stain and vegetation found on super structure of existing RUB

Figure 6-6: Typical Site Photographs of RUB

6.6 Vehicular Underpass (VUP)

There are 10 nos. of VUP on project stretch. Minor repairs like cracks in RCC substructure, replacement of expansion joints is required with repairs in approach slabs at few locations. Cleaning of vegetation growth and clogged vents is required through routine maintenance. Overall structural condition is good for these underpasses.

Table 6-5: Vehicular Underpass details

No.	Design Chainage (Km)	Side	Str. On	Deck Width (m)	Span Arrangement (m)	Steel Bearings (Nos)	Elastomeric bearing (Nos)	Expansion joint (Nos)	Type of Super structure
1	7+514	LHS	MCW	14.5	1 X 25	10	0	2	PSC I-Girder
		RHS	MCW	14.5	1 X 25	10	0	2	
2	11+580	LHS	MCW	14.5	1 X 12	0	0	0	Solid slab
		RHS	MCW	14.5	1 X 12	0	0	0	
3	13+263	LHS	MCW	14.5	1 X 12	0	0	0	Solid slab
		RHS	MCW	14.5	1 X 12	0	0	0	
4	19+140	LHS	MCW	14.5	2 X 30	28	0	3	PSC I-Girder
		RHS	MCW	14.5	2 X 30	28	0	3	
5	25+706	LHS	MCW	14.5	1 X 25	10	0	2	PSC I-Girder

No.	Design Chainage (Km)	Side	Str. On	Deck Width (m)	Span Arrange ment (m)	Steel Bearings (Nos)	Elastomeric bearing (Nos)	Expansion joint (Nos)	Type of Super structure
		RHS	MCW	14.5	1 X 25	10	0	2	
6	27+630	LHS	MCW	14.5	1 X12	0	0	0	Solid slab
		RHS	MCW	14.5	1 X12	0	0	0	
7	30+409	LHS	MCW	14.5	1 X12	0	0	0	Solid slab
		RHS	MCW	14.5	1 X12	0	0	0	
8	33+208	LHS	MCW	14.5	2 X 15	0	0	0	Solid slab
		RHS	MCW	14.5	2 X 15	0	0	0	
9	44+736	LHS	MCW	14.5	1 X 12	0	0	0	Solid slab
		RHS	MCW	14.5	1 X 12	0	0	0	
10	56+550	LHS	MCW	14.5	1 X 25	10	0	2	Solid slab
		RHS	MCW	14.5	1 X 25	10	0	2	

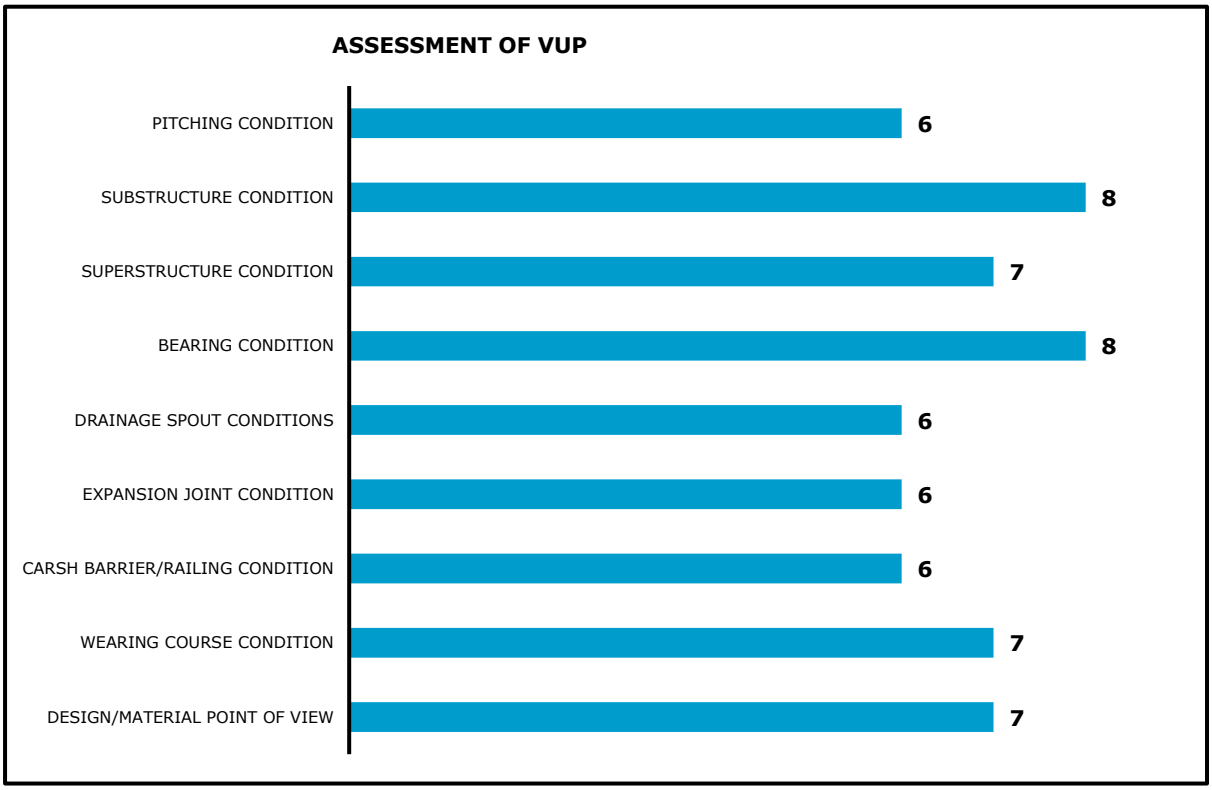


Figure 6-7: Comparative condition assessment of VUP.

There are 10 nos of VUP structures. All these structures are in sound condition. Only Routine maintenance like cleaning of expansion joint and drainage spout are required.

Figure 6-8: Typical Site Photographs of Underpasses





VUP at Ch. 7+700





VUP at Ch. 19+000





VUP at Ch. 13+257





VUP at Ch. 56+550





VUP at Ch. 25+900





VUP in completed at Ch. 40+114 due to land Issue

6.7 Light Vehicular Underpass (LVUP)

There are only 5 nos. of LVUPs in this Package. Structural condition of these structures is good. List of these LVUPs is given in the table below with their configuration.

Table 6-6: Light Vehicular Underpass

S.NO	Design Chainage (Km)	Side	Str On	Deck Width (m)	Span Arrangement (m)	Type of Superstructure
1	4+681	LHS	MCW	14.5	1 X 12	Solid slab
		RHS	MCW	14.5	1 X 12	
2	9+600	LHS	MCW	14.5	1 X 12	Solid slab
		RHS	MCW	14.5	1 X 12	
3	17+100	LHS	MCW	14.5	1 X 12	Solid slab
		RHS	MCW	14.5	1 X 12	
4	40+114	LHS	MCW	14.5	1 X 12	Solid slab
		RHS	MCW	14.5	1 X 12	
5	59+442	LHS	MCW	14.5	1 X 12	Solid slab

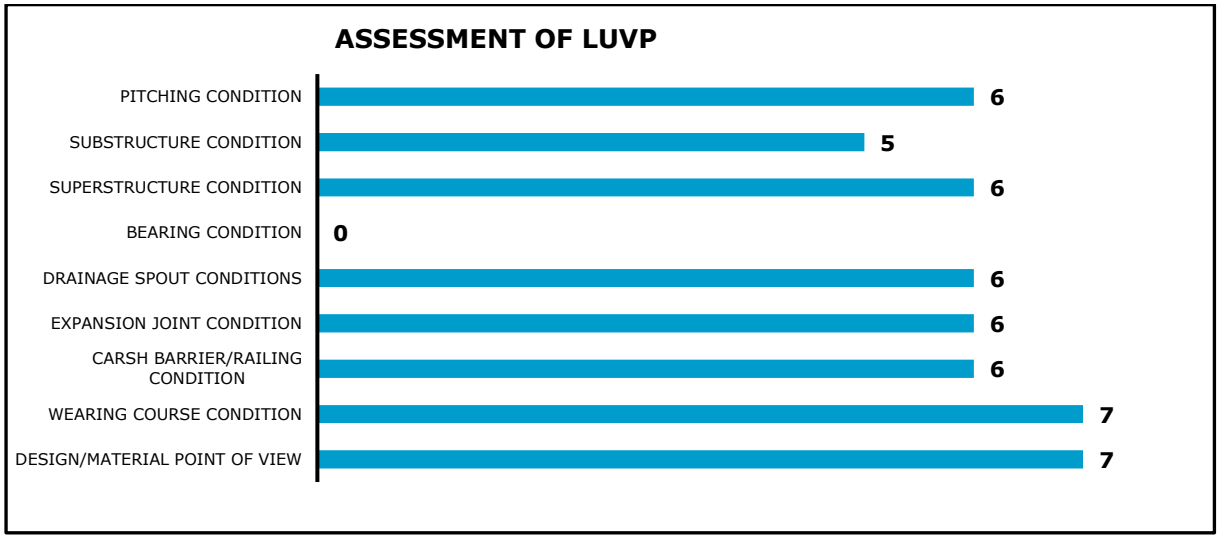


Figure 6-9: Comparative condition assessment of LVUP.

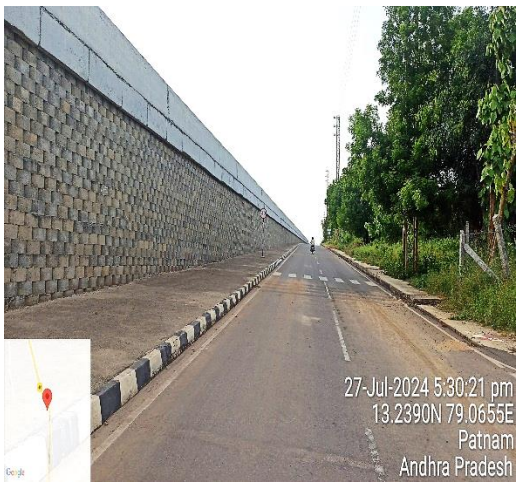
These 5 nos of LVUP's are in sound condition. Routine maintenance like cleaning of expansion joint and drainage spout are required.





LVUP at Ch. 59+540





LVUP at Ch. 4+640

6.8 Culverts

There are 115 nos. of culvert which includes RCC box type culverts, Slab culverts, and Hume pipe culverts. Structural condition of these culverts is satisfactory but requires maintenance for scours,

cleaning of waterway, cleaning of vegetations and repair of slope pitching. The details of the culverts across different packages are explained in the sections below,

Figure 6-10: Typical Site Photographs of Culverts



Erosion of soil observed due to stone pitching not found at Box culvert Ch. 12+643



stone pitching not found at Box culvert Ch. 53+582



stone pitching absent at one side of culvert Ch. 44+071



Box culvert Ch. 44+071



Box culvert Ch. 12+643



Box culvert Ch. 53+582

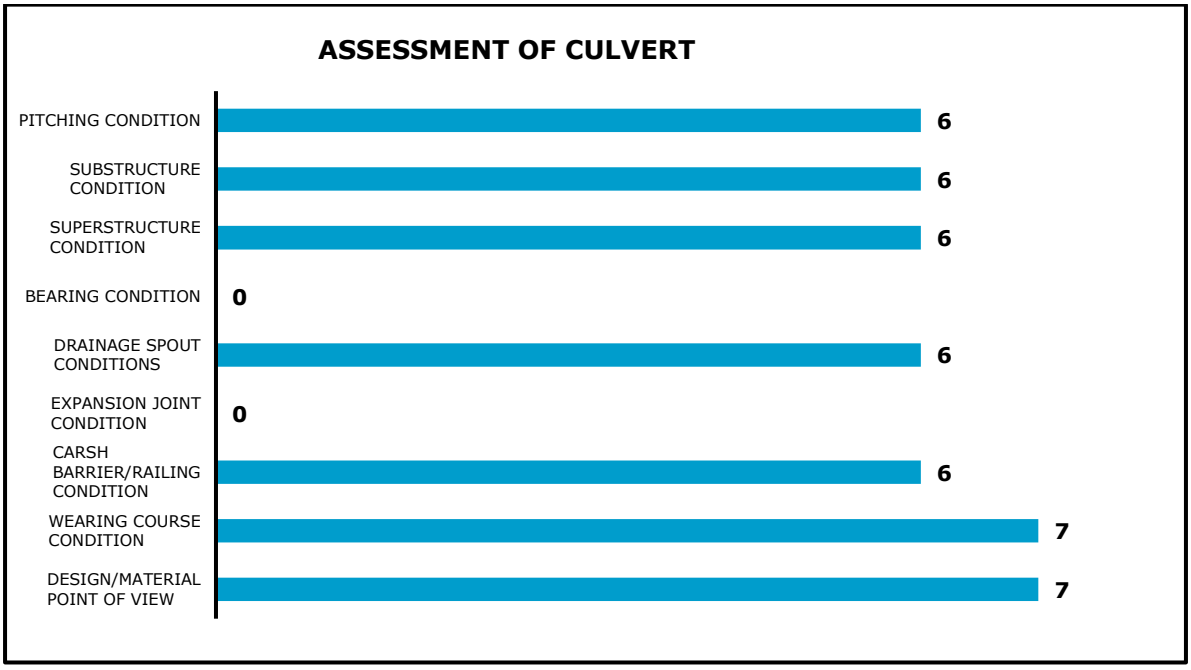


Figure 6-11: Comparative assessment of Culverts

6.9 General Observations

All the structures are visually inspected to find any cracking, spalling, staining, deformation, leaching, exposed reinforcement, honeycombing, condition of expansion joints, wearing coat, approach slabs, drainage, and damaged railing etc. Major Structures like Major Bridges, ROBs are inspected by MBIU and are reported in Annexure to Main Report.

The damages witnessed at the structures are due to irregularities in routine / preventive maintenance of these structures. There is no major distress in any structure of these packages. General observations are summarised as under:

- Vegetation growth on structure and waterway area
- clogged drainage spout of structures.
- cracks on crash barrier.
- Disturbed Quadrant pitching
- scour & bulging observed in protection work.
- exposed reinforcement at parapet of culvert.
- honeycombing at parapet of culvert.
- worn out & Potholes on wearing.
- debris found under culvert due to non-maintenance of waterway.

In general, the structures are found to be in structurally sound condition except for certain aspects requiring immediate repairs as under:

- Repair of Protection work by proper channelling of water flow.
- Minor crack repairs & honeycombing repairs at structural components
- Improving the drainage on the deck slab

7. ASSESSMENT OF PROJECT ASSETS - TOLL SYSTEMS

7.1 General

Technical Due Diligence of the TMS (Toll Management System), ATMS, ETC (Electronic Toll Collection System) and WIM (Weigh-in-Motion) System (as available) along 6 lane Chittoor to Mallavaram section of NH-140 in the state of Andhra Pradesh is done through site visits, site surveys, interactions at site and review of documents and reports.

7.2 Project Information

Toll Plaza 1 - Gadanki TP - Km 37+350 (NH 140)

No. of Lanes at each Toll Plaza

- Gadanki TP – It is a straight toll plaza and equipped with 12 Hybrid lanes at the toll plaza, no separate two-wheeler lanes are provided adjacent to the extra-wide lanes.

7.3 Gadanki TP - Toll System Maintenance

TMS maintenance is currently being undertaken by M/s Metro Infrasys at Gadanki toll plaza they are maintaining the toll equipment in good condition. The AVC systems are functional, and all lane controllers are found working in proper condition.

7.4 Gadanki TP - WIM system

WIM (Medium Speed Weigh in Motion) systems are installed in all 12 lanes by M/s Ashbee systems but were found to be nonfunctional and needs to be refurbished and recalibrated, currently no vehicle weight was being captured in the TMS. Stamping and calibration works are yet to be undertaken by the vendor.

7.5 Gadanki TP - SWB (Static Weigh Bridge)

Toll plaza is not equipped with Static Weigh Bridges

7.6 ATMS System

ATMS hardware was found installed and functional in this section of the highway, presented below in the table, however a detailed of the required quantity as per the Schedule A of the CA is tabulated further below in the next table separately.

Table 7-1: Installed HTMS / ATMS Equipment at NH 140

#	Parameter	Established Qty.
1	Video Surveillance System (CCTV PTZ Dome / Fixed Cameras)	12 (All Functional)
2	VIDS (ANPR Camera)	05 (All Functional)
3	Variable Message Signs	02 (All Functional)
4	Met Station	1 (Functional)
5	ATCC	1 (Not Functional)
6	Mobile Radio Communication System	Not Installed
7	Communication System utilizing Optic Fiber, GSM / GPRS and WiFi Communications linked to ATMS Control Centre	Functional through RF & GSM
8	Central Control Room with Workstations	1 No. (At Gadanki TP)

9	Fiber Optic Cable (48 Core)	All damaged, alternately RF connectivity is under commissioning.
10	Emergency Call Boxes	60 (All Functional)

Schedule A mentions the scope of ATMS as a part of Project Facilities on NH 140 as below.

Table 7-2: Scope of ATMS As per Tech schedule at NH 140

#	Equipment Description	Qty to be Installed
1	ECB	32
2	MET	1
3	MRCS	1
4	VMS	2
5	ATCC	1
6	PTZ	12
7	VIDS	5
8	VASD	8
9	Servers	1
10	Terminals	3
11	N/W Switch	2
12	TTES	0
13	Software	1
14	UPS	1
15	Control Room	1
16	Display	1

7.7 Review and Assessment of TMS (incl. AVCC Systems)

1. At Gadanki toll plaza in Section 3, the TMS is under maintenance by M/s Metro Infrasys, with open tolling technology, installation is independent of any other toll plaza on the highway stretch and integration with MS-WIM is pending due to non-functional equipment, post the repairs, the TMS should be ready to identify the vehicles carrying over load, however to collect the penalty on account of overloaded vehicle, there is a necessity of installation of Static Weigh Bridges in both directions of the toll plazas which has not been undertaken yet.
2. The AVCC hardware is working fine with an average accuracy of 96% which is fair, the equipment is maintained and functioning in proper condition, the validation is happening through inputs from AVCC and Incident Cameras installed in each lane, critical components required to check the vehicle classification e.g. AVC, cameras are functional and are as per standard industry requirements, automatic barriers are working but are in a bad shape.
3. The installed MS-WIM at the toll plazas is not found in functional and needs to be re-furbished and requires integration with minor civil works around the WIM area to maintain the proper slope and accuracy of detection of weight.
4. The site is using ILL connectivity through a BSNL for processing of all fastag transactions.

7.8 Assessment of Toll Operation and integration with TMS

The operations of the toll are being managed through a third-party agency at both sections, the site team is fully conversant with the given TMS functionalities and can generate all required reports as per the interaction with the site teams.

The LSDU i.e. Lane Status Display Unit to monitor the entire hardware of each lane is not provided which is an essential part for monitoring of the toll equipment on day-to-day basis and generating all alerts.

The back office of Gadanki Toll Plaza is functioning fairly with complete inputs from the lane hardware.

7.9 Backoffice TMS review

a. The TMS is controlled through the control room which is housed with the validator performing real time transaction validations with consolidated inputs of vehicle count and classification as per TC / RFID Antenna & AVC. There is no separate room for performing cashup function and all toll collectors come to the control room to deposit the collected money.

b. LSDU as stated above is not provided and equipment status / failures are not known to the shift supervisor until informed manually by the TC or found by the IT technician.

c. There was no device found for performing daily backups

d. As per the guidelines of IHMCL, the plaza server has to be installed with a hot-standby server arrangement however no hot-standby server was found to be installed.

e. No fake note detectors installed in the lane to detect counterfeit currency

7.10 Conclusion

The TMS at Gadanki toll plaza is performing fairly well and only certain equipment like MS-WIM, Automatic Boom Barriers etc needs to be refurbished / replaced under AMC.

Figure 7-1: Typical Site Photographs of Toll Plaza & Equipment



Gadanki Toll Plaza NH 140



MS-WIM - Gadanki Toll Plaza



Lane Controller and WIM Controller housed inside the toll booth





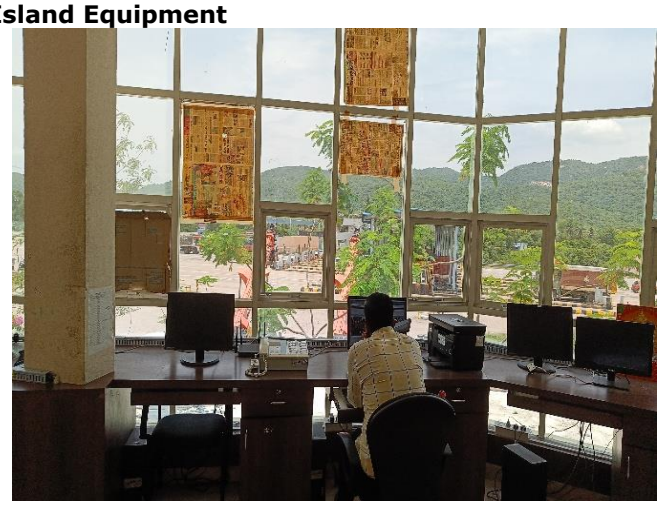
Lane Controller and WIM Controller housed inside the tunnel




Booth Equipment




Lane Island Equipment

Control Room arrangement including Cash up Room



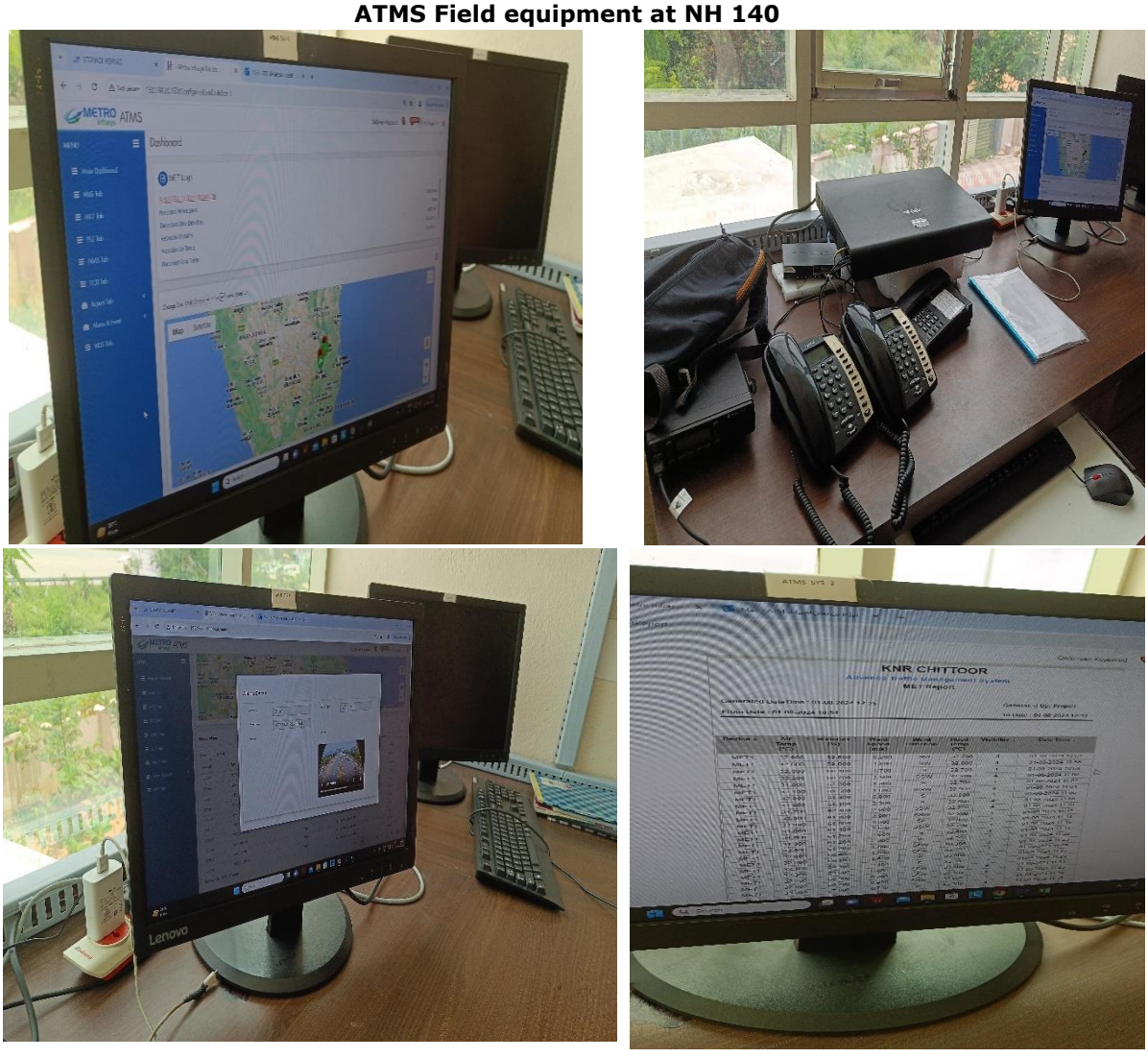

Server Room



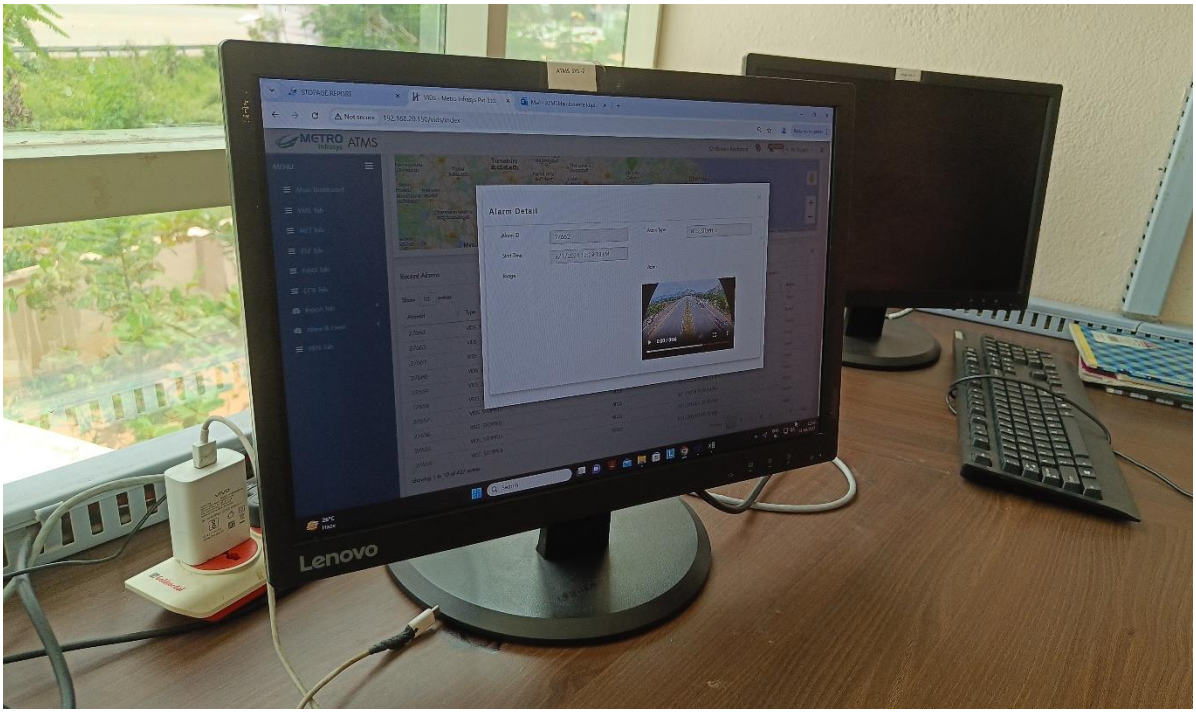





ATMS Field equipment at NH 140



ATMS Control Room Equipment


METRO ATMS
Alarm Detail
Lenovo

8. REVIEW OF MAINTENANCE REQUIREMENTS OF HAM CONCESSION AGREEMENT

		Project
	Agreement / Contract	Six Lanning of NH-140 from Chittoor (Design KM 0.000/Existing KM 158.000 of NH-4) to Mallavaram (Design KM 61.128/Existing KM 41.800 of NH-140) Design Length KM 61.128 in the State of Andhra Pradesh under Bharatmala Pariyojana on Hybrid Annuity Mode
1	Contracts	HAM Concession Agreement
2	O&M Manual	Can be reviewed when documents are available

8.1 Operation and Maintenance Obligations

As per Clause 17.1 of the existing CA, the Concessionaire shall operate and maintain the Project in accordance with this agreement either by itself, or through O&M Contractor and if required, modify, repair or otherwise make improvements to the Project Highway to comply with the provisions of this Agreement, Applicable Laws and Applicable Permits and conform to Specifications and Standards, and Good Industry Practice. The obligations of the concessionaire hereunder shall include:

- Procuring and ensuring safe, smooth and uninterrupted flow of traffic on the Project Highway during normal operating conditions.
- Minimising disruption to traffic in the event of accidents or other incidents affecting the safety and use of the Project Highway by providing a rapid and effective response and maintaining liaison with emergency services of the state.
- Carrying out periodic preventive maintenance of the Project Highway.
- Undertaking routine maintenance including prompt repairs of potholes, cracks, concrete joints, drains, embankments, structures, pavement markings, lighting, road signs and other traffic control devices.
- Undertaking major maintenance such as resurfacing of pavements, repairs to structures, and repairs and refurbishment of tolling system, hardware and other equipment;
- Preventing, with the assistance of concerned law enforcement agencies, any unauthorised entry to and exit from of the Project;
- Preventing, with the assistance of the concerned law enforcement agencies, any encroachments on the Project;
- Protection of the environment and provision of equipment and materials thereof;
- Operating and maintenance of all communication, control and administrative systems necessary for the efficient operation of the Project;
- Maintaining a public relations unit to interface with and attend to suggestions from the Users, of the Project Highways, the media, Government Agencies, and other external agencies; and
- Complying with Safety Requirements in accordance with Article 18.

Note: Compliance to existing CA conditions for O&M can be ascertained once the requisite documentation is provided or made available.

9. SOIL AND MATERIAL INVESTIGATION

9.1 General

As a part of soil and material investigation report preparation, the consultants have conducted tests on subgrade soils along the project corridor.

9.2 Field investigation – sampling and testing

Field tests were conducted on the subgrade soils and required pavement materials were collected for testing. Table 9-1 presents the sampling criteria, tests and testing procedures adopted for various field and laboratory tests.

Table 9-1: Site sampling and testing criteria

S. No.	Type of Soil Sample	Sampling Criteria	Testing Criteria	
			Description of Test	Standard Code Applicable
Existing subgrade and pavement materials				
i)	**Subgrade Strength Test Pits**	Minimum of one subgrade soil sample was obtained at an interval directed by the client & Material Engineer based on site condition.	In-situ Density	IS 2720 (Part – 29)
			In-situ moisture content	IS 2720 (Part – 2)
			Soil Classification	IS 1498
			Sieve Analysis	IS 2720 (Part – 4)
			Atterberg Limits	IS 2720 (Part – 5)
			Laboratory Compaction Test (using heavy compaction)	IS 2720 (Part – 8)
			Field Compaction	IS 2720 (Part-29)
			4-days soaked CBR	IS 2720 (Part – 16)
			Free swell Index	IS 2720 (Part-40)

9.3 Investigations on subgrade soils

Subgrade investigations were carried out to know the strength properties of the existing soil. It is ensured to dig subgrade strength test pits at an interval as directed by the client & material engineer based on the site condition. Various in-situ tests and laboratory tests are conducted on soil samples, as summarized in Table 9-1. The pavement composition details (pavement course, material type, and thickness) are also recorded at every test pit.

The test results and discussion are described in the section below.

Field tests were conducted as per the project requirement to determine the subgrade characteristics and strength. The field testing for subgrade soil includes:

- In-situ density determination at possible location of each test pit
- Field moisture content determination at possible location of each test pit

In-situ density (field density) and moisture content were determined as per the standards enlisted in Table 9-1. Field density is used to evaluate the degree of compaction and existing subgrade CBR at field density state. 50kg of samples were collected in damp proof bags for testing. Required laboratory testing as specified in Table 9-1 were conducted the details of field dry density and field moisture content test results are furnished in Annexure 9.1 and Table 9-2 presents a summary of

the test results for the entire project section. The field investigation photographs are shown in Figure 9-1.



Figure 9-1: Field Investigations sample photographs

Table 9-2: Summary of Subgrade Test Results

S. No	Existing Chainage (Km.)	Side (LHS/ RHS)	Soil Classification as per IS: 1498	Gravel content %	Sand content %	Clay & silt content %	Atterberg Limits [IS :2720-Pt-V]			Modified Proctor Test (IS:2720-Pt-VIII)		Field Density		4-Days Soaked CBR at MDD (%)	Free Swell Index (%)	Degree of Compaction (%)
							Liquid Limit (LL) %	Plastic Limit (PL) %	Plasticity Index (PI)	Max. dry density (gm/cc)	OMC (%)	Field Dry Density (gm/cc)	FMC (%)			
NH-140, Chittor to Mallavaram: (Km 0+000 to Km 61+128)																
1	5+250	LHS	SM	19.7	63.4	16.9	23	NP	NP	2.07	9.0	1.94	8.0	18.7	11.1	93.7
2	10+900	RHS	SM	12.0	71.7	16.3	21	NP	NP	2.09	8.8	1.94	8.5	19.8	0.0	92.8
3	15+900	LHS	SP-SM	26.9	61.3	11.8	20	NP	NP	2.11	8.6	1.98	8.0	22.1	0.0	93.8
4	19+700	RHS	SM	10.7	69.1	20.2	25	NP	NP	2.10	8.4	2.03	7.5	20.9	0.0	96.7
5	25+180	LHS	SP-SM	24.3	64.2	11.5	19	NP	NP	2.12	8.1	2.02	8.0	23.7	0.0	95.3
6	30+950	RHS	SM	14.3	70.1	15.6	23	NP	NP	2.09	9.2	1.97	7.0	19.6	11.1	94.3
7	35+100	LHS	SC	8.5	70.1	21.4	29	20	9	2.02	9.6	1.88	9.5	14.7	18.2	93.1
8	39+380	RHS	SW-SM	28.4	66.5	5.1	17	NP	NP	2.13	8.0	1.98	8.5	28.1	7.1	93.0
9	45+700	LHS	SM	8.5	72.1	19.4	23	NP	NP	2.09	8.7	1.93	7.0	16.3	0.0	92.3
10	50+300	RHS	SC	3.5	73.5	23.0	29	21	8	2.01	9.9	1.90	7.5	12.6	20.0	94.5
11	54+900	LHS	SM	6.8	75.9	17.3	21	NP	NP	2.07	8.6	1.98	8.0	19.1	11.1	95.7
12	60+800	RHS	SM	12.9	71.1	16.0	23	NP	NP	2.02	8.7	1.95	6.5	21.0	11.1	96.5

Observations and Conclusions

Soil Classification and Distribution

From Table 9-2, it is evident that subsoil is generally consistent throughout the project road and is predominantly Silty Sand and Clayey sand soils.

Summary of strength parameters in the soil investigation is shown below.

Variance between MDD and FDD is converted in-terms of degree of compaction.

Description	Liquid Limit	Plasticity Index	Free Swell Index	4-days soaked CBR	Degree of compaction
NH-140, Chittor to Mallavaram: Km 0+000 to Km 61+128	17%-29%	Max 9%	Max 20%	12.6%-28.1%	92.3%-96.7%
MoRTH Limits	**<50%**	**<25%**	**<50%**		

- All the measured LL, PI and FSI values are within the acceptable limits as per MoRTH guidelines.

9.4 Existing pavement composition

Existing pavement composition (pavement course, material type, and thickness) were recorded at an interval directed by the client & material engineer based on the site condition along the project road.

The summary of existing pavement crust thickness is presented in a tabular form as well as an illustrative bar graph in Table 9-3 and Figure 9-3 respectively and the pavement crust thickness photographs are shown in Figure 9-2.

Table 9-3: Summary of pavement crust along the project corridor

S. No.	Existing Chainage (Km.)	Side (LHS/ RHS)	Pavement Composition (mm)			
			Bituminous	WMM	GSB	Total Thickness
1	5+250	LHS	180	250	200	630
2	10+900	RHS	180	240	190	610
3	15+900	LHS	200	260	200	660
4	19+700	RHS	185	270	210	665
5	25+180	LHS	170	265	195	630
6	30+950	RHS	180	245	200	625
7	35+100	LHS	180	240	190	610
8	39+380	RHS	210	270	190	670
9	45+700	LHS	190	280	200	670
10	50+300	RHS	180	245	190	615
11	54+900	LHS	150	265	180	595
12	60+800	RHS	140	240	210	590



Figure 9-2: Sample Pavement Crust Thickness measuring photographs

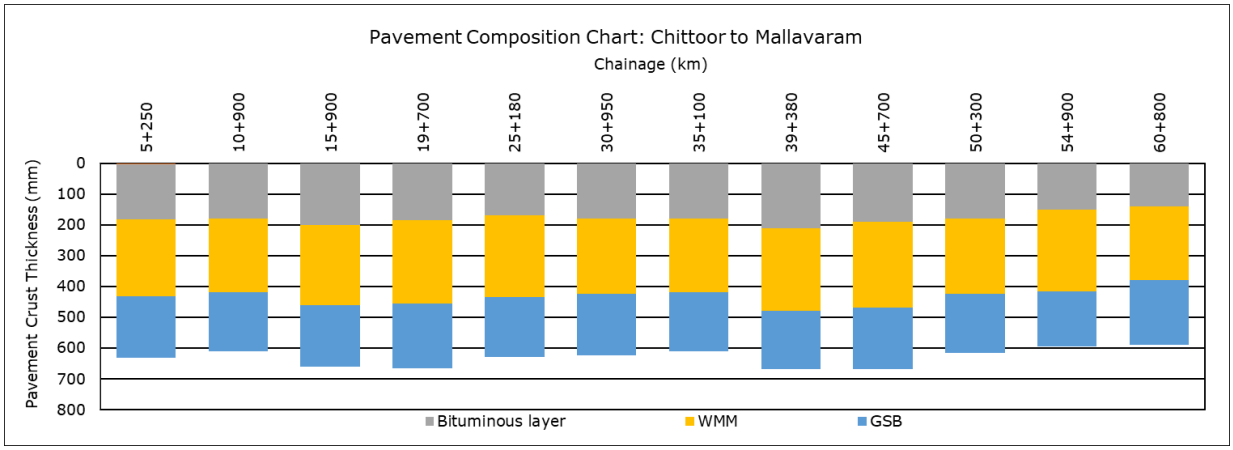


Figure 9-3: Existing Pavement Crust Summary along the project road.

Observations and Conclusions:

Chittoor to Mallavaram (Km 0+000 to Km 61+128):

6-Lane Flexible Pavement Section

- The existing pavement along the project corridor is flexible in nature. The pavement composition comprises of bituminous layer, granular base over the granular sub-base.
- Throughout the project road it possesses consistent bituminous/ granular layer thickness with an average of 179mm bituminous layer over the average Granular course of 452mm were observed.

10. PAVEMENT EVALUATION STUDIES

10.1 Pavement condition survey with Network Survey Vehicle

10.1.1 Network Survey Vehicle Description

Road Runner NSV was used for collection of condition data for this assignment. Road Runner (NSV) is multi-faceted road survey equipment which could be configured to collect a wide range of pavement condition data and asset data.

Road Runner NSV is capable of collecting roughness, rutting, pavement distresses, assets along with GPS coordinates and project chainage.

The main components which are integrated into Road Runner NSV are.

1. Digital Laser Profilers (DLP) -Road roughness and rutting.
2. Digital Imaging System (DIS) -Pavement distresses and road assets data.
3. Differential Global Positioning System (DGPS).
4. High Resolution Distance Measuring Instrument (HRDMI).



1. Digital Laser Profiler (DLP)

- DLP is integrated into the NSV consisting of eleven lasers to collect Road Roughness and Rutting.
- This inertial profiler is capable of recording the data continuously along each wheel path.

(a) Roughness

Road Runner NSV equipment fitted with dual wheel path laser profilometer to collect the roughness data. The roughness data was collected and reported for 100 m interval.

The outputs of the lasers and accelerometers located in each wheel path (750 mm either side of the Centre line of the vehicle) are sampled every 25 mm of longitudinal travel and used to calculate the longitudinal profile of the road.

The profile is then passed through the quarter car model to calculate the International Roughness Index (IRI) lane roughness as per the methodologies specified in the ASTM E-950.

(b) Rutting

Rutting will be measured and reported through DLP, and the data will be recorded at every 100m interval on both the wheel paths.

2. Digital Imaging System (DIS)

Digital Imaging System (DIS) in Network Survey Vehicle (NSV) consist of 5 high resolution roof mounted cameras to capture pavement distresses and road assets data. These cameras are oriented in a certain configuration to ensure that the information of interest, such as inventory or pavement condition, is being recorded in the camera field of view. Three cameras are forward facing and mounted

on front side of vehicle (Left corner, Centre and Right corner), covers 160° angle images and are set to sample at every 10m interval. Another two cameras are mounted on back side of the vehicle (Left corner, Right corner) to capture the distress image of pavement 10m*4m (length*width) i.e., captures at 10m interval.

Digital image system is capable of

- Collecting real time digital images.
- Achieving a sampling rate of at least one set per 2.5 meters for Distress camera's and one set per 10 meters for Asset cameras.
- Incorporating real time differentially corrected GPS (DGPS).
- Capturing & recording at highway speeds.
- Providing real time on-screen displays for operator verification during collection.
- Storing images straight to PC's / NAS (Network Attached Storage).
- Linking into the client's referencing system via distance and GPS.

3. Geo Referencing (DGPS Data)

Road Runner NSV is equipped with DGPS system, and it do collect all the data and images with geo-reference. Reference that image against GPS co-ordinates by logging the latitude, longitude of the specific image.

4. Distance Measuring Instrument (DMI)

Road Runner NSV is equipped with DMI, and it is fitted to rear tyre of the network survey vehicle. The distance and speed measurement performed by the distance measuring instrument, which is a distance transducer and it's highly accurate providing GPS distance and speed.

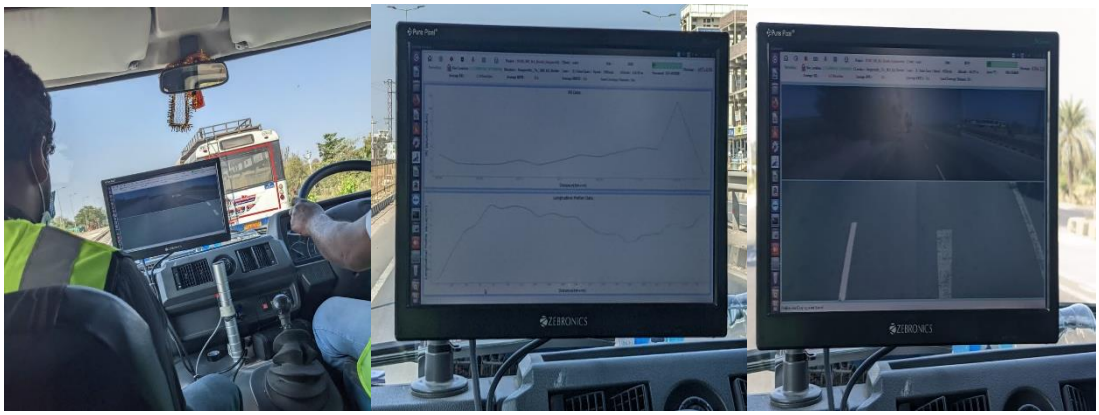


10.2 Methodology for NSV Field Testing

Usually, 4 members are assigned for site to collect the field data. Two of the trained/ experienced field engineers and two drivers during the collection phases of projects. During the survey, engineer is responsible for operating the vehicle's acquisition systems. Road Runner NSV dashboard tool is used to for data acquisition.

The survey will be carried out by lane wise, and the following steps will be followed during the survey.

- Engineer will setup the equipment and check the data collection system prior to the survey.
- Prior to the survey field engineer do set the project name, direction, lane number and starting chainage with increasing or decreasing (as per direction) details.
- The vehicle will run in middle of the lane and collects data up to a vehicle running speed of 80 Kmph.
- Digital Laser Profiler (DLP), Digital Imaging System (DIS) collect the data with GPS co-ordinates and chainage reference.
- Field Engineer will review the data collection and specifies any remarks/ details in observation column.
- At the end of project chainage, engineer will stop that particular survey and save all the recorded and the same process is followed for all other lanes of the project stretch.



10.3 Analysis of NSV Survey Data

Pavement condition survey was carried out on each lane of each carriage way with NSV. The NSV survey was conducted on the project corridor from 29/07/2024 to 31/07/2024, data was processed, analyzed, and presented in 100m interval. Detailed NSV data is presented in the following Annexures and summary of it presented as below.

10.3.1 Roughness

As stated in the earlier section, NSV collected the roughness data at 100m interval on each lane in terms of IRI (International Roughness Index) value.

In Indian context, the IRI values were converted to BI as per IRC: SP:16-2019 "Guidelines on Measuring Road Roughness and Norms" with the following equation.

$BI = 630*(IRI)^{\wedge 1.12}$

Where,

BI = Bump Integrator Roughness in mm/km

IRI = International Roughness Index.

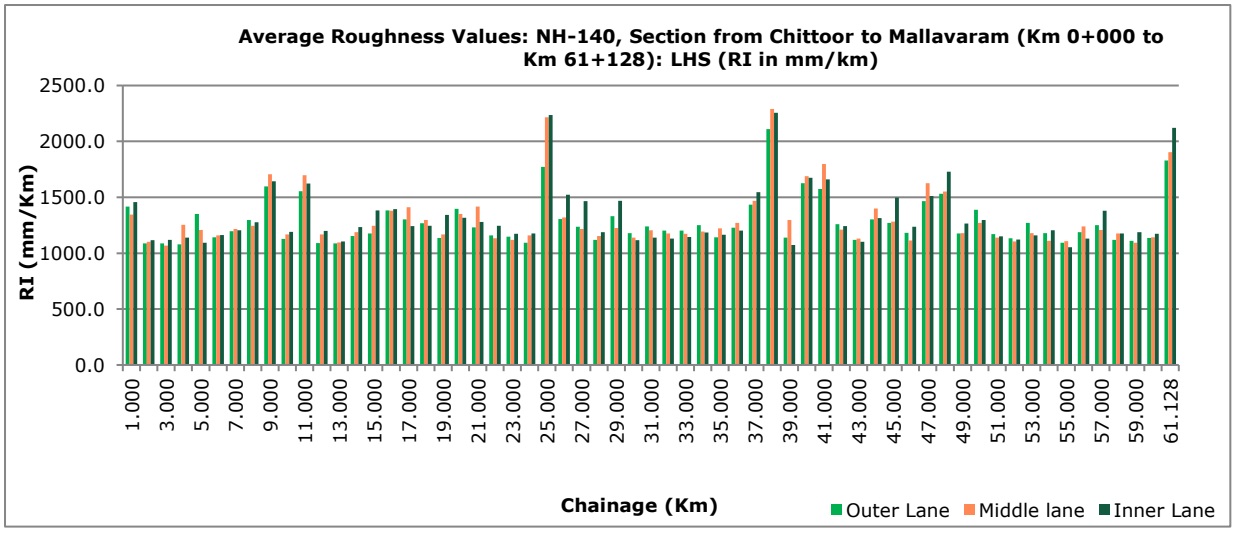
Roughness data of the pavement is collected through Digital Laser Profilers System (DLP) and the same is presented in Annexure 10.1 at an interval of 100 mts for each section. The obtained lane wise kilometer Roughness summary in terms of BI (mm/km) is presented in Table 10-1 for 6-lane flexible section (km 0+000 to km 61+128). The graphical representation of roughness data for LHS and RHS directions are presented in Figure 10-1 and Figure 10-2 respectively.

Table 10-1: Summary of roughness data on both directions (6- Lane Section) – Flexible pavement

Chainage (km)		LHS Direction				RHS Direction			
		Avg. BI (mm/km)				Avg. BI (mm/km)			
From	To	Outer Lane	Middle Lane	Inner Lane	Average	Outer Lane	Middle Lane	Inner Lane	Average
NH,140 Section from Chittoor to Mallavaram: Km 0+000 to Km 61+128									
0.000	1.000	1416.2	1344.6	1458.2	1406.3	1399.8	1560.8	1304.1	1421.6
1.000	2.000	1086.9	1101.3	1117.6	1101.9	1185.1	1198.6	1207.3	1197.0
2.000	3.000	1086.4	1068.4	1119.5	1091.4	1323.4	1309.1	1338.7	1323.7
3.000	4.000	1079.7	1253.4	1139.2	1157.4	1272.9	1384.4	1468.6	1375.3
4.000	5.000	1350.2	1208.9	1093.9	1217.7	1212.8	1209.2	1227.7	1216.6
5.000	6.000	1142.4	1160.3	1162.2	1155.0	1427.1	1336.2	1211.0	1324.8
6.000	7.000	1196.9	1215.6	1206.4	1206.3	1148.6	1353.4	1209.5	1237.2
7.000	8.000	1295.6	1244.0	1276.1	1271.9	1388.7	1309.9	1380.1	1359.6
8.000	9.000	1597.5	1706.8	1643.1	1649.1	1966.9	2034.5	2027.4	2009.6
9.000	10.000	1127.5	1167.9	1189.3	1161.6	1250.7	1342.8	1276.2	1289.9
10.000	11.000	1554.1	1698.5	1622.8	1625.1	1835.1	1894.6	1988.1	1905.9
11.000	12.000	1090.6	1167.7	1198.3	1152.2	1202.8	1197.3	1270.6	1223.6
12.000	13.000	1088.9	1097.3	1103.7	1096.6	1172.0	1201.6	1240.2	1204.6
13.000	14.000	1154.6	1187.0	1232.3	1191.3	1360.5	1360.4	1381.2	1367.4
14.000	15.000	1176.3	1244.1	1381.7	1267.4	1296.1	1303.7	1318.2	1306.0
15.000	16.000	1381.2	1381.0	1392.9	1385.1	1271.0	1582.1	1592.0	1481.7
16.000	17.000	1303.6	1410.2	1240.8	1318.2	1576.1	1426.7	1362.0	1454.9
17.000	18.000	1267.6	1297.8	1246.3	1270.6	1278.7	1268.4	1307.6	1284.9
18.000	19.000	1136.3	1167.6	1343.8	1215.9	1284.2	1267.7	1341.3	1297.7
19.000	20.000	1398.1	1352.3	1317.8	1356.1	1318.5	1442.7	1421.8	1394.3
20.000	21.000	1229.6	1416.2	1278.7	1308.2	1206.1	1307.8	1253.0	1255.6
21.000	22.000	1159.7	1132.6	1244.7	1179.0	1188.9	1328.6	1247.5	1255.0
22.000	23.000	1147.5	1119.8	1173.3	1146.8	1500.7	1684.6	1739.5	1641.6
23.000	24.000	1094.1	1159.9	1175.7	1143.3	1168.0	1240.6	1248.7	1219.1
24.000	25.000	1770.8	2215.0	2236.7	2074.2	1652.2	2051.2	1991.1	1898.2
25.000	26.000	1304.0	1318.2	1521.9	1381.4	1344.0	1488.0	1579.1	1470.4
26.000	27.000	1235.9	1217.1	1466.5	1306.5	1183.3	1343.9	1244.9	1257.4
27.000	28.000	1117.7	1153.7	1186.4	1152.6	1149.0	1250.2	1187.9	1195.7
28.000	29.000	1331.0	1224.9	1468.7	1341.6	1150.0	1233.4	1186.1	1189.9
29.000	30.000	1179.9	1139.6	1116.7	1145.4	1250.9	1281.4	1433.0	1321.7
30.000	31.000	1238.2	1205.8	1139.5	1194.5	1176.3	1222.0	1184.0	1194.1
31.000	32.000	1202.8	1175.9	1129.5	1169.4	1150.8	1239.4	1216.4	1202.2
32.000	33.000	1201.0	1173.1	1144.3	1172.8	1183.6	1271.9	1259.7	1238.4
33.000	34.000	1252.1	1194.9	1185.5	1210.8	1235.0	1377.9	1346.3	1319.7
34.000	35.000	1140.9	1222.9	1165.4	1176.4	1166.9	1164.9	1255.7	1195.8
35.000	36.000	1227.2	1270.9	1200.8	1233.0	1178.5	1262.3	1261.3	1234.0

Chainage (km)		LHS Direction				RHS Direction			
		Avg. BI (mm/km)				Avg. BI (mm/km)			
From	To	Outer Lane	Middle Lane	Inner Lane	Average	Outer Lane	Middle Lane	Inner Lane	Average
36.000	37.000	1433.9	1468.7	1545.2	1482.6	1351.4	1399.6	1368.2	1373.1
37.000	38.000	2110.6	2290.5	2255.8	2219.0	2024.4	2057.5	2163.1	2081.7
38.000	39.000	1138.4	1297.4	1074.2	1170.0	1403.0	1271.6	1262.4	1312.3
39.000	40.000	1627.0	1689.2	1674.8	1663.6	1491.7	1427.1	1520.4	1479.8
40.000	41.000	1574.7	1796.8	1659.6	1677.0	1254.9	2125.9	2171.4	1850.7
41.000	42.000	1260.1	1212.1	1241.2	1237.8	1177.2	1309.2	1339.9	1275.4
42.000	43.000	1118.7	1130.3	1102.2	1117.1	1085.7	1230.3	1250.1	1188.7
43.000	44.000	1302.2	1399.9	1312.9	1338.3	1392.7	1437.7	1454.5	1428.3
44.000	45.000	1271.8	1281.8	1497.5	1350.4	1302.1	1344.2	1333.4	1326.6
45.000	46.000	1181.5	1113.0	1236.0	1176.8	1194.3	1272.6	1326.1	1264.3
46.000	47.000	1465.9	1626.0	1511.0	1534.3	1467.8	1592.8	1536.0	1532.2
47.000	48.000	1530.8	1552.5	1729.6	1604.3	1629.4	1630.3	1664.4	1641.4
48.000	49.000	1177.7	1177.8	1264.1	1206.6	1339.5	1483.9	1368.9	1397.5
49.000	50.000	1389.5	1269.7	1296.0	1318.4	1447.2	1519.6	1544.8	1503.9
50.000	51.000	1169.6	1138.4	1149.4	1152.4	1203.5	1217.1	1259.9	1226.8
51.000	52.000	1133.2	1106.0	1121.3	1120.2	1282.5	1328.9	1344.1	1318.5
52.000	53.000	1269.7	1179.7	1160.1	1203.2	1370.7	1388.6	1370.6	1376.6
53.000	54.000	1180.2	1109.7	1203.8	1164.6	1187.4	1279.5	1247.1	1238.0
54.000	55.000	1092.8	1108.6	1053.5	1084.9	1268.9	1362.6	1301.2	1310.9
55.000	56.000	1188.9	1239.4	1131.2	1186.5	1172.3	1252.0	1217.8	1214.0
56.000	57.000	1251.8	1208.4	1378.8	1279.7	1479.5	1665.3	1612.3	1585.7
57.000	58.000	1119.1	1177.7	1176.9	1157.9	1229.5	1458.4	1499.2	1395.7
58.000	59.000	1109.3	1092.0	1187.1	1129.4	1243.4	1382.5	1223.9	1283.3
59.000	60.000	1136.8	1140.9	1173.9	1150.5	1315.1	1343.1	1259.7	1306.0
60.000	61.128	1830.0	1903.1	2120.9	1951.3	1655.2	1657.5	1677.7	1663.4

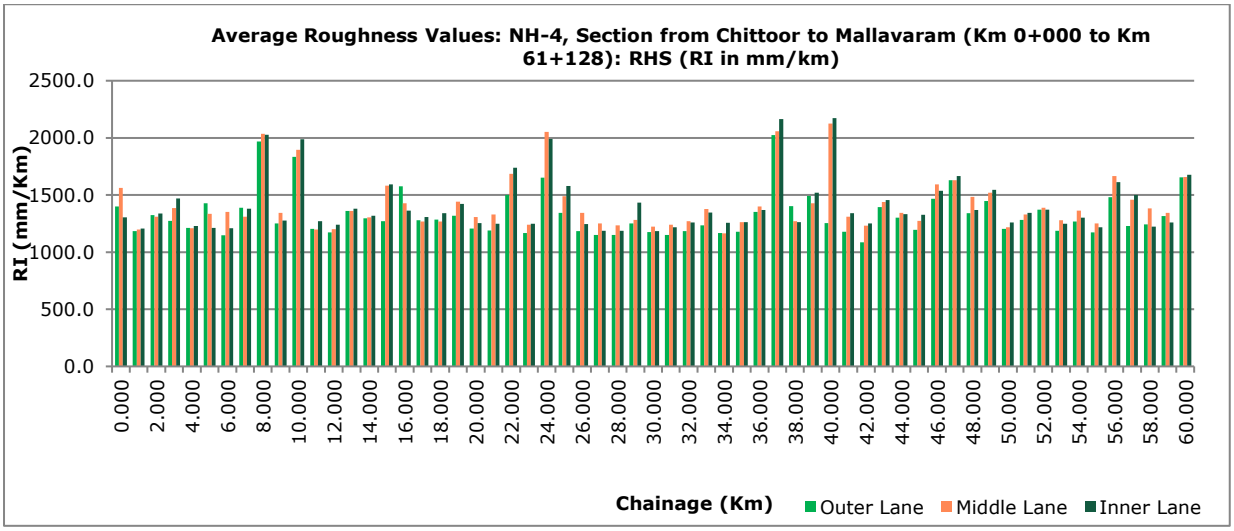
**From Km 39+450 to Km 40+700, due to land availability issues survey was not carried out.*



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From Km 39+450 to Km 40+700, due to land availability issues survey was not carried out

Figure 10-1: Illustrative summary of roughness on LHS direction



From Km 39+450 to Km 40+700, due to land availability issues survey was not carried out.

Figure 10-2: Illustrative summary of roughness on RHS direction

Observations:

Flexible Pavement Section (6-lane):

The roughness value of entire section is within the allowable limit (not more than 2750mm/km) only.

Table 10-2: Roughness summary in LHS & RHS direction (6- lane Section)

Roughness Summary														
S.no	Condition	BI (mm/km)	LHS						RHS					
			Outer Lane		Middle Lane		Inner Lane		Outer Lane		Middle Lane		Inner Lane	
			Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)
NH,140 Section from Chittoor to Mallavaram: (Km 0+000 to Km 61+128)														
1	Good	<1800	57.750	96.4	56.750	94.8	56.710	94.8	56.878	95.0	55.578	92.8	55.578	92.8
2	Fair	1800-2750	2.128	3.6	3.128	5.2	3.128	5.2	3.000	5.0	4.300	7.2	4.300	7.2
3	Poor	>2750	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
Length of Land availability issue			1.250		1.250		1.250		1.250		1.250		1.250	
Total Length (in km)			61.128		61.128		61.128		61.128		61.128		61.128	

From Km 39+450 to Km 40+700, due to land availability issues survey was not carried out.

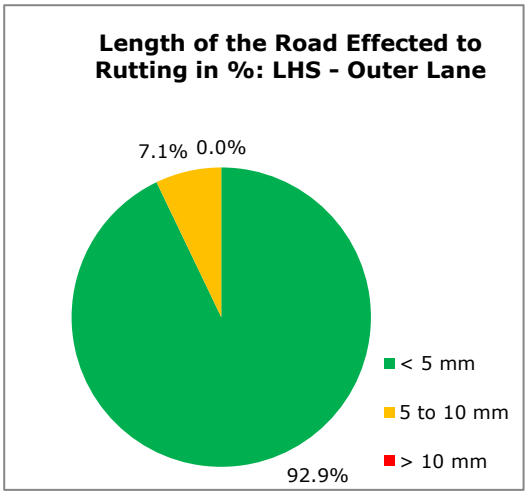
10.3.2 Rutting

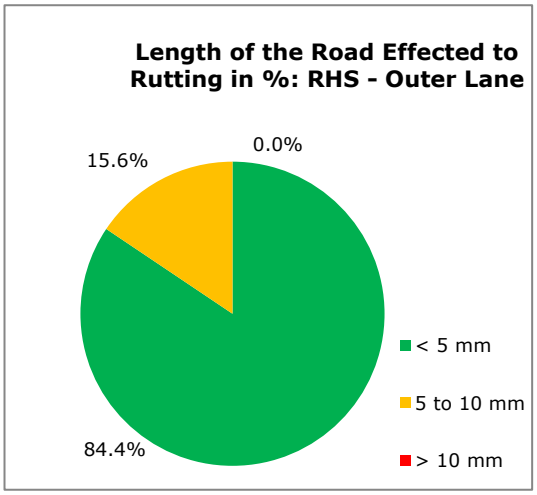
Rutting data of flexible pavement section is collected through digital laser profilers' system and the same is presented in Annexure 10.2 at an interval of 100mts. The obtained lane wise rutting summary is presented in Table 10-3 for both LHS and RHS directions. The graphical representation of rutting data is presented in Figure 10-3 for both LHS & RHS direction.

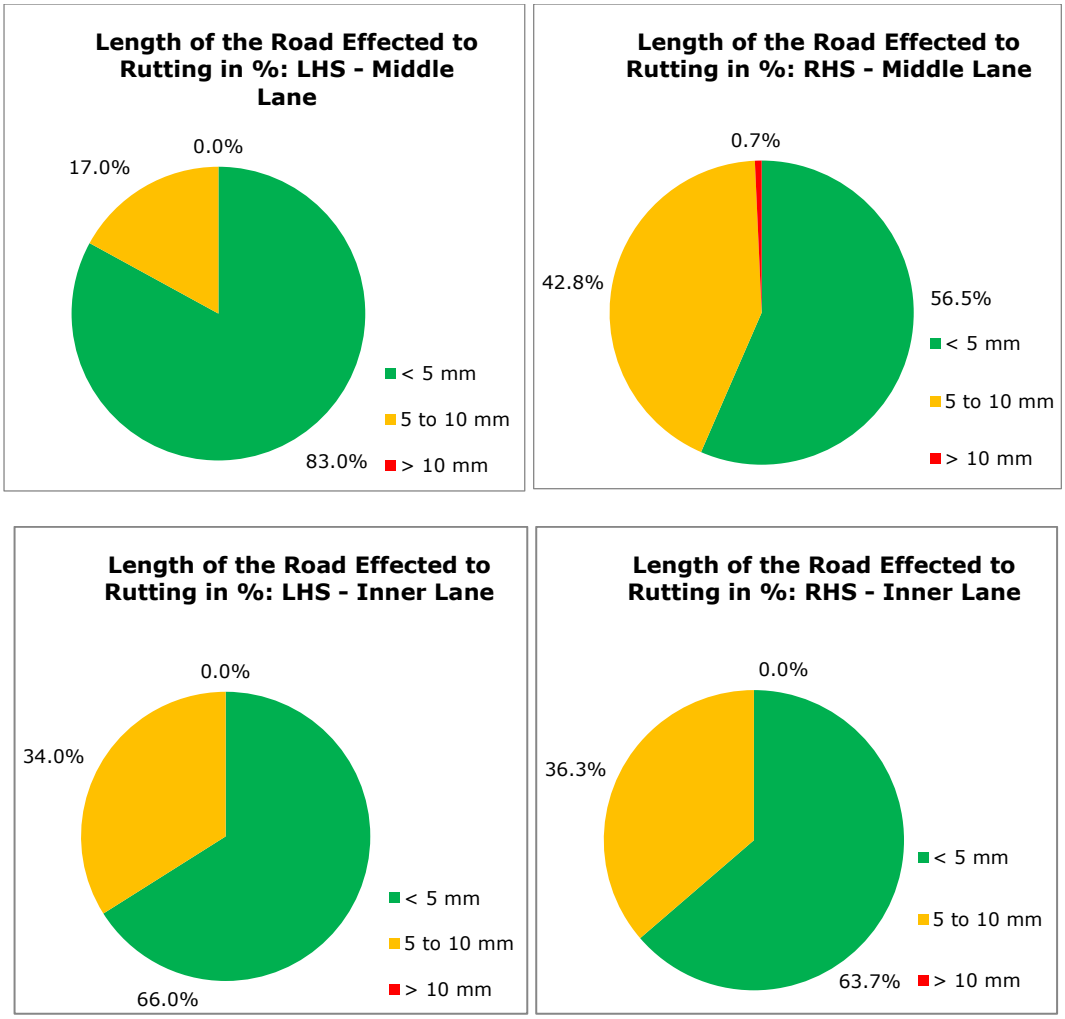
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Table 10-3: Summary of rutting data on both directions (6- Lane Section)

Summary of Rutting Analysis of LHS & RHS direction: NH,140 Section from Chittoor to Mallavaram, (Km 0+000 to Km 61+128)													
Distress	Depth (in mm)	Length of the Road Effected with Rutting											
		LHS (Length in Km)			LHS (Length in %)			RHS (Length in Km)			RHS (Length in %)		
		Outer Lane	Middle Lane	Inner Lane	Outer Lane	Middle Lane	Inner Lane	Outer Lane	Middle Lane	Inner Lane	Outer Lane	Middle Lane	Inner Lane
Rutting	< 5 mm	54.808	48.708	38.748	92.9	83.0	66.0	49.808	33.188	37.388	84.4	56.5	63.7
	5- 10 mm	4.200	10.000	19.920	7.1	17.0	34.0	9.200	25.100	21.320	15.6	42.8	36.3
	> 10 mm	0.000	0.000	0.000	0.0	0.0	0.000	0.000	0.420	0.000	0.0	0.7	0.0
Length of Land availability issue		1.250	1.250	1.250				1.250	1.250	1.250			
Total Length (in km)		61.128	61.128	61.128				61.128	61.128	61.128			







**From Km 39+450 to Km 40+700, due to land availability issues survey was not carried out*.

Figure 10-3: Illustrative summary of rutting for Chittoor to Mallavaram

Observations:

- In LHS direction rutting value is within desirable limit only. (not more than 10mm)
- In RHS middle lane direction a length of 0.420km rutting is more than 10mm.

10.3.3 Pavement distress data of Rigid Pavement

The following Pavement distresses are considered for assessing the rigid pavement condition as per IRC SP: 83-2018 (Guidelines for Maintenance, Repair and Rehabilitation of Cement concrete pavements);

- Cracking
  - Longitudinal cracks
  - Transverse cracks/ Diagonal Cracks
  - Corner cracks/ Corner breaks
  - Multiple cracks
- Spalling of Joints
- Joint seal defects
- Joint Faulting/ Stepping

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- Joint Separation
- Blow up/ Buckling
- Ravelling/ Scaling
- Potholes/ Pop outs

All the above pavement distresses will be provided at 10 m interval.

The existing distresses are measured in five level distress rating system as specified in IRC: SP: 83-2018. The five-level distress rating system is given in Table 10-4 below.

Table 10-4: Five-level distress rating system for Rigid Pavement

Distress Rating	Slab Condition	Severity (Defects) Rating
0	Excellent	No Discernible
1	Very Good	Minor
2	Good/Average	Moderate
3	Fair	Major
4	Poor	Extreme
5	Very Poor	Unsafe/ Unserviceable

The condition survey of the rigid pavement was carried out by observing all the listed distresses as specified in IRC: SP: 83-2018 in conformity with Proforma given code. Type of distresses and assessment rating as given in Table 4.5 of IRC: SP: 83-2018 is followed and the same is listed in Table 10-5 below.

Table 10-5: Type of distresses and its assessment rating

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating
1	**CRACKING**			
	Single Discrete Cracks Not interaction with Any joint	w=width of crack L=length of crack d=depth of crack D=depth of slab	0	Nil, not discernible
			1	w<0.2 mm, hair cracks
			2	w= 0.2 -0.5 mm, discernible from slow-moving car
			3	w=0.5-1.5 mm, discernible from fast-moving car
			4	w=1.5-3.00 mm
			5	w>3 mm
2	Single Transverse (or Diagonal) Crack intersecting with one or more joints	w=width of crack L=length of crack d=depth of crack D=depth of slab	0	Nil, not discernible
			1	w<0.2 mm, hair cracks
			2	w=0.2 -0.5 mm, discernible from slow vehicle
			3	w=0.5-3.0 mm, discernible from fast vehicle
			4	w=3.0-6.0 mm
			5	w>6mm, usually associated with spalling, and/or slab rocking under traffic
3	Single Longitudinal Crack intersecting with	w=width of crack L=length of crack d=depth of	0	Nil, not discernible
			1	w<0.5 mm, discernible from slow vehicle
			2	w= 0.5 -3.0 mm. discernible from fast vehicle

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating
	one or more joints	crack D=depth of slab	3	w=3.0-6.0 mm
			4	w=6.0-12. mm
			5	w>12mm, usually associated with spalling, and/or slab rocking under traffic
4	Multiple Cracks Intersecting with one or more joints or cracks	w=width of crack	0	Nil, not discernible
			1	w<0.2 mm, hair cracks
			2	w=0.2 - 0.5 mm, discernible from slow vehicle
			3	w=0.5-3.0 mm, discernible from fast vehicle
			4	w=3.0 - 6.0 mm panel broken into 2 or 3 pieces
			5	w > 6 mm and/or panel broken into more than 4 pieces
5	Corner Break	w=width of crack L=length of crack	0	Nil, not discernible
			1	w<0.5 mm only one corner broken
			2	w< 1.5 mm, L<0.6 m, only one corner broken
			3	w< 1.5 mm. L <0.6 m, two corners broken
			4	w>1.5 mm, L >0.6 m, or Three corners broken
			5	Three or four corners broken
6	Punchout (Applicable to CRCP only)	w=width of crack L=length (m/m^2)	0	Nil, not discernible
			1	w< 0.5 mm; L< 3 m/m^2
			2	either w>0.5 mm or L<3 m/m^2
			3	w> 1.5 mm and L< 3 m/m^2
			4	w>3 mm, L<3 m/m^2 and deformation
			5	w>3 mm, L>3 m/m^2 and deformation
7	**SURFACE DEFECTS**			
	Ravelling or Honey comb type surface	r= area damaged surface / total surface of slab (%) h=maximum depth of damage	0	Nil, not discernible
			1	r < 2 %
			2	r =2-10%
			3	r=10-25%
			4	r=25-50%
			5	r >50% and h>25 mm
8	Scaling	r= area damaged surface / total surface of slab (%) h=maximum depth of damage	0	Nil, not discernible
			1	r < 2 %
			2	r =2-10%
			3	r=10-20%
			4	r=20-30%
			5	r >30% and h>25 mm
9			0	

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating
	Polished Surface/ Glazing	t=texture depth sand patch test	1	t > 1mm
			2	t=1-0.6 mm
			3	t=0.6-0.3 mm
			4	t=0.3-0.1 mm
			5	t<0.1 mm
10	Pop out (small Hole), Pothole Refer Para 8.4	n=number/m2 d=diameter h= maximum depth		
			0	d<50 mm; h<25 mm; n <1 per 5 m^2
			1	d=50-100 mm: h<50 mm: n<1 per 5 m^2
			2	d=50-100 mm: h>50 mm: n<1 per 5 m^2
			3	d=100-300 mm: h<100 mm: n<1 per 5 m^2
			4	d=100-300 mm: h>100 mm: n<1 per 5 m^2
			5	d>300 mm: h>100 mm: n>1 per 5 m^2
	JOINT DEFECTS			
11	Joint Seal Defects	Loss or damage L=Length as % total joint length	0	Difficult to discern.
			1	Discernible, L<25% but of little immediate consequence eighth regard to ingress of water or trapping incompressible material.
			3	Notable, L>25% insufficient protection against ingress of water and trapping in incompressible material.
			5	Severe; w>3 mm negligible protection against ingress of water and trapping in incompressible material.
12	Spalling of Joints	w= width on either side of the joint L= Length as % total joint length	0	Nil, not discernible
			1	w<10 mm
			2	w=10-20 mm, L<25%
			3	w=20-40 mm, L >25%
			4	w=40-80mm, L >25%
			5	w>80mm, and L>25%
13	Faulting (or stepping) in Cracks or Joints	f=difference of level	0	Not discernible, f< 1 mm
			1	f< 3 mm
			2	f=3-6 mm
			3	f=6-12 mm
			4	f=12-18 mm
			5	f>18 mm
14	Blow up or buckling	h=vertical displacement from normal profile	0	Nil, not discernible
			1	h< 6 mm
			2	h=6-12 mm
			3	h=12-25 mm
			4	h>25 mm

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating
			5	shattered slabs, i.e., 4 or more pieces
15	Depression	h= negative vertical displacement from profile L= Length	0	Nil, not discernible, h<5 mm
			1	h=5-15 mm
			2	h=15-30 mm. Nos < 20% joints
			3	h=30-50 mm
			4	h>50mm or >20% joints
			5	h>100 mm
16	Heave	h= positive vertical displacement from profile L= Length	0	Nil, not discernible, h<5 mm
			1	h=5-15 mm
			2	h=15-30 mm. Nos < 20% joints
			3	h=30-50 mm
			4	h>50 mm or >20% joints
			5	h>100 mm
17	Bump	h=vertical displacement from normal profile	0	h<4 mm
			1	h=4-7 mm
			3	h= 7 - 15 mm
			5	h>15 mm
18	Lane to Shoulder Dropoff	f=difference of level	0	Nil, not discernible f<5 mm
			1	f=3-10 mm
			2	f=10-25 mm.
			3	f=25-50 mm
			4	f=50-75 mm
			5	f >75 mm
19	**DRAINAGE**			
	Pumping	quantity of fines and water expelled through open joints and cracks Nos/ 100 m stretch	0	Not discernible
			1 to 2	slight / occasional Nos <10%
			3 to 4	appreciable / Frequent 10-25%
			5	Abundant, crack development>25%
20	Ponding	Ponding on slabs due to blockage of drains	0-2	No discernible problem
			3 to 4	Blockages observed in drains, but water flowing
			5	Ponding, accumulation of water observed

Rigid Pavement distresses for Chittoor to Mallavaram section (km 0+000 to km 61+128) the rigid pavement distress summary is presented in Annexure 10.3. The rigid pavement condition summary of each section in lane wise is presented from Table 10-6.

Table 10-6: Rigid Pavement Distress Summary (6-Lane Section):

Rigid Pavement Distress Summary Based on Depth & Severity (Length in Km)																							
Severity	**Single discrete cracks**		**Longitudinal Cracks**		**Transverse/ Diagonal Cracks**		**Multiple Cracks**		**Corner Cracks/ Breaking**		**Joint Spalling/ Joint Damage**	**Joint Seal defects**	**Joint Separation**	**Faulting/ Stepping**	**Blow Up/ Buckling**	**Punchout**	**Ravelling**	**Scaling**	**Pothole/ Popout**	**At Structures/ Flexible Overlay Location**			
	>D/2	**<D/2**	**>D/2**	**<D/2**	**>D/2**	**<D/2**	**>D/2**	**<D/2**	**>D/2**	**<D/2**										**Patching**	**Delamination**	**Reflection Cracks**	**Cracking**
NH,140 Section from Chittoor to Mallavaram (Km 0+000 to Km 61+128): LHS Inner																							
0	1.170	1.060	1.170	1.080	1.170	1.120	1.170	1.000	1.170	1.170	0.980	1.170	1.170	1.170	1.170	1.170	1.170	1.170	1.170	1.150	1.170	1.170	1.170
1	0.000	0.100	0.000	0.090	0.000	0.050	0.000	0.140	0.000	0.000	0.150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
2	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.030	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
Total Length (Km)	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**
NH,140 Section from Chittoor to Mallavaram (Km 0+000 to Km 61+128): LHS Middle																							
0	1.170	1.070	1.170	1.070	1.170	1.120	1.170	1.050	1.170	1.170	0.930	1.160	1.170	1.170	1.170	1.170	1.170	1.170	1.170	1.170	1.170	1.170	1.170
1	0.000	0.090	0.000	0.090	0.000	0.040	0.000	0.040	0.000	0.000	0.140	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
2	0.000	0.010	0.000	0.010	0.000	0.000	0.000	0.070	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.010	0.000	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
Total Length (Km)	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**
NH,140 Section from Chittoor to Mallavaram (Km 0+000 to Km 61+128): LHS Outer																							
0	0.870	0.870	0.870	0.870	0.870	0.870	0.870	0.870	0.870	0.870	0.850	0.870	0.870	0.870	0.870	0.870	0.870	0.870	0.870	0.870	0.870	0.870	0.870
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
Total Length (Km)	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**
NH,140 Section from Chittoor to Mallavaram (Km 0+000 to Km 61+128): RHS Inner																							
0	1.170	1.170	1.170	0.920	1.170	1.100	1.170	1.090	1.170	1.160	0.910	1.170	1.170	1.170	1.170	1.170	1.170	1.160	1.170	1.160	1.170	1.170	1.170
1	0.000	0.000	0.000	0.180	0.000	0.070	0.000	0.070	0.000	0.010	0.180	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000			0.000	0.000
2	0.000	0.000	0.000	0.070	0.000	0.000	0.000	0.010	0.000	0.000	0.070	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
Total Length (Km)	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**
NH,140 Section from Chittoor to Mallavaram (Km 0+000 to Km 61+128): RHS Middle																							
0	1.170	1.100	1.170	1.050	1.170	1.110	1.170	1.120	1.170	1.170	0.940	1.160	1.170	1.170	1.170	1.170	1.170	1.160	1.170	1.170	1.170	1.170	1.170
1	0.000	0.040	0.000	0.100	0.000	0.010	0.000	0.050	0.000	0.000	0.070	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000			0.000	0.000
2	0.000	0.030	0.000	0.020	0.000	0.050	0.000	0.000	0.000	0.000	0.150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000

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Rigid Pavement Distress Summary Based on Depth & Severity (Length in Km)																							
Severity	**Single discrete cracks**		**Longitudinal Cracks**		**Transverse/ Diagonal Cracks**		**Multiple Cracks**		**Corner Cracks/ Breaking**		**Joint Spalling/ Joint Damage**	**Joint Seal defects**	**Joint Separation**	**Faulting/ Stepping**	**Blow Up/ Buckling**	**Punchout**	**Ravelling**	**Scaling**	**Pothole/ Popout**	**At Structures/ Flexible Overlay Location**			
	>D/2	**<D/2**	**>D/2**	**<D/2**	**>D/2**	**<D/2**	**>D/2**	**<D/2**	**>D/2**	**<D/2**										**Patching**	**Delamination**	**Reflection Cracks**	**Cracking**
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
Total Length (Km)	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**	**1.170**
NH,140 Section from Chittoor to Mallavaram (Km 0+000 to Km 61+128): RHS Outer																							
0	0.870	0.870	0.870	0.870	0.870	0.860	0.870	0.870	0.870	0.870	0.820	0.870	0.870	0.870	0.870	0.870	0.870	0.870	0.870	0.870	0.870	0.870	0.870
1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
2	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
Total Length (Km)	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**	**0.870**

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Pavement Distresses data for flexible pavement

The NSV software will process and geotag with corresponding co-ordinates and chainage, which will further categories the distress type, location, magnitude and severity.

Pavement distress data of Flexible pavement- Main carriageway

The following Pavement distresses are considered for assessing the flexible pavement condition as per IRC: 82-2023 "Code of Practice for Maintenance of Bituminous Road Surfaces".

- Cracking
  - Longitudinal cracks
  - Transverse cracks
  - Alligator cracks/ Crocodile cracks
  - Multiple cracks
- Ravelling
- Shoving
- Bleeding
- Slippage/ Delamination
- Potholes
  - Area: Surface Area of the Pothole.
  - Numbers
- Edge break
- Patching
- Settlements, Depressions

All the above pavement distress will be provided at 100 m interval.

The detailed pavement condition analysis and distress rating is carried out as per Table 5.1 given in IRC 82:2023. The detailed pavement distresses data of LHS and RHS directions are presented in Annexure 10.4(a) and Annexure 10.4(b). The pavement distress summary is presented in Table 10-7 for LHS and RHS directions. Few Sites investigation photographs in Figure 10-4 below.

Table 10-7: Summary of Flexible pavement distresses on both directions (6- Lane Section-Main CW)

Distress	Severity (% of Area)	Length of the Road Effected						Length of the Road Effected					
		LHS						RHS					
		Inner Lane		Middle Lane		Outer Lane		Inner Lane		Middle Lane		Outer Lane	
		Length in km	Length in %	Length in km	Length in %	Length in km	Length in %	Length in km	Length in %	Length in km	Length in %	Length in km	Length in %
NH,140 Section from Chittoor to Mallavaram (Km 0+000 to Km 61+128)													
Cracking	< 5%	58.068	98.98	58.208	99.15	59.008	100.00	56.458	96.17	56.558	96.34	58.408	98.98
	5% to 10%	0.400	0.68	0.300	0.51	0.000	0.00	1.000	1.70	1.500	2.56	0.300	0.51
	> 10%	0.200	0.34	0.200	0.34	0.000	0.00	1.250	2.13	0.650	1.11	0.300	0.51
Ravelling	< 1%	58.668	100.00	58.708	100.00	59.008	100.00	58.708	100.00	58.708	100.00	59.008	100.00
	1% to 10%	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
	> 10%	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
Potholes	Nil	58.668	100.00	58.708	100.00	59.008	100.00	58.708	100.00	58.708	100.00	59.008	100.00
	1 to 2	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
	>2	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
Patching	< 1%	58.668	100.00	58.708	100.00	59.008	100.00	58.658	99.91	58.658	99.91	58.908	99.83
	1% to 10%	0.000	0.00	0.000	0.00	0.000	0.00	0.050	0.09	0.050	0.09	0.100	0.17
	> 10%	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
Rut depth	< 5	38.748	66.05	48.708	82.97	54.808	92.88	37.388	63.68	33.188	56.53	49.808	84.41
	5 to 10	19.920	33.95	10.000	17.03	4.200	7.12	21.320	36.32	25.100	42.75	9.200	15.59
	> 10	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.420	0.72	0.000	0.00
IRI	< 2.55	51.700	88.12	53.200	90.62	54.300	92.02	51.900	88.40	52.000	88.57	54.728	92.75
	2.55 to 3.3	6.288	10.72	4.928	8.39	4.348	7.37	6.388	10.88	5.988	10.20	4.080	6.91
	> 3.3	0.680	1.16	0.580	0.99	0.360	0.61	0.420	0.72	0.720	1.23	0.200	0.34

**From Km 39+450 to Km 40+700, due to land availability issues survey was not carried out.*



Figure 10-4: Field testing photographs captured during the NSV survey

Pavement Observations:

Chittoor to Mallavaram Section (km 0+000 to km 61+128)

Main Carrigeway:

- The overall pavement condition is good, only milid rutting is oberved.
- In RHS direction few location Rutting and cracks were observed, apart from this overall section is good.
- The rigid pavement at RUB and Toll plaza is good, few slabs have a cracks and spalling were obsevred



Service Roads:

- The service roads in both direction is good, in a few location ravelling and bleeding were observed.



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Critical Issues:

- On the LHS section after RUB location Ch.24+800 the drainage water to be diverted to other low point as here water is dripping from top earthen layers near Gangamma temple-SRIPURAM due to obligatory point there might me some land acquisition issue. This water leakage is stripping the asphalt layer and need patch repair after sorting drainage issue.
- At km 43+800, in LHS direction the drainage blocked, and water is starts flowing on to the service roads.





The Service roads visual pavement condition summary is provided in the Table 10-8 below,

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Table 10-8: Service Roads visible condition summary from Km 0+000 to Km 61+128

Service Roads visual pavement condition summary						
LHS Direction						
From	**To**	**Length**	**Overall Condition**	**Distress Type**	**Remarks**	**LA Issues**
0.000	7.880	7.880	Good			
8.600	9.840	1.240	Good			
10.780	28.680	17.900	Good	Delamination & Cracking	1. at Km. 11+400 Delamination was observed. 2. at Km 18+700 the inner lane has cracks. 3. at Km 19+100 raveling was observed. 4. at km 21+210 LHS has bleeding 5. at 24+800 near RUB section stripping of pavement. 6. at Km 25.700 Junction Ravelling was observed.	1. from km 15.340 to km 15.380 Outer lane is obstruction 2. from km 24.800 to km 24.860 outer lane is obstruction 3. From Km 25.300 to km 25.400 outer lane is obstruction
28.680	28.710	0.030				Descope
28.710	36.920	8.210	Good			1. from km 34.080 to km 34.190 outer lane is obstruction
37.780	38.640	0.860	Good			
38.640	38.670	0.030	Good			
38.670	38.710	0.040				Descope
38.710	38.790	0.080	Good			
38.790	38.830	0.040				Descope
38.830	39.160	0.330	Good			Descope
39.160	39.330	0.170				
39.330	39.500	0.170	Good			
39.500	40.730	1.230				Descope
40.730	44.270	3.540	Good	Delamination & Alligator Cracks	1. Km 41+750 to Km 41.830 delamination of pavement. 2. at km 48.600 to Km 48.700 Alligator Cracks	
44.270	44.320	0.050				Descope (Work Done up to WMM 1st, Work Stopped Due to Encumbrance Land)
44.320	61.128	16.808	Good		at Km 60.990 to 61.128 section has raveling	1. from km 48.610 to km 48.680 outer lane is obstruction 2. From km 56.800 to km 56.900 outer lane is obstruction

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RHS Direction						
From	**To**	**Length**	**Overall Condition**	**Distress Type**	**Remarks**	**LA Issues**
61.128	53.760	7.368	Good			
53.760	53.690	0.070				Descope
53.690	47.680	6.010	Good		1. at Km 49+000 due to animal footprints pavement was damaged. 2. at Km 46+500 to delamination	
47.680	47.510	0.170				Descope
47.510	40.120	7.390	Good			
40.120	39.640	0.480				Descope
39.640	39.560	0.080	Good			
39.560	39.320	0.240				Descope
39.320	38.810	0.510	Good			
38.810	38.760	0.050				Descope
38.760	37.950	0.810	Good			
37.950	37.930	0.020				Descope
37.930	37.870	0.060	Good			
37.870	37.780	0.090				Descope
36.920	36.500	0.420	Good			
36.500	36.450	0.050				Descope
36.450	10.810	25.640	Good			From 24.400 to 24.350 Outer Lane is obstruction
9.840	8.600	1.240	Good			
7.880	0.000	7.880	Good			

10.4 Structural Evaluation of Flexible Pavement by Using FWD (Km 0+000 to Km 61+128)

10.4.1 Equipment Description and Test Methodology

Principle of Pavement Evaluation Using FWD

Performance of flexible pavements can be evaluated by applying loads on the pavements that simulate the actual traffic loading conditions, The recording of such responses is made by measuring the elastic deflection under such loads. The collected deflection data from survey is duly analysed considering the factors influencing the performance of pavement such as subgrade strength, thickness and quality of each of the pavement layers, drainage conditions, pavement surface temperature etc.
Among the equipment available for structural evaluation of pavements, the Falling Weight Deflectometer (FWD) is extensively used world-wide because it simulates, to a large extent, the actual loading conditions of the pavement. When a moving wheel load passes over the pavement it produces load pulses. Normal stresses (vertical as well as horizontal) at a location in the pavement will increase in magnitude from zero to a peak value as the moving wheel load approaches the location. The time taken for the stress pulse to vary from zero to peak value is termed as 'rise time of the pulse'. As the wheel moves away from the location, magnitude of stress reduces from peak value to zero. The time period during which the magnitude of stress pulse varies from 'zero-to-peak-to-zero' is the pulse duration. Peak load and the corresponding pavement responses are of interest for pavement evaluation.
The resulting load-deflection data can be interpreted through appropriate analytical techniques, such as back calculation technique, to estimate the elastic moduli of the pavement layers. The computed moduli are, in turn, used for (i) the strength evaluation of different layers of in-service pavements (ii) the estimation of the remaining life of in-service pavement (iii) determination of strengthening requirement, if any and (iv) evaluation of different rehabilitation alternatives (overlay, recycling, partial reconstruction, etc

Brief Description of Falling Weight Deflectometer (FWD)

Falling Weight Deflectometer is an impulse-generating device with a guide system. This device allows a variable weight to be dropped from a variable height. The apparatus has a loading plate which is used for uniform force distribution on the test layer. When the weight affects this plate, this loading plate ensures that the resulting force is applied perpendicularly to the test layer's surface. It also has a load cell for measuring the actual applied impulse. It also has one or more deflection sensors. (Note: Deflection basin tests require at least seven sensors). It also has a system for collecting, processing, and storing deflection data. Structural evaluation of pavements involves application of a standard load to the pavement and measuring its response in terms of stress, strain or deflection.

The basic working principle of the impulse loading equipment is to drop a mass on the pavement to produce an impulse load and measure the surface deflections. The mass is dropped on a spring system, which in turn transmits the load to the pavement through a loading plate. The resulting deflection bowl characteristics are observed and used in the back calculation of pavement material properties. The principle is illustrated in Figure 10-5

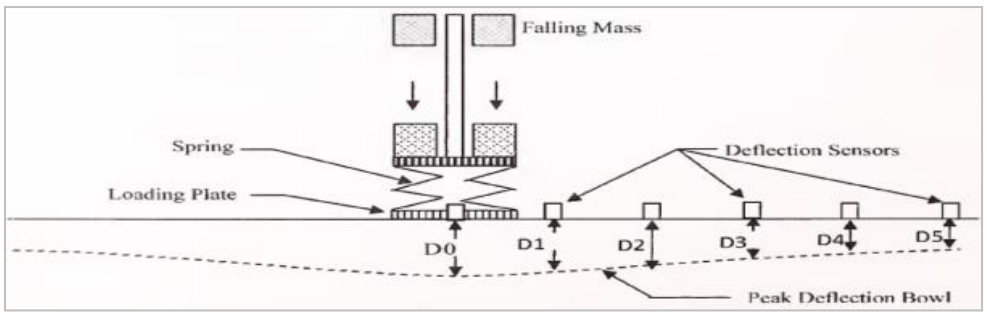


Figure 10-5: Working Principle of FWD

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FWD Instrument Used for the Deflection Survey: DYNATEST 8002 FWD

For the purpose of conducting FWD survey on the project road DYNATEST 8002 FWD Fully Automatic Vehicle-mounted FWD and ERAY FWD Fully Automatic Vehicle-mounted FWD were used. The FWD machines can apply a loading in the range of 12-150 kN, enabling them to simulate all type of vehicle loads on pavement surface. These models are equipped with a battery back-up and vehicle mounted set-up with all other accessories required for evaluation of pavement.

Moreover, this particular instruments mostly outperforms or matches all the criteria given in the IRC: 115-2014. Following Table 10-9 summarizes the technical specifications of the instruments against the specifications of FWD mentioned by IRC: 115-2014.

Table 10-9: Comparison between IRC and DYNATEST 8002 FWD Specifications

No	FWD Components	IRC :115-2014	DYNATEST 8002 FWD	Remarks
1	Plate Diameter	300/450 mm	300 mm	300 mm dia plate is recommended
2	Mass System	Single Mass	Single Mass	Matched
3	Falling Weight Mass	50kg to 700kg	50kg to 350kg	Matched
4	Height of fall	100mm to 600 mm	Variable	Matched
5	Target peak load	40kN	40-150kN	Matched
6	Load Cell Accuracy	+ 2 %	+ 1 %	Matched
7	Number of Deflection Transducers	6 to 9	7	Matched
8	Deflection Sensor Types	Geophones	Geophones	Matched
9	Reading Resolution of Deflection Transducers	Min 1 µm	1 µm	Matched
10	Deflection Transducers Accuracy	± 2 %	± 1 %	Matched

Testing Procedure and Methodology

The detailed test methodology and procedure was described in IRC: 115-2014 "Guidelines for Structural Evaluation and Strengthening of Flexible Road Pavements Using Falling Weight Deflectometer (FWD) Technique". However, as per the client's requirement the sampling procedure was customized in this project. In adherence to the same, structural evaluation of the existing 'pavement and subgrade system' by measuring its response in terms of deflection was carried out using FWD for the project road in the month of July 2024 (27/07/2024 to 29/07/2024).

Evaluation of pavement structural strength is carried out in accordance with requirements of TOR and IRC: 115-2014.

(a) Testing Equipment

The equipment used for the testing is:

- **DYNATEST 8002 FWD** Vehicle Mounted Falling Weight Deflectometer with 1 loading plate and 7 numbers of geophones placed at the spacing of 0, 300, 600, 900, 1200, 1500 and 1800mm from the centre of the loading plate.

- Air Temperature and Pavement Surface Temperature sensors as part of the FWD instrument.
- Glycerol and digital thermometer.
- Red flags and red cones and flashing lamps for traffic arrangement.

(b) Testing Frequency – as per IRC:115-2014

The entire length has been classified into section of uniform performance. As it is inexpedient to change the sample size for deflection measurement at frequent intervals, the minimum length of uniform section has been kept as 1.0km. The interval at which deflection measurements has been carried out was calculated by using the following formula of equation 1 of IRC: 115-2014 and the same are extracted for ready reference:

$n = ((z * CV)^2)/ (ME^2)$

Were,

n =sample size

z =standard normal deviate, 1.285 corresponding to 90 per cent (two-sided) confidence level

ME =10 per cent acceptable margin of error (as percentage of mean)

CV=Coefficient of variation of deflection (standard deviation/mean) expressed as percentage; 15 percent, 30percent and 45 percent for good, fair and poor condition respectively.

Though the length of uniform section divided by calculated sample size results the interval of FWD test, however the deflection measurement scheme depends upon the type of carriageway, number of lanes and the measurement along a lane. The same is detailed in Table 2 of IRC 115-2014 and the same is presented in Table 10-10 below.

Table 10-10: Guidelines for selection of deflection measurement scheme for 6-lane divided carriageway.

Recommended Measurement Scheme	Maximum Spacing(m) for test points along selected wheel path for pavements of different classification		
	Poor	Fair	Good
(i)measure along outer wheel paths of outermost lanes	30	65	250
(ii)measure along the outer wheel path of more distressed inner lane	60	130	500
(iii)measure along the centre line of paved shoulder (in case of widening projects)	120	260	500

Courtesy: Table 2 of IRC: 115-2014
Note: As per Scope of work we collected 4 points in Inner, 2 points in Middle and 2 points in Outer lanes per kilometre.

FWD Deflection Testing Points and Measurement

FWD deflection measurement has been carried out for each lane in both directions. FWD deflection measurement has been carried out at a test point along outer wheel path of each lane which is at an offset of 0.75m from the outer edge of outer lane, at 4.2m from the outer edge of outer lane for central lane and at 5.2m from the outer edge of outer lane as specified in section 5.4.5 of IRC: 115-2014. At every measurement location, four drops were made, such that the first drop is neglected as 'seating drop' and the rest three drops' deflections are recorded. Photographs of FWD test under progress at some locations are shown in Figure 10-6.



Figure 10-6: Photographs showing FWD survey under progress

Also, during survey pavement temperature of bituminous layer was recorded as per the procedure specified in section 5.4.7, xiii of IRC: 115-2014.

The following steps are carried out for measuring deflections at a test point:

i. Mark the test point on the pavement

ii. Centre the load plate over the test point

iii. Lower the loading plate onto the pavement ensuring there should be no standing water on the pavement surface. The loading plate should be in proper contact with pavement surface. The longitudinal and transverse slope of the pavement should not exceed 10 percent at the test location.

iv. Lower the frame holding the geophones so that the transducers are in contact with pavement surface.

v. Raise the mass to a pre-determined height required for producing a target load of 40 kN (+10%).

vi. Drop one seating load. The load and deflection data for this seating load is not recorded.

vii. Raise the mass and drop. Record the load and deflection data into the computer through data acquisition system. While peak load and peak deflections at different selected radial positions must be recorded. At least 2 drops should be made at one location for precision.

viii. If, during previous 2 steps, the deflections measured are giving variations or the deflections/load pulses are not proper, repeat the test drop.

ix. Raise the geophone frame and load plate and move to the next test location

x. Deflection measurements should not be made when the pavement temperature is more than 45°C.

10.4.2 Existing Pavement Composition Details

During test pit investigation, the existing pavement composition details are obtained at the interface of outer lane to earthen shoulder. For analysis purposes, along with the TDD consultant test pits investigation data, seller data also considered. The same test pits details are presented in Table 10-11.

Table 10-11: Summary of pavement crust details along the project corridor

S. No.	Chainage (Km)	Side (LHS/ RHS)	Pavement Composition (mm)		
			Bituminous layer	Granular Layer	Total Thickness
1	5+250	LHS	180	450	630
2	10+900	RHS	180	430	610
3	15+900	LHS	200	460	660
4	19+700	RHS	185	480	665
5	25+180	LHS	170	460	630
6	30+950	RHS	180	445	625
7	35+100	LHS	180	430	610
8	39+380	RHS	210	460	670
9	45+700	LHS	190	480	670
10	50+300	RHS	180	435	615
11	54+900	LHS	150	445	595
12	60+800	RHS	140	450	590

10.4.3 Pavement Condition

During the FWD survey the pavement surface is observed in good condition on the entire project road.

10.4.4 In-put Data for BACK Calculation Analysis

(a) Processing of Load and Deflection data

The FWD test data collected from different drops at each test point primarily consists of peak load and peak deflections at different radial locations. Unrealistic deflection values and obviously erroneous data must be removed.

Average values of load and deflections are calculated from the three drop test data collected. FWD tests were carried out using 40 kN impulse load. However, since the FWD equipment does not impart exactly the same load at every test point, normalization of all measured deflections was carried out to a common test load of 40 kN. Such 'normalization' of the data was carried out using the following formula:

$D_n = 40kN/L_m \times D_m$

where,

D_n = Normalized Deflection;

L_m = Imparted Load and

D_m = Measured Deflection

The "normalized deflection data" was then used for determining deflections, deflection bowl and finally in framing of homogeneous sections and calculation of overlay requirements. FWD normalised deflection data is presented in Annexure 10.6 for both LHS & RHS direction.

(b) Back-calculation of Layer Moduli

Layer moduli have been backcalculated using KGPBACK program. The pavement has been modelled as a three-layer system with bituminous layer, granular layer and subgrade. The following inputs have been provided for back analysis.

- Single wheel load 40 kN and contact pressure 0.56 MPa
- No. of deflection sensors: 7 (DYNATEST)
- Radial Distances of the Geophones i.e., 0, 300, 600, 900, 1200, 1500 and 1800mm (DYNATEST)
- Measured Surface Deflections normalized to 40kN in mm
- Pavement Layer Thicknesses (as measured from Trial Pits)
- Poisson's ratio of 0.5, 0.4 and 0.4 is considered for bituminous, granular and subgrade layers.
- Range of Possible modulus value (Lower and Upper limits) of bituminous layer, granular layer and subgrade

Range of different layers moduli given as input to KGPBACK for back-calculation. These ranges selected judiciously by an experienced pavement engineer taking into considerations about approximate age of pavement, visual assessment of the condition of bituminous layer, prevailing climatic conditions during deflection measurements and also based on information available from test pits, laboratory tests conducted as detailed in the sections below:

(c) Range of modulus for existing subgrade:

The range of moduli of existing subgrade layers is based on clause III.8.4 of IRC 115-2014.The range is taken as 20-100 MPa.

(d) Range of modulus value of existing granular layers i.e., base and subbase:

The range of moduli of existing granular layers is based on clause II.8.4 of IRC 115-2014.The range for combined (base and sub-base) is taken as 100-500 MPa.

(e) Range of modulus value of existing bituminous layers:

The range of moduli of existing thick bituminous layer has been determined on the basis of condition data. If the road condition is good the range is considered as 750MPa to 3000MPa, for sections with pavement condition is Fair- Poor, the range specified for thick bituminous layer 400 MPa to 1500 MPa as stipulated in section III.8.4 of IRC: 115-2014 has been taken into consideration.

10.4.5 Correction for data analysis

Correction for Temperature

Back-calculated moduli values of the bituminous layers evaluated by FWD survey are influenced by the pavement temperature. The standard pavement temperature for India is recommended as 35°C, hence the back-calculated moduli obtained at temperatures other than the identified standard temperature will have to be corrected using a suitable correction factor using equations 4 and 5 of IRC:115-2014 and the same is extracted below for ready reference.

ET1 = λ ET2

Were,

λ, temperature correction factor, is given as

λ = (1-0.238 lnT1) / (1-0.238 lnT2)

Were,

ET1 = Back-calculated modulus (MPa) at temperature T1 (°C)

ET2 = Back-calculated modulus (MPa) at temperature T2 (°C)

Correction for Seasonal Variation

Moisture content affects the strength of subgrade and granular sub base/base layers. The below equations are provided for Summer and Winter Seasonal reference.

$$E_{sub_mon} = 3.351 * \left(E_{sub_win}\right)^{0.7688} - 28.9 \ldots (6)$$

$$E_{sub_mon} = 0.8554 * (E_{sub_sum}) - 8.461 \ldots (7)$$

were,

E $_{sub_mon}$ = subgrade modulus in monsoon (MPa)

E $_{sub_sum}$ = subgrade modulus in Summer (MPa)

E $_{sub_win}$ = subgrade modulus in Winter (MPa)

$$E_{gran_mon=} -0.0003 * (E_{gran_sum})^2 + 0.9584 * (E_{gran_sum}) - 32.989 \ldots (8)$$

$$E_{gran_mon=} 10.5523 * (E_{gran_win})^{0.624} - 113.857 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

were,

E $_{gran_mon}$ = granular layer modulus in monsoon (MPa)

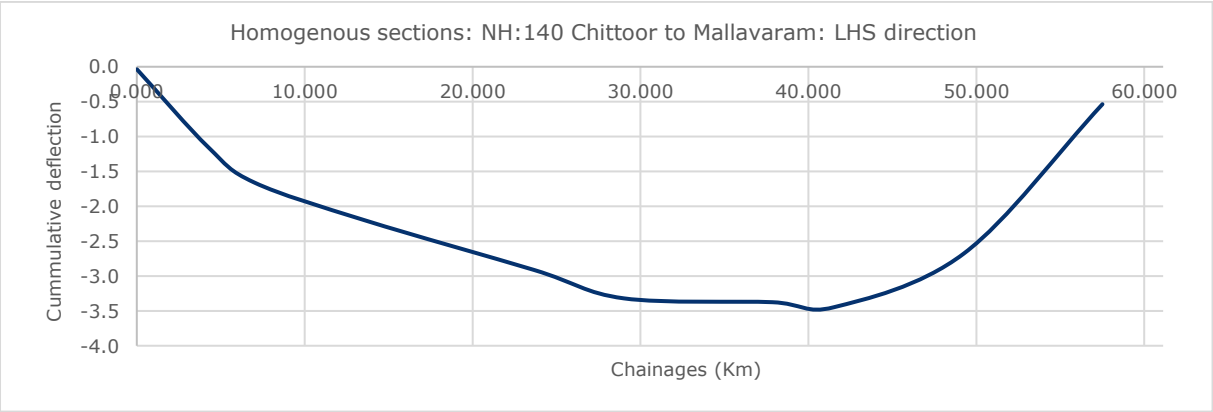
E $_{gran_sum}$ = granular layer modulus in Summer (MPa)

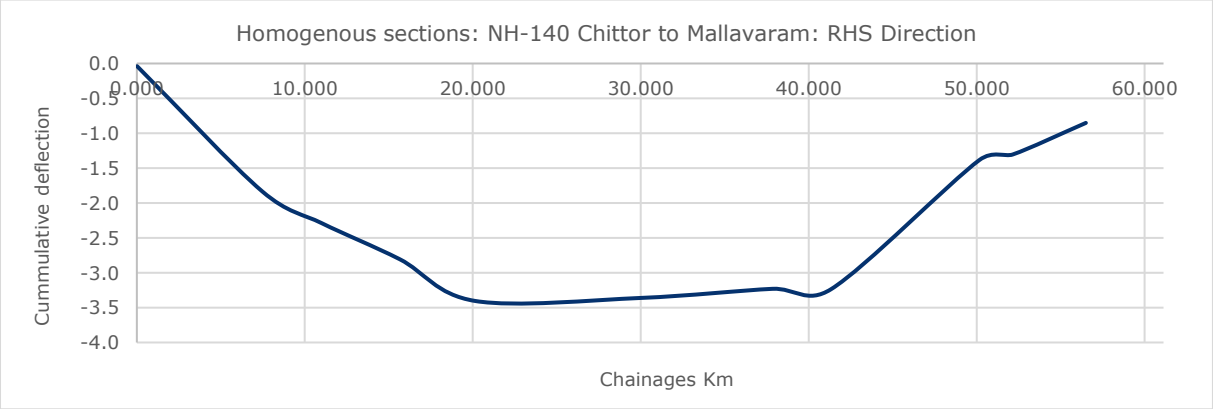
E $_{gran_win}$ = granular layer modulus in Winter (MPa)

Since the deflection measurements have been carried out in the month of July during Monsoon, hence seasonal correction factor is not applicable.

10.4.6 Results of 15th Percentile E Moduli Value of Pavement Layers

The Homogenous sections are identified by Cumulative difference approach. Cumulative difference graphs are drawn by using D0 deflection values and are presented below.





The summary of back calculated E values is presented in Annexure 10.7 for both LHS & RHS direction. The summary of 15th percentile elastic moduli is presented in Table 10-12 and Table 10-13 for LHS and RHS respectively.

Table 10-12: 15th percentile elastic moduli of pavement layers in LHS direction

Chainage (km)		15th percentile E values in LHS Direction		
From	To	Bituminous Layer	Granular Layer	Subgrade
0.000	4.200	1988.13	253.05	100.00
4.200	7.000	2017.22	238.72	100.00
7.000	13.600	1914.40	205.40	100.00
13.600	23.500	2026.61	205.64	99.90
23.500	29.000	2201.49	326.00	100.00
29.000	36.920	2316.39	323.16	100.00
37.790	41.500	2446.96	289.17	100.00
41.500	49.000	2384.75	216.10	100.00
49.000	57.500	2626.91	297.72	100.00
57.500	61.128	2672.18	396.44	99.92

Table 10-13: 15th percentile elastic moduli of pavement layers in RHS direction

Chainage (km)		15th percentile E values in RHS Direction		
From	To	Bituminous Layer	Granular Layer	Subgrade
0.000	7.400	1864.73	265.30	99.90
7.400	11.000	2722.01	168.74	99.89
11.000	15.500	2909.75	144.02	99.90
15.500	20.000	2911.51	132.88	99.90
20.000	30.000	2963.98	159.38	100.00
30.000	36.920	3000.00	172.86	99.90
37.790	41.300	2474.52	155.42	100.00
41.300	50.000	2531.21	205.00	100.00
50.000	52.000	3000.00	146.29	100.00
52.000	56.500	3000.00	164.04	99.91
56.500	61.128	3000.00	391.21	100.00

10.5 Remaining life estimation

The in-service three-layer pavement system has been analysed with the back-calculated corrected layer moduli and layer thicknesses. The critical strains have been calculated by IITPAVE program. From the performance criteria equations, the residual/remaining rutting and fatigue life have been estimated.

Performance Criteria

The layer moduli of in-service pavement back calculated from FWD deflection data are used to analyses the pavement for critical strains which are indicators of pavement performance in terms of rutting and fatigue cracking. The following approach is proposed for design of bituminous overlays for existing flexible pavements. The mechanistic criteria (fatigue and rutting) adopted in the Indian Roads

Congress guidelines (IRC:115-2014) for design of flexible pavements forms the basis for the overlay design method. Performance models adopted in these guidelines are given below.

a) Fatigue in Bituminous layer:

As it specified in IRC:115-2014, the fatigue model for 90 percent reliability was used as below;

$$N_f = 0.711 * 10^{-04} \times [1/\varepsilon_t]^{3.89} * [1/M_R]^{0.854}$$

Were,

N_f = fatigue life in cumulative standard axle load repetitions, in msa

ε_t = Maximum Tensile strain at the bottom of the bituminous layer;

M_R= resilient modulus of the bituminous layer, in MPa

b) Rutting in Subgrade:

Rutting model for 90 percent reliability level as specified in IRC:115-2014, was used as below;

$$N= 1.41 \times 10^{-08} [1/\varepsilon_v]^{4.5337}$$

Were,

N=Subgrade rutting life in cumulative standard axle load repetitions, in MSA

ε_v= Maximum Vertical strain in the subgrade

The detailed analysis was presented in Annexure 10.7 for both LHS & RHS direction, and the obtained remaining life are presented in Table 10-14 and Table 10-15 for LHS & RHS directions respectively, and the graphical representations are given in Figure 10-7**.**

Table 10-14: Obtained remaining life of existing pavement on LHS direction

Chainage (km)		Remaining life as per 90% reliability
From	To	
0.000	4.200	51
4.200	7.000	47
7.000	13.600	43
13.600	23.500	48
23.500	29.000	73
29.000	36.920	91
37.790	41.500	88
41.500	49.000	65
49.000	57.500	56
57.500	61.128	83

Table 10-15: Obtained remaining life of existing pavement on RHS direction

Chainage (km)		Remaining life as per 90% reliability
From	To	
0.000	7.400	50
7.400	11.000	45
11.000	15.500	42
15.500	20.000	44

Chainage (km)		Remaining life as per 90% reliability
From	To	
20.000	30.000	52
30.000	36.920	66
37.790	41.300	72
41.300	50.000	68
50.000	52.000	45
52.000	56.500	42
56.500	61.128	72

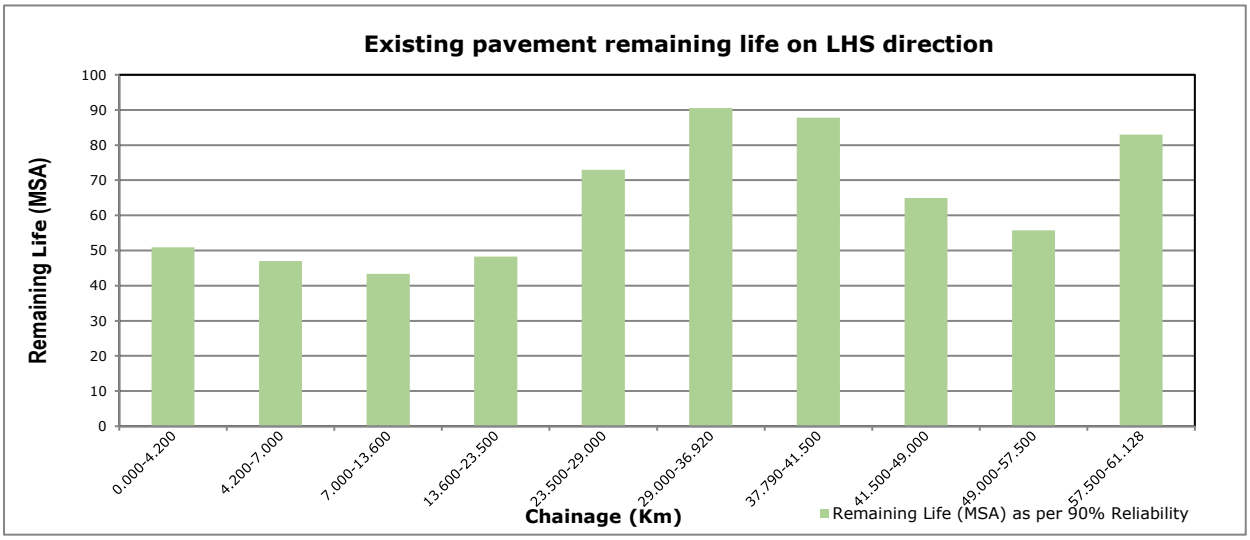


Figure 10-7: Illustrative summary of remaining life on both Directions (for 6- Lane)

10.6 Traffic Survey and Analysis

Axle load survey of 7 days has been conducted at the Toll Plaza Location. AADT and growth rates required for the further computations are provided by the client.

10.6.1 Annual Average Daily Traffic

The Annual Average Daily Traffic (AADT) in the FY 2025 are presented in Table 10-16**.**

Table 10-16: AADT of commercial class vehicles at toll plaza locations for both directions (year 2024-2025)

Location/ Vehicle Type	BUS	LCV	2-axle	3-axle	MAV
Gadanki Toll Plaza (km 37+250)- 6 lane section	1441	462	905	714	1664

*For MSA calculation purposes, a direction distribution of 50% is considered for both LHS and RHS direction.

10.6.2 Vehicle Damage Factor

The axle load survey was conducted at toll plaza location Km 37+320: Gadanki Toll Plaza; the number of equivalent 8.16 t standard axles for the different categories of commercial vehicles have been determined on the basis of the axle load surveys.

The equations for computing equivalency factor for single, tandem and tridem axles given below is used as directed in the IRC: 37-2018 for converting different axle load repetitions into equivalent standard axle load repetitions.

- Single axle with single wheel on either side = {axle load in kN / 65}^{4}
- Single axle with dual wheel on either side = {axle load in kN / 80}^{4}
- Tandem axle with single wheel on either side = {axle load in kN /148}^{4}
- Tridem axle with dual wheel on either side = {axle load in kN /224}^{4}

Referring to section 4.4.3 of IRC 37-2018, some tandem axles have only one (single) wheel on each side of the axle. In such cases, each axle of the tandem axle set may be considered as two separate single axles (with single wheels). Similarly, if the axle spectrum has a tridem axle with single wheels, it may be considered as three separate single axles having single wheels.

VDF values are obtained as per the analysis of 7 days axle load surveys are presented in Annexure 10.8 for Gadanki toll plaza, the summary presented in Table 10-17. The sample photographs axle load survey is shown in Figure 10-8.

Table 10-17: Summary of Vehicle Damage Factor (VDF)

Location/ Vehicle Type		BUS	LCV	2axle	3axle	MAV
NH-140: (Gadanki Toll Plaza-37+320)	LHS	1.175	0.818	3.343	3.943	8.221
	RHS	1.210	0.629	2.676	6.812	10.620



Figure 10-8: Photographs showing Axle load Survey

10.6.3 Design Traffic (Cumulative Number of Standard Axles)

The traffic loading in terms of the cumulative number of standard axles for the given period has been computed using the following relationship as given in IRC: 37-2018.

$$N = \frac{365 \times \left\{(1+r)^n - 1\right\}}{r} \times A \times D \times F$$

Were,

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N = Cumulative number of standard axles to be catered for the design life in terms of MSA.

r = Annual growth rate of commercial vehicles

n = Design life in years

A = Initial traffic in the year of completion of construction in terms of number of commercial vehicles per day exceeding 3 ton

D = Lane distribution factor

F = Vehicle Damage Factor

Based on the preceding discussions, the traffic loading in terms of cumulative number of equivalent 8.16 t standard axle loads, the AADT was provided by concessionaire and 5% growth rates are considered on year on year, and the design traffic was projected for next 10 years (FY YR 2035). Design traffic for flexible pavement design is computed and summarized in Table 10-18. The design MSA calculations are furnished from Annexure 10.9.

Table 10-18: Design traffic (MSA) in terms of ESAL for next 10years

Location	Design Traffic (MSA) up to FY- YR 2035	
	LHS	RHS
NH-140: Chittoor to Mallavaram (Km 0+000 to Km 61+128)	31	39

The Remaining life of existing pavement is more than the design traffic hence, no need of overlay in any of the flexible pavement section (Chittoor to Mallavaram).

11. DEVELOPMENT OF O&M STRATEGY

11.1 General

The Concessionaire is responsible for Operation & Maintenance of the Project Highway in accordance with the provisions of Article-17 of Concessionaire agreement for 6-lane section.

11.2 Salient Features

The important salient features in terms of project dates pertaining to project are provided in Table 3-1.

11.3 Review of Concession Agreement and Pavement Design report of Chittoor to Mallavaram (Km 0+000 to Km 61+128)

11.3.1 Concession Agreement: KNR Tirumala Infra Pvt ltd.- YR 2018

Schedule-B of Concession Agreement is a mandatory requirement prior to any formulation of design to be applied to the project during the execution.

a. Type of Carriageway:

- Flexible pavement is proposed for the entire project except at toll plaza location rigid pavement is provided.

b. Design Traffic (MSA):

- The contractor shall design for minimum design traffic of 100msa for main carriageway and 10msa for service roads. Minimum CVPD of 7405 is recommended for rigid pavement at toll plaza location.

c. Design Period:

- Design period is not specified.

d. Design CBR:

- Minimum design CBR is not specified.

e. Minimum Crust Thickness:

- As per schedule-B, the following minimum crust thickness are provided.

Carriageway Type	Type of layer	Thickness
Main Carriageway	BC (mm)	50
	DBM (mm)	110
	WMM (mm)	250
	GSB (mm)	200
Rigid Pavement	PQC (mm)	300
	DLC (mm)	150
	GSB (mm)	200
Service road	BC (mm)	40
	DBM (mm)	50
	WMM (mm)	250

	GSB (mm)	200

f. Specifications and Standards for the project:

- As per Schedule-D "Manual of specifications and standards for Six laning of highway through public private partnership published by the IRC: SP: 87-2013".

g. Maintenance requirements:

The concessionaire shall always procure that during the Operation Period, the Project Highway conforms to the maintenance requirements set forth in Schedule K (the "Maintenance Requirements")

Schedule K of the CA is presented in Table 11-1**.**

Repair / rectification of defects and deficiencies specified in Schedule K within time limit set forth hereunder

Table 11-1: Maintenance requirements with timelines

S. No.	Nature of Defect / Deficiency	Timelines for Repair/ Rectification
	Project Highway	
(a)	**Carriageway**	
(i)	Breach or blockade	Time Limit: Temporary restoration of traffic within 24 hours; permanent restoration within 15 (fifteen) days.
(ii)	Roughness value Exceeding 2,750 mm in a stretch of 1 km (as measured by a calibrated bump integrator)	Time Limit: 180 (One Hundred and Eighty) days
(iii)	Potholes	Time Limit: 48 hours
(iv)	Cracking in more than 5% of road surface in a stretch of 1 Km	Time Limit: 30 days
(v)	Rutting exceeding 10mm in more than 2% of the road surface in a stretch of 1 km	Time Limit: 30 days
(vi)	Bleeding / Skidding	Time Limit: 7 (Seven) days
(vii)	Ravelling / Stripping of Road surface exceeding 10 sq.m road	Time Limit: 15 (Fifteen) days.
(viii)	Damages to Pavement edges exceeding 10 cm	Time Limit: 15 (Fifteen) days.
(ix)	Removal of debris	Time Limit: 6 hours
(b)	**Hard / earth shoulders, side slopes, drains and culverts.**	
(i)	Variation by more than 2% in the prescribed slope of camber / cross fall	Time Limit: 30 (Thirty) days.
(ii)	Edge drop at shoulders exceeding 40 mm	Time Limit: 7 (Seven) days

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S. No.	Nature of Defect / Deficiency	Timelines for Repair/ Rectification
(iii)	Variation by more than 15% in the prescribed side (embankment) slopes	Time Limit: 30 (Thirty) days
(iv)	Rain cuts / gullies in slope	Time Limit: 7 (Seven) days
(v)	Damage to or silting of culverts and side drains during and immediately preceding the rainy season	Time Limit: 7 (Seven) days
(vi)	Desilting of drains in urban / semi-urban areas	Time Limit: 48 hours
(C)	**Roadside furniture including road signs and pavement marking**	
(i)	Damage to shape or position, poor visibility or loss of retro-reflectivity	Time Limit: 48 hours
(d)	**Street lighting and telecom (ATMS)**	
(i)	Any major failure of the system	Time Limit: 24 hours
(ii)	Faults and minor failures	Time Limit: 8 hours
(e)	**Trees and plantation**	
(i)	Obstruction in a minimum headroom of 5 m above carriageway or obstruction in visibility of road signs	Time Limit: 24 hours
(ii)	Deterioration in health of trees and bushes	Time Limit: Timely watering and treatment
(iii)	Trees and bushes requiring replacement	Time Limit: 90 days
(iv)	Removal of vegetation affecting sight line and road structures	Time Limit: 15 (Fifteen) days
(f)	**Rest areas**	
(i)	Cleaning of toilets	Time Limit: Every 4 hours
(ii)	Defects in electrical, water and sanitary installations	Time Limit: 24 hours
(g)	**Other Project Facilities and Approach roads**	
(i)	Damage in approach roads, pedestrian facilities, truck laybys, bus-bays, cattle crossings, (Traffic Aid Posts, Medical Aid Posts) and service road	Time Limit: 15 (Fifteen) days.
	Bridges	
(a)	**Superstructure**	*Cracks* Temporary measures Time Limit: Within 48 Hours

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S. No.	Nature of Defect / Deficiency	Timelines for Repair/ Rectification
		Permanent measures Time Limit: Within 45 days *Spalling / Scaling* Time Limit: Within 15 days
(b)	**Foundations**	Scouring and/or cavitation Time Limit: 15 (Fifteen) days
(c)	**Piers, abutments, return walls and wing walls**	*Cracks and damages including settlement and tilting* Time Limit: 30 (Thirty) days
(d)	**Bearings (metallic) of bridges**	*Deformation* Time Limit: 15 (Fifteen) days;
(e)	**Joints in bridges**	*Loosening and malfunctioning of joints* Time Limit: 15 (Fifteen) days
(f)	**Other items relating to Bridges**	
(i)	Deforming of pads in elastomeric bearings	Time Limit: 7 (Seven) days
(ii)	Gathering of dirt in bearings and joints; or clogging of spouts, weep holes and vent-holes	Time Limit: 3 (Three) days
(iii)	Damage or deterioration in kerbs, parapets, handrails and crash barriers	Time Limit: 3 (Three) days.
(iv)	Rain-cuts or erosion of banks of the side slopes of approaches	Time Limit: 15 (Fifteen) days
(v)	Damage to wearing coat	Time Limit: 15 (Fifteen) days
(vi)	Damage or deterioration in approach slabs, pitching, apron, toes, floor or guide bunds	Time Limit: 30 (Thirty) days.
(vii)	Growth of vegetation affecting the structure or obstructing the waterway	Time Limit: 15 (Fifteen) days

Observations on schedule B/D/K:

- Minimum CBR value was not specified in the schedules. Hence, concessionaire has an opportunity to explore good borrow areas and utilize the soils with good CBR value.
- Schedule -D has specified that the design standards of the project in accordance with 'Manual of Specifications and Standards for Six Laning of National Highways through Public Private Partnership (IRC: SP:87-2013)'.
- In Schedule -K, it has specified the intervention of concessionaire when the roughness value exceeds 27500 mm/km (as measured by a standard rough meter/bump integrator). However, the frequency/interval of testing the roughness was not specified.

11.3.2 Pavement design report: KNR Tirumala Infra Pvt ltd.- YR 2018

For the purposes of review and evaluation the pavement design report is not available. As per the concessionaire June-2024 MPR, the following crust thickness is adopted.

Table 11-2: Design thickness of Flexible pavement

Carriageway Type	Type of layer	Thickness (mm)
Main carriageway	BC	50
	DBM	110
	WMM	250
	GSB	200
Service road	BC	40
	DBM	50
	WMM	250
	GSB	200

Table 11-3: Design thickness of Rigid pavement

Type of layer	Thickness
PQC (mm)	300
DLC (mm)	150
GSB (mm)	200

11.4 Review of Technical Schedules

A) Chittoor to Mallavaram section NH 140 from Km 0+000 to Km 61+128

Schedule-B of Concession Agreement is a mandatory requirement prior to any formulation of design to be applied to the project during the execution.

a. Repair and Rehabilitation of Pavement

- As per Section 3.1.III of schedule-B, the periodic maintenance in every sixth years in full length of project stretch including main carriageway, service/slip Road, ramps and at facilities etc.
- A Roughness of <2750 mm shall be maintained by the existing HAM Concessionaire prior to handing over to InVIT Concessionaire. After O&M handover of project stretch to InVIT, the InVIT concessionaire shall maintain the roughness level at <2750mm, however after a functional overlay (Roughness exceeding 2750 mm) or structural overlay (FWD Test) is provided in any particular stretch length then that particular length shall be maintained at a roughness level mentioned in Schedule F after that overlay. For clarification, InVIT concessionaire shall maintain a roughness level (mentioned in Schedule F) in a stretch length where overlay (Structural or Functional) has been provided by InVIT concessionaire.

b. Specifications and Standards for the project:

- As per Schedule-C "Manual of specifications and standards for Six laning of highway through public private partnership published by the IRC: SP: 87-2019".

B) Maintenance requirements as per TOT schedule-F

The concessionaire shall procure that at all times during the Operation Period, the Project Highway conforms to the maintenance requirements set forth in Schedule F (the "Maintenance Requirements")

Repair / Rectification of defect and deficiencies for six lane section specified in schedule-F with in time limit set are represented in Table 11-4**.**

Table 11-4: Maintenance requirement as per TOT schedules-F

a) Maintenance criteria for Flexible Pavement

Assert Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/ Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specification
		Desirable	Acceptable					
Flexible Pavement (Pavement of MCW, Service Road, approaches of Grade structure, approaches of connecting roads, slip roads, lay byes etc. as applicable)	Potholes	Nil	<0.1 % of area and subject to limit of 10 mm in depth	Daily	Length Measurement Unit like Scale, Tape, Odometer etc.	IRC:82-2015 and Distress Identification Manual for Long Term Pavement Performance Program, FHWA 2003	24-48 hours	MORT&H Specification 3004.2
	Cracking	Nil	<5 % subject to limit of 0.5 sqm for any 50m length	Daily			7-15 days	MORT&H Specification 3004.3
	Rutting	Nil	<10mm	Daily	Straight Edge		15-30 days	MORT&H Specification 3004.2
	Corrugations and Shoving	Nil	<0.1 % of area	Daily	Length Measurement Unit like Scale, Tape, Odometer etc.		2-7 days	IRC:82-2015
	Bleeding	Nill	<1 % of area	Daily			3-7 days	MORT&H Specification 3004.4
	Ravelling/Stripping	Nil	<1 % of area	Daily			7-15 days	IRC 82-2015 read with IRC Sp-81
	Edge Deformation / Breaking	Nil	<1m for any 100m section and width <0.1m at any location, restricted to 30cm from the edge	Daily			7-15 days	IRC 82-2015
	Roughness BI	2000mm/Km	2400mm/Km	Bi-Annually			180 days	IRC 82-2015

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Assert Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/ Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specification
		Desirable	Acceptable					
	Rutting	<10mm for any 50 m section and/or, length of section <5m	<10mm for any 50 m section and/or, length of section <10m	Bi-Annually	Network Survey Vehicle (NSV) with all its module such as Laser Profilometer, Transverse profile logger, Laser crack measurement system, Video logging modules, high resolution Odometer etc	ASTM E950 (98) :2004 –Standard Test Method for measuring Longitudinal Profile of Travelled Surfaces with Accelerometer Established Inertial Profiling Reference and ASTM E1656 - 94:2000- Standard Guide for Classification of Automatic Pavement Condition Survey Equipment	15-30 days	IRC 82-2015
	Pavement rating based on distress per IRC 82 / Pavement Condition Index as per ASTM 6433- 07	>3/85	>2.1/70	Bi-Annually			180 days	IRC 82-2015/ ASTM D 6433-07
	Other Pavement Distresses			Bi-Annually			2-7 days	IRC:82-2015
	Skid Number	60SN	50SN	Bi-Annually	SCRIM (Sideway force Coefficient Routine Investigation Machine or equivalent) British Pendulum Tester	IRC:82-2015	180 days	BS:7941-1:2006, IRC:82-2015/ ASTM 274
	Deflection/ Remaining Life			Annually	Falling Weight Deflectometer	IRC 115:2014	180 days	IRC:115-2014
Rigid Pavement (Pavement of MCW, Service Road, Grade structure, approaches of connecting	Roughness BI	<2200mm/km	>2400mm/km	Bi-Annually	Class I Profilometer	ASTM E950 (98):2004 and ASTM E1656-94:2000	180 days	IRC: SP:83-2018
	Skid	Skid Resistance no. at different speed of vehicles		Bi-Annually	SCRIM (Sideway force Coefficient Routine	IRC: SP:83-2018	180 days	IRC: SP:83-2018

Assert Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/ Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specification
		Desirable	Acceptable					
roads, slip roads, lay byes etc. as applicable)		Minium SN	Traffic Speed (km/h)		Investigation Machine or equivalent) British Pendulum Tester			
		36	50					
		33	65					
		32	80					
		31	95					
		31	110					
Embankment/ Slope	Edge drop at shoulders	Nil	40mm	Daily	Length Measurement Unit Like Scale, Tape, odometer etc.	IRC	7-15 days	MORT&H Specification
	Slope of camber/ cross fall	Nil	<2% variation in prescribed slope of camber/ cross fall	Daily			7-15 days	MORT&H Specification
	Embankment Slopes	Nil	<15% variation in prescribe side slope	Daily			7-15 days	MORT&H Specification
	Embankment Protection	Nil	Nil	Daily	NA		7-15 days	MORT&H Specification
	Rain Cuts/ Gullies in slope	Nil	Nil	Daily Specially During Rainy Season	NA	IRC	7-15 days	MORT&H Specification
Cut Section/ Slope	Unstable slopes	Nil	-		NA	IRC	2-7 days	MORT&H Specification

b) Maintenance criteria for Rigid Pavement

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
1	Cracking					
	Single Discrete Cracks Not	w = width of crack, L = length of	0	Nil not discernible	No Action	Not Applicable
			1	w < 0.2 mm. hair cracks		

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
	intersecting with any joint	crack, d = depth of crack, D = depth of slab	2	w = 0.2 - 0.5 mm, discernible from slow-moving car	Seal without delay	Full Depth Repair Dismantle and reconstruct affected portion - See Para 5.4, within 15 days
			3	w = 0.5 - 1.5 mm, discernible from fast-moving car		
			4	w = 1.5 - 3.0 mm	Seal and stitch if L > 1m. Within 7 days	
			5	w > 3 mm.		
2	Single Transverse (or Diagonal) Crack intersecting with one or more joints	w = width of crack, L = length of crack, d = depth of crack, D = depth of slab	0	Nil, not discernible	No Action	
			1	w < 0.2 mm, hair cracks	Route and seal with epoxy. Within 7 days	Seal Staple within 15days & Cross stich
			2	w = 0.2 - 0.5 mm, discernible from slow Car		
			3	w = 0.5 - 3.0 mm, discernible from fast car	Route, Seal, and stitch, if L > 1m. Within 7 days	Full Depth Repair Dismantle and reconstruct affected portion with norms & Specifications - See Para 5.5 &refer chapter 9 of IRC: SP: 83-2018, within 15 days.
			4	w = 3.0 - 6.0 mm	Not applicable	Staple or Dowel Bar Retrofit within 15 days
			5	w > 6 mm, usually associated with spalling, and/ or slab rocking under traffic	Not Applicable (full depth crack)	Staple or Dowel Bar Retrofit within 15 days
3	Single Longitudinal Crack intersecting with one or more joints	w = width of crack, L = length of crack, d = depth of crack, D = depth of slab	0	Nil, not discernible	No Action	
			1	w < 0.5 mm, discern able from slow moving vehicle	Seal and stich if L >l m within 7 days	Seal and Cross-Stich or Staple within 15 days
			2	w = 0.5 - 3.0 mm, discernible from fast vehicle		

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
			3	w = 3.0 - 6.0 mm	Staple, if L > 1m. Within 15 days	Partial Depth Repair with or without dowel bar retrofit within 15 days or
			4	w = 6.0 - 12.0 mm, usually associated with spalling	Not Applicable	
			5	w > 12 mm, usually associated with spalling, and/or slab rocking under traffic	Not Applicable, (Rocking/ Spalling indicates full depth crack)	Full Depth Repair Dismantle and reconstruct affected portion - See Fig 5.6 and Chapter 9 of IRC: SP:83-2018, within 15 days
4	Multiple Cracks intersecting with one or more joints or cracks	w = width of crack	0	Nil, not discernible	No Action	-
			1	w < 0.2 mm, hair cracks	Seal, and stitch if L > 1m. Within 15 days	
			2	w = 0.2 - 0.5 mm. discernible from slow vehicle		
			3	w = 0.5 - 3.0 mm, discernible from fast vehicle	Full depth repair within 15 days	Dismantle, Reinstate subbase, Reconstruct whole slab as per specification within 30 days
			4	w = 3.0 - 6.0 mm panel broken into 2 or 3 pieces		
			5	w > 6 mm and/or panel broken into more than 4 pieces		
5	Corner Break	w = width of crack, L = length of crack	0	Nil, not discernible	No Action	-
			1	w < 0.5 mm; only 1 corner broken	Seal with low viscosity epoxy to secure broken parts within 7 days	
			2	w < 1.5 mm; L < 0.6 m, only one corner broken		
			3	w < 1.5 mm; L < 0.6 m, two corners broken	Partial Depth (Refer Figure 8.3 of IRC: SP:83-2018) within 15 days	Full depth repair within 30 days.
			4	w > 1.5 mm; L > 0.6 m or three corners broken		
			5	three or four corners broken		Reinstate sub-base, and reconstruct the slab as per norms & Specifications within 30 days.
6	Punchout (Applicable to Continuous Reinforced Concrete Pavement (CRCP) only)	w = width of crack, L = length (m/m2)	0	Nil, not discernible		
			1	w < 0.5 mm; L < 3 m/m2	Not Applicable, (Punch- out is full depth Distress)	Seal with low viscosity epoxy to secure broken parts Within 15 days
			2	either w > 0.5 mm or L < 3 m/m2		
			3	w > 1.5 mm and L < 3 m/m2		Full depth repair - Cut out and replace damaged area taking care not to damage reinforcement. Within 30 days.

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
			4	w > 3 mm, L < 3 m/m2 and deformation		
			5	w > 3 mm, L > 3 m/m2 and deformation		
Surface Defects						
7	Ravelling or Honeycomb type surface	r = area damaged surface / total surface of slab (%) h = maximum depth of damage	0	Nil, not discernible	Short Term	Long Term
					No action.	Not Applicable
			1	r < 2 %	Local repair of areas damaged and liable to damage. Within 15 days	
			2	r = 2 - 10 %		
			3	r = 10-25%	Bonded Inlay 2 or 3 slabs if affecting. Within 30 days	
			4	r = 25 - 50 %		
			5	r > 50% and h > 25 mm	Reconstruct slabs 4 or more slabs if affecting. Within 30 days	
8	Scaling	r = damaged surface / total surface of slab (%) h = maximum depth of damage	0	Nil, not discernible	Short Term	Long Term
					No action.	Not Applicable
			1	r < 2 %	Local repair of areas damaged and liable to be damaged. Within 7 days	
			2	r = 2 - 10 %		
			3	r = 10 - 20%	Bonded Inlay Within 15 days	
			4	r = 20 - 30 %		
			5	r > 30 % and h > 25 mm	Reconstruct slab Within 30 days	
9	Polished Surface/ Glazing	t = texture depth, sand patch test	0		No action.	Not Applicable
			1	t > 1 mm		
			2	t = 1 - 0.6 mm	Monitor rate of deterioration	
			3	t = 0.6 - 0.3 mm		
			4	t = 0.3 - 0.1 mm		
			5	t < 0.1 mm	Diamond Grinding if affecting 50% or more slabs in a continuous stretch of minimum 5 km. Within 30 days	

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
10	Popout (Small Hole), Pothole Refer Para 8.4	n = number / m2,	0	d < 50 mm; h < 25 mm; n < 1 per 5 m2	No action.	Not Applicable
		d = diameter,	1	d = 50 - 100 mm: h < 50 mm; n < 1 per 5 m2	Partial depth repair 65 mm deep Within 15 days	
		h = maximum depth	2	d = 50 - 100 mm; h > 50 mm; n < 1 per 5 m2		
			3	d = 100 - 300 mm; h < 100 mm n < 1 per 5 m2	Partial depth repair 110mm i.e 10 mm more than the depth of the hole. Within 30 days	
			4	d = 100 - 300 mm; h > 100 mm; n < 1 per 5 m2		
			5	d > 300 mm; h > 100 mm: n > 1 per 5 m2	Full depth repair. Within 30 days	
Joint Defect						
11	Joint Seal Defects	loss or damage L = Length as % total joint length	0	Difficult to discern.	Short Term	Long Term
					No action.	Not Applicable
			1	Discernible, L< 25% but of little immediate consequence with regard to ingress of water or trapping incompressible material.	Clean joint, inspect later.	
			3	Notable. L > 25% insufficient protection against ingress of water and trapping incompressible material.	Clean and reapply sealant in selected locations. Within 7 days	
			5	Severe; w > 3 mm negligible protection against ingress of water and trapping incompressible material.	Clean, widen and reseal the joint. Within 7 days	
12	Spalling of Joints	w = width on either side of the joint, L = length of spalled portion (as % joint length)	0	Nil, not discernible	No action.	Not Applicable
			1	w < 10 mm	Apply low viscosity epoxy resin/ mortar in cracked portion Within 7 days	
			2	w = 10 - 20 mm, L < 25%		
			3	w = 20 - 40 mm, L > 25%	Partial Depth Repair Within 15 days	
			4	w = 40 - 80 mm, L > 25%	30-50 mm deep, h= w + 20% of w Within 30 days	
			5	w > 80 mm, and L > 25%	50 - 100 mm deep repair. H = w + 20% of w Within 30 days	
13		f = difference of level	0	not discernible, < 1 mm	No action.	
			1	f < 3 mm		

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
	Faulting (or Stepping) in Cracks or Joints		2	f = 3 - 6 mm	Determine cause and observe	
			3	f = 6 - 12 mm	Diamond Grinding within 15 days	
			4	f= 12 - 18 mm	Raise sunken slab.	
			5	f> 18 mm	Strengthen subgrade and sub-base by grouting, within 30 days	
14	Blowup or buckling	h = vertical displacement from normal profile	0	Nil, not discernible	No action.	
			1	h < 6 mm		
			2	h = 6 - 12 mm	Install Signs to Warn Traffic Within 24 hours	
			3	h = 12 - 25 mm		
			4	h > 25 mm	Full Depth Repair Within 30 days	
			5	shattered slabs, i.e 4 or more pieces	Replace broken slabs. Within 30 days	
15	Depression	h = negative vertical displacement from normal profile L =length	0	Not discernible, h < 5 mm	No action.	
			1	h = 5 - 15 mm		
			2	h = 15-30 mm, Nos <20% joints	Install Signs to Warn Traffic within 24 hours	
			3	h = 30 - 50 mm		
			4	h > 50 mm or > 20% joints	Strengthen subgrade. Reinstate pavement at normal level if length L < 20 m. within 30 days	
			5	h > 100 mm		
16	Heave	h = positive vertical displacement from normal profile, L = length	0	Not discernible. h < 5 mm	No action.	
			1	h = 5 - 15 mm	Follow up.	
			2	h = 15 - 30 mm, Nos <20% joints	Install Signs to Warn Traffic within 24 hours	
			3	h = 30 - 50 mm		

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
			4	h > 50 mm or > 20% joints	Stabilise subgrade. Reinstate pavement at normal level within 30 days	
			5	h > 100 mm		
17	Bump	h = vertical displacement from normal profile	0	h < 4 mm	No action.	
			1	h = 4 - 7 mm	Grind, in case of new construction within 7 days	
			3	h = 7 - 15 mm	Grind in case of Ongoing maintenance within 15 days	
			5	h > 15 mm		
18	Lane to Shoulder Dropoff	f = difference of level	0	Nil, not discernible < 3mm	No action.	-
			1	f = 3 - 10 mm	Spot repair of shoulder. Within 3 days	-
			2	f = 10 - 25 mm		-
			3	f = 25 - 50 mm	Fill up shoulder Within 7 days	-
			4	f = 50 - 75 mm		For any 100 m stretch Reconstruct shoulder, if affecting 25% or more of stretch Within 30 days
			5	f > 75 mm		
Drainage						
19	Pumping	Quantity of fines and water expelled through open joints and cracks Nos/100 m stretch	0	not discernible	No Action	
			1 to 2	Slight/occasional Nos < 10%	Repair cracks and joints without delay	Inspect and repair sub-drainage at distressed sections and upstream.
			3 to 4	Appreciable/ Frequent 10-25%	Lift or jack slab within 30 days	
			5	Abundant, crack development >25%	Repair distressed pavement sections. Strengthen subgrade and subbase. Replace slab. Within 30 days	
20	Ponding	Ponding on slabs due to blockage of drains	0-2	No discernible problem	No action	
			3 to 4	Blockages observed in drains, but water flowing	Clean drains etc., follow up, deep grooving in transverse direction to remove water, within 7 days	Action required to stop water damaging foundation within 15 days.
			5	Ponding accumulation of water observed	Deep grooving in transverse direction to remove water-hydro planning within 7 days	

11.5 Traffic Survey and Analysis

Due diligence conducted a 7 day axle load survey at the two existing toll plaza's locations. All other required input parameters like AADT & growth rates are provided by the client. For the design traffic was assed till the end of concessionaire period. All the calculations and analysis are presented in Chapter-10. The summary of VDF and design MSA is presented below.

The VDF values obtained based on the 7 days axle load survey is presented below table.

Location/ Vehicle Type		BUS	LCV	2axle	3axle	MAV
NH-140: (Gadanki Toll Plaza-37+320)	LHS	1.175	0.818	3.343	3.943	8.221
	RHS	1.210	0.629	2.676	6.812	10.620

The AADT was provided by the concessionaire and 5% growth rates are considered on year on year, and the design traffic was projected for next 10 years (FY YR 2035). Design traffic for flexible pavement design is computed and summary is presented below table.

Location	Design Traffic (MSA) up to FY- YR 2035	
	LHS	RHS
NH-140: Chittoor to Mallavaram (Km 0+000 to Km 61+128)	31	39

11.6 Immediate Repairs

Immediate repair of flexible/ rigid pavement is recommended based on the un-acceptable condition of the pavement surface and roughness. For 6-lane section roughness >2750mm/km is considered as limiting value.

11.6.1 Immediate repair in 6-lane section (Chittoor to Mallavaram)

According to Article 3 of the existing HAM Concession Agreement, the operation period is 15 years, starting from the date of the completion certificate (achieved in YR 2023). Hence, this section is not considered for any immediate repairs.

11.7 O & M Strategy

The Periodic maintenance strategy of each section is presented below.

Table 11-5: Periodic & Major maintenance strategy of 6 lane section (Chittoor to Mallavaram)- Flexible Pavement

NH-140, Section from Chittoor to Mallavaram (Km 0+000 to Km 61+128)			
Year	**Description**	**Main Carriageway**	**Service Roads**
YR 2036 (10.05.2036 Handover Date)	-	Maintenance by the on-going concessionaire	
YR 2040-41 & YR 2041-42	1st Renewal Layer	40mm BC in 100% length in Both direction 50mm DBM in 10% length in Both direction	30mm BC in 100% length and 50mm DBM in 10% length on both direction with milling.
YR 2044-45	2nd Renewal Layer	Micro Surfacing in 100% length in Both direction	
Modified bitumen is recommended for BC overlay works on Main Carriageway. VG-40 grade bitumen is recommended for DBM rehabilitation works on Main Carriageway. VG-40 grade bitumen is recommended for Service roads			

12. COST ESTIMATE

12.1 General

Cost Estimates have been worked out for expenses on Immediate Works (CAPEX) and expenses on operations and maintenance (OPEX). The cost estimates have been worked out at present rates considering 2024-25 as the base year.

12.2 Assumptions

The cost estimates are based on the following assumptions:

(a) Bitumen has been assumed to be sourced from IOCL Chennai Refinery. The distance (to & fro) from the midpoint of Project Highway is taken as 182 km. Modified Bitumen and VG-40 grade bitumen is considered in our cost estimate.

(b) Hire charges for the Machinery have been considered in accordance with CSR Andhra Pradesh 2023-24 and escalation have been considered 5% every year. Rates for various items of works have been arrived at based on 'Standard Data Book for Analysis of Rates' published by MORT&H.

(c) Manpower rates have been taken from Minimum Wages for Office of the Labour commissioner Odisha effective from 1 October 2024.

(d) Material Rates are obtained from CSR Andhra Pradesh 2023-24 and escalation have been considered 5% every year.

(e) Sand and Aggregate are considered to be sourced from the nearest quarry located on project highway at approximately 30 km form the mid-point of Project Highway.

(f) Cement is considered to be procured from the nearest local market.

(g) Rate of steel is taken from SAIL December-2024

(h) Some of the rates are based on Consultant's experience on the similar ongoing projects in adjacent locations.

(i) Overheads and profits have been considered based on MORT&H Standard Data Book. Applicable taxes have been considered in the Rate Analysis.

12.3 CAPEX

Details of CAPEX are worked out under the following categories.

- Immediate maintenance / defect rectification.
- O&M maintenance

12.3.1 Immediate Maintenance

As per site investigation we have considered for immediate maintenance. A few items noticed are covered under routine maintenance.

However, it is to be noted that some of the equipment installed at Mahasamudram & Gadanki Toll Plaza are quite old and will require replacement for proper functioning during O&M period.

12.4 O&M Estimates

Operation and Maintenance estimates have been worked out under the following heads:

(a) Preventive Maintenance / Routine Maintenance

(b) Operations

(c) Major Maintenance

12.4.1 Routine Maintenance - Categories

Routine Maintenance covers all activities required to maintain the road in traffic worthy condition to provide desired comforts to the road users. Routine Maintenance can be classified into following three categories:

(a) Routine or day to day maintenance

(b) Pre-monsoon maintenance

(c) Post monsoon maintenance

12.4.1.1 Routine or day to day maintenance

Routine maintenance is required continuously on the road stretch and structures and covers the following activities:

(a) Cleaning of the Road

(b) Pavement maintenance to include crack sealing and pothole repairs

(c) Shoulder repairs

(d) Maintenance of avenue plantation, horticulture, and median plantation

(e) Maintenance of signage, gantry boards and road furniture.

(f) Maintenance of culverts, bridge drainage spouts, expansion joints, side slopes and verges

(g) Surface cleaning, dust or vegetation control, sand removal from structures

(h) Reporting any damage caused to bridges by traffic accidents

(i) Maintenance of guard rails and crash barrier etc.

12.4.1.2 Pre-monsoon Maintenance

This is carried out prior to the monsoons and includes the following:

(a) Inspection of channels/streams to ensure that there are no accumulation of logs, trees and other debris in the vicinity of piers and abutments.

(b) Cleaning of roadside / median drains.

(c) Removal of vegetation growth on sub structures.

(d) Cleaning of culverts.

12.4.1.3 Post-monsoon Maintenance

This includes maintenance that is carried out immediately after the monsoons and includes the following:

(a) Inspection of all structures for any damages and taking appropriate actions.

(b) Cleaning of roadside drains, culverts etc.

12.5 Operations Estimates

12.5.1 Toll Plaza

This cost includes the following:

(a) Maintenance of Toll Plaza building, booths, and tolling equipment.

(b) Security of the booths, lanes, and toll plazas.

(c) Collection of toll and handling of cash till bank deposit.

(d) Provision of IT in-charge, IT supervisor, other staff at Toll Plaza location.

(e) Administration and essential facilities for the staff and road users.

(f) Maintenance of Toll Plaza equipment and replacement of expendable and short life items.

(g) Electricity cost including standby generator.

12.5.2 Highway

This cost includes the following:

(a) Providing one patrolling vehicle including operating cost for round-the-clock patrolling of the Project Highway.

(b) Providing of one ambulance at Toll Plaza for accident victims.

(c) Provision of one crane with 30 MT and tow truck facilities for clearing the highway and evacuating the breakdown vehicles at Toll Plaza.

(d) Provision of one Broomer for cleaning of the highway.

(e) Expenditure on medical aid and provision of nursing staff.

(f) Cost of tests and surveys.

12.5.3 Energy

As per the Concession agreement, electrification is to be provided at the toll plaza and priority intersections. Streetlight luminaries, high mast lights with electricity tariff, provision of standby Genset are considered in the cost estimate.

12.5.4 Miscellaneous

(a) We have taken IE cost as per Industry norms.

(b) Insurance expenses have been taken as per Industry norms.

12.6 Summary of Cost on Initial Improvement Works

Summary of Cost on Initial Improvement Works are given in Table 12-1.

Table 12-1: Initial Improvement Works Cost

S. No.	Particulars	Cost
		NHIT
1	**Restoration/Improvement works of Toll Plaza**	5.55
	(A) Civil Cost	**5.55**
	GST 18 % on (A)	1.00
	(B) Total Civil Cost including GST 18%	**6.55**

12.7 Year Wise Summary of CAPEX & OPEX

Year-wise summary of CAPEX & OPEX for the balance concession period till FY 2044-45 is estimated and presented in Table 12-2:

Table 12-2: Summary of Year wise CAPEX & OPEX (0+000 to 61+128)

Sl. No.	FY	Initial Improvement Cost (in INR Cr.)	Major Maintenance Cost (in INR Cr.)				Operation & Maintenance Cost (in INR Cr.)								
			Road (MCW, SR, Toll Plaza)	Structure	ATMS	TMS	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026	6.55	-	-	-	-	0.60	-	-	-	-	5.54	0.30	-	4.48
2	2026-2027	-	-	-	-	-	0.60	-	-	-	-	5.54	0.30	-	5.25
3	2027-2028	-	-	-	-	-	0.60	-	-	-	-	5.54	0.30	-	5.37
4	2028-2029	-	-	-	-	-	0.60	-	-	-	-	5.30	0.30	-	5.28
5	2029-2030	-	-	-	-	-	0.60	-	-	-	-	5.30	0.30	-	5.37
6	2030-2031	-	-	-	-	-	0.60	-	-	-	-	4.93	0.30	-	5.38
7	2031-2032	-	-	-	-	2.37	0.60	-	-	-	-	4.57	0.30	-	5.25
8	2032-2033	-	-	-	-	-	0.60	-	-	-	-	4.39	0.30	-	6.03
9	2033-2034	-	-	-	-	-	0.60	-	-	-	-	4.39	0.30	-	5.56
10	2034-2035	-	-	-	-	-	0.60	-	-	-	-	4.39	0.30	-	5.39
11	2035-2036	-	-	-	-	-	0.60	-	-	-	-	4.39	0.30	-	5.50
12	2036-2037	-	0.98	-	-	-	4.56	2.73	2.48	4.94	0.43	4.39	2.48	2.52	5.56
13	2037-2038	-	5.20	-	-	-	4.56	2.73	2.48	4.94	0.43	4.39	2.48	1.54	5.65
14	2038-2039	-	-	-	-	4.74	4.56	2.73	2.48	4.94	0.43	4.39	2.48	1.54	5.51
15	2039-2040	-	-	-	-	-	4.56	2.73	2.48	4.94	0.43	4.39	2.48	1.54	6.35
16	2040-2041	-	80.87	-	9.01	-	4.56	2.73	2.48	4.94	0.43	4.39	2.48	1.99	5.77
17	2041-2042	-	80.87	31.01	-	-	4.56	2.73	2.48	4.94	0.43	4.39	2.48	1.54	5.93
18	2042-2043	-	-	-	-	-	4.56	2.73	2.48	4.94	0.43	4.39	2.48	1.54	5.86
19	2043-2044	-	-	-	-	-	4.56	2.73	2.48	4.94	0.43	4.39	2.48	1.54	5.90
20	2044-2045	-	36.47	-	-	-	4.56	2.73	2.48	4.94	0.43	4.39	2.48	1.99	5.90
Total		**6.55**	**204.40**	**31.01**	**9.01**	**7.10**	**47.69**	**24.61**	**22.30**	**44.48**	**3.84**	**93.78**	**25.61**	**15.77**	**111.29**

Note: The costs for Admin, SPV, IE, and other office expenses are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

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FOUR LANE PROJECT OF TAMILNADU/ANDHRA PRADESH BORDER TO KARNATAKA BORDER OF NH-4, LENGTH 84.797 KM, IN THE STATE OF ANDHRA PRADESH



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TECHNICAL DUE DILIGENCE REPORT

FOUR LANE PROJECT OF TAMILNADU/ANDHRA PRADESH BORDER TO KARNATAKA BORDER OF NH-4, LENGTH 84.797 KM, IN THE STATE OF ANDHRA PRADESH

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Acronyms and Abbreviations

BBD	Benkelman Beam Deflection	LCV	Light Commercial Vehicle
BOQ	Bill of Quantities	LHS	Left hand side
BC	Bituminous Concrete	LIE	Lenders' Independent Engineer
BOT	Build, Operate and Transfer	LT	Low Tension
CA	Concession Agreement	MOEF	Ministry of Environment and Forest
CAPEX	Capital Expenditure	MORT&H	Ministry of Road Transport & Highways
COD	Commercial Operation Date	MPRDC	Madhya Pradesh Road Development Corporation
CRPF	Central Reserve Police Force	MSA	Million Standard Axle
C & G	Clearing and grubbing	NCR	Non-Compliance Report
CRMB	Crumb Rubber Modified Bitumen	NH	National Highways
CUP	Cattle Under Pass	NHAI	National Highways Authority of India
DBM	Dense Bitumen Macadam	NHDP	National Highway Development Programme
DLC	Dense Lean Concrete	NRMB	Natural Rubber Modified Bitumen
DFO	Divisional Forest Office	NOC	No Objection Certificate
DG	Diesel Generator	OFC	Optical Fibre Cable
DLP	Defect liability period	OPEX	Operation Expenditure
DPR	Detailed Project Report	O&M	Operation and Maintenance
EIA	Environment Impact Assessment	PPE	Personal Protection Equipment
EMP	Environment Management Plan	PPP	Public-Private/Public Sector Partnership
EPC	Engineering Procurement & Construction	PQC	Pavement Quality Concrete
FCI	Food Corporation of India	PUP	Pedestrian Under pass
FRL	Formation Road Level	PWD	Public Works Department

FWD	Falling Weight Deflectometer	PCC	Plain Cement Concrete
GAD	General Arrangement Drawing	PD	Project Director
GFC	Good for Construction	PIU	Project Implementation Unit
GOI	Government of India	PLR	Prime lending rate
GSB	Granular Subbase	PMB	Polymer Modified Bitumen
HT	High Tension	PMC	Project Management Consultant
HMP	Hot Mix Plant	PUP	Pedestrian Under Pass
HDM	Highway Development & Management	QA/QC	Quality Assurance / Quality Control
IC	Independent Consultant	SDBC	Semi-dense Bitumen Concrete
IE	Independent Engineer	SPV	Special Purpose Vehicle
IPC	Interim Payment Certification	VDF	Vehicle Damage Factor
IRC	Indian Road Congress		

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1. EXECUTIVE SUMMARY

1.1 Ramboll Scope

NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED have entrusted Ramboll India Private Limited for technical due diligence study of 84.797 km long National Highway corridor comprising four lane section of NH-4 from Tamil Nadu / AP border to Nalagampalli to Karnataka Border in the State of Andhra Pradesh. Accordingly, Ramboll team has undertaken the work of preparing advisory report based on study of project related reports and documents, visual inspections, and field investigations.

1.2 Project Introduction

The Government of India had entrusted to National Highways Authority of India (NHAI) the development, maintenance, and management of National Highway No. 04 and 140 which includes.

Project i Rehabilitation and Upgradation of NH-4 from Km 133.360 to km 171.590 (Andhra Pradesh / Tamil Nadu Border to Nalagampalli Village) to four lanes with paved shoulder under NHDP-IV on EPC mode. (Project-1)

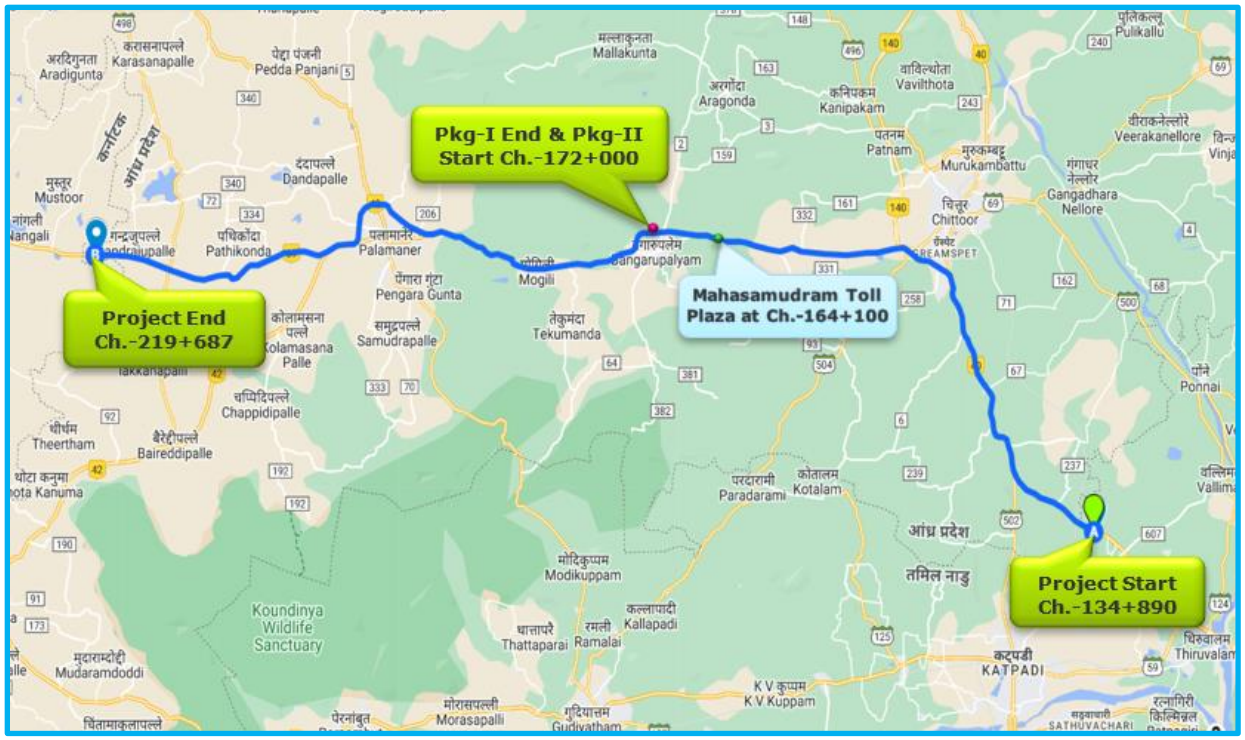
Project ii Rehabilitation and Upgradation of NH-4 from Nalagampalli (Existing Km.171.590/Design Km.172.00) to AP/Karnataka Border (Existing Km.216.912/Design Km.219.687) to four lanes with paved shoulders (Design length = 47.687 Km) under NHDP-IV on EPC mode.

The Authority had invited proposals by its Request for Proposal for above three Projects. After evaluation of the bids received, the Authority had accepted the bid of the selected bidder and issued its Letter of Acceptance No. (i) RW/NH-37015/13/2016-NHDP-IVA dated 24.06.2016; (ii) NHAI/NH-4/Nalagampalli/2016-17/264 dated 30.03.2017 respectively for the two Projects.

Further, for Project (i) after termination of the EPC Contractor for the project – "Rehabilitation and Upgradation of NH-4 from Km 133.360 to km 171.590 (Andhra Pradesh / Tamil Nadu Border to Nalagampalli Village) to four lane with paved shoulder", National Highways Authority of India resolved to rehabilitate and augment the "Construction of 1 No's ROB, 2 No's VUPs, Service roads, provision of lighting and construction of other miscellaneous works at various stretches including maintenance of existing section of NH-4 from AP /Tamil Nadu Boarder (Km. 134.890) to Nalagampalli village (Km.172.000) under EPC mode in the state of Andhra Pradesh" on Engineering, Procurement, Construction ("EPC") basis.

Accordingly, the Authority accordingly invited the proposals from the eligible bidders for the balance works of the Project, including maintenance. After evaluation of the bids received, the Authority accepted the bid of the selected bidder and issued its Letter of Acceptance No. NHAI/ ROVJA/P25015/NLGPALK/2019/734 dated 13.04.2023 for balance work of the Project including its maintenance.

Project (ii) had achieved COD and the projects are now under maintenance. DLP of Project (ii) is expected to be completed by January 2025.



Project Location Map

1.3 Project Description

The project road is in the administrative location of Chittoor district in the state of Karnataka. The project traverse's major settlement areas such as Bomma Samudram, Vasanthapuram, Gudipala, Ramapuram, Kothapalli, Gangasagram, Iruvaram, Prasanth Nagar, Lakshmaiahkandiga, Mahasamudram, Nalagam palli, Palamakulapalle, Palamaner, Vepanapalle, Pakalavaripalli, Ithepalli.

Project i - The project starts at Tamilnadu/Andhra Pradesh Border at Km 134+890 and ends at km 172+000 at Nalagampalli on NH-4.

Project ii - The project starts at km 172+000 at Nalagampalli on NH-4 and ends at km 219+687 at Andhra Pradesh / Karnataka Border.

Particulars	Project i	Project ii
Project Name	Rehabilitation and Upgradation of NH-4 from Km 133.360 to km 171.590 (Andhra Pradesh / Tamil Nadu Border to Nalagampalli Village) to four lanes with paved shoulder / Construction of 1 No's ROB, 2 No's VUPs, Service roads, provision of lighting and construction of other miscellaneous works at various stretches including maintenance of existing section of NH-4 from AP /Tamil Nadu Boarder (Km. 134.890) to Nalagampalli village (Km.172.000)	Rehabilitation and Upgradation of NH-4 from Nalagampalli (Existing Km.171.590 /Design Km.172.00) to AP/Karnataka Border (Existing Km.216.912 /Design Km.219.687) to four lanes with paved shoulders (Design length = 47.687 Km)
Mode of the Execution (BOT Toll/ BOT Annuity/ EPC/ HAM/ Others)	EPC Mode under NHDP Phase – IV / EPC Mode	EPC Mode under NHDP Phase - IV
Project Phase	Partially under construction with Tolling, Operation, Maintenance	Operation and Maintenance
No. of Lanes/ Configuration	4 Lane divided carriageway	4 Lane divided carriageway
Length of the Project (in Km)	37.110 km	47.687 km
Client	NHAI	
NH No.	NH-4	NH-4
EPC Contractor / Concessionaire	Gayatri Projects Ltd / SD Infra	Dilip Buildcon Ltd
Total Project Cost	INR 306 Crores / INR 149.77 Crores	INR 959.06 Crores
Independent Engineer (O&M Phase)	Aarvee Associates Architects Engineers & Consultants Pvt. Ltd.	Aarvee Associates Architects Engineers & Consultants Pvt. Ltd.
LOA	13 March 2023	30 March 2017
Date of Signing of CA	18 May 2023	02 November 2017
Appointed Date	19 June 2023	15 November 2017
Scheduled Completion date for EPC Contract	550th day from appointment date i.e. 19 December 2024	
Completion Certificate	19.01.2025 (expected), remaining 1.43 km ROB expected 31.07.2025	31 July 2019
End Date of Concession period / Maintenance obligation for	Defect liability period 10 years after COD	Defect liability period 4 years after

Particulars	Project i	Project ii
Latest EPC Contract		COD
O&M Handover date	18 December 2034	DLP extended till rectification of defects (expected to complete by 31.01.2025)
No. of Toll Plazas (Number and Location)	Toll Plaza 1: Mahasamudram Toll Plaza	-

1.4 Scope of work

Broadly the Scope of services encompasses the following:

- Review of available documents and site visit
- Field inspection, investigations, and Analysis
- Operations and Maintenance assessment
- Major Maintenance strategy and assessment
- Estimation of Opex and CapEx.
- Preparation of presentation and project report

1.5 Assessment of Project Assets

Projects asset inventory and their condition assessment is prepared through visual inspection during site visits, review and analysing the reports shared by the client, by field investigations validating the findings and by NSV survey. All the elements and components pertaining to project asset are reported in subsequent Chapter 5, 6 & 7 of this report and their assessment is used to prepare the strategy for preventive, routine, and periodic maintenance. The overall condition of the project and its assets are satisfactory. Detailed asset inventory and pavement evaluation is provided separately in Annexure I & II to this main report.

S.No.	Item - Features	Units	Project i	Project ii	Total
1	**Service Road**	km	13.018	51.906	64.924
2	**Bypasses**	km	1.04	13.09	14.13
3	**Major Intersections**	Nos.	6	4	10
4	**Minor Intersection**	Nos.	41	33	74
5	**Bus bay & Bus Shelters**	Nos.	43	32	75
6	**Truck Lay Bye**	Nos.	2	6	8
7	**Rest Area**	Nos.	0	0	0
8	**Toll Plaza**	Nos.	1	0	1
	Toll Plaza lane	Nos.	10	0	10
9	**Median Opening**	Nos.	30	11	41
10	**Street Light Poles**	Nos.	160	1710	1870

S.No.	Item - Features	Units	Project i	Project ii	Total
11	High mast Lights	Nos.	11	0	11
12	Solar Blinkers	Nos.	36	63	99
13	Avenue Plantation	km	9.975	35.911	45.886
14	Median Plantation	km	15.248	34.797	50.045
15	Fuel station	Nos.	9	11	20
16	Sign Boards	Nos.	490	352	842
17	Gantry Sign Board	Nos.	5	28	33
18	Pedestrian Guard Rail	km	0.34	0.319	0.659
19	Rigid Concrete Barrier	km	2.309	26.578	28.887
20	W Beam Crash Barrier	km	11.278	36.587	47.865
21	Shoulder/Separator Drain	km	7.572	14.865	22.437
22	Earthen Drain/ Chute Drain	km	41.524	66.543	108.067
23	Median Longitudinal Drain	km	10.956	5.103	16.059
24	CCTV	Nos.	52	1	53
25	VMS	Nos.	0	0	0
26	Delineators	Nos.	85	231	316
27	Object Hazard Marking	Nos.	111	185	296
28	Chevrons	Nos.	165	500	665
29	Road Studs	Nos.	2103	10359	12462
30	Foot Path	km	12.553	15.279	27.832
31	Entry/ Exit	Nos.	0	20	20
32	5th Kilometer Stones	Nos.	4	10	14
33	Km Stones/Ordinary KM stones	Nos.	8	58	66
34	Hectometer Stones	Nos.	29	145	174
35	Kerb	km	64.769	133.842	198.611

1.6 Assessment of Structures

Site data is collected and analysed for condition and inventory of Major bridges, and Grade separators using the Mobile Bridge Inspection Unit (MBIU). Comprehensive visual inspection is carried out for assessing the minor bridges, underpasses, overpasses, and culverts of the entire project stretch of 84.797 kms. During the inspection and condition survey no major failure/Distresses is observed however minor cracks, exposed reinforcement at parapet, honeycombing repairs at structural components,

clogged drainage spout, debris found under culvert and waterways and vegetation found on superstructures with unwanted material found around the bearings.

Total nos. of structures on the Project Highway are given in the table below

Sl. No.	Item	Project i	Project ii	Total
1	Major Bridges	-	1	1
2	Minor Bridges	6	6	12
3	RUB	-	-	0
4	ROB	1	-	1
5	Overpass	3	-	3
6	VUP	4	12	16
7	LVUP	-	-	0
8	PUP/CUP	-	-	0
9	FOB	-	-	0
10	HP Culvert	44	10	54
11	Box Culvert	31	41	72
12	Slab Culvert	13	-	13

1.7 Toll Management System (TMS)

The project has one toll plaza comprising of hybrid ETC lane infrastructure of combined 10 lanes. Mahasamudram TP - is a staggered toll plaza and equipped with 5+5 Hybrid lanes in each direction installed at 260 meters between them. No separate two-wheeler lanes are provided adjacent to the extra-wide lanes in any of these two plazas.

Further it is also found that none of the directions of the toll plaza are equipped with Static Weigh Bridges.

At Mahasamudram TP Medium Speed Weigh in Motion systems are installed in all 10 lanes and are found to be in good condition as it is relatively a new installation. Old software's are noticed to under replacement. Integration of the MS-WIMs is not done and no vehicle weight is being captured in the TMS. Stamping and calibration works are yet to be undertaken by the vendor.

Regarding TMS functionality, at Mahasamudram toll plaza the old hardware are being replaced, currently none of the AVC systems are functional and all lane controllers are found with doors unlocked and not in proper condition. Installation team is in process of replacing only partial hardware, which is essential to manage the show, therefore calculation of equipment ageing cannot be done. However, the TMS is not being maintained in proper shape.

In Project i & ii, no HTMS hardware is found installed, however a detailed working of the required HTMS / ATMS is presented in chapter 7.

1.8 Soil and Material investigation

Soil and Material investigation are done with the samples collected from pit investigation and the results are narrated in Chapter 9.

Subsoil is generally consistent throughout the project road and is predominantly Silty Sand and Clayey sand soils.

Summary of strength parameters in the soil investigation is shown below.

Description	Liquid Limit	Plasticity Index	Free Swell Index	4-days soaked CBR	Degree of compaction
Project (i) - NH-4, AP/ TN Border to Nalagampalli: Km 134+890 to Km 172+000	17%-28%	Max 7%	Max 15.2%	11.3%-27.1%	92.0%-96.5%
Project (ii) - NH-4: Nalagampalli to AP/ KA Border: Km 172+000 to Km 219+687	19%-33%	Max 13%	Max 25.1%	10.3%-16.1%	92.1%-98.5%
MoRTH Limits	**<50%**	**<25%**	**<50%**		

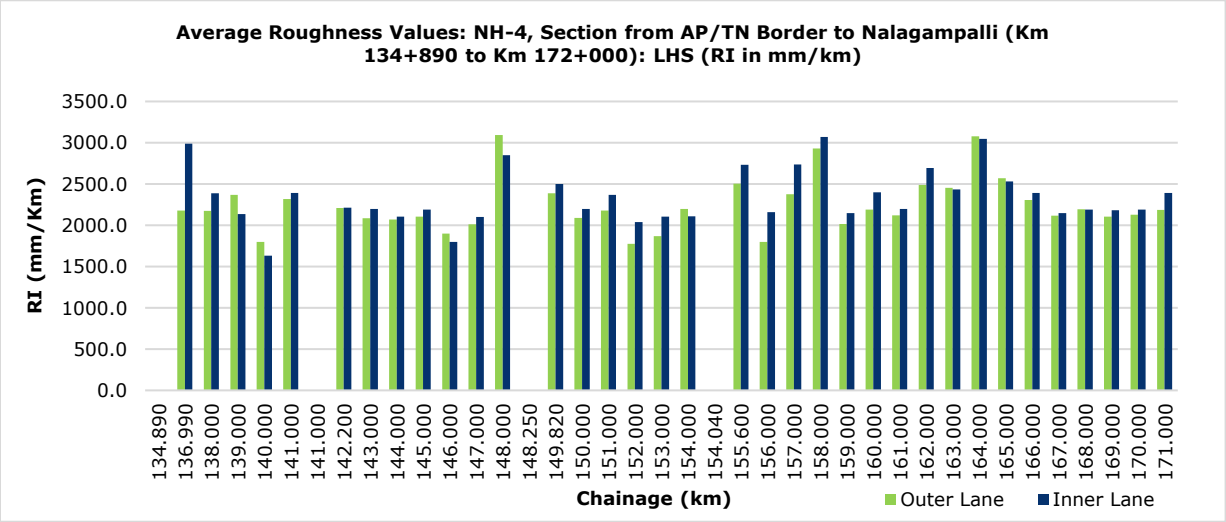
*Variance between MDD and FDD is converted in-terms of degree of compaction

All the measured LL, PI and FSI values are within the acceptable limits as per MoRTH guidelines.

Project (i) & (ii) - The existing pavement along the project corridor is rigid in nature. The pavement composition comprises of PQC, DLC and granular sub-base.

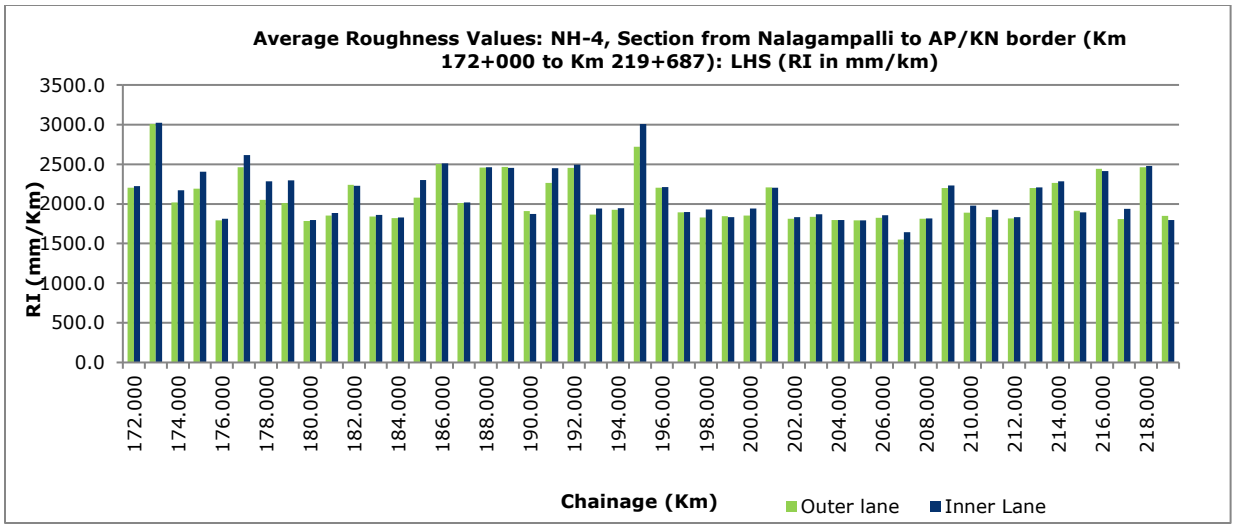
1.9 Pavement Evaluation

Pavement condition survey was carried out on each lane of each carriage way with NSV. The obtained lane wise Roughness summary in terms of BI (mm/km) is illustrated below and in Chapter 10 for Main carriage way LHS and RHS respectively for Projects (i) & (ii).

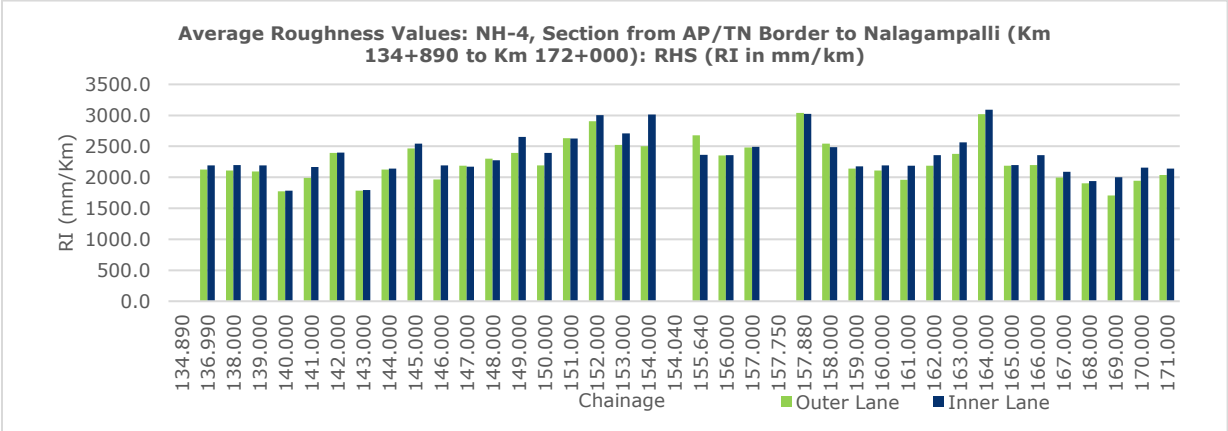


Km 134+890 to Km 158+800, Isolated sections are not surveyed

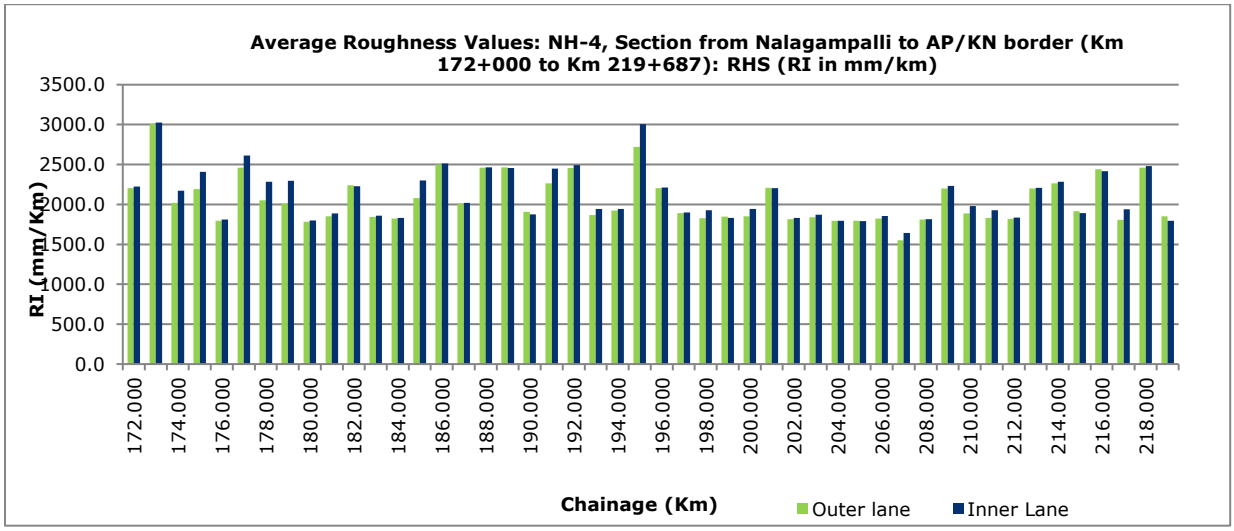
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Illustrative summary of roughness for LHS direction of both Projects



**Km 134+890 to Km 158+800, Isolated sections are not surveyed due to Work in progress.*



Illustrative summary of roughness for RHS direction of both Projects

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For Project (i) and (ii)

As per Schedule-B of TOT Schedule clause 3.1 (III) Repair and Rehabilitation of Pavement - a Roughness of <2400 mm shall be maintained by the existing EPC Contractor prior to handing over to InVIT Concessionaire. After O&M handover of project stretch to InVIT, the InVIT concessionaire shall maintain the roughness level at <2400mm (mentioned in Schedule F) including in stretches where overlay (Structural or Functional) / panel replacement / joint repair / any type of repair to panels has been provided by InVIT concessionaire.

Pavement Observations:

For Project (i) – in Main Carriageway, few slabs on both direction has severe cracks, joint spalling and failed patch repairs. Due to structural issues, the sections has many corner breaks. In Service Road, majority of the service roads are under construction.

For Project (ii) - in Main Carriageway, due to structural issues, the sections has many corner breaks. Major bridges have wearing surface issues, it is in Fair to Poor condition, and majorly in tapered lane joints are opening, along with plant saplings growing in the joint gaps. Lot of sealed cracks are observed. Section where there are deceleration lanes at the junctions for the Mainline carriageway the joint opening is more common. In both directions, failed patch repairs, cracking, pavement dip and joint spalling are observed in the stretch. From Km 192+000 to km 219+687, the pavement condition is good in LHS and RHS direction and compared to the other sections, major distressess are not observed. In Service Road, overall pavement condition is fair, few of service roads have cracks, potholes and ravelling. At structures approaches, pavement is detorated.

FWD deflection measurement has been carried out for each carriageway to evaluate the pavement structural strength and analysis of remaining life of project is carried out in conformity with IRC: 115-2014 and presented in Chapter 10 of this report.

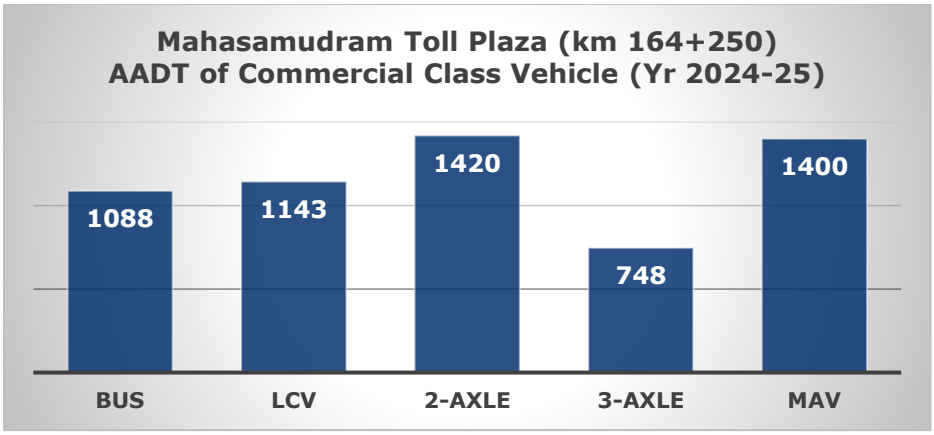
Analysis of Rigid Pavements and observations:

As per IRC: 117-2015, the rigid pavement analysis is carried out to determine the following PQC parameters, Evaluation of subgrade modulus, elastic modulus of concrete and flexural strength of concrete pavement. Detection of possible locations of voids underneath the rigid pavement Load Transfer Efficiency (LTE) of Joints (%).

For Project (i) - it is understood that around 66.10% of testing points in LHS direction and around 54.50% of testing points in RHS direction of the rigid pavement having E value >30000 MPa in Main Carriage way. Similarly, around 41.90% of testing points in LHS direction and 43.90% of testing points in RHS direction of the of the rigid pavement having flexural strength >4.5Mpa in Main Carriage way.

For Project (ii) - it is understood that around 81.90% of testing points in LHS direction and around 67.90% of testing points in RHS direction of the rigid pavement having E value >30000 MPa in Main Carriage way. Similarly, around 72.20% of testing points in LHS direction and 60.50% of testing points in RHS direction of the of the rigid pavement having flexural strength >4.5MPa in Main Carriage way. Load Transfer Efficiency (LTE) for Transverse joints and Longitudinal joints is more than 50% for both LHS & RHS direction for Main Carriage way.

Team for Technical Due Diligence conducted a 48 hrs axle load survey at the toll plaza location. The Annual Average Daily Traffic (AADT) of all commercial class vehicles as provided by the client is shown below



VDF values are obtained as per the analysis of 7 days axle load survey are presented below:

Location/ Vehicle Type		BUS	LCV	2axle	3axle	MAV
NH-4: (Mahasamudram Toll Plaza-164+250)	LHS	1.085	0.633	2.901	4.402	10.017
	RHS	1.080	0.688	2.598	4.926	8.115

AADT was provided by client and 5% growth rates are considered on year, and the design traffic was projected for next 10 years (YR 2035-36).

In the rigid pavement section from AP/TN border to AP/KN border (Project i & ii) no overlay requirement is analysed in general, hence no MSA calculations are done in this section.

1.10 Operation and Maintenance Requirements and Strategy

The Contractor and concessionaire shall always maintain that during the Operation Period, the Project Highway conforms to the maintenance requirements set forth in Schedule E, Article 14 and 17 of EPC Contract Agreement and in Schedule F (the "Maintenance Requirements" of TOT CA).

A. Schedule E of EPC Contract
B. Schedule F of the TOT CA

Distresses develop in rigid pavements (in Project i & ii) are described with severity index, and repairing measures are given in Chapter 11. All appropriate technical and contractual parameters are careful reviewed to formulate the strategy of immediate repair and rehabilitation for the existing distresses and roughness. The quantities estimated for each lane are presented in Chapter 11.

The Major Maintenance Strategy is assessed in 2 scenarios based on engineering practice and HDM-4 model. The recommended Major Maintenance Strategy till the end of TOT concession period is presented below and also elaborated in Chapter 11.

Major/Periodic Maintenance Strategy

Project i – Rigid Pavement

NH-4, Section from Chittoor to Nalagampalli (Km 134+890 to Km 172+000)			
Year	**Description**	**Main carriageway (Rigid Pavement)**	**Service Roads (Flexible Pavement)**
YR 2034 (Hand over date: 18.12.2034)		Maintenance by the Existing O&M contractor	
YR 2035-2036	1st Renewal Layer	2.00% of total surface area of panel repair/replacement	30mm BC in 100% project length and 50mm DBM with milling on 10% project length.
		0.50% surface area grouting with a depth of 50mm	
		100% of joints cleaning and replacement of joint seal	
		100% of project length for Re-texturing.	
VG-40 grade bitumen is recommended for Service roads. Capacity augmentation of this stretch is envisaged in FY 2039-40 and FY 2040-41			

Project ii – Rigid Pavement

NH-4, Section from Nalagampalli to Chittoor (Km 172+000 to Km 219+687)			
Year	**Description**	**Main carriageway (Rigid Pavement)**	**Service Roads (Flexible Pavement)**
YR 2025 (Expecting Hand over)	Immediate Repair/ Rehabilitation	Maintenance by the Existing EPC contractor	30mm BC is considered in 20% affected length. (Existing EPC Contractor already performing pavement rectification at site).
		10% of total affected length given in NSV test (Existing EPC Contractor already performing pavement rectification at site)	
		10% of joints cleaning and replacement of joint seal out of total affected length (Existing EPC Contractor already performing pavement rectification at site)	
YR 2032-2033 & YR 2033-2034	1st Renewal Layer	2.00% of total surface area of panel repair/replacement	30mm BC in 100% project length and 50mm DBM with milling on 10% project length.
		0.50% surface area grouting with a depth of 50mm.	
		100% of joints cleaning and replacement of joint seal	
		100% of project length for Re-texturing.	

NH-4, Section from Nalagampalli to Chittoor (Km 172+000 to Km 219+687)			
Year	**Description**	**Main carriageway (Rigid Pavement)**	**Service Roads (Flexible Pavement)**
VG-40 grade bitumen is recommended for Service roads. Capacity augmentation of this stretch is envisaged in FY 2039-40 and FY 2040-41			

1.11 Cost Estimate

The cost estimate is worked out for expenses on Immediate Works (CAPEX) and expenses on operations and maintenance (OPEX) at present rates considering 2024-25 as the base year and is detailed in Chapter 12. Capacity augmentation of Project i and ii is envisaged in FY 2039-40 and FY 2040-41. The costs for Admin, SPV, IE, and other office expenses are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation. Cost Estimate is worked out for expenses on

i. The costs for the restoration and improvement of the Toll Plaza and the Toll Management System (TMS) are included in Capex. Initial improvements work like Rectification of Rigid Pavement, repair and rehabilitation of RE wall bulging in Project ii, Installation of Damaged Sign Board, Thermoplastic/Transverse Bar Marking on pavement, Installation of 5th, KM, HM, Boundary Stone, Painting of Kerb Stone, Incident Management, AMC cost for TMS & HTMS etc. are to be executed by TOT Concessionaire.
ii. Lighting, Tolling operations, Revalidation survey, Insurance Charges, Administrative Expenses – is included as Operational cost for TOT Concessionaire.
iii. Routine Maintenance and Repairs – to be done by EPC Contractor till end of DLP and thereafter by TOT Concessionaire till FY 2044-45 (End of Concession period of TOT Concessionaire).
iv. Periodic Maintenance - to be executed by EPC Contractor till end of DLP and then by TOT Concessionaire till FY 2044-45.
v. Bitumen has been assumed to be sourced from IOCL Chennai Refinery. The distance (to & fro) from the midpoint of Project Highway is taken as 182 km. Modified Bitumen and VG-40 grade bitumen is considered in cost estimate.

Initial improvement works is estimated as INR 20.13 Crore.

Periodic Maintenance is estimated as INR 172.73 Cr.

Routine maintenance cost is INR 67.71 Cr.

Operational cost till end of concession for this 84.797 km stretch is INR 505.47 Cr.

Capex, Periodic Maintenance and Opex for this 4-lane corridor is estimated till end FY 2044-45 as INR 698.33 Cr.

2. INTRODUCTION, APPROACH AND METHODOLOGY

National Highways Infra Investment Managers Private Limited have entrusted Ramboll India Private Limited for conducting technical due diligence study for 84.797 km long National Highway corridor comprising four lane section of NH-4 from Tamil Nadu / AP border to Nalagampalli to Karnataka Border in the State of Andhra Pradesh.

Accordingly, Ramboll team has undertaken the work of preparing Technical Due Diligence Report based on study of project related reports and documents, visual inspections, and field investigations.

2.1 Scope of Work and Compliances

The scope of work agreed with National Highways Infra Investment Managers Private Limited for conducting the technical due diligence study is presented in Table 2-1. The table also presents the chapters of the Technical Due Diligence Report where different items of scope of work are covered.

Table 2-1: Scope of Work and Compliances

SN	Scope of Work	Discussed At
1	**Site Visit and Pavement condition Survey – Visual Assessment** Site visit will be undertaken by Highway and Structural Engineers, Pavement Expert, Quantity Survey Experts, TMS & HTMS Expert and engineers to have visual assessment done for the project stretch. Observations will be recorded and critical issues for the Project will be identified and red flagged. Project Structural integrity issues that require rectification / re-mediation will be observed and recorded along with possible risk mitigation strategy & costing thereof. The Consultant shall carry out a detailed reconnaissance of the project area and shall record and highlight important features and point out any issue that may be of importance to the Client in terms of operation and maintenance of the project.	Chapter 3, 5, 6, 7
2	**Conducting inventory, condition surveys and Field Investigations for Project Road** Inventory and detailed condition surveys will be conducted for project highway, bridges & cross drainage structures, project assets, safety appurtenances, TMS & ATMS system including recommendation for either strengthening / rehabilitation or reconstruction / replacement. *Requirements for NDT tests will be identified and informed. Based on the preliminary investigations and walk-through along the stretch, the Consultant shall prepare a project road map indicating the following elements Inventory of existing project assets Existing pavement condition – kilometer-wise (along with Photographs thereof) Intersecting/Crossroads (along with Photographs thereof); Inventory and condition assessment of CD structures (along with Photographs thereof).	Chapter 3, 5, 6, 7, 9

SN	Scope of Work	Discussed At
	Condition assessment of pavement. Condition assessment of structures. Review the extent of balance work. The Consultant should prepare a photo-documentation (Soft copy) of the mentioned areas and any other important findings. The Consultant shall assess the adequacy of Operations & Maintenance, Toll Management System and Advanced Toll Management system. The following field investigations will be carried out for the project stretch. Falling Weight Deflectometer (FWD) Surveys NSV Survey Test Pit investigations. Axle Load Surveys Bridge Inspection by MBIU (For Major Structures - length of structure >60m)	
3	**Review of available Project Documents and Reports** The available reports (EPC Contracts, Approved Pavement design report, Monthly Progress Reports, As-built Drawings, Correspondences of stake holders, Asset Management Contracts, Maintenance Manuals, Maintenance history etc) will be reviewed. The Consultant shall assess the completion status of work Vis-à-vis compared with schedule B, C and Schedule D	Chapter 3, 4, 5, 6, 7, 8
4	**Review of construction material and quality, Rehabilitation Plans by Developing strategy for immediate/periodic maintenance.** The Consultant should review of Quality of construction and compaction based on available data and from Laboratory testing of samples collected from trial pits. The Consultant should conduct visual inspection of expansion joints and bearings etc of the structures to assess the condition and requirements for its repair, replacements and / or rehabilitation. The pavement stretches along with the type of distresses will be identified analysing NSV and FWD data. The Consultant should assess maintenance cycles for pavements using HDM analysis. Repair techniques will be suggested for stretches requiring immediate rehabilitation measures. Pavement maintenance strategy (functional overlay/ structural overlay) will be developed for the entire concession period to bring back riding quality of each lane of the carriageway to maximum permissible as stipulated in the Concession Agreement.	Chapter 5, 6, 7, 9, 10, 11

SN	Scope of Work	Discussed At
5	**Preparation of BoQ and Cost Estimate** Bill of Quantities will be prepared for Immediate repairs, Routine maintenance, Periodic/major maintenance, O&M Cost, and Improvement works as per Schedule B of the CA. O&M cost will involve Routine maintenance and Incident Management, Tolling Operations, Admin Expenses and Preventive Maintenance. The Consultant should provide cost till the end of the contract period including any expected extension of Concession periods as informed by the Client. For assessing the cost, Ramboll will use rates available in the market or from the inhouse data base.	Chapter 12

2.2 Deliverables and Timelines

The deliverables and the timelines for the study are as under:

SN	Deliverables	Time period
1	Submission of Red Flag Report /critical issues	Within 14 days from commencement of site visit.
2	Submission of Draft Report	Within 6-7 Weeks from the date of receipt of LOA or all data whichever is later
3	Submission of Final Report	Within one week from the date of receipt of comments from Client or within two weeks from the date of submission of draft report

The above timelines assume that all project related data are available at the start of work.

2.3 Structure of the Report

In line with the requirements of agreed scope of work, this Technical Due Diligence Report is being submitted. The report is organised in the following fashion.

Chapter 1	**Executive Summary:** The chapter presents an overview of the project after review & study of documents, site investigations and estimates for maintenance.
Chapter 2	**Introduction, Approach and Methodology:** The chapter presents a brief approach and methodology adopted for carrying out the Due Diligence Study.
Chapter 3	**Project Description:** The chapter summarises the project features based on Concession Agreement requirements.

Chapter 4	**Review of Existing EPC Contract:** This chapter contains a short review of existing contract of the Projects.
Chapter 5	**Assessment of Project Assets - Highway:** The chapter presents the details of various essential features of the project highway recorded through reconnaissance survey and data obtained through NSV Survey.
Chapter 6	**Assessment of Project Assets - Structures:** The chapter presents the details of various essential features of the structures recorded through visual inspection and by using MBIU.
Chapter 7	**Assessment of Project Assets – Toll Management Systems:** The chapter presents the details of various essential features of the Toll Plaza Systems and associated facilities recorded through visual inspection.
Chapter 8	**Review of Existing O&M Contracts and Maintenance Manuals:** The chapter contains a short review of the Operation and Maintenance Obligations of the EPC Contractor.
Chapter 9	**Soil and Material Investigation:** This chapter discusses the results of soil and material tests carried out for the project stretch.
Chapter 10	**Pavement Evaluation Studies:** This chapter describes the tests carried for pavement evaluation and analyses of the test results.
Chapter 11	**Development of O&M Strategy:** The chapter presents the details of O&M strategy developed based on the Pavement evaluation studies and analysis described in Chapter 10.
Chapter 12	**Cost Estimate:** The chapter outlines the key assumption considered for cost estimate and provides details of cost estimates under various heads viz immediate, O&M and major maintenance for the concession period.

2.4 List of Shared Documents of the project.

Documents shared by National Highways Infra Investment Managers Private Limited for Technical Due Diligence of the project and Ramboll gathered data during site inspection from PIU - Tirupati, IE and Concessionaire's site office of this Project, under guidance of National Highways Infra Investment Managers Private Limited.

-
- Concession Agreement of the projects
- Technical schedule of Tolling, Operation, Maintenance & Transfer of the projects

- Projects under INVIT Round 4 - Prebid replies.
- Technical Due Diligence Report of the projects for effective implementation of asset Monetization program under TOT & InvIT with BOQ and cost estimate.
- Pavement design Report (Project 1, 2)
- As built drawings (for Project 2)
- Letters on COD (Project 2)
- Monthly maintenance Reports of IE (Project 2)
- Monthly Progress Report (Project 1)
- Pavement Design Report (Project 2)
- Operation & Maintenance Manual (Project 2)
- Insurance Policy
- Asset Inventory (Project 1, 2)
- MBIU survey Report (Project 2)
- NSV Report (Project 2)
- Safety Audit Report (Project 2)
- KMZ file
- Electrical details (Project 2)
- Existing stage Audit report (Project 1)

2.5 Approach and Methodology

Our approach and methodology to address the requirements defined in terms of reference are briefly presented below.

- Identification of objectives of Client through detailed study of scope of work and discussions with the Client.
- Identification of Assignment specific team of professionals covering all the skills and specializations required and involving with the assignment from day one.
- A Team Leader is assigned to coordinate various events / activities of various team members.
- Assessment of data / information required is made at the time of Proposal / Engagement letter and the list is shared with the Client.

2.6 Study

The following briefly presents the process followed for the present study.

- The data available for the project are collected from site offices of PIU – NHAI and of respective Independent Engineers of three Projects.
- The data is reviewed by the study team and information collated in different categories e.g., asset inventory, contracts, change of scope, communications from NHAI, maintenance strategy

and maintenance costs etc.

- Data gaps are identified through the above process and communicated to the Client.
- Detailed review of all the available data is carried out.
- Site visit is made by team of experts to understand the project features and observations are recorded.
- Field tests are carried out as per agreed scope of work.
- The test results are analysed in detail and maintenance strategies are developed.
- Inferences are made on various items of scope of work based on the available data and compared with the requirements of concession Agreement. Issues are flagged wherever required.
- The costs associated with the project under various head (immediate, routine operation and maintenance and Major Maintenance) are worked out in accordance with the requirements of existing EPC Contract under current scenario.
- Finally, a comprehensive report is prepared covering all aspects of the agreed scope of work.

2.7 Delivery

Delivery follows the following flow:

- Formats of agreed deliverables are formalized and shared with Client, wherever required.
- Deliverables are shared with the Client within agreed timelines.

2.8 Feedback

Regular and end-of-the-assignment feedback are obtained from the client for further enhancing the quality of service.

3. PROJECT DESCRIPTION

The Government of India had entrusted to National Highways Authority of India (NHAI) the development, maintenance, and management of National Highway No. 4 which includes.

Project i - Rehabilitation and Upgradation of NH-4 from Km 133.360 to km 171.590 (Andhra Pradesh / Tamil Nadu Border to Nalagampalli Village) to four lanes with paved shoulder under NHDP-IV on EPC mode.

Project ii - Rehabilitation and Upgradation of NH-4 from Nalagampalli (Existing Km.171.590/Design Km.172.00) to AP/Karnataka Border (Existing Km.216.912/Design Km.219.687) to four lanes with paved shoulders (Design length = 47.687 Km) under NHDP-IV on EPC mode.

The Authority had invited proposals by its Request for Proposal for above two Projects. After evaluation of the bids received, the Authority had accepted the bid of the selected bidder and issued its Letter of Acceptance No. (i) RW/NH-37015/13/2016-NHDP-IVA dated 24.06.2016; (ii) NHAI/NH-4/Nalagampalli/2016-17/264 dated 30.03.2017 respectively for the two Projects.

After termination of the EPC Contractor for the project (i) – "Rehabilitation and Upgradation of NH-4 from Km 133.360 to km 171.590 (Andhra Pradesh / Tamil Nadu Border to Nalagampalli Village) to four lane with paved shoulder", National Highways Authority of India resolved to rehabilitate and augment the "Construction of 1 No's ROB, 2 No's VUPs, Service roads, provision of lighting and construction of other miscellaneous works at various stretches including maintenance of existing section of NH-4 from AP /Tamil Nadu Boarder (Km. 134.890) to Nalagampalli village (Km.172.000) under EPC mode in the state of Andhra Pradesh" on Engineering, Procurement, Construction ("EPC") basis.

Accordingly, the Authority accordingly invited the proposals from the eligible bidders. After evaluation of the bids received, the Authority accepted the bid of the selected bidder and issued its Letter of Acceptance No. NHAI/ROVJA/P25015/NLGPALK/2019 /734 dated 13.04.2023 for balance work of the Project including its maintenance.

Project (i) work is expected to be completed by Jan 2025 and DLP of this project is 10 years whereas, Project (ii) and (iii) had achieved COD and the projects are now under maintenance. DLP of Project (ii) is expected to be completed by January 2025.

Further, National Highways Authority of India (NHAI) has setup InvIT to monetize its completed and operational national highways projects with the objective of mobilizing additional resources through capital markets. Accordingly, National Highways Authority of India (NHAI) ("the Sponsor") set up National Highways Infra Trust ("the Trust") as an irrevocable infrastructure trust. The Investment objectives of the Trust are to carry on the activities of, and to make investments, as an Infrastructure Investment Trust. National Highways Infra Investment Managers Private Limited ("NHIIMPL") is a Private Limited Company set up to act as the Investment Manager to the Infrastructure Investment Trust ("InvIT") and is the Investment Manager of the National Highways Infra Trust ("NHIT" or "Trust"). NHIIMPL is, responsible for all the decisions in relation to the day-to-day management and administration of InvIT assets and the investments of the trust as may be incidental or necessary for the advancement or fulfilment of the investment objectives of the trust in accordance with the InvIT Regulations. NHIPMPL or "Project Manager" was incorporated as a private limited company as a wholly owned subsidiary of NHAI. The Project Manager (will undertakes operations and maintenance of the Assets, including making arrangements for maintenance of the assets held by the Trust.



Figure 3-1: Location Map of Project Stretch

3.1 Terrain

The project road generally passes through plain terrain. The land use along the project stretch (i) and (ii) is mostly residential and commercial with built-up areas and remaining is mostly agricultural land, whereas project. The project falls under seismic zone 2.

3.2 Right of Way

The right of way (RoW) available in the projects are 45m to 60 m for 4 lane projects (i) and (ii) as specified in Schedule A & B of the existing EPC Contract Agreements of these two Projects.

3.3 Administrative Details of the Project

Administrative details of the project are listed below.

Table 3-1: Administrative Details of the Project

Particulars	Project i	Project ii
Project Name	Rehabilitation and Upgradation of NH-4 from Km 133.360 to km 171.590 (Andhra Pradesh / Tamil Nadu Border to Nalagampalli Village) to four lanes with paved shoulder / Construction of 1 No's ROB, 2 No's VUPs, Service roads, provision of lighting and construction of other miscellaneous works at various stretches including maintenance of existing section of NH-4 from AP /Tamil Nadu Boarder (Km. 134.890) to Nalagampalli village (Km.172.000)	Rehabilitation and Upgradation of NH-4 from Nalagampalli (Existing Km.171.590 /Design Km.172.00) to AP/Karnataka Border (Existing Km.216.912 /Design Km.219.687) to four lanes with paved shoulders (Design length = 47.687 Km)
Mode of the Execution (BOT Toll/ BOT Annuity/ EPC/ HAM/ Others)	EPC Mode under NHDP Phase – IV / EPC Mode	EPC Mode under NHDP Phase - IV
Project Phase	Partially under construction with Tolling, Operation, Maintenance	Operation and Maintenance
No. of Lanes/ Configuration	4 Lane divided carriageway	4 Lane divided carriageway
Length of the Project (in Km)	37.110 km	47.687 km
Client	NHAI	
NH No.	NH-4	NH-4
EPC Contractor / Concessionaire	Gayatri Projects Ltd / SD Infra	Dilip Buildcon Ltd
Total Project Cost	INR 306 Crores / INR 149.77 Crores	INR 959.06 Crores
Independent Engineer (O&M Phase)	Aarvee Associates Architects Engineers & Consultants Pvt. Ltd.	Aarvee Associates Architects Engineers & Consultants Pvt. Ltd.
LOA	13 March 2023	30 March 2017
Date of Signing of CA	18 May 2023	02 November 2017
Appointed Date	19 June 2023	15 November 2017
Scheduled Completion date for EPC Contract	550th day from appointment date i.e. 19 December 2024	

Particulars	Project i	Project ii
Completion Certificate	19.01.2025 (expected), remaining 1.43 km ROB expected 31.07.2025	31 July 2019
End Date of Concession period / Maintenance obligation for Latest EPC Contract	Defect liability period 10 years after COD	Defect liability period 4 years after COD
O&M Handover date	18 December 2034	DLP extended till rectification of defects (expected to complete by 31.01.2025)
No. of Toll Plazas (Number and Location)	Toll Plaza 1: Mahasamudram Toll Plaza	-

3.4 Salient Features of the Project and Scope of Work

The salient features of the project and scope of work in accordance with Schedules B and C are presented in Table 3-2.

Table 3-2: Salient Features of the Project and Scope of Work

S.No.	Item - Features	Units	Project i	Project ii	Total
1	**Service Road**	km	13.018	51.906	64.924
2	**Bypasses**	km	1.04	13.09	14.13
3	**Major Intersections**	Nos.	6	4	10
4	**Minor Intersection**	Nos.	41	33	74
5	**Bus bay & Bus Shelters**	Nos.	43	32	75
6	**Truck Lay Bye**	Nos.	2	6	8
7	**Rest Area**	Nos.	0	0	0
8	**Toll Plaza**	Nos.	1	0	1
	Toll Plaza lane	Nos.	10	0	10
9	**Median Opening**	Nos.	30	11	41
10	**Street Light Poles**	Nos.	160	1710	1870
11	**High mast Lights**	Nos.	11	0	11
12	**Solar Blinkers**	Nos.	36	63	99
13	**Avenue Plantation**	km	9.975	35.911	45.886
14	**Median Plantation**	km	15.248	34.797	50.045
15	**Fuel station**	Nos.	9	11	20

S.No.	Item - Features	Units	Project i	Project ii	Total
16	Sign Boards	Nos.	490	352	842
17	Gantry Sign Board	Nos.	5	28	33
18	Pedestrian Guard Rail	km	0.34	0.319	0.659
19	Rigid Concrete Barrier	km	2.309	26.578	28.887
20	W Beam Crash Barrier	km	11.278	36.587	47.865
21	Shoulder/Separator Drain	km	7.572	14.865	22.437
22	Earthen Drain/ Chute Drain	km	41.524	66.543	108.067
23	Median Longitudinal Drain	km	10.956	5.103	16.059
24	CCTV	Nos.	52	1	53
25	VMS	Nos.	0	0	0
26	Delineators	Nos.	85	231	316
27	Object Hazard Marking	Nos.	111	185	296
28	Chevrons	Nos.	165	500	665
29	Road Studs	Nos.	2103	10359	12462
30	Foot Path	km	12.553	15.279	27.832
31	Entry/ Exit	Nos.	0	20	20
32	5th Kilometer Stones	Nos.	4	10	14
33	Km Stones/Ordinary KM stones	Nos.	8	58	66
34	Hectometer Stones	Nos.	29	145	174
35	Kerb	km	64.769	133.842	198.611

List of structures on the Project Highway

Sl. No.	Item	Project i	Project ii	Total
1	Major Bridges	-	1	1
2	Minor Bridges	6	6	12
3	RUB	-	-	0
4	ROB	1	-	1
5	Overpass	3	-	3
6	VUP	4	12	16
7	LVUP	-	-	0

Sl. No.	Item	Project i	Project ii	Total
8	PUP/CUP	-	-	0
9	FOB	-	-	0
10	HP Culvert	44	10	54
11	Box Culvert	31	41	72
12	Slab Culvert	13	-	13

3.5 Specification and Standards

For Project (i) – 4 lanes from Km 134+890 at Tamil Nadu / Andhra Pradesh Border to Nalagampalli at Km 172.00 on NH-4.

Four - Laning of the Project Highway shall conform to the Manual of Specifications and Standards for Four-Laning of Highways published by the IRC (IRC: SP: 84-2019) respectively. However, certain deviation from IRC-SP-84-2019 as listed in Schedule D of the CA is given below.

Deviations from the Manual

The terms "Concessionaire", "Independent Engineer" and "Concession Agreement" used in the Manual shall be deemed to be substituted by the terms "Contractor", "Authority's Engineer" and "Agreement" respectively.

Table 3-3: Deviation and Reference for Project i

Sl. No.	Clause as per Manual	Description	Provision as per Manual	Deviations / Modified Provision
1.	2.6	Width of paved shoulder	2.5 m	1.5 m
2.	2.6	Width of earthen shoulder	1.5 m	2 m
3.	2.17	4-lane Divided Highway with service roads and with raised median	Fig. 2.5	TCS-11I, IIIA, IIIB, IIIC, IIID, IIIE
4.	2.17	4-lane Divided Highway without service roads and with raised median	Fig. 2.4	TCS-I, IA, II
5.	7.3	Cross-Section of Grade Separated Structure Vehicular Underpass and Elevated Section	Fig. 7.8	TCS-VI, VIA
6.	7.3	Typical Cross Section of Bridge/ROB at Deck level with footpath	Fig. 7.2A	TCS- VII
7.	-	Typical Cross Section for 4 ane VUP/LVUP/Flyover approach section with Slip roads on both sides	-	TCS-IV, IVA, IVB, V

For Project (ii) – 4 lanes from Km 172.000 at Nalagampalli to km 219.687 at Andhra Pradesh / Karnataka Border on NH-4

All Materials, works and construction operations shall conform to the Manual of Specifications and Standards for Four -Laning of Highways (IRC: SP:84-2014), referred to as the Manual, and MORTH

Specifications for Road and Bridge Works. Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Authority's Engineer

Deviations from the Manual

The terms "Concessionaire", "Independent Engineer" and "Concession Agreement" used in the Manual shall be deemed to be substituted by the terms "Contractor", "Authority's Engineer" and "Agreement" respectively.

Table 3-4: Deviation and Reference for Project ii

Sl. No.	Item	Description of Deviation	Clause reference
1.	Minimum width of proposed ROW should be 60m for development of 4 lane highway.	The proposed ROW has been restricted to 45m except for the proposed bypasses at Bangarupalayam of length 5.545 km, Palamaner Town of length 7.545 km & Realignments at Mogili and at few curves for length of 2.14 km, where 60m ROW has been proposed.	2.3
2.	Intermediate Sight Distance shall be adopted throughout.	Stopping Sight Distance Considered in the design of Summit Curves.	2.9.5
3.	The width of the service road shall be 7.0m wide carriageway and I.5 m wide Earthen Shoulders	Service Road of 7.5m / Slip Road of 5.5m at approaches of Vehicular Underpasses.	2.12.2.1
4.	Wherever service roads are provided, provision shall be made for proper entry and exit ramps between the main highway and the service roads, duly keeping in view future widening of main highway to six-lanes. The layout shall be as per Figure 2.1 A to 2.1 B.	The service roads have been connected to the main highway through slip ins and slip outs.	2.12.2.3
5.	Minimum width of the Footpath of 1.5m	Footpath of 1.5 m including metallic crash barrier has been provided.	2.15
6.	The median width is 5m (including 0.5m shyness on either side) in general and the minimum width proposed at built up stretches is 2.5m including shyness.	For 6 lane cross section with slip roads of 5.5m at approaches of Underpasses, 1.5m median (Comprising 0.5m RCC crash barrier +0.5m kerb shyness on either side) is provided	2.5
The cart track in stretches given in para 2.8 of Schedule-B shall be provided in addition to the features as per typical cross sections given in para 2.11 of Schedule-B.			

4. REVIEW OF EXISTING EPC CONTRACT AGREEMENTS

REHABILITATION AND UPGRADATION OF NH-4 FROM KM 134.890 TO KM 172.00 (ANDHRA PRADESH/ TAMIL NADU BORDER TO NALAGAMPALLI VILLAGE) TO FOUR LANE PAVED SHOULDERS (TOTAL LENGTH 37.11 KM) IN THE STATE OF ANDHRA PRADESH UNDER NHDP-IV IN THE ON-EPC MODE

PROJECT i

This chapter contains a short review of the Contract Agreement for the above-mentioned Project

4.1 Brief Review of Contract Agreement

It may be noted that The Contract Agreement is primarily divided into Six parts and various Schedules that are available at the end. Contents of each of the Six parts and the Schedule is briefly mentioned below.

Part I Definitions and Interpretations

Addresses - the Definition and Interpretation, measurements and arithmetic conventions, priority of agreements and errors/discrepancies.

Part II Scope of the Project

Scope of the Project: Scope of the Project.

Obligations of the Authority: Obligations of the Authority, maintenance obligations prior to the appointed date, environmental clearances, deemed termination upon delay.

Obligations of the contractor: Obligations of the contractor, obligations relating to subcontractors and any other agreements, employment of foreign nationals, contractor's personnel, advertisement on project highway, contractors care for the works, electricity water and other services, unforeseeable difficulties, coordination of the works, environmental measures, site data, sufficiency of contract price, clearance of the site.

Representations and warranties: Representation and warranties of the contractor, representations and warranties of the authority, disclosure.

Disclaimer: Disclaimer.

Part III Construction and maintenance

Performance security: Performance security, extension of performance security and additional performance security, appropriation of performance security, release of performance security, retention money.

Right of way: The site, procurement of the site, damages for delay in handing over the site, site to be free from encumbrances, protection of sight from encroachments, special temporary right of way, access to authority and the authorities engineer, geological and archaeological findings.

Utilities and trees: Existing utilities and roads, shifting of obstructing utilities, new utilities, felling of trees, dismantling of structures, development.

Design and construction of project highway: Obligations prior to commencement of works, design and drawings, construction of the project highway, maintenance during construction., extension of time for completion, incomplete works, maintenance manual, as built records, contractors use of authority's documents.

Quality assurance monitoring and supervision: Quality of materials and workmanship, quality control system, methodology, inspection and technical audit by the authority, external technical audit, inspection of construction records, monthly progress reports, inspection, samples, tests, examination of works before covering up, rejection, remedial work, delays during construction, quality control records and documents, video recording, suspension of unsafe construction work, staff and labour.

Completion certificate: Test on completion, completion certificate, rescheduling of tests,

Change of scope: Change of scope, procedure for change of scope, payment for change of scope, restrictions on change of scope, power of authority to undertake works.

Maintenance: Maintenance obligations of the contractor, maintenance requirements, maintenance program, safety, vehicle breakdowns and accidents, linked closure, reduction of payment for non-performance of maintenance obligations, authorities right to take remedial measures, restoration of loss more damage of property project highway, overriding powers of authority, taking over certificate.

Supervision and monitoring during maintenance, inspection by the Contractor, inspection and payments, tests, reports of unusual occurrence.

Traffic regulation: Traffic regulation by contractor.

Defects liability: Defects liability. Remedying defects, cost of remedying defects, contractors' failure to rectify defects, extension of defects liability.

Authority engineer: Appointment of authority engineer, duties and authority of authority engineer, delegation by authority engineer, instructions of the authority engineer, determination by authorities engineer, remuneration of the authorities engineer, termination of the authorities engineer.

Part IV Financial Covenants

Payments: Payments, contract price, advance payment, procedure for estimating the payments for the works, stage payment statement for works, stage payment for works, monthly maintenance statement of the project highway, payment for maintenance of project highway, payment of damages, time of payment and interest, price adjustment for works, restrictions on price adjustment, price adjustment for maintenance of project highway, final payment statement, discharge, final payment certificate, final payment statement for maintenance, change in law, correction of interim payment certificates, authorities claims, bonus for early completion.

Insurance: Insurance, insurance that works and maintenance, notice to authority, evidence of insurance cover, remedy for failure to ensure, waiver for subrogation, contractors' waiver, cross liabilities, accident or injury to workmen, insurance against accident to workman, application of insurance proceeds, compliance with policy conditions, general requirements of insurance policies.

Part V Force Majeure and Termination

Force Majeure: Force Majeure, non-political event, indirect political event, political event, duty to report force measure event, effect of force measure event on the agreement, termination notice for force majeure event, termination payment for force your event, dispute resolution, excuse from performance of obligations

Suspension of contractor's rights: suspension upon contractors' default, authority to act on behalf of contractor, revocation of suspension.

Termination: termination for contractor default termination for authority default, termination for authorities Indians, requirements after termination, valuation of unpaid works, termination payment, other rights and obligations of the parties, survival of rights, foreclosure with mutual consent.

Part VI Other Provisions

Assignment and charges: Restrictions on assignment and charges, hypothecation of materials or plant.

Liability and indemnity: General indemnity, indemnity by the contractor, notice and contest of claims, defense of claims, survival on termination.

Dispute resolution: Conciliation, arbitration, adjudication by regulatory authority, tribunal or Commission,

Miscellaneous: Governing law and jurisdiction, waiver of immunity, delayed payments, waiver liability for review of documents and drawings, exclusion of implied warranties etc, survival, entire agreement, severability, no partnership, third parties, successors and assigns, notices, language, counterparts, confidentiality, copyright and intellectual property rights, limitation of liability, care and supply of documents, authorities use of contractors documents, contractors use of authorities documents, access to site by others, term, amendments, representation and bribes, no agency.

Schedules

A. Site of the project
B. Development of the project highway
C. Project facilities
D. Specifications and standards
E. Maintenance requirements
F. Applicable permits
G. Contract price weightages.
H. Drawings
I. Project completion schedule
J. Test on completion.
K. Completion certificate
L. Payment reduction for non-compliance
M. Selection of authority engineer
N. Forms of payment statements
O. Insurance
P. Test on completion of maintenance period.
Q. Taking over certificate
R. Procedure for dispute resolution board

REHABILITATION AND UPGRADATION OF NH-4 FROM NALAGAMPALLI (EXISTING KM 171.560/ DESIGN KM 172.000) TO AP/KARNATAKA BORDER (EXISTING KM 216.912/ DESIGN KM 219.687) TO FOUR LANE WITH PAVED SHOULDER (DESIGN LENGTH = 47.687) UNDER NHDP-IV IN THE STATE OF ANDHRA PRADESH ON EPC MODE

PROJECT ii

This chapter contains a short review of the Contract Agreement for the above-mentioned Project

4.2 Brief Review of Contract Agreement

It may be noted that The Contract Agreement is primarily divided into Six parts and various Schedules that are available at the end. Contents of each of the Six parts and the Schedule is briefly mentioned below.

Part I Definitions and Interpretations

Addresses - the Definition and Interpretation, measurements and arithmetic conventions, priority of agreements and errors/discrepancies, joint and several liability.

Part II Scope of the Project

Scope of the Project: Scope of the Project.

Obligations of the contractor: Obligations of the contractor, obligations relating to subcontractors and any other agreements, employment of foreign nationals, contractor's personnel, advertisement on project highway, contractors care for the works, electricity water and other services, unforeseeable difficulties.

Obligations of the Authority: Obligations of the Authority, maintenance obligations prior to the appointed date, environmental clearances.

Representations and warranties: Representation and warranties of the contractor, representations and warranties of the authority, disclosure.

Disclaimer: Disclaimer.

Part III Construction and maintenance

Performance security: Performance security, extension of performance security and additional performance security, appropriation of performance security, release of performance security, retention money.

Right of way: The site, procurement of the site, damages for delay in handing over the site, site to be free from encumbrances, protection of sight from encroachments, special temporary right of way, access to authority and the authorities engineer, geological and archaeological findings,

Utilities and trees: Existing utilities and roads, shifting of obstructing utilities, new utilities, felling of trees.

Design and construction of project highway, Obligations prior to commencement of works, design and drawings, construction of the project highway, maintenance during construction., extension of time for completion, incomplete works, maintenance manual.

Quality assurance monitoring and supervision: Quality of materials and workmanship, quality control system, methodology, inspection and technical audit by the authority, external technical audit,

inspection of construction records, monthly progress reports, inspection, samples, tests, examination of works before covering up, rejection, remedial work, delays during construction, quality control records and documents, video recording, suspension of unsafe construction work, staff and labour.

Completion certificate: Test on completion, provisional certificate, completion of remaining works, completion certificate, rescheduling of tests.

Change of scope: Change of scope, procedure for change of scope, payment for change of scope, restrictions on change of scope, power of authority to undertake works.

Maintenance: Maintenance obligations of the contractor, maintenance requirements, maintenance program, safety, vehicle breakdowns and accidents, linked closure, reduction of payment for non-performance of maintenance obligations, authorities right to take remedial measures, restoration of loss more damage of property project highway, overriding powers of authority.

Supervision and monitoring during maintenance, Inspection by the Contractor, inspection and payments, tests, reports of unusual occurrence.

Traffic regulation: Traffic regulation by contractor.

Defects liability: Defects liability. Remedying defects, cost of remedying defects, contractors' failure to rectify defects, extension of defects liability.

Authority engineer: Appointment of authority engineer, duties and authority of authority engineer, delegation by authority engineer, instructions of the authority engineer, determination by authorities engineer, remuneration of the authorities engineer, termination of the authorities engineer.

Part IV Financial Covenants

Payments: Payments, contract price, advance payment, procedure for estimating the payments for the works, stage payment statement for works, stage payment for works, monthly maintenance statement of the project highway, payment for maintenance of project highway, payment of damages, time of payment and interest, price adjustment for works, restrictions on price adjustment, price adjustment for maintenance of project highway, final payment statement, discharge, final payment certificate, final payment statement for maintenance, change in law, correction of interim payment certificates, authorities claims, bonus for early completion.

Insurance: Insurance, insurance that works and maintenance, notice to authority, evidence of insurance cover, remedy for failure to ensure, waiver for subrogation, contractors' waiver, cross liabilities, accident or injury to workmen, insurance against accident to workman, application of insurance proceeds, compliance with policy conditions, general requirements of insurance policies.

Part V Force Majeure and Termination

Force Majeure: Force Majeure, non-political event, indirect political event, political event, duty to report force measure event, effect of force measure event on the agreement, termination notice for force majeure event, termination payment for force your event, dispute resolution, excuse from performance of obligations.

Suspension of contractor's rights: Suspension upon contractors' default, authority to act on behalf of contractor, revocation of suspension.

Termination: Termination for contractor default termination for authority default, termination for authorities Indians, requirements after termination, valuation of unpaid works, termination payment, other rights and obligations of the parties, survival of rights.

Part VI Other Provisions

Assignment and charges: restrictions on assignment and charges, hypothecation of materials or plant.

Liability and indemnity: General indemnity, indemnity by the contractor, notice and contest of claims, defense of claims, survival on termination.

Dispute resolution: Dispute resolution, conciliation, arbitration, adjudication by regulatory authority, tribunal or Commission.

Miscellaneous: Governing law and jurisdiction, waiver of immunity, delayed payments, waiver liability for review of documents and drawings, exclusion of implied warranties etc, survival, entire agreement, severability, no partnership, third parties, successors and assigns, notices, language, counterparts, confidentiality, copyright and intellectual property rights, limitation of liability.

Schedules

S. Site of the project
T. Development of the project highway
U. Project facilities
V. Specifications and standards
W. Maintenance requirements
X. Applicable permits
Y. Contract price weightages.
Z. Drawings
AA. Project completion schedule
BB. Test on completion.
CC. Completion certificate
DD. Provisional/Completion Certificate
EE. Payment reduction for non-compliance
FF. Selection of authority engineer
GG. Forms of payment statements
HH. Insurance

5. ASSESSMENT OF PROJECT ASSETS – HIGHWAY

5.1 Service Roads/ Slip Roads

At 4-lane section of AP/TN Border to 172+000

Within this project, service roads and slip roads are being constructed using flexible pavement techniques. Construction is currently underway at multiple locations along the project stretch. The project team is committed to completing the work efficiently while maintaining high-quality standards.

The total length of service roads included in this Project is 13.081 kilometers, spanning various sections of the project area. For a comprehensive overview of service and slip roads, including details on the locations where construction is in progress, please refer to Annexure 5.2.

To further illustrate the current status and progress of service road construction, photographs are included below.



Figure 5-1: Service roads. at 4-lane section of AP/TN Border to 172+000

At 4-lane section of 172+000 to AP/ KA Border

Within this project, service roads and slip roads have been constructed utilizing flexible pavement techniques. An assessment of the overall pavement condition reveals a generally good state. However, it's observed that pavement markings, while present in some areas, are faded in certain locations.

The total length of service roads encompassed within this project Project is 51.906 kilometers. For a comprehensive overview of service and slip roads, including their specific locations within the project highway, please refer to Annexure 5.2.



Figure 5-2: Service roads. at 4-lane section of 172+000 to AP/ KA Border

5.2 Bypass

At 4-lane section of AP/TN Border to 172+000

M/s. SD Infra is doing the balance works to complete this 4-lane Project. In Schedule A Clause 16 there is one bypass from Km 166.770 to km 167.810 (length 1.040 km). This KG Satram bypass is now constructed. Details of bypasses are listed in Annexure 5.3.

At 4-lane section of 172+000 to AP/ KA Border

Two Bypasses are constructed in this Project (length 13.090 Km). Condition of the bypasses is good. Details of bypasses are listed in Annexure 5.3 and some photographs of the bypass are given below.





Figure 5-3: Bypass. at 4-lane section of 172+000 to AP/ KA Border

5.3 Intersections



Figure 5-4: Minor Intersections

At 4lane section of AP/TN Border to 172+000

There are 20 junctions in this Project. Out of these, there are 03 major junctions and 17 minor junctions. Junctions are with flexible pavement provided. The details of major junctions are given the Annexure 5.4 and minor junctions are given the Annexure 5.5.



Figure 5-5: Major Intersections at 4-lane section of AP/TN Border to 158+800



Figure 5-6: Minor Intersections at 4-lane section of AP/TN Border to 158+800

At 4-lane section of 172+000 to AP/ KA Border

There is total 61 junctions along the project road. Out of these, there are 07 major junctions and 54 minor junctions. Junctions are with flexible pavement provided. The details of major junctions are given the Annexure 5.4 and minor junctions are given the Annexure 5.5.



Figure 5-7: Major Intersections at 4-lane section of 172+000 to AP/ KA Border



Figure 5-8: Minor Intersections at 4-lane section of 172+000 to AP/ KA Border

5.4 Bus bay and Bus Shelter

At 4lane section of AP/TN Border to 172+000

There are 43 numbers of bus shelters along the project road, out of these 06 bus shelters are under construction. Lighting is not provided at any bus bay locations. Pavement condition of bus bays is satisfactory. Details of Bus Bay and bus Shelters are presented in Annexure 5.6. Some photographs are shown below**.**



Figure 5-9: Bus Bay and Bus Shelter at 4-lane section of AP/TN Border to 172+000

At 4-lane section of 172+000 to AP/ KA Border

There are 32 numbers of bus shelters along this project road, out of these 01-bus shelter do not have bus bay. Pavement condition of bus bays is satisfactory. Details of Bus Bay and bus Shelters are presented in Annexure 5.6. Representative photographs are shown below**.**



Figure 5-10: Bus Bay and Bus Shelter at 4-lane section of 172+000 to AP/ KA Border

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5.5 Truck lay bye

At 4lane section of AP/TN Border to 172+000

There are 04 Truck lay byes and are operational on both sides. These Truck lay byes don't have the essential facilities like lighting, Toilet block, drinking water, rest room etc. Truck lay bye's locations are given in Annexure 5.7 with some photographs below.



Figure 5-11: Truck Lay bye at 4-lane section of AP/TN Border to 172+000

At 4-lane section of 172+000 to AP/ KA Border

There are 06 Truck Lay-byes on this stretch, and they are currently in good condition. However, none of these Truck Lay-byes are equipped with essential facilities like Toilet block, Drinking water, rest room etc. Truck lay byes locations are given in Annexure 5.7 with some photographs below.



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Figure 5-12: Truck Lay bye at 4-lane section of 172+000 to AP/ KA Border

5.6 Toll Plaza

At 4lane section of AP/TN Border to 172+000

The Toll Plaza at km 164+100, known as the Mahasamudram Toll Plaza, is located on NH-4 and is currently operational. This is a staggered toll plaza, designed to manage traffic efficiently across both directions. The toll plaza is equipped with 5+5 lanes, which include reversible lanes to optimize traffic flow, particularly during peak hours or emergencies. This lane configuration ensures smooth vehicle movement and minimizes delays for commuters. Key facilities available at the Mahasamudram Toll Plaza include:

- Canopy to provide shade and shelter for vehicles passing through the toll lanes.
- High mast lighting to ensure proper illumination, enhancing safety and visibility during nighttime operations.
- Toilet blocks to serve the needs of toll plaza staff and travelers.
- Operational management of toll plaza is being done from the office constructed over the canopy of the plaza.

The details of the Toll Plaza, including its features and operational setup, are provided in Annexure 5.9 and in Chapter 7 of this report. Additionally, photographs of the Mahasamudram Toll Plaza are included below to provide a visual representation of its layout and current condition.



Figure 5-13: Toll Plaza at 4-lane section of 172+000 to AP/ KA Border

At 4-lane section of 172+000 to AP/ KA Border

This stretch doesn't have any Toll Plaza.

5.7 Median opening

At 4lane section of AP/TN Border to 172+000

Median openings are provided as per scope stipulated in the CA and according to the requirement of local authority and residents along the project highway. In most places work is under progress. 30 Nos. Median opening is found at site. List of median openings on Project Stretch are given in Annexure 5.10. Photographs of median openings are shown below.

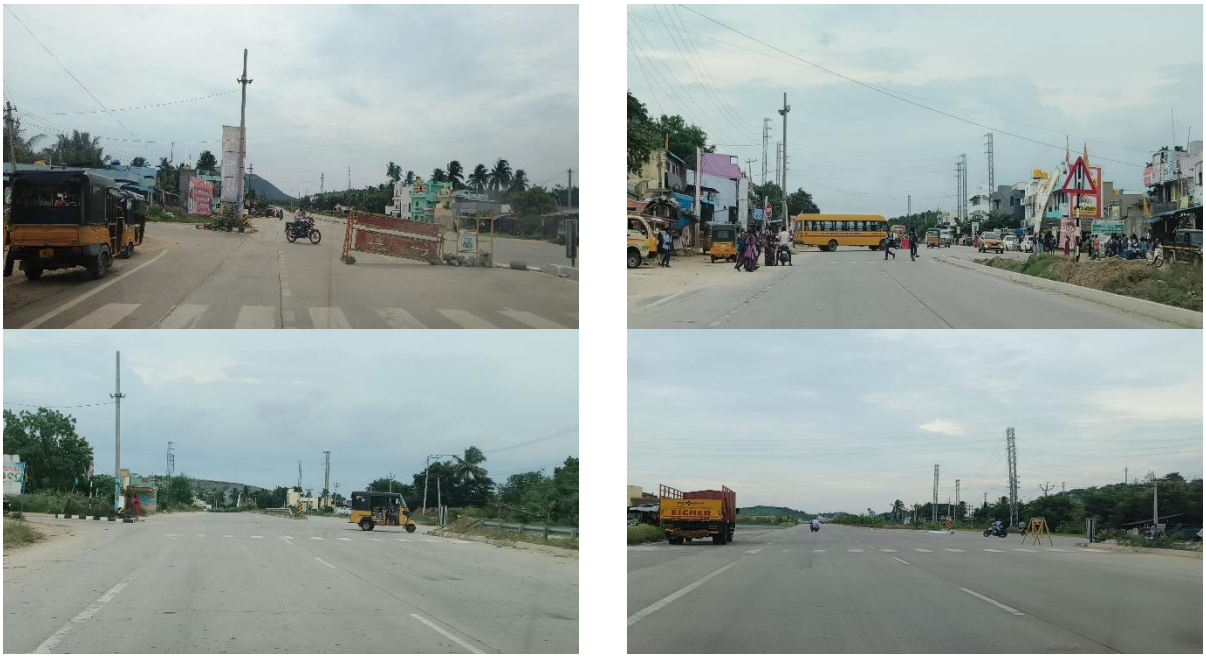


Figure 5-14: Median Opening at 4-lane section of AP/TN Border to 158+800

At 4-lane section of 172+000 to AP/ KA Border

Median openings are provided as per scope stipulated in the contract and according to the requirement of local authority and residents along the project highway. 11 Nos. Median openings are found during visual inspection. List of median openings on Project Stretch are given in Annexure 5.10. with some photographs below.






Figure 5-15: Median Opening at 4-lane section of 172+000 to AP/ KA Border

5.8 Drainage System

At 4lane section of AP/TN Border to 172+000

Drainage arrangements are provided in the project, but lined and unlined drains need proper maintenance by cleaning debris and vegetations to make the arrangement working. At few locations drainage work is under construction. List of Drains with their locations are provided in Annexure 5.11. Illustrative photographs are presented below**.**




Figure 5-16: Drainage system at 4-lane section of AP/TN Border to 172+000

At 4-lane section of 172+000 to AP/ KA Border

Drainage arrangements are provided in the project. Efficient Drainage arrangements have tried along the corridor in the form of Covered RCC Drain, open lined drain, Median lined drain, earthen drain. Debris, vegetations and blockages at different locations are seen during site inspection which requires regular maintenance to make the drainage system effective. List of locations showing this Drainage system is provided in Annexure 5.11. Illustrative photographs are presented below**.**



Figure 5-17: Drainage system. at 4-lane section of 172+000 to AP/ KA Border

5.9 Traffic Signage

At 4-lane section of AP/TN Border to 172+000

Road signs including traffic signs, overhead Gantry Mounted signs, Kerb mounted signs and median signs are available along the Project Highway. There are about 490 sign boards, 01 Overhead Gantry signs boards and 04 Cantilever Gantry Signs boards on Project Stretch, most of the sign boards are physically in good condition. Work on the project is still ongoing. The details of all traffic signs are provided in Annexure 5.12 & 5.13 respectively for Sign Boards and Overhead Gantry Signs. Few Photographs are illustrated below.



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Figure 5-18: Traffic Signs Boards at 4-lane section of AP/TN Border to 172+000

At 4-lane section of 172+000 to AP/ KA Border

Road signs including traffic signs, overhead Gantry Mounted signs, Kerb mounted signs and median signs are available along the Project Highway. There are about 352 sign boards, 08 Overhead Gantry signs boards and 20 Cantilever Gantry Signs boards on Project Stretch, most of the sign boards are physically in good condition. The details of all traffic signs are provided in Annexure 5.12 & 5.13 respectively for Sign Boards, Overhead Gantry Signs and Cantilever Gantry Signs. Photographs are shown below.





Figure 5-19: Traffic Signs Boards at 4-lane section of 172+000 to AP/ KA Border

5.10 Highway lighting

At 4-lane section of AP/TN Border to 172+000

Highway / Street Lighting work is undergoing in this project stretch, currently light poles have been installed only at some locations. List of Highway / Street lighting work in progress on Project Stretch are given in Annexure 5.14 to Annexure 5.15 in tabular form. and Photographs are presented below.

Solar Blinker lights are provided at median openings and at-grade intersections. Work is under progress in this project stretch, due to which temporary blinkers have been installed also at some locations. List of solar blinkers on Project Stretch are also given Annexure 5.16 respectively and Photographs are presented below.



Figure 5-20: Highway Lighting at 4-lane section of 172+000 to AP/ KA Border

At 4-lane section of 172+000 to AP/ KA Border

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Highway / Street lighting is found at Built-up Locations / Urban areas, VUP's, Truck Lay byes, Bus Bays, Major Junctions. Streetlights are provided with 10m high single / double arm posts. Streetlights, and High Mast lighting is also provided at Toll Plazas. These lights are properly maintained and are in good condition. List of Highway / Street lighting on Project Stretch are given in Annexure 5.14 to Annexure 5.15 and Photographs are presented below.

Solar Blinker lights are provided at median openings and at-grade intersections. List of solar blinkers on Project Stretch are also given Annexure 5.16 respectively and Photographs are presented below.



Figure 5-21: Highway Lighting at 4-lane section of 172+000 to AP/ KA Border

5.11 Plantation (Median/Avenue)

At 4-lane section of AP/TN Border to 172+000

Landscaping and avenue plantation is visible along the road but sparsely available. Shrubs and flowering plants are also intermittently placed in the median along the project highway with limited varieties. median plantation is observed along the road. Median Plantation is available intermittently along the project highway with variety of plants. There are too many weeds and vegetation in the median it needs to be cleared. A list of Plantation on Project Stretch is given in Annexure 5.17 and. Annexure 5.18 respectively and photographs are shown below.

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Figure 5-22: Plantation (Median/Avenue) at 4-lane section of AP/TN Border to 172+000

At 4-lane section of 172+000 to AP/ KA Border

Landscaping avenue Plantation is visible along the road but sparsely available. Shrubs and flowering plants are also intermittently placed in the median along the project highway with limited varieties. median plantation is observed along the road but again it is available intermittently along the project highway with limited varieties of plants. A list of Plantation on Project Stretch is given in Annexure 5.17 and. Annexure 5.18 respectively and photographs are shown below.



Figure 5-23: Plantation (Median/Avenue) at 4-lane section of 172+000 to AP/ KA Border

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5.12 Metal Beam Crash Barriers

At 4-lane section of AP/TN Border to 172+000

Metal Beam Crash Barriers have provided at main Carriageway for high embankment and curves. MBCB is installed at many places however work is under progress at few locations. It is observed that Crash Barrier are in fair condition which can be reinstated through routine maintenance activities. List of metal Beam Crash Barriers on Project Stretch are given in Annexure 5.19. Following are some photographs of Metal beam crash barrier.



Figure 5-24: Metal Beam Crash Barriers at 4-lane section of AP/TN Border to 172+000

At 4-lane section of 172+000 to AP/ KA Border

Metal Beam Crash Barriers are provided at main Carriageway, at underpasses, at structure approaches along the project and at locations of high embankment on Shoulder side. MBCB have been found in poor condition and damage at some locations. These damaged MBCB can be reinstated through routine maintenance activities. List of metal Beam Crash Barriers on Project Stretch are given in Annexure 5.19. Following are some photographs of Metal beam crash barrier.

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Figure 5-25: Metal Beam Crash Barriers at 4-lane section of 172+000 to AP/ KA Border

5.13 Fuel Station

At 4-lane section of AP/TN Border to 172+000

Fuel stations along the Project Stretch and access arrangement for the same has been captured during Visual Inspection Inventory survey. The details are listed in Annexure 5.23. Photographs are presented below.



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Figure 5-26: Fuel stations at 4-lane section of AP/TN Border to 172+000

At 4-lane section of 172+000 to AP/ KA Border

Fuel stations along the Project Stretch and access arrangement for the same has been captured during Visual Inspection Inventory survey. The details are listed in Annexure 5.24. Photographs are presented below.



Figure 5-27: Fuel stations at 4-lane section of 172+000 to AP/ KA Border

5.14 Kilometre stone/Hectometre stones

At 4-lane section of AP/TN Border to 172+000

5th Kilometre Stones, Kilometre Stone and hectometre stone work is in progress in this project stretch.

At 4-lane section of 172+000 to AP/ KA Border

Kilometre 5th Stones, Kilometre Stone and hectometre stones are visible along the stretch. Some of them found uprooted / damaged or script is faded which requires routine maintenance. The existing stones obtained from site visit are presented in the Annexure 5.26 and Annexure 5.27 and photographs are shown below.



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Figure 5-28: KM & HM Stone at 4-lane section of 172+000 to AP/ KA Border

6. ASSESSMENT OF PROJECT ASSETS – STRUCTURES

6.1 General

The project comprises of 84.797 Km stretch including in the Project i & ii. These Projects include the four-lane section of NH-4 from Tamil Nadu / AP border to Nalagampalli to Karnataka Border in the State of Andhra Pradesh. The various structures comprising the project are given in Table 6-1.

6.2 Structural Inventory

The visual condition survey of all the structures is carried out by Structural Expert/Bridge Engineer of the consultant team with an inspection is aimed at identifying and quantifying deterioration, which may be caused by applied loads and factors such as deadload, live load, wind load and physical (e.g. wear, abrasion) / chemical (e.g. corrosion due to environmental exposure) influences. Apart from inspection of bridge damage caused by unpredictable natural phenomena (e.g. earthquake, flood) or collision by vehicles or vessels, inspection is also needed to identify or follow up the effect of any built-in imperfections. Inspection can also provide insights into the structural condition to address issues proactively, helps in devising necessary remedial measures to enhance safety and performance, contributes to extending the service life of bridges through timely intervention and maintenance strategies.

Table 6-1: Summary of Structures

No.	Item	Project-i as per site inspection	Qty. as per TOT Technical Schedule	Project-ii as per site inspection	Qty. as per TOT Technical Schedule	Total
1	Major Bridges	-	-	1	1	1
2	Minor Bridges	6	6	6	6	12
3	VUP	4	4	12	12	16
4	LVUP	-	-	-	-	-
5	VOP	3	3	-	-	3
6	ROB	1	1	-	-	1
7	RUB	-	-	-	-	-
8	FOB	-	-	-	-	-
9	HPC	46	9	10	10	56
10	Box Culvert	30	30	41	41	71
11	Slab culvert	13	13	-	-	13

Note:1, In Project i, there are total 46 nos of HPC to be constructed out of which 9 HPC's are constructed as mentioned in TOT Sch-A. Remaining culverts are to be constructed by SD Infra which are in their scope of work.

The collection and analysis of Major bridges, RUBs and Grade separators condition and inventory data is done using the Mobile Bridge Inspection Unit (MBIU) and comprehensive visual inspection is carried out for assessing the minor bridges, underpasses, overpasses, and culverts of the entire project stretch of 84.797 kms. During the inspection and condition survey no major failure/Distresses is observed however minor cracks, exposed reinforcement at parapet, honeycombing repairs at structural components, clogged drainage spout, debris found under culvert and waterways and vegetation found

on superstructures with unwanted material found around the bearings. The return walls are inspected to locate any separation of these from the abutment. Any unusual differential settlement which gives rise to cracks in the return or wing walls are inspected along with condition of stone pitching for all the bridges.

Following codes are used for the condition rating of the structural members.

Code	Description
N	NOT APPLICABLE
9	EXCELLENT CONDITION
8	VERY GOOD CONDITION - no problems noted
7	GOOD CONDITION – some minor problems
6	SATISFACTORY CONDITION - structural elements show some minor deterioration
5	FAIR CONDITION - all primary structural elements are sound but may have minor section loss, cracking, spilling or scour
4	POOR CONDITION - advanced section loss, deterioration, Spalling or scour
3	SERIOUS CONDITION - loss of section, deterioration, spelling or scour have seriously affected primary structural components Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present
2	CRITICAL CONDITION - advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken
1	IMMINENT' FAILURE CONDITION - major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic, but corrective action may put back in light service.
0	FAILED CONDITION - out of service - beyond corrective action

6.3 Major Bridges

There are 01 no. of Major Bridge. The Major Bridge is in sound condition with no distresses with fair state of maintenance. Cleaning of expansion joint, bearings and drainage spouts is required.

Details of major bridge structures on the Project Highway are as per Table 6-2.

Table 6-2: Details of Major Bridges

S.No.	Design Chainage (Km)	Side	Type of Structure	Structure on	Deck Width (m)	Span Arrangement (m)	Steel Bearings (nos)	Elastomeric bearing (nos)	Type of expansion joint	Expansion joint (nos)	Type of Superstructure
Project i											
Nil (No major Structures)											
Project ii											
1	201+619	LHS	MJB	MCW	14.5	5 X 14	0	60	Strip seal	6	Solid slab
		RHS	MJB	MCW	14.5	5 X 14	0	60		6	

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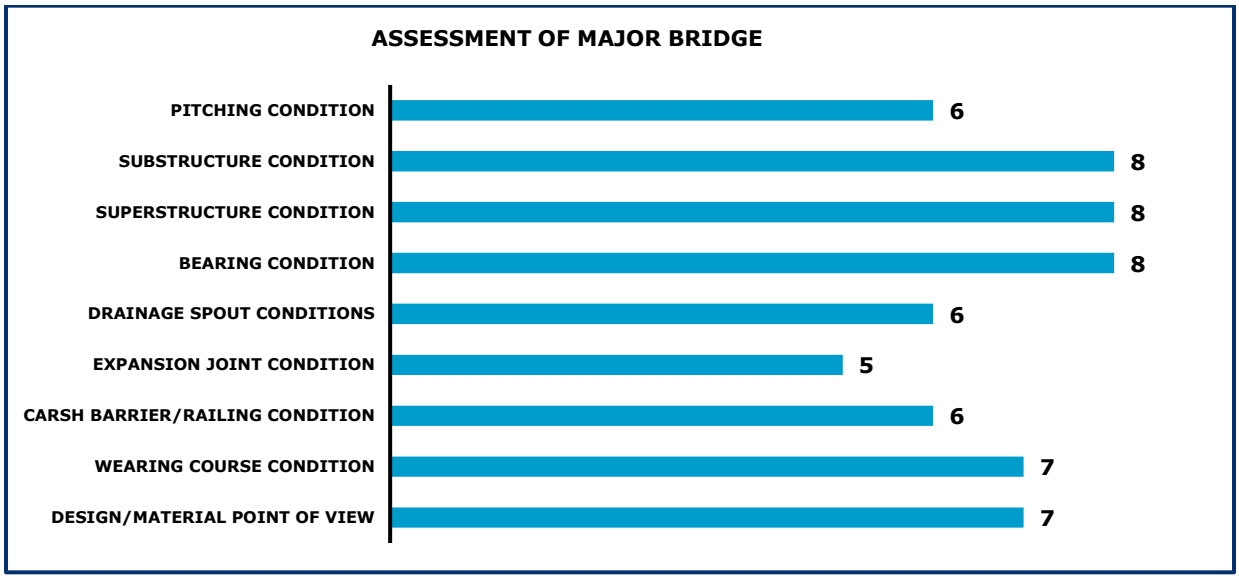


Figure 6-1: Comparative condition assessment of Major Bridges

In **Project-ii**, there are 1 nos of major structures found on this project stretch at Ch. 200+619. This bridge is appearing to be sound condition with no major distresses. Routine maintenance like cleaning & repair of expansion joint and drainage spout are required. On this structure elastomeric pad used as bearings.



MJB at Ch. 200+619



MJB at Ch. 200+619



Elastomeric pad



Elastomeric pad



Silt and derbris on main carriegway



Waterway

Figure 6-2: Typical Site Photographs of Major Bridges in the Project ii

6.4 Minor Bridges

There are 12 nos. of Minor Bridge on project stretch. Maintenance of these minor bridges are in fair condition. Minor repair is required like cleaning of carriageway, waterway, and repair of leakage in wall and top slab and erosion of side slab of the left side of minor bridge at chainage 214+487.

Details of minor bridge structures on the Project Highway are as per Table 6-3 given below.

Table 6-3: Details of Minor Bridges

S.No	Design Chainage (Km)	Side	Str On	Deck Width (m)	Span Arrangement (m)	Nos of Steel Bearings	Nos of Elastomeric bearings	Nos of Expansion joint	Type of Superstructure	Remarks
Project i										
1	138+100	LHS	MCW	12.5	1 X 9	0	0	0	Box type MNB	
		RHS	MCW	12.5	1 X 9	0	0	0		
2	145+952	LHS	MCW	12.5	2 X 6.5	0	0	0	Box type MNB	
		RHS	MCW	12.5	2 X 6.5	0	0	0		
3	149+430	LHS	MCW	12.5	2 x3.6	0	0	0	Box type MNB	
		RHS	MCW	12.5	2 x3.6	0	0	0		
4	151+910	LHS	MCW	14	2 x 7.0	0	0	0	Box type MNB	
		RHS	MCW	14	2 x 7.0	0	0	0		
5	157+842	LHS	MCW	14	2 x 30	4	16	3	PSC GIRDER	2 Nos of rocker and 2 nos of POT-PTFE bearing with 16 nos of elastomeric bearings.
		RHS	MCW	14	4 x 15	0	0	0	RCC GIRDER	Repair & Rehabilitation work in progress including wearing coat replacement
6	158+563	BHS	MCW	39.5	2 x 6.5 + 1 x7.0	0	0	0	Box type MNB	
Project ii										
7	173+ 602	LHS	MCW	14	4 X12	0	40	5	Solid slab	
		RHS	MCW	11.5	4 X12	0	40	5		
		RHS	SR	7.5	4 X12	0	24	5		
		RHS	SR	7.5	4 X12	0	24	5		
8	175+600	LHS	MCW	14	3 X 10.67	0	30	4	Solid slab	
		RHS	MCW	14	3 X 10.67	0	30	4		

S.No	Design Chainage (Km)	Side	Str On	Deck Width (m)	Span Arrangement (m)	Nos of Steel Bearings	Nos of Elastomeric bearings	Nos of Expansion joint	Type of Superstructure	Remarks
		LHS	SR	7.5	3 X 10.67	0	18	4		
		RHS	SR	7.5	3 X 10.67	0	18	4		
9	179+000	LHS	MCW	11.5	3 X 10	0	0	0	Box MNB	
		RHS	MCW	11.5	3 X 10	0	0	0		
		LHS	SR	7.5	3 X 10	0	0	0		
		RHS	SR	7.5	3 X 10	0	0	0		
10	195+600	LHS	MCW	14	1 X 5.3 + 1 X5	0	0	0	Box MNB	
		RHS	MCW	14	1 X 5.3 + 1 X5	0	0	0		
		LHS	SR	7.5	1 X 5.3 + 1 X5	0	0	0		
		RHS	SR	7.5	1 X 5.3 + 1 X5	0	0	0		
11	196+720	LHS	MCW	14	1 X 5.3 + 1 X5	0	0	0	Box MNB	
		RHS	MCW	14	1 X 5.3 + 1 X5	0	0	0		
		LHS	SR	7.5	1 X 5.3 + 1 X5	0	0	0		
		RHS	SR	7.5	1 X 5.3 + 1 X5	0	0	0		
12	215+400	LHS	MCW	12.5	3X11	0	0	0	RCC Solid slab	
		RHS	MCW	12.5	3X11	0	0	0		

* All expansion joints are strip seal type

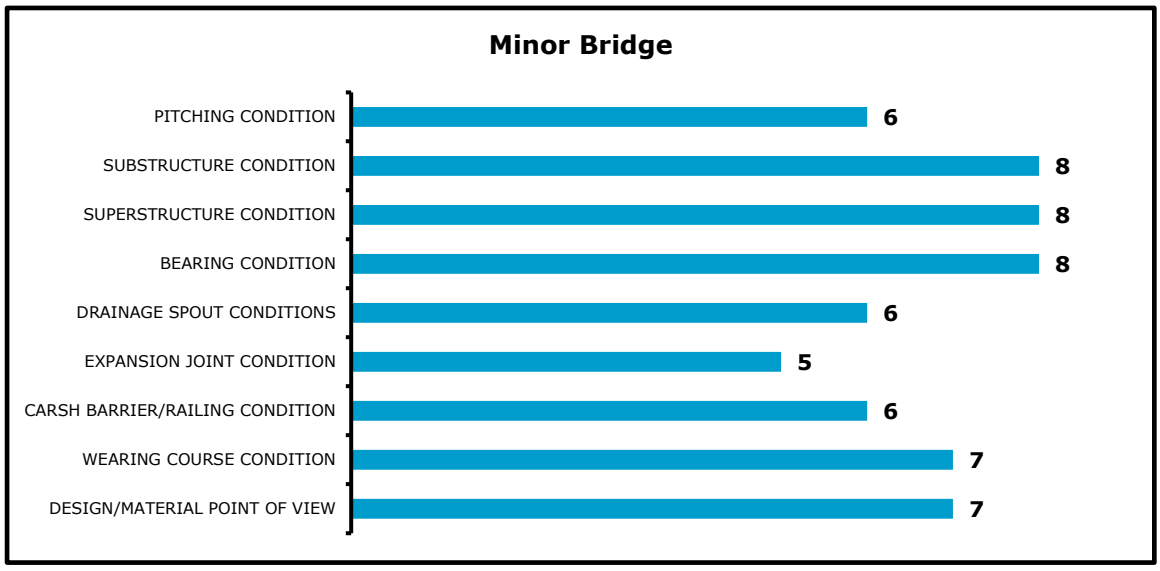
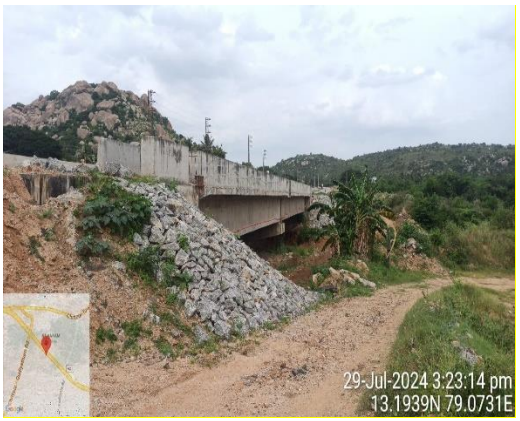


Figure 6-3: Comparative condition assessment of Minor Bridges

In **Project i**, there are 6 nos of minor bridges. These bridges are in sound condition with no major distresses. Stone pitching work in progress on all the minor bridges. Routine maintenance like cleaning & repair of expansion joint and drainage spout are required.

At Ch.158+563, the Left-side new minor bridge has been built and Right-side existing minor bridge is under repair and strengthening work. Three types of bearings have been used on left side new minor bridge structure like elastomeric bearing, rocker bearing and POT-PTFE bearing.





MNB at LHS Ch. 157+842



Repair & Rehabilitation work in progress including wearing coat replacement at RHS Ch. 157+842





MNB at Ch. 158+563



Pitching work in progress at Ch. 138+100



Carriageway of MNB at Ch. 138+100



Pitching work in progress at Ch. 146+040



Carriageway of MNB at Ch. 146+040

Figure 6-4: Site Photographs of Minor Bridges at Project i

In **Project ii**, there are 6 nos of minor bridges. These bridges are in satisfactory condition with no major distresses although there is one issue observed on few minor bridges of service road where approach slab is found settled on both sides. It is noticed that the railing and crash barrier requires painting at few locations.





settlement of approach slab at service road on both side MNB at Ch. 179+000



Crash barrier requires repaint at MNB Ch. 175+600



Soffit of deck slab of MNB at Ch. 175+600



Expansion joint



Elastomeric bearing



MNB at Ch. 173+602



MNB at Ch. 173+602



Expansion joint MNb at 175+600



Elastomeric bearing of MNb at 175+600



MNB at Ch.195+600



MNB at Ch.195+600

Figure 6-5: Site Photographs of Minor Bridges at Project ii

6.5 ROB (Railway Over Bridge)

In **Project i**, there is 1 no. of ROB on project stretch. This ROB is under construction by EPC Contractor, M/s. S.D Infra. During inspection it was observed that foundation work is in progress.

Table 6-4: ROB

S.No	Design Chainage (Km)	Type of Structure	Side	Str On	Deck Width (m)	Span Arrangement (m)	Type of Superstructure
11	136+350	ROB	LHS	MCW	12.3	1 X 25 + 1 x 37.2 + 1 x 25	Steel & RCC Girder
			RHS	MCW	12.3	1 X 25 + 1 x 37.2 + 1 x 25	Steel & RCC Girder

Note: As per TOT Sch A clause 5f, ROB shall be provided at the following location, length 872m. Pile foundation work in progress during site inspection.



Foundation work in progress of ROB structure at Ch.201+619

Figure 6-6: Site Photographs of ROB during site visit

6.6 Vehicular Underpass (VUP)

There are 26 nos. of VUP on project stretch. Minor repairs like cracks in RCC substructure, replacement of expansion joints is required with repairs in approach slabs at few locations. Cleaning of vegetation growth and clogged vents is required through routine maintenance. Overall structural condition is good for these underpasses.

Table 6-5: Vehicular Underpass details

No.	Design Chainage (Km)	Side	Str. On	Deck Width (m)	Span Arrangement (m)	Steel Bearings (Nos)	Elastomeric bearing (Nos)	Expansion joint (Nos)	Type of Super structure	Remarks
Project i										
1	141+810	LHS	MCW	14.5	2 X 12	0	0	0	Box type VUP	Pavement work in progress on both side approaches
2	149+010	LHS	MCW	14	1 X 30	0	10	2	PSC I-Girder	WIP
3	158+800	RHS	MCW	14	2 X 12	0	0	0	Box type MNB	Completed
4	155+060	LHS	MCW	14	1 X 30	0	10	2	PSC I-Girder	work in progress
		RHS	MCW	14	1 X 30	0	10	2		
Project ii										
5	172+300	LHS	MCW	14.5	1 X 24	0	10	2	PSC I-Girder	-
6	175+500	LHS	MCW	14.5	1 X 12	0	0	0	Box VUP	-
		RHS	MCW	14.5	1 X 12	0	0	0		-
7	178+000	LHS	MCW	14.5	1 X 24	0	10	2	PSC I-Girder	-
8	182+608	LHS	MCW	14.75	1 X 12	0	0	0	Box VUP	-
		RHS	MCW	14.75	1 X 12	0	0	0		-
9	193+100	LHS	MCW	14.5	1 X 24	0	10	2	PSC I-Girder	-
10	194+045	LHS	MCW	14.5	1 X 12	0	0	0	Box VUP	-
		RHS	MCW	14.5	1 X 12	0	0	0		-
11	197+025	LHS	MCW	14.5	1 X 24	0	10	2	PSC I-Girder	-
		RHS	MCW	14.5	1 X 24	0	10	2		-
12	200+167	LHS	MCW	14.75	1 X 24	0	10	2	PSC I-Girder	-

No.	Design Chainage (Km)	Side	Str. On	Deck Width (m)	Span Arrangement (m)	Steel Bearings (Nos)	Elastomeric bearing (Nos)	Expansion joint (Nos)	Type of Super structure	Remarks
		RHS	MCW	14.75	1 X 24	0	10	2		-
13	202+150	LHS	MCW	14.75	1 X 24	0	10	2	PSC I-Girder	-
		RHS	MCW	14.75	1 X 24	0	10	2		-
14	209+999	LHS	MCW	14.75	1 X 12	0	0	0	Box VUP	-
		RHS	MCW	14.75	1 X 12	0	0	0		-
15	213+720	LHS	MCW	14.75	1 X 12	0	0	0	Box VUP	-
		RHS	MCW	14.75	1 X 12	0	0	0		-
16	216+376	LHS	MCW	14.75	1 X 12	0	0	0	Box VUP	-
		RHS	MCW	14.75	1 X 12	0	0	0		-

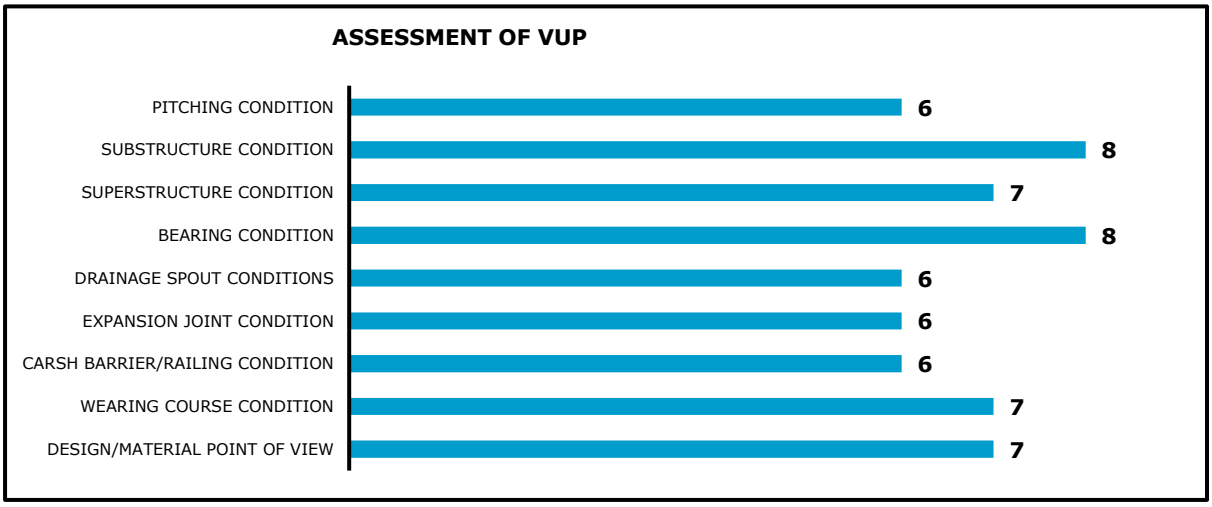


Figure 6-7: Comparative condition assessment of VUP.

In **Project i -** there are 4 VUP's, in which 3 nos of VUP's under construction.

1. VUP at Ch.149+060
2. This is single span structure with 5 nos of PSC girder.
3. PSC Girder has been launched on POT-PTFE bearings.
4. Approach's work in progress on both side of the structure.



1. VUP at Ch. 155+040
2. This is single span structure with 10 nos of PSC girder on both sides.
3. PSC Girder has been launched on POT-PTFE bearings.



1. VUP at Ch.158+800
2. This is box type VUP.



In **Project ii**, there are 12 nos of VUP structures. These structures are in good condition with no major distresses. Honeycombing is observed in concrete of the deck slab of structures which can be repaired with epoxy grouting.

Figure 6-8: Typical Site Photographs of Underpasses





VUP at Ch. 175+300



VUP at Ch. 178+000



VUP at Ch. 197+400



Honeycombing on VUP at Ch. 172+300



Elastomeric bearing on VUP at Ch. 172+300



Honeycombing on VUP at Ch. 178+000



VUP at Ch. 193+100





Honeycombing on VUP at Ch 202+100



VUP at Ch. 182+350

VUP at Ch. 202+200



VUP at Ch. 194+045

6.7 Vehicular Overpass (VOP)

There are only 03 nos. of VOP, and all are in Project i. Construction of all three VOPs are in progress during site inspection. Some photographs are presented below.



Another expressway crossed over NH-4 with VOP at Ch. 151+500



Another expressway crossed over NH-4 with VOP at Ch. 146+050 & 147+950

6.8 Culverts

There are 139 nos. of culvert which includes RCC box type culverts (72 nos.), Slab culverts (13 nos.), and Hume pipe culverts (54 nos.). Structural condition of these culverts is satisfactory but requires maintenance for scours, cleaning of waterway, cleaning of vegetations and repair of slope pitching. The details of the culverts across different Projects are explained in the sections below,

In **Project i**, there are 88 nos of culverts (31 no. Box culvert, 13 no. Slab culvert and 44 no. of HPC). Construction of some culverts are in progress at site as noticed during site inventory and inspection. Few photographs of culverts under construction are given below.

Figure 6-9: Site Photographs of Culverts in Project i

1. Box culvert work in progress at Ch. 135+890.
2. Culvert has been built on main carriageway and Right-side service road.
3. Culvert is under construction at left side service road.



1. Box culvert Work in progress at Ch. 136+100.
2. Box culvert has been built on Right side carriageway of service road.
3. Culvert is under construction at main carriageway and left side service road.



1. Box culvert Work in progress at Ch. 136+600.
2. Box culvert has been built on Left side carriageway of service road.
3. Culvert is under construction at main carriageway and right-side service road.





Box culvert at Ch. 138+400



Un -pitched side slope at box culvert at Ch. 138+400



Pitching work in Progress at Ch.152+000



Pitching work in Progress at 152+975

In **Project ii**, there are 51 nos of culverts. Structural condition found good during visual inspection. Routine maintenance like cleaning & removal of vegetation are required.

Figure 6-10: Site Photographs of Culverts in Project ii



Box culvert Ch. 192+190



HPC at Ch. 179+300



Box culvert Ch. 212+500



Box culvert Ch. 188+200





Slab culvert at Ch. 217+920 Box culvert Ch. 194+050

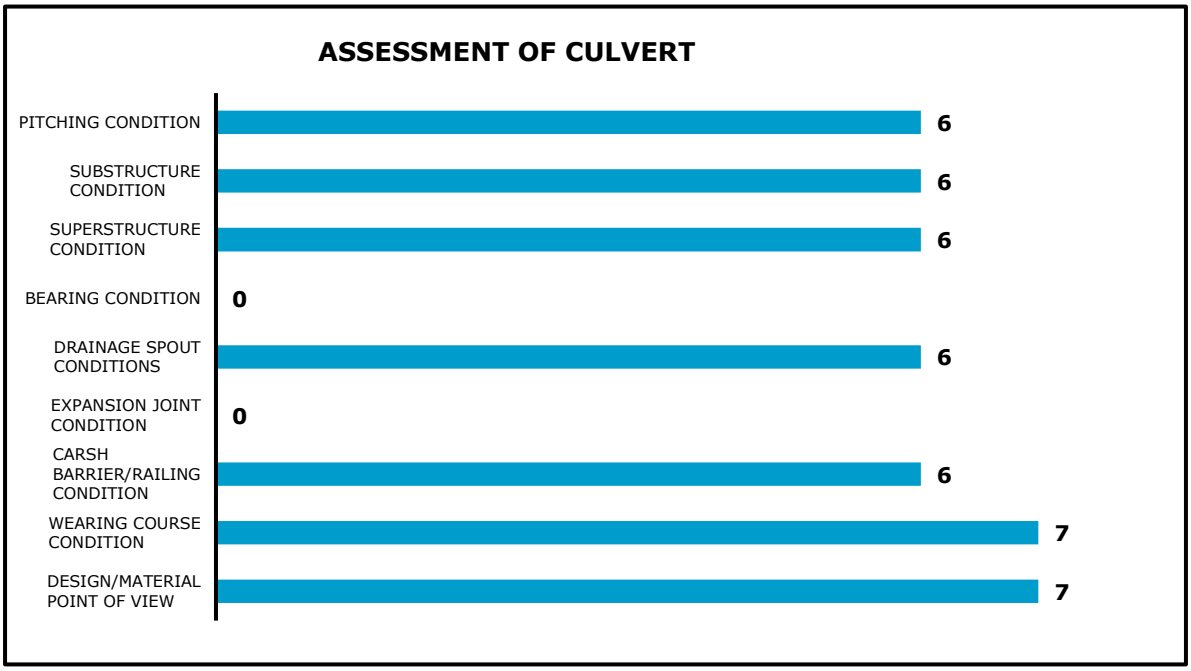


Figure 6-11: Comparative assessment of Culverts

6.9 General Observations

All the structures are visually inspected to find any cracking, spalling, staining, deformation, leaching, exposed reinforcement, honeycombing, condition of expansion joints, wearing coat, approach slabs, drainage, and damaged railing etc. Major Structures like Major Bridges, ROBs are inspected by MBIU and are reported in Annexure to Main Report.

The damages witnessed at the structures are due to irregularities in routine / preventive maintenance of these structures. There is no major distress in any structure of these Projects. General observations are summarised as under:

- Vegetation growth on structure and waterway area
- clogged drainage spout of structures.
- cracks on crash barrier.
- Disturbed Quadrant pitching
- scour & bulging observed in protection work.
- exposed reinforcement at parapet of culvert.
- honeycombing at parapet of culvert.
- worn out & Potholes on wearing.
- debris found under culvert due to non-maintenance of waterway.

In general, the structures are found to be in structurally sound condition except for certain aspects requiring immediate repairs as under:

- Repair of Protection work by proper channelling of water flow.
- Minor crack repairs & honeycombing repairs at structural components
- Improving the drainage on the deck slab
- Expansion joints of VOP at chainage 258+800 and Major bridge need repair.

6.10 RE Wall (RE Panel Wall) Repair Strategy in Project ii

The RE panels have been bulged significantly and it is clearly visible to naked eye. May be due to loss of grip between geogrid connection to RE panel and soil for which panel is deflected. This cause slippage of geogrid outwardly in soil. The reason due to improper compaction in embankment, behind the wall.

Cracks have been developed at most of the RE Panels. This may be due to poor concrete at the tile of precast and soil earth pressure. The interlocking edge of some RE Panels has been cracked and damaged. At Ch. 216+300 to 216+600 towards AP/KA border Nailing has been done at RE panels.

It is observed that the existing EPC Contractor is rectifying all these defects, and few defects are already rectified as of now.

Table 6-6: RE Wall Observation

RE Wall						
S.NO	Chainage (km)		Side	Length (m)	Height (m)	Observation
	From	To				
1	193450	192550	BHS	900	8	Local bulging
2	195500	194990	BHS	510	8	Local bulging
3	197400	197000	BHS	400	8	Global bulging
4	210580	210450	BHS	130	8	Global bulging
5	214000	213700	BHS	300	8	Global bulging
6	216600	216300	BHS	300	8	Local bulging
Total length (m)				**2540**		

6.11 Routine maintenance and minor repair

Spalling of concrete requiring patching is usually caused by corrosion of steel reinforcement. Honeycomb is the effect of inadequate compaction of concrete while being cast. Patching is a temporary repair measure unless all the chloride-contaminated concrete is removed before the deck is patched. Spalling of width less than 300 mm and depth less than 50mm have been dealt with here. The repair comprises application of polymer cement repair mortar on the spalled portion of concrete after treating the area with suitable bonding agent and after applying anticorrosion paint on the surfaces of the corroded rebar, if any. The work requires adequate curing. Work sequence of Epoxy Coating is as shown Figure.

During the Bridge service life, several components of bridges get unclean due to deposition of foreign materials. Materials that collect on the deck surface flow with the rainwater towards the drainage spouts which may choke the outlets and affect drainage. Also, the materials that collect on the deck and carried by the rainwater towards the expansion joints can pass through any opening present therein and accumulate on the pier cap, abutment caps and around the bearings. Such debris accumulation can cause malfunction of bearings/corrosion in metal bearing since debris tend to hold water. Also, growth of vegetation such as grass, shrubs, and other plants on the components of bridges is very common.

Table 6-7: Remedial Measure Methods

S. No.	Defect/Deficiency	Remedial measure
1	Debris accumulation	Cleaning
2	Water flow obstruction	Removing obstructions
3	Material loss from stone pitching	Repairing of stone pitching

4	Spalling and minor honeycombing	Epoxy/patching/cement grouting
5	Minor corrosion of steel	Painting
6	Abnormal bituminous pavement	Partial repair of pavement

7. ASSESSMENT OF PROJECT ASSETS - TOLL SYSTEMS

7.1 General

Technical Due Diligence of the TMS (Toll Management System), ATMS, ETC (Electronic Toll Collection System) and WIM (Weigh-in-Motion) System (as available) along 4 lane Tamil Nadu/Andhra Pradesh Border to Nalagampalli to Andhra Pradesh/Karnataka Border Section of NH 4 from Km 134+890 to Km 219+687 in the State of Andhra Pradesh is done through site visits, site surveys, interactions at site and review of documents and reports.

7.2 Project Information

Toll Plaza 1 - Mahasamudram TP - Km 164+100 LHS & Km 164+360 RHS (Staggered) (NH 4)

No. of Lanes at each Toll Plaza

- Project 1 TP – Mahasamudram TP – It is a staggered toll plaza and equipped with 5+5 Hybrid lanes in each direction installed at 260 meters between them, no separate two-wheeler lanes are provided adjacent to the extra-wide lanes.

7.3 Mahasamudram TP - Toll System Maintenance

The TMS maintenance is currently being undertaken by M/s Vaaan Infra at Mahasamudram toll plaza they are replacing the old hardware which was originally installed by M/s Arya Omnitalk, currently none of the AVC systems are functional and all lane controllers are found with doors unlocked and not in proper condition, the installation team is in process of replacing only partial hardware which is essential to manage the show, therefore calculation of equipment ageing cannot be done. However, the TMS is not being maintained in proper shape duly explained in this report.

7.4 Mahasamudram TP - Weigh In Motion (WIM) system.

Medium Speed Weigh In Motion systems are installed in all 10 lanes by M/s Appalto and are found to be in good condition as it is relatively a new installation done through M/s Arya Omnitalk. However since M/s Vaaan Infra is replacing the old software, the integration of the MS-WIMs is not done and no vehicle weight was being captured in the TMS. Stamping and calibration works are yet to be undertaken by the vendor.

7.5 Mahasamudram TP - Static Weigh Bridge (SWB)

At this Toll Plaza Static Weigh Bridge is not installed for any direction of traffic.

7.6 Project (i) & (ii) - ATMS System

No ATMS hardware was found installed in this section of the highway.

Schedule A mentions about the scope of ATMS as a part of Project Facilities on the project highway. As there is no existing ATMS in the project stretch, a detailed working of the required HTMS / ATMS has been done as per Schedule A of TOT Technical Schedule and is presented separately in the cost chapter.

Table 7-1: ATMS scope as per Tech Schedule at NH - 4

#	Equipment Description	Qty to be Installed
1	ECB	0
2	MET	1
3	MRCS	0
4	VMS	3
5	ATCC	1

6	**PTZ**	**31**
7	**VIDS**	**6**
8	**VASD**	**8**
9	**Servers**	**1**
10	**Terminals**	**3**
11	**N/W Switch**	**2**
12	**TTES**	**0**
13	**Software**	**1**
14	**UPS**	**1**
15	**Control Room**	**1**
16	**Display**	**1**

7.7 Review and Assessment of TMS (incl. AVCC Systems)

1. At Mahasamudram toll plaza, TMS is under maintenance by M/s VaaaN Infra, with open tolling technology, installation is independent of any other toll plaza on the highway stretch and integration with MS-WIM is pending, post that integration, the TMS should be ready to identify the vehicles carrying over load, however to collect the penalty on account of overloaded vehicle, there is a necessity of installation of Static Weigh Bridges in both directions of the toll plazas which has not been undertaken yet.
2. Lane hardware is faulty and under replacement by M/s VaaaN Infra, most of the equipment is either faulty or not working in proper condition, the equipment in extreme lanes i.e. Lane 1 & 10 has been removed or put off and the lanes have been made to use for passing non-tollable / VIP / Exempt vehicles, the validation is happening through CCTV cameras, critical components required to check the vehicle classification e.g. AVC in all lanes is not functional, the validator for performing the validation function in through CCTV cameras which is not a standard industry practice, automatic barriers are working but are in a bad shape.
3. The installed MS-WIM at the toll plazas is found in good condition and can be re-used and requires integration with minor civil works around the WIM area to maintain the proper slope and accuracy of detection of weight.
4. The site is using ILL connectivity through Airtel for processing of fastag transactions.

7.8 Assessment of Toll Operation and integration with TMS

The operations of the toll are being managed through a third-party agency at both sections, the site team is fully conversant with the given TMS functionalities and can generate all required reports as per the interaction with the site teams.

The LSDU i.e. Lane Status Display Unit to monitor the entire hardware of each lane is not provided which is an essential part for monitoring of the toll equipment on day-to-day basis and generating all alerts.

In the absence of any input from the incident camera and AVC, the TMS is working like a ticketing system at Mahasamudram Toll plaza with no checks / controls in place, the validator is blindly accepting all transactions by accepting the TC class and has no clue if the TC is correctly classifying the vehicles or if the Fastag vehicle is crossing with the correct tag.

There is no reconciliation of the revenue collected through the fastag vehicles at the toll plaza and no review of all rejected transactions by the acquirer bank / NPCI.

It would be pertinent to mention that the revenue of the Mahasamudram toll plaza is not assured for appropriate collection.

7.9 Backoffice TMS review

a. The TMS is controlled through the control room which is housed with the validator performing real time transaction validations without any control mechanism, there is no separate room for performing cashup function and all toll collectors come to the control room to deposit the collected money.

b. LSDU as stated above is not provided and equipment status / failures are not known to the shift supervisor until informed manually by the TC or found by the IT technician.

c. There was no device found for performing daily backups

d. As per the guidelines of IHMCL, the plaza server has to be installed with a hot-standby server arrangement however no hot-standby server was found to be installed.

e. No fake note detectors installed in the lane to detect counterfeit currency.

7.10 Conclusion

The TMS at Mahasamudram toll plaza in Project i was in a bad shape and was currently getting replaced through M/s Vaaan Infra under AMC, the same needs an immediate overhaul / immediate replacement with proper backoffice functionality to control and audit the toll operations process.

Figure 7-1: Typical Site Photographs of Toll Plaza & Equipment



Mahasamudram Toll Plaza (LHS) NH 4



Mahasamudram Toll Plaza (RHS) NH 4



MS-WIM - Mahasamudram Toll Plaza



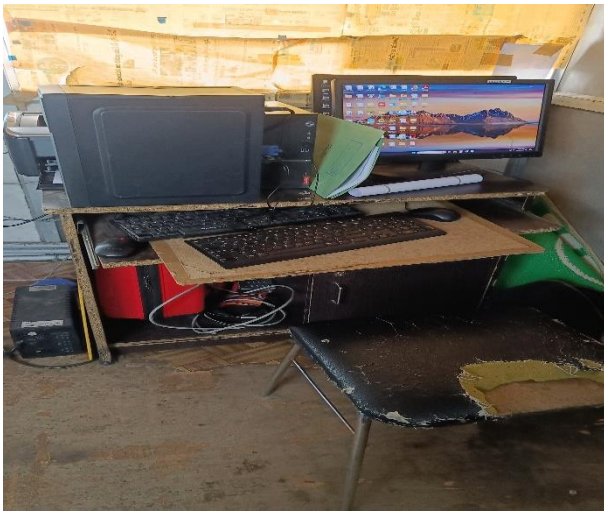

Booth Equipment Project i & iii respectively




Lane Island Equipment Project i




Control Room arrangement including Cash up Room Project i




Server Room Project i

8. REVIEW OF MAINTENANCE REQUIREMENTS OF EPC CONTRACT AGREEMENTS

		Project i	Project ii
	Agreement / Contract	Rehabilitation and Upgradation of NH-4 from km 134.890 to km 172.00 (Andhra Pradesh/ Tamil Nadu Border to Nalagampalli village) to four lane paved shoulders (Total Length 37.11 km) in the State of Andhra Pradesh under NHDP-IV in the on-EPC mode	Rehabilitation and Upgradation of NH-4 from Nalagampalli (Existing Km 171.560/ Design Km 172.000) to AP/Karnataka Border (Existing Km 216.912/ Design Km 219.687) to four Lane with paved shoulder (Design Length = 47.687) under NHDP-IV in the State of Andhra Pradesh on EPC mode
1	Contracts	EPC Contract Agreement	EPC Contract Agreement
2	O&M Manual	No O&M Manual received	No O&M Manual received

Project i

8.1 Supervision and Monitoring During Maintenance (Project i)

As per Clause 15.1 of EPC Contract Agreement, the EPC Contractor shall undertake regular Inspections, Regulate Traffic and shall be responsible for rectifications of Defects and Deficiencies during the Defects Liability Period. The obligations of the EPC Contractor are summarised hereunder:

- **Inspection by the contractor:**

  Detailed pre-monsoon inspection of all bridges, culverts and drainage system in accordance with the guidelines contained in IRC SP 35.

  The contractor shall prepare a maintenance manual, and a maintenance program.

  The contractor shall carry out maintenance in accordance to the maintenance manual and the maintenance program approved by the authority engineer.

  The contractor shall carry out tests as per instructions of authority engineer for the maintenance of the asset.

  The contractor shall prepare reports of unusual occurrences.

- **Traffic Regulation by Contractor:**

  The contractor shall take all required measures for the safety of users during the construction and maintenance of the project.

  The contractor shall provide, erect and maintain all such barricades, signs, markings, flags and lights as may be required as per good industry practice for the safety of traffic passing through the section under construction or maintenance.

  Where necessary the contractor shall make temporary diversions to allow safe flow of traffic on part with of the carriageway. This shall be with the prior approval of the authority engineer.

- **Defects Liability Period**

  The contractor shall repair or rectify all defects and deficiencies observed by the authority engineer during the defect's liability period.

  The cost of remedying defects shall be to the risk and cost of the contractor.

The authority engineer may instruct the contractor to examine the cause of any defect in the works or part thereof before the expiry of the defect's liability. The contractor is liable for the cost of repairs for defects attributable to the contractor.

Note: - The EPC contractor for this Project is presently carrying out the construction works to be completed by 2034. Currently there are no O&M or asset management sub-contracts.

Project ii

8.2 Supervision and Monitoring During Maintenance (Project ii)

As per Clause 15.1 of EPC Contract Agreement, the EPC Contractor shall undertake regular Inspections, Regulate Traffic and shall be responsible for rectifications of Defects and Deficiencies during the Defects Liability Period. The obligations of the EPC Contractor are summarised hereunder:

- **Inspection by the contractor:**

  Detailed pre-monsoon inspection of all bridges, culverts and drainage system in accordance with the guidelines contained in IRC SP 35.

  The contractor shall prepare a maintenance manual, and a maintenance program pulse stop

  The contractor shall carry out maintenance in accordance to the maintenance manual and the maintenance program approved by the authority engineer.

  The contractor shall carry out tests as per instructions of authority engineer for the maintenance of the asset.

  The contractor shall prepare reports of unusual occurrences.

- **Traffic Regulation by Contractor:**

  The contractor shall take all required measures for the safety of users during the construction and maintenance of the project.

  The contractor shall provide, erect and maintain all such barricades, signs, markings, flags and lights as may be required as per good industry practice for the safety of traffic passing through the section under construction or maintenance.

  Where necessary the contractor shall make temporary diversions to allow safe flow of traffic on part with of the carriageway. This shall be with the prior approval of the authority engineer.

- **Defects Liability Period**

  The contractor shall repair or rectify all defects and deficiencies observed by the authority engineer during the defect's liability period.

  The cost of remedying defects shall be to the risk and cost of the contractor.

  The authority engineer may instruct the contractor to examine the cause of any defect in the works or part thereof before the expiry of the defect's liability. The contractor is liable for the cost of repairs for defects attributable to the contractor.

Note: - The EPC contractor for this Project is expected to complete the works by April 2025. Currently there are no O&M or asset management sub-contracts.

9. SOIL AND MATERIAL INVESTIGATION

9.1 General

As a part of soil and material investigation report preparation, the consultants have conducted tests on subgrade soils along the project corridor.

9.2 Field investigation – sampling and testing

Field tests were conducted on the subgrade soils and required pavement materials were collected for testing. Table 9-1 presents the sampling criteria, tests and testing procedures adopted for various field and laboratory tests.

Table 9-1: Site sampling and testing criteria

S. No.	Type of Soil Sample	Sampling Criteria	Testing Criteria	
			Description of Test	Standard Code Applicable
Existing subgrade and pavement materials				
i)	**Subgrade Strength Test Pits**	Minimum of one subgrade soil sample was obtained at an interval directed by the client & Material Engineer based on site condition.	In-situ Density	IS 2720 (Part – 29)
			In-situ moisture content	IS 2720 (Part – 2)
			Soil Classification	IS 1498
			Sieve Analysis	IS 2720 (Part – 4)
			Atterberg Limits	IS 2720 (Part – 5)
			Laboratory Compaction Test (using heavy compaction)	IS 2720 (Part – 8)
			Field Compaction	IS 2720 (Part-29)
			4-days soaked CBR	IS 2720 (Part – 16)
			Free swell Index	IS 2720 (Part-40)

9.3 Investigations on subgrade soils

Subgrade investigations were carried out to know the strength properties of the existing soil. It is ensured to dig subgrade strength test pits at an interval as directed by the client & material engineer based on the site condition. Various in-situ tests and laboratory tests are conducted on soil samples, as summarized in Table 9-1. The pavement composition details (pavement course, material type, and thickness) are also recorded at every test pit.

The test results and discussion are described in the section below.

Field tests were conducted as per the project requirement to determine the subgrade characteristics and strength. The field testing for subgrade soil includes:

- In-situ density determination at possible location of each test pit
- Field moisture content determination at possible location of each test pit

In-situ density (field density) and moisture content were determined as per the standards enlisted in Table 9-1. Field density is used to evaluate the degree of compaction and existing subgrade CBR at field density state. 50kg of samples were collected in damp proof bags for testing. Required laboratory testing as specified in Table 9-1 were conducted the details of field dry density and field moisture content test results are furnished in Annexure 9.1 and Table 9-2 presents a summary of the test results for the entire project section. The field investigation photographs are shown in Figure 9-1.



Figure 9-1: Field Investigations sample photographs

Table 9-2: Summary of Subgrade Test Results

S. No	Existing Chainage (Km.)	Side (LHS/ RHS)	Soil Classification as per IS: 1498	Gravel content %	Sand content %	Clay & silt content %	Atterberg Limits [IS :2720-Pt-V]			Modified Proctor Test (IS:2720-Pt-VIII)		Field Density		4-Days Soaked CBR at MDD (%)	Free Swell Index (%)	Degree of Compaction (%)
							Liquid Limit (LL) %	Plastic Limit (PL) %	Plasticity Index (PI)	Max. dry density (gm/cc)	OMC (%)	Field Dry Density (gm/cc)	FMC (%)			
NH-4, AP/ TN Border to Nalagampalli: (Km 134+890 to Km 172+000)																
1	138+150	LHS	SM-SC	24.9	58.0	17.1	28	21	7	2.03	9.4	1.93	10.0	14.3	15.2	95.1
2	143+380	RHS	SW-SM	10.9	80.0	9.1	21	NP	NP	2.10	8.1	1.96	8.0	21.7	10.0	93.3
3	148+000	LHS	SW-SM	35.6	56.2	8.2	17	NP	NP	2.13	8.3	1.98	6.0	27.1	0.0	93.0
4	153+380	RHS	SM	17.8	65.5	16.7	24	NP	NP	2.09	8.5	1.99	7.0	19.6	10.0	95.2
5	160+050	LHS	SW-SM	7.7	83.7	8.6	19	NP	NP	2.12	8.5	1.95	8.0	25.5	12.5	92.0
6	164+600	RHS	SM	18.1	56.9	25.0	21	NP	NP	2.03	8.0	1.89	9.0	18.5	11.1	93.1
7	168+150	LHS	SM	2.5	63.7	33.8	25	NP	NP	1.99	9.1	1.92	7.0	11.3	0.0	96.5
NH-4, Nalagampalli to AP/ KA Border: (Km 172+000 to Km 219+687)																
8	172+500	RHS	SM	21.1	62.1	16.8	23	NP	NP	2.06	8.9	1.94	7.0	14.2	10.0	94.2
9	180+600	LHS	SM	3.2	69.4	27.4	26	NP	NP	2.04	9.1	1.88	7.0	12.9	10.0	92.2
10	184+200	RHS	SC	6.0	70.9	23.1	27	19	8	2.02	9.6	1.90	9.0	12.1	20.0	94.1
11	187+900	LHS	SP-SM	20.6	68.9	10.5	19	NP	NP	2.09	8.3	2.04	8.0	10.7	0.0	97.6
12	193+600	RHS	SC	9.1	61.5	29.4	29	20	9	1.99	10.1	1.89	7.0	12.1	22.2	95.0
13	198+100	LHS	SC	13.0	66.3	20.7	27	19	8	2.02	9.2	1.98	7.0	13.6	15.2	98.0
14	203+300	RHS	SM	15.6	63.1	21.3	20	NP	NP	2.07	8.3	1.92	8.0	16.1	7.1	92.8
15	208+000	LHS	SC	6.8	65.9	27.3	33	20	13	1.96	10.7	1.93	6.0	10.3	25.1	98.5
16	214+600	RHS	SM	4.2	66.9	28.9	25	NP	NP	1.98	9.0	1.87	7.0	12.7	11.1	94.4
17	218+000	LHS	SC	7.4	61.4	31.2	29	19	10	2.03	9.9	1.87	7.5	10.9	25.0	92.1

Observations and Conclusions

Soil Classification and Distribution

From Table 9-2, it is evident that subsoil is generally consistent throughout the project road and is predominantly Silty Sand and Clayey sand soils.

Summary of strength parameters in the soil investigation is shown below.

Variance between MDD and FDD is converted in-terms of degree of compaction.

Description	Liquid Limit	Plasticity Index	Free Swell Index	4-days soaked CBR	Degree of compaction
NH-4, AP/ TN Border to Nalagampalli: Km 134+890 to Km 172+000	17%-28%	Max 7%	Max 15.2%	11.3%-27.1%	92.0%-96.5%
NH-4: Nalagampalli to AP/ KA Border: Km 172+000 to Km 219+687	19%-33%	Max 13%	Max 25.1%	10.3%-16.1%	92.1%-98.5%
MoRTH Limits	**<50%**	**<25%**	**<50%**		

- All the measured LL, PI and FSI values are within the acceptable limits as per MoRTH guidelines.

9.4 Existing pavement composition

Existing pavement composition (pavement course, material type, and thickness) were recorded at an interval directed by the client & material engineer based on the site condition along the project road.

The summary of existing pavement crust thickness is presented in a tabular form as well as an illustrative bar graph in Table 9-3 and Figure 9-3 respectively and the pavement crust thickness photographs are shown in Figure 9-2.

Table 9-3: Summary of pavement crust along the project corridor

S. No.	Existing Chainage (Km.)	Side (LHS/ RHS)	Pavement Composition (mm)					
			PQC	DLC	Bituminous	WMM	GSB	Total Thickness
NH-4, AP/ TN Border to Nalagampalli: (Km 134+890 to Km 172+000)								
1	138+150	LHS	300	140			150	590
2	143+380	RHS	300	140			130	570
3	148+000	LHS	325	140			110	575
4	153+380	RHS	290	140			160	590
5	160+050	LHS	310	150			150	610
6	164+600	RHS	300	145			150	595
7	168+150	LHS	285	160			160	605
NH-4, Nalagampalli to AP/ KA Border: (Km 172+000 to Km 219+687)								
8	172+500	RHS	265	155			200	620
9	180+600	LHS	270	140			160	570
10	184+200	RHS	265	150			150	565
11	187+900	LHS	275	140			130	545
12	193+600	RHS	260	150			220	630
13	198+100	LHS	265	155			180	600
14	203+300	RHS	295	175			160	630
15	208+000	LHS	280	150			150	580
16	214+600	RHS	295	150			150	595
17	218+000	LHS	290	165			155	610



Figure 9-2: Sample Pavement Crust Thickness measuring photographs

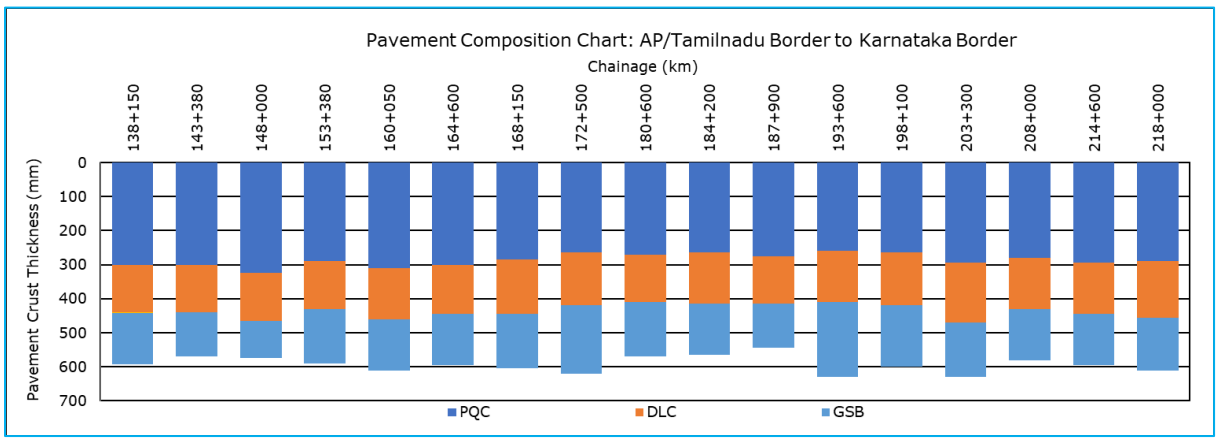


Figure 9-3: Existing Pavement Crust Summary along the project road.

Observations and Conclusions:

4-Lane Rigid Pavement Section

- The existing pavement along the project corridor is rigid in nature. The pavement composition comprises of PQC, DLC and granular sub-base.
- Throughout the project road it possesses consistent PQC, DLC and granular subbase layer thickness with the below average values presented below.

Chainages, Km	PQC	DLC	GSB
134+890 to 172+000	301mm	145mm	145mm
172+000 to 219+687	276mm	153mm	165mm

10. PAVEMENT EVALUATION STUDIES

10.1 Pavement condition survey with Network Survey Vehicle

10.1.1 Network Survey Vehicle Description

Road Runner NSV was used for collection of condition data for this assignment. Road Runner (NSV) is multi-faceted road survey equipment which could be configured to collect a wide range of pavement condition data and asset data.

Road Runner NSV is capable of collecting roughness, rutting, pavement distresses, assets along with GPS coordinates and project chainage.

The main components which are integrated into Road Runner NSV are.

1. Digital Laser Profilers (DLP) -Road roughness and rutting.
2. Digital Imaging System (DIS) -Pavement distresses and road assets data.
3. Differential Global Positioning System (DGPS).
4. High Resolution Distance Measuring Instrument (HRDMI).



1. Digital Laser Profiler (DLP)

- DLP is integrated into the NSV consisting of eleven lasers to collect Road Roughness and Rutting.
- This inertial profiler is capable of recording the data continuously along each wheel path.

(a) Roughness

Road Runner NSV equipment fitted with dual wheel path laser profilometer to collect the roughness data. The roughness data was collected and reported for 100 m interval.

The outputs of the lasers and accelerometers located in each wheel path (750 mm either side of the Centre line of the vehicle) are sampled every 25 mm of longitudinal travel and used to calculate the longitudinal profile of the road.

The profile is then passed through the quarter car model to calculate the International Roughness Index (IRI) lane roughness as per the methodologies specified in the ASTM E-950.

(b) Rutting

Rutting will be measured and reported through DLP, and the data will be recorded at every 100m interval on both the wheel paths.

2. Digital Imaging System (DIS)

Digital Imaging System (DIS) in Network Survey Vehicle (NSV) consist of 5 high resolution roof mounted cameras to capture pavement distresses and road assets data. These cameras are oriented in a certain configuration to ensure that the information of interest, such as inventory or pavement condition, is being recorded in the camera field of view. Three cameras are forward facing and mounted

on front side of vehicle (Left corner, Centre and Right corner), covers 160° angle images and are set to sample at every 10m interval. Another two cameras are mounted on back side of the vehicle (Left corner, Right corner) to capture the distress image of pavement 10m*4m (length*width) i.e., captures at 10m interval.

Digital image system is capable of

- Collecting real time digital images.
- Achieving a sampling rate of at least one set per 2.5 meters for Distress camera's and one set per 10 meters for Asset cameras.
- Incorporating real time differentially corrected GPS (DGPS).
- Capturing & recording at highway speeds.
- Providing real time on-screen displays for operator verification during collection.
- Storing images straight to PC's / NAS (Network Attached Storage).
- Linking into the client's referencing system via distance and GPS.

3. Geo Referencing (DGPS Data)

Road Runner NSV is equipped with DGPS system, and it do collect all the data and images with geo-reference. Reference that image against GPS co-ordinates by logging the latitude, longitude of the specific image.

4. Distance Measuring Instrument (DMI)

Road Runner NSV is equipped with DMI, and it is fitted to rear tyre of the network survey vehicle. The distance and speed measurement performed by the distance measuring instrument, which is a distance transducer and it's highly accurate providing GPS distance and speed.

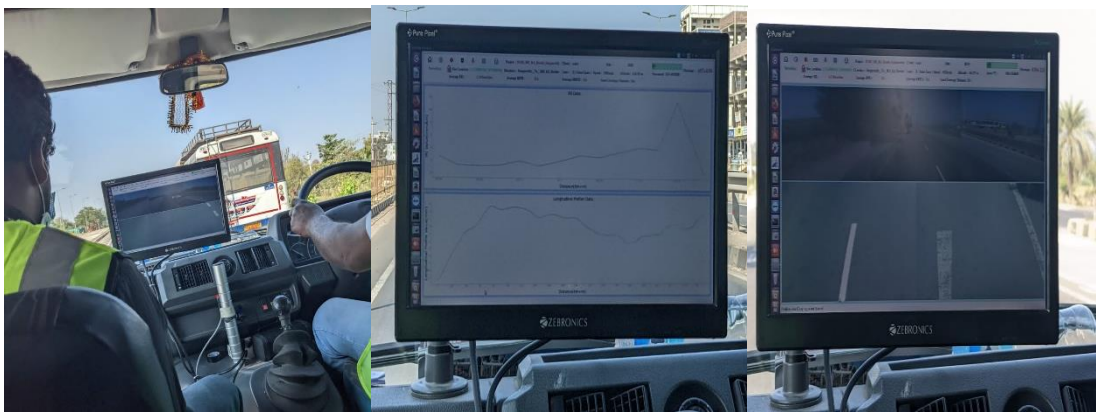


10.2 Methodology for NSV Field Testing

Usually, 4 members are assigned for site to collect the field data. Two of the trained/ experienced field engineers and two drivers during the collection phases of projects. During the survey, engineer is responsible for operating the vehicle's acquisition systems. Road Runner NSV dashboard tool is used to for data acquisition.

The survey will be carried out by lane wise, and the following steps will be followed during the survey.

- Engineer will setup the equipment and check the data collection system prior to the survey.
- Prior to the survey field engineer do set the project name, direction, lane number and starting chainage with increasing or decreasing (as per direction) details.
- The vehicle will run in middle of the lane and collects data up to a vehicle running speed of 80 Kmph.
- Digital Laser Profiler (DLP), Digital Imaging System (DIS) collect the data with GPS co-ordinates and chainage reference.
- Field Engineer will review the data collection and specifies any remarks/ details in observation column.
- At the end of project chainage, engineer will stop that particular survey and save all the recorded and the same process is followed for all other lanes of the project stretch.



10.3 Analysis of NSV Survey Data

Pavement condition survey was carried out on each lane of each carriage way with NSV. The NSV survey was conducted on the project corridor from 29/07/2024 to 31/07/2024, data was processed, analyzed, and presented in 100m interval. Detailed NSV data is presented in the following Annexures and summary of it presented as below.

10.3.1 Roughness

As stated in the earlier section, NSV collected the roughness data at 100m interval on each lane in terms of IRI (International Roughness Index) value.

In Indian context, the IRI values were converted to BI as per IRC: SP:16-2019 "Guidelines on Measuring Road Roughness and Norms" with the following equation.

$BI = 630*(IRI)^{\wedge 1.12}$

Where,

BI = Bump Integrator Roughness in mm/km

IRI = International Roughness Index.

Roughness data of the pavement is collected through Digital Laser Profilers System (DLP) and the same is presented in Annexure 10.1(a) to Annexure 10.1(c) at an interval of 100 mts for each section. The obtained lane wise kilometer Roughness summary in terms of BI (mm/km) is presented in Table 10-1 and Table 10-2 for 4-lane rigid section (km 134+890 to km 172+000 & km 172+000 to km 219+687). The graphical representation of roughness data for LHS and RHS directions are presented in Figure 10-1 and Figure 10-2 respectively. Some of site survey pictures are in Figure 10-3.

Table 10-1: Summary of roughness data on both directions (4- lane section)- Rigid Pavement on LHS direction

Chainage (km)		LHS Direction		
		Avg. BI (mm/km)		
From	To	Outer Lane	Inner Lane	Average
Project I - NH-4 Section from AP/TN Border to Nalagampalli: Km 134+890 to Km 172+000				
134.890	136.990	-	-	-
136.990	138.000	2179.3	2987.2	2583.3
138.000	139.000	2173.5	2388.9	2281.2
139.000	140.000	2368.8	2134.3	2251.5
140.000	141.000	1798.8	1633.7	1716.2
141.000	141.100	2318.0	2391.1	2354.5
141.100	142.200	Under Construction		
142.200	143.000	2210.6	2214.8	2212.7
143.000	144.000	2085.3	2197.4	2141.3
144.000	145.000	2070.8	2105.2	2088.0
145.000	146.000	2104.4	2191.8	2148.1
146.000	147.000	1898.2	1798.6	1848.4
147.000	148.000	2010.9	2102.4	2056.6
148.000	148.250	3094.3	2848.1	2971.2
148.250	149.820	Under Construction		
149.820	150.000	2385.9	2501.6	2443.7
150.000	151.000	2088.8	2199.3	2144.1
151.000	152.000	2179.4	2368.0	2273.7
152.000	153.000	1774.7	2038.6	1906.6
153.000	154.000	1867.0	2103.5	1985.3
154.000	154.040	2196.6	2108.1	2152.4
154.040	155.600	Under Construction		
155.600	156.000	2503.9	2734.3	2619.1
156.000	157.000	1799.1	2159.0	1979.0
157.000	158.000	2377.5	2736.2	2556.9
158.800	159.000	2931.7	3069.1	3000.4
159.000	160.000	2015.3	2146.6	2080.9
160.000	161.000	2189.0	2399.5	2294.3
161.000	162.000	2121.8	2195.8	2158.8
162.000	163.000	2487.3	2692.6	2589.9
163.000	164.000	2455.0	2433.2	2444.1
164.000	165.000	3076.1	3047.8	3061.9
165.000	166.000	2569.2	2530.1	2549.6
166.000	167.000	2308.1	2393.3	2350.7
167.000	168.000	2117.0	2149.2	2133.1

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Chainage (km)		LHS Direction		
		Avg. BI (mm/km)		
From	To	Outer Lane	Inner Lane	Average
168.000	169.000	2195.3	2188.2	2191.7
169.000	170.000	2105.2	2183.9	2144.6
170.000	171.000	2129.1	2190.3	2159.7
171.000	172.000	2184.7	2392.0	2288.4
Project ii – NH-4 Section from Nalagampalli to AP/KN Border: Km 172+000 to Km 219+687				
From	**To**	**Outer Lane**	**Inner Lane**	**Average**
172.000	173.000	2204.7	2223.1	2213.9
173.000	174.000	3007.6	3023.9	3015.7
174.000	175.000	2018.9	2171.1	2095.0
175.000	176.000	2190.7	2406.6	2298.6
176.000	177.000	1793.9	1812.5	1803.2
177.000	178.000	2460.2	2614.4	2537.3
178.000	179.000	2052.2	2285.0	2168.6
179.000	180.000	2012.1	2294.9	2153.5
180.000	181.000	1784.6	1797.2	1790.9
181.000	182.000	1851.8	1886.5	1869.2
182.000	183.000	2240.4	2227.1	2233.7
183.000	184.000	1842.6	1860.9	1851.8
184.000	185.000	1821.1	1829.9	1825.5
185.000	186.000	2080.5	2299.9	2190.2
186.000	187.000	2500.8	2511.1	2505.9
187.000	188.000	2011.1	2017.6	2014.4
188.000	189.000	2458.5	2464.0	2461.2
189.000	190.000	2465.8	2456.0	2460.9
190.000	191.000	1908.1	1874.3	1891.2
191.000	192.000	2264.5	2449.3	2356.9
192.000	193.000	2455.3	2494.4	2474.8
193.000	194.000	1865.1	1942.0	1903.6
194.000	195.000	1923.9	1944.7	1934.3
195.000	196.000	2719.3	3007.5	2863.4
196.000	197.000	2204.1	2211.6	2207.8
197.000	198.000	1892.6	1897.8	1895.2
198.000	199.000	1827.9	1927.6	1877.7
199.000	200.000	1845.8	1831.0	1838.4
200.000	201.000	1852.4	1941.3	1896.8
201.000	202.000	2207.9	2202.9	2205.4
202.000	203.000	1814.2	1832.2	1823.2
203.000	204.000	1838.3	1870.0	1854.2

Chainage (km)		LHS Direction		
		Avg. BI (mm/km)		
From	To	Outer Lane	Inner Lane	Average
204.000	205.000	1794.7	1796.6	1795.7
205.000	206.000	1794.3	1791.2	1792.7
206.000	207.000	1823.3	1855.3	1839.3
207.000	208.000	1550.0	1641.8	1595.9
208.000	209.000	1811.8	1815.3	1813.5
209.000	210.000	2201.4	2231.2	2216.3
210.000	211.000	1888.1	1979.4	1933.8
211.000	212.000	1832.1	1925.2	1878.7
212.000	213.000	1817.2	1834.3	1825.7
213.000	214.000	2201.7	2209.2	2205.5
214.000	215.000	2264.7	2282.6	2273.7
215.000	216.000	1913.3	1893.0	1903.1
216.000	217.000	2440.6	2415.1	2427.8
217.000	218.000	1808.5	1938.6	1873.6
218.000	219.000	2462.0	2479.7	2470.9
219.000	219.687	1849.2	1796.0	1822.6

**Km 134+890 to Km 158+800, Isolated sections are not surveyed due to Work in progress.*

Table 10-2: Summary of roughness data on both directions (4- lane section)- Rigid Pavement on RHS direction

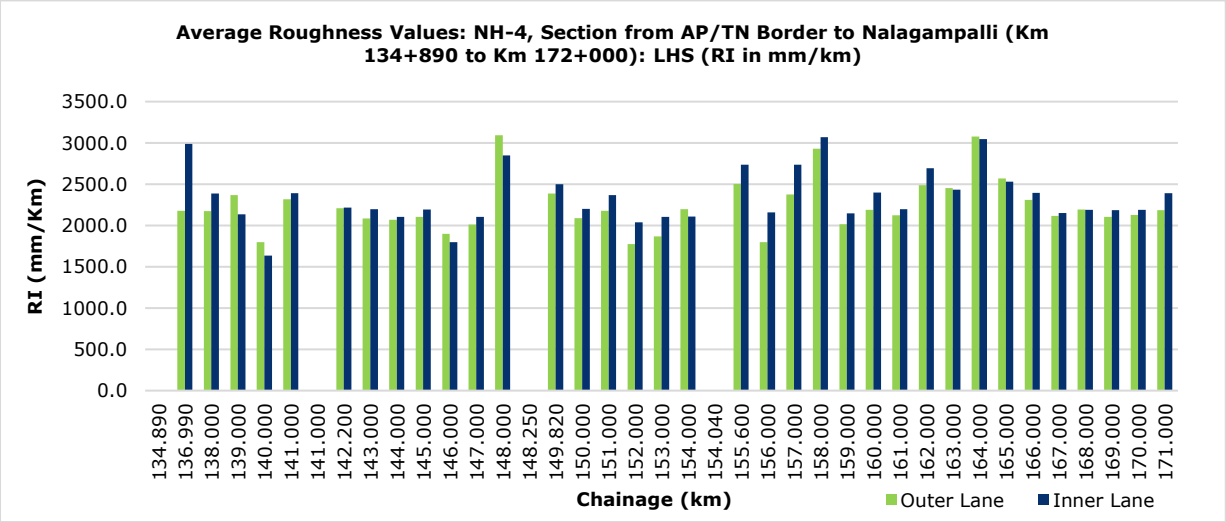
Chainage (km)		RHS Direction		
		Avg. BI (mm/km)		
From	To	Outer Lane	Inner Lane	Average
Project i – NH-4 Section from AP/TN Border to Nalagampalli: Km 134+890 to Km 172+000				
134.890	136.990	-	-	-
136.990	138.000	2126.9	2192.7	2159.8
138.000	139.000	2110.2	2195.7	2153.0
139.000	140.000	2093.2	2193.1	2143.1
140.000	141.000	1774.8	1786.1	1780.5
141.000	142.000	1992.3	2166.0	2079.2
142.000	143.000	2396.1	2397.4	2396.8
143.000	144.000	1783.5	1796.2	1789.9
144.000	145.000	2127.7	2142.4	2135.0
145.000	146.000	2465.7	2544.3	2505.0
146.000	147.000	1964.2	2193.2	2078.7
147.000	148.000	2186.3	2171.8	2179.0
148.000	149.000	2301.3	2273.3	2287.3
149.000	150.000	2396.1	2651.4	2523.8
150.000	151.000	2194.2	2391.4	2292.8
151.000	152.000	2633.6	2628.3	2630.9
152.000	153.000	2904.1	3000.7	2952.4
153.000	154.000	2523.2	2708.3	2615.7
154.000	154.040	2501.3	3013.6	2757.4
154.040	155.640	Under Construction		
155.640	156.000	2675.9	2361.4	2518.6
156.000	157.000	2354.0	2358.7	2356.4

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Chainage (km)		RHS Direction		
		Avg. BI (mm/km)		
From	To	Outer Lane	Inner Lane	Average
157.000	157.770	2481.1	2490.8	2485.9
157.770	157.880	Under Construction		
157.880	158.000	3038.8	3026.1	3032.5
158.000	159.000	2541.8	2487.4	2514.6
159.000	160.000	2141.6	2177.4	2159.5
160.000	161.000	2111.6	2194.3	2153.0
161.000	162.000	1959.0	2188.5	2073.7
162.000	163.000	2185.0	2355.5	2270.2
163.000	164.000	2380.7	2564.7	2472.7
164.000	165.000	3016.3	3089.0	3052.6
165.000	166.000	2189.0	2197.9	2193.5
166.000	167.000	2196.5	2357.0	2276.7
167.000	168.000	1994.1	2090.5	2042.3
168.000	169.000	1905.7	1937.6	1921.7
169.000	170.000	1707.4	2003.3	1855.4
170.000	171.000	1942.1	2154.0	2048.0
171.000	172.000	2035.1	2142.7	2088.9
Project ii – NH-4 Section from Nalagampalli to AP/KN Border: Km 172+000 to Km 219+687				
From	**To**	**Outer Lane**	**Inner Lane**	**Average**
172.000	173.000	2567.0	2427.5	2497.2
173.000	174.000	3000.2	3000.6	3000.4
174.000	175.000	2027.8	2192.0	2109.9
175.000	176.000	2585.6	2653.0	2619.3
176.000	177.000	2406.8	2649.1	2527.9
177.000	178.000	2406.7	2412.9	2409.8
178.000	179.000	2196.8	2280.5	2238.7
179.000	180.000	2182.0	2192.8	2187.4
180.000	181.000	2159.9	2179.6	2169.7
181.000	182.000	2165.3	2177.1	2171.2
182.000	183.000	2381.2	2280.9	2331.1
183.000	184.000	2190.7	2151.7	2171.2
184.000	185.000	1787.6	1796.3	1791.9
185.000	186.000	2304.5	2373.9	2339.2
186.000	187.000	2579.0	3003.3	2791.2
187.000	188.000	2619.0	2637.2	2628.1
188.000	189.000	2275.7	2323.4	2299.6
189.000	190.000	2193.3	2277.2	2235.3
190.000	191.000	2197.2	2189.9	2193.6
191.000	192.000	2157.2	2193.3	2175.3
192.000	193.000	1999.1	2078.6	2038.9
193.000	194.000	2025.4	2191.3	2108.4
194.000	195.000	2191.5	2197.4	2194.4
195.000	196.000	1999.5	2189.8	2094.7
196.000	197.000	2194.9	2195.8	2195.4
197.000	198.000	2077.0	2228.4	2152.7
198.000	199.000	1815.6	1840.1	1827.9
199.000	200.000	2161.4	2198.9	2180.2
200.000	201.000	2306.8	2185.1	2246.0
201.000	202.000	2292.4	2341.3	2316.9
202.000	203.000	2068.6	2219.0	2143.8
203.000	204.000	1727.8	1787.2	1757.5
204.000	205.000	1936.8	2180.5	2058.6

Chainage (km)		RHS Direction		
		Avg. BI (mm/km)		
From	To	Outer Lane	Inner Lane	Average
205.000	206.000	1781.7	1796.4	1789.1
206.000	207.000	2351.3	2779.0	2565.1
207.000	208.000	1647.6	1795.5	1721.6
208.000	209.000	1935.0	1968.2	1951.6
209.000	210.000	2299.7	2344.3	2322.0
210.000	211.000	2161.2	2198.1	2179.7
211.000	212.000	2007.6	1999.7	2003.6
212.000	213.000	1903.0	1959.7	1931.3
213.000	214.000	2408.2	2459.8	2434.0
214.000	215.000	1850.4	2158.8	2004.6
215.000	216.000	1943.4	1988.6	1966.0
216.000	217.000	2227.6	2472.8	2350.2
217.000	218.000	1760.1	1794.1	1777.1
218.000	219.000	1919.2	2009.8	1964.5
219.000	219.687	1782.7	1964.6	1873.7

**Km 134+890 to Km 158+800, Isolated sections are not surveyed due to Work in progress.*



**Km 134+890 to Km 158+800, Isolated sections are not surveyed due to Work in progress.*

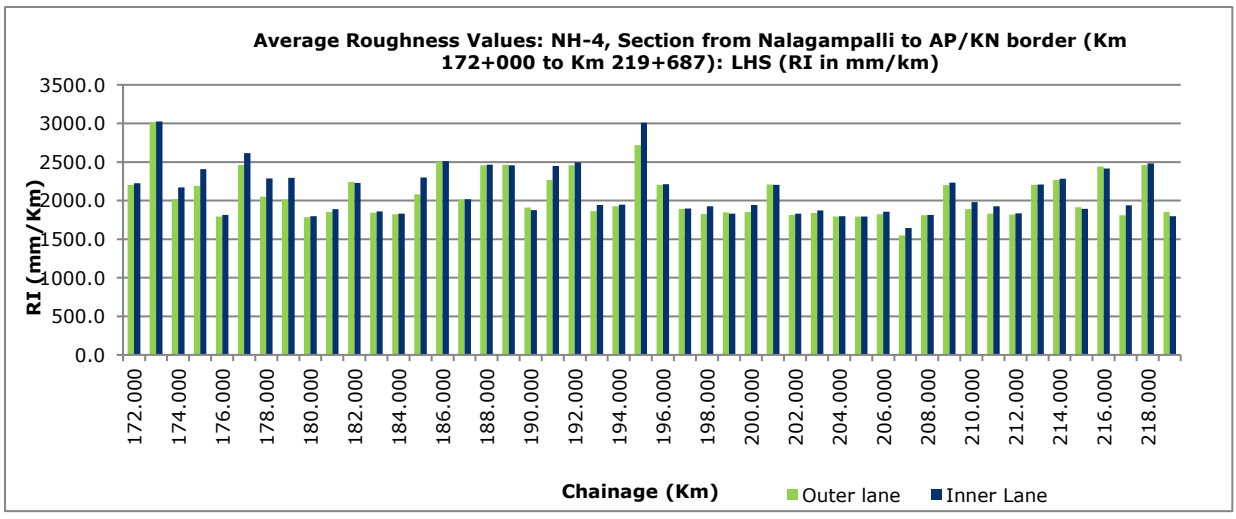
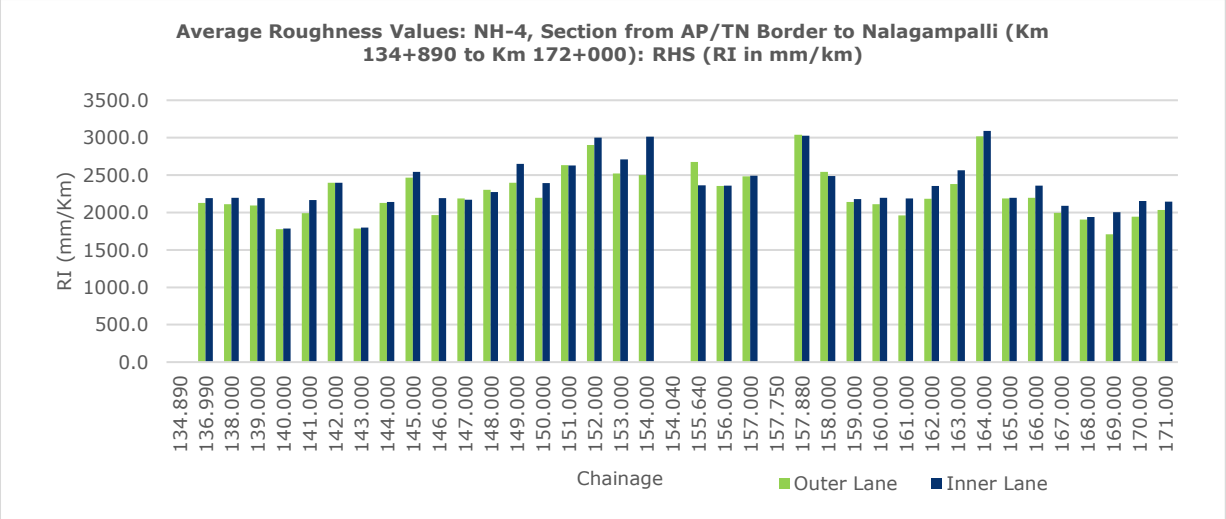


Figure 10-1: Illustrative summary of roughness on LHS direction of all sections

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**Km 134+890 to Km 158+800, Isolated sections are not surveyed due to Work in progress.*

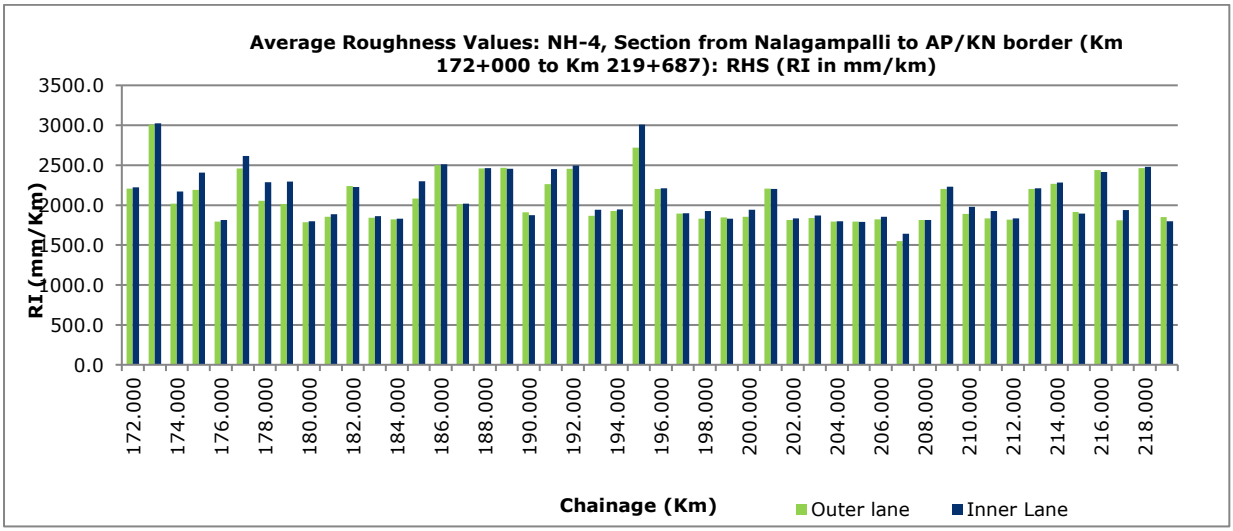


Figure 10-2: Illustrative summary of roughness on RHS direction of all sections

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Observations:

Rigid pavement Section: (4-lane)

The roughness more than 2400 mm/km is considered max allowable limit.

Table 10-3: Roughness summary in LHS & RHS direction (4- lane section)

Roughness Summary:										
S.no	Condition	BI (mm/km)	LHS				RHS			
			Outer Lane		Inner Lane		Outer Lane		Inner Lane	
			Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)
NH,4 Section from AP/TN Border to Nalagampalli: Km 134+890 to Km 172+000										
1	Good	<1800	3.000	9.7	2.000	6.5	3.000	9.0	2.000	6.2
2	Fair	1800-2400	22.130	71.9	20.940	68.0	23.010	69.1	21.600	67.2
3	Poor	>2400	5.650	18.4	7.840	25.5	7.270	21.8	8.530	26.5
Stretch under construction/ Traffic diversion			6.330		6.330		3.830		4.980	
Total Length (in km)			37.110		37.110		37.110		37.110	
NH,4 Section from Nalagampalli to AP/KN Border: Km 172+000 to Km 219+687										
1	Good	<1800	5.000	10.5	4.687	9.8	5.687	11.9	5.000	10.5
2	Fair	1800-2400	33.687	70.6	32.000	67.1	34.000	71.3	32.687	68.5
3	Poor	>2400	9.000	18.9	11.000	23.1	8.000	16.8	10.000	21.0
Total Length (in km)			47.687		47.687		47.687		47.687	

**Km 134+890 to Km 158+800, Isolated sections are not surveyed due to Work in progress.*

10.3.2 Pavement distress data of Rigid Pavement

The following Pavement distresses are considered for assessing the rigid pavement condition as per IRC SP: 83-2018 (Guidelines for Maintenance, Repair and Rehabilitation of Cement concrete pavements);

- Cracking
  - Longitudinal cracks
  - Transverse cracks/ Diagonal Cracks
  - Corner cracks/ Corner breaks
  - Multiple cracks
- Spalling of Joints
- Joint seal defects
- Joint Faulting/ Stepping
- Joint Separation
- Blow up/ Buckling
- Ravelling/ Scaling
- Potholes/ Pop outs

All the above pavement distresses will be provided at 10 m interval.

The existing distresses are measured in five level distress rating system as specified in IRC: SP: 83-2018. The five-level distress rating system is given in Table 10-4 below.

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Table 10-4: Five-level distress rating system for Rigid Pavement

Distress Rating	Slab Condition	Severity (Defects) Rating
0	Excellent	No Discernible
1	Very Good	Minor
2	Good/Average	Moderate
3	Fair	Major
4	Poor	Extreme
5	Very Poor	Unsafe/ Unserviceable

The condition survey of the rigid pavement was carried out by observing all the listed distresses as specified in IRC: SP: 83-2018 in conformity with Proforma given code. Type of distresses and assessment rating as given in Table 4.5 of IRC: SP: 83-2018 is followed and the same is listed in Table 10-5 below.

Table 10-5: Type of distresses and its assessment rating

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating
1	**CRACKING**			
	Single Discrete Cracks Not interaction with Any joint	w=width of crack L=length of crack d=depth of crack D=depth of slab	0	Nil, not discernible
			1	w<0.2 mm, hair cracks
			2	w= 0.2 -0.5 mm, discernible from slow-moving car
			3	w=0.5-1.5 mm, discernible from fast-moving car
			4	w=1.5-3.00 mm
			5	w>3 mm
2	Single Transverse (or Diagonal) Crack intersecting with one or more joints	w=width of crack L=length of crack d=depth of crack D=depth of slab	0	Nil, not discernible
			1	w<0.2 mm, hair cracks
			2	w=0.2 -0.5 mm, discernible from slow vehicle
			3	w=0.5-3.0 mm, discernible from fast vehicle
			4	w=3.0-6.0 mm
			5	w>6mm, usually associated with spalling, and/or slab rocking under traffic
3	Single Longitudinal Crack intersecting with one or more joints	w=width of crack L=length of crack d=depth of crack D=depth of slab	0	Nil, not discernible
			1	w<0.5 mm, discernible from slow vehicle
			2	w= 0.5 -3.0 mm. discernible from fast vehicle
			3	w=3.0-6.0 mm
			4	w=6.0-12. mm
			5	w>12mm, usually associated with spalling, and/or slab rocking under traffic
4	Multiple Cracks Intersecting with	w=width of crack	0	Nil, not discernible
			1	w<0.2 mm, hair cracks

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S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating
	one or more joints or cracks		2	w=0.2 - 0.5 mm, discernible from slow vehicle
			3	w=0.5-3.0 mm, discernible from fast vehicle
			4	w=3.0 - 6.0 mm panel broken into 2 or 3 pieces
			5	w > 6 mm and/or panel broken into more than 4 pieces
5	Corner Break	w=width of crack L=length of crack	0	Nil, not discernible
			1	w<0.5 mm only one corner broken
			2	w< 1.5 mm, L<0.6 m, only one corner broken
			3	w< 1.5 mm. L <0.6 m, two corners broken
			4	w>1.5 mm, L >0.6 m, or Three corners broken
			5	Three or four corners broken
6	Punchout (Applicable to CRCP only)	w=width of crack L=length (m/m^2)	0	Nil, not discernible
			1	w< 0.5 mm; L< 3 m/m^2
			2	either w>0.5 mm or L<3 m/m^2
			3	w> 1.5 mm and L< 3 m/m^2
			4	w>3 mm, L<3 m/m^2 and deformation
			5	w>3 mm, L>3 m/m^2 and deformation
7	**SURFACE DEFECTS**			
	Ravelling or Honey comb type surface	r= area damaged surface / total surface of slab (%) h=maximum depth of damage	0	Nil, not discernible
			1	r < 2 %
			2	r =2-10%
			3	r=10-25%
			4	r=25-50%
			5	r >50% and h>25 mm
8	Scaling	r= area damaged surface / total surface of slab (%) h=maximum depth of damage	0	Nil, not discernible
			1	r < 2 %
			2	r =2-10%
			3	r=10-20%
			4	r=20-30%
			5	r >30% and h>25 mm
9	Polished Surface/ Glazing	t=texture depth sand patch test	0	
			1	t > 1mm
			2	t=1-0.6 mm
			3	t=0.6-0.3 mm
			4	t=0.3-0.1 mm
			5	t<0.1 mm
10				

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating
	Pop out (small Hole), Pothole Refer Para 8.4	n=number/m2 d=diameter h= maximum depth	0	d<50 mm; h<25 mm; n <1 per 5 m^2
			1	d=50-100 mm: h<50 mm: n<1 per 5 m^2
			2	d=50-100 mm: h>50 mm: n<1 per 5 m^2
			3	d=100-300 mm: h<100 mm: n<1 per 5 m^2
			4	d=100-300 mm: h>100 mm: n<1 per 5 m^2
			5	d>300 mm: h>100 mm: n>1 per 5 m^2
	JOINT DEFECTS			
11	Joint Seal Defects	Loss or damage L=Length as % total joint length	0	Difficult to discern.
			1	Discernible, L<25% but of little immediate consequence eighth regard to ingress of water or trapping incompressible material.
			3	Notable, L>25% insufficient protection against ingress of water and trapping in incompressible material.
			5	Severe; w>3 mm negligible protection against ingress of water and trapping in incompressible material.
12	Spalling of Joints	w= width on either side of the joint L= Length as % total joint length	0	Nil, not discernible
			1	w<10 mm
			2	w=10-20 mm, L<25%
			3	w=20-40 mm, L >25%
			4	w=40-80mm, L >25%
			5	w>80mm, and L>25%
13	Faulting (or stepping) in Cracks or Joints	f=difference of level	0	Not discernible, f< 1 mm
			1	f< 3 mm
			2	f=3-6 mm
			3	f=6-12 mm
			4	f=12-18 mm
			5	f>18 mm
14	Blow up or buckling	h=vertical displacement from normal profile	0	Nil, not discernible
			1	h< 6 mm
			2	h=6-12 mm
			3	h=12-25 mm
			4	h>25 mm
			5	shattered slabs, i.e., 4 or more pieces
15	Depression	h= negative vertical displacement from profile L= Length	0	Nil, not discernible, h<5 mm
			1	h=5-15 mm
			2	h=15-30 mm. Nos < 20% joints
			3	h=30-50 mm
			4	h>50mm or >20% joints

S. No	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating
			5	h>100 mm
16	Heave	h= positive vertical displacement from profile L= Length	0	Nil, not discernible, h<5 mm
			1	h=5-15 mm
			2	h=15-30 mm. Nos < 20% joints
			3	h=30-50 mm
			4	h>50 mm or >20% joints
			5	h>100 mm
17	Bump	h=vertical displacement from normal profile	0	h<4 mm
			1	h=4-7 mm
			3	h= 7 - 15 mm
			5	h>15 mm
			0	Nil, not discernible f<5 mm
18	Lane to Shoulder Dropoff	f=difference of level	1	f=3-10 mm
			2	f=10-25 mm.
			3	f=25-50 mm
			4	f=50-75 mm
			5	f >75 mm
19	**DRAINAGE**			
	Pumping	quantity of fines and water expelled through open joints and cracks Nos/ 100 m stretch	0	Not discernible
			1 to 2	slight / occasional Nos <10%
			3 to 4	appreciable / Frequent 10-25%
			5	Abundant, crack development>25%
20	Ponding	Ponding on slabs due to blockage of drains	0-2	No discernible problem
			3 to 4	Blockages observed in drains, but water flowing
			5	Ponding, accumulation of water observed

Rigid Pavement distresses were presented in Annexure 10.2 (a) for AP/TN border to Nalagampalli section (km 134+890 to km 172+000) and Nalagampalli to AP/KN border section (km 172+000 to km 219+687) is presented in Annexure 10.2 (b) for each lane in LHS & RHS directions. The rigid pavement condition summary of each section in lane wise is presented from Table 10-6.

Table 10-6: Rigid Pavement Distress Summary (4-Lane Sections):

Rigid Pavement Distress Summary Based on Depth & Severity (Length in Km)																							
Severity	**Single discrete cracks**		**Longitudinal Cracks**		**Transverse/ Diagonal Cracks**		**Multiple Cracks**		**Corner Cracks/ Breaking**		**Joint Spalling/ Joint Damage**	**Joint Seal defects**	**Joint Separation**	**Faulting/ Stepping**	**Blow Up/ Buckling**	**Punchout**	**Ravelling**	**Scaling**	**Pothole/ Popout**	**At Structures/ Flexible Overlay Location**			
	>D/2	**<D/2**	**>D/2**	**<D/2**	**>D/2**	**<D/2**	**>D/2**	**<D/2**	**>D/2**	**<D/2**										**Patching**	**Delamination**	**Reflection Cracks**	**Cracking**
NH,4 Section from AP/TN Border to Nalagampalli: Km 134+890 to Km 172+000: LHS Inner																							
0	30.780	29.900	30.780	29.710	30.780	29.600	30.780	30.680	30.750	29.140	29.710	30.400	30.780	30.780	30.780	30.780	30.700	30.760	30.780	30.710	30.780	30.770	30.780
1	0.000	0.810	0.000	0.830	0.000	0.860	0.000	0.080	0.000	0.670	0.450	0.250	0.000	0.000	0.000	0.000	0.040	0.020	0.000			0.010	0.000
2	0.000	0.070	0.000	0.220	0.000	0.310	0.000	0.000	0.000	0.750	0.440	0.130	0.000	0.000	0.000	0.000	0.020	0.000	0.000			0.000	0.000
3	0.000	0.000	0.000	0.020	0.000	0.010	0.000	0.000	0.030	0.200	0.110	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.070	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
Total Length (Km)	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**
NH,4 Section from AP/TN Border to Nalagampalli: Km 134+890 to Km 172+000: LHS Outer																							
0	30.780	30.540	30.710	28.520	30.780	29.850	30.780	30.620	30.770	30.600	29.810	30.780	30.780	30.780	30.780	30.780	30.570	30.760	30.780	30.720	30.780	30.780	30.780
1	0.000	0.140	0.000	0.810	0.000	0.440	0.000	0.070	0.010	0.080	0.580	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000			0.000	0.000
2	0.000	0.100	0.010	1.160	0.000	0.450	0.000	0.070	0.000	0.080	0.260	0.000	0.000	0.000	0.000	0.000	0.110	0.020	0.000			0.000	0.000
3	0.000	0.000	0.040	0.290	0.000	0.040	0.000	0.010	0.000	0.000	0.080	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.060	0.000	0.000	0.000
4	0.000	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.040	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000			0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
Total Length (Km)	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**	**30.780**
NH,4 Section from AP/TN Border to Nalagampalli: Km 134+890 to Km 172+000: RHS Inner																							
0	32.130	32.100	32.130	30.940	32.120	30.700	32.130	31.940	32.090	30.630	30.710	31.730	32.100	32.130	32.130	32.130	32.090	32.080	32.130	32.070	32.130	32.130	32.130
1	0.000	0.030	0.000	1.030	0.000	1.110	0.000	0.120	0.000	0.410	0.640	0.130	0.030	0.000	0.000	0.000	0.020	0.050	0.000			0.000	0.000
2	0.000	0.000	0.000	0.160	0.000	0.290	0.000	0.040	0.000	0.550	0.440	0.200	0.000	0.000	0.000	0.000	0.020	0.000	0.000			0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.030	0.000	0.000	0.040	0.440	0.150	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.000	0.100	0.150	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
5	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
Total Length (Km)	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**	**32.130**
NH,4 Section from AP/TN Border to Nalagampalli: Km 134+890 to Km 172+000: RHS Outer																							
0	33.280	33.120	33.250	31.500	33.260	31.970	33.280	32.970	33.280	33.130	32.350	33.280	33.280	33.280	33.280	33.280	33.140	33.260	33.280	33.250	33.280	33.270	33.280
1	0.000	0.150	0.000	0.970	0.000	0.790	0.000	0.280	0.000	0.060	0.360	0.000	0.000	0.000	0.000	0.000	0.070	0.010	0.000			0.010	0.000
2	0.000	0.010	0.000	0.570	0.000	0.360	0.000	0.010	0.000	0.090	0.320	0.000	0.000	0.000	0.000	0.000	0.060	0.010	0.000			0.000	0.000
3	0.000	0.000	0.000	0.240	0.000	0.160	0.000	0.010	0.000	0.000	0.120	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.000	0.000	0.000
4	0.000	0.000	0.030	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.090	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000			0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
Total Length (Km)	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**	**33.280**
NH,4 Section from Nalagampalli to AP/KN Border: Km 172+000 to Km219+687: LHS Inner																							
0	47.687	46.927	47.627	45.907	47.667	44.837	47.657	47.247	47.687	45.987	44.677	45.087	47.677	47.687	47.687	47.687	47.487	47.627	47.687	47.457	47.677	47.437	47.687
1	0.000	0.730	0.000	1.190	0.000	1.440	0.000	0.430	0.000	0.770	1.390	0.280	0.000	0.000	0.000	0.000	0.090	0.060	0.000			0.110	0.000
2	0.000	0.030	0.000	0.470	0.000	1.140	0.000	0.000	0.000	0.800	1.290	1.030	0.010	0.000	0.000	0.000	0.090	0.000	0.000			0.080	0.000
3	0.000	0.000	0.020	0.120	0.000	0.270	0.030	0.000	0.000	0.130	0.160	1.280	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.230	0.010	0.060	0.000
4	0.000	0.000	0.030	0.000	0.010	0.000	0.000	0.010	0.000	0.000	0.110	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000

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Rigid Pavement Distress Summary Based on Depth & Severity (Length in Km)																							
Severity	Single discrete cracks		Longitudinal Cracks		Transverse/ Diagonal Cracks		Multiple Cracks		Corner Cracks/ Breaking		Joint Spalling/ Joint Damage	Joint Seal defects	Joint Separation	Faulting/ Stepping	Blow Up/ Buckling	Punchout	Ravelling	Scaling	Pothole/ Popout	At Structures/ Flexible Overlay Location			
	>D/2	<D/2	>D/2	<D/2	>D/2	<D/2	>D/2	<D/2	>D/2	<D/2										Patching	Delamination	Reflection Cracks	Cracking
5	0.000	0.000	0.010	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
Total Length (Km)	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**
NH,4 Section from Nalagampalli to AP/KN Border: Km 172+000 to Km219+687: LHS Outer																							
0	47.687	47.407	47.667	44.747	47.687	45.677	47.677	47.417	47.687	47.287	46.710	46.677	47.687	47.687	47.687	47.687	47.547	47.687	47.687	47.637	47.687	47.427	47.687
1	0.000	0.260	0.000	1.730	0.000	1.050	0.000	0.170	0.000	0.340	0.477	0.310	0.000	0.000	0.000	0.000	0.010	0.000	0.000			0.200	0.000
2	0.000	0.020	0.000	1.160	0.000	0.860	0.000	0.080	0.000	0.030	0.380	0.300	0.000	0.000	0.000	0.000	0.080	0.000	0.000			0.030	0.000
3	0.000	0.000	0.020	0.050	0.000	0.100	0.010	0.010	0.000	0.030	0.090	0.400	0.000	0.000	0.000	0.000	0.050	0.000	0.000	0.050	0.000	0.030	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
NH,4 Section from Nalagampalli to AP/KN Border: Km 172+000 to Km219+687: RHS Inner																							
0	47.687	47.637	47.687	46.337	47.687	45.947	47.667	47.497	47.687	46.297	46.097	46.907	47.687	47.687	47.687	47.687	47.607	47.677	47.687	47.687	47.687	47.627	47.687
1	0.000	0.050	0.000	1.010	0.000	1.130	0.000	0.070	0.000	0.550	1.080	0.760	0.000	0.000	0.000	0.000	0.040	0.010	0.000			0.050	0.000
2	0.000	0.000	0.000	0.320	0.000	0.580	0.000	0.110	0.000	0.640	0.410	0.020	0.000	0.000	0.000	0.000	0.040	0.000	0.000			0.010	0.000
3	0.000	0.000	0.000	0.020	0.000	0.030	0.010	0.010	0.000	0.200	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
Total Length (Km)	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**
NH,4 Section from Nalagampalli to AP/KN Border: Km 172+000 to Km219+687: RHS Outer																							
0	47.687	47.687	47.587	45.287	47.607	46.107	47.677	47.547	47.687	47.597	46.797	47.097	47.687	47.687	47.687	47.687	47.527	47.677	47.687	47.637	47.687	47.397	47.687
1	0.000	0.000	0.000	1.200	0.000	0.760	0.000	0.090	0.000	0.030	0.110	0.070	0.000	0.000	0.000	0.000	0.040	0.010	0.000			0.150	0.000
2	0.000	0.000	0.000	0.750	0.000	0.570	0.000	0.010	0.000	0.040	0.530	0.170	0.000	0.000	0.000	0.000	0.080	0.000	0.000			0.120	0.000
3	0.000	0.000	0.000	0.450	0.010	0.250	0.000	0.020	0.000	0.010	0.170	0.340	0.000	0.000	0.000	0.000	0.030	0.000	0.000	0.050	0.000	0.020	0.000
4	0.000	0.000	0.090	0.000	0.070	0.000	0.010	0.020	0.000	0.010	0.060	0.010	0.000	0.000	0.000	0.000	0.010	0.000	0.000			0.000	0.000
5	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			0.000	0.000
Total Length (Km)	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**	**47.687**

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Figure 10-3: Field testing photographs captured during the NSV survey

Pavement Observations:

AP/TN Border to Nalagampalli (km 134+890 to km 172+000) - 4 Lane Section

Main Carrigeway:

- In both directions in a few slabs has serve cracks, joint spalling and failed patch repairs were observed.
- Due to structural issues, the sections has many corner breaks.
- In both directions, failed patch repairs, cracking, pavement dip and joint spalling are observed in the stretch.



Service Roads:

- Majority of the service roads are under construction. The summary of the pavement condition is summarised below in the Table 10-7



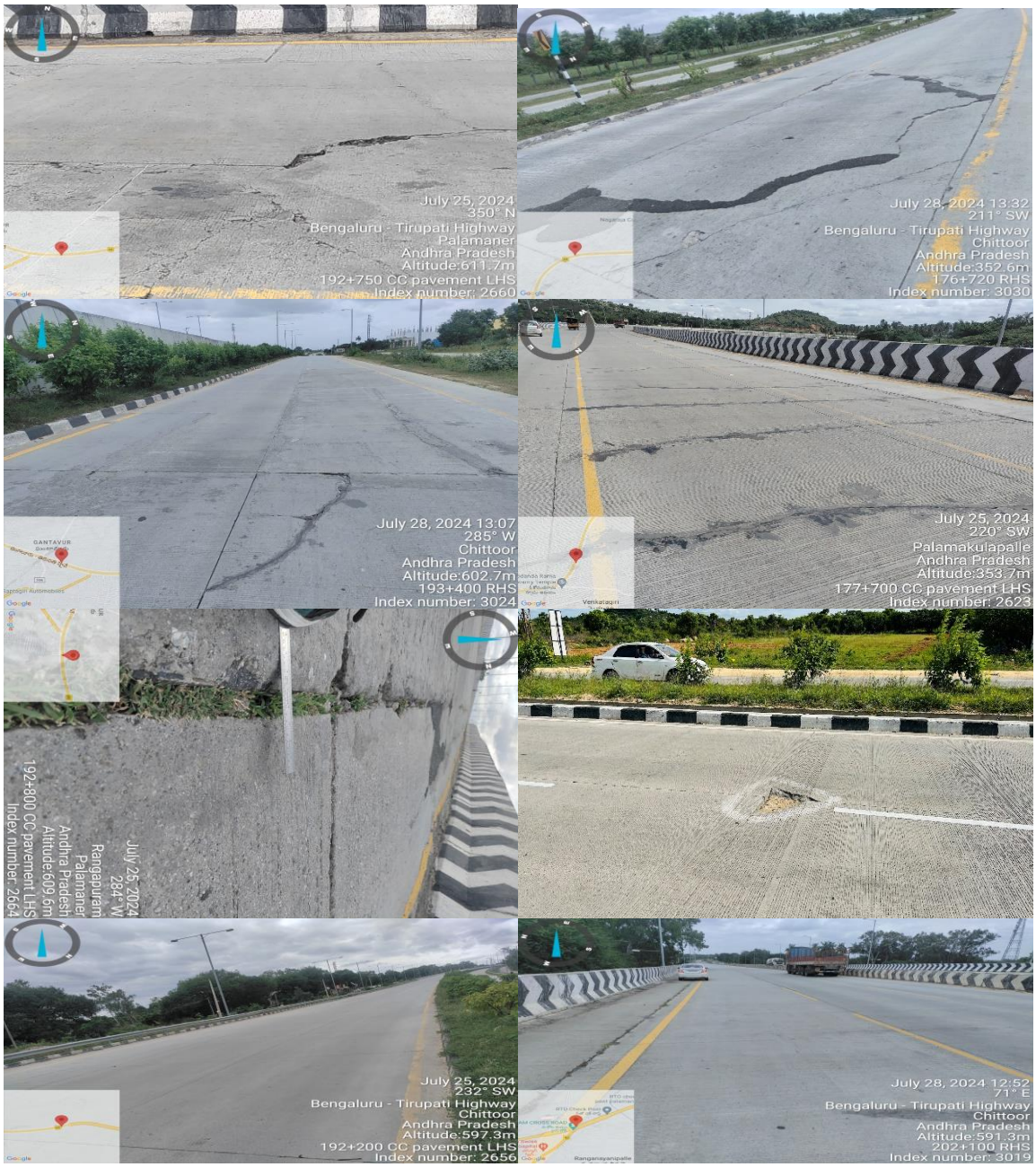

Table 10-7: Service Roads visible condition summary from km 134+890 to km 172+000)

Service Roads visual pavement condition summary					
LHS Direction					
From	**To**	**Length**	**Condition**	**Distress Type**	**Remarks**
135.680	136.860	1.180			Service road Under Construction
154.500	156.150	1.650			Service road Under Construction
141.240	142.100	0.860	Good	No Major Distress	
158.880	159.840	0.960			Service road Under Construction
160.450	160.650	0.200			Service road Under Construction
167.800	168.000	0.200			Service road Under Construction
RHS Direction					
From	**To**	**Length**	**Condition**	**Distress Type**	**Remarks**
160.620	160.360	0.260			Service road Under Construction
159.830	159.320	0.510			Service road Under Construction
159.300	158.120	1.180			Service road Under Construction
157.650	154.500	3.150			Service road Under Construction
136.860	135.680	1.180			Service road Under Construction

Nalagampalli to AP/KN Border (km 172+000 to km 219+687) - 4 Lane Section

Main Carrigeway:

- Due to structural issues, the sections has many corner breaks.
- Major bridges have wearing surface issues, it is in Fair to Poor condition, and majorly tapered lane, faulting, joints are opening, along with plant saplings growing in the joint gaps.
- Lot of sealed cracks are observed.
- Section where we have the deceleration lanes at the junctions for the Mainline carriageway the joint opening is more common.
- In both directions, failed patch repairs, cracking, pavement dip and joint spalling are observed in the stretch.
- From Km 192+000 to km 219+687, the pavement condition is good in LHS and RHS direction compare to the other section, no major distress are observed.



In structure locations, most of the bridges are damaged. As Dilip buildcon ltd site team verbally stated that, CRRI suggest to do the 50mm DBM & 50mm BC on existing pavement with geogrid membrane below.



Service Roads:

- Few service roads are under construction.
- The overall pavement condition is fair, because few of service roads have major cracks, potholes and ravelling. At structures approaches, pavement is detorated.



The Summary of Service roads visible condition is shwon below in the Table 10-8

Table 10-8: Service Roads visible condition summary from Km 172+000 to Km 219+687

Service Roads visual pavement condition summary

LHS Direction					
From	**To**	**Length**	**Overall Condition**	**Distress Type**	**Remarks**
172.620	180.420	7.800	Fair to Poor	Alligator Cracks & Ravelling,	1. km 173.800 to km 173. 900 Ravelling. 2. km 174.000 to 174.100 alligator cracks 3. km 174.500 to km 174.800 Pavement is damaged. 4. 175.800 to Km 176.100 Delamination and Cracks 5. km 176+800to 177+200 pavement is damaged. 6. Majority of pavement is raveling 7. Start and end of SR, pavement is deteriorated
182.070	184.045	1.975	Good	Ravelling	Ravelling at few locations
192.180	200.531	8.351	Fair to Poor	Alligator Cracks, Ravelling & damaged pavement	1. km 192.160 to km 192.250 Bituminous layers completely damaged 2. km 193.600 to km 193.800 Cracks. 3. Km 195.700 near structure location pavement is damaged. 4. km 195.700 to km 197.900 pavement condition is poor 5. Km 199.200 to km 199.400 Bituminous layers completely damaged. 6. Km 199.480 Pothole. 7. Km 200.100 to km 200.300 near junction raveling is noticed.
200.895	201.000	0.105	Good		
201.750	202.410	0.660	Good to Fair	Ravelling and cracks	1. Start of SR road requires the immediate repairs. 2. In few locations Ravelling and Cracks were observed.
206.100	206.300	0.200	Good		
209.410	210.720	1.310	Fair	Potholes	1. km 209.900 potholes are observed. 2. km 210.000 at VUP pavement condition is poor
211.430	214.450	3.020	Good to Fair	Potholes, Ravelling	1. Service Road starting need to be repair and outer lane pavement is deteriorated. 2. At structure location pavement condition is poor. 3. km 213.700 pavement is damaged.
215.940	216.850	0.910	Good	Ravelling	
218.470	218.800	0.330	Good	Ravelling	
RHS Direction					
From	**To**	**Length**	**Overall Condition**	**Distress Type**	**Remarks**
218.800	218.450	0.350	Good	No Major distress	
216.820	215.940	0.880	Good	No Major distress	
214.430	211.400	3.030	Good	Ravelling & Cracks	at Junction 213+720, condition is not satisfactory
210.700	209.400	1.300	Good	No Major distress	
206.300	206.100	0.200	Good	No Major distress	
202.410	201.770	0.640	Good	No Major distress	

201.000	200.940	0.060	Good	No Major distress	
200.530	192.130	8.400	Good to Fair	Ravelling, Potholes & Cracks	1. Km 197+750 to Km 196+200 the entire section has fully damaged. (Cracks & Potholes) 2. Km 195+200 the culvert approach is fully damaged. 3. Km 194+800 at Junction location raveling was observed. 4. Km 192+300 Pothole was observed.
184.040	182.070	1.970	Good to Fair	No Major distress	at Junction 182+600 condition is not good.
180.420	172.710	7.710	Fair to Poor	Major distresses	1. K m 179+110 to Km 179+050 Dip at the pavement. 2. Km 177+600 to Km 176+850 Pavement condition is poor. (Severe potholes & cracks) 3. Km 174+850 to Km 174+000 pavement has damaged

10.4 Structural Evaluation of Rigid Pavements using FWD (Km 134+890 to Km 219+687)

The structural evaluation was carried out in conformity with IRC: 117-2015, "Guidelines for The Structural Evaluation of Rigid Pavement by Falling Weight Deflectometer (FWD)".

10.4.1 Principle of Rigid pavement evaluation using FWD

Performance of Rigid pavements can be evaluated by applying loads on the pavements that simulate the traffic loading, recording the response to such loading by measuring the deflection under such loads, and analysing these data duly considering the factors influencing the performance such as PQC thickness and Load on the pavement.

Among the equipment available for structural evaluation of pavements, the Falling Weight Deflectometer (FWD) is extensively used worldwide because it simulates, to a large extent, the actual loading conditions of pavement.

The resulting load-deflection data can be interpreted through appropriate analytical techniques, to estimate the modulus of Subgrade reaction. The computed moduli are, in turn used for (i) the Elastic Modulus of Concrete and the Strength of Concrete (ii) the Flexural strength of the concrete slab of in-service pavements (iii) determination of Strengthening requirement, in the presence of voids if the deflections are much higher than normal and (iv) evaluation of different rehabilitation alternatives (Slab replacement etc.)

Structural evaluation exercise also includes Load transfer Efficiency at the transverse and longitudinal joints, (i) determination of Strengthening requirement, if any and (ii) evaluation of different rehabilitation alternatives (Retrofitting of Joints etc.)

10.4.2 Testing procedure & Methodology for Rigid pavements:

The detailed test methodology and procedure was described in IRC: 117-2015 "Guidelines for Structural Evaluation and Strengthening of Rigid Road Pavements Using Falling Weight Deflectometer (FWD) Technique". Deflection measurement points were taken as per the existing pavement condition. In adherence to the same, structural evaluation of the existing 'pavement and subgrade system' by measuring its response in terms of deflection. The survey was carried out using FWD for the project from 29/07/2024 to 01/08/2024.

Evaluation of pavement structural strength would be carried out in accordance with requirements of TOR and IRC: 117-2015.

(a) Testing Equipment

The equipment used for the testing is:

- DYNATEST 8002 FWD (for 4- Lane section) Vehicle Mounted Falling Weight Deflectometer with 1 loading plate and 7 numbers of geophones placed at the spacing of 0, 300, 600, 900, 1200, 1500 and 1800mm from the centre of the loading plate.
- GPS, Air Temperature and Pavement Surface Temperature sensors as part of the FWD instrument.
- Red flags and red cones and flashing lamps for traffic arrangement.

(b) Testing Frequency – as per IRC:117-2015

FWD deflection data may be collected at interiors, corners, transverse joints, and longitudinal joints, in the outer lanes at 500 m intervals. Heavy loads travel mostly in outer lanes and very often greater distresses also are found in the outer lanes. If there are distresses in the inner lanes also FWD test should be done in those lanes.

(c) Loading Positions – as per IRC:117-2015

The loading positions are presented in Figure 10-4**.**

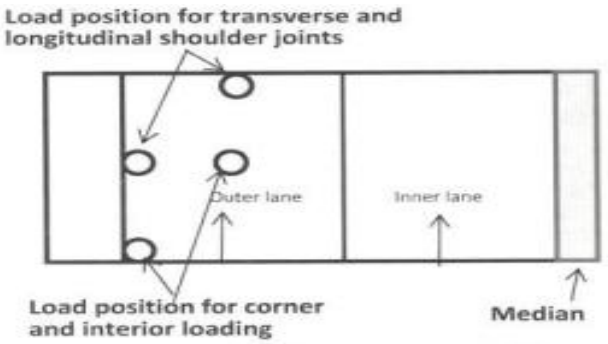


Figure 10-4: Load Positions for Corner, Interior, Transverse and Longitudinal Shoulder Joints

10.5 FWD Deflections points & measurement -Rigid pavement

As it is specified in IRC:117-2015 FWD deflection measurement has carried out for Corner, Interior, Transverse Joint and Longitudinal joint in the outer lane at an interval of 500 m. At every measurement location, four drops were made, such that the first drop was the 'seating drop' and with the remaining three drops deflections were recorded.

The following steps are carried out for measuring deflections at a test point:

i. Mark the test point on the pavement

ii. Centre the load plate over the test point

iii. Lower the loading plate onto the pavement ensuring there should be no standing water on the pavement surface. The loading plate should be in proper contact with pavement surface. The longitudinal and transverse slope of the pavement should not exceed 10 percent at the test location.

iv. Lower the frame holding the geophones so that the transducers are in contact with pavement surface.

v. The target peak load in the range of 40 kN to 60 kN or higher may be applied on concrete pavements to get a reasonable deflection. Since pavements of major highways are very stiff and a higher load may be required to get a deflection of about 0.15 mm.

vi. Drop one seating load, load and deflection data for which need not be recorded.

vii. Raise the mass and drop. Record the load and deflection data into the computer through data acquisition system. While peak load and peak deflections at different selected radial positions must be recorded. At least 2 drops should be made at one location for precision.

viii. If, during previous 2 steps, the deflections measured are giving variations or the deflections/load pulses are not proper, repeat the drop.

ix. Raise the geophone frame and load plate and move to the next test location.

x. Deflection measurements should not be made when the pavement temperature is more than 40°C.

Testing photographs of FWD test on rigid pavement at some locations are shown in Figure 10-5**.**



Figure 10-5: Photographs showing FWD survey under progress (Rigid Pavement)

10.6 Rigid pavement composition and Pavement condition

The adopted PQC crust thickness during construction stage is considered for analysis and the same is presented in below Table 10-9**.**

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Table 10-9: Average PQC crust thickness

Section	Chainages	Average PQC thickness in mm	
		LHS	RHS
AP/TN Border to Nalagampalli	(Km 134+890 to Km 172+000)	305	296
Nalagampalli to AP/KN Border	(Km 172+000 to Km 219+687)	276	276

10.7 Rigid pavement composition and Pavement condition

a) Processing of Area and Deflection data.

The FWD test should be done at 0mm, 300mm, 600mm, 900mm radial distances from the center of loading point should be measured.

The area of Deflection basin is calculated by

$$A=6(1+2(D_1/D_0)+2(D_2/D_0)+(D_3/D_0))$$

Where,

A=Area parameter of the deflection basin

D_0=Deflection at center of the loading plate in mm

D_1= Deflection in mm at 300mm from center of the loading plate

D_2= Deflection in mm at 600mm from center of the loading plate

D_3= Deflection in mm at 900mm from center of the loading plate

From the area of deflection basin, Radius of relativeness (l) can be evaluated from the charts given in IRC: 117 (Appendix V) and the normalized deflections are found.

b) Evaluation of Subgrade Modulus, Elastic Modulus of concrete, Strength of concrete, Flexural Strength of concrete.

Subgrade moduli value can be found for normalized deflections and average of all should be taken as subgrade modulus.

$$k_i = \frac{Pd_i}{l^2 D_i}$$

Where,

i=1,2,3,4

l=Radius of relative stiffness, mm

P=Load in KN

D_i=Measured deflections in mm at various radial distance

d_i=Normalized deflections in mm at various radial distances

Elastic Modulus (MPa) of concrete can be found by using the formulae

$$E_c = \frac{12(1-\mu_c)kl^4}{1000h^3}$$

Where,

μ_c= Poisson's Ratio of Concrete

h= Thickness of concrete layer in mm

l= Radius of relative stiffness in mm

k=modulus of subgrade reaction in MPa/m

E= Elastic modulus of concrete, MPa

Strength of concrete can be determined from the E_C from the following,

$$f_c = \sqrt{\left(\frac{E_C}{5000}\right)}$$

Flexural strength can be determined from the f_c of the concrete slab as given below:

$$f_{mr} = 0.7\sqrt{f_c}$$

Poisson's ratio for different layers i.e., 0.15 for concrete and 0.45 for subgrade.

c) Evaluation of Load Transfer Efficiency of Joints

Transverse as well as longitudinal joints deteriorate with traffic due to continuous loading. For a new pavement, the joint efficiency is nearly 100 percent since the deflections on either side of the joint under a wheel load are almost equal and the ratio decreases as the joints deteriorate under repeated loading.

When deflection sensors are the either side of a joint with deflections D1 and D2 on the loaded and unloaded sides. Deflections on the Loaded and Unloaded side at a Joint is presented in Figure 10-6.

$$LTE = 100\left(\frac{D_2}{D_1}\right)$$

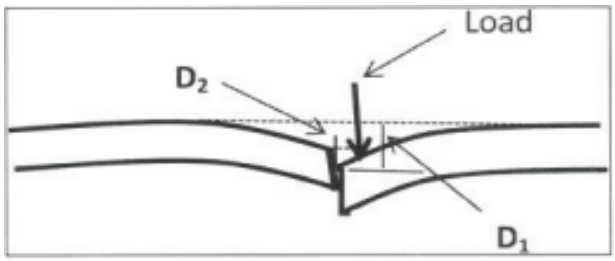


Figure 10-6: Deflections on the Loaded and Unloaded side at a Joint

For a new pavement, $D_1 = D_2$ but D_2 becomes less and less as the joints deteriorate.

If $D_2/D_1 < 0.5$ transverse joints in critical condition

If $D_2/D_1 < 0.4$ longitudinal joints in critical condition

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D_1 is the deflection on the loaded side of the slab

& D_2 is the deflection on the unloaded side of the slab

10.8 Analysis of Rigid pavements

As per IRC: 117-2015, the rigid pavement analysis was carried out to determine the following PQC parameters.

- Evaluation of subgrade modulus, elastic modulus of concrete and flexural strength of concrete pavement.
- Detection of possible locations of voids underneath the rigid pavement
- Load Transfer Efficiency (LTE) of Joints (%)

The detailed analysis of PQC parameters and Load Transfer Efficiency of the rigid pavement are presented in Annexure 10.4 and Annexure 10.5 for AP/TN border to Nalagampalli and Nalagampalli to AP/KN border respectively.

10.8.1 Observations and findings

From the obtained test results the observations where draw-down. The range of Elastic Modulus and percentage of length is specified in Table 10-10 below;

Table 10-10: The range of Elastic Modulus and percentage of Project Road

Pavement Layer	Range	Percentage of Project Road				Percentage of Project Road			
		NH,4 Section from AP/TN Border to Nalagampalli: Km 134+890 to Km 172+000				NH,4 Section from Nalagampalli to AP/KN Border: Km 172+000 to Km219+687			
		LHS		RHS		LHS		RHS	
		Interior	Interior & Corner	Interior	Interior & Corner	Interior	Interior & Corner	Interior	Interior & Corner
Elastic Modulus of PQC Layer (MPa)	> 30000	66.1%	67.7%	54.5%	57.6%	81.9%	66.7%	67.9%	69.1%
	30000 - 25000	12.9%	12.1%	12.1%	10.6%	6.9%	11.1%	11.1%	8.6%
	25000 - 20000	16.1%	12.1%	16.7%	16.7%	8.3%	18.8%	14.8%	14.2%
	20000 - 10000	4.8%	8.1%	16.7%	15.2%	2.8%	2.8%	6.2%	8.0%
	< 10000	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%
Flexural Strength of PQC Layer (MPa)	> 4.5	41.9%	41.9%	43.9%	35.6%	72.2%	59.0%	60.5%	59.9%
	4.5 - 3.5	37.1%	37.9%	22.7%	32.6%	16.7%	18.8%	18.5%	17.9%
	3.5 - 2.5	16.1%	12.9%	22.7%	22.7%	9.7%	20.1%	18.5%	16.0%
	<2.5	4.8%	7.3%	10.6%	9.1%	1.4%	2.1%	2.5%	6.2%
Modulus of Subgrade Reaction, k (MPa/m)	> 55 (Equivalent CBR > 10%)	40.3%	29.8%	50.0%	37.1%	33.3%	35.4%	59.3%	57.4%
	55 to 50.3 (Equivalent CBR > 8-10%)	11.3%	9.7%	12.1%	9.8%	5.6%	9.0%	9.9%	9.9%
	< 50.3 (Equivalent CBR < 8%)	48.4%	60.5%	37.9%	53.0%	61.1%	55.6%	30.9%	32.7%

Further, the Elastic modulus, Flexural strength and LTE is assessed, and the summary of details are presented in Table 10-11 below.

Table 10-11: Summary of Obtained Rigid Pavement Parameters

Section	Direction	Elastic Modulus (MPa) of PQC > 30000 MPa		Flexural Strength of PQC > 4.5 MPa		TRANSVERSE JOINT		LONGITUDINAL JOINT	
						Load Transfer Efficiency (LTE)			
		Interior	Interior & Corner	Interior	Interior & Corner	>80%	<50%	>80%	<40%
NH,4 Section from AP/TN Border to Nalagampalli: Km 134+890 to Km 172+000	LHS	66.1%	67.7%	41.9%	41.9%	93.5%	0.0%	98.4%	0.0%
	RHS	54.5%	57.6%	43.9%	35.6%	90.9%	0.0%	93.9%	0.0%
NH,4 Section from Nalagampalli to AP/KN Border: Km 172+000 to Km219+687	LHS	81.9%	66.7%	72.2%	59.0%	98.6%	0.0%	100.0%	0.0%
	RHS	67.9%	69.1%	60.5%	59.9%	96.3%	0.0%	87.7%	0.0%

10.8.2 Possible air voids underneath of the pavement

Table 10-12: Possible air Voids underneath of the Rigid Pavement

Section	Parameter	Air Voids (Interior)		Air Voids (Corner)	
		LHS	RHS	LHS	RHS
NH,4 Section from AP/TN Border to Nalagampalli: Km 134+890 to Km 172+000	Average deflection (in Micron)	175.1	178.4	196.4	194.3
	Panels with Air Voids %	1.61%	3.03%	0.00%	6.06%
NH,4 Section from Nalagampalli to AP/KN Border: Km 172+000 to Km219+687	Average deflection (in Micron)	180.1	171.9	202.5	184.9
	Panels with Air Voids %	2.78%	6.17%	1.39%	2.47%

**To analyze the locations of possible air voids, statistical quartile outlier concept is used. Based on this analysis method in LHS direction the deflection more than 253.28 microns & deflection more than 244.13 micron in RHS direction for Interior, and deflection more than 290.14 microns in LHS direction & deflection more than 253.27 microns in RHS direction for Corner was considered as air voids under panels in AP/TN Border to Nalagampalli Section. In Nalagampalli to AP/KN Border Section the deflection more than 251.86 microns in LHS direction & deflection more than 208.16 microns in RHS direction for Interior, and deflection more than 269.01 microns in LHS direction & deflection more than 231.17 microns in RHS direction for Corner was considered as air voids under panels.*

Observations:

NH-4 AP/TN Border to Nalagampalli (Km 134+890 to Km 172+000):

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- From the above, it is understood that around 66.10% of testing points in LHS direction and around 54.50% of testing points in RHS direction of the rigid pavement having E value >30000 MPa in Main Carriage way.
- Similarly, around 41.90% of testing points in LHS direction and 43.90% of testing points in RHS direction of the of the rigid pavement having flexural strength >4.5Mpa in Main Carriage way.
- Load Transfer Efficiency (LTE) for Transverse joints and Longitudinal joints is more than 50% for both LHS & RHS direction for Main Carriage way.

NH-4 Nalagampalli to AP/KN Border (Km 172+000 to Km 219+687):

- From the above, it is understood that around 81.90% of testing points in LHS direction and around 67.90% of testing points in RHS direction of the rigid pavement having E value >30000 MPa in Main Carriage way.
- Similarly, around 72.20% of testing points in LHS direction and 60.50% of testing points in RHS direction of the of the rigid pavement having flexural strength >4.5MPa in Main Carriage way.
- Load Transfer Efficiency (LTE) for Transverse joints and Longitudinal joints is more than 50% for both LHS & RHS direction for Main Carriage way.

10.9 Traffic Survey and Analysis

Axle load survey of 7 days has been conducted at Toll Plaza Locations. The AADT and growth rates required for the further computations are provided by the client.

10.9.1 Annual Average Daily Traffic

The Annual Average Daily Traffic (AADT) in the FY 2025 are presented in Table 10-13**.**

Table 10-13: AADT of commercial class vehicles at toll plaza locations for both directions (year 2024-2025)

Location/ Vehicle Type	BUS	LCV	2-axle	3-axle	MAV
Mahasamudram Toll Plaza (km 164+250)- 4 lane section)	1088	1143	1420	748	1400

*For MSA calculation purposes, a direction distribution of 50% is considered for both LHS and RHS direction.

10.9.2 Vehicle Damage Factor

The axle load survey was conducted at toll plaza locations (Km 164+250: Mahasamudram toll plaza); the number of equivalent 8.16 t standard axles for the different categories of commercial vehicles have been determined on the basis of the axle load surveys.

The equations for computing equivalency factor for single, tandem and tridem axles given below is used as directed in the IRC: 37-2018 for converting different axle load repetitions into equivalent standard axle load repetitions.

- Single axle with single wheel on either side = {axle load in kN / 65}^{4}
- Single axle with dual wheel on either side = {axle load in kN / 80}^{4}
- Tandem axle with single wheel on either side = {axle load in kN /148}^{4}
- Tridem axle with dual wheel on either side = {axle load in kN /224}^{4}

Referring to section 4.4.3 of IRC 37-2018, some tandem axles have only one (single) wheel on each side of the axle. In such cases, each axle of the tandem axle set may be considered as two separate

single axles (with single wheels). Similarly, if the axle spectrum has a tridem axle with single wheels, it may be considered as three separate single axles having single wheels.

VDF values are obtained as per the analysis of 7 days axle load surveys are presented in Annexure 10.4 for Mahasamudram toll plaza Annexure, the summary presented in Table 10-14. The sample photographs axle load survey is shown in Figure 10-7.

Table 10-14: Summary of Vehicle Damage Factor (VDF)

Location/ Vehicle Type		BUS	LCV	2axle	3axle	MAV
NH-4: (Mahasamudram Toll Plaza-164+250)	LHS	1.085	0.633	2.901	4.402	10.017
	RHS	1.080	0.688	2.598	4.926	8.115

In the rigid pavement section from AP/TN border to AP/KN border no overlay requirement is analysed in general, hence no MSA calculations are done in this section.



Figure 10-7: Photographs showing Axle load Survey

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11. DEVELOPMENT OF O&M STRATEGY

11.1 General

The Concessionaire is responsible for Operation & Maintenance of the Project Highway in accordance with the provisions of Article-14 of the EPC Agreement for 4-lane section.

11.2 Salient Features

The important salient features in terms of project dates pertaining to project are provided in Table 3-1 of this report.

11.3 Review of EPC Agreement and Pavement Design report of AP/TN border to Nalagampalli (Km 134+890 to Km 172+000)

11.3.1 EPC Agreement: Gayatri Projects Limited (GPL)- YR 2017

Schedule-B of Concession Agreement is a mandatory requirement prior to any formulation of design to be applied to the project during the execution. The following details in CA are summarized below.

a. Type of Carriageway:

- Rigid Pavement was proposed for main carriageway for entire section and flexible pavement for service roads.

b. Design Traffic (MSA):

- The contractor shall design the pavement for design traffic of 2584 CVPD for section km 134+890 to km 141+000 and 8265 CVPD for section km 141+000 to km 172+000.

c. Design Period:

- Rigid pavement is designed for minimum design period of 30years, and flexible pavement designed for 15 years, and stage construction is not allowed.

d. Design CBR:

- Minimum design CBR is not specified.

e. Minimum Crust Thicknesses:

- The minimum crust composition given is detailed in the table below.

Description	From km 134+890 to km 141+000	From km 141+000 to km 172+000
CVPD	2584	8265
PQC Slab M40 Grade (mm)	300	320
DLC (mm)	150	150
GSB (mm)	150	150

f. Specifications and Standards for the project:

- As per Schedule-D "Manual of specifications and standards for four laning of highway through PPP IRC: SP: 84-2014".

g. Maintenance requirements:

- The concessionaire shall maintain the roughness value of 2200mm/km, set forth in Schedule E (the "Maintenance Requirements")

Observations on schedules B/D/E:

- Minimum CBR value was not specified in the Schedules. Hence, concessionaire has an opportunity to explore good borrow areas and utilize the soils with good CBR value.
- Schedule -D has specified that the design standards of the project shall be in accordance with 'Manual of Specifications and Standards for Four Laning of National Highways through Public Private Partnership (IRC: SP: 84-2014)'.
- In Schedule -E, it has specified the intervention of concessionaire when the roughness value exceeds 2200 mm/km.

11.3.2 Review of Pavement Design Report - YR 2018 (GPL)

Pavement Design Report (PDR) of 'Four Laning of AP/TN border to Nalagampalli of NH-4 from Km 134.890 to Km 158.800 in the state of Andhra Pradesh' describes the basis and design for pavement for main road. The existing road is with rigid pavement in main carriageway and flexible in service-roads.

a) Design life of Pavement

- Main carriageway is designed for 30 years, and flexible pavement is designed for 15 years design period.

b) Design traffic

- EPC Contractor conducts the CVC survey and axle load survey (24hrs) at km 135+000 and km 146+000.
- Based on traffic survey at km 135+000 CVPD of 2986 and km 146+000 CVPD of 9551 is obtained, same is considered for the design purposes
- A design traffic of 10msa has been considered for the service roads.

c) Design CBR

- For the design purposes 10% CBR was adopted.

d) Pavement Composition

As per the pavement design report, EPC contractor has divided the project stretch as two homogenous sections. The design pavement crust thickness of main carriageway is presented in Table 11-1 and service roads is presented in Table 11-2.

Table 11-1: Design thicknesses of main carriageway

Description	km 134+890 to km 141+000	km 141+000 to km 172+000
Panel Size	4.5m x 4.0m, 4.5m x 3.5m with 1.5m tied shoulder	
CVPD	2986	9551
PQC Slab M40 Grade (mm)	300	320
DLC (mm)	150	150
GSB (mm)	150	150
Dowel bar		
Dia (mm)	32	32
Length (mm)	450	450
Spacing (mm)	300	300
Tie bar		
Dia (mm)	12	12
Length (mm)	640	640
Spacing (mm)	460	430

Table 11-2: Design thicknesses of service roads

Description	Thickness in mm
BC (mm)	40
DBM (mm)	60
WMM (mm)	250
GSB (mm)	200

Observations on PDR (Pavement Design Report):

- Minimum CBR was not specified in agreement. Hence, contractor adopted a design CBR of 10%.
- The CVPD mentioned in schedule is less than the CVPD obtained from traffic survey, hence contractor considered the maximum CVPD for design proposes.
- The Rigid pavement was designed according to IRC:58-2015, and the design was cross-verified and found to be satisfactory.

11.3.3 EPC Agreement: SD Infra -YR 2023

Schedule-B of Concession Agreement is a mandatory requirement prior to any formulation of design to be applied to the project during the execution.

a. Type of Carriageway:

- The pavement shall be flexible for entire project highway except for widening of existing road where rigid pavement shall be provided.

b. Design Traffic (MSA):

- The contractor shall design for minimum design traffic of 50msa for main carriageway and 10msa for service roads. For widening portions, crust composition of existing pavement shall be adopted.

c. Design Period:

- The flexible pavement shall be designed for minimum design period of 20 years and rigid pavement is 30 years. Stage construction is not allowed.

d. Design CBR:

- Minimum design CBR was not specified.

e. Minimum Crust Thickness:

- The minimum crust composition was also not specified.

f. Specifications and Standards for the project:

- As per Schedule-D "Manual of specifications and standards for four laning of highway through IRC: SP: 84-2019".

g. Maintenance requirements:

The concessionaire shall procure that at all times during the Operation Period, the Project Highway conforms to the maintenance requirements set forth in Schedule E (the "Maintenance Requirements")

Schedule E of the Agreement is represented in Table 11-3***.***

Repair / Rectification of Defects and deficiencies specified in Schedule E within time limit set forth hereunder.

Table 11-3: Maintenance requirement with timelines

a) Flexible Pavement

Assert Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/ Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specification
		Desirable	Acceptable					
Flexible Pavement (Pavement of MCW, Service Road, approaches of Grade structure, approaches of connecting roads, slip roads, lay byes etc. as applicable)	Potholes	Nil	<0.1 % of area and subject to limit of 10 mm in depth	Daily	Length Measurement Unit like Scale, Tape, Odometer etc.	IRC:82-2015 and Distress Identification Manual for Long Term Pavement Performance Program, FHWA 2003	24-48 hours	MORT&H Specification 3004.2
	Cracking	Nil	<5 % subject to limit of 0.5 sqm for any 50m length	Daily			7-15 days	MORT&H Specification 3004.3
	Rutting	Nil	<5mm	Daily	Straight Edge		15-30 days	MORT&H Specification 3004.2
	Corrugations and Shoving	Nil	<0.1 % of area	Daily	Length Measurement Unit like Scale, Tape, Odometer etc.		3-7 days	IRC:82-2015
	Bleeding	Nil	<1 % of area	Daily			3-7 days	MORT&H Specification 3004.4
	Ravelling/Stripping	Nil	<1 % of area	Daily			7-15 days	IRC 82-2015 read with IRC Sp-81
	Edge Deformation / Breaking	Nil	<1m for any 100m section and width <0.1m at any location, restricted to 30cm from the edge	Daily			7-15 days	IRC 82-2015
	Roughness BI	2000mm/Km	2400mm/Km	Bi-Annually	Class 1 Profilometer SCRIM (Sideway-force Coefficient Routine Investigation Machine or equivalent)	Class 1 Profilometer: ASTM E950(98):2004- Standard Test Method for measuring Longitudinal Profile of Travelled Surfaces with Accelerometer Established Inertial Profiling	180 days	IRC 82-2015
	Skid Number	60SN	50SN	Bi-Annually			180 days	IRC 7941-1:2006

Assert Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/ Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specification
		Desirable	Acceptable					
						Reference ASTM E1656-94:2000. Standard Guide for Classification of Automatic Pavement Condition Survey		
	Pavement Condition Index	3	2.1	Bi-Annually			180 days	IRC 82-2015
	Other Pavement Distresses			Bi-Annually			2-7 days	IRC:82-2015
	Deflection/ Remaining Life			Annually	Falling Weight Deflectometer	IRC 115:2014	180 days	IRC:115-2014
Rigid Pavement (Pavement of MCW, Service	Roughness BI	2200mm/km	2400mm/km	Bi-Annually	Class I Profilometer	ASTM E950 (98):2004 and ASTM E1656-94:2000	180 days	IRC: SP:83-2008

Assert Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/ Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specification
		Desirable	Acceptable					
Road, Grade structure, approaches of connecting roads, slip roads, lay byes etc. as applicable)	Skid	Skid Resistance no. at different speed of vehicles		Bi-Annually	SCRIM (Sideway-force Coefficient Routine Investigation Machine or equivalent)	IRC: SP:83-2008	180 days	IRC: SP:83-2008
		Minium SN / Traffic Speed (km/h): 36 / 50; 33 / 65; 32 / 80; 31 / 95; 31 / 110			Coefficient Routine Investigation Machine or equivalent)			
Embankment/ Slope	Edge drop at shoulders	Nil	40mm	Daily	Length Measurement Unit Like Scale, Tape, odometer etc.	IRC	7-15 days	MORT&H Specification 408.4
	Slope of camber/ cross fall	Nil	<2% variation in prescribed slope of camber/ cross fall	Daily			7-15 days	MORT&H Specification 408.4
	Embankment Slopes	Nil	<15% variation in prescribe side slope	Daily			7-15 days	MORT&H Specification 408.4
	Embankment Protection	Nil	Nil	Daily	NA		7-15 days	MORT&H Specification
	Rain Cuts/ Gullies in slope	Nil	Nil	Daily Specially During Rainy Season	NA		7-15 days	MORT&H Specification

b) Rigid Pavement

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
1	Cracking					
		w = width of crack, L = length of crack, d =	0	Nil not discernible	No Action	Not Applicable
			1	w < 0.2 mm. hair cracks		

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
	Single Discrete Cracks Not intersecting with any joint	depth of crack, D = depth of slab	2	w = 0.2 - 0.5 mm, discernible from slow-moving car	Seal without delay	Seal and stitch if L > 1m. Within 7 days
			3	w = 0.5 - 1.5 mm, discernible from fast-moving car		
			4	w = 1.5 - 3.0 mm	Seal and stitch if L > 1m. Within 7 days	retrofit, FDR for affected portion within 15 days
			5	w > 3 mm.		
2	Single Transverse (or Diagonal) Crack intersecting with one or more joints	w = width of crack, L = length of crack, d = depth of crack, D = depth of slab	0	Nil, not discernible	No Action	
			1	w < 0.2 mm, hair cracks	Route and seal with epoxy. Within 7 days	Staple or dowel bar retrofit. Within 15 days
			2	w = 0.2 - 0.5 mm, discernible from slow vehicle		
			3	w = 0.5 - 3.0 mm, discernible from fast vehicle	Route, Seal, and stitch, if L > 1m. Within 7 days	
			4	w = 3.0 - 6.0 mm	Dowel bar Retrofit Within 15 days	Dismantle and reconstruct affected portion with norms and specifications see para 5.5 & 9.2 Within 15 days
			5	w > 6 mm, usually associated with spalling, and/ or slab rocking under traffic	Not Applicable as it may be full depth	
3	Single Longitudinal Crack intersecting with one or more joints	w = width of crack, L = length of crack, d = depth of crack, D = depth of slab	0	Nil, not discernible	No Action	
			1	w < 0.5 mm, discern able from slow moving vehicle	Seal with epoxy if L > 1m. Within 7 days	Staple or dowel bar retrofit. Within 15 days
			2	w = 0.5 - 3.0 mm, discernible from fast vehicle	Route, Seal and stitch, if L > 1m. Within 15 days	-
			3	w = 3.0 - 6.0 mm	Staple, if L > 1m. Within 15 days	Partial Depth Repair with stapling. Within 15 days
			4	w = 6.0 - 12.0 mm, usually associated with spalling	Not Applicable as it may be full depth	
			5	w > 12 mm, usually associated with spalling, and/or slab rocking under traffic		Full Depth Repair Dismantle and reconstruct affected portion as per norms

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
						and specifications see para 5.6.4
4	Multiple Cracks intersecting with one or more joints or cracks	w = width of crack	0	Nil, not discernible	No Action	-
			1	w < 0.2 mm, hair cracks	Seal, and stitch if L > 1m. Within 15 days	
			2	w = 0.2 - 0.5 mm. discernible from slow vehicle		
			3	w = 0.5 - 3.0 mm, discernible from fast vehicle	Full depth repair within 15 days	Dismantle, Reinstate subbase, Reconstruct whole slab as per specification within 30 days
			4	w = 3.0 - 6.0 mm panel broken into 2 or 3 pieces		
			5	w > 6 mm and/or panel broken into more than 4 pieces		
5	Corner Break	w = width of crack, L = length of crack	0	Nil, not discernible	No Action	-
			1	w < 0.5 mm; only 1 corner broken	Seal with low viscosity epoxy to secure broken parts Within 7 days	Seal with epoxy Within 7 days
			2	w < 1.5 mm; L < 0.6 m, only one corner broken		
			3	w < 1.5 mm; L < 0.6 m, two corners broken	Partial Depth (Refer Fig 8.3 of IRC: SP: 83:2008) Within 15 days	Full depth repair
			4	w > 1.5 mm; L > 0.6 m or three corners broken		
			5	three or four corners broken		Reinstate sub-base, and reconstruct the slab as per norms and specifications
6	Punchout (Applicable to Continuous Reinforced Concrete Pavement (CRCP) only)	w = width of crack, L = length (m/m2)	0	Nil, not discernible	-	No Action
			1	w < 0.5 mm; L < 3 m/m2	Not Applicable as it may be full depth	Seal with low viscosity epoxy to secure broken parts. Within 15 days
			2	either w > 0.5 mm or L < 3 m/m2		
			3	w > 1.5 mm and L < 3 m/m2		
			4	w > 3 mm, L < 3 m/m2 and deformation		Full depth repair - Cut out and replace damaged area taking care not to damage reinforcement. Within 30 days
			5	w > 3 mm, L > 3 m/m2 and deformation		

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
Surface Defects						
7	Ravelling or Honeycomb type surface	r = area damaged surface / total surface of slab (%) h = maximum depth of damage	0	Nil, not discernible	Short Term No action.	Long Term Not Applicable
			1	r < 2 %	Local repair of areas damaged and liable to damage. Within 15 days	
			2	r = 2 - 10 %		
			3	r = 10-25%	Bonded Inlay 2 or 3 slabs if affecting. Within 30 days	
			4	r = 25 - 50 %		
			5	r > 50% and h > 25 mm	Reconstruct slabs 4 or more slabs if affecting. Within 30 days	
8	Scaling	r = damaged surface / total surface of slab (%) h = maximum depth of damage	0	Nil, not discernible	Short Term No action.	Long Term Not Applicable
			1	r < 2 %	Local repair of areas damaged and liable to be damaged. Within 7 days	
			2	r = 2 - 10 %		
			3	r = 10 - 20%	Bonded Inlay Within 15 days	
			4	r = 20 - 30 %		
			5	r > 30 % and h > 25 mm	Reconstruct slab Within 30 days	
9	Polished Surface/ Glazing	t = texture depth, sand patch test	0		No action.	
			1	t > 1 mm		
			2	t = 1 - 0.6 mm	Monitor rate of deterioration	
			3	t = 0.6 - 0.3 mm		
			4	t = 0.3 - 0.1 mm		
			5	t < 0.1 mm	Diamond Grinding if affecting 50% or more slabs in a continuous stretch of minimum 5 km. Within 30 days	
10	Popout (Small Hole), Pothole Refer Para 8.4	n = number / m2, d = diameter, h = maximum depth	0	d < 50 mm; h < 25 mm; n < 1 per 5 m2	No action.	Not Applicable
			1	d = 50 - 100 mm: h < 50 mm; n < 1 per 5 m2	Partial depth repair 65 mm deep Within 15 days	
			2	d = 50 - 100 mm; h > 50 mm; n < 1 per 5 m2		
			3	d = 100 - 300 mm; h < 100 mm n < 1 per 5 m2	Partial depth repair 110mm i.e 10 mm more than the depth of the hole. Within 30 days	
			4	d = 100 - 300 mm; h > 100 mm; n < 1 per 5 m2		

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
			5	d > 300 mm; h > 100 mm: n > 1 per 5 m2	Full depth repair. Within 30 days	
Joint Defect						
11	Joint Seal Defects	loss or damage L = Length as % total joint length	0	Difficult to discern.	Short Term No action.	Long Term Not Applicable
			1	Discernible, L< 25% but of little immediate consequence with regard to ingress of water or trapping incompressible material.	Clean joint, inspect later.	
			2			
			3	Notable. L > 25% insufficient protection against ingress of water and trapping incompressible material.	Clean and reapply sealant in selected locations. Within 7 days	
			4			
			5	Severe; w > 3 mm negligible protection against ingress of water and trapping incompressible material.	Clean, widen and reseal the joint. Within 7 days	
12	Spalling of Joints	w = width on either side of the joint, L = length of spalled portion (as % joint length)	0	Nil, not discernible	No action.	Not Applicable
			1	w < 10 mm	Apply low viscosity epoxy resin/ mortar in cracked portion Within 7 days	
			2	w = 10 - 20 mm, L < 25%		
			3	w = 20 - 40 mm, L > 25%	Partial Depth Repair Within 15 days	
			4	w = 40 - 80 mm, L > 25%	30-50 mm deep, h= w + 20% of w Within 30 days	
			5	w > 80 mm, and L > 25%	50 - 100 mm deep repair. H = w + 20% of w Within 30 days	
13	Faulting (or Stepping) in Cracks or Joints	f = difference of level	0	not discernible, < 1 mm	No action.	No Action
			1	f < 3 mm		
			2	f = 3 - 6 mm	Determine cause and observe take action for diamond grinding	Replace the slab as appropriate Within 30 days
			3	f = 6 - 12 mm	Diamond Grinding	
			4	f= 12 - 18 mm	Raise sunken slab.	

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
			5	f> 18 mm	Strengthen subgrade and sub-base by grouting, raising sunken slab	Replace the slab as appropriate Within 30 days
14	Blowup or Buckling	h = vertical displacement from normal profile			SHORT TERM	LONG TERM
			0	Nil, not discernible	No action.	
			1	h < 6 mm		
			2	h = 6 - 12 mm	Install Signs to Warn Traffic Within 7 days	
			3	h = 12 - 25 mm		
			4	h > 25 mm	Full Depth Repair Within 30 days	
			5	shattered slabs, i.e 4 or more pieces	Replace broken slabs. Within 30 days	
15	Depression	h = negative vertical displacement from normal profile L =length	0	Not discernible, h < 5 mm	No action.	Not Applicable
			1	h = 5 - 15 mm		
			2	h = 15-30 mm, Nos <20% joints	Install Signs to Warn Traffic within 7 days	
			3	h = 30 - 50 mm		
			4	h > 50 mm or > 20% joints	Strengthen subgrade. Reinstate pavement at normal level if length L < 20 m. within 30 days	
			5	h > 100 mm		
16	Heave	h = positive vertical displacement from normal profile, L = length	0	Not discernible. h < 5 mm	Short Term	Long Term
					No action.	scrabble
			1	h = 5 - 15 mm	Follow up.	
			2	h = 15 - 30 mm, Nos <20% joints	Install Signs to Warn Traffic within 7 days	
			3	h = 30 - 50 mm		
			4	h > 50 mm or > 20% joints	Stabilise subgrade. Reinstate pavement at normal level if length < 20 m. within 30 days	
			5	h > 100 mm		
17	Bump	h = vertical displacement from normal profile	0	h < 4 mm	No action.	
			1	h = 4 - 7 mm	Grind, in case of new construction within 7 days	Construction Limit for New Construction
			2			

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
			3	h = 7 - 15 mm	Grind in case of ongoing maintenance Within 15 days	Replace in case of new construction Within 30 days
			4			
			5	h > 15 mm	Full depth repair Within 30 days	Full depth repair Within 30 days
18	Lane to Shoulder Dropoff	f = difference of level	0	Nil, not discernible < 3mm	SHORT TERM	LONG TERM
					No action.	-
			1	f = 3 - 10 mm	Spot repair of shoulder. Within 7 days	-
			2	f = 10 - 25 mm		-
			3	f = 25 - 50 mm	Fill up shoulder Within 7 days	-
			4	f = 50 - 75 mm		For any 100 m stretch Reconstruct shoulder, if affecting 25% or more of stretch Within 30 days
			5	f > 75 mm		
Drainage						
19	Pumping	Quantity of fines and water expelled through open joints and cracks Nos	0	not discernible	No Action	
			1 to 2	Slight/occasional Nos < 10%	Repair cracks and joints without delay	Inspect and repair sub-drainage at distressed sections and upstream.
			3 to 4	Appreciable/ Frequent 10-25%	Lift or jack slab within 30 days	
		Nos/100 m stretch	5	Abundant, crack development >25%	Repair distressed pavement sections. Strengthen subgrade and subbase. Replace slab. Within 30 days	
20	Ponding	Ponding on slabs due to blockage of drains	0-2	No discernible problem	No action	
			3 to 4	Blockages observed in drains, but water flowing	Clean drains etc within 7 days follow up	Action required to stop water damaging foundation within 30 days.
			5	Ponding accumulation of water observed	-do-	

Observations on schedules B/D/E:

- Minimum CBR value was not specified in the Schedules. Hence, concessionaire has an opportunity to explore good borrow areas and utilize the soils with good CBR value.
- Minimum design traffic for main carriageway is specified as 50msa, while for service road it is specified as 10msa.
- Schedule -D has specified that the design standards of the project shall be in accordance with 'Manual of Specifications and Standards for Four Laning of National Highways through Public Private Partnership (IRC: SP:84-2019)'.
- In Schedule -E, it has specified the intervention of concessionaire when the roughness value exceeds 2400 mm/km.

11.3.4 Review of Pavement Design Report- YR 2023 (SD Infra)

Pavement Design Report (PDR) of 'Four Laning of AP/TN border to Nalagampalli of NH-4 from Km 134.890 to Km 172.000 in the state of Andhra Pradesh' describes the basis and design for pavement for main road. The pavement shall be flexible type for entire project highway except for widening of existing road where rigid pavement shall be provided and flexible in service-roads.

a) Design life of Pavement

- The flexible pavement is designed for 20 years and rigid pavement is designed for 30years.

b) Annual Average Daily Traffic (AADT)

- As per PDR, EPC Contractor conducts the traffic survey at km 148+400 in base year 2023, the AADT summary is presented below,

Direction	Mode of Traffic				
	BUS	LCV	2-Axle	3-Axle	MAV
LHS	367	348	306	272	283
LHS	400	256	240	262	317

c) Vehicle Damage Factor (VDF)

- As per PDR, EPC Contractor conducts the traffic survey at km 148+400, the VDF summary is presented below.

Direction	Mode of Traffic				
	BUS	LCV	2-Axle	3-Axle	MAV
LHS	1.181	0.693	3.264	3.019	5.133
LHS	1.665	0.698	3.118	3.197	5.157

d) Design Traffic

- As per PDR, the estimated design traffic of main carriageway is 44msa which is less than the msa specified in schedule-B. Hence, contractor consider a design traffic of 50msa.
- A design traffic of 10msa was considered for service roads.

e) Design CBR

- A design CBR of 10% was consider for flexible pavement in main carriageway.
- A design CBR of 8% was considered for widening of existing rigid pavement sections.
- All service roads are designed for design CBR of 8%.

f) Pavement Composition

As per the pavement design report, the following pavement crust thickness is considered.

Table 11-4: Design thicknesses of flexible pavement (MCW)

Description	From km 134+890 to km 172+000 Thickness in mm
BC (mm)	40
DBM (mm)	105
WMM (mm)	250
GSB (mm)	200

Table 11-5: Design thicknesses of rigid pavement (MCW)

Description	Details (km 138+490 to km 172+000)
Pannel Size	L X B (4.5m x 3.5m)
PQC Slab M40 Grade (mm)	300
DLC (mm)	150
GSB (mm)	150
Dowel bar	
Dia (mm)	38
Length (mm)	450
Spacing (mm)	300
Tie bar	
Dia (mm)	12
Length (mm)	640
Spacing (mm)	600

Table 11-6: Design thicknesses of service roads

Description	From km 134+890 to km 172+000 Thickness in mm
BC (mm)	30
DBM (mm)	50
WMM (mm)	250
GSB (mm)	200

Observations on PDR:

- The pavement shall be flexible except for widening of existing rigid pavement.
- Minimum CBR was not specified in agreement. Hence, contractor adopted the 8% and 10% CBR.
  - The mix design parameters used are Va = 3.5% and Vbe = 11.5%.
  - 90% reliability was considered for the flexible pavement design of main carriageway.

11.4 Review of Existing EPC Agreement and Pavement Design report of Nalagampalli to AP/KN Border (Km 172+000 to Km 219+687)

11.4.1 Existing EPC Agreement: Dilip Buildcon Ltd (DBL)- YR 2017

Schedule-B of Concession Agreement is a mandatory requirement prior to any formulation of design to be applied to the project during the execution.

a. Type of Carriageway:

- Rigid Pavement is proposed for main carriageway for entire section and flexible pavement for service roads.

b. Design Traffic (MSA):

- The design traffic for each homogeneous section was presented in below table.

S. No	Homogenous Section	Design traffic (CVPD)
1	Km 172+000 to Km 178+500	7914
2	Km 178+500 to Km 192+600	7562
3	Km 192+600 to Km 200+600	6578
4	Km 200+600 to Km 219+687	7562

- Service roads are designed for a minimum design traffic of 10msa.

c. Design Period:

- Rigid pavement shall be designed for minimum design period of 30years.

d. Design CBR:

- Minimum design CBR is not specified.

e. Minimum Crust Thickness:

- Minimum crust thickness is not specified.

f. Specifications and Standards for the project:

- As per Schedule-D "Manual of specifications and standards for four laning of highway through PPP IRC: SP: 84-2014".

g. Maintenance requirements:

The concessionaire shall procure that at all times during the Operation Period, the Project Highway conforms to the maintenance requirements set forth in Schedule E (the "Maintenance Requirements")

Schedule E of the EPC Agreement is represented in Table 11-7**.**

Repair / Rectification of Defects and deficiencies specified in Schedule E within time limit set forth hereunder

Table 11-7: Maintenance requirement with timelines

S. No.	Nature of Defect / Deficiency	Timelines for Repair/ Rectification
	Project Highway	

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S. No.	Nature of Defect / Deficiency	Timelines for Repair/ Rectification
(a)	**Carriageway**	
(i)	Breach or blockade	Time Limit: Temporary restoration of traffic within 24 hours; permanent restoration within 15 (fifteen) days.
(ii)	Roughness value Exceeding 2,200 mm in a stretch of 1 km (as measured by a calibrated bump integrator)	Time Limit: 120 (One Hundred and Twenty) days
(iii)	Potholes	Time Limit: 24 hours
(iv)	Cracking in more than 5% of road surface in a stretch of 1 Km	Time Limit: 15 days
(v)	Rutting exceeding 10mm in more than 2% of the road surface in a stretch of 1 km	Time Limit: 30 days
(vi)	Bleeding / Skidding	Time Limit: 7 (Seven) days
(vii)	Any other defect/ distress on the road	Time Limit: 15 (Fifteen) days.
(viii)	Damages to Pavement edges	Time Limit: 15 (Fifteen) days.
(ix)	Removal of debris	Time Limit: 6 hours
(b)	**Granular earth shoulders, side slopes, drains and culverts.**	
(i)	Variation by more than 1% in the prescribed slope of camber / cross fall	Time Limit: 7 (Seven) days
(ii)	Edge drop at shoulders exceeding 40 mm	Time Limit: 7 (Seven) days
(iii)	Variation by more than 15% in the prescribed side (embankment) slopes	Time Limit: 30 (Thirty) days
(iv)	Rain cuts / gullies in slope	Time Limit: 7 (Seven) days
(v)	Damage to or silting of culverts and side drains during and immediately preceding the rainy season	Time Limit: 7 (Seven) days
(vi)	Desilting of drains in urban / semi-urban areas	Time Limit: 24 hours
(vii)	Ralling, parapets, crash barrier	Time Limit: 7 (Seven) days
(C)	**Roadside furniture including road signs and pavement marking**	
(i)	Damage to shape or position, poor visibility or loss of retro-reflectivity	Time Limit: 48 hours
(ii)	Painting of km stone, railing parapets, crash barrier	Time Limit: As and when required/ once every year
(iii)	Damaged/missing road signs required	Time Limit: 7 (Seven) days

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S. No.	Nature of Defect / Deficiency	Timelines for Repair/ Rectification
	replacement	
(iv)	Damaged to road mark ups	Time Limit: 7 (Seven) days
(d)	**Street lighting**	
(i)	Any major failure of the system	Time Limit: 24 hours
(ii)	Faults and minor failures	Time Limit: 8 hours
(e)	**Trees and plantation**	
(i)	Obstruction in a minimum headroom of 5 m above carriageway or obstruction in visibility of road signs	Time Limit: 24 hours
(ii)	Removal of fallen trees from carriageway	Time Limit: 4 hours
(iii)	Deterioration in health of trees and bushes	Time Limit: Timely watering and treatment
(iv)	Trees and bushes requiring replacement	Time Limit: 30 days
(v)	Removal of vegetation affecting sight line and road structures	Time Limit: 15 (Fifteen) days
(f)	**Rest areas**	
(i)	Cleaning of toilets	Time Limit: Every 4 hours
(ii)	Defects in electrical, water and sanitary installations	Time Limit: 24 hours
(g)	**Toll Plazas**	
(h)	**Other Project Facilities and Approach roads**	
(i)	Damage in approach roads, pedestrian facilities, truck laybys, bus-bays, cattle crossings, (Traffic Aid Posts, Medical Aid Posts) and service road	Time Limit: 15 (Fifteen) days.
(ii)	Damaged vehicle or debris on the road	Time Limit: 4 hours
(iii)	Malfunctioning of the mobile crane	Time Limit: 4 hours
	Bridges	
(a)	**Superstructure**	*Cracks* Temporary measures Time Limit: Within 48 Hours Permanent measures Time Limit: Within 15 days
(b)	**Foundations**	Scouring and/or cavitation Time Limit: 15 (Fifteen) days
(c)	**Piers, abutments, return walls and wing walls**	*Cracks and damages including settlement and tilting*

S. No.	Nature of Defect / Deficiency	Timelines for Repair/ Rectification
		Time Limit: 30 (Thirty) days
(d)	**Bearings (metallic) of bridges**	*Deformation* Time Limit: 15 (Fifteen) days;
(e)	**Joints in bridges**	*Loosening and malfunctioning of joints* Time Limit: 15 (Fifteen) days
(f)	**Other items relating to Bridges**	
(i)	Deforming of pads in elastomeric bearings	Time Limit: 7 (Seven) days
(ii)	Gathering of dirt in bearings and joints; or clogging of spouts, weep holes and vent-holes	Time Limit: 3 (Three) days
(iii)	Damage or deterioration in kerbs, parapets, handrails and crash barriers	Time Limit: 3 (Three) days.
(iv)	Rain-cuts or erosion of banks of the side slopes of approaches	Time Limit: 7 (Fifteen) days
(v)	Damage to wearing coat	Time Limit: 15 (Fifteen) days
(vi)	Damage or deterioration in approach slabs, pitching, apron, toes, floor or guide bunds	Time Limit: 30 (Thirty) days.
(vii)	Growth of vegetation affecting the structure or obstructing the waterway	Time Limit: 15 (Fifteen) days

Observations on schedules B/D/E:

- Minimum CBR value was not specified in the Schedules. Hence, concessionaire has an opportunity to explore good borrow areas and utilize the soils with good CBR value.
- Schedule -D has specified that the design standards of the project shall be in accordance with 'Manual of Specifications and Standards for Four Laning of National Highways through Public Private Partnership'.
- In Schedule -E, it has specified the intervention of concessionaire when the roughness value exceeds 2200 mm/km.

11.4.2 Review of Pavement Design Report- YR 2018 (DBL)

Pavement Design Report (PDR) of 'Four Laning of Nalagampalli to AP/KN border of NH-4 from Km 172.000 to Km 219.687 in the state of Andhra Pradesh' describes the basis and design for pavement for main road. The existing road is with rigid pavement in main carriageway and flexible in service-roads.

a) Design life of Pavement

- Main carriageway was designed for 30 years.

b) Design traffic

- EPC Contractor has conducted the traffic surveys at km 171+590, km 198+200 and at km 201+000, where the design traffic (CVPD) of 4661, 4777 and 3287 is achieved respectively.
- A design traffic of 10msa is considered for the service roads.

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c) Design CBR

- In the design 6% CBR is adopted for main carriageway and 9% CBR is considered for service roads. However, as per the IRC:58-2015, the minimum design CBR is 8%.

d) Pavement Composition

As per the pavement design report, EPC contractor has divided the project stretch as two homogenous sections. The adopted pavement crust thickness is of main carriageway is presented in Table 11-8 and service road is presented in Table 11-9**.**

Table 11-8: Design thicknesses of Main carriageway

Description	From km 172+000 to km 219+687	
PQC Slab M40 Grade (mm)	270	
DLC (mm)	150	
GSB (mm)	150	
Dowel bar (Expansion & Contraction joint)		
Dia (mm)	32	
Length (mm)	500	
Spacing (mm)	300	
Deformed tie bars		
Slab Dimensions	3.5m x 4.0m	3.5m x 4.25m
Dia (mm)	12	12
Length (mm)	640	640
Spacing (mm)	580	540

Table 11-9: Design thicknesses of Service roads

Description	From km 172+000 to km 219+687 Thickness in mm
BC (mm)	30
DBM (mm)	50
WMM (mm)	250
GSB (mm)	200

Observations:

- Minimum CBR is not specified in agreement. Hence, contractor adopted a design CBR of 6% for Main carriageway and 9% CBR for service roads.
- The Rigid pavement was designed according to IRC:58-2015, and the design was cross-verified and found to be satisfactory.

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A) Maintenance requirements as per TOT schedule-F

The concessionaire shall procure that at all times during the Operation Period, the Project Highway conforms to the maintenance requirements set forth in Schedule F (the "Maintenance Requirements")

Repair / Rectification of defect and deficiencies for four lane section specified in schedule-F with in time limit set are represented in Table 11-10**.**

Table 11-10: Maintenance requirement as per TOT schedules-F

a) Maintenance criteria for Flexible Pavement

Assert Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/ Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specification
		Desirable	Acceptable					
Flexible Pavement (Pavement of MCW, Service Road, approaches of Grade structure, approaches of connecting roads, slip roads, lay byes etc. as applicable)	Potholes	Nil	<0.1 % of area and subject to limit of 10 mm in depth	Daily	Length Measurement Unit like Scale, Tape, Odometer etc.	IRC:82-2015 and Distress Identification Manual for Long Term Pavement Performance Program, FHWA 2003	24-48 hours	MORT&H Specification 3004.2
	Cracking	Nil	<5 % subject to limit of 0.5 sqm for any 50m length	Daily			7-15 days	MORT&H Specification 3004.3
	Rutting	Nil	<10mm	Daily	Straight Edge		15-30 days	MORT&H Specification 3004.2
	Corrugations and Shoving	Nil	<0.1 % of area	Daily	Length Measurement Unit like Scale, Tape, Odometer etc.		2-7 days	IRC:82-2015
	Bleeding	Nill	<1 % of area	Daily			3-7 days	MORT&H Specification 3004.4
	Ravelling/Stripping	Nil	<1 % of area	Daily			7-15 days	IRC 82-2015 read with IRC SP 81
	Edge Deformation / Breaking	Nil	<1m for any 100m section and width <0.1m at any location, restricted to 30cm from the edge	Daily			7-15 days	IRC 82-2015
	Roughness BI	2000mm/Km	2400mm/Km	Bi-Annually	Network Survey Vehicle (NSV) with all its module such as Laser Profilometer, Transverse profile logger, Laser crack measurement system, Video logging modules, high resolution Odometer etc	ASTM E950 (98) :2004 –Standard Test Method for measuring Longitudinal Profile of Travelled Surfaces with Accelerometer Established Inertial Profiling Reference and ASTM E1656 - 94:2000- Standard Guide for	180 days	IRC 82-2015
	Rutting	<10mm for any 50 m section and/or, length of section <5m	<10mm for any 50 m section and/or, length of section <10m	Bi-Annually			15-30 days	IRC 82-2015
	Pavement rating based on distress per IRC 82 / Pavement Condition Index as per ASTM 6433- 07	>3/85	>2.1/70	Bi-Annually			180 days	IRC 82-2015/ ASTM D 6433-07
	Other Pavement Distresses			Bi-Annually			2-7 days	IRC:82-2015

Assert Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/ Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specification
		Desirable	Acceptable					
						Classification of Automatic Pavement Condition Survey Equipment		
	Skid Number	60SN	50SN	Bi-Annually	SCRIM (Sideway force Coefficient Routine Investigation Machine or equivalent) British Pendulum Tester	IRC:82-2015	180 days	BS:7941-1:2006, IRC:82-2015/ ASTM 274
	Deflection/ Remaining Life			Annually	Falling Weight Deflectometer	IRC 115:2014	180 days	IRC:115-2014
Rigid Pavement (Pavement of MCW, Service Road, Grade structure, approaches of connecting roads, slip roads, lay byes etc. as applicable)	Roughness BI	<2200mm/km	>2400mm/km	Bi-Annually	Class I Profilometer	ASTM E950 (98):2004 and ASTM E1656-94:2000	180 days	IRC: SP:83-2018
	Skid	Skid Resistance no. at different speed of vehicles		Bi-Annually	SCRIM (Sideway force Coefficient Routine Investigation Machine or equivalent) British Pendulum Tester	IRC: SP:83-2018	180 days	IRC: SP:83-2018
		Minium SN	Traffic Speed (km/h)					
		36	50					
		33	65					
		32	80					
		31	95					
		31	110					
Embankment/ Slope	Edge drop at shoulders	Nil	40mm	Daily	Length Measurement Unit Like Scale, Tape, odometer etc.	IRC	7-15 days	MORT&H Specification
	Slope of camber/ cross fall	Nil	<2% variation in prescribed slope of camber/ cross fall	Daily			7-15 days	MORT&H Specification
	Embankment Slopes	Nil	<15% variation in prescribe side slope	Daily			7-15 days	MORT&H Specification
	Embankment Protection	Nil	Nil	Daily	NA		7-15 days	MORT&H Specification

Assert Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/ Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specification
		Desirable	Acceptable					
	Rain Cuts/ Gullies in slope	Nil	Nil	Daily Specially During Rainy Season	NA	IRC	7-15 days	MORT&H Specification
Cut Section/ Slope	Unstable slopes	Nil	-		NA	IRC	2-7 days	MORT&H Specification

b) Maintenance criteria for Rigid Pavement

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
1	Cracking					
	Single Discrete Cracks Not intersecting with any joint	w = width of crack, L = length of crack, d = depth of crack, D = depth of slab	0	Nil not discernible	No Action	Not Applicable
			1	w < 0.2 mm. hair cracks		
			2	w = 0.2 - 0.5 mm, discernible from slow-moving car	Seal without delay	Full Depth Repair Dismantle and reconstruct affected portion - See Para 5.4, within 15 days
			3	w = 0.5 - 1.5 mm, discernible from fast-moving car		
			4	w = 1.5 - 3.0 mm	Seal and stitch if L > 1m. Within 7 days	
			5	w > 3 mm.		
2	Single Transverse (or Diagonal) Crack intersecting with one or more joints	w = width of crack, L = length of crack, d = depth of crack, D = depth of slab	0	Nil, not discernible	No Action	
			1	w < 0.2 mm, hair cracks	Route and seal with epoxy. Within 7 days	Seal Staple within 15days & Cross stich
			2	w = 0.2 - 0.5 mm, discernible from slow Car		
			3	w = 0.5 - 3.0 mm, discernible from fast car	Route, Seal, and stitch, if L > 1m. Within 7 days	Full Depth Repair Dismantle and reconstruct affected portion with norms & Specifications - See Para 5.5 &refer chapter 9 of IRC: SP: 83-2018, within 15 days.
			4	w = 3.0 - 6.0 mm	Not applicable	Staple or Dowel Bar Retrofit within 15 days

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
			5	w > 6 mm, usually associated with spalling, and/ or slab rocking under traffic	Not Applicable (full depth crack)	Staple or Dowel Bar Retrofit within 15 days
3	Single Longitudinal Crack intersecting with one or more joints	w = width of crack, L = length of crack, d = depth of crack, D = depth of slab	0	Nil, not discernible	No Action	
			1	w < 0.5 mm, discern able from slow moving vehicle	Seal and stich if L >l m within 7 days	Seal and Cross-Stich or Staple within 15 days
			2	w = 0.5 - 3.0 mm, discernible from fast vehicle		
			3	w = 3.0 - 6.0 mm	Staple, if L > 1m. Within 15 days	Partial Depth Repair with or without dowel bar retrofit within 15 days or
			4	w = 6.0 - 12.0 mm, usually associated with spalling	Not Applicable	
			5	w > 12 mm, usually associated with spalling, and/or slab rocking under traffic	Not Applicable, (Rocking/ Spalling indicates full depth crack)	Full Depth Repair Dismantle and reconstruct affected portion - See Fig 5.6 and Chapter 9 of IRC: SP:83-2018, within 15 days
4	Multiple Cracks intersecting with one or more joints or cracks	w = width of crack	0	Nil, not discernible	No Action	-
			1	w < 0.2 mm, hair cracks	Seal, and stitch if L > 1m. Within 15 days	
			2	w = 0.2 - 0.5 mm. discernible from slow vehicle		
			3	w = 0.5 - 3.0 mm, discernible from fast vehicle	Full depth repair within 15 days	Dismantle, Reinstate subbase, Reconstruct whole slab as per specification within 30 days
			4	w = 3.0 - 6.0 mm panel broken into 2 or 3 pieces		
			5	w > 6 mm and/or panel broken into more than 4 pieces		
5	Corner Break	w = width of crack, L = length of crack	0	Nil, not discernible	No Action	-
			1	w < 0.5 mm; only 1 corner broken	Seal with low viscosity epoxy to secure broken parts within 7 days	
			2	w < 1.5 mm; L < 0.6 m, only one corner broken		
			3	w < 1.5 mm; L < 0.6 m, two corners broken	Partial Depth (Refer Figure 8.3 of IRC: SP:83-2018) within 15 days	Full depth repair within 30 days.
			4	w > 1.5 mm; L > 0.6 m or three corners broken		
			5	three or four corners broken		Reinstate sub-base and reconstruct the slab as per norms & Specifications within 30 days.
6	Punchout (Applicable to Continuous Reinforced Concrete Pavement (CRCP) only)	w = width of crack, L = length (m/m2)	0	Nil, not discernible		
			1	w < 0.5 mm; L < 3 m/m2	Not Applicable, (Punch- out is full depth Distress)	Seal with low viscosity epoxy to secure broken parts Within 15 days
			2	either w > 0.5 mm or L < 3 m/m2		
			3	w > 1.5 mm and L < 3 m/m2		Full depth repair - Cut out and replace damaged area taking care not to damage reinforcement. Within 30 days.
			4	w > 3 mm, L < 3 m/m2 and deformation		

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
			5	w > 3 mm, L > 3 m/m2 and deformation		
Surface Defects						
7	Ravelling or Honeycomb type surface	r = area damaged surface / total surface of slab (%) h = maximum depth of damage	0	Nil, not discernible	Short Term No action.	Long Term Not Applicable
			1	r < 2 %	Local repair of areas damaged and liable to damage. Within 15 days	
			2	r = 2 - 10 %		
			3	r = 10-25%	Bonded Inlay 2 or 3 slabs if affecting. Within 30 days	
			4	r = 25 - 50 %		
			5	r > 50% and h > 25 mm	Reconstruct slabs 4 or more slabs if affecting. Within 30 days	
8	Scaling	r = damaged surface / total surface of slab (%) h = maximum depth of damage	0	Nil, not discernible	Short Term No action.	Long Term Not Applicable
			1	r < 2 %	Local repair of areas damaged and liable to be damaged. Within 7 days	
			2	r = 2 - 10 %		
			3	r = 10 - 20%	Bonded Inlay Within 15 days	
			4	r = 20 - 30 %		
			5	r > 30 % and h > 25 mm	Reconstruct slab Within 30 days	
9	Polished Surface/ Glazing	t = texture depth, sand patch test	0		No action.	Not Applicable
			1	t > 1 mm		
			2	t = 1 - 0.6 mm	Monitor rate of deterioration	
			3	t = 0.6 - 0.3 mm		
			4	t = 0.3 - 0.1 mm		
			5	t < 0.1 mm	Diamond Grinding if affecting 50% or more slabs in a continuous stretch of minimum 5 km. Within 30 days	
10	Popout (Small Hole), Pothole Refer Para 8.4	n = number / m2,	0	d < 50 mm; h < 25 mm; n < 1 per 5 m2	No action.	Not Applicable
		d = diameter,	1	d = 50 - 100 mm: h < 50 mm; n < 1 per 5 m2	Partial depth repair 65 mm deep Within 15 days	
		h = maximum depth	2	d = 50 - 100 mm; h > 50 mm; n < 1 per 5 m2		
			3	d = 100 - 300 mm; h < 100 mm n < 1 per 5 m2	Partial depth repair 110mm i.e 10 mm more than the depth of the hole. Within 30 days	
			4	d = 100 - 300 mm; h > 100 mm; n < 1 per 5 m2		
			5	d > 300 mm; h > 100 mm: n > 1 per 5 m2	Full depth repair. Within 30 days	
Joint Defect						

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
11	Joint Seal Defects	loss or damage L = Length as % total joint length	0	Difficult to discern.	Short Term No action.	Long Term Not Applicable
			1	Discernible, L< 25% but of little immediate consequence with regard to ingress of water or trapping incompressible material.	Clean joint, inspect later.	
			3	Notable. L > 25% insufficient protection against ingress of water and trapping incompressible material.	Clean and reapply sealant in selected locations. Within 7 days	
			5	Severe; w > 3 mm negligible protection against ingress of water and trapping incompressible material.	Clean, widen and reseal the joint. Within 7 days	
12	Spalling of Joints	w = width on either side of the joint, L = length of spalled portion (as % joint length)	0	Nil, not discernible	No action.	Not Applicable
			1	w < 10 mm	Apply low viscosity epoxy resin/ mortar in cracked portion Within 7 days	
			2	w = 10 - 20 mm, L < 25%		
			3	w = 20 - 40 mm, L > 25%	Partial Depth Repair Within 15 days	
			4	w = 40 - 80 mm, L > 25%	30-50 mm deep, h= w + 20% of w Within 30 days	
			5	w > 80 mm, and L > 25%	50 - 100 mm deep repair. H = w + 20% of w Within 30 days	
13	Faulting (or Stepping) in Cracks or Joints	f = difference of level	0	not discernible, < 1 mm	No action.	
			1	f < 3 mm		
			2	f = 3 - 6 mm	Determine cause and observe	
			3	f = 6 - 12 mm	Diamond Grinding within 15 days	
			4	f= 12 - 18 mm	Raise sunken slab.	
			5	f> 18 mm	Strengthen subgrade and sub-base by grouting, within 30 days	
14	Blowup or buckling	h = vertical displacement from normal profile	0	Nil, not discernible	No action.	
			1	h < 6 mm		
			2	h = 6 - 12 mm	Install Signs to Warn Traffic Within 24 hours	
			3	h = 12 - 25 mm		
			4	h > 25 mm	Full Depth Repair Within 30 days	
			5	shattered slabs, i.e 4 or more pieces	Replace broken slabs. Within 30 days	

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
15	Depression	h = negative vertical displacement from normal profile L =length	0	Not discernible, h < 5 mm	No action.	
			1	h = 5 - 15 mm		
			2	h = 15-30 mm, Nos <20% joints	Install Signs to Warn Traffic within 24 hours	
			3	h = 30 - 50 mm		
			4	h > 50 mm or > 20% joints	Strengthen subgrade. Reinstate pavement at normal level if length L < 20 m. within 30 days	
			5	h > 100 mm		
16	Heave	h = positive vertical displacement from normal profile, L = length	0	Not discernible. h < 5 mm	No action.	
			1	h = 5 - 15 mm	Follow up.	
			2	h = 15 - 30 mm, Nos <20% joints	Install Signs to Warn Traffic within 24 hours	
			3	h = 30 - 50 mm		
			4	h > 50 mm or > 20% joints	Stabilise subgrade. Reinstate pavement at normal level within 30 days	
			5	h > 100 mm		
17	Bump	h = vertical displacement from normal profile	0	h < 4 mm	No action.	
			1	h = 4 - 7 mm	Grind, in case of new construction within 7 days	
			3	h = 7 - 15 mm	Grind in case of Ongoing maintenance within 15 days	
			5	h > 15 mm		
18	Lane to Shoulder Dropoff	f = difference of level	0	Nil, not discernible < 3mm	No action.	-
			1	f = 3 - 10 mm	Spot repair of shoulder. Within 3 days	-
			2	f = 10 - 25 mm		-
			3	f = 25 - 50 mm	Fill up shoulder Within 7 days	-
			4	f = 50 - 75 mm		For any 100 m stretch Reconstruct shoulder, if affecting 25% or more of stretch Within 30 days
			5	f > 75 mm		
Drainage						

S No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
19	Pumping	Quantity of fines and water expelled through open joints and cracks Nos/100 m stretch	0	not discernible	No Action	
			1 to 2	Slight/occasional Nos < 10%	Repair cracks and joints without delay	Inspect and repair sub-drainage at distressed sections and upstream.
			3 to 4	Appreciable/ Frequent 10-25%	Lift or jack slab within 30 days	
			5	Abundant, crack development >25%	Repair distressed pavement sections. Strengthen subgrade and subbase. Replace slab. Within 30 days	
20	Ponding	Ponding on slabs due to blockage of drains	0-2	No discernible problem	No action	
			3 to 4	Blockages observed in drains, but water flowing	Clean drains etc., follow up, deep grooving in transverse direction to remove water, within 7 days	Action required to stop water damaging foundation within 15 days.
			5	Ponding accumulation of water observed	Deep grooving in transverse direction to remove water-hydro planning within 7 days	

11.5 Traffic Survey and Analysis

7 days axle load survey is conducted at the existing toll plaza location. All other required input parameters like AADT & growth rates are provided by the client. For the design traffic was assed till the end of concessionaire period. All the calculations and analysis are presented in Chapter 10. The summary of VDF and design MSA is presented below.

The VDF values obtained based on the 7 days axle load survey is presented below table.

Location/ Vehicle Type		BUS	LCV	2axle	3axle	MAV
NH-4: (Mahasamudram Toll Plaza-164+250)	LHS	1.085	0.633	2.901	4.402	10.017
	RHS	1.080	0.688	2.598	4.926	8.115

11.6 Immediate Repairs

Immediate repair of flexible/ rigid pavement is recommended based on the un-acceptable condition of the pavement surface and roughness. For 4-lane section a roughness>2400mm/km is considered as limiting value.

11.6.1 Immediate repair in 4-lane section (AP/TN Border to AP/KN Border)

a) AP/TN Border to Nalagampalli (km 134+890 to km 172+000)

According to the article of 14 of SD infra-EPC agreement the maintenance period is 10years from date of completion certificate. Hence, the section from km 134+890 to km 172+000 is not considered for any immediate repairs.

b) Nalagampalli to AP/KN Border (km 172+000 to km 219+687)

According to the article of 17 of DBL-EPC agreement the Defect Liability Period is 4 years from date of completion certificate (achieved in YR 2019). DLP period of Project ii ended on 30 July 2023 however it is extended till rectification of repairs are completed (which is estimated as 31 Jan 2025).

Functional evaluation of pavement is carried out as per the NSV equipment to assess the present condition of the road and it is found that a few distresses are observed on pavement and also at some locations roughness (BI) exceeding the limiting value (>2400mm/km) is considered for diamond grinding and the details are listed in Table 11-11.

The structural evaluation of the pavement is carried out as per the FWD survey. Based on the %air voids few slabs are requires grouting. The quantities are tabulated from Table 11-12 and Table 11-13 in LHS and RHS direction respectively. However, the detailed roughness data and condition data was presented in annexures of Chapter 10.

Existing EPC Contractor will rectify roughness, voids under panels and panel replacement works etc. of pavement before handover of the project to TOT Concessionaire however for safer side some provisional amount is kept for repairs whenever required.

Table 11-11: Locations recommended for Diamond grinding (BI>2400mm/km)

S. No.	Chainage (km)		Side	Lane	Avg. BI (mm/km)	
	From	To			Length (km)	Avg. BI (mm/km)
1	173.000	174.000	LHS	Inner	1.000	3023.9
2	175.000	176.000	LHS	Inner	1.000	2406.6
3	177.000	178.000	LHS	Inner	1.000	2614.4
4	186.000	187.000	LHS	Inner	1.000	2511.1
5	188.000	189.000	LHS	Inner	1.000	2464.0

S. No.	Chainage (km)		Side	Lane	Avg. BI (mm/km)	
	From	To			Length (km)	Avg. BI (mm/km)
6	189.000	190.000	LHS	Inner	1.000	2456.0
7	191.000	192.000	LHS	Inner	1.000	2449.3
8	192.000	193.000	LHS	Inner	1.000	2494.4
9	195.000	196.000	LHS	Inner	1.000	3007.5
10	216.000	217.000	LHS	Inner	1.000	2415.1
11	218.000	219.000	LHS	Inner	1.000	2479.7
12	173.000	174.000	LHS	Outer	1.000	3007.6
13	177.000	178.000	LHS	Outer	1.000	2460.2
14	186.000	187.000	LHS	Outer	1.000	2500.8
15	188.000	189.000	LHS	Outer	1.000	2458.5
16	189.000	190.000	LHS	Outer	1.000	2465.8
17	192.000	193.000	LHS	Outer	1.000	2455.3
18	195.000	196.000	LHS	Outer	1.000	2719.3
19	216.000	217.000	LHS	Outer	1.000	2440.6
20	218.000	219.000	LHS	Outer	1.000	2462.0
21	217.000	216.000	RHS	Inner	1.000	2472.8
22	214.000	213.000	RHS	Inner	1.000	2459.8
23	207.000	206.000	RHS	Inner	1.000	2779.0
24	188.000	187.000	RHS	Inner	1.000	2637.2
25	187.000	186.000	RHS	Inner	1.000	3003.3
26	178.000	177.000	RHS	Inner	1.000	2412.9
27	177.000	176.000	RHS	Inner	1.000	2649.1
28	176.000	175.000	RHS	Inner	1.000	2653.0
29	174.000	173.000	RHS	Inner	1.000	3000.6
30	173.000	172.000	RHS	Inner	1.000	2427.5
31	214.000	213.000	RHS	Outer	1.000	2408.2
32	188.000	187.000	RHS	Outer	1.000	2619.0
33	187.000	186.000	RHS	Outer	1.000	2579.0
34	178.000	177.000	RHS	Outer	1.000	2406.7
35	177.000	176.000	RHS	Outer	1.000	2406.8
36	176.000	175.000	RHS	Outer	1.000	2585.6
37	174.000	173.000	RHS	Outer	1.000	3000.2
38	173.000	172.000	RHS	Outer	1.000	2567.0
Total lane km					**38.000**	

Table 11-12: Immediate repair of Rigid pavement – LHS Direction

S. No	Repairs	LHS Inner Lane			LHS Outer Lane		
		Effected Length (m)/ Area (Sq.m)	No. of Panels Effected	Quantity (Cu.m)	Effected Length (m)/ Area (Sq.m)	No. of Panels Effected	Quantity (Cu.m)
1	Slab Replacement (PQC + DLC+ 1.5m Tied concrete shoulder)						
	PQC		0			0	
	DLC						
	1.5m Tied concrete shoulder						
2	Reconstruct Slab		7	34		4	19.4
3	Full Depth Repair or Dismantle and Reconstruct affected portion		4	19.4		2	9.7
4	Partial Width Repair (Rm.)	44.6	34	123.9	11.2	6	21.9
5	Partial Width Repair for Joint Spalling/ Joint Damage (Rm.)	119.4	44	20	22.2	12	5.5
6	Staple or dowel bar retrofit (Rm.)	4	2	-	0	0	-
7	Seal and Stitch (Rm.)	747.5	276	-	1523.7	466	-
8	Seal and Staple (Rm.)	62.1	19	-	20.7	7	-
9	Route and Seal (Rm.)	554.8	274	-	588.8	221	-
10	Seal with Low viscosity epoxy (also for Joint Separation) (Rm.)	2314.1	903	-	990.2	312	-
11	Lay Patch with Premix material (For Flexible: Delamination on structures & Patching) (Sqm)	52.3	-	-	2.2	-	-
12	Seal without delay	0.03	5	-	0.02	3	-
13	Local repair of areas damaged and liable to damage (Sq.m)	19.92	24	-	15.3	9	-
14	Bonded inlay (Sq.m)	7.69	2	-	30.7	5	-
15	Panels for 50mm grouting (Sq.m)	697 (44 Approx. slabs)					

Table 11-13: Immediate repair of rigid pavement – RHS Direction

S. No	Repairs	LHS Inner Lane			LHS Outer Lane		
		Effected Length (m)/ Area (Sq.m)	No. of Panels Effected	Quantity (Cu.m)	Effected Length (m)/ Area (Sq.m)	No. of Panels Effected	Quantity (Cu.m)
1	Slab Replacement (PQC + DLC+ 1.5m Tied concrete shoulder)						
	PQC		1	4.7	0.0	2	9.5
	DLC			2.4	0.0		6.8
	1.5m Tied concrete shoulder			0.0	0.0		4.1
2	Reconstruct Slab		2	9.7		2	9.7
3	Full Depth Repair or Dismantle and Reconstruct affected portion		2	9.7		9	43.7
4	Partial Width Repair (Rm.)	8.6	20	72.9	50.5	15	54.7
5	Partial Width Repair for Joint Spalling/ Joint Damage (Rm.)	33.7	12	5.5	54.9	27	12.3
6	Staple or dowel bar retrofit (Rm.)	0.0	0	-	22.4	7	-
7	Seal and Stitch (Rm.)	654.9	199	-	806.5	287	-
8	Seal and Staple (Rm.)	5.5	2	-	267.7	78	-
9	Route and Seal (Rm.)	505.8	200	-	427.0	163	-
10	Seal with Low viscosity epoxy (also for Joint Separation) (Rm.)	955.5	427	-	614.1	195	-
11	Lay Patch with Premix material (For Flexible: Delamination on structures & Patching) (Sqm)	0.5	-	-	13.3	-	-
12	Seal without delay	0.0	-	-	0.0	-	-
13	Local repair of areas damaged and liable to damage (Sq.m)	6.8	9.0		16.7	13	-
14	Bonded inlay (Sq.m)	0.0	0.0		25.8	4	-
15	Panels for 50mm grouting (Sq.m)	1236 (79 Approx. slabs)					

11.7 O & M Strategy

The Periodic maintenance strategy of each section is presented below.

Table 11-14: Periodic & Major maintenance strategy of 4 lane section (AP/TN Border to Nalagampalli)

NH-4, Section from Chittoor to Nalagampalli (Km 134+890 to Km 172+000)- SD Infra			
Year	**Description**	**Main carriageway (Rigid Pavement)**	**Service Roads (Flexible Pavement)**
YR 2034 (Hand over date: 18.12.2034)		Maintenance by the Existing EPC contractor	
YR 2035-2036	1st Renewal Layer	2.00% of total surface area of panel repair/replacement	30mm BC in 100% project length and 50mm DBM with milling on 10% project length.
		0.50% surface area grouting with a depth of 50mm	
		100% of joints cleaning and replacement of joint seal	
		100% of project length for Re-texturing.	
		100% of joints cleaning and replacement of joint seal	
VG-40 grade bitumen is recommended for Service roads. Capacity augmentation of the project is envisaged in FY 2039-40 and FY 2040-41			

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Table 11-15: Periodic & Major maintenance strategy of 4 lane section (Nalagampalli to AP/KN Border)

NH-4, Section from Nalagampalli to Chittoor (Km 172+000 to Km 219+687)- DBL			
Year	**Description**	**Main carriageway (Rigid Pavement)**	**Service Roads (Flexible Pavement)**
YR 2025 (Expecting Hand over)	Immediate Repair/ Rehabilitation	Maintenance by the Existing EPC contractor	30mm BC is considered in 20% affected length. (Existing EPC Contractor already performing pavement rectification at site)
		10% of total affected length given in NSV test (Existing EPC Contractor already performing pavement rectification at site)	
		10% of joints cleaning and replacement of joint seal out of affected length (Existing EPC Contractor already performing pavement rectification at site)	
YR 2032-33 & YR 2033-34	1st Renewal Layer	2.00% of total surface area of panel repair/replacement	30mm BC in 100% project length and 50mm DBM with milling on 10% project length.
		0.50% surface area grouting with a depth of 50mm.	
		100% of joints cleaning and replacement of joint seal	
		100% of project length for Re-texturing.	
VG-40 grade bitumen is recommended for Service roads. Capacity augmentation of the project is envisaged in FY 2039-40 and FY 2040-41			

12. COST ESTIMATE

12.1 General

Cost Estimates have been worked out for expenses on Immediate Works (CAPEX) and expenses on operations and maintenance (OPEX). The cost estimates have been worked out at present rates considering 2024-25 as the base year.

12.2 Assumptions

The cost estimates are based on the following assumptions:

(a) Bitumen has been assumed to be sourced from IOCL Chennai Refinery. The distance (to & fro) from the midpoint of Project Highway is taken as 182 km. Modified Bitumen and VG-40 grade bitumen is considered in our cost estimate.

(b) Hire charges for the Machinery have been considered in accordance with CSR Andhra Pradesh 2023-24 and escalation have been considered 5% every year. Rates for various items of works have been arrived at based on 'Standard Data Book for Analysis of Rates' published by MORT&H.

(c) Manpower rates have been taken from Minimum Wages for Office of the Labour commissioner Odisha effective from 1 October 2024.

(d) Material Rates are obtained from CSR Andhra Pradesh 2023-24 and escalation have been considered 5% every year.

(e) Sand and Aggregate are considered to be sourced from the nearest quarry located on project highway at approximately 30 km form the mid-point of Project Highway.

(f) Cement is considered to be procured from the nearest local market.

(g) Rate of steel is taken from SAIL December-2024

(h) Some of the rates are based on Consultant's experience on the similar ongoing projects in adjacent locations.

(i) Overheads and profits have been considered based on MORT&H Standard Data Book. Applicable taxes have been considered in the Rate Analysis.

12.3 CAPEX

Details of CAPEX are worked out under the following categories.

- Immediate maintenance / defect rectification.
- O&M maintenance

12.3.1 Immediate Maintenance

As per site investigation we have considered for immediate maintenance. A few items noticed are covered under routine maintenance.

However, it is to be noted that some of the equipment installed at Mahasamudram Toll Plaza are quite old and will require replacement for proper functioning during O&M period.

12.4 O&M Estimates

Operation and Maintenance estimates have been worked out under the following heads:

(a) Preventive Maintenance / Routine Maintenance

(b) Operations

(c) Major Maintenance

12.4.1 Routine Maintenance - Categories

Routine Maintenance covers all activities required to maintain the road in traffic worthy condition to provide desired comforts to the road users. Routine Maintenance can be classified into following three categories:

(a) Routine or day to day maintenance

(b) Pre-monsoon maintenance

(c) Post monsoon maintenance

12.4.1.1 Routine or day to day maintenance

Routine maintenance is required continuously on the road stretch and structures and covers the following activities:

(a) Cleaning of the Road

(b) Pavement maintenance to include crack sealing and pothole repairs

(c) Shoulder repairs

(d) Maintenance of avenue plantation, horticulture, and median plantation

(e) Maintenance of signage, gantry boards and road furniture.

(f) Maintenance of culverts, bridge drainage spouts, expansion joints, side slopes and verges

(g) Surface cleaning, dust or vegetation control, sand removal from structures

(h) Reporting any damage caused to bridges by traffic accidents

(i) Maintenance of guard rails and crash barrier etc.

12.4.1.2 Pre-monsoon Maintenance

This is carried out prior to the monsoons and includes the following:

(a) Inspection of channels/streams to ensure that there are no accumulation of logs, trees and other debris in the vicinity of piers and abutments.

(b) Cleaning of roadside / median drains.

(c) Removal of vegetation growth on sub structures.

(d) Cleaning of culverts.

12.4.1.3 Post-monsoon Maintenance

This includes maintenance that is carried out immediately after the monsoons and includes the following:

(a) Inspection of all structures for any damages and taking appropriate actions.

(b) Cleaning of roadside drains, culverts etc.

12.5 Operations Estimates

12.5.1 Toll Plaza

This cost includes the following:

(a) Maintenance of Toll Plaza building, booths, and tolling equipment.

(b) Security of the booths, lanes, and toll plazas.

(c) Collection of toll and handling of cash till bank deposit.

(d) Provision of IT in-charge, IT supervisor, other staff at Toll Plaza location.

(e) Administration and essential facilities for the staff and road users.

(f) Maintenance of Toll Plaza equipment and replacement of expendable and short life items.

(g) Electricity cost including standby generator.

12.5.2 Highway

This cost includes the following:

(a) Providing one patrolling vehicle including operating cost for round-the-clock patrolling of the Project Highway.

(b) Providing of one ambulance at Toll Plaza for accident victims.

(c) Provision of one crane with 30 MT and tow truck facilities for clearing the highway and evacuating the breakdown vehicles at Toll Plaza.

(d) Provision of one Broomer for cleaning of the highway.

(e) Expenditure on medical aid and provision of nursing staff.

(f) Cost of tests and surveys.

12.5.3 Energy

Streetlight luminaries, high mast lights with electricity tariff, provision of standby Genset are considered in the cost estimate.

12.5.4 Miscellaneous

(a) We have taken IE cost as per Industry norms.

(b) Insurance expenses have been taken as per Industry norms.

12.6 Summary of Cost on Initial Improvement Works

Summary of Cost on Initial Improvement Works are given in Table 12-1.

Table 12-1: Initial Improvement Works Cost

S. No.	Particulars	Cost
		NHIT
1	**Bituminous and Rigid Pavement Courses**	5.17
2	**R&R of Bridges**	0.04
3	**R&R of Culverts**	0.02
4	**RE Wall Bulging**	0.87
5	**Revalidation Survey**	0.25
6	**Restoration/Improvement works of Toll Plaza**	6.45
7	**Approach slab cost (Settled)**	0.32
8	**Truck lay bye (Sewage disposal system)**	0.10

S. No.	Particulars	Cost
		NHIT
9	**Median & Avenue plantation**	0.16
10	**Installation of Damaged Sign Board**	0.24
11	**Thermoplastic/Transverse Bar Marking**	3.21
12	**Installation of 5th, KM, HM, Boundary Stone**	0.08
13	**Installation of Antiglare Screen**	0.02
14	**Painting of Kerb Stone**	0.14
	(A) Civil Cost	**17.06**
	GST 18 % on (A)	3.07
	(B) Total Civil Cost including GST 18%	**20.13**

12.7 Year Wise Summary of CAPEX & OPEX

Year-wise summary of CAPEX & OPEX for the balance concession period till FY 2044-45 is estimated and presented in Table 12-2.

Table 12-2: Summary of Year wise CAPEX & OPEX (km 134+890 to 219+689)

Sl. No.	FY	Initial Improvement Cost (in INR Cr.)	Major Maintenance Cost (in INR Cr.)				Operation & Maintenance Cost (in INR Cr.)								
			Road (MCW, SR, Toll Plaza)	Structure	ATMS	TMS	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026	20.13	-	-	-	-	3.83	2.05	2.45	3.21	1.70	5.09	1.25	1.32	5.67
2	2026-2027	-	-	-	-	-	3.83	2.05	2.45	3.21	1.70	5.09	1.25	1.04	6.44
3	2027-2028	-	7.60	-	-	-	3.83	2.05	2.45	3.21	1.70	5.09	1.25	1.04	6.55
4	2028-2029	-	-	-	-	-	3.83	2.05	2.45	3.21	1.70	4.92	1.25	1.04	6.45
5	2029-2030	-	-	-	-	-	3.83	2.05	2.45	3.21	1.70	4.92	1.25	1.15	6.55
6	2030-2031	-	4.22	-	-	-	3.83	2.05	2.45	3.21	1.70	4.60	1.25	1.04	6.56
7	2031-2032	-	-	-	-	-	3.83	2.05	2.45	3.21	1.70	4.27	1.25	1.04	6.41
8	2032-2033	-	40.96	0.61	8.91	2.05	3.83	2.05	2.45	3.21	1.70	4.11	1.25	1.04	7.25
9	2033-2034	-	40.96	0.61	-	-	3.83	2.05	2.45	3.21	1.70	4.11	1.25	1.15	6.73
10	2034-2035	-	1.11	-	-	-	5.92	3.40	3.48	6.24	2.05	4.11	1.92	2.22	6.56
11	2035-2036	-	50.16	1.11	3.73	-	5.92	3.40	3.48	6.24	2.05	4.11	1.92	1.98	6.67
12	2036-2037	-	4.22	2.36	-	-	5.92	3.40	3.48	6.24	2.05	4.11	1.92	1.98	6.73
13	2037-2038	-	-	-	-	-	5.92	3.40	3.48	6.24	2.05	4.11	1.92	2.10	6.83
14	2038-2039	-	-	-	-	-	5.92	3.40	3.48	6.24	2.05	4.11	1.92	1.98	6.68
15	2039-2040	-	-	-	-	4.11	0.60	-	-	-	-	4.11	1.92	-	7.57
16	2040-2041	-	-	-	-	-	0.60	-	-	-	-	4.11	1.92	-	6.95
17	2041-2042	-	-	-	-	-	0.60	-	-	-	-	4.11	2.50	-	7.11
18	2042-2043	-	-	-	-	-	0.60	-	-	-	-	4.11	2.50	-	7.03
19	2043-2044	-	-	-	-	-	0.60	-	-	-	-	4.11	2.50	-	7.07
20	2044-2045	-	-	-	-	-	0.60	-	-	-	-	4.11	2.50	-	7.07
Total		**20.13**	**149.24**	**4.69**	**12.64**	**6.16**	**67.71**	**35.50**	**39.43**	**60.12**	**25.52**	**87.46**	**34.75**	**20.10**	**134.88**

Note: The costs for Admin, SPV, IE, and other office expenses are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

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NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED

FINAL REPORT

Tolling, Operation, Maintenance and Transfer of Four-Lane Bareilly-Sitapur Section of NH-30 (old NH-24) from km 262 to km 419.590 in the State of Uttar Pradesh

SAMARTH INFRAENGG Technocrats Private Limited

February 2025

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LIST OF ABBREVIATIONS AND SYMBOLS

AADT	-Average Annual Daily Traffic
AE	-Authority Engineer
AMC	-Annual Maintenance Contract
ATMS	-Advanced Traffic Management System
BC	-Bituminous Concrete
BOQ	-Bill of Quantities
BOT	-Build, Operate & Transfer
CA	-Concession Agreement
CBR	-California Bearing Ratio
CCB	-Concrete Crash Barrier
CCR	-Cement Concrete Railing
COD	-Commercial Operation Date
COS	-Change of Scope
CPI	-Consumer Price Index
CUP	-Cattle Underpass
CVC	-Classified Volume Count
CVPD	-Commercial Vehicles per Day
DBM	-Dense Bituminous Concrete
DPR	-Detailed Project Report
ECB	-Emergency Call Box
EPC	-Engineering, Procurement and Construction
ESI	- Employees' State Insurance
FDD	-Filed Dry Density
FOB	-Foot Over Bridge
FRL	-Finished Road Level
FSI	-Free Swell Index
FWD	-Falling Weight Deflectometer
FY	-Financial Year
GOI	- Government of India
GR	-Growth Rates
GS	-Grade Separated
GSB	-Granular Sub Base
GST	-Goods and Services Tax
HCPT	-Half cell Potential Test
HPC	-Hume Pipe Culvert
HR	- Human Resources
HTMS	-Highway Traffic Management Systems
IE	-Independent Engineer
IRC	- Indian Roads Congress
IRC SP	- Indian Roads Congress Special Publications

IRI	-International Roughness Index
Km	-kilometer
LHS	-Left Hand Side
LL	-Liquid Limit
LS	-Lumpsum
m	-Meter
MBIU	-Mobile Bridge Inspection Unit
MCB	-Metal Beam Crash Barrier
MCS	-Micro Surfacing
MCW	-Main Carriageway
MDD	-Maximum Dry Density
MHR	-Metallic Hand Rail
MJB	-Major Bridge
mm	-Millimeter
MM	-Major Maintenance
MNB	-Minor Bridge
MoRTH	- Ministry of Road Transport & Highways
Mpa	-Mega Pascal
MR	-Resilient Modulus
MSA	-Million Standard Axle
NDT	-Non-Destructive Testing
NHAI	- National Highways Authority of India
NSV	-Network survey Vehicle
O&M	- Operation and Maintenance
OL	-Overlay
PF	-Provident Fund
PGR	-Pedestrian Guard Rail
PI	-Plasticity Index
PL	-Plastic Limit
PM	-Periodic Maintenance
PUP	-Pedestrian Under pass
R&R	-Repair and Rehabilitation
RCC	-Reinforced Cement Concrete
RE Wall	-Reinforced Earth Wall
RHS	-Right Hand Side
RHT	-Rebound Hammer Test
RI	-Roughness Index
RM	-Routine Maintenance
ROB	-Road Over Bridge
RPO	-Route Patrol Officer
RUB	-Road Under Bridge
SDBC	-Semi-Dense Bituminous Concrete

SPV	-Special Purpose Vehicle
SR	-Service Road
SWB	-Static Weigh Bridge
TCS	-Typical cross Section
TDRT	-Transient Dynamic Response test
TMS	-Toll Management System
UPVT	-Ultra Pulse Velocity test
VDF	-Vehicle Damage Factor
VG	-Viscosity Grade
VUP	-Vehicular Underpass
WBM	-Water Bound Macadam
WMM	-Wet Mix Macadam
WPI	-Wholesale Price Index

CHAPTER 1. INTRODUCTION

1.1 INTRODUCTION

National Highways Authority of India ("NHAI"/ "Authority") is an autonomous body of the Government of India ("GoI") under the Ministry of Road Transport and Highways ("MoRTH") and was constituted on June 15, 1989 by an Act of Parliament titled - The National Highways Authority of India Act, 1988 ("NHAI Act"). NHAI was operationalized in February 1995 with the appointment of full time Chairman and other Members. The functioning of NHAI is governed by NHAI Act and rules, and regulations framed thereunder.

NHAI has set up an Infrastructure Investment Trust Namely **National Highways Infra Trust ("InvIT")** and is acting as its Sponsor to the said InvIT.

National Highways Infra Investment Managers Private Limited ("NHIIMPL") has been appointed as the Investment Manager to the InvIT. Accordingly, with refence to Letter of Empanelment, (LOE ref: NHIIMPL/I&A/TC/2022/04 dtd 03 Nov 2022) by Investment Manager the following works are awarded to M/s SAMARTH INFRAENGG Technocrats Pvt Ltd vide their letter ref: NHIIMPL/FY2024-25/RFP/Technical Consultant/LOA/04 dated 16.08.2024.

Project	Length (km)	No. of Plazas
Muzaffarnagar – Haridwar (Uttarakhand) From km 130+560 to Km 209+120	78.560	2 (TP-1, Chhapar TP-2, Bahadrabad)
Bareilly-Sitapur (Uttar Pradesh) **From km 262 to km 419.590**	**157.59**	**2** (TP-1, Faridpur TP-2, Maigalgunj)

Presently the project stretch is under Operation and Maintenance stage and the fee is being collected from Toll Plaza-1 at Km 266.900 near Faridpur village for a length of 78.800 km and Toll Plaza-2 at km 372.160 Maigalgunj Village for a length of 78.790 km.

The concession period is 20 years commencing from Appointed Date for TOT Concessionaire to demand and collect appropriate Fee, operate, manage and maintain the Project Highway.

M/s SAMARTH INFRAENGG Technocrats Pvt Ltd has undertaken Technical Due Diligence study for the said project to estimate initial capex including improvements and immediate requirements for repair & rehabilitation of various elements of project highway and also to make an assessment of Major maintenance requirements and Operation & Maintenance costs for entire concession period.

This report highlights the findings of "Technical Due Diligence Services of Four-Lane Bareilly-Sitapur Section of NH-24 (new NH-30) from km 262 to km 419.590 in the State of Uttar Pradesh.

1.2 PROJECT AT A GLANCE

Project road is a four-lane divided Project Highway starts at Km 262.000 and ends at Km 419.590 of NH-30. The total length of the project highway is 157.590 km.

National Highway 30 (NH 30) NH 30 connects Sitarganj in Uttarakhand with Ibrahimpatnam, Vijayawada in Andhra Pradesh. The total length of this highway is 1,984.3 km. The highway passes through the states Uttarakhand, Chhattisgarh, Madhya Pradesh, Uttar Pradesh, Telangana & Andhra Pradesh.

The Project Road is a part NH-30 falling in Uttar Pradesh State. The Highway connects several cities and town such as Bareilly, Faridpur, Tilhar, Railway Settlement Roza, Jang Bahadur Ganj, Maigalganj, Maholi, Sitapur in the state of Uttar Pradesh.



Map Showing the Project Corridor

The start and end of the project chainage system with respect to CA and Site are as presented below.

Table 1: Project Corridor Chainage System

Referencing system	Start Point (km)	End Point (km)	Length (km)	Remarks
As per CA Chainage	262.000	419.590	157.590	NH-30
As per Site	262.000	419.590	157.590	NH-30

Photograph showing the start and end point of the project road are presented below:

	
A view of the Start Point of Project Road at km 262.000	**A view of the End Point of Project Road at km 419.590**

1.3 OBJECTIVE AND SCOPE OF SERVICES

The main objective of the study is to review the current status of project corridor including details pertaining to its construction and maintenance and to provide requisite technical information for processing the acquisition of said project by client. Objective of the study can be broadly defined with following tasks:

A) Review of Project Document

- ✓ Review of DPRs/ draft CA/ Schedules pertaining to the scope of work and understand the Sch-B requirements for improvement works for the assessment of capex and Opex during the concession period.
- ✓ Review of As-built drawings and Designs
- ✓ Collection of relevant records and documents and review of same
- ✓ Review of correspondences with IE, if any, on technical issues.
- ✓ Review of EPC, Operation, Maintenance and Systems Contracts
- ✓ Review of Progress Reports, if any Prepare head of terms (highlight the key commercial, technical terms of the contracts) for the reviewed Contracts - EPC, O&M, Asset Management, Operational Agreements (if any), CAs (key technical items) etc.
- ✓ Review of Asset Management Contracts to understand the maintenance of asset from the Concession agreement perspective
- ✓ Review the technical approvals / consents from IE or another agency required under the CA

B) Field Investigations

- ✓ Undertake detailed reconnaissance to appreciate the project corridor characteristics
- ✓ Undertake field investigations to collect first-hand information on present condition of project road and establish the requirements for rehabilitation and up gradation
- ✓ Carrying out inventory and condition surveys for Project Road;
- ✓ Carrying out Inventory and detailed condition surveys for bridges & cross drainage structures (along with Photographs thereof) including recommendation for either strengthening/rehabilitation or reconstruction; Identify requirements of NDT tests if any (to be executed if required and commissioned by client with separate mutually agreed payments).

- ✓ For Major Structures (length of structure>60m), detailed Visual inspection shall be undertaken with MBIU.
- ✓ Video-graphic survey of the entire Project corridor/s.
- ✓ Axle load survey for 24 Hrs. + 7days in both directions of traffic at toll plaza location (7-day traffic count to be provided by client).
- ✓ Test pits required @ every 5 km interval (staggered) along the Project corridor.
- ✓ Carrying out necessary laboratory tests to determine the CBR value of the sub grade materials.
- ✓ Carrying out deflection test by Falling Weight Deflect meter (FWD) for existing pavement as per relevant IRC code at the rate of 5 points in km in each direction making it 10 points for both directions.
- ✓ Carrying out Roughness Survey on each lane of Project Corridors using NSV Survey.
- ✓ Availability of construction materials.
- ✓ Assess drainage adequacy: Review of available hydrological reports and assess the availability and condition of existing road side drainage along the corridors.
- ✓ The outputs of investigations are basically used to identify the strengthening requirements for project sections and also used to form the inputs for deterioration modelling.

C) Validation of Executed Works and Assessment of Improvement Works

- ✓ Validation of executed works with respect to Schedule A of the CA by physical verification at site
- ✓ Assess the present status of the projects with relevant standards and confirm that works are meeting the requirements and have been accepted by the authorities.
- ✓ Understand the scope requirements for Improvement works from the Sch-B of the CA
- ✓ Where project stretch / structures / service roads / ancillary works are pending and if not covered in the Sch-B scope of the draft CA, then assessment of details relating to land acquisition, approvals, timelines for completion, etc. along with cost forecast
- ✓ Cost estimates for any missing items and all works included in the Sch-B of the CA
- ✓ Make an assessment of any risks associated with already executed works

D) Quality Audit

- ✓ Review quality of construction based on available data, available design and drawings.
- ✓ Review of Quality of materials from Laboratory testing for aggregates & soil
- ✓ Check compaction and quality of subgrade material used vide test pits
- ✓ Visual inspection of bridges for any visible distress and anomalies. Identify requirements of NDT testing based on same.
- ✓ Examine Expansion joints and bridge bearings condition and assess requirements for replacements
- ✓ Shall be examining expansion joints visually to the extent possible. Shall use high binoculars/ pictures from accessible points. Shall review all photographs closely and come to a conclusion on same.
- ✓ Identify any critical issues / red flags in relation to the quality or condition of the projects; Identify any structural integrity issues that require rectification / re-mediation;

E) Rehabilitation Plans & Designs

- ✓ Check the adequacy of designs carried out for execution based on available reports
- ✓ Undertake designs for immediate rehabilitation requirements based on CA specifications using FWD data and condition assessment surveys
- ✓ Assess the requirements of rehabilitation to bridges/CD structures by structure based on visual inspections and compare with Sch-B requirements of the draft CA

- ✓ Assess the requirements including BOQ and cost estimates of repair and replacements for various elements and ancillary works

F) Major Maintenance

- ✓ Review of current maintenance system.
- ✓ Preparation of the maintenance costs to be incurred over the period of the concession keeping in mind the maintenance requirements of the Concession Agreement.
- ✓ Detailed assessment of maintenance cycles for pavements using HDM4 analysis and estimation of maintenance cost for the concession period
- ✓ To understand the current maintenance strategy for each of the project and review the BOQ to be provided by the DPR consultant for adequacy in relation to Major Maintenance work of Highways, structures, Road Furniture and other site-specific requirements as per respective CA
- ✓ Minor maintenance will be included in routine maintenance and estimated year wise based on assumed percentages based on present condition.
- ✓ Identify any impacts on revenue due to Major Maintenance.
- ✓ Maintenance requirements for approaches to Underpass forming part of CA would also be assessed.

G) Cost of Improvement Works and Operations

- ✓ Preparation of O&M cost for the concession period.
- ✓ Assess the adequacy of costs assumed in the vendor model are adequate to meet the major maintenance, stage construction and routine maintenance requirements.
- ✓ Independently develop a bottom-up forecast of Operating expenses for project, with detailed break-up of each type of operating expense, along with underlying assumptions

H) BOQ and Cost Estimates

- ✓ Preparation of BOQ & Cost for Improvement works as per Sch-B of the CA
- ✓ Preparation of BOQ and Costs for Major Maintenance
- ✓ Preparation of BOQ and cost for Routine maintenance and Route Patrolling
- ✓ Preparation of BOQ and Cost for Operations
- ✓ Preparation of year-by-year O&M cost
- ✓ The costs would be provided till the end of the concession period including any expected extension of Concession periods as informed by the Client.
- ✓ Benchmarking of costs against other similar Indian toll roads where available (using available data)
- ✓ Historical trend analysis on the maintenance program based on the existing pavement condition and review of all relevant maintenance plans/ documents of NHAI or its concessionaires or contractors.
- ✓ Review and comment on the current organizational structure from an O&M perspective at each asset. Also suggest an indicative organization structure based on project / CA requirements

1.4 DATA COLLECTION AND REVIEW

In brief, following were covered

- ✓ Review of Concession Agreement & Schedules,
- ✓ Review of Detailed Project Report prepared by NHAI
- ✓ Review of As-built drawings, Plan and profiles, Structural drawings & Detailed Project Reports and Designs where available

- ✓ Review of O&M costs as presented in DPR reports
- ✓ Review of MPR provided by NHAI
- ✓ Review of Latest NSV and FWD data provided by PIU, NHAI

1.5 KEY PROJECT DETAILS

National Highways Authority of India (NHAI) terminated M/s ERA Infra Engineering Limited's contract for the Bareilly-Sitapur highway project NH-24 (now NH-30) largely due to extensive delays and project performance issues. Originally this project was awarded in 2011, and intended for completion within a few years but continued to face setbacks due to funding challenges, execution delays, and financial troubles within Era Infra. As a result, construction lagged well beyond the scheduled deadline, leading NHAI to cancel the contract and seek alternative avenues to complete the project efficiently. Accordingly, Era Infra's contract for the Bareilly-Sitapur project was terminated in the year 2019 Following ERA's removal, NHAI resumed and reissued parts of the project for bidding to other contractors to ensure completion.

Thus, the balance works were awarded in the year 2019 to consortium comprising of Raj Corporation Ltd., Siddarth Constructions, and Jagdish Saran with Raj Corporation as the lead member on item rate contract.

Following Table highlights the important timelines of the project corridor at a glance:

Type of work	**Balance work**	**ROB at Km. 314.630**	**3No: MJB/MNB 1 no-VUP, 1No.2Lane Cross FO**	**Overlay at Intermittent location**
Concessionaire/ Contractor:	**JV of Raj Corporation Ltd.**	**M/S Kaluwala Construction Private Ltd**	**M/S Jagadish Saran**	**M/S Atcon India Limited**
Contract Type:	**Bill of Quantity**	**EPC**	**EPC mode**	**Bill of Quantity (Item rate, Single% basis)**
LOA:	15.10.2019	20.06.2022	18.12.2023	19.01.2024
Agreement Date:	21.11.2019	30.08.2022	24.01.2024	25.01.2024
Appointed Date:			23.02.2024	12.02.2024
Actual Start date:	17.12.2019	24.10.2022	23.02.2024	12.02.2024
Schedule Completion date:	08.03.2024	23.10.2023		
EOT:	30.08.2024 But As per Sch-A (pg A-5) completed 12.04.2023			
Likely Completion:	31.08.2024	09.05.2023 (completed)	22.02.2025	11.02.2025
Maintenance period:	5 years	10 years	5 years	DLP: 5 years

Construction Activities observed at these locations during site visit by the respective contractors respectively

Under Constructions								
S.no	From	To	Package	Length	Type	Side	Remarks	Contractor
1	327.250	327.700	PKG-1	450	MJB	RHS	Not yet Completed	M/S Jagdish Saran
2	411.000	411.300	PKG-1	300	MNB	RHS	Not yet Completed	M/S Jagdish Saran
3	413.830	413.830	PKG-1	0	Cross Flyover		Not yet Completed	M/S Jagdish Saran
4	415.800	416.000	PKG-1	200	MNB	RHS	Not yet Completed	M/S Jagdish Saran
5	416.300	417.050	PKG-1	750	VUP	BHS	BC Laying in Progress	M/S Jagdish Saran

**Note:*

1. Ongoing Mill & Overlay works of DBM were observed on site by M/S Atcon Pvt Ltd with varying thicknesses as per FWD report approved by the Supervision Consultant and Authority. And BC overlay works are yet to be started.

1.6 O&M REQUIREMENTS

Few important O&M requirements as per schedules/manuals are described as below.

- ✓ Applicable Manual is IRC: SP:84-2019
- ✓ Applicable Schedule for O&M period is Schedule-F.
- ✓ Schedule-F, performance parameters indicate the desirable limit of Roughness values should not exceed 2000 mm/km, whereas its acceptable limits Is 2400 mm/km and needs to be corrected within 180 days. Roughness Surveys shall be carried out Bi-Annually.
- ✓ Schedule-F, performance parameters indicate the FWD survey shall be carried out Annually as per IRC: 115-2014 for flexible pavement and needs to be corrected within 180 days
- ✓ No specific Handing Over (Divestment) requirements are mentioned under CA. It shall be same as Schedule-F.

1.7 KEY OBSERVATIONS

General project Key observations are as presented below.

- Majority of Length is being overlaid with DBM and BC by M/S ATCON India Pvt Ltd. The recently laid DBM appears to be ravelled at some locations with coarser texture and big size aggregates in the mix. BC shall be laid to avoid further damage to DBM.
- Old Surface, where overlay is not done exhibits severe Ravelling, Dry Surface with cracks mostly in inner lane of the project. Whitish surface with stripping is also noticed Majority of approaches and urban areas where not overlaid are in a poor shape.
- Milling and Patching is mostly done for a width of 5m on median side which indicates more damage is observed in inner lanes.
- Rutting and shoving is observed on approaches of grade separators. Mostly these locations are milled and patched.

- More traffic is observed between Bareilly-Shajahanpur than Shajahanpur-Sitapur. It seems traffic loading is less in Section 2.
- Dense vegetation is seen on the slope at approaches of embankments. Geocell is also used on the slope for slope protection. However, there are slope erosions at several places along the corridor. It is likely to have erosions on such type of soils (Sandy Silts).
- Vegetation is also seen on the median and earthen shoulders all along the corridor. It is required to be cleaned as part of Routine maintenance.
- Long length of narrow median without any crash barrier is noticed along the corridor. Antiglare is also not provided. Natural vegetation grown in median is helping against light glare. This narrow median location requires safety improvements.
- Construction finish of RE walls and crash barriers are not up to the mark as line and level is not maintained properly. Poor Finish at New ROB at KM 413. Crash barrier appears to be bent on RHS side without line and Level, RE wall Bulging observed on RHS side.
- ROB at 334: Poor finish of Crash barrier/Median Drain, Rutting/Undulations in Approach. RE wall started to bulge.
- RE wall bulging is observed at some the structures. Major Bulging is noticed at new ROB at Km 403 on RHS A2 side. External reinforced wall is under construction at this location to protect RE Wall at the bottom.
- RE wall bulging at ROB KM 334.245- 334.310, 8 m height on LHS A1. Cracking/Crushing of panels also noted. Water stagnation adjacent RE wall on RHS side A2.
- Soil Nailing/RE wall bulging noted at VUP approach at Km 396 near Abutments on LHS&RHS
- RE wall Bulged/Damaged at ROB approach A2 at Km 403. External RCC wall is done by side of RE wall as protection/Support
- Mild Bulging of RE wall at approach RHS A1/A2 Km 407/2.
- RE wall at ROB@ km 413 RHS side started bulging.
- Low height crash barriers were constructed at several approaches. Pipe railing may be required to be installed on crash barriers.
- Water stagnation is observed at several super elevated (Curved) sections indicating poor drainage facilities. It is required to provide median drain at these locations to avoid ponding.
- Temple in Median at Km 300 & Km 412 & Tree on Paved Shoulder at Km 380 (RHS) safety hazards.
- Kerbed road is observed on approaches to Major Bridges where high embankment exist Chutes provided on slope require local pitching to avoid erosion.
- Narrow Approach (only 7 m) at Km 277-278 with narrow median. No crash barrier in narrow median. Unsafe approach safety hazard.
- Culvert Parapet at Km 281.250 has a Narrow carriageway posing Safety Hazard.
- Major Bridges under construction at Km 416, KM 411 in finishing stages. It may require 3-4 months for completion.

- Fencing Adjacent to Paved Shoulder near Bareilly (Km 268) for avenue plantation. This is posing Safety Hazard.
- KM 269-268 RHS: Slope Erosion observed.
- KM 282-283: Partial wall on Sloped Embankment Broken/Failed. Slope Failure may happen.
- KM 288-289: Both sides Approach slopes are noticed erosion. Geocell used but it is Damaged.
- KM 303-304 RHS: Approach slopes are noticed erosion. Needs chutes and protection
- Slope Erosion is noticed on Approach at 332/400 on LHS
- Slope erosion noticed on Approach at KM 365.3 on RHS Side for 10 m on A 1 side
- KM 369/3 on LHS Tree uprooted and formed big cavity towards Paved shoulder side.
- KM 376-377: Rain cuts & Slope erosion are noticed
- Rain Cut in Km 385 and also noticed Slope Erosion.
- 389.7-390.8: High Embankment with chutes at MJB approach, Require local protection for Chutes.
- Slope erosion on RHS at KM 392/600 RHS RAP Poured Need Chutes.
- Slope Erosion 394-391 at frequent intervals, Rain Cuts RHS
- During the MBIU surveys, at couple of locations damaged bearings are observed. These need to be replaced.
- MJB at km.289+250 LHS - Superstructure in span-2 slided approximately 100mm towards the shoulder side on pier P1 and all the bearings were damaged. Realignment by lifting of superstructure and bearings replacement is required as an immediate action to safeguard the structure from further damage.

CHAPTER 2. SURVEYS AND INVESTIGATIONS

2.1 INTRODUCTION

The main objective of undertaking Surveys and Investigations is to appreciate the existing engineering features along the project corridor and to understand the present condition of the various elements of the project road and to prepare required inputs for various rehabilitation and maintenance strategies.

Following Survey and Investigations have been undertaken as a part of study with an objective to understand the present condition of the road and there by access the quality of construction and as well to prepare requisite rehabilitation/corrective designs where necessary.

- Road Inventory Surveys
- Pavement Condition using NSV
- FWD Surveys
- Roughness Surveys using NSV
- Pavement Composition surveys (Test Pits)
- Subgrade Investigations & Laboratory testing
- Material Investigations
- Axle Load Survey
- Structure Inventory and Condition Surveys

These surveys have been performed in the month of August/September 2024.

2.2 ROAD INVENTORY

The project corridor features a 4-lane divided carriageway for most of its length. Generally, the carriageway width of flexible pavement is 7.5 meters wide, including shyness, and is flanked by paved shoulders (varying width from 0.5m to 4m) and 1 to 2 meters of earthen shoulders on each side of the median. These widths vary at structure locations and approaches to major junctions. At Toll Plaza location rigid pavement is provided.

The median is typically 4.5 meters wide for the majority of the corridor. At median openings, the width reduces to 1 meter to accommodate storage lanes. In built-up sections, 1-to-2-meter median is observed.

In general, road embankments heights are in the range of 0.5m-3m. However, embankment heights higher than 3m are observed mainly in the approaches to CD-Structures and Underpass locations.

The project corridor mainly traverses through plain terrain. The land use along the project road is predominantly agricultural and built-up areas. It passes through several urban settlements, including Bareilly, Faridpur, Tilhar, Railway Settlement Roza, Jang Bahadur Ganj, Maigalganj, Maholi, and Sitapur.

Typical View of Project Road is shown below:



A view of the Project Corridor at Km 293.000



A view of the Project Corridor at Km 315.540



A view of the Project Corridor at km 333.500



A view of the Project Corridor at Km 368.400

The Project Road has 26 Nos. of Major junctions and 284 Nos of Minor junctions. Photographs showing the Major Junctions and minor junctions are presented below:



Major Junction at km 271.950 RHS



Major Junction at km 309.700 LHS



Minor Junction at km 307.250 RHS



Minor Junction at km 371.500 LHS

There are 47 Nos. of High masts provided near Junctions and Toll Plaza locations. Whereas, Highway lighting is provided for length of 37.350 kms near built-up sections, Bus bays and Truck lay-bye location. Few photos showing High mast and highway lighting are presented below:



A view of High Mast Lighting at km 266.650



A view Solar Lighting at Km 306.100 RHS



A view of Double arm lighting at Km 314.500

Project Road consists of 10 Nos. of Bus bays with shelters, 6 Nos. of Bus shelter. Few photos taken at the Bus Bays and Bus Shelters are presented below:



Bus Bay With Bus shelter @ Km 312.620 RHS



Bus Bay with Bus shelter @ Km 385.100 LHS

There are 4 Nos. of Truck lay byes provided along the project corridor with Flexible pavement. The condition of the pavement appears to be fair. A Separator is provided in between main carriageway and Truck lay-bye portion.

Few photos depicting the Truck lay-bye portion are presented below:

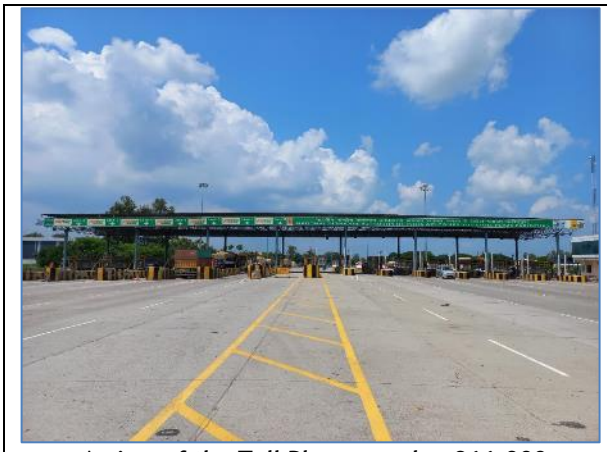


A view Truck Lay bye at Km 271.500 RHS



A view Truck Layby at Km 306.000 RHS

The Project Road has 2 No. of Toll Plazas at Km 266.900 (Faridpur plaza) and km 372.160 (Maigalganj Plaza) respectively. Rigid pavement exists at toll plaza location and condition appears to be fair. It has 7+1 lanes on each side. 12 Nos. of High mast lighting have been provided at TP-1 and 11 Nos. are at TP-2.



A view of the Toll Plaza near km 266.900



A view of the Toll Plaza near km 372.160



A view of the admin building at km 266.900



A view of Weigh bridge at km 372.160

Service/slip roads are constructed with flexible pavement and have varying carriageway widths ranging from 3.5 meters to 7 meters, covering a total length of 65.3 km. This length includes some extra-wide roads with paver blocks. Specially, narrow road width of 3.5m is observed at Land constraint locations. Photos depicting the surface type, condition, and other associated features such as drainage are included below.



7m wide service road at Km 283.200 LHS



7m wide service road at Km 295.390 RHS

	
7m wide service road at Km 305.410 RHS	7m wide service road at Km 408.300 LHS

The collected Road Inventory Data is presented in **Appendix 1** of this Report.

2.3 PAVEMENT CONDITION SURVEYS

The collected Pavement Condition Data using NSV surveys for main carriageway is presented in **Appendix 2** of this Report.

The photographs showing the pavement condition of the Project Road is presented below.

		
Wide Cracking at km-287+600 RHS	Ravelling at km-305+900 LHS	Patching cum Shoving at Km-312+450 RHS
		
Ravelling @ km 316.000 LHS	Rutting with Cracking at km-318+360 LHS	Rutting cum Shoving at km-330+000 LHS

		
Fair condition @ km 333.500 LHS	**Delamination at km-356+200 RHS**	**Alligator Cracking at km-382+050 LHS**

2.4 FALLING WEIGHT DEFLECTOMETER (FWD) SURVEYS

2.4.1 Falling Weight Deflectometer Survey (Flexible Pavement)

In order to evaluate the structural strength of the existing pavement, Falling Weight Deflectometer (FWD) survey has been carried out along the project road in line with IRC: 115-2014.

- ✓ Prior to the start the surveys, Load repeatability tests are performed on each day
- ✓ The target Peak Load of 40 KN (+/- 4 KN) is maintained during survey.
- ✓ At Regular intervals of time Pavement temperature is noted.
- ✓ For every 1 Km of stretch 5 test Points (2 pts- Outer, 3 pts-inner) were taken on Main Carriageway in each direction.
- ✓ Temperature correction equation is applied for back calculated modulus of BT and winter seasonal correction factor is applied as test performed in Aug/Sept month for the back calculated modulus of granular and Subgrade.

The collected FWD Data and Analysis is presented in **Appendix 3** of this Report.

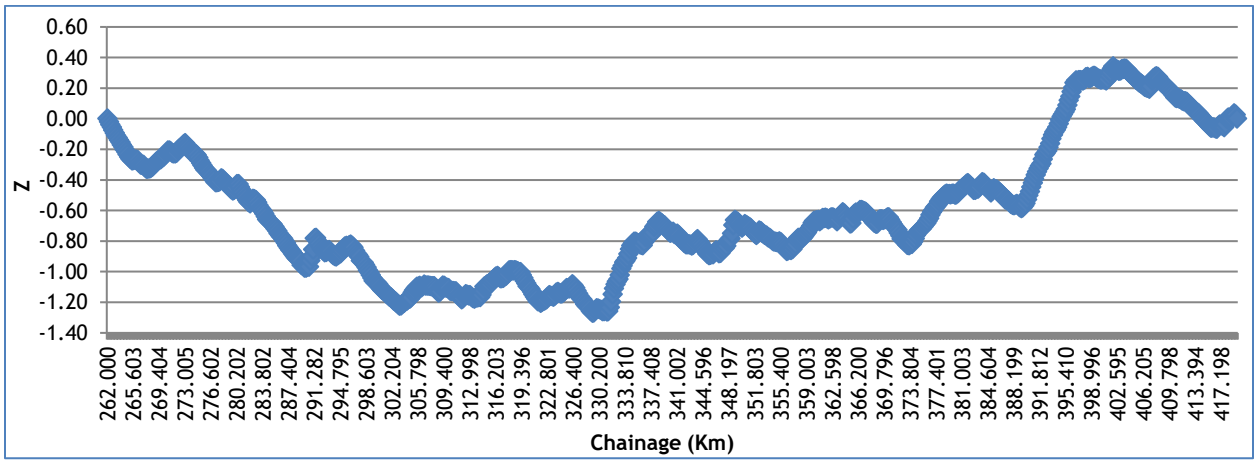
Few photos taken during the progress of FWD Surveys are presented below:

	
FWD Survey in progress	**FWD Survey in progress**

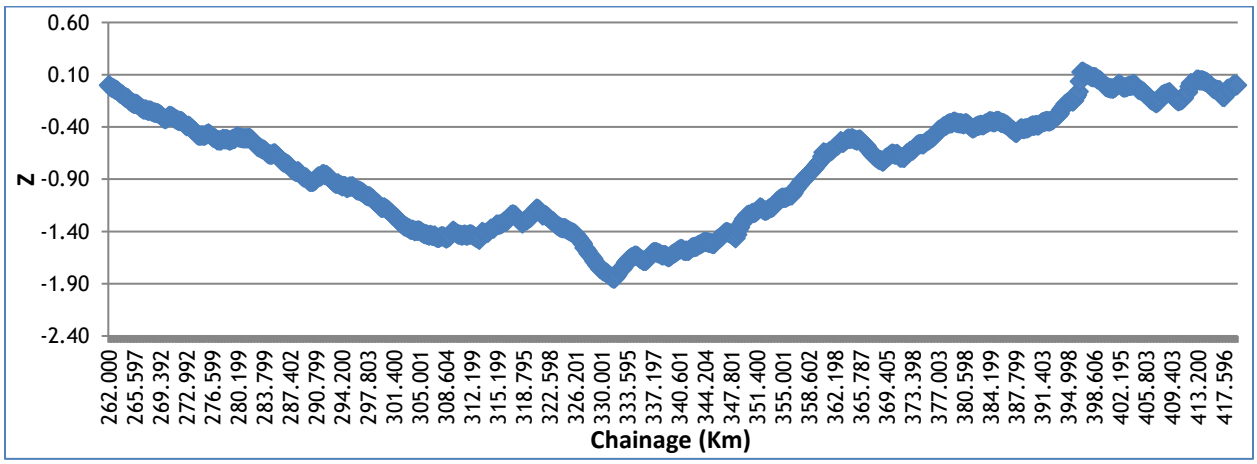
Cumulative Difference Approach (CDA) has been used for the identification of homogeneous sections on the basis of Surface Curvature Index (SCI). SCI is calculated as the difference between D_0 and

D_{300}, where D_0 and D_{300} are the peak deflections (mm) measured at the center of loading plate and at a radial distance of 300mm

The homogenous sections in each direction of traffic (i.e., LHS & RHS) for the project stretch have been identified for Main carriageway are presented in graphical representation of followed by tables.



Delineation of Homogeneous Section – LHS



Delineation of Homogeneous Section - RHS

Based on the above graphs, the flexible pavement section has been sub-divided into homogeneous section for LHS and RHS direction as given below.

Table 2: FWD Data - Homogenous Section of MCW-LHS

Homo Sections	From (Km)	To (Km)	Length (Km)	Remarks
1	262.000	264.198	2.20	
2	264.198	266.750	2.55	
3	266.750	267.050	0.30	Toll Plaza
4	267.050	270.001	2.95	
5	270.001	272.803	2.80	

Homo Sections	From (Km)	To (Km)	Length (Km)	Remarks
6	272.803	275.800	3.00	
7	275.800	279.404	3.60	
8	279.404	282.201	2.80	
9	282.201	285.807	3.61	
10	285.807	289.400	3.59	
11	289.400	292.401	3.00	
12	292.401	295.400	3.00	
13	295.400	299.398	4.00	
14	299.398	303.203	3.80	
15	303.203	305.997	2.79	
16	305.997	308.396	2.40	
17	308.396	311.404	3.01	
18	311.404	314.000	2.60	
19	314.000	316.601	2.60	
20	316.601	318.805	2.20	
21	318.805	321.601	2.80	
22	321.601	324.004	2.40	
23	324.004	326.400	2.40	
24	326.400	327.250	0.85	
	327.250	327.700	0.45	Diversion
	327.700	329.600	1.90	
25	329.600	332.010	2.41	
26	332.010	334.400	2.39	
27	334.400	337.597	3.20	
28	337.597	340.800	3.20	
29	340.800	343.598	2.80	
30	343.598	346.598	3.00	
31	346.598	349.002	2.40	
32	349.002	352.002	3.00	
33	352.002	355.200	3.20	
34	355.200	358.396	3.20	
35	358.396	361.008	2.61	
36	361.008	363.395	2.39	
37	363.395	365.999	2.60	
38	365.999	370.389	4.39	
39	370.389	371.950	1.56	
	371.950	372.250	0.30	Toll Plaza
	372.250	374.602	2.35	
40	374.602	378.001	3.40	
41	378.001	381.196	3.20	
42	381.196	384.002	2.81	
43	384.002	386.803	2.80	
44	386.803	389.610	2.81	
45	389.610	393.005	3.39	
46	393.005	396.401	3.40	
47	396.401	398.996	2.59	
48	398.996	401.773	2.78	

Homo Sections	From (Km)	To (Km)	Length (Km)	Remarks
49	401.773	404.598	2.82	
50	404.598	407.404	2.81	
51	407.404	410.000	2.60	
52	410.000	412.807	2.81	
53	412.807	415.604	2.80	
54	415.604	419.590	3.99	
Total length			**157.590**	

Table 3: FWD Data -Homogenous Section of MCW – RHS

Homo Sections	From (Km)	To (Km)	Length (Km)	Remarks
1	262.000	264.197	2.20	
2	264.197	266.750	2.55	
3	266.750	267.050	0.30	Toll Paza
4	267.050	269.997	2.95	
5	269.997	272.798	2.80	
6	272.798	275.598	2.80	
7	275.598	278.395	2.80	
8	278.395	281.197	2.80	
9	281.197	284.001	2.80	
10	284.001	287.002	3.00	
11	287.002	289.995	2.99	
12	289.995	291.996	2.00	
13	291.996	295.991	4.00	
14	295.991	299.407	3.42	
15	299.407	302.799	3.39	
16	302.799	305.992	3.19	
17	305.992	309.395	3.40	
18	309.395	313.996	4.60	
19	313.996	317.001	3.01	
20	317.001	320.596	3.60	
22	320.596	323.797	3.20	
23	323.797	326.404	2.61	
24	326.404	327.250	0.85	
	327.250	327.700	0.45	MJB U/C
	327.700	329.600	1.90	
25	329.600	332.004	2.40	
26	332.004	334.331	2.33	
27	334.331	336.806	2.47	
28	336.806	340.800	3.99	
29	340.800	343.402	2.60	
30	343.402	345.999	2.60	
31	345.999	348.402	2.40	
32	348.402	351.400	3.00	
33	351.400	354.206	2.81	
34	354.206	358.401	4.19	
35	358.401	362.798	4.40	
36	362.798	365.787	2.99	

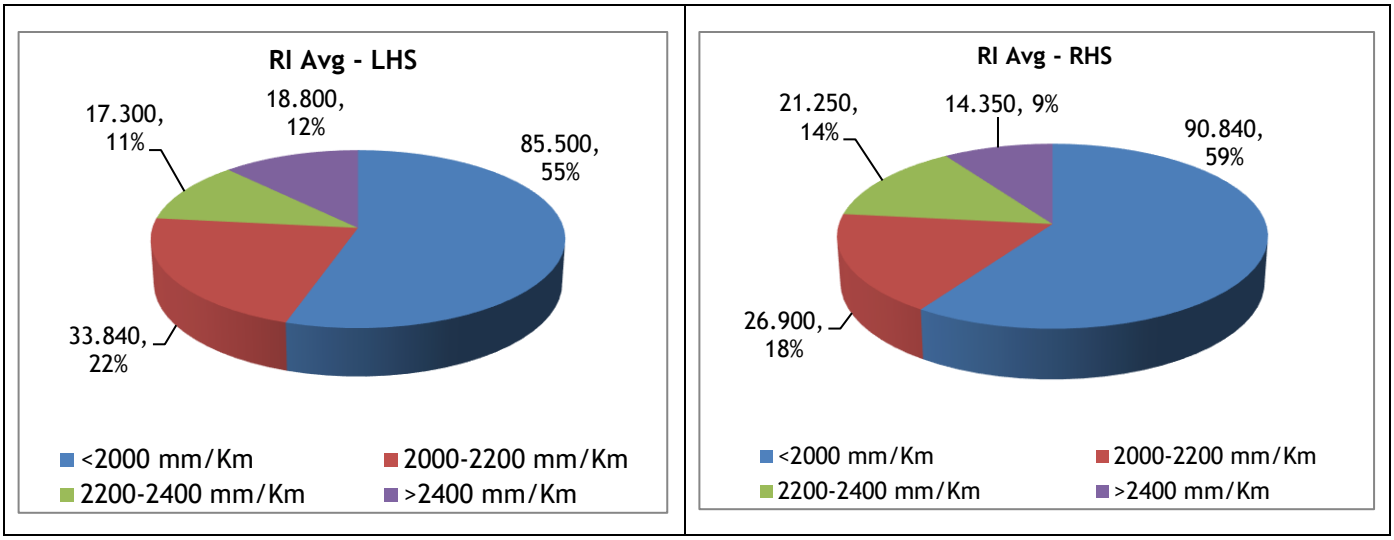
Homo Sections	From (Km)	To (Km)	Length (Km)	Remarks
37	365.787	370.190	4.40	
38	370.190	371.950	1.76	
	371.950	372.250	0.30	Toll Paza
	372.250	373.001	0.75	
39	373.001	376.192	3.19	
40	376.192	378.804	2.61	
41	378.804	381.600	2.80	
42	381.600	384.804	3.20	
43	384.804	387.598	2.79	
44	387.598	391.799	4.20	
45	391.799	395.396	3.60	
46	395.396	397.789	2.39	
47	397.789	400.793	3.00	
48	400.793	403.565	2.77	
49	403.565	407.000	3.44	
50	407.000	411.000	4.00	
51	411.000	411.300	0.30	MNB U/C
52	411.300	415.800	4.50	
53	415.800	416.000	0.20	MNB U/C
54	416.000	416.300	0.30	
	416.300	417.050	0.75	Overlay Under Progress
	417.050	419.590	2.54	
Total length			**157.590**	

2.5 ROUGHNESS SURVEYS

The Roughness data has been collected using **Network Survey Vehicle** and analyzed in terms of International Roughness Index (IRI), separately for each lane, for both direction of travel. Pavement Roughness data collection and computation of IRI for each km length in each direction is presented in **Appendix 4** of this Report.

As per Schedule-F of TOT, the desirable level of service for Roughness values for bituminous pavement surface is considered to less than 2000 mm/Km and the acceptable limits are less than 2400mm/Km.

Average Roughness Index (RI) values along the corridor were grouped in to four categories, Pie chart showing the range of RI values in each carriageway of the project road have been presented below:



About 55% in LHS & 59% in RHS carriageway of the project length has good to fair riding quality respectively.

2.6 PAVEMENT COMPOSITION SURVEYS (TEST PITS)

The composition of the existing pavement crust has been noted from test pit surveys. Thus, a total of 36 Nos. of pits have been dug along the corridor and its pavement composition has been noted.

Results of the test pit survey showing average thickness of pavement layers are presented in the Table below.

Table 4: Pavement Composition of Existing Pavement along Project Road

S No	Test Pit Number	Chainage Km	Direction	BT (mm)	WMM (mm)	N.GSB (mm)	C.GSB (mm)	Brick Soling (mm)	PQC (mm)	DLC (mm)	Total (mm)
1	BS -TP-1	263+900	LHS	230	170	100					500
2	BS -TP-1A	272+000	LHS	180	220	200					600
3	BS -TP-2	269+400	RHS	185	230	200					615
4	BS -TP-3	276+150	LHS	155	230	190					575
5	BS -TP-4	280+550	RHS	180	210	200					590
6	BS -TP-5	285+450	LHS	200	200	180					580
7	BS -TP-6	289+500	RHS	230	270		210	150			860
8	BS -TP-7	294+100	LHS	185	260	160					605
9	BS -TP-8	300+400	RHS	230	200	230					660
10	BS -TP-9	306+500	LHS	170	320	180					670
11	BS -TP-10	309+950	RHS	180	260	220					660
12	BS -TP-11	316+400	LHS	225	250	230					705
13	BS -TP-12	320+750	RHS	170	180	110					460
14	BS -TP-13	325+000	LHS	165	270	210					645
15	BS -TP-14	330+500	RHS	140	250	170					560
16	BS -TP-15	335+150	LHS	220	190	190		150			750
17	BS -TP-16	339+900	RHS	180	250	200					630

S No	Test Pit Number	Chainage Km	Direction	BT (mm)	WMM (mm)	N.GSB (mm)	C.GSB (mm)	Brick Soling (mm)	PQC (mm)	DLC (mm)	Total (mm)
18	BS -TP-17	345+850	LHS	175	240	120					535
19	BS -TP-18	350+050	RHS	180	190	230					600
20	BS -TP-19	354+450	LHS	185	190			160			535
21	BS -TP-20	260+150	RHS	175	240	190					605
22	BS -TP-21	364+450	LHS	160	220	160					540
23	BS -TP-22	368+600	RHS	160	260	200					620
24	BS -TP-23	375+000	LHS	210	200	250					660
25	BS -TP-24	379+750	RHS	165	250	250					665
26	BS -TP-25	385+200	LHS	220	170	180					570
27	BS -TP-26	389+050	RHS	160	230	180	250				820
28	BS -TP-27	393+900	LHS	180	280	180					640
29	BS -TP-28	400+600	RHS	260	210	190					660
30	BS -TP-29	405+950	LHS	270	250	180					700
31	BS -TP-30	410+250	RHS	250	240	180					670
32	BS -TP-31	415+350	LHS	175	250	190					615
33	BS -TP-32	419+350	RHS	220	250	170					640
34	BS -SR-TP-1	303+300	LHS	80	220	140					440
35	BS -SRTP-2	392+700	RHS	70	150	110					330
36	BS -TL-TP-1	372+050	LHS						350	180	530

2.7 SUBGRADE INVESTIGATIONS & LABORATORY TESTING

Sub-grade Investigations have been carried out to examine the subgrade soil characteristics along the project road. A total 36 Nos. of test pits have been carefully dug from the pavement surface up to sub-grade level. Out of 36 nos,33 nos are done on main carriageway and remaining 2nos are done in Service Road, 1nos are done in Toll Plaza. Field density tests have been conducted for subgrade samples and a small quantity of sample has also been collected in airtight containers for determining the field moisture content. Upon completion of the field density test, representative sample of sub-grade soil has been collected in bulk, in gunny bags from each test pit for laboratory testing.

The soil samples collected have been tested for the following properties to assess the existing sub-grade soil properties.

- Sieve analysis
- Atterberg limits
- Heavy compaction
- Four (4) days soaked CBR as per IS standards at 97% of MDD as applicable for sub-grade (Heavy Compaction)
- Free swelling index

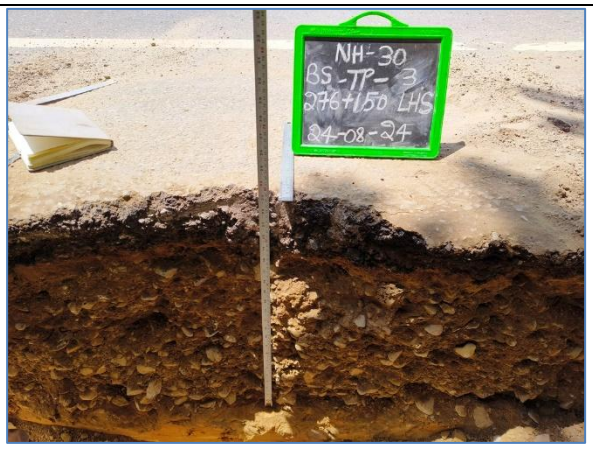
Few sample photos of the test pit locations where the subgrade samples collected are as presented below.



BS-TP-1



BS-TP-2



BS -TP-3



BS -TP-4



BS-TP-5



BS-TP-6



BS-TP-7



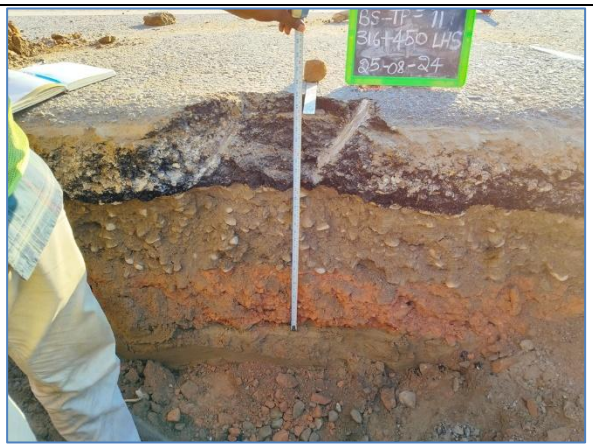
BS-TP-8



BS-TP-9



BS-TP-10



BS-TP-11



BS-TP-12



BS-TP-13



BS-TP-14



BS-TP-15



BS-TP-16



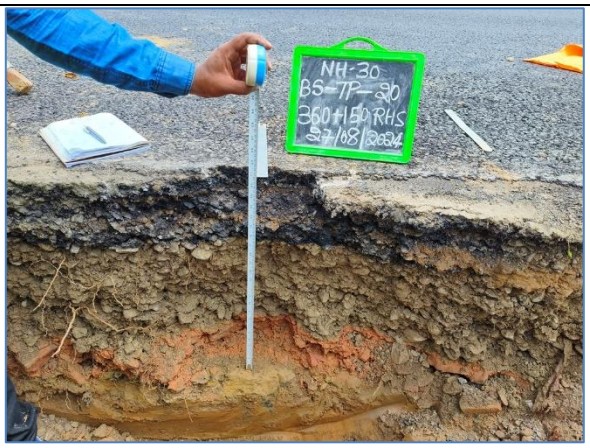
BS-TP-17



BS-TP-18



BS-TP-19



BS-TP-20



BS-TP-21



BS-TP-22



BS-TP-23



BS-TP-24



BS-TP-25



BS-TP-26



BS-TP-27



BS-TP-28



BS-TP-29



BS-TP-30



BS-TP-31



BS-TP-32



BS-SR-TP-1



BS-SR-TP-2



BS-TL-TP-1

2.8 GSB Layer Investigations in Median

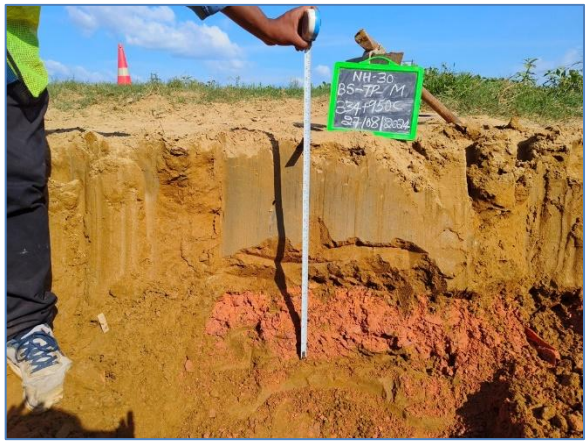
Investigations of the GSB (Granular Sub-Base) layer have been conducted to assess the continuity of the GSB layer thickness in the median along the project road. A total of 14 pits were carefully excavated in the median down to the top level of the sub grade.

Sl. No	Median No	Chainage	Side	Offset from Kerb	GSB Thickness	Test Pit Chainage	Side	Test Pit Thickness of GSB	Difference
		Kms		*m*	*mm*	*Kms*		*mm*	*mm*
1	BS-TP-M1	345+350	Centre	Full width	80	345+850	LHS	120	40
2	BS-TP-M2	334+950	Centre	Full width	200	335+150	LHS	190	-10
3	BS-TP-M3	322+830	Centre	Full width	130	320+750	RHS	110	-20
4	BS-TP-M4	368+600	Centre	1.5	200	368+600	RHS	200	0
5	BS-TP-M5	380+750	Centre	1.5	110	379+750	RHS	250	140
6	BS-TP-M6	291+750	Centre	1.5	No GSB Layer	393+900	LHS	180	
7	BS-TP-M7	286+300	Centre	1.5	100	285+450	LHS	180	80
8	BS-TP-M8	293+330	Centre	1.5	old BT	294+100	LHS	160	
9	BS-TP-M9	300+850	Centre	1.5	220	300+400	RHS	230	10
10	BS-TP-M10	311+900	Centre	1.5	120	309+950	RHS	220	100
11	BS-TP-M11	358+800	Centre	1.5	150	260+150	RHS	190	40
12	BS-TP-M12	369+300	Centre	1.5	110	368+600	RHS	200	90
13	BS-TP-M13	382+300	Centre	1.5	80	385+200	LHS	180	100
14	BS-TP-M14	393+500	Centre	1.5	100	393+900	LHS	180	80

Few sample photos of the Median pit locations where the GSB layer investigations are done as presented below.



BS-TP-M-1



BS-TP-M-2

	
BS-TP-M-3	BS-TP-M-4
	
BS-TP-M-4	BS-TP-M-5
	
BS-TP-M-6	BS-TP-M-7

	
BS-TP-M-8	BS-TP-M-9
	
BS-TP-M-10	BS-TP-M-11
	
BS-TP-M-12	BS-TP-M-13



BS-TP-M-14

2.9 BORROW AREAS

Potential borrow area identified at 16 Nos. of locations for the use of embankment/subgrade construction works within economic haulage leads. The sources identified as potential borrow areas along with certain useful information such as distance from the project road, location, village name, etc., have also been presented in this table below.

Table 5: Borrow Area Samples Details

S No	Borrow Area No	Chainage	Side	Offset	Village and contact person	Quantity	Rate	Remarks	Co-ordinate
		Kms		*Kms*			*Rs.*		
1	BS-BP-1	411+550	RHS	2.0	Vill- Badaura Name: Jaya Ram Phone:9984841383	5 Acres* 6 feet	Not told	Pvt. Land	27.5808581 80.6378701
2	BS-BP-2	334+950	LHS	4.0	Vill- Naguma Name: Vijaya Rajput Phone:7607710963	10Acres* 3 feet	Bigha- Rs-60000 3ft	Pvt. Land	27.8685299 79.9706971
3	BS-BP-3	343+500	LHS	6.0	Vill- Balak Ram Name: Sarahi Phone: 9651673858	11Acres* 3 feet	Not told	Pvt. Land	27.8676691 80.0239410
4	BS-BP-4	356+250	RHS	1.5	Vill- Grampanai Name: Ram kavel Phone: 8737056520	13Acres* 6 feet	Not told	Pvt. Land	27.7771393 80.1493903
5	BS-BP-5	365+450	RHS	1.5	Vill- Hrmpasigum Name: Arjun Singh Phone: 7068277799	20Acres* 3 feet	Not told	Pvt. Land	27.7498710 80.2367941
6	BS-BP-6	372+400	RHS	2.0	Vill- Rajajania Name: Anupam Tiwari Phone: 7068277799	6Acres* 3 feet	Not told	Pvt. Land	27.7330866 80.2975451
7	BS-BP-7	383+650	LHS	2.2 kms	Vill- Murasania Name: Sanjay Phone: 8772852748	35Acres* 3 feet	Not told	Pvt. Land	27.7061460 80.3877830

S No	Borrow Area No	Chainage	Side	Offset	Village and contact person	Quantity	Rate	Remarks	Co-ordinate
		Kms		*Kms*			*Rs.*		
8	BS-BP-8	317+450	LHS	2.2 kms	Vill- Raj kurd Name: Mahender Phone: 8953264030	20Acres* 3 feet	Not told	Pvt. Land	27.9038513 79.8631365
9	BS-BP-9	308+870	RHS	2.4 kms	Vill- Tihar Vilhara Name: Arjun Singh Phone: 7985383433	22Acres* 3 feet	Bigha-Rs-24000 3ft	Pvt. Land	27.9409479 79.7615314
10	BS-BP-10	298+850	LHS	1.5 kms	Vill- Khariya Name: Rajesh Phone: 9793120073	15Acres* 3 feet	Not told	Pvt. Land	Sample not collected only Identified
11	BS-BP-11	289+150	LHS	2.5 kms	Vill- Fatehganj Name: Mirza Bhai Phone: 8533042505	8Acres* 3 feet	Not told	Pvt. Land	28.0846959 79.6489564
12	BS-BP-12	282+380	LHS	1.7 kms	Vill- Stiswa Name: Sambeer singh Phone: 9548153079	12Acres* 3 feet	Not told	Pvt. Land	28.1367116 79.6163787
13	BS-BP-13	274+180	LHS	1.0 km	Vill- Bakainiya Name: Ram sevek Phone: 9012031848	30Acres* 3 feet	Not told	Pvt. Land	28.1910344 79.5598819
14	BS-BP-14	263+200	LHS	2.3 kms	Vill-Kesharpur Name: Rajesh Phone: Not told	13Acres* 3 feet	Not told	Pvt. Land	28.2643234 79.5257012
15	BS-BP-15	401+150	LHS	2.0 kms	Vill- Dadabad Link Rd Name: Ajnesh Verma Phone: 8853273603	12Acres* 3 feet	Not told	Pvt. Land	
16	BS-BP-16	389+450	LHS	1.0 kms	Vill- Chendra Name: Jayam Dhaba Phone: 6392505570	15Acres* 3 feet	Not told	Pvt. Land	27.669542 80.445045

Soil samples from these borrow sources have been collected in bulk by excavating test pits down up to 1.0m depth from the existing ground surface. The top organic soil layer of approximately 150mm thickness was removed before sampling. The samples collected from these identified borrow pits/ gravel quarries have been tested for the suitability of utilizing them as embankment fill/ sub-grade. Few sample photos of borrow area locations are as presented below.



BS-BP-1



BS-BP-2

	
BS-BP-3	BS-BP-4
	
BS-BP-5	BS-BP-6
	
BS-BP-7	BS-BP-8

	
BS-BP-9	BS-BP-11
	
BS-BP-12	BS-BP-13
	
BS-BP-14	BS-BP-15



BS-BP-16

2.10 AGGREGATE SAMPLES

Aggregates samples 1 Nos. from crusher has been identified for the use of sub-base, base, surface courses and concrete works has been collected. The locations, estimated quantity, basic cost of material and the approximate distance from each source to the nearest point on the project corridor are compiled in Tables below.

Table 6: Aggregate Samples Details

sample No.	Chainage	Left/ Right	Name of Village	Name of Source/ Crusher	Lead	Approx. Qty	Basic cost of the material	Remarks	Co-ordinate
	Kms				*Kms*	*Ton*	*Rs.*		
BS-AQ-1	262+000	LHS	Bazpur	**Cusher:** BBSB stone Crusher **Name:** Jaspal singh **Mobile:** 9690000425	115	Plenty	40mm-Rs 60.95/- Qtl 20mm-Rs 60.95/- Qtl 10mm-Rs 54.29/- Qtl 6mm-Rs 50.48/- Qtl Dust-Rs 50.48/- Qtl WMM/GSB-Rs 55.24/- Qtl	GST -5%	19.4530833 78.4738894

2.11 SAND SAMPLES

River Sand samples of 1 Nos. have been collected from the source and tested. The location of this sand quarry along with lead to the Project Road is presented in the following table

Table 7: Sand Samples Details

Sand Source	Village & Name	Name of river & Village	Chainage	side	Offset	Rate	Co-ordinate
			Kms		*Kms*		
BS-SQ-1	Vill -Rai Kurd Name - Srikanth Mob-9956444546	Garra River	317+450	LHS	2.5	Not told	27.9066696 79.8608992

Photo showing Sand sample is presented below:



BS-SQ-1, 317+450

2.12 AXLE LOAD SURVEYS

Traffic loading has a significant impact on pavement performance and design. This is because the damage that vehicles create to a road depends very strongly on the axle loads of the vehicles. The exact relationship is influenced by the type of road structure and the way the road deteriorates but a “fourth power” damage law gives a good approximation.

An axle load study has been conducted using portable axle load pads for 24 hrs near Toll Plaza-1 at km 266.900 on 26.08.2024 and at Toll Plaza-2 at km 372.160 on 28.08.2024. Further, again 7 days axle load survey has been conducted at the same locations from 18.10.2024 to 25.10.2024 The survey has been conducted in both the directions, and data captured on random sampling basis. The collected axle load data and analysis is presented in **Appendix 5** of this Report. The vehicle damage factors have been calculated using the standard axle loadings given in IRC: 37-2018. The adopted standard axle loadings are presented in the following table.

Table 8: Details of Standard Axles Used

Axle Configuration	Standard Axle load (Tonnes)*/ KN	Remarks
Single Wheel, Single Axle	6.60/65	As per IRC 37-2018
Dual Wheel, Single Axle	8.16/80	As per IRC 37-2018
Dual Wheel, Tandem Axle group	15.10/148	As per IRC 37-2018

Axle Configuration	Standard Axle load (Tonnes)*/ KN	Remarks
Dual Wheel, Tridem Axle group	22.90/224	As per IRC 37-2018

Few photographs illustrating the survey locations and axle load measurements are presented below.



Axle Load Survey



Axle Load Survey



Axle Load Survey



Axle Load Survey

The combined 24 hrs axle load data and 7-day axle load data are used to arrive VDF. The Direction wise VDF for each mode of commercial traffic has been estimated. Results of axle load surveys have been presented in the following table.

Table 9: VDF Values Estimated at the Toll Plaza

Vehicle Type	Faridpur Toll plaza (km 266.900)		Maigalganj Toll Plaza (km 372.160)	
	UP	DN	UP	DN
BUS	0.77	0.76	0.86	1.13
2-Axle	1.73	1.66	2.59	2.31
3-Axle	3.16	4.15	4.99	5.30
M Axle	10.29	11.58	16.89	15.54
LCV	0.84	0.82	1.20	1.30

CHAPTER 3. VALIDATION OF EXECUTED WORKS

3.1 ROAD WORKS

The project road has been closely inspected to verify the executed works on ground. The scope works to be executed by the Concessionaire/Contractor as envisaged in CA is compared with the executed work on the Ground. As a part of the validation, the available as-built drawings and the inventory data received from the Concessionaire were also referred. Each structure has been inspected to note down its structural configuration and condition. The following table highlights the scope comparison of the executed works on ground.

The project corridor appears to have been constructed with the cross-sectional elements matching to those given in the manual at the time of execution. The carriageway width of 7.0m plus shyness of 0.5m flanked by paved shoulders of 0.5 to 4m and Earthen shoulders of 1-to-2-meter on either side of carriageway has been provided over the entire length except at structures.

Table 10: Scope Comparison of Executed works

S. No.	Particulars	Length/ Nos	Total for O&M	As per Sch-A	As per Site	As per Sch-B	As per DPR	Remarks
1	**Start Chainage (Km)**	Km	262.00	262.000	262.000			
2	**End Chainage (Km)**	Km	419.59	419.590	419.590			
3	Length of the Project Corridor	Kms	157.59	157.590	157.590			
4	Service Road / Slip Road (Including Taper Length)	Kms	134.20	61.150	74.71		59.490	As per site Including taper length+0.91 kms of Toll office roads+4.090Kms of Extra wide roads
5	ROBs	Nos	5	5	5			
6	Flyovers	Nos	3	3	3			
7	VOP	Nos	1	1	1			Under Construction
8	VUPs	Nos	34	22	23		11	1 VUP at km. 334+250 not given in CA.
9	LVUP's	Nos	2	0	0		2	
10	PUP's/CUP's	Nos	9	8	9			1 PUP at km. 291+020 not given in CA.
11	EUPs	Nos	-	0				
12	FOBs	Nos	13				13	
13	Major Bridges	Nos	7	7	7			
14	Minor Bridges	Nos	25	17	19		6	2 MNB's at km. 335+785 & 411+990 given in culverts as per CA.
15	Culverts (Pipe)	Nos	97	90	97			Extra Pipe culverts found at site km. 297+800, 324+975, 325+160, 332+250, 333+050, 336+860, 358+820
16	Culvert (Box)	Nos	70	66	70			Extra Box culverts found at site km. 296+210, 299+880, 305+390, 305+650, 357+170, 357+830.
17	SVUP	Nos	1				1	

S. No.	Particulars	Length/ Nos	Total for O&M	As per Sch-A	As per Site	As per Sch-B	As per DPR	Remarks
18	Major Junctions	Nos	26	26	26			
19	Minor junctions	Nos	284	263	284			
20	High Embankments	Kms	36.46		36.46			
21	Chutes	Nos	4,101		4,101			
22	RCC Wall-Full Height	Kms	2.66		2.66			
23	RCC Wall + Soil Emb	Kms	10.96		10.96			
24	RE Panels - Full height	Kms	51.72		22.42		29.300	
25	RE Panels / Blocks Area	Sqm	273,250		112,100		161150	
26	RCC Cover Drain	Kms	93.71	27.650	30.77		62.940	
27	RCC Open Lined Drain	Kms	0.25		0.25			
28	Earthen Drain	Kms	0.90	0.900	-			
29	Median drain	Kms	2.15		2.15			
30	Median Cuts	Nos	746		746			
31	Toll Plaza	Nos	2	2	2			
32	No. of Lanes (Both side)	Nos	32	32	32			
33	Route Patrolling Vehicle	Nos	4		2		2	
34	Ambulance	Nos	4		2		2	
35	Cranes	Nos	4		2		2	
36	Varying Message Signs (VMS)	Nos	16		16		26	
37	Emergency Call Box	Nos	313		153		160	
38	High Mast Lights	Nos	47		47			
39	Medium Mast Lights	Nos	-					
40	Low Mast Lights	Nos	10		10			
41	Highway Lighting (length only)	Kms	37.35		37.35			
42	Single Arm Lightnings	Nos	1,173		54		1119	
43	Double Arm Lightnings	Nos	3,337		1,256		2081	
44	Solar Blinkers	Nos	267		75.00	192	124	
45	Solar Lights with Panel	Nos	79		-	79		
46	Bus Bays with Shelter	Nos	10	10	10			
47	Bus Shelters	Nos	6	1	6			
48	Truck Lay bye	Nos	11	4	4	7	7	
49	Median Opening	Nos	64	64	63			
50	Median Plantation Functional	Kms	50.13		50.13			
51	Median Plantation:non-Functional	Kms	77.69		77.69			
52	Median Plantation	Nos.	102,256		102,256			
53	Road Markings	Kms	157.59		157.59			
54	Delineators	Nos	433		433			
55	Kilometre Stones	Nos	254		254			
56	Hectometre Stones	Nos	1,260		1,260			
57	5th Km Stone	Nos	62		62			
58	Traffic Attenuators	Nos	86			86	86	

S. No.	Particulars	Length/ Nos	Total for O&M	As per Sch-A	As per Site	As per Sch-B	As per DPR	Remarks
59	Studs	Nos	19,208		15,264	3944		
60	Road Signs	Nos	5,557		1,870	2422	3687	Sch-B Qty is as per Junction improvements + Truck lay byes
61	2-Lane Gantry Sign Boards	Nos	59		11	48		Sch-B Qty is as per Junction improvements
62	Cantilever Sign Boards	Nos	82		32		50	
63	Toll Plaza Sign Boards	Nos	16		16			
64	Antiglare	Nos	30,385		-		30385	
65	Single Face W-Beam Safety Barriers	Kms	128.29		39.09		89.20	
66	Rigid Concrete Barriers	Kms	78.40		41.49		36.91	
67	Concrete Railing	Kms	0.76		0.76			
68	Steel Railing	Kms	15.27		15.27			
69	Pedestrian Guard Rails	Kms	31.89		-		31.89	
70	Boundary Stones	Nos	6,320			6320		

Note: The DPR mentioned service roads, lighting and structures etc. are not considered in the present Capex as these works will be executed by Authority in the due course of time. However, the same has be considered in Opex for future maintenance.

The location-wise details of service roads and slip roads are presented in **Appendix 6** of this report. The summary of total length of these service/slip roads is provided below:

Table 11: Summary of Service Roads/Slip Roads along Project Road

Description	LHS		RHS		Total
	Flexible	Paver Block	Flexible	Paver Block	
Units	*Kms*	*Kms*	*Kms*	*Kms*	*Kms*
As Per Site					
Service Road	2.120	-	3.680	-	5.800
Slip Road	26.370	-	28.130	-	54.500
Extra wide Road	0.100	0.870	0.170	2.950	4.090
Toll office Road	0.910	-	-	-	0.910

RCC covered drains are installed over a length of 30.770 km at various locations along the project corridor. Additionally, open lined drains cover a length of 0.250 km, and median drains are provided for 2.150 km. The locations and conditions of these drains are detailed in **Appendix 6**, with a summary presented in the table below.

Table 12: Summary of Drains along the project road

Drains	LHS	RHS	Median	Total
	Kms	*Kms*	*Kms*	*Kms*
RCC Cover Drain	16.465	14.305	-	30.770
RCC Open Lined Drain	0.250	0.000	-	0.250
Median Drain	-	-	2.150	2.150

RE walls, RCC Wall full height and partial walls with soil embankments are found in approaches to the grade separator locations, high embankment locations and at CD-structures locations along the Project Corridor which account for a total length of 72.500 Km. The detailed list is presented in **Appendix 6** and its summary is presented below:

Table 13: Summary of Slope Protection along Project Road

Slope Protection Type	LHS	RHS	Total
Units	*Kms*	*Kms*	*Kms*
High Embankment(>6m)	20.090	16.370	36.460
RCC Wall Full Height	2.180	0.480	2.660
RCC Wall + Soil Emb	4.810	6.150	10.960
RE Wall Full Height (Panels)	10.810	11.610	22.420

A total of 63 median openings were observed on-site, consisting of 24 normal openings and 39 with reserved lanes. Additionally, 59 unauthorized openings were noted. For median openings with a reserved lane provision, the 4.5m median width is reduced to 1.0 meter. Detailed location-wise information is provided in **Appendix 6**, and a summary of the openings is presented below.

Table 14: Summary of Median Openings

Type Median Opening	Total
Units	*Nos*
Normal Lane	24
Reserve lane	39
Un-Authorized	59

The project road has a total of 310 junctions as observed in site. A comprehensive list of major and minor junctions is provided in **Appendix 6** of this report.

Safety barriers have been installed along the project road at high embankments, sharp curves and approaches of grade-separated and cross-drainage Structures. Details of safety barriers provided along the corridor are as follows:

- Single-Face W-barrier (MBCB): Observed in a length of 39.090 kms. Further details are provided in **Appendix 6** of this report.
- Concrete Crash Barrier (CCB) and Concrete Railing (CHR): Observed at Structure locations with CCB length of 41.485 kms and Concrete Railing length of 0.760 kms. Further details are provided in **Appendix 6** of this report.
- Pedestrian Guard Rails (PGR): Observed in a length of 15.270 kms. Further details are provided in **Appendix 6** of this report.

Table 15: Summary of Safety Barriers

Summary of Safety Barriers		
Barrier Type	Length	Damage
	Kms	*m*
CCB	41.485	-
CHR	0.760	-
MBCB	39.090	1280

Summary of Safety Barriers		
Barrier Type	Length	Damage
	Kms	*m*
PGR	15.270	660
Total	**96.605**	**1940**

Road furniture, including high masts, highway lighting, and signboards, has been installed along the project road. The summary of the lighting and signboards is presented below, with detailed lists provided in **Appendix 6** of this report.

Table 16: Summary of Highway lighting and High mast

Highway Lighting Summary							
Description	LHS	Median	RHS	Total	Damage / Missing		
					Pole	Arm	Bulb
	Nos	*Nos*	*Nos*	*Nos*	*Nos*	*Nos*	*Nos*
High-mast Pole	20	-	27	**47**	-	-	-
High-mast Fixture	190	-	274	**464**	-	-	-
Low-mast Pole	2	-	8	**10**	-	-	-
Low-mast Fixture	12	-	48	**60**	-	-	-
Double Arm Pole	341	584	331	**1256**	10	4	34
Solar Single arm	27	-	27	**54**	2	-	-

Table 17: Road Signs along Project Road

Summary of Road Signs				
Description	LHS	RHS	Junctions	Total
Unit	*Nos*	*Nos*	*Nos*	*Nos*
Overhead Gantry	4	4	3	11
Cantilever Gantry	10	11	11	32
Toll Boards	8	8	-	16
ADS/RAS	11	26	-	37
Rectangular	56	39	3	98
Triangular	236	209	150	595
Circular	88	84	-	172
Octagonal	11	11	102	124
Flag Type	17	19	1	37
Chevron	291	303	-	594
Hazard	53	58	-	111
Route marker	49	53	-	102
Total	**834**	**825**	**270**	**1929**

The project road has 10 Nos. of Bus Bays with shelter, 6 Nos. of bus shelters on both sides of Highway. The details are presented in **Appendix 6** of this report.

Table 18: Bus Bays with Shelters

Side	Bus Shelter	Bus Bay with Bus Shelter	Total
	Nos	*Nos*	*Nos*
LHS	2	4	6
RHS	4	6	10
Total	**6**	**10**	**16**

The project road includes a total of 4 truck laybyes. These laybys feature with flexible pavement and are generally in fair condition. Separators are provided between the main carriageway and the truck layby areas. Detailed information about these locations is presented below.

Table 19: Details of Truck Laybye

Truck Lay Bye Summary	
Side	**Flexible**
	Nos
LHS	1
RHS	3
Total	4

3.2 STRUCTURES

List of all Structures found during the inventory surveys along the corridor are as follows:

Table 20: Summary of Structures

S. No.	Type of Str	No. of Structures As per CA	No. of Structures			Total No.of Str's	Total No.of Locations	Remarks
			LHS	RHS	BHS			
1	ROB	5	5	5	-	10	5	-
2	MJB	7	7	7	-	14	7	-
3	MNB	17	22	22	-	44	19	> 2 MNB's at km. 335+785 & 411+990 given in box culverts as per CA.
4	Flyover	3	3	3	-	6	3	-
5	VUP	22	23	23	-	46	23	> 1 VUP at km. 334+250 not given in CA.
6	PUP	8	9	9	-	18	9	> 1 PUP at km. 291+020 not given in CA.
7	VOP	1	-	-	1	1	1	-
8	BC	66	-	-	70	70	70	> Extra Box culverts found at site km. 296+210, 299+880, 305+390, 305+650, 357+170, 357+830.
9	PC	90	-	-	97	97	97	> Extra Pipe culverts found at site km. 297+800, 324+975, 325+160, 332+250, 333+050, 336+860, 358+820.

Table 21: Age of Structures

S.No.	Type of Str	LHS		RHS		BHS		Total (Nos)		Total no. of Str's
		Old	New	Old	New	Old	New	Old	New	
1	ROB	1	4	-	5	-	-	1	9	10
2	MJB	3	4	1	6	-	-	4	10	14
3	MNB	2	20	2	20	-	-	4	40	44
4	Flyover	-	3	-	3	-	-	-	6	6
5	VUP	-	23	-	23	-	-	-	46	46
6	PUP	-	9	-	9	-	-	-	18	18
7	VOP	-	-	-	-	-	1	-	1	1

Table 22: summary of MCW & Service Road structures

S.No.	Type of Str	MCW			SR	
		LHS	RHS	BHS	LHS	RHS
1	ROB	5	5	-	-	-
2	MJB	7	7	-	-	-
3	MNB	19	19	-	3	3
4	Flyover	3	3	-	-	-
5	VUP	23	23	-	-	-
6	PUP	9	9	-	-	-
7	VOP	-	-	1	-	-

Table 23: Summary of Expansion Joints & Bearings

S.No.	Type of Str	Expansion joints		Bearings					
				Pot PTFE		Elastomeric		Rocker	
		Old	New	Old	New	Old	New	Old	New
1	ROB	4	28	-	106	8	84	-	-
2	MJB	12	53	30	430	42	-	-	-
3	MNB	5	11	-	38	4	32	8	-
4	Flyover	-	12	-	48	-	-	-	-
5	VUP	-	8	-	40	-	-	-	-
6	VOP	-	3	-	16	-	-	-	-
Total		**21**	**115**	**30**	**678**	**54**	**116**	**8**	-
		136		**708**		**170**		**8**	
				886					

Table 24: Summary of Superstructures

S.No	Type of Str	Steel Girder	Steel Girder & RCC Girder	Steel Girder & RCC Solid Slab	RCC Girder & RCC Solid Slab	Box Girder	RCC Girder	PSC Girder	RCC Box	RCC Solid Slab	Total no. of Structures
1	ROB	5	2	2	1	-	-	-	-	-	10
2	MJB	10	-	-	-	2	1	1	-	-	14
3	MNB	2	-	-	-	1	2	1	36	2	44
4	Flyover	6	-	-	-	-	-	-	-	-	6
5	VUP	4	-	-	-	-	-	-	42	-	46
6	PUP	-	-	-	-	-	-	-	18	-	18
7	VOP	1	-	-	-	-	-	-	-	-	1
Total		**28**	**2**	**2**	**1**	**3**	**3**	**2**	**96**	**2**	**139**

Table 25: Summary of Substructures

S.No	Type of Str	ABUTMENT					PIER			
		Trestle Type	Spill Through Abutment	RCC Wall	Brick Masonry Wall	RCC Circular Type	Trestle Type	RCC Circular Type	RCC Wall	Brick Masonry Wall
1	ROB	9	1	-	-	-	6	-	-	-
2	MJB	-	3	11	-	-	-	11	3	-
3	MNB	-	2	40	2	-	-	-	37	2
4	Flyover	-	-	-	-	6	-	-	-	-
5	VUP	-	-	42	-	4	-	-	-	-
6	PUP	-	-	18	-	-	-	-	-	-
7	VOP	-	-	-	-	1	-	1	-	-
Total		**9**	**6**	**111**	**2**	**11**	**6**	**12**	**40**	**2**
		139					**60**			

Location-wise details of major structures are as presented below.

Table 26: List of Major Structures

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Skew	Span Arrangement (No x Length)	Deck Width (m)	Remarks
1	270+100	VUP	LHS	MCW	New	No	1 x 10.5	13.25	-
2	270+100	VUP	RHS	MCW	New	No	1 x 10.5	13.25	-
3	274+170	PUP	LHS	MCW	New	No	1 x 7.5	13.25	-
4	274+170	PUP	RHS	MCW	New	No	1 x 7.5	13.25	-
5	275+790	MNB	LHS	MCW	New	No	3 x 6	12.00	-
6	275+790	MNB	RHS	MCW	New	No	3 x 6	12.00	-
7	277+770	VUP	LHS	MCW	New	No	1 x 10.5	13.25	-
8	277+770	VUP	RHS	MCW	New	No	1 x 10.5	13.25	-
9	282+375	VUP	LHS	MCW	New	No	1 x 10.5	13.25	-
10	282+375	VUP	RHS	MCW	New	No	1 x 10.5	13.25	-
11	285+040	MNB	LHS	MCW	New	No	2 x 5	12.00	-
12	285+040	MNB	RHS	MCW	New	No	2 x 5	12.00	-
13	288+205	VUP	LHS	MCW	New	No	1 x 10.5	13.25	-
14	288+205	VUP	RHS	MCW	New	No	1 x 10.5	13.25	-
15	289+250	MJB	LHS	MCW	New	No	6 x 22.5	11.75	-
16	289+250	MJB	RHS	MCW	New	No	6 x 22.5	11.75	-
17	290+330	MNB	LHS	MCW	New	No	3 x 6	12.00	-
18	290+330	MNB	RHS	MCW	New	No	3 x 6	12.00	-
19	290+330	MNB	LHS	SR	New	No	3 x 6	11.50	-
20	290+330	MNB	RHS	SR	New	No	3 x 6	11.50	-
21	290+400	PUP	LHS	MCW	New	No	1 x 7.5	12.00	-
22	290+400	PUP	RHS	MCW	New	No	1 x 7.5	12.00	-
23	290+650	ROB	LHS	MCW	New	Yes	2 x 40 + 1 x 52	12.00	-
24	290+650	ROB	RHS	MCW	New	Yes	2 x 40 + 1 x 52	12.00	-
25	290+813	PUP	LHS	MCW	New	No	1 x 7.5	12.00	-
26	290+813	PUP	RHS	MCW	New	No	1 x 7.5	12.00	-
27	292+450	MNB	LHS	MCW	New	No	2 x 6	13.25	-
28	292+450	MNB	RHS	MCW	New	No	2 x 6	13.25	-
29	295+375	VUP	LHS	MCW	New	No	1 x 30	11.50	-
30	295+375	VUP	RHS	MCW	New	No	1 x 30	11.50	-
31	296+310	MNB	LHS	MCW	New	No	2 x 8.1	13.25	-
32	296+310	MNB	RHS	MCW	New	No	2 x 8.1	13.25	-
33	303+656	VUP	LHS	MCW	New	No	1 x 10.5	13.25	-
34	303+656	VUP	RHS	MCW	New	No	1 x 10.5	13.25	-
35	305+400	Flyover	LHS	MCW	New	Yes	1 x 31.5	10.60	-
36	305+400	Flyover	RHS	MCW	New	Yes	1 x 31.5	10.60	-
37	307+465	MNB	LHS	MCW	New	No	3 x 6	13.25	-
38	307+465	MNB	RHS	MCW	New	No	3 x 6	13.25	-
39	310+680	MNB	LHS	MCW	New	No	2 x 5	12.00	-
40	310+680	MNB	RHS	MCW	New	No	2 x 5	12.00	-
41	314+630	ROB	LHS	MCW	New	No	2 x 12.15 + 1 x 19	15.00	-
42	314+630	ROB	RHS	MCW	New	No	2 x 12.15 + 1 x 19	15.00	-
43	315+629	MNB	LHS	MCW	New	No	2 x 5	13.25	-
44	315+629	MNB	RHS	MCW	New	No	2 x 5	13.25	-
45	315+629	MNB	LHS	SR	New	No	2 x 5	10.75	-
46	315+629	MNB	RHS	SR	New	No	2 x 5	10.75	-
47	315+740	VUP	LHS	MCW	New	No	1 x 10.5	13.25	-
48	315+740	VUP	RHS	MCW	New	No	1 x 10.5	13.25	-
49	316+275	MNB	LHS	MCW	New	No	2 x 6	13.25	-
50	316+275	MNB	RHS	MCW	New	No	2 x 6	13.25	-
51	317+107	MNB	LHS	MCW	New	No	3 x 6	13.25	-
52	317+107	MNB	RHS	MCW	New	No	3 x 6	13.25	-
53	325+620	Flyover	LHS	MCW	New	No	1 x 31	10.60	-
54	325+620	Flyover	RHS	MCW	New	No	1 x 31	10.60	-

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Skew	Span Arrangement (No x Length)	Deck Width (m)	Remarks
55	327+590	MJB	LHS	MCW	Old	No	2 x 25 + 3 x 40	11.00	-
56	327+590	MJB	RHS	MCW	New	No	1 x 25 + 1 x 40 + 1 x 32 + 1 x 52 + 1 x 21	12.00	Under Construction
57	328+520	MJB	LHS	MCW	Old	No	2 x 30 + 1 x 40	11.00	-
58	328+520	MJB	RHS	MCW	New	No	2 x 30 + 1 x 40	11.75	-
59	329+600	Flyover	LHS	MCW	New	No	1 x 31	10.60	-
60	329+600	Flyover	RHS	MCW	New	No	1 x 31	10.60	-
61	331+922	VUP	LHS	MCW	New	Yes	1 x 13	12.00	-
62	331+922	VUP	RHS	MCW	New	Yes	1 x 13	12.00	-
63	332+235	VUP	LHS	MCW	New	No	1 x 12	12.00	-
64	332+235	VUP	RHS	MCW	New	No	1 x 12	12.00	-
65	333+242	MNB	LHS	MCW	New	Yes	2 x 22	12.00	-
66	333+242	MNB	RHS	MCW	New	Yes	2 x 22	12.00	-
67	334+150	MNB	LHS	MCW	New	Yes	3 x 6	17.50	-
68	334+150	MNB	RHS	MCW	New	Yes	3 x 6	17.50	-
69	334+150	MNB	LHS	SR	New	Yes	3 x 6	11.25	-
70	334+150	MNB	RHS	SR	New	Yes	3 x 6	11.25	-
71	334+250	VUP	LHS	MCW	New	No	1 x 10.5	17.80	-
72	334+250	VUP	RHS	MCW	New	No	1 x 10.5	17.80	-
73	334+475	ROB	LHS	MCW	New	Yes	1 x 16.8 + 1 x 55	12.00	-
74	334+475	ROB	RHS	MCW	New	Yes	1 x 16.8 + 1 x 55	12.00	-
75	334+610	VUP	LHS	MCW	New	No	1 x 10.5	17.80	-
76	334+610	VUP	RHS	MCW	New	No	1 x 10.5	17.80	-
77	335+785	MNB	LHS	MCW	New	No	1 x 8	12.50	-
78	335+785	MNB	RHS	MCW	New	No	1 x 8	12.50	-
79	336+620	VUP	LHS	MCW	New	No	1 x 12	12.00	-
80	336+620	VUP	RHS	MCW	New	No	1 x 12	12.00	-
81	343+485	MNB	LHS	MCW	New	Yes	2 x 7.5	13.25	-
82	343+485	MNB	RHS	MCW	New	Yes	2 x 7.5	13.25	-
83	345+240	MNB	LHS	MCW	New	No	3 x 6	13.25	-
84	345+240	MNB	RHS	MCW	New	No	3 x 6	13.25	-
85	348+830	MNB	LHS	MCW	New	No	1 x 48	12.50	-
86	348+830	MNB	RHS	MCW	Old	No	1 x 48	11.75	-
87	358+080	VUP	LHS	MCW	New	Yes	1 x 10.9	13.70	-
88	358+080	VUP	RHS	MCW	New	Yes	1 x 10.9	13.70	-
89	360+850	MJB	LHS	MCW	New	No	2 x 32.5	13.00	-
90	360+850	MJB	RHS	MCW	Old	No	3 x 21.6	12.00	-
91	361+620	VUP	LHS	MCW	New	No	1 x 10.5	13.25	-
92	361+620	VUP	RHS	MCW	New	No	1 x 10.5	13.25	-
93	363+690	VUP	LHS	MCW	New	No	1 x 10.5	13.25	-
94	363+690	VUP	RHS	MCW	New	No	1 x 10.5	13.25	-
95	365+440	VUP	LHS	MCW	New	No	1 x 10.5	13.25	-
96	365+440	VUP	RHS	MCW	New	No	1 x 10.5	13.25	-
97	369+080	MJB	LHS	MCW	New	No	4 x 22.5 + 1 x 20 + 1 x 25	11.75	-
98	369+080	MJB	RHS	MCW	New	No	4 x 22.5 + 1 x 20 + 1 x 25	11.75	-
99	370+100	PUP	LHS	MCW	New	No	1 x 7.5	13.25	-
100	370+100	PUP	RHS	MCW	New	No	1 x 7.5	13.25	-
101	377+370	VUP	LHS	MCW	New	Yes	1 x 12.8	13.25	-
102	377+370	VUP	RHS	MCW	New	Yes	1 x 12.8	13.25	-
103	383+650	VUP	LHS	MCW	New	No	1 x 10.5	13.25	-
104	383+650	VUP	RHS	MCW	New	No	1 x 10.5	13.25	-
105	388+140	PUP	LHS	MCW	New	No	1 x 7.5	13.25	-
106	388+140	PUP	RHS	MCW	New	No	1 x 7.5	13.25	-

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Skew	Span Arrangement (No x Length)	Deck Width (m)	Remarks
107	390+300	MJB	LHS	MCW	New	No	2 x 32.2 + 1 x 40	11.75	-
108	390+300	MJB	RHS	MCW	New	No	2 x 32.2 + 1 x 40	11.75	-
109	392+460	VUP	LHS	MCW	New	Yes	1 x 10.5	13.25	-
110	392+460	VUP	RHS	MCW	New	Yes	1 x 10.5	13.25	-
111	396+175	VUP	LHS	MCW	New	No	1 x 30	11.50	-
112	396+175	VUP	RHS	MCW	New	No	1 x 30	11.50	-
113	397+970	MNB	LHS	MCW	New	No	2 x 7.5	10.50	-
114	397+970	MNB	RHS	MCW	Old	No	4 x 3.5	10.50	-
115	401+510	VUP	LHS	MCW	New	No	1 x 10.5	13.25	-
116	401+510	VUP	RHS	MCW	New	No	1 x 10.5	13.25	-
117	402+980	PUP	LHS	MCW	New	No	1 x 9.5	12.10	-
118	402+980	PUP	RHS	MCW	New	No	1 x 9.5	12.10	-
119	403+380	ROB	LHS	MCW	New	Yes	1 x 51.7	12.00	-
120	403+380	ROB	RHS	MCW	New	Yes	1 x 51.7	12.00	-
121	403+630	PUP	LHS	MCW	New	No	1 x 9.5	12.10	-
122	403+630	PUP	RHS	MCW	New	No	1 x 9.5	12.10	-
123	407+615	PUP	LHS	MCW	New	No	1 x 10.5	13.25	-
124	407+615	PUP	RHS	MCW	New	No	1 x 10.5	13.25	-
125	411+135	MNB	LHS	MCW	Old	No	2 x 28.25	11.00	-
126	411+135	MNB	RHS	MCW	New	No	2 x 28.25	12.00	Under Construction
127	411+990	MNB	LHS	MCW	Old	No	1 x 7.5	11.00	-
128	411+990	MNB	RHS	MCW	New	No	1 x 7.5	12.75	-
129	412+980	ROB	LHS	MCW	Old	Yes	1 x 8 + 1 x 17.5 + 1 x 8	12.00	-
130	412+980	ROB	RHS	MCW	New	Yes	1 x 44	12.00	-
131	413+860	VOP	BHS	MCW	New	No	2 x 31	9.00	Under Construction
132	415+900	MJB	LHS	MCW	Old	No	3 x 32.2	11.00	-
133	415+900	MJB	RHS	MCW	New	No	3 x 32.2	12.00	Under Construction
134	416+720	VUP	LHS	MCW	New	No	1 x 10.5	12.40	-
135	416+720	VUP	RHS	MCW	New	No	1 x 10.5	12.40	-
136	417+820	VUP	LHS	MCW	New	Yes	1 x 10.5	14.50	-
137	417+820	VUP	RHS	MCW	New	Yes	1 x 10.5	14.50	-
138	418+700	PUP	LHS	MCW	New	No	1 x 7.5	13.25	-
139	418+700	PUP	RHS	MCW	New	No	1 x 7.5	13.25	-

At high level bridges and water flow structures where accessibility is a concern in that locations MBIU Inspection has been carried out at the following locations.

Table 27: Summary of structures inspected with MBIU

S.No.	Site Chainage (Km)	Type of Structure	Side	Age of Structure	Span Arrangement (No x Length)	Total Length (m)	Type of Superstructure
1	289+250	MJB	LHS	New	6 x 22.5	135	Steel Girder
2	295+375	VUP	RHS	New	1 x 30	30	Steel Girder
3	305+400	Flyover	LHS	New	1 x 31.5	31.5	Steel Girder
4	305+400	Flyover	RHS	New	1 x 31.5	31.5	Steel Girder
5	328+520	MJB	LHS	Old	2 x 30 + 1 x 40	100	Box Girder
6	328+520	MJB	RHS	New	2 x 30 + 1 x 40	100	Steel Girder
7	329+600	Flyover	LHS	New	1 x 31	31	Steel Girder
8	329+600	Flyover	RHS	New	1 x 31	31	Steel Girder
9	369+080	MJB	LHS	New	4 x 22.5 + 1 x 20 + 1 x 25	135	Steel Girder
10	369+080	MJB	RHS	New	4 x 22.5 + 1 x 20 + 1 x 25	135	Steel Girder
11	390+300	MJB	LHS	New	2 x 32.2 + 1 x 40	104.4	Steel Girder
12	390+300	MJB	RHS	New	2 x 32.2 + 1 x 40	104.4	Steel Girder

4.1 MATERIAL INVESTIGATION INFERENCES

4.1.1 EMBANKMENT & SUBGRADE

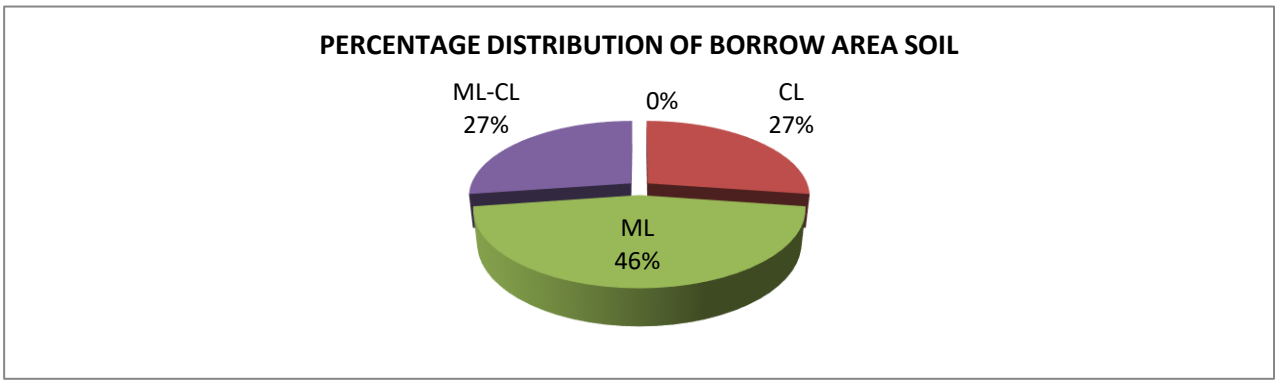
The embankment for project road has been constructed with available soils from nearby areas. The soil appears to be Coarse grained type in nature and embankment appears to be in good condition over the entire length of project. No major settlements or depressions have been noted even at high embankment locations. Out of 15 samples 5 samples belongs to ML type of soil, 4 sample belongs to SM type of soil, 3 sample belongs to CL type of soil and 3 sample belongs to ML-CL type of soil.

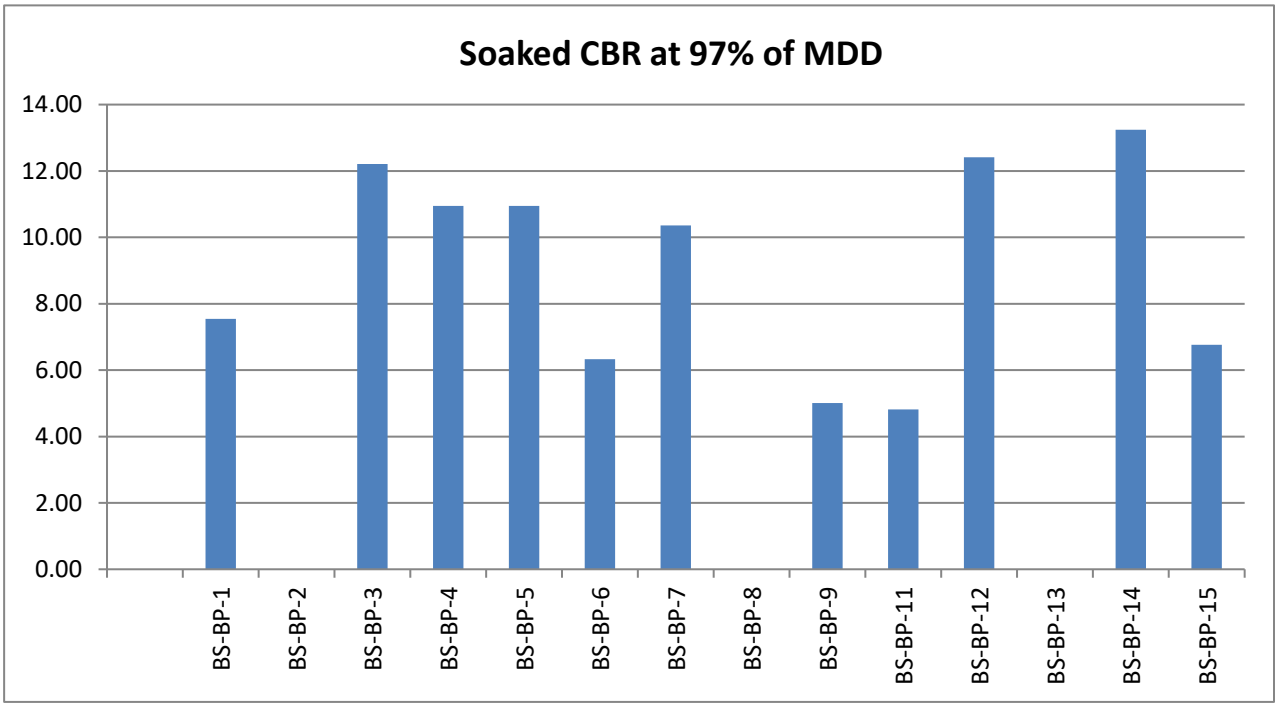
Summary of the test results carried out on these samples are presented in the following tables whilst the complete details are presented as an **Appendix 7** of this report.

Table 28: Test Results of Borrow area Samples

Lab Sample No	Site Identification		Grain Size Analysis					Atterberg Limits (%)			Soil Class	MDD (gm/cc)	OMC (%)	Dry Density at 97% MDD	Soaked CBR 97% MDD	Free Swelling Index (%)
	Location (km)	Up/Dn	Percentage passing from					LL	PL	PI						
			4.75 mm IS Sieve	425 mic IS Sieve	75 mic IS Sieve	Gravel %	Sand %									
BS-BP-1	411+550	RHS	98.78	96.39	68.02	1.22	30.76	-	NP	-	ML	1.89	12.30	1.83	7.54	5
BS-BP-2	334+950	LHS	99.98	99.67	87.05	0.02	12.93	-	NP	-	ML	1.69	14.30	1.64	NA	0
BS-BP-3	343+500	LHS	99.96	98.43	94.89	0.04	5.07	25	20	5	ML-CL	1.94	9.80	1.88	11.34	8
BS-BP-4	356+250	RHS	99.85	99.17	91.14	0.15	8.71	24	18	6	ML-CL	1.88	12.50	1.82	10.68	4
BS-BP-5	365+450	RHS	100.00	99.44	89.7	0	10.3	25	19	6	ML-CL	1.88	12.60	1.82	10.68	5
BS-BP-6	372+400	RHS	100.00	99.4	39.86	0	60.14	-	NP	-	SM	1.85	12.60	1.79	5.61	0
BS-BP-7	383+650	LHS	99.97	98.5	50.85	0.03	49.12	22	14	8	CL	2.02	10.50	1.96	7.85	10
BS-BP-8	317+450	LHS	100.00	99.74	6.76	0	93.24	-	NP	-	SM	1.66	12.60	1.61	NA	5
BS-BP-9	308+870	RHS	100.00	99.78	92.58	0	7.42	30	19	11	CL	1.88	11.30	1.82	5.01	8
BS-BP-11	289+150	LHS	99.88	99.73	62.44	0.12	37.44	-	NP	-	ML	1.75	12.30	1.70	4.82	0
BS-BP-12	282+380	LHS	99.88	98.06	39.45	0.12	60.43	-	NP	-	SM	1.98	10.60	1.92	11.97	15
BS-BP-13	274+180	LHS	100.00	98.68	2.59	0	97.41	-	NP	-	SM	1.63	14.20	1.58	NA	0
BS-BP-14	263+200	LHS	100.00	99.65	81.65	0	18.35	-	NP	-	ML	2.07	7.50	2.01	13.24	10

Lab Sample No	Site Identification		Grain Size Analysis					Atterberg Limits (%)			Soil Class	MDD (gm/cc)	OMC (%)	Dry Density at 97% MDD	Soaked CBR 97% MDD	Free Swelling Index (%)
	Location (km)	Up/Dn	Percentage passing from					LL	PL	PI						
			4.75 mm IS Sieve	425 mic IS Sieve	75 mic IS Sieve	Gravel %	Sand %									
BS-BP-15	401+150	LHS	97.62	89.1	79.02	2.38	18.6	27	18	9	CL	1.98	11.50	1.92	5.89	9
BS-BP-16	389+450	LHS	94.69	90.82	86.8	5.31	7.89	-	NP	-	ML	1.93	10.50	1.87	10.66	5





➢ SUBGRADE

The subgrade samples collected from the test pits taken from project road appears to be in fair condition as revealed by test pit investigations. Soil classification has been done according to IS Classification of Soils (ISC) as detailed in IS 1498 - 1978.

Laboratory test results indicate that majority of the Subgrade soil samples collected belongs to Coarse Grained Soil. Out of 35 Nos. of samples 6 Nos. of samples belongs to CL type of soil, 9 Nos. of sample belongs to ML type of soil,12 Nos of samples belongs to SM type, 7 Nos of samples belongs to ML-CL type of soils and 1 Nos of sample belongs to SM-SC type of soils.

Pie Chart showing the percentage distribution of soil classification of existing subgrade sample is presented below:

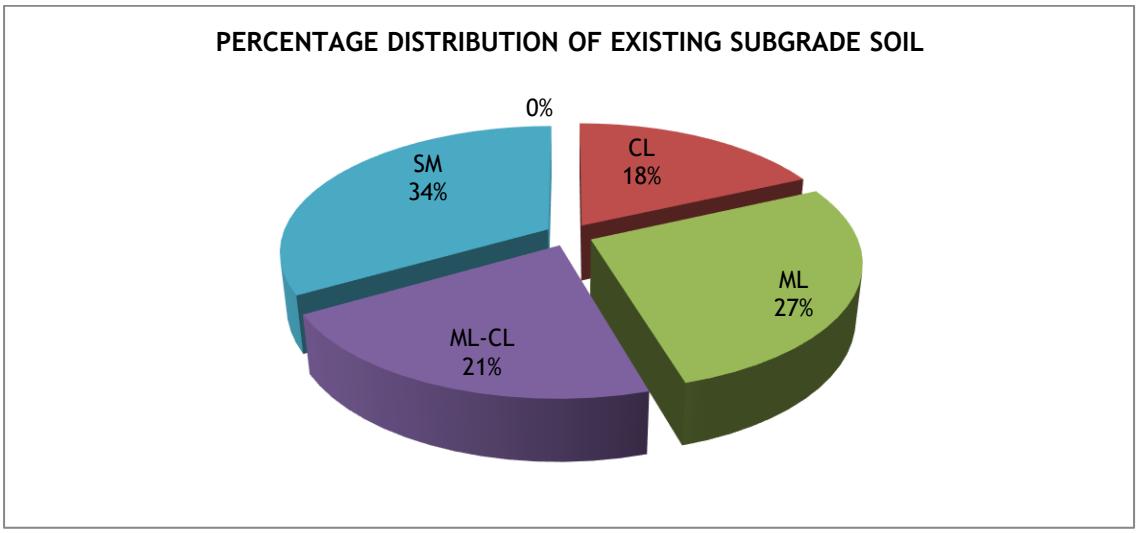
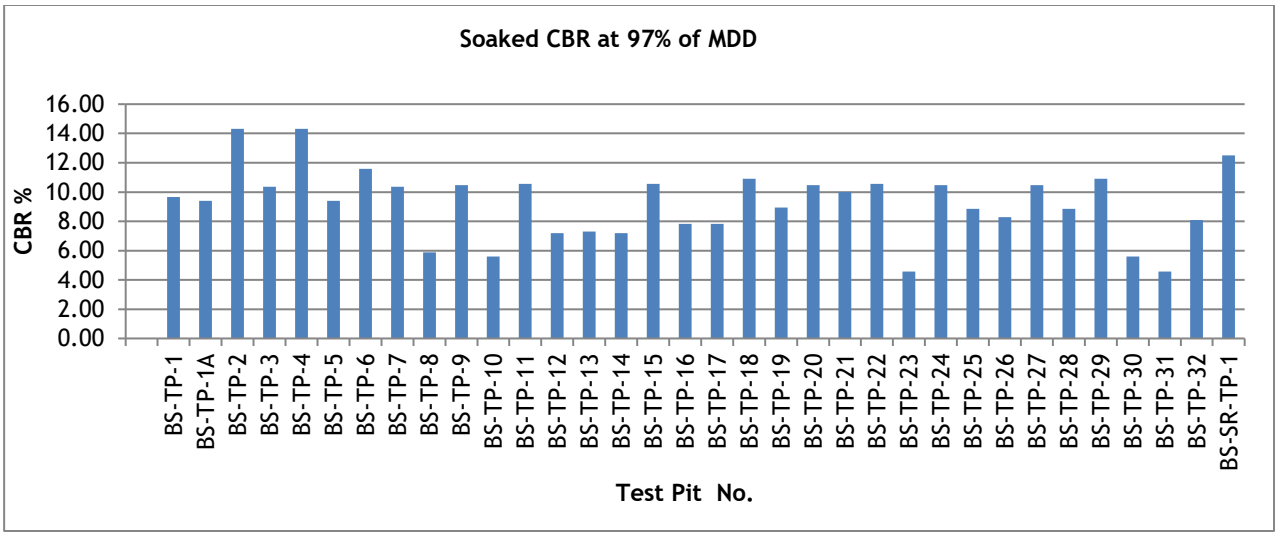


Table 29: Test results of Existing Subgrade Soils

Lab Sample No	Site Identification		Grain Size Analysis					Atterberg Limits (%)			Soil Class	MDD	OMC	Dry Density at 97% MDD	Final Soaked CBR 97% MDD	Free Swelling Index
	Location	Up/Dn	Percentage passing from					LL	PL	PI						
			4.75 mm IS Sieve	425 mic IS Sieve	75 mic IS Sieve	Gravel %	Sand %									
	Kms		*%*	*%*	*%*	*%*	*%*	*%*	*%*			*gm/cc*	*%*	*g/cc*	*%*	*%*
BS-TP-1	263+900	LHS	99.66	96.45	46.93	0.34	52.73	19	15	4	SM-SC	2.01	9.80	1.95	9.66	5
BS-TP-1A	272+000	LHS	99.87	99.27	32.5	0.13	67.37	-	NP	-	SM	1.88	11.1	1.82	9.39	0
BS-TP-2	269+400	RHS	100	98.98	40.07	0.00	59.93	-	NP	-	SM	2.05	9.00	1.99	14.31	10
BS-TP-3	276+150	LHS	98.80	89.11	60.64	1.20	38.16	19	16	3	ML	2.04	8.90	1.98	10.36	5
BS-TP-4	280+550	RHS	99.83	98.14	36.03	0.17	63.80	-	NP	-	SM	2.04	10.30	1.98	14.31	10
BS-TP-5	285+450	LHS	99.55	97.3	37.07	0.45	62.48	-	NP	-	SM	1.88	9.00	1.82	9.39	0
BS-TP-6	289+500	RHS	99.25	97.68	65.61	0.75	33.64	-	NP	-	ML	1.94	9.50	1.88	11.58	5

Lab Sample No	Site Identification		Grain Size Analysis					Atterberg Limits (%)			Soil Class	MDD	OMC	Dry Density at 97% MDD	Final Soaked CBR 97% MDD	Free Swelling Index
	Location	Up/Dn	Percentage passing from					LL	PL	PI						
			4.75 mm IS Sieve	425 mic IS Sieve	75 mic IS Sieve	Gravel %	Sand %									
BS-TP-7	294+100	LHS	98.35	94.97	53.7	1.65	44.65	-	NP	-	ML	2.05	9.40	1.99	10.36	0
BS-TP-8	300+400	RHS	99.83	98.58	26.27	0.17	73.56	-	NP	-	SM	1.79	14.00	1.74	5.89	0
BS-TP-9	306+500	LHS	99.38	97.05	69.27	0.62	30.11	25	21	4	ML-CL	1.93	12.70	1.87	10.46	5
BS-TP-10	309+950	RHS	99.90	98.87	87.80	0.1	12.10	32	20	12	CL	1.83	15.10	1.78	5.60	25
BS-TP-11	316+400	LHS	90.93	77.11	57.82	9.07	33.11	20	18	2	ML	1.97	12.30	1.91	10.56	5
BS-TP-12	320+750	RHS	99.72	98.37	81.51	0.28	18.21	24	20	4	ML-CL	1.90	9.80	1.84	7.20	15
BS-TP-13	325+000	LHS	100.00	99.32	40.88	0	59.12	-	NP	-	SM	1.85	12.50	1.79	7.30	0
BS-TP-14	330+500	RHS	98.77	96.89	88.49	1.23	10.28	28	21	7	ML-CL	1.88	13.50	1.82	7.20	13
BS-TP-15	335+150	LHS	99.25	97.19	53.18	0.75	46.07	-	NP	-	ML	1.97	9.70	1.91	10.56	5
BS-TP-16	339+900	RHS	98.21	94.32	90.74	1.79	7.47	29	19	10	CL	1.89	13.50	1.83	7.83	4
BS-TP-17	345+850	LHS	99.42	97.55	89.48	0.58	9.94	34	21	13	CL	1.90	12.90	1.84	7.83	15
BS-TP-18	350+050	RHS	99.35	95.55	94.27	0.65	5.08	26	20	6	ML-CL	1.98	10.90	1.92	10.90	12
BS-TP-19	354+450	LHS	100	99.09	26.55	0	73.45	-	NP	-	SM	1.85	11.60	1.79	8.95	0
BS-TP-20	260+150	RHS	97.73	95.41	56.48	2.27	41.25	-	NP	-	ML	1.99	10.30	1.93	10.46	0
BS-TP-21	364+450	LHS	98.80	95.96	64.14	1.2	34.66	23	16	7	ML-CL	1.95	12.70	1.89	10.01	0
BS-TP-22	368+600	RHS	99.68	98.22	77.68	0.32	22.00	-	NP	-	ML	1.97	9.20	1.91	10.56	5
BS-TP-23	375+000	LHS	100	99.04	27.94	0	72.06	-	NP	-	SM	1.73	13.80	1.68	4.57	0
BS-TP-24	379+750	RHS	98.78	97.51	38.08	1.22	60.70	-	NP	-	SM	1.98	9.10	1.92	10.46	0
BS-TP-25	385+200	LHS	98.41	92.37	71.11	1.59	27.30	28	19	9	CL	1.91	10.50	1.85	8.86	13
BS-TP-26	389+050	RHS	97.49	96.47	33.38	2.51	64.11	-	NP	-	SM	1.92	12.30	1.86	8.29	0
BS-TP-27	393+900	LHS	99.20	98.14	52.17	0.8	47.03	-	NP	-	ML	1.98	11.30	1.92	10.46	10
BS-TP-28	400+600	RHS	88.48	82.54	81.17	11.52	7.31	27	19	8	CL	1.93	11.50	1.87	8.86	4
BS-TP-29	405+950	LHS	91.07	80.69	72.75	8.93	18.32	23	17	6	ML-CL	1.99	10.90	1.93	10.90	8
BS-TP-30	410+250	RHS	98.13	94	91.17	1.87	6.96	34	22	12	CL	1.82	14.00	1.77	5.60	15
BS-TP-31	415+350	LHS	99.11	98.23	34.05	0.89	65.06	-	NP	-	SM	1.73	15.00	1.68	4.57	0
BS-TP-32	419+350	RHS	98.10	95.73	87.75	1.9	10.35	-	NP	-	ML	1.88	12.80	1.82	8.08	0
BS-SR-TP-1	303+300	LHS	99.93	98.62	58.19	0.07	41.74	19	15	4	ML-CL	2.05	10.00	1.99	12.51	5
BS-SR-TP-2	392+700	RHS	99.60	98.24	44.87	0.4	54.73	-	NP	-	SM	1.87	13.40	1.81	6.03	5



The following observations can be made from the above test results conducted on of existing subgrade samples

- Liquid Limit are in the range of 19% to 34%, all the samples satisfying the criterion LL<50%.
- Plastic Limit are in the range of 15% to 22% satisfying PI<25 criteria.
- Maximum Dry Density for all subgrade samples varies between 1.73 and 2.05 gm/cc. 2 Nos of samples not satisfying the MDD criterion and remaining 33 Nos of samples satisfying MDD criterion (MDD>=1.75 gm/cc).
- OMC for existing subgrade samples varies in between 8.90% to 15.10%.
- Free Swelling Index for existing subgrade samples varies in between 0% to 25%. All the 35 Nos of samples satisfying the FSI criterion (FSI<=50%)
- CBR Values are varying from 4.57% to 14.31%.

Subgrade samples are satisfying the MORTH specification criteria.

Material related tests reports are provided in **Appendix-7** of this report.

4.1.2 AGGREGATES

Aggregates collected from the source have been tested for Aggregate Impact Value (AIV), water absorption and specific gravity tests. The Table below represents the test results of the Aggregate and Sand Samples.

Table 30: Test Results of Aggregate Samples

S. No	Sample	Location	Side	Size of Aggregate	AIV	Water Absorption	Specific Gravity	Remark
		Kms		*mm*	*%*	*%*		
1	BS-AQ-1	262+000	LHS	20 mm	9	0.50	2.81	

Note: The above Aggregate sample satisfying MoRTH requirements i.e., AIV (max. limit is 24% for BC-layer) and Water Absorption max. limit is 2%

4.1.3 SAND

The test results of the sand samples are as presented below.

Table 31: Test Results of Sand Samples

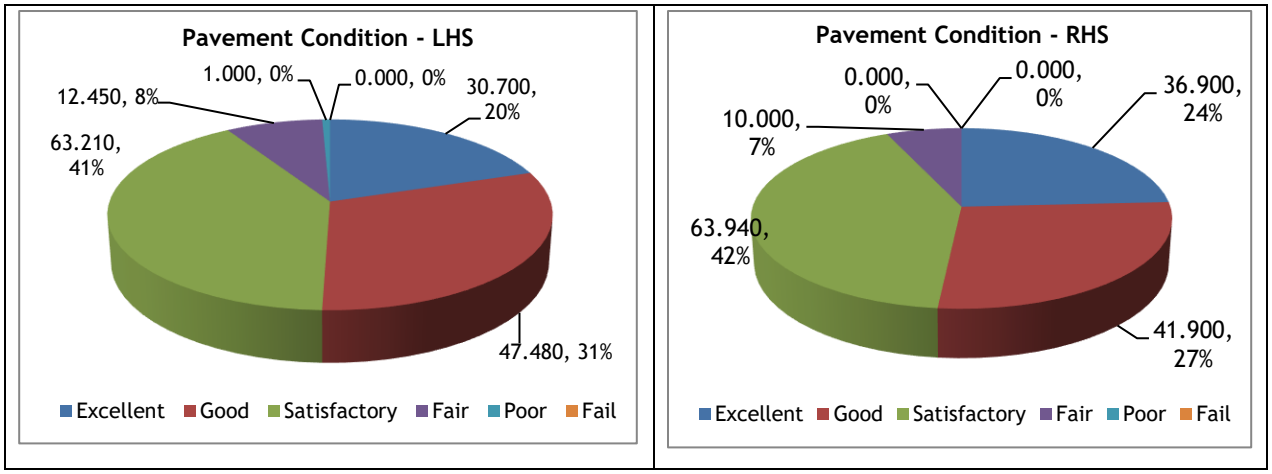
S. No	Sample No	Chainage	Side	10 mm Passing	4.75 mm Passing	2.36 mm Passing	1.18mm Passing	600mic Passing	300mic Passing	150mic Passing	FM	ZONE
		Kms		*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	
1	BS-SQ-1	317+450	LHS	100	100	100	99.9	99.6	96.4	20.1	0.84	No Zone

4.2 PAVEMENT CONDITION

The distresses in bituminous surface have been captured on Main carriageway for each lane separately by NSV survey. Pavement Condition rating (PCI) as per IRC:82-2023 from the data collected for each km length in each direction has been presented in the **Annexure-2** of this report.

The project corridor has been provided with flexible pavement over entire length including service roads. Rigid pavement is only provided at Toll Plaza. Presently, overlay works are being done in bits and pieces by item rate contract to M/s Atcon India Pvt Ltd. The type of distresses observed are cracking, Raveling, Patching, Rutting and Delamination.

The Pavement condition rating is presented in Pie-chart from Excellent to Fail are as below:



The tabulated data is as presented below:

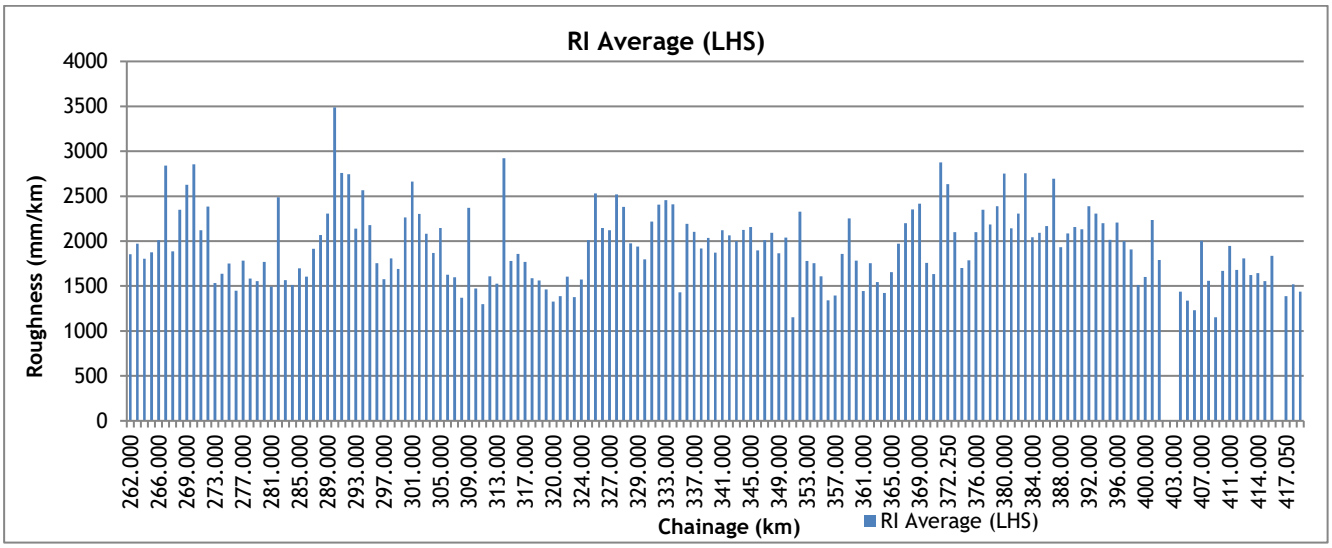
Overall PCI		Rating as per IRC 82	Length (km)	Length (km)
>	<=			
90	100	Excellent	30.700	36.900
80	90	Good	47.480	41.900
60	80	Satisfactory	63.210	63.940
40	60	Fair	12.450	10.000
20	40	Poor	1.000	0.000

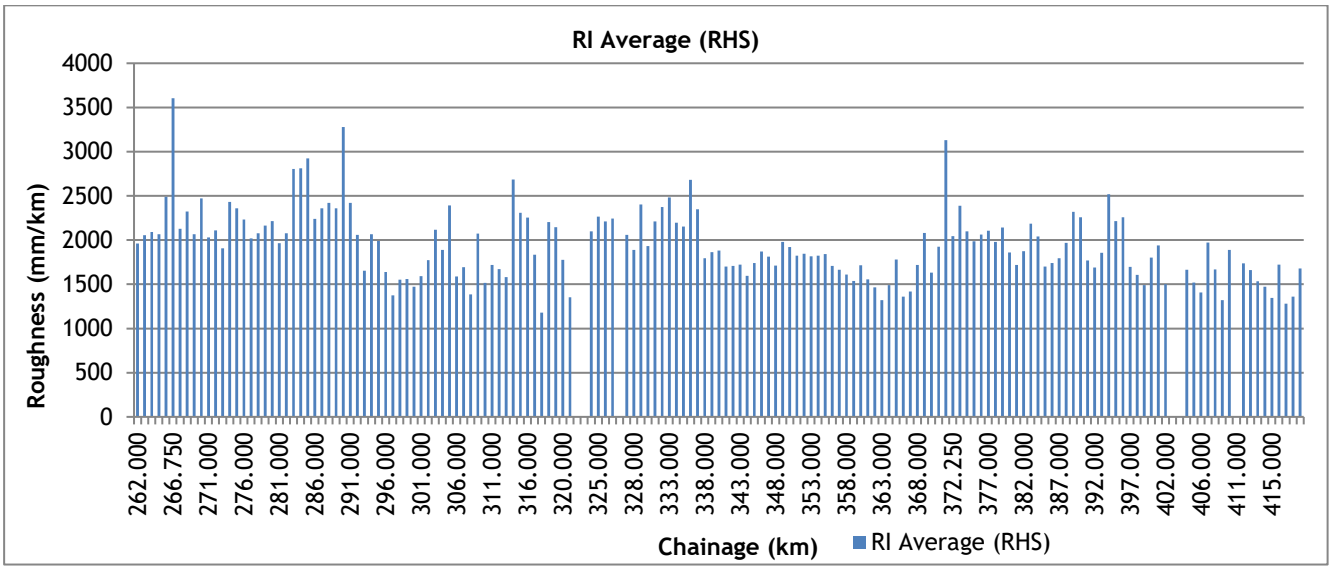
Overall PCI		Rating as per IRC 82	Length (km)	Length (km)
>	<=			
0	20	Fail	0.000	0.000
No Data (due to diversions/Toll Plaza/Under construction)			2.750	4.850
Total Length			**157.590**	**157.590**

From NSV pavement condition analysis, an overlay, is warranted for a length of 76.6 kms in LHS and 73.9 kms in RHS for the rating satisfactory to Fail.

4.3 ROUGHNESS

The km-wise roughness values are presented in bar chart are as follows





Based on the above, considering the Km-stone reference system the summary of direction-wise km lengths having varying roughness values are as presented below.

Roughness (mm/km)		LHS (Km)	RHS (Km)
>=	<		
	2000	85.500	90.840
2000	2200	33.840	26.900
2200	2400	17.300	21.250
2400		18.800	14.350
No Data (due to diversions/Under construction)		2.150	4.250
Total Length		157.590	157.590

It can be noted from the above that, the 18.800 kms in LHS and 14.350 kms in RHS are having roughness values greater than Schedule-F, specified limit of 2400mm/km and thus warrants for functional overlay. Sections between 2200-2400 range may also require a roughness correction course within short period of time. Thus, it is imperative to consider roughness correction layer for such sections also.

4.4 FWD ANALYSIS

4.4.1 FWD ANALYSIS AND ASSESSMENT OF OVERLAY REQUIREMENT

By looking at the age and condition and performance of the pavement following different set of ranges have been used while finalizing the modulus values:

Layer	Bituminous Layers	Granular Layer Modulus	Subgrade
Modulus Value (MPa)	750-3000 & 400 -1500	100-500	50-75

Bituminous layer Moduli obtained from back calculations shall be corrected for a standard pavement temperature of 35ºC using given equations. Whereas, for back calculated moduli values obtained for granular and subgrade layer shall be corrected for seasonal variations (using winter and summer equations). For this FWD results, winter seasonal correction factor is applied for granular and subgrade layer. The design moduli (15^{th} percentile moduli) of in-service layers for each homogenous section are given in table below.

Table 32: Design Moduli of different layers - LHS CW

S.No	Side	From	To	Length (Km)	15th Percentile MR values		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)
1	LHS	262.00	264.20	2.20	1543	393	64
2	LHS	264.20	266.75	2.55	1547	392	64
3	LHS	266.75	267.05	0.30	Toll Plaza		
4	LHS	267.05	270.00	2.95	1354	322	64
5	LHS	270.00	272.80	2.80	1406	215	64
6	LHS	272.80	275.80	3.00	1474	392	64
7	LHS	275.80	279.40	3.60	1458	389	64
8	LHS	279.40	282.20	2.80	1186	391	64
9	LHS	282.20	285.81	3.61	1199	392	64
10	LHS	285.81	289.40	3.59	1186	392	64
11	LHS	289.40	292.40	3.00	1581	385	64
12	LHS	292.40	295.40	3.00	1496	387	64
13	LHS	295.40	299.40	4.00	1479	393	64
14	LHS	299.40	303.20	3.80	1483	393	64

S.No	Side	From	To	Length (Km)	15th Percentile MR values		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)
15	LHS	303.20	306.00	2.79	1429	281	64
16	LHS	306.00	308.40	2.40	1298	391	64
17	LHS	308.40	311.40	3.01	1267	389	64
18	LHS	311.40	314.00	2.60	1294	391	64
19	LHS	314.00	316.60	2.60	538	142	64
20	LHS	316.60	318.81	2.20	1188	391	64
21	LHS	318.81	321.60	2.80	1375	393	64
22	LHS	321.60	324.00	2.40	1235	228	64
23	LHS	324.00	326.40	2.40	1212	251	64
24	LHS	326.40	327.25	0.85	1456	388	64
25	LHS	327.25	327.70	0.45			
26	LHS	327.70	329.60	1.90			
27	LHS	329.60	332.01	2.41	1489	370	64
28	LHS	332.01	334.40	2.39	382	74	64
29	LHS	334.40	337.60	3.20	1112	198	64
30	LHS	337.60	340.80	3.20	2479	378	64
31	LHS	340.80	343.60	2.80	2468	389	64
32	LHS	343.60	346.60	3.00	1254	379	64
33	LHS	346.60	349.00	2.40	2082	210	63
34	LHS	349.00	352.00	3.00	2902	394	64
35	LHS	352.00	355.20	3.20	2147	390	64
36	LHS	355.20	358.40	3.20	1036	345	64
37	LHS	358.40	361.01	2.61	807	141	64
38	LHS	361.01	363.40	2.39	1101	387	64
39	LHS	363.40	366.00	2.60	1095	390	64
40	LHS	366.00	370.39	4.39	2198	364	64
41	LHS	370.39	371.95	1.56	1131	391	64
42	LHS	371.95	372.25	0.30			
43	LHS	372.25	374.60	2.35			
44	LHS	374.60	378.00	3.40	774	173	64
45	LHS	378.00	381.20	3.20	2186	282	64
46	LHS	381.20	384.00	2.81	2274	380	64
47	LHS	384.00	386.80	2.80	2315	392	64
48	LHS	386.80	389.61	2.81	2180	350	64
49	LHS	389.61	393.01	3.39	432	75	64
50	LHS	393.01	396.40	3.40	429	73	64
51	LHS	396.40	399.00	2.59	1402	365	64
52	LHS	399.00	401.77	2.78	1387	362	64
53	LHS	401.77	404.60	2.82	1421	360	64
54	LHS	404.60	407.40	2.81	1517	393	64
55	LHS	407.40	410.00	2.60	1490	391	64
56	LHS	410.00	412.81	2.81	1500	393	64
57	LHS	412.81	415.60	2.80	1501	392	64
58	LHS	415.60	419.59	3.99	1479	388	64
Total length				**157.590**			

Table 33: Design Moduli of different layers - RHS CW

S.No	Side	From	To	Length (Km)	15th Percentile MR values		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)
1	RHS	262.00	264.20	2.20	1509	393	64
2	RHS	264.20	266.75	2.55	1535	390	64
3	RHS	266.75	267.05	0.30	Toll Plaza		
4	RHS	267.05	270.00	2.95	1220	368	64
5	RHS	270.00	272.80	2.80	1111	359	64
6	RHS	272.80	275.60	2.80	1189	390	64
7	RHS	275.60	278.40	2.80	1429	385	64
8	RHS	278.40	281.20	2.80	1404	267	64
9	RHS	281.20	284.00	2.80	1423	393	64
10	RHS	284.00	287.00	3.00	1458	390	64
11	RHS	287.00	290.00	2.99	1445	390	64
12	RHS	290.00	292.00	2.00	597	116	64
13	RHS	292.00	295.99	4.00	1391	392	64
14	RHS	295.99	299.41	3.42	1490	393	64
15	RHS	299.41	302.80	3.39	1467	391	64
16	RHS	302.80	305.99	3.19	1467	378	64
17	RHS	305.99	309.40	3.40	1332	170	64
18	RHS	309.40	314.00	4.60	1315	350	64
19	RHS	314.00	317.00	3.01	632	112	64
20	RHS	317.00	320.60	3.60	1440	248	64
21	RHS	320.60	323.80	3.20	1285	386	64
22	RHS	323.80	326.40	2.61	1150	388	64
23	RHS	326.40	327.25	0.85	1281	391	64
24	RHS	327.25	327.70	0.45			
25	RHS	327.70	329.60	1.90			
26	RHS	329.60	332.00	2.40	1281	391	64
27	RHS	332.00	334.33	2.33	929	73	64
28	RHS	334.33	336.81	2.47	1103	318	64
29	RHS	336.81	340.80	3.99	1069	329	64
30	RHS	340.80	343.40	2.60	1222	138	64
31	RHS	343.40	346.00	2.6	1175	135	64
32	RHS	346.00	348.40	2.40	2944	392	64
33	RHS	348.40	351.40	3.00	803	153	64
34	RHS	351.40	354.21	2.81	1677	290	63
35	RHS	354.21	358.40	4.19	1208	124	64
36	RHS	358.40	362.80	4.40	893	137	64
37	RHS	362.80	365.79	2.99	1428	260	64
38	RHS	365.79	370.19	4.40	2879	358	64
39	RHS	370.19	371.95	1.76	1175	115	64
40	RHS	371.95	372.25	0.30			
41	RHS	372.25	373.00	0.75			
42	RHS	373.00	376.19	3.19	1958	185	64
43	RHS	376.19	378.80	2.61	1909	206	64
44	RHS	378.80	381.60	2.80	2879	389	64
45	RHS	381.60	384.80	3.20	1214	139	64
46	RHS	384.80	387.60	2.79	2806	313	64
47	RHS	387.60	391.80	4.20	1301	135	64
48	RHS	391.80	395.40	3.60	1260	132	64

S.No	Side	From	To	Length (Km)	15th Percentile MR values		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)
49	RHS	395.40	397.79	2.39	1256	378	64
50	RHS	397.79	400.79	3.00	1313	359	64
51	RHS	400.79	403.57	2.77	1156	334	64
52	RHS	403.57	407.00	3.44	1428	390	64
53	RHS	407.00	411.00	4.00	917	352	64
54	RHS	411.00	411.30	0.30	Under construction		
55	RHS	411.30	415.80	4.50	1354	355	64
56	RHS	415.80	416.00	0.20	Under construction		
57	RHS	416.00	416.30	0.30	1106	209	64
58	RHS	416.30	417.05	0.75			
59	RHS	417.05	419.59	2.54			
Total length				157.590			

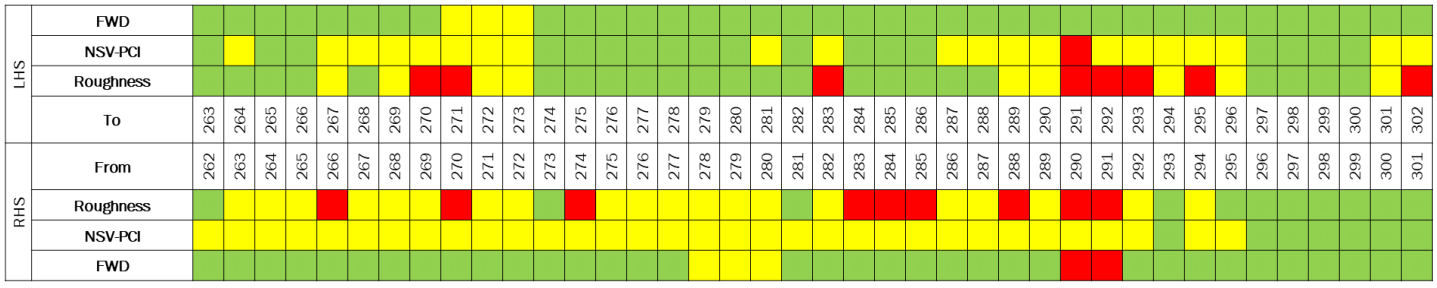
Observations on FWD Results

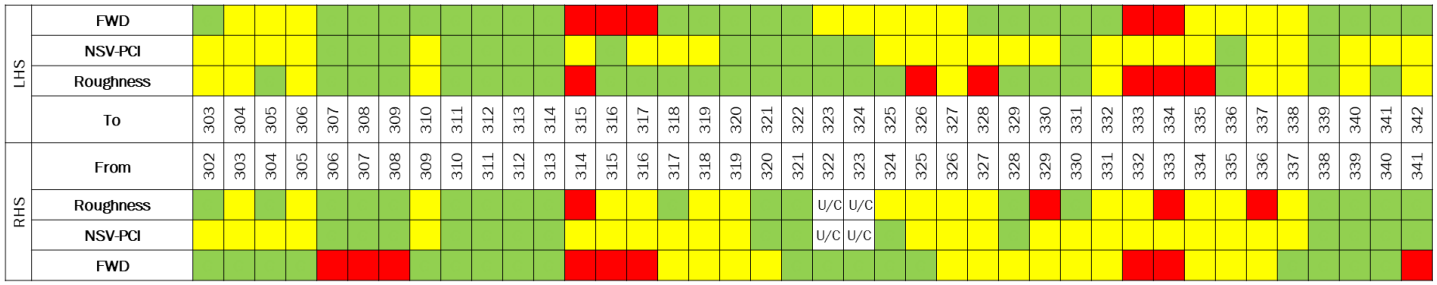
It can be noticed from the above table that the layer moduli for the three layers are varying along the length and direction. The MR value for BT layer is 382 MPa to 2902 MPa in LHS Carriageway & 597 MPa to 2944 MPa in RHS Carriageway. The MR value for Granular Layers is 73 MPa to 394 MPa in LHS Carriageway & 73 MPa to 393 MPa in RHS Carriageway. Similarly, the MR value for Subgrade Layer is 63 Mpa to 64 Mpa in both LHS & RHS Carriageways.

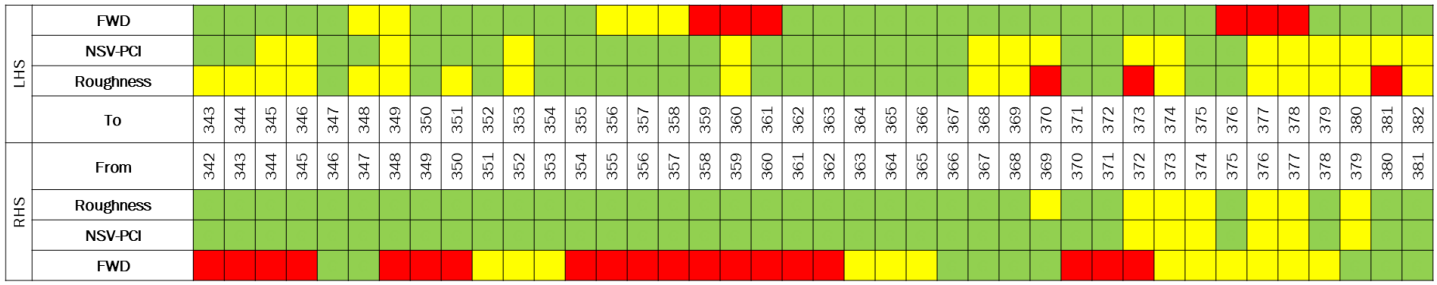
4.5 PAVEMENT RATING CHART

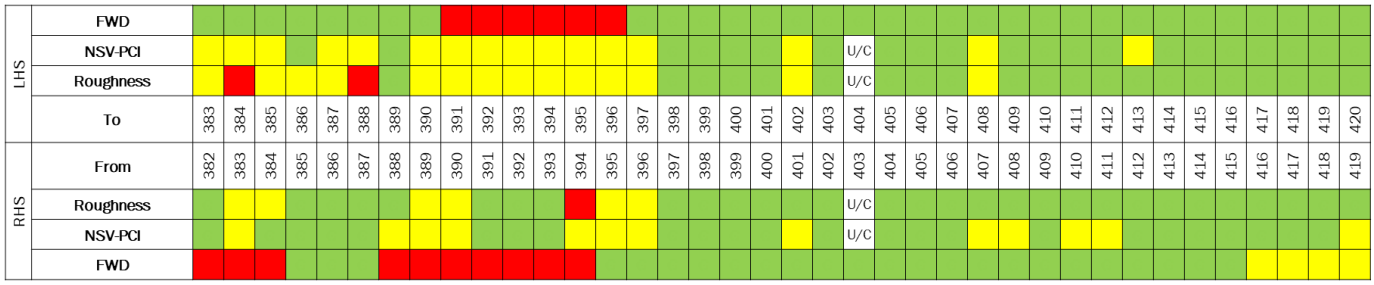
Pavement is rated for Roughness/PCI/FWD as good, fair and poor based on the following criteria along with strip-chart is presented as below:

Condition		FWD	Roughness	PCI
	Poor	OL Thick of 90mm and above	>2400 mm/Km	0 > PCI ≤ 40
	Fair	OL Thick of 50 mm	2000 - 2400 mm/Km	40 > PCI ≤ 80
	Good	No Overlay	≤ 2000 mm/Km	80 > PCI ≤ 100







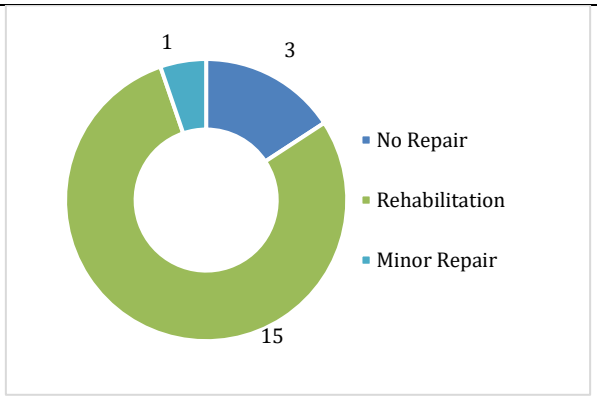


4.6 STRUCTURES

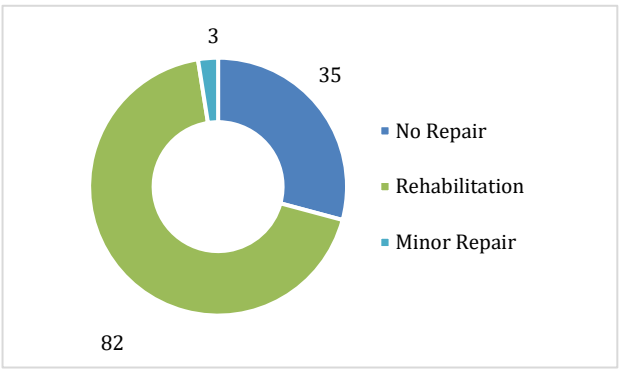
Inventory and asset condition of all the existing structures falling within project road have been verified as per IRC: SP-35 procedures and guidelines with following field surveys

- Inventory of existing highway bridges / structures
- Visual condition survey of existing highway bridges / structures
- MBIU investigation at inaccessible structures

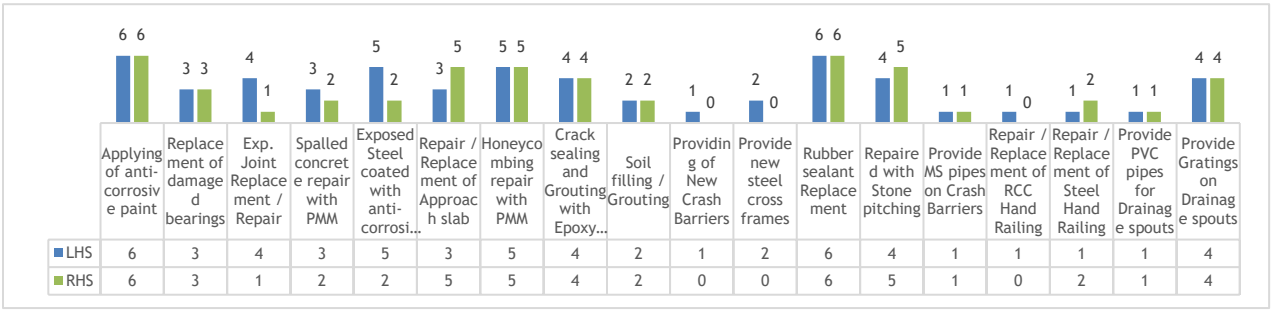
Each and every structure has been verified at site and detailed inventory and condition survey is presented in **Appendix-8** of this report.



Maintenance of major structures (Length >60m)

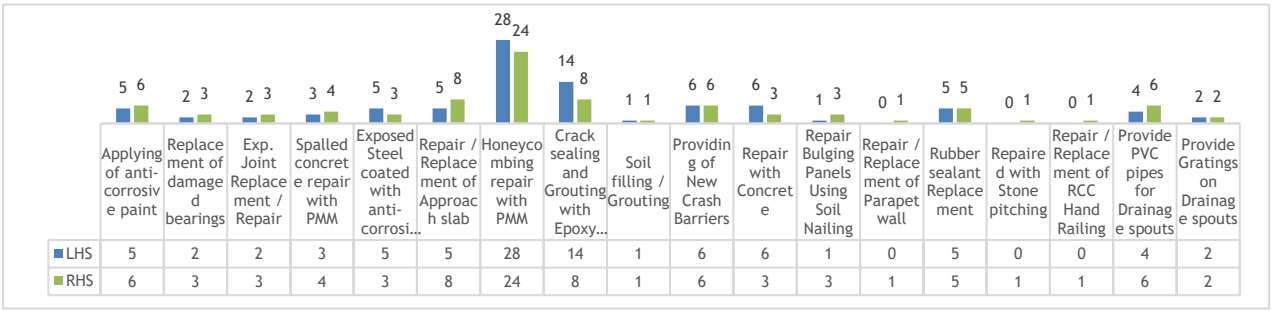


Maintenance of minor structures (Length <60m)



	Applying of anti-corrosive paint	Replacement of damaged bearings	Exp. Joint Replacement / Repair	Spalled concrete repair with PMM	Exposed Steel coated with anti-corrosi...	Repair / Replacement of Approach slab	Honeycombing repair with PMM	Crack sealing and Grouting with Epoxy...	Soil filling / Grouting	Providing of New Crash Barriers	Provide new steel cross frames	Rubber sealant Replacement	Repaired with Stone pitching	Provide MS pipes on Crash Barriers	Repair / Replacement of RCC Hand Railing	Repair / Replacement of Steel Hand Railing	Provide PVC pipes for Drainage spouts	Provide Gratings on Drainage spouts
LHS	6	3	4	3	5	3	5	4	2	1	2	6	4	1	1	1	1	4
RHS	6	3	1	2	2	5	5	4	2	0	0	6	5	1	0	2	1	4

Type of repairs at number of locations for Major structures



	Applying of anti-corrosive paint	Replacement of damaged bearings	Exp. Joint Replacement / Repair	Spalled concrete repair with PMM	Exposed Steel coated with anti-corrosi...	Repair / Replacement of Approach slab	Honeycombing repair with PMM	Crack sealing and Grouting with Epoxy...	Soil filling / Grouting	Providing of New Crash Barriers	Repair with Concrete	Repair Bulging Panels Using Soil Nailing	Repair / Replacement of Parapet wall	Rubber sealant Replacement	Repaired with Stone pitching	Repair / Replacement of RCC Hand Railing	Provide PVC pipes for Drainage spouts	Provide Gratings on Drainage spouts
LHS	5	2	2	3	5	5	28	14	1	6	6	1	0	5	0	0	4	2
RHS	6	3	3	4	3	8	24	8	1	6	3	3	1	5	1	1	6	2

Type of repairs at number of locations for Minor structures

Overall condition of few of the major structures are presented on sample basis of below. However, each and every structure details are presented in **Appendix-8** of this report.

Chainage: 290+650
General Description
LHS MCW (New)

- Type of Structure : ROB
- Span Arrangement : 2 x 40 + 1 x 52 m
- Total length of Structure : 132 m
- Total deck width of Structure : 12 m
- Type of Foundation : Not Visible
- Type of Substructure (Abutment & Pier) : Trestle Type
- Type of Superstructure : Steel Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash Barrier & MS Hand Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- ✓ Rubber sealant damaged in Expansion joint on P2. (1 No's)
- ✓ Honeycomb & Reinforcement exposed on pier cap P-2 in Span-3.
- ✓ Corrosion observed on steel girders at some locations in all spans.






Chainage: 289+250
General Description
LHS MCW (New)

- Type of Structure : MJB
- Span Arrangement : 6 x 22.5 m
- Total length of Structure : 135 m
- Total deck width of Structure : 11.75 m
- Type of Foundation : Not Visible
- Type of Substructure (Abutment & Pier) : RCC Wall & RCC Circular Type
- Type of Superstructure : Steel Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash Barrier & MS Hand Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- ✓ Rubber sealant damaged in Expansion joint on A1 & P2. (2 No's)
- ✓ Steel Hand railing partially damaged at shoulder side.
- ✓ Approach slab settlement observed at A2 side.
- ✓ MS Pipe railing missing on crash barrier.
- ✓ Honeycomb and Reinforcement exposed on soffit of Cantilever slab near A2 in Span-6.
- ✓ Grating not provided for all drainage spouts.
- ✓ Corrosion observed on steel girders at some locations in all spans.
- ✓ Quadrant pitching not provided at A1 & A2.
- ✓ **The superstructure slided approximately 100mm towards the shoulder side on pier P1 in span S2.**
- ✓ Cracks observed on soffit of deck slab in between girders G1 & G2, G2 & G3, G3 & G4 in span S1.
- ✓ Delamination & Reinforcement exposed on soffit of deck slab at pier P2 in span S2.
- ✓ Cracks and leaching observed on soffit of deck slab in between girders G2 & G3, G3 & G4 in span S3.
- ✓ Cracks observed on Pier cap P4.
- ✓ Crack observed on Pedestal (Pe3) Pier P3 in span S4.
- ✓ Cracks observed on Pier & Pier cap P5.
- ✓ Bearing damage (B1, B2, B4 & B5) observed on Abutment A1 & Pier P1 in span S1.
- ✓ Bearing damage (B1, B2, B4 & B5) observed on Pier P1 & Pier P2 in span S2.
- ✓ Bearing damage (B1, B2, B4 & B5) observed on Pier P2 & Pier P3 in span S3.
- ✓ Bearing damage (B1, B2 & B4) observed on Pier P3 in span S4.
- ✓ Bearing damage (B2, B3 & B4) observed on Pier P4 in span S4.
- ✓ Bearing damage (B1, B2, B4 & B5) observed on Pier P4 & Pier P5 in span S5.
- ✓ Bearing damage (B1, B2, B4 & B5) observed on Pier P5 & Abutment A2 in span S6.
- ✓ Soil erosion observed at A1 & A2 side.
- ✓ Previous repair observed on deck slab in span S3.
- ✓ Missing of steel cross frames in span S1 & S2.






















Chainage: 275+790
General Description
LHS MCW (New)

- Type of Structure : MNB
- Span Arrangement : 3 x 6 m
- Total length of Structure : 18 m
- Total deck width of Structure : 12 m
- Type of Foundation : Raft
- Type of Substructure (Abutment & Pier) : RCC Wall
- Type of Superstructure : RCC Box
- Type of Bearing : Not Applicable
- Type of Railing / Crash Barrier : Crash Barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- ✓ Honeycomb observed on deck slab edge at shoulder side & median side.
- ✓ Crash barrier not constructed at shoulder side.






Chainage: 329+600
General Description
RHS MCW (New)

- Type of Structure : Flyover
- Span Arrangement : 1 x 31 m
- Total length of Structure : 31 m
- Total deck width of Structure : 10.6 m
- Type of Foundation : Not Visible
- Type of Substructure (Abutment & Pier) : RCC Circular Type
- Type of Superstructure : Steel Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash Barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- ✓ PVC down take pipes damaged.
- ✓ Corrosion observed on steel girders at some locations.
- ✓ Rubber sealant damaged in Expansion joint on A1. (1 No's)
- ✓ Bearing damage (B1, B2 & B4) observed on Abutment A1.
- ✓ Bearing damage (B1, B2, B3 & B4) observed on Abutment A2.
- ✓ Minor cracks observed on deck slab.













Chainage: 295+375
General Description
RHS MCW (New)

- Type of Structure : VUP
- Span Arrangement : 1 x 30 m
- Total length of Structure : 30 m
- Total deck width of Structure : 11.5 m
- Type of Foundation : Not Visible
- Type of Substructure (Abutment & Pier) : RCC Circular Type
- Type of Superstructure : Steel Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash Barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- ✓ PVC down take pipes damaged.
- ✓ Corrosion stains observed on girders.
- ✓ Approach slab settlement observed at A1 side.
- ✓ Spalling observed on soffit of top slab at A1 shoulder side.
- ✓ Honeycomb observed on dirt wall at A2 side.
- ✓ Expansion joint damaged on A2.
- ✓ Expansion joint rubber sealant damage on A1.
- ✓ Bearing damage (B5) observed on Abutment A1 & A2.













Table 34 Details of Major Structures

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Deck Width (m)	Type of Substructure		Type of Superstructure	Type of Bearings
								Abutment	Pier		
1	290+650	ROB	LHS	MCW	New	2 x 40 + 1 x 52	12.00	Trestle Type	Trestle Type	Steel Girder	Pot PTFE
2	290+650	ROB	RHS	MCW	New	2 x 40 + 1 x 52	12.00	Trestle Type	Trestle Type	Steel Girder	Pot PTFE
3	314+630	ROB	LHS	MCW	New	2 x 12.15 + 1 x 19	15.00	Trestle Type	Trestle Type	Steel Girder & RCC Girder	Elastomeric
4	314+630	ROB	RHS	MCW	New	2 x 12.15 + 1 x 19	15.00	Trestle Type	Trestle Type	Steel Girder & RCC Girder	Elastomeric
5	334+475	ROB	LHS	MCW	New	1 x 16.8 + 1 x 55	12.00	Trestle Type	Trestle Type	Steel Girder & RCC Solid Slab	Pot PTFE & Elastomeric
6	334+475	ROB	RHS	MCW	New	1 x 16.8 + 1 x 55	12.00	Trestle Type	Trestle Type	Steel Girder & RCC Solid Slab	Pot PTFE & Elastomeric
7	403+380	ROB	LHS	MCW	New	1 x 51.7	12.00	Trestle Type	-	Steel Girder	Pot PTFE
8	403+380	ROB	RHS	MCW	New	1 x 51.7	12.00	Trestle Type	-	Steel Girder	Pot PTFE
9	412+980	ROB	LHS	MCW	Old	1 x 8 + 1 x 17.5 + 1 x 8	12.00	Spill Through Abutment	-	RCC Girder & RCC Solid Slab	Elastomeric
10	412+980	ROB	RHS	MCW	New	1 x 44	12.00	Trestle Type	-	Steel Girder	Pot PTFE
11	289+250	MJB	LHS	MCW	New	6 x 22.5	11.75	RCC Wall	RCC Circular Type	Steel Girder	Pot PTFE
12	289+250	MJB	RHS	MCW	New	6 x 22.5	11.75	RCC Wall	RCC Circular Type	Steel Girder	Pot PTFE
13	327+590	MJB	LHS	MCW	Old	2 x 25 + 3 x 40	11.00	Spill Through Abutment	RCC Circular Type	Box Girder	Pot PTFE
14	327+590	MJB	RHS	MCW	New	1 x 25 + 1 x 40 + 1 x 32 + 1 x 52 + 1 x 21	12.00	RCC Wall	RCC Circular Type	Steel Girder	Pot PTFE
15	328+520	MJB	LHS	MCW	Old	2 x 30 + 1 x 40	11.00	Spill Through Abutment	RCC Circular Type	Box Girder	Pot PTFE
16	328+520	MJB	RHS	MCW	New	2 x 30 + 1 x 40	11.75	RCC Wall	RCC Circular Type	Steel Girder	Pot PTFE
17	360+850	MJB	LHS	MCW	New	2 x 32.5	13.00	RCC Wall	RCC Circular Type	Steel Girder	Pot PTFE
18	360+850	MJB	RHS	MCW	Old	3 x 21.6	12.00	RCC Wall	RCC Wall	RCC Girder	Elastomeric
19	369+080	MJB	LHS	MCW	New	4 x 22.5 + 1 x 20 + 1 x 25	11.75	RCC Wall	RCC Circular Type	Steel Girder	Pot PTFE
20	369+080	MJB	RHS	MCW	New	4 x 22.5 + 1 x 20 + 1 x 25	11.75	RCC Wall	RCC Circular Type	Steel Girder	Pot PTFE
21	390+300	MJB	LHS	MCW	New	2 x 32.2 + 1 x 40	11.75	RCC Wall	RCC Circular Type	Steel Girder	Pot PTFE
22	390+300	MJB	RHS	MCW	New	2 x 32.2 + 1 x 40	11.75	RCC Wall	RCC Circular Type	Steel Girder	Pot PTFE
23	415+900	MJB	LHS	MCW	Old	3 x 32.2	11.00	Spill Through Abutment	RCC Wall	PSC Girder	Elastomeric
24	415+900	MJB	RHS	MCW	New	3 x 32.2	12.00	RCC Wall	RCC Wall	Steel Girder	Pot PTFE
25	275+790	MNB	LHS	MCW	New	3 x 6	12.00	RCC Wall	RCC Wall	RCC Box	-
26	275+790	MNB	RHS	MCW	New	3 x 6	12.00	RCC Wall	RCC Wall	RCC Box	-
27	285+040	MNB	LHS	MCW	New	2 x 5	12.00	RCC Wall	RCC Wall	RCC Box	-
28	285+040	MNB	RHS	MCW	New	2 x 5	12.00	RCC Wall	RCC Wall	RCC Box	-
29	290+330	MNB	LHS	MCW	New	3 x 6	12.00	RCC Wall	RCC Wall	RCC Box	-
30	290+330	MNB	RHS	MCW	New	3 x 6	12.00	RCC Wall	RCC Wall	RCC Box	-
31	290+330	MNB	LHS	SR	New	3 x 6	11.50	RCC Wall	RCC Wall	RCC Box	-
32	290+330	MNB	RHS	SR	New	3 x 6	11.50	RCC Wall	RCC Wall	RCC Box	-

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Deck Width (m)	Type of Substructure		Type of Superstructure	Type of Bearings
								Abutment	Pier		
33	292+450	MNB	LHS	MCW	New	2 x 6	13.25	RCC Wall	RCC Wall	RCC Box	-
34	292+450	MNB	RHS	MCW	New	2 x 6	13.25	RCC Wall	RCC Wall	RCC Box	-
35	296+310	MNB	LHS	MCW	New	2 x 8.1	13.25	RCC Wall	RCC Wall	RCC Box	-
36	296+310	MNB	RHS	MCW	New	2 x 8.1	13.25	RCC Wall	RCC Wall	RCC Box	-
37	307+465	MNB	LHS	MCW	New	3 x 6	13.25	RCC Wall	RCC Wall	RCC Box	-
38	307+465	MNB	RHS	MCW	New	3 x 6	13.25	RCC Wall	RCC Wall	RCC Box	-
39	310+680	MNB	LHS	MCW	New	2 x 5	12.00	RCC Wall	RCC Wall	RCC Box	-
40	310+680	MNB	RHS	MCW	New	2 x 5	12.00	RCC Wall	RCC Wall	RCC Box	-
41	315+629	MNB	LHS	MCW	New	2 x 5	13.25	RCC Wall	RCC Wall	RCC Box	-
42	315+629	MNB	RHS	MCW	New	2 x 5	13.25	RCC Wall	RCC Wall	RCC Box	-
43	315+629	MNB	LHS	SR	New	2 x 5	10.75	RCC Wall	RCC Wall	RCC Box	-
44	315+629	MNB	RHS	SR	New	2 x 5	10.75	RCC Wall	RCC Wall	RCC Box	-
45	316+275	MNB	LHS	MCW	New	2 x 6	13.25	RCC Wall	RCC Wall	RCC Box	-
46	316+275	MNB	RHS	MCW	New	2 x 6	13.25	RCC Wall	RCC Wall	RCC Box	-
47	317+107	MNB	LHS	MCW	New	3 x 6	13.25	RCC Wall	RCC Wall	RCC Box	-
48	317+107	MNB	RHS	MCW	New	3 x 6	13.25	RCC Wall	RCC Wall	RCC Box	-
49	333+242	MNB	LHS	MCW	New	2 x 22	12.00	RCC Wall	RCC Wall	RCC Girder	Pot PTFE & Elastomeric
50	333+242	MNB	RHS	MCW	New	2 x 22	12.00	RCC Wall	RCC Wall	RCC Girder	Pot PTFE & Elastomeric
51	334+150	MNB	LHS	MCW	New	3 x 6	17.50	RCC Wall	RCC Wall	RCC Box	-
52	334+150	MNB	RHS	MCW	New	3 x 6	17.50	RCC Wall	RCC Wall	RCC Box	-
53	334+150	MNB	LHS	SR	New	3 x 6	11.25	RCC Wall	RCC Wall	RCC Box	-
54	334+150	MNB	RHS	SR	New	3 x 6	11.25	RCC Wall	RCC Wall	RCC Box	-
55	335+785	MNB	LHS	MCW	New	1 x 8	12.50	RCC Wall	-	RCC Box	-
56	335+785	MNB	RHS	MCW	New	1 x 8	12.50	RCC Wall	-	RCC Box	-
57	343+485	MNB	LHS	MCW	New	2 x 7.5	13.25	RCC Wall	RCC Wall	RCC Box	-
58	343+485	MNB	RHS	MCW	New	2 x 7.5	13.25	RCC Wall	RCC Wall	RCC Box	-
59	345+240	MNB	LHS	MCW	New	3 x 6	13.25	RCC Wall	RCC Wall	RCC Box	-
60	345+240	MNB	RHS	MCW	New	3 x 6	13.25	RCC Wall	RCC Wall	RCC Box	-
61	348+830	MNB	LHS	MCW	New	1 x 48	12.50	RCC Wall	-	Steel Girder	Pot PTFE
62	348+830	MNB	RHS	MCW	Old	1 x 48	11.75	RCC Wall	-	Box Girder	Elastomeric
63	397+970	MNB	LHS	MCW	New	2 x 7.5	10.50	RCC Wall	RCC Wall	RCC Box	-
64	397+970	MNB	RHS	MCW	Old	4 x 3.5	10.50	Brick Masonry Wall	Brick Masonry Wall	RCC Solid Slab	-
65	411+135	MNB	LHS	MCW	Old	2 x 28.25	11.00	Spill Through Abutment	RCC Wall	PSC Girder	Rocker Roller
66	411+135	MNB	RHS	MCW	New	2 x 28.25	12.00	Spill Through Abutment	RCC Wall	Steel Girder	Pot PTFE
67	411+990	MNB	LHS	MCW	Old	1 x 7.5	11.00	Brick Masonry Wall	Brick Masonry Wall	RCC Solid Slab	-
68	411+990	MNB	RHS	MCW	New	1 x 7.5	12.75	RCC Wall	-	RCC Box	-
69	305+400	Flyover	LHS	MCW	New	1 x 31.5	10.60	RCC Circular Type	-	Steel Girder	Pot PTFE

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Deck Width (m)	Type of Substructure		Type of Superstructure	Type of Bearings
								Abutment	Pier		
70	305+400	Flyover	RHS	MCW	New	1 x 31.5	10.60	RCC Circular Type	-	Steel Girder	Pot PTFE
71	325+620	Flyover	LHS	MCW	New	1 x 31	10.60	RCC Circular Type	-	Steel Girder	Pot PTFE
72	325+620	Flyover	RHS	MCW	New	1 x 31	10.60	RCC Circular Type	-	Steel Girder	Pot PTFE
73	329+600	Flyover	LHS	MCW	New	1 x 31	10.60	RCC Circular Type	-	Steel Girder	Pot PTFE
74	329+600	Flyover	RHS	MCW	New	1 x 31	10.60	RCC Circular Type	-	Steel Girder	Pot PTFE
75	270+100	VUP	LHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
76	270+100	VUP	RHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
77	277+770	VUP	LHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
78	277+770	VUP	RHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
79	282+375	VUP	LHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
80	282+375	VUP	RHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
81	288+205	VUP	LHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
82	288+205	VUP	RHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
83	295+375	VUP	LHS	MCW	New	1 x 30	11.50	RCC Circular Type	-	Steel Girder	Pot PTFE
84	295+375	VUP	RHS	MCW	New	1 x 30	11.50	RCC Circular Type	-	Steel Girder	Pot PTFE
85	303+656	VUP	LHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
86	303+656	VUP	RHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
87	315+740	VUP	LHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
88	315+740	VUP	RHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
89	331+922	VUP	LHS	MCW	New	1 x 13	12.00	RCC Wall	-	RCC Box	-
90	331+922	VUP	RHS	MCW	New	1 x 13	12.00	RCC Wall	-	RCC Box	-
91	332+235	VUP	LHS	MCW	New	1 x 12	12.00	RCC Wall	-	RCC Box	-
92	332+235	VUP	RHS	MCW	New	1 x 12	12.00	RCC Wall	-	RCC Box	-
93	334+250	VUP	LHS	MCW	New	1 x 10.5	17.80	RCC Wall	-	RCC Box	-
94	334+250	VUP	RHS	MCW	New	1 x 10.5	17.80	RCC Wall	-	RCC Box	-
95	334+610	VUP	LHS	MCW	New	1 x 10.5	17.80	RCC Wall	-	RCC Box	-
96	334+610	VUP	RHS	MCW	New	1 x 10.5	17.80	RCC Wall	-	RCC Box	-
97	336+620	VUP	LHS	MCW	New	1 x 12	12.00	RCC Wall	-	RCC Box	-
98	336+620	VUP	RHS	MCW	New	1 x 12	12.00	RCC Wall	-	RCC Box	-
99	358+080	VUP	LHS	MCW	New	1 x 10.9	13.70	RCC Wall	-	RCC Box	-
100	358+080	VUP	RHS	MCW	New	1 x 10.9	13.70	RCC Wall	-	RCC Box	-
101	361+620	VUP	LHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
102	361+620	VUP	RHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
103	363+690	VUP	LHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
104	363+690	VUP	RHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
105	365+440	VUP	LHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
106	365+440	VUP	RHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Deck Width (m)	Type of Substructure		Type of Superstructure	Type of Bearings
								Abutment	Pier		
107	377+370	VUP	LHS	MCW	New	1 x 12.8	13.25	RCC Wall	-	RCC Box	-
108	377+370	VUP	RHS	MCW	New	1 x 12.8	13.25	RCC Wall	-	RCC Box	-
109	383+650	VUP	LHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
110	383+650	VUP	RHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
111	392+460	VUP	LHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
112	392+460	VUP	RHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
113	396+175	VUP	LHS	MCW	New	1 x 30	11.50	RCC Circular Type	-	Steel Girder	Pot PTFE
114	396+175	VUP	RHS	MCW	New	1 x 30	11.50	RCC Circular Type	-	Steel Girder	Pot PTFE
115	401+510	VUP	LHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
116	401+510	VUP	RHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
117	416+720	VUP	LHS	MCW	New	1 x 10.5	12.40	RCC Wall	-	RCC Box	-
118	416+720	VUP	RHS	MCW	New	1 x 10.5	12.40	RCC Wall	-	RCC Box	-
119	417+820	VUP	LHS	MCW	New	1 x 10.5	14.50	RCC Wall	-	RCC Box	-
120	417+820	VUP	RHS	MCW	New	1 x 10.5	14.50	RCC Wall	-	RCC Box	-
121	274+170	PUP	LHS	MCW	New	1 x 7.5	13.25	RCC Wall	-	RCC Box	-
122	274+170	PUP	RHS	MCW	New	1 x 7.5	13.25	RCC Wall	-	RCC Box	-
123	290+400	PUP	LHS	MCW	New	1 x 7.5	12.00	RCC Wall	-	RCC Box	-
124	290+400	PUP	RHS	MCW	New	1 x 7.5	12.00	RCC Wall	-	RCC Box	-
125	291+040	PUP	LHS	MCW	New	1 x 7.5	12.00	RCC Wall	-	RCC Box	-
126	291+040	PUP	RHS	MCW	New	1 x 7.5	12.00	RCC Wall	-	RCC Box	-
127	370+100	PUP	LHS	MCW	New	1 x 7.5	13.25	RCC Wall	-	RCC Box	-
128	370+100	PUP	RHS	MCW	New	1 x 7.5	13.25	RCC Wall	-	RCC Box	-
129	388+140	PUP	LHS	MCW	New	1 x 7.5	13.25	RCC Wall	-	RCC Box	-
130	388+140	PUP	RHS	MCW	New	1 x 7.5	13.25	RCC Wall	-	RCC Box	-
131	402+980	PUP	LHS	MCW	New	1 x 9.5	12.10	RCC Wall	-	RCC Box	-
132	402+980	PUP	RHS	MCW	New	1 x 9.5	12.10	RCC Wall	-	RCC Box	-
133	403+630	PUP	LHS	MCW	New	1 x 9.5	12.10	RCC Wall	-	RCC Box	-
134	403+630	PUP	RHS	MCW	New	1 x 9.5	12.10	RCC Wall	-	RCC Box	-
135	407+615	PUP	LHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
136	407+615	PUP	RHS	MCW	New	1 x 10.5	13.25	RCC Wall	-	RCC Box	-
137	418+700	PUP	LHS	MCW	New	1 x 7.5	13.25	RCC Wall	-	RCC Box	-
138	418+700	PUP	RHS	MCW	New	1 x 7.5	13.25	RCC Wall	-	RCC Box	-
139	413+860	VOP	BHS	MCW	New	2 x 31	9.00	RCC Circular Type	RCC Circular Type	Steel Girder	Pot PTFE

Photos of Structures Inspected With MBIU








Observation on Structures

- The Project stretch have 67 no's of major structures, in that 5 ROB's, 7 MJB's, 19 MNB's, 3 Flyover's, 23 VUP's, 9 PUP's & 1 VOP's.
- The Project Road has varieties of super structure types for various structures such as Steel Girder, RCC Girder, Box Girder, PSC Girder, RCC Box & RCC Solid Slab.
- In this Project stretch, there are Pot PTFE (Old-30 No's & New-678No's), Elastomeric (Old-54 No's & New-116No's) & Rocker Roller (Old-8 No's) observed in Girder type Structures.
- Structures are having 136 No's of Expansion joints in that 21 No's on old structures and 115 No's on new structures.
- There are 9 No's of old bridges existing on left side 6 No's & right side 3 No's. (1 ROB's, 4 MJB's, 4 MNB's)
- **MJB at km.289+250 LHS - Superstructure in span-2 slided approximately 100mm towards the shoulder side on pier P1 and all the bearings were damaged. Realignment by lifting of superstructure and bearings replacement is required as an immediate action to safeguard the structure from further damage.**
- During the MBIU surveys, at couple of locations damaged bearings are observed. These need to be replaced.

- Some structures are already repaired and it would be necessary to closely examine these structures for further distress during the maintenance period/Project duration, by way of close inspection and testing.
- Debris observed on Abutment pier cap, Expansion joints are filled with debris, wearing coat, Drainage spouts are clogged at couple of locations
- Structural distress was observed at couple of locations viz Cracks, Honeycombs, spalling of concrete, Reinforcement exposed etc
- Bulging of the RE walls has been observed, and soil nailing has been carried out to address this issue at the ROB (km403+380 RHS), to arrest further bulging external RCC-wall construction is initiated,
- Cracks and leaching were observed on the soffit of the deck and the side walls of box type underpasses at few locations

Photos depicting existing Box Culverts/Slab & Pipe Culverts are presented below:

 Box Culvert @ 266+620	 Box Culvert @ 294+260	 Box Culvert @ 320+645
 Pipe Culvert @ 348+960	 Pipe Culvert @ 384+380	 Pipe Culvert @ 414+650

4.7 DRAINAGE AND SLOPE PROTECTION

- ✓ Lined Covered drains observed at urban locations and at service road Locations along the corridor.
- ✓ No major damages observed at covered drain locations.

4.8 TRAFFIC SAFETY AND ROAD FURNITURE

- ✓ Metal beam crash barriers provided along the project road appear to be intact over entire length except for few locations where it got damaged.
- ✓ Pedestrian guard rails installed on the median, Separator & appear to be intact over entire length except for few locations where it got damaged. PGR in narrow median observed to be insufficient and hence taken for replacement by MBCB and CCB based on median width in EPC cost.
- ✓ Median Opening locations appear to be in good condition. Few Unauthorized openings were observed along the project stretch require proper closing.
- ✓ Solar blinkers are in Fair condition at median openings in the entire project corridor.
- ✓ Street lightings and High masts are observed at urban locations, Toll Plaza & Junction Locations. At few locations street lightings are got damaged/ not functioning well and those items are addressed in the initial cost.

4.9 ROAD USER FACILITIES

- ✓ The Bus Bay with Shelters and Truck lay byes were provided along the corridor.

CHAPTER 5. REHABILITATION PLANS AND DESIGNS

5.1 DESIGN TRAFFIC LOADING

Design Traffic loading has been estimated by considering the latest traffic supplied by client (given for FY2025) whereas, VDFs as estimated from the latest axle load survey data and min. 5% growth rates for 10 years, 15 years and 20 years design period as below:

Table 35: Traffic Volume (AADT)

Vehicle/Mode	Toll Plaza-1 Km 266+900		Toll Plaza-2 Km 372+160	
	LHS (No.)	RHS (No.)	LHS (No.)	RHS (No.)
BUS	526	526	263	263
2A truck	689	689	537	537
3A truck	427	427	400	400
MAV truck	1116	1116	737	737
LCV	246	246	193	193

The MSA calculated considering the above scenario is as follows.

Table 36: Estimated Design traffic loading

Toll Plaza-1 at Faridpur Km 266+900		
Design Period	LHS	RHS
10 Years	55	62
15 Years	95	107
20 Years	146	165

Toll Plaza-2 Maigalganj Km 372+160		
Design Period	LHS	RHS
10 Years	63	59
15 Years	108	102
20 Years	166	156

The computation of traffic loadings is presented in **Appendix 9** of this Report. Design traffic corresponding to 10 years period has been considered for overlay design.

5.2 PAVEMENT REHABILITATION AND STRENGTHENING

5.2.1 Flexible Pavement Strengthening

For Design the Overlay Thickness the following method as suggested in IRC: 115 has been used

- The existing pavement is considered as a 3-layer system consisting of subgrade, granular and bituminous layer. The remaining life of exiting pavement in terms of Fatigue and Rutting life (MSA) are estimated

- The remaining life is compared with design traffic loading. An overlay with assumed thickness is considered on exiting pavement where required.
- The Total system including the proposed Overlay (Trial thickness) is assumed as a four-layer system and considered the relevant MR values for all the four layers namely New BT layer, existing bituminous surface, total existing Granular layers and Subgrade layers.
- The MR value for the New BT is assumed as 3000 MPA (considering VG40 Bituminous grade) for Main Carriageway and for all the remaining three layers, the MR Values derived and finalized from the FWD Analysis are considered
- Critical Tensile strains and Vertical strains are found out by using the IIT PAVE Software at the bottom of existing bituminous layer and at the top of the subgrade layer respectively.
- The Fatigue and Rutting equations (equation given in the IRC: 115) have been used to estimate the Fatigue and Rutting Life of the Pavement system considering 90% reliability equations.
- The Obtained Fatigue and Rutting Life are compared with the required life for the assumed trial overlay thickness.

Remaining life of the existing pavement from the above analysis is presented in the following tables:

Table 37: Remaining life of the existing pavement on LHS Carriageway

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC -115 Equations for 90% Reliability			Remarks
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA	
1	LHS	262.00	264.20	2.20	1543	393	64	230	350	580	1543	0.0002664	0.0001210	233	226	55	No Overlay
2	LHS	264.20	266.75	2.55	1547	392	64	230	350	580	1547	0.0002664	0.0001211	232	226	55	No Overlay
3	LHS	266.75	267.05	0.30													Toll Plaza
4	LHS	267.05	270.00	2.95	1354	322	64	193	401	595	1354	0.0002973	0.0001649	78	138	55	No Overlay
5	LHS	270.00	272.80	2.80	1406	215	64	180	420	600	1406	0.0003357	0.0002196	25	79	55	Overlay
6	LHS	272.80	275.80	3.00	1474	392	64	165	420	585	1474	0.0002890	0.0001588	84	156	55	No Overlay
7	LHS	275.80	279.40	3.60	1458	389	64	155	420	575	1458	0.0003019	0.0001688	67	128	55	No Overlay
8	LHS	279.40	282.20	2.80	1186	391	64	181	397	578	1186	0.0003010	0.0001563	108	130	55	No Overlay
9	LHS	282.20	285.81	3.61	1199	392	64	200	380	580	1199	0.0002927	0.0001451	142	148	55	No Overlay
10	LHS	285.81	289.40	3.59	1186	392	64	200	380	580	1186	0.0002934	0.0001454	143	146	55	No Overlay
11	LHS	289.40	292.40	3.00	1581	385	64	186	417	603	1581	0.0002670	0.0001427	120	224	55	No Overlay
12	LHS	292.40	295.40	3.00	1496	387	64	185	420	605	1496	0.0002684	0.0001450	118	219	55	No Overlay
13	LHS	295.40	299.40	4.00	1479	393	64	185	420	605	1479	0.0002674	0.0001439	123	223	55	No Overlay
14	LHS	299.40	303.20	3.80	1483	393	64	173	483	656	1483	0.0002388	0.0001500	104	372	55	No Overlay
15	LHS	303.20	306.00	2.79	1429	281	64	170	500	670	1429	0.0002655	0.0001920	41	230	55	Overlay
16	LHS	306.00	308.40	2.40	1298	391	64	170	500	670	1298	0.0002371	0.0001585	94	384	55	No Overlay
17	LHS	308.40	311.40	3.01	1267	389	64	170	500	670	1267	0.0002385	0.0001602	92	374	55	No Overlay
18	LHS	311.40	314.00	2.60	1294	391	64	225	480	705	1294	0.0002073	0.0001255	235	706	55	No Overlay
19	LHS	314.00	316.60	2.60	538	142	64	225	480	705	538	0.0003332	0.0003288	12	82	55	Overlay
20	LHS	316.60	318.81	2.20	1188	391	64	225	480	705	1188	0.0002109	0.0001286	230	653	55	No Overlay
21	LHS	318.81	321.60	2.80	1375	393	64	204	480	684	1375	0.0002191	0.0001341	172	549	55	No Overlay
22	LHS	321.60	324.00	2.40	1235	228	64	165	480	645	1235	0.0003121	0.0002379	20	110	55	Overlay
23	LHS	324.00	326.40	2.40	1212	251	64	165	480	645	1212	0.0003032	0.0002259	25	126	55	Overlay
24	LHS	326.40	327.25	0.85	1456	388	64	165	480	645	1456	0.0002495	0.0001586	85	305	55	No Overlay
25	LHS	327.25	327.70	0.45													Diversion
26	LHS	327.70	329.60	1.90													No Overlay
27	LHS	329.60	332.01	2.41	1489	370	64	211	391	602	1489	0.0002660	0.0001355	154	228	55	No Overlay
28	LHS	332.01	334.40	2.39	382	74	64	220	380	600	382	0.0004982	0.0005664	2	13	55	Overlay
29	LHS	334.40	337.60	3.20	1112	198	64	220	380	600	1112	0.0003362	0.0002111	35	79	55	Overlay
30	LHS	337.60	340.80	3.20	2479	378	64	214	378	592	2479	0.0002379	0.0001097	227	378	55	No Overlay
31	LHS	340.80	343.60	2.80	2468	389	64	175	360	535	2468	0.0002935	0.0001307	115	146	63	No Overlay
32	LHS	343.60	346.60	3.00	1254	379	64	175	360	535	1254	0.0003411	0.0001641	85	74	63	No Overlay
33	LHS	346.60	349.00	2.40	2082	210	63	175	360	535	2082	0.0003662	0.0001941	29	53	63	Overlay
34	LHS	349.00	352.00	3.00	2902	394	64	182	353	535	2902	0.0002770	0.0001182	149	190	63	No Overlay
35	LHS	352.00	355.20	3.20	2147	390	64	185	350	535	2147	0.0002969	0.0001319	126	138	63	No Overlay
36	LHS	355.20	358.40	3.20	1036	345	64	185	350	535	1036	0.0003619	0.0001769	75	56	63	Overlay
37	LHS	358.40	361.01	2.61	807	141	64	170	368	538	807	0.0004931	0.0003705	5	14	63	Overlay
38	LHS	361.01	363.40	2.39	1101	387	64	160	380	540	1101	0.0003473	0.0001785	68	68	63	No Overlay
39	LHS	363.40	366.00	2.60	1095	390	64	160	380	540	1095	0.0003466	0.0001776	70	69	63	No Overlay

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC -115 Equations for 90% Reliability			
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA	Remarks
40	LHS	366.00	370.39	4.39	2198	364	64	169	393	562	2198	0.0002908	0.0001440	87	152	63	No Overlay
41	LHS	370.39	371.95	1.56								0.0002398	0.0001392	176	365	63	No Overlay
42	LHS	371.95	372.25	0.30	1131	391	64	210	450	660	1131						Toll Plaza
43	LHS	372.25	374.60	2.35													No Overlay
44	LHS	374.60	378.00	3.40	774	173	64	210	450	660	774	0.0003333	0.0002729	18	82	63	Overlay
45	LHS	378.00	381.20	3.20	2186	282	64	214	413	626	2186	0.0002472	0.0001327	121	318	63	No Overlay
46	LHS	381.20	384.00	2.81	2274	380	64	220	350	570	2274	0.0002531	0.0001118	227	286	63	No Overlay
47	LHS	384.00	386.80	2.80	2315	392	64	220	350	570	2315	0.0002495	0.0001092	245	305	63	No Overlay
48	LHS	386.80	389.61	2.81	2180	350	64	217	358	575	2180	0.0002605	0.0001200	179	251	63	No Overlay
49	LHS	389.61	393.01	3.39	432	75	64	180	460	640	432	0.0004712	0.0006493	1	17	63	Overlay
50	LHS	393.01	396.40	3.40	429	73	64	180	460	640	429	0.0004730	0.0006611	1	17	63	Overlay
51	LHS	396.40	399.00	2.59	1402	365	64	180	460	640	1402	0.0002561	0.0001559	94	271	63	No Overlay
52	LHS	399.00	401.77	2.78	1387	362	64	244	439	683	1387	0.0002161	0.0001205	259	585	63	No Overlay
53	LHS	401.77	404.60	2.82	1421	360	64	270	430	700	1421	0.0002013	0.0001077	393	806	63	No Overlay
54	LHS	404.60	407.40	2.81	1517	393	64	270	430	700	1517	0.0001926	0.0000998	501	985	63	No Overlay
55	LHS	407.40	410.00	2.60	1490	391	64	270	430	700	1490	0.0001938	0.0001007	490	958	63	No Overlay
56	LHS	410.00	412.81	2.81	1500	393	64	195	438	633	1500	0.0002457	0.0001369	148	327	63	No Overlay
57	LHS	412.81	415.60	2.80	1501	392	64	175	440	615	1501	0.0002634	0.0001491	106	238	63	No Overlay
58	LHS	415.60	419.59	3.99	1479	388	64	175	440	615	1479	0.0002652	0.0001511	102	231	63	No Overlay
Total length				157.590													

Table 38: Remaining life of the existing pavement on RHS Carriageway

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC -115 Equations for 90% Reliability			
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA	Remarks
1	RHS	262.00	264.20	2.20	1509	393	64	175	430	605	1509	0.0002697	0.0001488	106	214	62	No Overlay
2	RHS	264.20	266.75	2.55	1535	390	64	183	430	613	1535	0.0002616	0.0001440	119	246	62	No Overlay
3	RHS	266.75	267.05	0.30													Toll Plaza
4	RHS	267.05	270.00	2.95	1220	368	64	185	430	615	1220	0.0002770	0.0001586	99	190	62	No Overlay
5	RHS	270.00	272.80	2.80	1111	359	64	185	430	615	1111	0.0002844	0.0001653	92	168	62	No Overlay
6	RHS	272.80	275.60	2.80	1189	390	64	184	424	608	1189	0.0002775	0.0001534	116	188	62	No Overlay
7	RHS	275.60	278.40	2.80	1429	385	64	180	410	590	1429	0.0002836	0.0001508	106	170	62	No Overlay
8	RHS	278.40	281.20	2.80	1404	267	64	180	410	590	1404	0.0003229	0.0001939	40	95	62	Overlay
9	RHS	281.20	284.00	2.80	1423	393	64	180	410	590	1423	0.0002816	0.0001487	112	176	62	No Overlay
10	RHS	284.00	287.00	3.00	1458	390	64	213	457	670	1458	0.0002222	0.0001282	195	515	62	No Overlay

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC -115 Equations for 90% Reliability			
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA	Remarks
11	RHS	287.00	290.00	2.99	1445	390	64	230	480	710	1445	0.0001996	0.0001190	263	838	62	No Overlay
12	RHS	290.00	292.00	2.00	597	116	64	230	480	710	597	0.0003328	0.0003464	9	83	62	Overlay
13	RHS	292.00	295.99	4.00	1391	392	64	230	465	695	1391	0.0002077	0.0001204	259	700	62	No Overlay
14	RHS	295.99	299.41	3.42	1490	393	64	230	430	660	1490	0.0002215	0.0001187	258	523	62	No Overlay
15	RHS	299.41	302.80	3.39	1467	391	64	230	430	660	1467	0.0002226	0.0001197	254	511	62	No Overlay
16	RHS	302.80	305.99	3.19	1467	378	64	214	446	660	1467	0.0002295	0.0001304	182	445	62	No Overlay
17	RHS	305.99	309.40	3.40	1332	170	64	180	480	660	1332	0.0003149	0.0002525	15	106	62	Overlay
18	RHS	309.40	314.00	4.60	1315	350	64	180	480	660	1315	0.0002507	0.0001631	84	298	62	No Overlay
19	RHS	314.00	317.00	3.01	632	112	64	175	415	590	632	0.0004706	0.0004530	3	17	62	Overlay
20	RHS	317.00	320.60	3.60	1440	248	64	170	350	520	1440	0.0003993	0.0002142	27	36	62	Overlay
21	RHS	320.60	323.80	3.20	1285	386	64	170	350	520	1285	0.0003540	0.0001655	80	62	62	No Overlay
22	RHS	323.80	326.40	2.61	1150	388	64	161	372	532	1150	0.0003510	0.0001759	70	65	62	No Overlay
23	RHS	326.40	327.25	0.85								0.0003259	0.0001873	50	91	62	Overlay
24	RHS	327.25	327.70	0.45	1281	391	64	140	420	560	1281						Under Construction
25	RHS	327.70	329.60	1.90												62	Overlay
26	RHS	329.60	332.00	2.40	1281	391	64	140	420	560	1281	0.0003259	0.0001873	50	91	62	Overlay
27	RHS	332.00	334.33	2.33	929	73	64	140	420	560	929	0.0005347	0.0005748	1	10	62	Overlay
28	RHS	334.33	336.81	2.47	1103	318	64	167	440	607	1103	0.0003099	0.0001975	46	114	62	Overlay
29	RHS	336.81	340.80	3.99	1069	329	64	180	450	630	1069	0.0002863	0.0001813	66	163	62	No Overlay
30	RHS	340.80	343.40	2.60	1222	138	64	180	450	630	1222	0.0003578	0.0002929	9	59	59	Overlay
31	RHS	343.40	346.00	2.60	1175	135	64	180	436	616	1175	0.0003736	0.0003022	8	49	59	Overlay
32	RHS	346.00	348.40	2.40	2944	392	64	180	420	600	2944	0.0002372	0.0001156	160	383	59	No Overlay
33	RHS	348.40	351.40	3.00	803	153	64	180	420	600	803	0.0004092	0.0003347	8	32	59	Overlay
34	RHS	351.40	354.21	2.81	1677	290	63	180	420	600	1677	0.0002983	0.0001723	55	136	59	Overlay
35	RHS	354.21	358.40	4.19	1208	124	64	180	420	600	1208	0.0003898	0.0003108	7	40	59	Overlay
36	RHS	358.40	362.80	4.40	893	137	64	164	453	616	893	0.0004060	0.0003685	5	34	59	Overlay
37	RHS	362.80	365.79	2.99	1428	260	64	160	460	620	1428	0.0003118	0.0002144	27	111	59	Overlay
38	RHS	365.79	370.19	4.40	2879	358	64	160	460	620	2879	0.0002450	0.0001338	92	331	59	No Overlay
39	RHS	370.19	371.95	1.76								0.0003991	0.0003639	4	36	59	Overlay
40	RHS	371.95	372.25	0.30	1175	115	64	160	460	620	1175						Toll Plaza
41	RHS	372.25	373.00	0.75												59	Overlay
42	RHS	373.00	376.19	3.19	1958	185	64	163	488	651	1958	0.0003019	0.0002205	18	128	59	Overlay
43	RHS	376.19	378.80	2.61	1909	206	64	165	500	665	1909	0.0002846	0.0002089	23	168	59	Overlay
44	RHS	378.80	381.60	2.80	2879	389	64	165	500	665	2879	0.0002118	0.0001233	127	640	59	No Overlay
45	RHS	381.60	384.80	3.20	1214	139	64	164	520	684	1214	0.0003297	0.0003172	7	86	59	Overlay
46	RHS	384.80	387.60	2.79	2806	313	64	160	660	820	2806	0.0001692	0.0001414	76	1772	59	No Overlay
47	RHS	387.60	391.80	4.20	1301	135	64	160	660	820	1301	0.0002516	0.0003161	6	293	59	Overlay
48	RHS	391.80	395.40	3.60	1260	132	64	177	617	793	1260	0.0002589	0.0002957	9	258	59	Overlay
49	RHS	395.40	397.79	2.39	1256	378	64	260	400	660	1256	0.0002261	0.0001146	343	476	59	No Overlay
50	RHS	397.79	400.79	3.00	1313	359	64	260	400	660	1313	0.0002272	0.0001168	307	466	59	No Overlay
51	RHS	400.79	403.57	2.77	1156	334	64	260	400	660	1156	0.0002398	0.0001276	242	365	59	No Overlay

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC -115 Equations for 90% Reliability			
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA	Remarks
52	RHS	403.57	407.00	3.44	1428	390	64	255	409	665	1428	0.0002160	0.0001097	364	586	59	No Overlay
53	RHS	407.00	411.00	4.00	917	352	64	250	420	670	917	0.0002456	0.0001361	230	327	59	No Overlay
54	RHS	411.00	411.30	0.30													Under Construction
55	RHS	411.30	415.80	4.50	1354	355	64	243	420	663	1354	0.0002292	0.0001242	235	448	59	No Overlay
56	RHS	415.80	416.00	0.20													Under Construction
57	RHS	416.00	416.30	0.30	1106	209	64	220	420	640	1106	0.0003036	0.0002036	41	125	59	Overlay
58	RHS	416.30	417.05	0.75													Under Construction
59	RHS	417.05	419.59	2.54								0.0003036	0.0002036	41	125	59	Overlay
Total length				157.590													

From the above, it is to note that if the target MSA (10yr design MSA) is more than obtained remaining life of the existing pavement, then it is required to provide an overlay to ensure the life after over lay should be more than design MSA. Accordingly, based on this criterion, an overlay is warranted for a length of 36.98 km in LHS and 69.498 km in RHS.

The required overlay sections are analyzed in accordance with IRC:37 guidelines, using assumed overlay thicknesses to determine vertical and horizontal strains. Subsequently, fatigue and rutting life are evaluated in terms of MSAs. Throughout this process, it is ensured that the remaining life (MSA) of the existing pavement always exceeds the calculated 10-year design MSA.

The following tables indicates the proposed overlay thicknesses in LHS and RHS directions respectively.

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		VG 40 - 3000 Mpa	Total BT (mm)	Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC - 115 Equations for 90% Reliability		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)	Proposed BT (mm)				Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf-Fatigue life, MSA	Rutting life,MSA	Target MSA
5	LHS	270.00	272.80	2.80	1406	215	64	180	420	50	230	650	1406	0.0002509	0.0001647	76	297	55
15	LHS	303.20	306.00	2.79	1429	281	64	170	500	50	220	720	1429	0.0002055	0.0001473	116	734	55
19	LHS	314.00	316.60	2.60	538	142	64	225	480	90	315	795	538	0.0002093	0.0001847	110	676	55
22	LHS	321.60	324.00	2.40	1235	228	64	165	480	50	215	695	1235	0.0002357	0.0001793	61	394	55
23	LHS	324.00	326.40	2.40	1212	251	64	165	480	50	215	695	1212	0.0002302	0.0001714	74	439	55
28	LHS	332.01	334.40	2.39	382	74	64	220	380	115	335	715	382	0.0002544	0.0002361	57	279	55
29	LHS	334.40	337.60	3.20	1112	198	64	220	380	50	270	650	1112	0.0002489	0.0001584	108	308	55

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		VG 40 - 3000 Mpa	Total BT (mm)	Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC - 115 Equations for 90% Reliability		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)	Proposed BT (mm)				Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf-Fatigue life, MSA	Rutting life,MSA	Target MSA
33	LHS	346.60	349.00	2.40	2082	210	63	175	360	50	225	585	2082	0.0002737	0.0001453	88	200	63
36	LHS	355.20	358.40	3.20	1036	345	64	185	350	50	235	585	1036	0.0002702	0.0001411	180	212	63
37	LHS	358.40	361.01	2.61	807	141	64	170	368	100	270	638	807	0.0002720	0.0001938	65	206	63
44	LHS	374.60	378.00	3.40	774	173	64	210	450	90	300	750	774	0.0002086	0.0001591	145	686	63
49	LHS	389.61	393.01	3.39	432	75	64	180	460	140	320	780	432	0.0002148	0.0002174	71	601	63
50	LHS	393.01	396.40	3.40	429	73	64	180	460	140	320	780	429	0.0002149	0.0002200	68	599	63
Total length				36.985														

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		VG-40 3000Mpa	Total BT (mm)	Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC - 115 Equations for 90% Reliability		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)	Proposed BT(mm)				Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA
8	RHS	278.40	281.20	2.80	1404	267	64	180	410	50	230	640	1404	0.0002439	0.0001485	114	338	62
12	RHS	290.00	292.00	2.00	597	116	64	230	480	90	320	800	597	0.0002058	0.0001923	86	729	62
17	RHS	305.99	309.40	3.40	1332	170	64	180	480	90	270	750	1332	0.0001975	0.0001471	123	879	62
19	RHS	314.00	317.00	3.01	632	112	64	175	415	115	290	705	632	0.0002439	0.0002033	66	338	62
20	RHS	317.00	320.60	3.60	1440	248	64	170	350	50	220	570	1440	0.0002940	0.0001632	77	145	62
23	RHS	326.40	327.25	0.85	1281	391	64	140	420	50	190	610	1281	0.0002485	0.0001448	136	310	62
24	RHS	327.25	327.70															
25	RHS	327.70	329.60	1.90						50								62
26	RHS	329.60	332.00	2.40	1281	391	64	140	420	50	190	610	1281	0.0002485	0.0001448	136	310	62
27	RHS	332.00	334.33	2.33	929	73	64	140	420	150	290	710	929	0.0002135	0.0001878	65	617	62
28	RHS	334.33	336.81	2.47	1103	318	64	167	440	50	217	657	1103	0.0002355	0.0001535	123	396	62
30	RHS	340.80	343.40	2.60	1222	138	64	180	450	90	270	720	1222	0.0002167	0.0001660	83	577	59
31	RHS	343.40	346.00	2.60	1175	135	64	180	436	90	270	706	1175	0.0002243	0.0001707	77	494	59

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		VG-40 3000Mpa	Total BT (mm)	Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC - 115 Equations for 90% Reliability		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)	Proposed BT(mm)				Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA
33	RHS	348.40	351.40	3.00	803	153	64	180	420	90	270	690	803	0.0002459	0.0001896	71	325	59
34	RHS	351.40	354.21	2.81	1677	290	63	180	420	50	230	650	1677	0.0002289	0.0001325	152	450	59
35	RHS	354.21	358.40	4.19	1208	124	64	180	420	90	270	690	1208	0.0002307	0.0001739	70	435	59
36	RHS	358.40	362.80	4.40	893	137	64	164	453	100	264	716	893	0.0002321	0.0001916	62	423	59
37	RHS	362.80	365.79	2.99	1428	260	64	160	460	50	210	670	1428	0.0002371	0.0001625	79	384	59
39	RHS	370.19	371.95	1.76	1175	115	64	160	460	105	265	725	1175	0.0002194	0.0001804	62	546	59
40	RHS	371.95	372.25															
41	RHS	372.25	373.00	0.75						105								59
42	RHS	373.00	376.19	3.19	1958	185	64	163	488	50	213	701	1958	0.0002301	0.0001624	60	440	59
43	RHS	376.19	378.80	2.61	1909	206	64	165	500	50	215	715	1909	0.0002189	0.0001553	74	551	59
45	RHS	381.60	384.80	3.20	1214	139	64	164	520	90	254	774	1214	0.0002038	0.0001777	64	762	59
47	RHS	387.60	391.80	4.20	1301	135	64	160	660	90	250	910	1301	0.0001643	0.0001756	63	2025	59
48	RHS	391.80	395.40	3.60	1260	132	64	177	617	90	267	883	1260	0.0001665	0.0001660	81	1906	59
57	RHS	416.00	416.30	0.30	1106	209	64	220	420	50	270	690	1106	0.0002276	0.0001534	123	462	59
58	RHS	416.30	417.05															
59	RHS	417.05	419.59	2.54						50								59
Total length				69.498														

Input data used and the output from the IIT Pave software has been presented as screen shots for ready reference as **Appendix 10** of this Report.

Summary of Overlay thickness from FWD analysis is as follows:

Overlay Thickness (mm)	Length (km)	
	LHS	RHS
50	19.19	28.46
90	6.00	28.80
100	2.61	4.40
105	-	2.51
115	-	3.01
120	2.39	-
140	6.79	-
150	-	2.33

Overall summary of overlay/renewal requirement of project corridor arrived from combining PCI (Pavement Condition Index), Roughness (IRI>2200mm/Km) and FWD analysis is as below

Main Carriageway -LHS					
Recommended Overlay	**No Overlay**	**To be Overlaid**	**DBM Completed**	**BC Completed**	**Total Length (Km)**
Overlay as per FWD survey	10.600	5.800	7.500	13.100	**37.000**
Overlay based on Roughness index(>2200mm/km)	8.500	2.500	7.100	6.700	**24.800**
Overlay based on PCI	7.700	4.700	8.000	7.200	**27.600**
No Overlay	20.800	11.400	11.300	24.690	**68.190**

Main Carriageway -RHS					
Recommended Overlay	**No Overlay**	**To be Overlaid**	**DBM Completed**	**BC Completed**	**Total Length (Km)**
Overlay as per FWD survey	8.800	15.100	28.100	17.590	**69.590**
Overlay based on Roughness index(>2200mm/km)	1.400	9.000	0.200	8.000	**18.600**
Overlay based on PCI	4.000	10.200	0.600	10.400	**25.200**
No Overlay	8.200	11.6	10.000	14.400	**44.200**

5.3 STRUCTURAL REHABILITATION

All the structure found to be in fair condition except minor treatment like repair of stone pitching, cleaning of drainage spouts, cleaning of vegetation etc. may be required. Detailed structural rehabilitation quantities have been worked out based on the prevailing condition of existing structures. This methodology describes in detail the procedure for the execution of each item of rehabilitation work of the Existing Bridges of the project.

The scope of this methodology covers the items mentioned below for rehabilitation work of all the existing Bridges.

- Repair/ Replacement of Existing Bearings
- Repair / Replacement of Existing Expansion Joints
- Repair / Replacement of Existing Wearing Coat
- Profile Correction for Existing Deck Slab by Cement Concrete
- Sealing of Cracks for Bridges by Epoxy Resin
- Replacement of Spalled Concrete of ECW by Epoxy Mortar
- Cement Grouting for Repair of Existing Bridges
- Guniting / Shotcrete for Repair of Existing Bridges
- Providing & Fixing of Drainage Spouts
- Repair of Substructure Component
- Repair / Replacement of Railing & Crash Barrier
- Epoxy Bonding between New and Old Concrete.

5.4 SCHEDULE-B SCOPE

Few major items of Schedule-B are required to be constructed are as below.

Clause	Description	Scope	Remarks
Clause 2.	Grade Separated Structure	Nil	But as per DPR Cost and as per Clause 4.1 the Cost is estimated for VUPs and approaches
Clause 4.1.a(i)	At-grade Intersections: Major Junctions i) New Junctions to be developed	1Number at Km 326.500	New to be developed
Clause 4.1.a(ii)	At-grade Intersections: Major Junctions ii) Existing Major Junction to be retained with Safety Enhancement	1Number at Km 413.820	Safety enhancement of these junctions by providing signage, road marking, blinkers, pedestrian crossing facility etc. as per relevant IRC Codes and Standards need to be provided in accordance with IRC SP: 84 -2019 and as per Annexure I and Annexure II
Clause 4.1.b (i)	Minor Junctions: All junctions below are to be retained with Safety Enhancement i. Junctions with MCW	181 numbers	
Clause 4.1.b (iii)	Iii Minor Junction with Service Road / Slip Road	80 numbers	
Clause 4.2	At-grade Intersections below Grade Separator / Interchanges	At 11 numbers	These shall be provided as given at para-2.9 of this Annex-I of the Schedule B. and

Clause	Description	Scope	Remarks
	a) New Junction to be developed due to New Proposal of Grade Separator (Major)		section-3 of manual and as per Annexure III and IV of Schedule B. But There is no Clause 2.9 in this schedule
Clause 4.2	b) New Junction to be developed due to New Proposal of Grade Separator (Minor)	At 3 numbers	
Clause 4.2	c) Existing Junction to be retained with Safety Enhancement:	At 13 numbers	
Clause 6.1	6.1 Repair and Rehabilitation of Pavement	As per FWD and NSV Report. But as per Clause 61.1. to 6.1.3 the scope is Nil	
Clause 7.1	7 (d) Drainage where Embankment Height is more than 3m (Clause No. 6.4 IRC: SP:84-2019)	New - Nil As there is no modification of main carriageway is envisaged	Existing Drainage chutes, stone pitching and any other measures as provided shall be repaired and restored in working conditions.
Clause 7.1	e) Drainage for Structures (Clause No. 6.8 IRC: SP:84-2019)	Minimum HPVC 200 mm dia. shall be provided for disposal of rainwater with PCC encasing	Apart from this pavement cost and chamber arrayment cost shall be considered
Clause 7.1	f) Drainage for Underpass	A suitable drainage arrangement for draining storm water from Underpass shall be provided	If required, need to consider pumping system
Clause 7.1	g) Drainage arrangements of Retaining Structures	Drainage fixtures and dropdown pipes shall be of rigid, corrosion resistant material not less than 100 mm dia	
Clause 8.3.3	8. Structures: 8.3.3 Culverts on Crossroads:	existing crossroads culvert shall be repair and maintained	
Clause 8.4.7	8.4.7	Refer: Annexure V for Repair & Rehabilitation of Structures	Any other additional Items which are required shall also be executed and NO Change of Scope is admissible for any extra items
Clause 12	12 Project Facilities		
Clause 12.1	12.1 Toll Plaza	TMS System shall be upgraded if required	
Clause 12.2.2	12.2.2 Traffic Signs	Additional signs as per this clause shall be provided	
Clause 12.2.6	Solar Blinkers	Solar Blinkers shall be provided median openings and entry/exit ramps	
Clause 12.2.7	12.2.7 Traffic Impact Attenuators	66 numbers on flyover/grade separated structure at exit from main carriageway	
Clause 12.2.7	12.2.7 Traffic Impact Attenuators	20 numbers Infront of Islands of Toll Plaza	
Clause 12.2.7	12.2.7 Traffic Impact Attenuators	Any other location	
Clause 12.2.8	12.2.8 Transverse Bar Marking	1. Median openings (U-Turn Facilities) 2. Toll Plaza approaches 3. Approaches to At-Grade junctions 4. Exit ramps and downside of the approach of the flyovers	Refer: Annexure VI for Transverse Bar Marking
Clause 12.2.10	12.2.10 Antiglare at Narrow Median Location	Nil In addition to above --- Antiglare is to be provided as per site requirement	
Clause 12.3	12.3 Operation and Maintenance centers	The minimum land for O & M center shall be 2000 sq.m and shall be	

Clause	Description	Scope	Remarks
		acquired by the Concessionaire at his own cost and risk	
Clause 12.4	12.4 Rest Areas / Wayside Amenities	Nil	
Clause 12.5	12.5 Truck Lay Bye	New truck lay byes-------7 numbers Additional Facilities at existing Truc lay byes---4 numbers	At existing---Rest area with toilets, drinking water and Telephone facility to be provided Traffic Signs board / marking / road studs / lighting are to be provided at Truck Laybys as per IRC SP: 84-2019
Clause 12.6	12.6 Bus Bay and Bus Shelter	bays and Bus shelters---11 locations	Existing Bus Shelter is to be repair / rehabilitated
Clause 12.7	12.7 Highway Lighting	Solar lighting at Rest Area, Truck Lay bus, Bus Bays and Shelters etc.	
Clause 12.9	12.9 ATMS	Video Surveillance System—157 Km PTZ Camera ---------- 137 Numbers Video Incident Detection and Enforcement System (VIDES)---34 Nos Vehicle Actuated Speed Display System----4 Numbers VMS Systems Displays (Full Gantry 4 Lane) -----26 Nos VMS Portable type-------Nil Network / Communication Infrastructure----304 km ATMS Control Centre—2 Nos Power Supply for ATMS--2 Nos Provision of Electronic Call Boxes-160	The ATMS system shall provide and maintain as per NHAI / Policy Guidelines / Standard Documents 2023, Policy Circular No. 11.53/2023 dated 10th October 2023, also implement the circular issued from time to time
Clause 12.10	12.10 Highway Patrol	1 per every 50Km	Time being consider 4 number as the project length is more than 150 and less than 200Km
Clause 12.11	12.11 Emergency Medical Services	1 per every 50Km	Time being consider 4 number as the project length is more than 150 and less than 200Km
Clause 12.12	12.12 Cranes	1 per every 50Km	Time being consider 4 number as the project length is more than 150 and less than 200Km

All these items are quantified in BOQ under EPC cost.

CHAPTER 6. OPERATION AND MAINTENANCE

6.1 INTRODUCTION

Looking at the contractual requirements of maintaining project road under specified level of roughness it is felt that roughness is the most important criterion for finalizing the O&M schedule for the project. Accordingly, the methodology adopted by present consultants includes predicting the roughness year by year under the traffic using a well acknowledged HDM-4 model developed for developing countries like India after lot of research by World Bank. The said model is widely prescribed by MORTH and NHAI during the preparation of detailed project reports for several projects in doing economic analysis for the projects. The economic analysis mainly consists of two parts:

1. Predicting the road deterioration and estimating VOC
2. Estimating Benefits

Considering its importance and present use in India, consultants felt prudent to use the first part, i.e estimating road deterioration and predicting roughness in HDM 4 model to finalize the O&M schedule for the project. This approach is more scientific as it does not assume hypothetical deflection values at 10^{th} and 20^{th} year and includes main criterion of maintaining roughness at 2400mm/Km as per Schedule F.

6.2 CA SPECIFICATIONS FOR MAJOR MAINTENANCE

Schedule F prescribe the maintenance standards to be adopted for project. Summary of same is presented below.

- Appliable Manual: Four lane manual IRC SP 84-2019 published by IRC
- Applicable Schedule for O&M: Schedule-F and Manual
- Maximum Roughness Allowed: 2400mm/km
- Frequency of Roughness Test: 2 times per year
- Frequency of FWD Test: once in a year
- Schedule-B, Clause 6.1 minimum overlay thickness of BC on the main carriageway shall be 50mm

6.3 INPUTS FOR M&M SCHEDULE

6.3.1 Project Sections

Considering traffic scenario, project road has been divided into two sections viz.,

- Section-1: Bareilly to Shahjahanpur section- km 262.000 to km 340.800, length 78.80 km
- Section-2: Shahjahanpur to Sitapur section- km 340.800 to km 419.590, length 78.79 km

Each section is further categorized based on the findings from FWD (Falling Weight Deflectometer), Roughness, and PCI (Pavement Condition Index) into two sub-sections as

- Overlay section (with 50mm OL and 90mm OL) and
- No overlay section

Then, taking the consideration of Roughness as a key criterion for major maintenance, further the above sub-sections categorized in to four cases below:

- Case 1: Roughness value <2000 mm/Km
- Case 2: Roughness values >2000<2200 mm/Km
- Case 3: Roughness>2200<2400 mm/Km
- Case 4: Roughness>2400 mm/Km

Direction wise analysis has been done separately for LHS (UP)/RHS (DN) and each direction length has been divided into sections based on above.

6.3.2 Traffic (AADT)

The following traffic data has been used in the analysis is as below:

Vehicle/Mode	Km. 266+900 Faridpur Toll Plaza-1: Secton-1		Km. 372+160 Maigalganj: Toll Plaza-1 Secton-2	
	LHS	RHS	LHS	RHS
CAR	4594	4594	2212	2212
BUS	526	526	263	263
2A truck	689	689	537	537
3A truck	427	427	400	400
MAV truck	1116	1116	737	737
LCV	246	246	193	193

The actual growth rates are considered for further analysis.

6.3.3 Vehicle Damage Factors (VDF)

VDF values as obtained from axle load surveys are used for various sections are as given below:

Section-1(Km. 266+900 Faridpur TP)					Section-2(Km. 372+160 Maigalganj TP)	
S No.	Vehicle Type	LHS	RHS		LHS	RHS
1	2-Axle	1.73	1.66		2.59	2.31
2	3-Axle	3.16	4.15		4.99	5.30
3	LCV	0.84	0.82		1.20	1.30
4	MAV	10.29	11.58		16.89	15.54
5	Bus	0.77	0.76		0.86	1.13

6.3.4 HDM Inputs

FWD, Roughness, Pavement condition values are used as obtained from surveys and investigations for various sections and different cases as below:

Section-1: No Overlay

Section-1 No OL	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, km	17.000	1.000			8.000			
Roughness, mm/km	1604	2122			1516			
IRI. m/km	2.30	2.96			2.19			
Deflection, mm	0.24	0.25			0.36			
Cracking %	3.59	0.34			6.60			
Raveling %	0.25	0.03			0.04			
Rut Depth, mm	5.35	6.94			4.67			
Patching, %	0.48	0.00			0.55			
Potholes, %	0.06	0.00			0.00			
BT Crust, mm	185	165			216			
Granular Crust, mm	432	480			426			

Section-1: 50mm Overlay

Section-1 50mm OL	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, km	16.800	8.000	5.000	16.800	4.000	6.000	9.000	7.000
Roughness, mm/km	1757	2119	2292	1757	1924	2089	2303	2651
IRI. m/km	2.50	2.95	3.17	2.50	2.71	2.92	3.18	3.60
Deflection, mm	0.33	0.40	0.29	0.33	0.39	0.39	0.41	0.41
Cracking %	5.26	0.93	5.66	5.26	3.60	2.84	2.73	5.50
Raveling %	0.32	0.01	0.05	0.32	0.04	0.01	0.04	0.03
Rut Depth, mm	6.71	8.57	7.10	6.71	8.74	7.11	9.75	9.91
Patching, %	0.96	0.08	0.86	0.96	0.52	0.64	0.80	1.17
Potholes, %	0.11	0.50	0.20	0.11	0.50	0.00	0.11	0.00
BT Crust, mm	193	194	186	193	185	194	167	178
Granular Crust, mm	424	428	450	424	425	433	432	434

Section-1: 90mm Overlay

Section-1 90mm OL	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, km	13.000	3.000	2.000	5.000	17.800	12.000	8.000	7.000
Roughness, mm/km	1623	2091	2368	2677	1771	2094	2272	2727
IRI. m/km	2.33	2.92	3.26	3.64	2.52	2.92	3.14	3.70
Deflection, mm	0.36	0.37	0.53	0.58	0.45	0.44	0.45	0.58
Cracking %	3.42	12.60	19.90	7.99	6.87	6.60	10.84	8.88
Raveling %	0.18	0.34	0.35	0.19	0.03	0.04	0.05	0.03
Rut Depth, mm	4.96	6.02	7.85	11.08	6.15	7.11	8.68	9.17
Patching, %	0.60	0.58	1.82	0.83	1.55	1.53	2.24	1.74
Potholes, %	0.08	0.33	0.50	0.60	0.00	0.17	0.13	0.00
BT Crust, mm	200	198	180	206	183	181	189	196
Granular Crust, mm	448	397	420	416	434	421	412	454

Section-2: No Overlay

Section-2 No OL	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, km	25.590				16.000	1.000		
Roughness, mm/km	1573				1598	2080		
IRI. m/km	2.26				2.29	2.90		
Deflection, mm	0.33				0.38	0.57		
Cracking %	2.35				4.05	0.00		
Raveling %	0.01				0.10	0.00		
Rut Depth, mm	4.64				4.76	4.99		
Patching, %	0.19				0.69	0.00		
Potholes, %	0.00				0.06	0.00		
BT Crust, mm	209				248	160		
Granular Crust, mm	427				416	460		

Section-2: 50mm Overlay

Section-2 50mm OL	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, km	13.200	16.000	5.000	5.000	25.590	6.000	-	-
Roughness, mm/km	1755	2090	2322	2699	1698	2107	-	-
IRI. m/km	2.49	2.92	3.20	3.66	2.42	2.94	-	-
Deflection, mm	0.36	0.35	0.37	0.37	0.45	0.58	-	-
Cracking %	4.60	1.38	0.89	1.72	4.44	1.10	-	-
Raveling %	0.01	0.02	0.01	0.05	0.09	0.08	-	-
Rut Depth, mm	5.45	5.39	6.01	5.13	5.69	6.78	-	-
Patching, %	0.20	0.10	0.04	0.21	0.48	0.66	-	-
Potholes, %	0.07	0.00	0.40	0.40	0.35	0.50	-	-
BT Crust, mm	184	196	209	208	188	180	-	-
Granular Crust, mm	374	370	392	383	467	475	-	-

Section-2: 90mm Overlay

Section-2 90mm OL	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, km	3.000	6.000	5.000	-	23.200	2.000	4.000	1.000
Roughness, mm/km	1672	2131	2301	-	1755	2114	2295	2519
IRI. m/km	2.39	2.97	3.18	-	2.50	2.95	3.17	3.45
Deflection, mm	0.50	0.71	0.67	-	0.60	0.56	0.51	0.62
Cracking %	0.15	9.27	5.86	-	1.03	0.00	0.78	0.73
Raveling %	0.01	0.03	0.01	-	0.02	0.00	0.05	0.00
Rut Depth, mm	4.69	8.94	9.01	-	5.23	6.24	5.49	5.74
Patching, %	0.06	0.58	0.36	-	0.10	0.00	0.44	0.00
Potholes, %	0.00	0.17	0.20	-	0.00	0.00	0.25	0.00
BT Crust, mm	177	190	185	-	172	164	185	177
Granular Crust, mm	403	457	438	-	479	540	545	617

6.3.5 Options for MM Schedule

Based on the requirements of CA, various options have been considered to be used as responsive overlays triggered at specified level of roughness of 2400mm/km. MCS as a base option been considered to examine its feasibility for major maintenance.

Following options were considered in the analysis:

- ✓ Base Case: MCS at Roughness of 2400mm/Km with regular maintenance
- ✓ Opt-1: Responsive Mill & Overlay of 40mm BC whenever roughness is >2400mm/KM with regular maintenance
- ✓ Opt-2: Responsive Mill & Overlay of 50mm BC whenever roughness is >2400mm/KM with regular maintenance

6.4 ROUHGNESS PROGRESSION

Roughness progression for each section under each alternative maintenance option has been done using the deterioration models in HDM-4. Following sample graphs represents the roughness progression for each alternative:

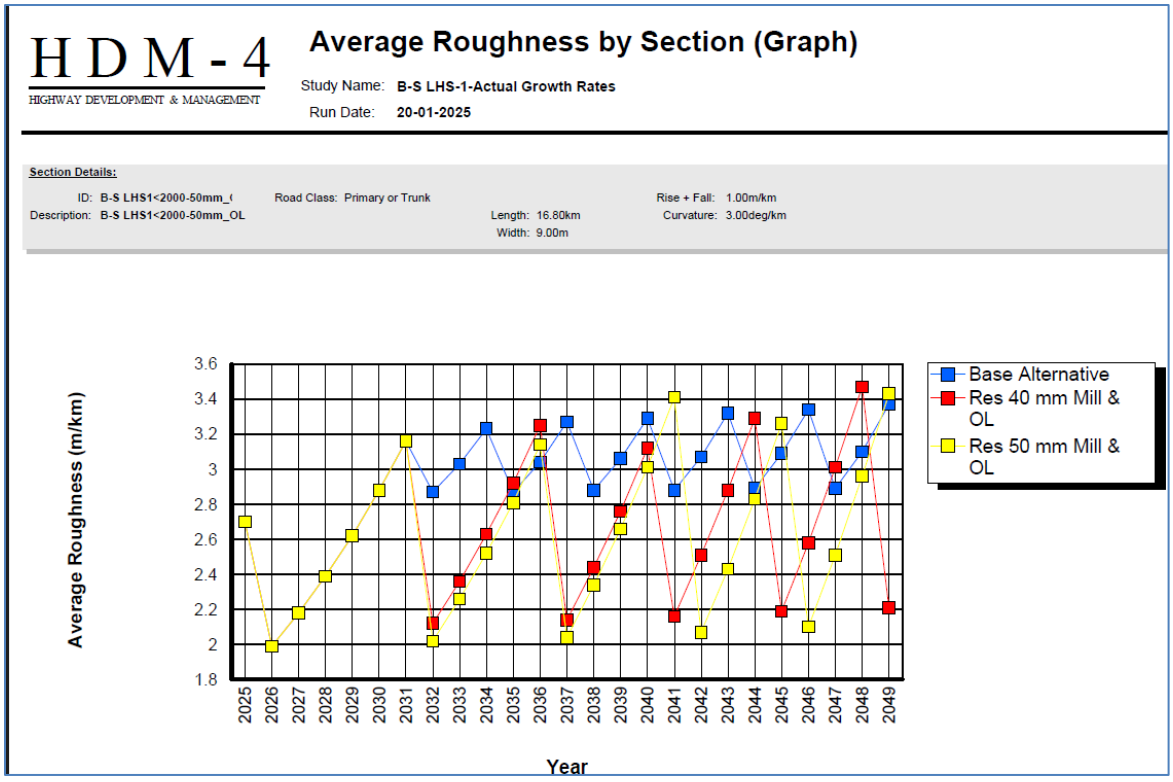


Figure 1: Average Roughness in LHS (UP) Carriageway (Sec-1) 50mm OL<2000

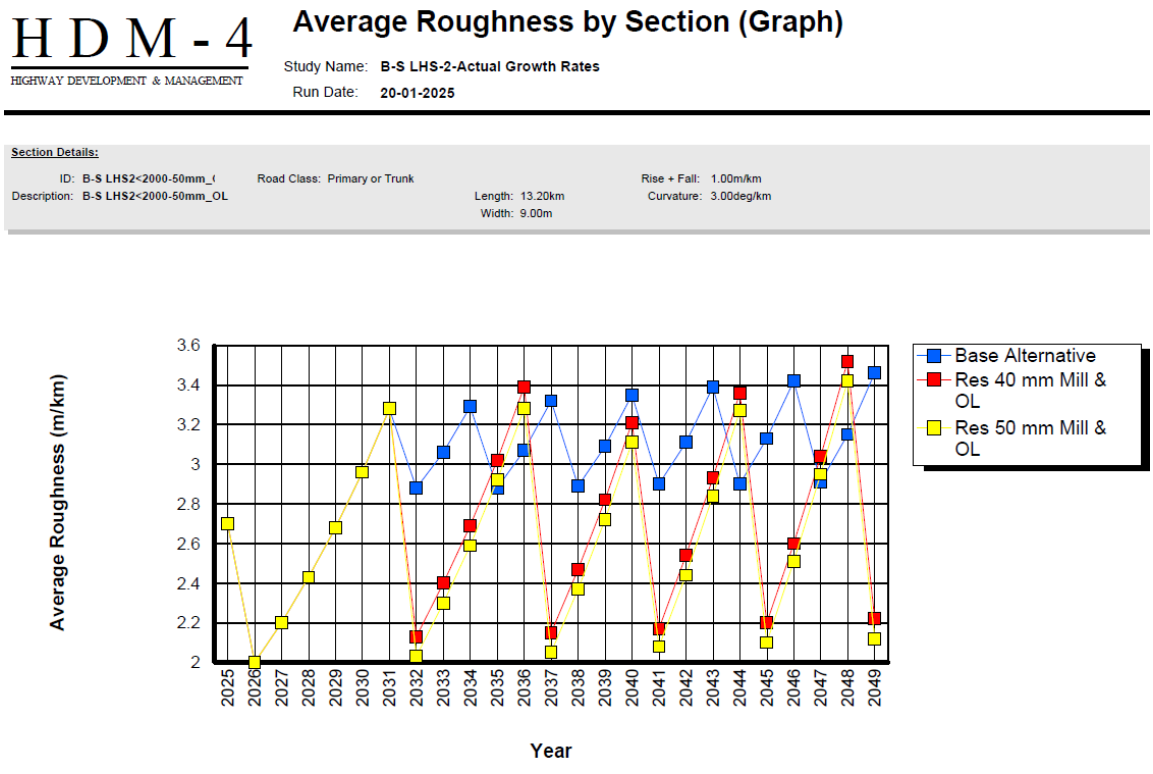


Figure 2: Average Roughness in LHS (UP) Carriageway (Sec-2) 50mm Overlay<2000

H D M - 4 Average Roughness by Section (Graph)

Section Details:

ID: B-S RHS1<2400-90mm_ Road Class: Primary or Trunk Rise + Fall: 1.00m/km
Description: B-S RHS1<2400-90mm_OL Length: 8.00km Curvature: 3.00deg/km
Width: 9.00m

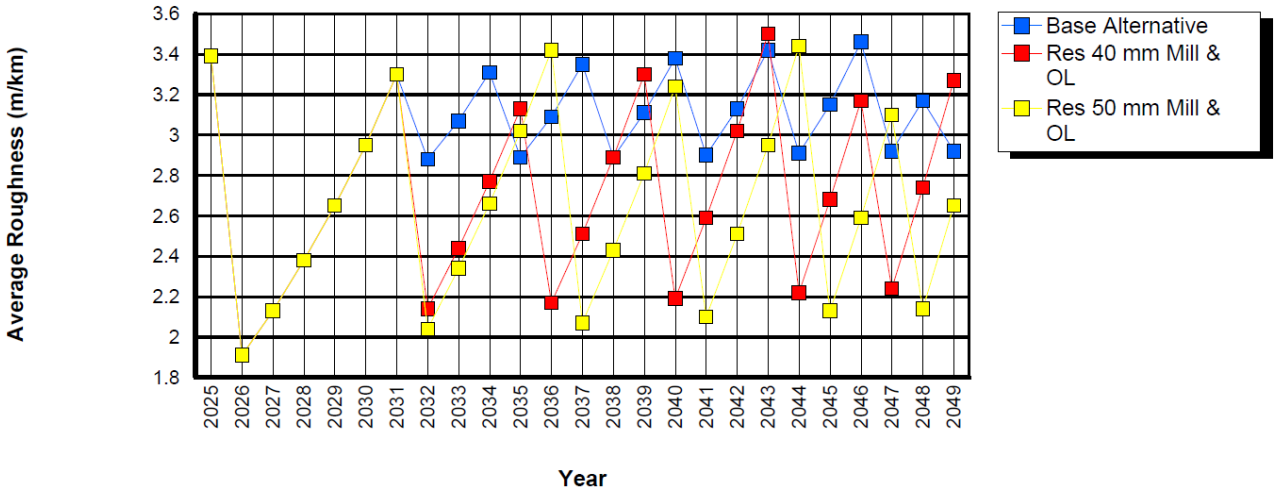


Figure 3: Average Roughness in RHS (DN) Carriageway (Sec-1) 50mm OL<2400

H D M - 4
HIGHWAY DEVELOPMENT & MANAGEMENT

Average Roughness by Section (Graph)

Study Name: B-S RHS-2-Actual Growth Rates
Run Date: 20-01-2025

Section Details:

ID: B-S RHS2<2000-50mm_ Road Class: Primary or Trunk Rise + Fall: 1.00m/km
Description: B-S RHS2<2000-50mm_OL Length: 25.59km Curvature: 3.00deg/km
Width: 9.00m

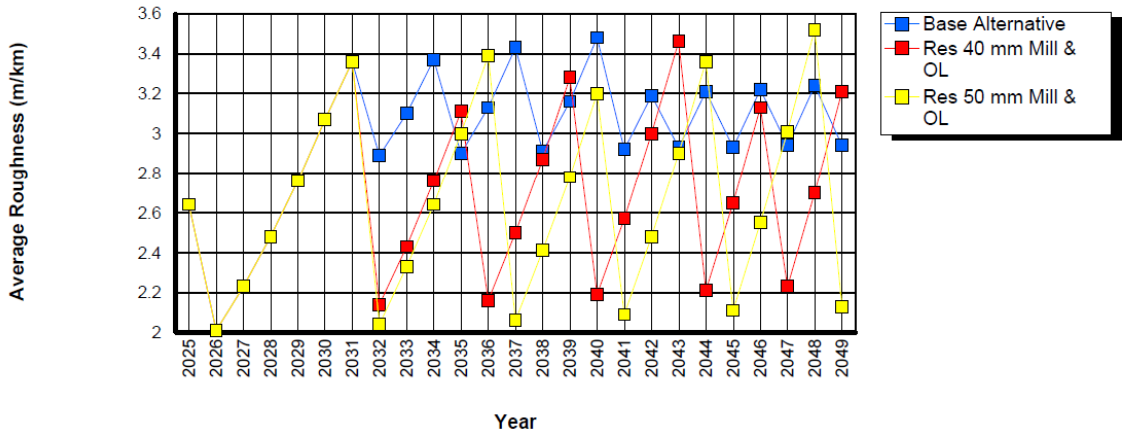


Figure 4: Average Roughness in RHS (DN) Carriageway (Sec-2) 50mm OL<2000

6.5 M&M SCHEDULE

Looking at the present condition, progression of traffic with actual traffic growth rates, it is felt prudent to consider 50mm OL as the preferred option, with certain percentage of additional DBM in required cycles.

Before release of schedules without considering the capacity augmentation, HDM model has been run to understand the requirement of MMR cycle and thus 4 cycles are envisaged after considering the initial overlays. Upon obtaining the schedules, the adopted MM schedule for the project is as below:

Table 39: Adopted MM schedule LHS & RHS

Section-1: LHS (Obtained Vs Adjusted)

- **50mm Overlay**

	Obtained		Adjusted			Obtained				Adjusted					Obtained				Adjusted				
LHS	<2000	>=2000 and <2200	<2000	>=2000 and <2200	Remarks	<2000	>=2000 and <2200	>=2200 and <2400	>=2400	<2000	>=2000 and <2200	>=2200 and <2400	>=2400	Remarks	<2000	>=2000 and <2200	>=2200 and <2400mm	>=2400	<2000	>=2000 and <2200	>=2200 and <2400mm	>=2400	Remarks
Criteria:	No Overlay		No Overlay			50mm				50mm					90mm				90mm				
Length:	17.000	1.000	17.000	1.000		16.800	8.000	5.000	8.000	16.800	8.000	5.000	8.000		13.000	3.000	2.00	5.000	13.000	3.000	2.000	5.000	
Year																							
2025		50				50	50	50	50						90	90	90	90					
2026				50						50	50	50	50						90	90	90	90	
2027																							
2028	50		MCS																				
2029																							
2030																							
2031			50	50	10% DBM	50	50		50	50	50	50	50	10% DBM			50	50	50	50	50	50	10% DBM
2032		50						50							50	50							
2033																							
2034	50																						
2035																							
2036						50	50		50								50	50					
2037			50	50	15% DBM					50	50	50	50	15% DBM	50	50			50	50	50	50	15% DBM
2038		50			cap			50						cap									cap
2039	50				cap									cap									cap
2040					DLP		50		50					DLP			50	50					DLP
2041					DLP	50								DLP	50	50							DLP
2042					DLP									DLP									DLP
2043		50			DLP			50						DLP									DLP
2044	50				DLP		50		50					DLP			50	50					DLP
2045			MCS	MCS	10% DBM	50				MCS	MCS	MCS	MCS	10% DBM	50	50			MCS	MCS	MCS	MCS	10% DBM

Section-1: RHS (Obtained Vs Adjusted)

➢ 50mm Overlay

	Obtained	Adjusted		Obtained				Adjusted					Obtained				Adjusted				
RHS	<2000	<2000		<2000	>=2000 and <2200	>=2200 and <2400	>=2400	<2000	>=2000 and <2200	>=2200 and <2400	>=2400		<2000	>=2000 and <2200	>=2200 and <2400	>=2400	<2000	>=2000 and <2200	>=2200 and <2400	>=2400	
Criteria:	No Overlay	No Overlay		50mm				50mm					90mm				90mm				
Length:	8.000	8.000		4.000	6.000	9.000	7.000	4.000	6.000	9.000	7.000		17.80	12.000	8.000	7.000	17.80	12.000	8.000	7.000	
Year																					
2025				50	50	50	50	50	50	50	50		90	90	90	90					
2026		50															90	90	90	90	
2027	50																				
2028																					
2029				50																	
2030																50					
2031					50	50	50						50	50	50						
2032	50	50	10% DBM					50	50	50	50	10% DBM					50	50	50	50	10% DBM
2033				50																	
2034																50					
2035																					
2036				50	50	50	50						50	50	50						
2037	50	50	15% DBM					50	50	50	50	15% DBM					50	50	50	50	15% DBM
2038			Cap									Cap				50					Cap
2039			Cap	50								Cap									Cap
2040			DLP		50	50	50					DLP	50	50	50						DLP
2041	50		DLP									DLP									DLP
2042			DLP	50								DLP				50					DLP
2043			DLP									DLP									DLP
2044			DLP		50	50	50					DLP	50	50	50						DLP
2045	50	MCS	10% DBM	50				MCS	MCS	MCS	MCS	10% DBM				50	MCS	MCS	MCS	MCS	10% DBM

Section-2: LHS (Obtained Vs Adjusted)

➢ 50mm Overlay

	Obtained	Adjusted		Obtained				Adjusted					Obtained			Adjusted			
LHS	<2000	<2000	Remarks	<2000	>=2000 and <2200	>=2200 and <2400	>=2400	<2000	>=2000 and <2200	>=2200 and <2400	>=2400	Remarks	<2000	>=2000 and <2200	>=2200 and <2400	<2000	>=2000 and <2200	>=2200 and <2400	Remarks
Criteria:	No Overlay	No Overlay		50mm				50mm					90mm			90mm			
Length :	25.590	25.590		13.000	16.200	5.000	5.000	13.000	16.200	5.000	5.000		3.000	6.000	5.000	3.000	6.000	5.000	
Year																			
2025				50	50	50	50						90	90	90				
2026		50						50	50	50	50					90	90	90	
2027	50																		
2028																			
2029																			
2030														50	50				
2031		50	50% DBM	50	50	50	50	50	50	50	50	50% DBM	50			50	50	50	50% DBM
2032																			
2033	50																		
2034														50	50				
2035																			
2036				50	50	50	50						50						
2037																			
2038	50	50	50% DBM					50	50	50	50	50% DBM		50	50	50	50	50	50% DBM
2039																			
2040				50	50	50	50						50						
2041														50	50				
2042	50																		
2043																			
2044		50	10% DBM	50	50	50	50	50	50	50	50	10% DBM	50	50	50	50	50	50	10% DBM
2045																			

Section-2: RHS (Obtained Vs Adjusted)

- **50mm Overlay**

	Obtained		Adjusted			Obtained			Adjusted				Obtained				Adjusted				
RHS	<2000	>=2000 and <2200	<2000	>=2000 and <2200	Remarks	<2000	>=2000 and <2200	>=2200 and <2400	<2000	>=2000 and <2200	>=2200 and <2400	Remarks	<2000	>=2000 and <2200	>=2200 and <2400	>=2400	<2000	>=2000 and <2200	>=2200 and <2400	>=2400	Remarks
Criteria :	No Overlay	No Overlay	No Overlay	No Overlay		50mm			50mm				90mm				90mm				
Length:	16.000	1.000	16.000	1.000		25.590	6.000		26.59	6.000			23.20	2.000	4.000	1.000	23.20	2.00	4.000	1.00	
Year																					
2025		50				50	50						90	90	90	90					
2026			50	50					50	50							90	90	90	90	
2027	50																				
2028																					
2029																					
2030		50					50									50					
2031						50							50	50	50						
2032	50		50	50	50% DBM				50	50		50% DBM					50	50	50	50	50% DBM
2033																					
2034		50					50									50					
2035													50								
2036						50								50	50						
2037	50																				
2038		50	50	50	50% DBM		50		50	50		50% DBM				50	50	50	50	50	50% DBM
2039													50								
2040						50								50	50						
2041	50																				
2042		50					50									50					
2043													50								
2044			50	50	10% DBM	50			50	50		10% DBM		50	50		50	50	50	50	10% DBM
2045	50	50					50									50					

Section-1: LHS & RHS (Adjusted)

➢ 50mm Overlay

	LHS- Adjusted													RHS- Adjusted										
	<2000	>=2000 and <2200	Remarks	<2000	>=2000 and <2200	>=2200 and <2400	>=2400	Remarks	<2000	>=2000 and <2200	>=2200 and <2400 mm	>=2400	remarks	<2000	Remarks	<2000	>=2000 and <2200	>=2200 and <2400	>=2400	Remarks	<2000	>=2000 and <2200	>=2200 and <2400	>=2400	Remarks
Criteria:	No Overlay	No Overlay		50mm					90mm					No Overlay		50mm					90mm				
Length:	17.0	1.00		16.8	8.0	5.00	8.00		13.0	3.00	2.000	3.00		8.00		4.0	6.00	9.00	7.00		17.8	12.0	8.00	7.00	
Year																									
2025																50	50	50	50						
2026		50		50	50	50	50		90	90	90	90		50							90	90	90	90	
2027																									
2028	MCS																								
2029																									
2030	50	50	25% DBM	50	50	50	50	25% DBM	50	50	50	50	25% DBM												
2031														50	25% DBM	50	50	50	50	25% DBM	50	50	50	50	25% DBM
2032																									
2033																									
2034																									
2035																									
2036	50	50	25% DBM	50	50	50	50	25% DBM	50	50	50	50	25% DBM												
2037														50	25% DBM	50	50	50	50	25% DBM	50	50	50	50	25% DBM
2038			cap					cap					cap		Cap					Cap					Cap
2039			cap					cap					cap		Cap					Cap					Cap
2040			DLP					DLP					DLP		DLP					DLP					DLP
2041			DLP					DLP					DLP		DLP					DLP					DLP
2042			DLP					DLP					DLP		DLP					DLP					DLP
2043			DLP					DLP					DLP		DLP					DLP					DLP
2044			DLP					DLP					DLP		DLP					DLP					DLP
2045																									

Section-2: LHS & RHS (Adjusted)

➢ 50mm Overlay

	LHS Adjusted										
LHS	<2000	Remarks	<2000	>=2000 and <2200	>=2200 and <2400	>=2400	Remarks	<2000	>=2000 and <2200	>=2200 and <2400	Remarks
Criteria:	No OL		50mm					90 mm			
Length :	25.6		13	16.2	5.0	5.0		3.0	6.0	5.0	
Year											
2025											
2026	50		50	50	50	50		90	90	90	
2027											
2028											
2029											
2030	50	25% DBM	50	50	50	50	25% DBM	50	50	50	25% DBM
2031											
2032											
2033											
2034											
2035											
2036	50	25% DBM	50	50	50	50	25% DBM	50	50	50	25% DBM
2037											
2038											
2039											
2040											
2041											
2042	50	22% DBM	50	50	50	50	22% DBM	50	50	50	23% DBM
2043											
2044											
2045											

	RHS Adjusted										
<2000	>=2000 and <2200	Remarks	<2000	>=2000 and <2200	>=2200 and <2400	Remarks	<2000	>=2000 and <2200	>=2200 and <2400	>=2400	Remarks
No OL			50mm				90 mm				
16	1.0		25.6	6.0			23.2	2.0	4.0	1.0	
50	50		50	50			90	90	90	90	
50	50	25% DBM	50	50		25% DBM	50	50	50	50	25% DBM
50	50	25% DBM	50	50		25% DBM	50	50	50	50	25% DBM
50	50		50	50			50	50	50	50	

6.6 STRUCTURAL PERIODIC MAINTENANCE STRATEGY

Expansion joints:

- Visual inspection is carried out to check for seal breakages, Armor angle, Weld failures, cracks between deck & Expansion joints concrete and Joints filled with debris. Such joints replaced immediately.
- Joint buried with debris shall be inspected for any distress, if any distress is shown it shall be replays immediately.
- During visual inspection it is seen that some Expansion joints are bad where as some are not showing any defects.
- Due to this it is considered provident to change the Expansion joints which are visibly damaged in initial stage.
- In the absence of records pertaining to Expansion joint replacements it is highly difficult to predict the date of replacement needed for compliance to IRC codal requirements. Balance joints which are not replaced initially will be replaced as on when defects are shown in the joints. This aspect is considered in BOQ.

Bearings:

- In order to identify the bearings requiring immediate replacement, the following strategy is adopted.
- Girder Bridges showing diagonal cracks at support, distress in the Pedestals and any form of distress in support location is regarded as a candidate for replacement. By visual inspection there are only a handful of such situations.
- Wherever pedestals are damaged either by cracking or spalling poisons confinement is proposed by Jacketing/MS plate bonding such procedure is very effective and common.
- All Metallic Bearings need to be taken up for servicing.

Wearing Coat:

It is necessary to replace the wearing coat at every 15years interval, as wearing coat is a very weak component of the bridge structure which is subjected to severe deterioration due to loading, environment etc. As of now, we have considered sealing of cracks by Fog Seal and for which does not show any distress other than cracking by viz. Pot holes, abrading etc. Based on this aspect, this cost has been considered in highway O&M cost.

Periodic Maintenance strategy for Replacement of Bearings & Expansion joint:

Below strategy has been considered for periodic major maintenance of the structures.

S No	Description	Bridge components
1	Old structure	Structures which are already available during 4-laning
2	New Structure	Structures which are constructed during 4-laning

Age	Description	Item	structures-Assumption-MMR				
			% of Replacement of Major components				
			2026	2031	2036	2041	2045
New	Super structure lifting with Pot bearings	Pot	10%	25%	25%	25%	25%
New	Super structure lifting with Elastomeric bearings	Ela	10%	25%	25%	25%	25%
New	Super structure lifting with Rocker bearings	Rocker	0%	0%	0%	0%	0%
Old	Super structure lifting with Pot bearings	Pot	35%	65%	10%	20%	25%
Old	Super structure lifting with Elastomeric bearings	Ela	35%	65%	10%	20%	25%
Old	Super structure lifting with Rocker bearings	Rocker	35%	65%	10%	10%	10%
New	Pot bearing cost	Pot	10%	25%	25%	25%	25%
New	Elastomeric bearing cost	Ela	10%	25%	25%	25%	25%
New	Rocker bearing cost	0	0%	0%	0%	0%	0%
Old	Pot bearing cost	Pot	35%	65%	10%	20%	25%
Old	Elastomeric bearing cost	Ela	35%	65%	10%	20%	25%
Old	Rocker bearing cost	0	35%	65%	10%	10%	10%
New	Expansion joint Replacement	EJ	13%	31%	31%	31%	31%
Old	Expansion joint Replacement	EJ	44%	81%	13%	24%	29%
New	Others	-	16%	39%	39%	39%	39%
Old	Others	-	55%	102%	16%	30%	36%

Cost Component for various items and activities have been worked out by considering the Best Industry practice and most appropriate methods. Detailed quantities for work items have been estimated based on the details presented in previous chapters for various heads.

The gist of the cost components considered are presented below:

- Immediate Repair's Cost
- Routine Maintenance Cost
- Incident Management Cost
- Periodic Maintenance Cost
- Operations Cost
- Year by Year total O&M Costs

7.1 RATE ANALYSIS

Detailed rate analysis has been carried out based on MORTH guidelines to arrive at the unit rates of various items. Material rates and their leads from the project corridor are considered as per the material investigations done on the project road. Summary of unit rates arrived at are presented in table below:

Table 40: Unit Rates of Basic Material

Sl.no	Description	Units	Source	Basic rate excluding Transportation & GST	Lead in Kms
1	VG-40 (CAPEX)	MT	Mathura	50,602	329
2	Modified Bitumen- VG-40 /CRMB-MMR	MT	Mathura	47,147	329
3	Good earth	Cu.m	BA	104	6
4	40 mm	Cu.m	Crusher	915	200
5	20 mm	Cu.m	Crusher	915	200
6	12 mm	Cu.m	Crusher	815	200
7	6 mm	Cu.m	Crusher	818	200
8	Dust	Cu.m	Crusher	818	200
9	M sand	Cu.m	Crusher	981	200
10	CRMB-55	MT	Mathura	48,752	329
11	CRMB-55-MMR	MT	Mathura	43,877	329
12	SS1	MT	Mathura	50,000	329
13	Steel	MT	Bareilly	50,000	104
14	HTS Strands	MT	Bareilly	75,000	104
15	Cement	MT	Bareilly	7,300	104

Note: For future asphalt pavement rehabilitation works, a normative standardized cost for Bitumen (VG-40 & PMB) has been determined based on historical bitumen rates from August 2020 to December 2024

Table 41: Unit Rates of Major Material excluding GST

Sl.no	Item	Unit	Rate (INR) Excluding GST
1	BC - G1-VG-40-CAPEX	Cum	13,604
2	BC - G1-VG-40/CRMB-MMR	Cum	13,082
3	Tack coat on bituminous surface	Sqm	15
4	DBM G-1-VG-40	Cum	11,479
5	Tack coat on granular	Sqm	17
6	Prime Coat	Sqm	50
7	WMM	Cum	4,260
8	GSB G-2	Cum	4,123
9	CTSB	Cum	4,727
10	CTB	Cum	5,314
11	PQC	Cum	9,526
12	DLC	Cum	5,540
13	SG	Cum	553
14	Road Marking	Sqm	585
15	M15	Cum	8,091
16	M20	Cum	8,849
17	M25	Cum	9,500
18	M30	Cum	9,456
19	M35	Cum	9,728
20	M40	Cum	9,872
21	PSC M45	Cum	11,863
22	HYSD	MT	73,670
23	HT strand	MT	1,54,161

NOTE: 1. Item rates considered for Small projects

2. Labour: Central Minimum Wages as on Oct'2024 for "C Area" Category of construction workers

7.2 INITIAL IMPROVEMENT WORKS (SCHEDULE-B)

Costs associated with initial improvements are estimated based on the detailed asset inventory and condition assessment surveys, Pavement condition and structural condition assessment surveys. Items which are not executed as part of scope or in damaged condition have been considered for immediate costs as a part of 1-year capex. Following items are mainly considered for Initial Improvement costs:

- Scope given in schedule-B
- Scope which is not executed
- Road work items
- Bridge Work Items
- Pavement Rehabilitation works
- Structural Rehabilitation works
- Drainage Works
- Slope Protection works
- Safety Works

On review of the contemporary records and on ground assessment the cost to complete is given below.

Table 42: CAPEX Cost FY26

S. No.	Particulars	Amount Rs
1	Immediate Repair's (Highway)	41,81,07,375
2	Immediate Repair's - Structures	16,83,49,357
3	Schedule-B (Str)	15,31,02,991
4	Schedule-B (Highways and misc)	48,03,74,900
5	TMS	9,54,71,371
6	ATMS	42,28,42,537
7	Revalidation surveys	1,22,28,444
8	Toll plaza renovation cost including replacement of Office Furniture, all building, Canopy, all misc. items etc.	5,00,70,146
	Sub-Total (in Rs.)	1,80,05,47,122
	Total Cost Including GST @ 18% (in Rs.)	2,12,46,45,604
	Total Amount (in Crore Rs.)---- **A**	212.46
	Rigid pavement repair at Toll Plaza Including GST @ 18% (in Rs.Cr)--**B**	1.26
	Service road rehabilitation works Including GST @ 18% (in Rs.Cr)--**C**	18.34
	Total Capex in Crore (A+B+C)	**232.06**

(A) Immediate Repair's (Highway)

S. No	Description	Unit	Quantity	Rate	Amount
1	Embankment - Damage	Cum	4150.142	500	20,74,739
2	RCC Wall-**(Re construction 1m Height)**	Cum	50	9600	4,80,023
3	RCC Wall-Reinforcement **(Re construction 1m Height)**	MT	2.5	73342	1,83,355
4	Chute Drains	Rmt	1898	2600	49,35,896
5	RCC Cover Drain	Rmt	77	2770	2,13,295
6	RCC Cover Drain	Rmt	235	2770	6,50,964
7	RCC Cover Drain	Rmt	10	11608	1,16,083
8	Kerb	Rmt	6000	544.00	32,64,000
9	Cracks on RE Wall (Seel with apoxy putty)	Rmt	507	850	4,30,950
10	Delineators	Nos	53	822	43,566
11	5th Km Stone	Nos	18	8312	1,49,623
12	Km Stones	Nos	123	4829	5,93,942
13	Km Stones	Nos	2	1000	2,000
14	Km Stones	Nos	11	173	1,901
15	Hectometre Stone	Nos	1243	1301	16,16,894
16	Metal Beam Crash Barrier (MCB)	Rmt	1280	1164	14,90,534
17	Toll Boards	Nos	4	4919	19,678
18	ADS/RAS	Nos	11	4919	54,113
19	Recangular	Nos	18	6211	1,11,793
20	Triangular	Nos	92	5903	5,43,102
21	Circular	Nos	60	8936	5,36,155
22	Octagonal	Nos	6	9307	55,840
23	Flag Type	Nos	12	3866	46,397
24	Chevron	Nos	189	4919	9,29,767
25	Hazard	Nos	30	4100	1,22,985
26	Route marker	Nos	15	4919	73,791
27	Bus Shelter - Roof - Metallic Sheet	Sq.m.	23.2	5000	1,16,000
28	Bus Shelter - Hollow Square Rods	Rmt	6	200	1,200
29	Lights	Nos	34	2293	77,964
30	Light Poles - Single & Double & Triple Arm	Nos	4	3000	12,000
31	Light Poles - Single Arm	Nos	2	71238	1,42,476
32	Light Poles - Double Arm	Nos	10	76435	7,64,352
33	VMS	Nos	2	458137	9,16,273
34	ECB	Nos	112	7995	8,95,462
35	ECB	Nos	112	5000	5,60,000
36	ECB	Nos	41	42000	17,22,000
	Total cost excluding GST				41,81,07,375

(B) Immediate Repair's (Structures)

S. No	Description	Unit	Total Quantity	Rate in Rs	Amount in Rs
1	Cleaning and adding rubber sealant near expansion joints	Rm	556	451	250701
2	Replacement of Damaged Steel Railing all complete as per technical specifications and as directed by the Engineer	Rm	38	6376	242298
3	Provision of an RCC crash barrier (0.35sqm cross sectional area) constructed with M-40 grade concrete including reinforcement	cum	130.3	14793	1928128
4	Lifting of superstructure by providing necessary hydraulic jacks, mechanical jacks, sleepers, packing etc complete including cost of labour, equipment, tools, consumables etc complete.	Nos	35	162038	5671313
5	POT/PTFE bearings	Nos	324	107050	34684200
6	Cutting of groove of 15 mm x 15 mm along crack and sealing the same with epoxy putty including cost of material, labour etc.	RM	460	1015	466900
7	RCC (Super Structures)	cum	66	1775	117316
8	Approach slab dismantling	cum	701	1775	1243571
9	Construction of Aprroach slab on Both side of approaches including reinforcement	cum	467	20909	9765830
10	Providing of New Drainage spouts	Nos	19	4906	90766
11	Weed removal (Vegetation)	Man days	416	2594	1079000
12	Anti-corrosion paint for Steel 45 microns primer with Zinc bonding coat	Lit	10	656	6300
13	Concrete	Cum	66	14605	965299
14	HYSD Bars	MT	3	96304	254603
15	Sealing of cracks/porous concrete by injection process through nipples/Grouting complete as per Technical Specification.	Sqm	70	1536	106865
16	Patching of damaged concrete surface with polymer Modified mortar upto maximum thickness of 45mm thickness in layer not exceeding 15mm and curing compounds, available in present formulations, to be applied including bond coat.	sqm	368	2975	1094205
17	Sealing of crack / porous concrete with Epoxy Grout by injection through nipples complete as per clause 2803.1.	Kg	1608	1519	2442150
18	Providing and laying Plain cement concrete M15 grade, mechanically mixed and compacted, including centering and shuttering all complete.	cum	234	11944	2789278
19	Providing and laying Filter material underneath pitching in slopes.	cum	41	4929	202264
20	Providing and laying Pitching on slopes laid over prepared filter media including boulder apron laid dry in front of toe of embankments.	cum	62	4969	308437
21	Steel pipe	Rm	574	908	520905
22	Repair of Drainage spouts including down take pipe & etc	Rm	292	260	75920
23	Replacement of existing damaged Expansion joints by providing and laying of Strip Seal Expansion Joint System, including removal of existing damaged expansion joints by dismantling of deck slab, wearing coat etc. and back filling of the recess up to final finish	Rm	793	26203	20765742

S. No	Description	Unit	Total Quantity	Rate in Rs	Amount in Rs
	level with **Mlicro conc**, complete as per M.O.R. T&H specification.				
24	Structural steel	MT	95	88149	8344020
25	RC Jacketing	Sq.m	81	390	31395
26	Epoxy paint (4 mic)	Sq.m	32600	1815	59168392
27	Soil Nailing for RE walls	Sq.m	106	5186	551039
28	Providing & laying of Preformed pultruded Carbon Fibre Laminates that provide high tensile strength for flexural reinforcement of concrete. used to strengthen the RCC slab.	Sq.m	169	5834	984445
Sub-total (A)					16,61,51,282
Immediate (U/C): (B)					21,98,074
Protection works (C)					
Immediate Repair's - Structures, without GST (A)+(B)+(C)					**16,83,49,357**
Schedule-B (Str)					**15,31,02,991**

(C) Schedule-B (Highways and misc)

S No	Description	Amount, Rs
4	Drains	28,000
5	Road furniture	28,57,81,831
6	Bus-bay	11,00,000
7	Truck parking	4,80,40,219
8	Entry /Exit Ramps & Intersections	11,10,87,353
9	Toll Plaza	2,00,000
10	Miscellaneous	7,50,000
13	Box Culvert	1,05,12,503
	Sub-Total	45,74,99,905
b	Contingencies, 5%	2,28,74,995
	TOTAL	**48,03,74,900**

(D) TMS Cost

The TMS cost arrived are based quotes obtained by NHIT, from different vendors such as Comvision, Devaditya and Efkon for the amount Rs 9,54,71,371.

(D) ATMS Cost

ATMS cost computed with reference to MoRTH 2023 circular for installation of TMCS, VIDS, VASDS, VMS system, DTS/OFC etc.

7.3 ROUTINE MAINTENANCE & INCIDENT MANAGEMENT COSTS

Routine maintenance costs include general maintenance costs of road elements, bridge elements and road furniture and appurtenances. This can be mainly divided into two parts as:

- ✓ General Maintenance of Works
- ✓ Repairs to Highway & Bridge Elements

7.3.1 General Routine Maintenance

General Routine Maintenance of Roads generally include following items:

- Cleaning of Project facilities
- Structures cleaning,
- Cleaning of ROW
- Cleaning and Maintenance of Toll Plaza
- Unlined Drain Maintenance
- Lined Drain Maintenance
- Maintenance of Highway Lighting at Toll Plaza and other project locations
- Median Plantation maintenance & Avenue plantation maintenance:
- Maintenance of Road Furniture
- Maintenance of Road Safety Items

The above items are estimated by considering the detailed break-up of following items:

- Manpower including Managers/Labour etc.
- Vehicles for Labour Transport/Water Tankers/Sweeping Machines etc.
- Resources/Equipment's such as grass cutters, tools, jet sprayers, hydraulic trimmers etc.

7.3.2 Repairs to Highway & Bridge Works

Repairs to highway and bridge works have been estimated based on the assumed quantities (Percentage basis) of execution for every year.

These items include the following:

1	Providing treatment for sealing of road surface / isolated cracks at scattered locations
	i) Covered with 6.7 mm size stone chipping @ 0.1 cum/ 10 sqm.
	ii) covered with dry coarse sand passing through 2.36 mm sieve and retained on 180 micron sieve @ 0.03 cum/10 sqm heated to 600 C
	iii) filling discrete cracks with slow curing bitumen emulsion as per Technical Specification Clause 3004.3.3
2	Providing treatment to bleeding bituminous surface at scattered locations
3	Providing localized repair to rutted portion and edge breaking of bituminous surface
4	Providing treatment and repair to pot-holes and patch work
5	Providing and laying dense bituminous macadam using bitumen grade VG 40 complete as per Technical Specification Clause 507
6	Proving and laying bituminous concrete (asphaltic concrete)
	(a) Using bitumen (VG-40) as per IRC: SP: 53
7	Road Roughness survey
8	Turfing on embankment slopes and at all other Project Facilities
9	Providing repair to stone pitching/apron at scattered locations
10	Rain Cuts Maintenance: Restoration of rain cuts soil, moorum, gravel or a mixture of these
11	Providing and laying apron/ stone pitching on slopes of guide bunds/ road embankment / other location
12	Providing and laying stone aggregate filter material (150 mm compacted thickness) underneath pitching
13	Unlined drain
14	Filling in median island with approved materials with all leads and lifts complete as per TS Clause No. 407

15	Replacing damaged / broken railing with new pre-cast / cast-in-situ, concrete railing to match with existing design and pattern.
24	Carrying out repair to road signs including strengthening resetting or otherwise repairing signs and delineators
	a) Road sign board mounted on single post
	b) Road sign board mounted on double post
	c) Overhead/ Gantry Sign boards
	d) Delineator
25	Supplying and fixing at site retro-reflectorized type **sign boards/signs**
	90cm Equilateral triangle
	60cm circular
	90 cm circular
	90cm high octagon
	80cm x 60cm rectangle
	Chevron signs 60cm x 45cm
	Place identification signs (Fig 15.7 of IRC 67)
	Providing and fixing Object Markers
	Providing and fixing of retro-reflectorized Route Marker signs (size 450mm x 600mm)
26	**Hazard Marker Sign :**
	a) size 90 x 30 cm
	b) size 30cm triangular side cluster of red reflectors (screen printed)
27	Cats Eyes/Raised pavement marker (NMC Nails Less)
28	Painting two coats on old surface after minor repairs to give an even and smooth surface and printing letters and figures with synthetic enamel paint
	a) Hectometer stones
	b) Kilometer Stone
	c) 5 Kilometer stone
	d) Boundary stone
	e) Guard stone
29	Providing painting lettering and fixing of distance measurement stones including dismantling of old damaged/ broken ones, confirming to TS Clause 804
	a) Hectometer stones
	b) Kilometer Stone
	c) 5 Kilometer stone
	d) Boundary stone
	e) Guard stone
30	Providing and fixing road delineators conforming to TS Clause No. 805 as directed by the Engineer.
31	Repainting the kerb stones and separation barrier with first quality synthetic enamel paint of approved brand
32	Painting all types of pavement markings including lines, dashes, arrows etc. on roads as per relevant IRC/MOST standards after cleaning the surface complete in all respects as directed by the Engineer.
	a) Hot applied Thermoplastic compound
	(i) Lane / Centre Line / Edge Line
	(ii) Direction Arrows
	(iii) Diagonal Chevrons Markings
33	Supplying and laying cast-in-situ cement concrete kerb without channel section
	a) by Manual/machine including formwork
34	Major repair / replacement of metal beam crash barrier (W profile guard rails)
35	Providing and fixing chain link/ welded mesh fencing / square bars fencing
36	Dismantling the old damaged chain link/welded mesh / square bars fencing and replacing it with new chain link/ welded mesh/square bars fencing
37	Provision of rumble strips
38	Shoulder Maintenance:

39	synthetic enamel paint of approved brand on metal pedestrian guard rail
40	Dismantling of wearing course

B. Structures

1. Wearing coat comprising of 50 mm thick BC.
2. Cleaning and adding rubber sealant near expansion joints.
3. Modular Expansion joints.
4. Replacement of Damaged Concrete Railing all complete as per Technical specifications and as directed by the Engineer
5. Provision of an RCC crash barrier (0.35sqm cross sectional area) constructed with M-40 grade concrete including reinforcement
6. Cleaning of rocker & roller bearing using high pressure water jet, free from rust scales, re-setting & greasing the bearings using graphite grease including cost of materials, labour etc., complete.
7. POT PTF Bearings greasing and maintaining (sand plastering).
8. Elastomeric Bearings and maintaining.
9. Cutting of groove of 15 mm x 15 mm along crack and sealing the same with epoxy putty including cost of material, labour etc.
10. Carrying out 50 to 60 mm thick shortsheeting using a mix proportion of 1:2:2 (cement: sand:6 mm down aggregate) added with Polypropylene fibers at a dosage rate of 125 gms/bag of cement including cost of labour, material, scaffolding, equipment etc complete.
11. Repair of Floor Aprons, pitching and other protection works
12. Cleaning of Drainage Spouts
13. M-25 Concrete

7.3.3 Incident Management Cost

Incident Management & Safety items include the following:

- ✓ ATMS control room operations,
- ✓ Regular patrolling & reaching accident/incident site,
- ✓ providing relief to injured persons including taking them to nearest hospital and attending to the safety requirements at the location (putting cones, safely guide & manage the traffic using signs, safety barricades, etc.),
- ✓ removal of accident /breakdown vehicles, removing of dead animals/birds lying on the highway and loading, unloading, transportation & disposal of surplus material left over by accidental vehicle or otherwise lying on road (on carriageway) and
- ✓ Encroachment prevention & removal with all lead & lifts complete with proper communication equipment,
- ✓ consumables, materials, suitable Towing vehicles, Ambulance, patrolling vehicles and manpower like drivers, helpers, para-medical staff, labour including deployment of crane and all works shall be done as per requirement and as directed by Client representative and as per Relevant Specifications as applicable.

7.4 OPERATIONS COSTS

In addition to the above-mentioned General Routine maintenance, Repair & Rehabilitation cost for Road and structures, Incident management cost the following the Cost towards Operations include:

- Electricity Charges
- Toll Plaza Operation cost
- Insurance Charges
- Road Asset Management System (RAMS), Bridge Management System (BMS) & Surveys
- Other Office Expense (Admin, SPV, IE and Other)

Table 43: O&M Cost in Crores (including GST)

FY	Operation & Maintenance Cost (in INR Cr.)								
	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
2025-2026	8.15	4.87	0.00	7.93	2.87	11.82	5.05	3.21	8.55
2026-2027	8.15	4.87	5.49	7.93	2.87	11.82	5.05	1.94	9.82
2027-2028	8.15	4.87	5.49	7.93	2.87	11.82	5.05	1.94	10.01
2028-2029	8.15	5.59	5.49	7.93	7.85	11.75	5.05	2.13	9.85
2029-2030	8.15	8.17	5.49	7.93	7.85	11.75	5.05	3.05	10.01
2030-2031	8.15	8.17	5.49	7.93	7.85	10.85	5.05	2.47	10.03
2031-2032	8.15	8.17	5.49	7.93	7.85	9.96	5.05	2.47	9.80
2032-2033	8.15	8.17	5.49	7.93	7.85	9.52	5.05	2.47	11.14
2033-2034	8.15	8.17	5.49	7.93	7.85	9.52	5.05	3.05	10.31
2034-2035	8.15	8.17	5.49	7.93	7.85	9.52	5.05	2.47	10.03
2035-2036	8.15	8.17	5.49	7.93	7.85	9.52	5.05	2.47	10.21
2036-2037	8.15	8.17	5.49	7.93	7.85	9.52	5.05	2.47	10.31
2037-2038	4.08	4.14	2.74	4.68	3.91	9.52	5.05	2.19	9.92
2038-2039	4.08	4.14	2.74	4.68	3.91	9.52	5.05	1.61	9.68
2039-2040	4.08	4.14	2.74	4.68	3.91	9.52	6.17	1.61	11.12
2040-2041	4.08	4.14	2.74	4.68	3.91	9.52	6.17	1.61	10.12
2041-2042	4.08	4.14	2.74	4.68	3.91	9.52	6.17	2.19	10.39
2042-2043	4.08	4.14	2.74	4.68	3.91	9.52	6.17	1.61	10.26
2043-2044	4.08	4.14	2.74	4.68	3.91	9.52	6.17	1.61	10.33
2044-2045	9.95	10.02	5.97	7.93	9.58	9.52	6.17	2.85	10.87
Total	**136.34**	**124.51**	**85.50**	**135.85**	**116.21**	**203.50**	**107.75**	**45.49**	**202.75**

Note: 1) The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation.

2) All other remaining costs are based on FY 2025 with GST and without escalation.

3) The amount is Crores inclusive of GST and without escalation

7.5 PERIODIC MAINTENANCE COSTS

Cost towards major maintenance include following:

- ✓ Cost of Periodic maintenance of Pavement based on Finalized MM schedule
- ✓ Cost of Periodic Maintenance of Structures
- ✓ Cost of Periodic replacement of Toll Equipment's & Software

Table 44: Major Maintenance Cost

FY	Major Maintenance Cost (in INR Cr.)			
	Road (MCW, SR, Toll Plaza)	Structure	ATMS	TMS
2025-2026	-	-	-	-
2026-2027	-	-	-	-
2027-2028	4.14	-	-	-
2028-2029	0.02	-	-	-
2029-2030	274.21	-	-	-
2030-2031	92.21	12.22	-	-
2031-2032	4.62	-	19.96	5.63
2032-2033	-	-	-	-
2033-2034	4.98	-	-	-
2034-2035	0.02	2.66	-	-
2035-2036	274.21	17.79	-	-
2036-2037	92.21	-	-	-
2037-2038	-	-	-	-
2038-2039	4.62	-	14.93	11.27
2039-2040	1.24	1.89	-	-
2040-2041	-	9.33	-	-
2041-2042	183.23	-	-	-
2042-2043	-	-	-	-
2043-2044	-	2.66	-	-
2044-2045	4.62	23.61	-	-
Total	**940.34**	**70.16**	**34.88**	**16.90**

Note: The amount is Crores inclusive of GST and without escalation, considering FY2025 rates

7.6 CAPACITY AUGMENTATION

The capacity augmentation is envisaged in the year FY2038 & FY2039 with 5-year DLP up to FY2044 for Section-1: Bareilly to Shahjahanpur from km 262.000 to km 340.800.

- The capacity augmentation is envisaged in the year FY2038 & FY2039 for Section-1: Bareilly to Shahjahanpur from km 262.000 to km 340.800.
- The MSA estimated for 10years, LHS: 55MSA and RHS: 62MSA for Toll Plaza-1 at Faridpur Km 266+900 and LHS: 63MSA and RHS: 59MSA for Toll Plaza-2 at Maigalgunj Km 372+160.
- From FWD analysis, strengthening overlay is warranted for a length of 36.9 km in LHS and 69.498 km in RHS. M/s Atcon is doing strengthening work in entire length except 58 km balance length which is under DLP of another contractor.
- From Roughness analysis, Functional overlay, is warranted for a length of 18.800kms in LHS and 14.350 kms in RHS are having roughness values greater than Schedule-F, specified limit of 2400mm/km.
- From NSV pavement condition analysis, an overlay, is warranted for a length of 76.6 kms in LHS and 73.9 kms in RHS for the rating satisfactory. M/s Atcon is doing strengthening work in entire length except 58 km balance length which is under DLP of another contractor.

  The above mentioned FWD, roughness and PCI lengths are superimposed in order to eliminate the overlapped sections and final considerations are as presented below

Recommended Overlay	No Overlay	To be Overlaid	DBM Completed	BC Completed	Total Length (Km)
Main Carriageway -LHS					
Overlay as per FWD survey	10.600	5.800	7.500	13.100	**37.000**
Overlay based on Roughness index(>2200mm/km)	8.500	2.500	7.100	6.700	**24.800**
Overlay based on PCI	7.700	4.700	8.000	7.200	**27.600**
No Overlay	20.800	11.400	11.300	24.690	**68.190**
Main Carriageway -RHS					
Overlay as per FWD survey	8.800	15.100	28.100	17.590	**69.590**
Overlay based on Roughness index(>2200mm/km)	1.400	9.000	0.200	8.000	**18.600**
Overlay based on PCI	4.000	10.200	0.600	10.400	**25.200**
No Overlay	8.200	11.600	10.000	14.400	**44.200**

- Minimum Central Wages for labour is considered for Category “C” as of OCT’2024 with 0% escalation considered.
- Overheads and Contractor’s profits are considered from MORTH Standard data book -2019 for “Small Project” category.

- The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. All other remaining costs are based on FY 2025 with GST and without escalation

NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED

FINAL REPORT

Tolling, Operation, Maintenance and Transfer of Four lane, Muzaffarnagar-Haridwar section of NH-334 from km 130.560 to km 209.120 in the state of Uttar Pradesh & Uttarakhand

SAMARTH INFRAENGG Technocrats Private Limited

February 2025

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LIST OF ABBREVIATIONS AND SYMBOLS

AADT	-Average Annual Daily Traffic
AE	-Authority Engineer
AMC	-Annual Maintenance Contract
ATMS	-Advanced Traffic Management System
BC	-Bituminous Concrete
BOQ	-Bill of Quantities
BOT	-Build, Operate & Transfer
CA	-Concession Agreement
CBR	-California Bearing Ratio
CCB	-Concrete Crash Barrier
CCR	-Cement Concrete Railing
COD	-Commercial Operation Date
COS	-Change of Scope
CPI	-Consumer Price Index
CUP	-Cattle Underpass
CVC	-Classified Volume Count
CVPD	-Commercial Vehicles per Day
DBM	-Dense Bituminous Concrete
DPR	-Detailed Project Report
ECB	-Emergency Call Box
EPC	-Engineering, Procurement and Construction
ESI	- Employees' State Insurance

FDD	-Filed Dry Density
FOB	-Foot Over Bridge
FRL	-Finished Road Level
FSI	-Free Swell Index
FWD	-Falling Weight Deflectometer
FY	-Financial Year
GOI	- Government of India
GR	-Growth Rates
GS	-Grade Separated
GSB	-Granular Sub Base
GST	-Goods and Services Tax
HCPT	-Half-cell Potential Test
HPC	-Hume Pipe Culvert
HR	- Human Resources
ATMS	-Advance Traffic Management Systems
IE	-Independent Engineer
IRC	- Indian Roads Congress
IRC SP	- Indian Roads Congress Special Publications
IRI	-International Roughness Index
Km	-kilometer
LHS	-Left Hand Side
LL	-Liquid Limit
LS	-Lumpsum
m	-Meter
MBIU	-Mobile Bridge Inspection Unit
MCB	-Metal Beam Crash Barrier
MCS	-Micro Surfacing
MCW	-Main Carriageway
MDD	-Maximum Dry Density
MHR	-Metallic Hand Rail
MJB	-Major Bridge
mm	-Millimeter
MM	-Major Maintenance
MNB	-Minor Bridge
MoRTH	- Ministry of Road Transport & Highways
Mpa	-Mega Pascal
MR	-Resilient Modulus
MSA	-Million Standard Axle
NDT	-Non-Destructive Testing
NHAI	- National Highways Authority of India
NSV	-Network survey Vehicle
O&M	- Operation and Maintenance

OL	-Overlay
PF	-Provident Fund
PGR	-Pedestrian Guard Rail
PI	-Plasticity Index
PL	-Plastic Limit
PM	-Periodic Maintenance
PUP	-Pedestrian Underpass
R&R	-Repair and Rehabilitation
RCC	-Reinforced Cement Concrete
RE Wall	-Reinforced Earth Wall
RHS	-Right Hand Side
RHT	-Rebound Hammer Test
RI	-Roughness Index
RM	-Routine Maintenance
ROB	-Road Over Bridge
RPO	-Route Patrol Officer
RUB	-Road Under Bridge
SDBC	-Semi-Dense Bituminous Concrete
SPV	-Special Purpose Vehicle
SR	-Service Road
SWB	-Static Weigh Bridge
TCS	-Typical cross Section
TDRT	-Transient Dynamic Response test
TMS	-Toll Management System
UPVT	-Ultra Pulse Velocity test
VDF	-Vehicle Damage Factor
VG	-Viscosity Grade
VUP	-Vehicular Underpass
WBM	-Water Bound Macadam
WMM	-Wet Mix Macadam
WPI	-Wholesale Price Index

CHAPTER 1. INTRODUCTION

1.1 INTRODUCTION

National Highways Authority of India ("NHAI"/ "Authority") is an autonomous body of the Government of India ("GoI") under the Ministry of Road Transport and Highways ("MoRTH") and was constituted on June 15, 1989 by an Act of Parliament titled - The National Highways Authority of India Act, 1988 ("NHAI Act"). NHAI was operationalized in February 1995 with the appointment of full time Chairman and other Members. The functioning of NHAI is governed by NHAI Act and rules, and regulations framed thereunder.

NHAI has set up an Infrastructure Investment Trust Namely **National Highways Infra Trust ("InvIT")** and is acting as its Sponsor to the said InvIT.

National Highways Infra Investment Managers Private Limited ("NHIIMPL") has been appointed as the Investment Manager to the InvIT. Accordingly, with refence to Letter of Empanelment, (LOE ref: NHIIMPL/I&A/TC/2022/04 dtd 03 Nov 2022) by Investment Manager the following works are awarded to M/s SAMARTH INFRAENGG Technocrats Pvt Ltd vide their letter ref: NHIIMPL/FY2024-25/RFP/Technical Consultant/LOA/04 dated 16.08.2024.

Project	Length (km)	No. of Plazas
Muzaffarnagar–Haridwar (Uttar Pradesh & Uttarakhand) From km 130+560 to Km 209+120	78.560	2 (TP-1, Chhapar TP-2, Bahadrabad)
Bareilly-Sitapur (Uttar Pradesh) From km 262 to km 419.590	157.59	2 (TP-1, Faridpur TP-2, Maigalgunj)

Presently the project stretch, "Muzaffarnagar–Haridwar" is under Operation and Maintenance stage and the fee is being collected from Toll Plazas at km 138+700 near Chhapar village for a length of 35.440 km and at km 187+500 near Bahadrabad village for a length of 43.120 km.

The concession period is 20 years commencing from Appointed Date for TOT Concessionaire to demand and collect appropriate Fee, operate, manage and maintain the Project Highway.

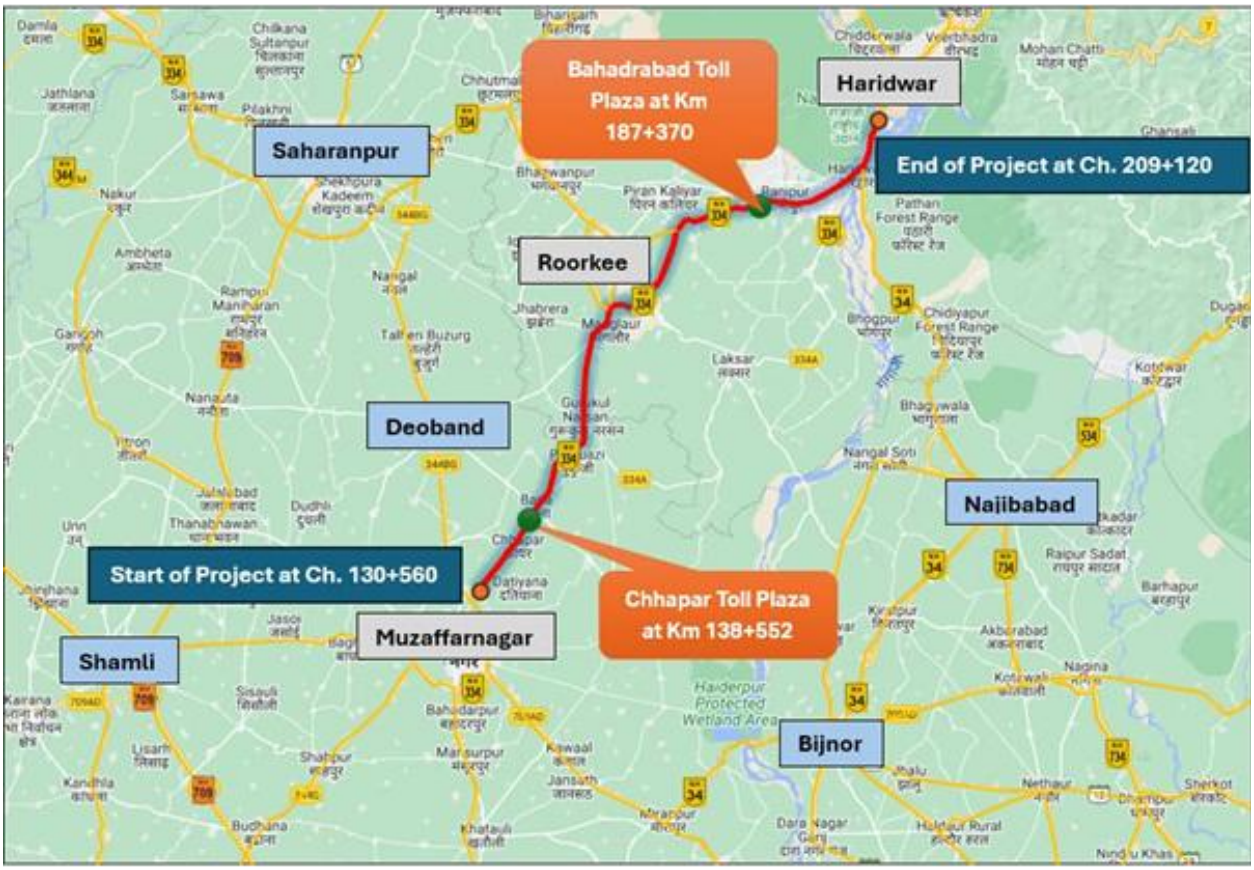
M/s SAMARTH INFRAENGG Technocrats Pvt Ltd has undertaken Technical Due Diligence study for the said project to estimate initial capex including improvements and immediate requirements for repair & rehabilitation of various elements of project highway and also to make an assessment of Major maintenance requirements and Operation & Maintenance costs for entire concession period.

This report highlights the findings of "Technical Due Diligence Services of Four/Six Laning of ***Muzaffarnagar- Haridwar Section*** of NH-334 from km 130+560 to km 209+120 in the state of Uttar Pradesh & Uttarakhand**".**

1.2 PROJECT AT A GLANCE

Project road is a four-lane divided Project Highway with a Flexible Pavement and starts at km 130+560 of NH- 334 and ends at Km 209+120. The total length of the project highway is 78.560 Km.

National Highway – 334 begins from Bulandshahr in Uttar Pradesh and ends in Haridwar in the state of Uttarakhand. It is a critical supporting route for enhancing regional connectivity, reducing congestion on main highways, and supporting both local and pilgrim traffic. This Highway connects several cities and towns such as Bulandshahr, Hapur, Meerut, Muzaffarnagar, Roorkee & Bahadrabad in the state of Uttar Pradesh and Uttarakhand.



Map Showing the Project Corridor

The start and end of the project chainage system with respect to CA and Site are as presented below.

Table 1: Project Corridor Chainage System

Referencing system	Start Point (km)	End Point (km)	Length (km)
As per CA Chainage	130.560	209.120	78.560
As per Site	130.560	209.120	78.560

Photograph showing the start and end point of the project road are presented below:

	
A view of the Start Point of Project Road at Km 130.560	**A view of the End Point of Project Road at Km 209.120**

1.3 OBJECTIVE AND SCOPE OF SERVICES

The main objective of the study is to evaluate the current status of project corridor including details pertaining to identify requirements of initial repair & rehabilitation and estimate major maintenance needs and operation and maintenance costs over the concession period and provide requisite technical information for processing the acquisition of said project by client. Objective of the study can be broadly defined with following tasks:

A) Review of Project Document

- ✓ Review of DPRs/ draft CA/ Schedules pertaining to the scope of work and understand the Sch-B requirements for improvement works for the assessment of capex and Opex during the concession period.
- ✓ Review of As-built drawings and Designs
- ✓ Collection of relevant records and documents and review of same
- ✓ Review of correspondences with IE, if any, on technical issues.
- ✓ Review of EPC, Operation, Maintenance and Systems Contracts
- ✓ Review of Progress Reports, if any Prepare head of terms (highlight the key commercial, technical terms of the contracts) for the reviewed Contracts - EPC, O&M, Asset Management, Operational Agreements (if any), CAs (key technical items) etc.
- ✓ Review of Asset Management Contracts to understand the maintenance of asset from the Concession agreement perspective
- ✓ Review the technical approvals / consents from IE or another agency required under the CA

B) Field Investigations

- ✓ Undertake detailed reconnaissance to appreciate the project corridor characteristics

- ✓ Undertake field investigations to collect first-hand information on present condition of project road and establish the requirements for rehabilitation and up gradation
- ✓ Carrying out inventory and condition surveys for Project Road;
- ✓ Carrying out Inventory and detailed condition surveys for bridges & cross drainage structures (along with Photographs thereof) including recommendation for either strengthening/rehabilitation or reconstruction; Identify requirements of NDT tests if any (to be executed if required and commissioned by client with separate mutually agreed payments).
- ✓ For Major Structures (length of structure>60m), detailed Visual inspection shall be undertaken with MBIU.
- ✓ Video-graphic survey of the entire Project corridor/s.
- ✓ Axle load survey for 7days in both directions of traffic at toll plaza location (7-day traffic count to be provided by client).
- ✓ Test pits required @ every 5 km interval (staggered) along the Project corridor and carrying out necessary laboratory tests to determine the CBR value of the sub grade materials.
- ✓ Carrying out deflection test by Falling Weight Deflect meter (FWD) for existing pavement as per relevant IRC code at the rate of 5 points in km in each direction making it 10 points for both directions.
- ✓ Carrying out Roughness Survey on each lane of Project Corridors using NSV Surveys
- ✓ Availability of construction materials.
- ✓ Assess drainage adequacy: Review of available hydrological reports and assess the availability and condition of existing road side drainage along the corridors.
- ✓ The outputs of investigations are basically used to identify the strengthening requirements for project sections and also used to form the inputs for deterioration modelling.

C) Validation of Executed Works and Assessment of Improvement Works

- ✓ Validation of executed works with respect to Schedule A of the CA by physical verification at site
- ✓ Assess the present status of the projects with relevant standards and confirm that works are meeting the requirements and have been accepted by the authorities.
- ✓ Understand the scope requirements for Improvement works from the Sch-B of the CA
- ✓ Where project stretch / structures / service roads / ancillary works are pending and if not covered in the Sch-B scope of the CA, then assessment of details relating to land acquisition, approvals, timelines for completion, etc. along with cost forecast
- ✓ Cost estimates for any missing items and all works included in the Sch-B of the CA
- ✓ Make an assessment of any risks associated with already executed works

D) Quality Audit

- ✓ Review quality of construction based on available data, available design and drawings.
- ✓ Review of Quality of materials from Laboratory testing for aggregates & soil
- ✓ Check compaction and quality of subgrade material used vide test pits
- ✓ Visual inspection of bridges for any visible distress and anomalies. Identify requirements of NDT testing based on same.
- ✓ Examine Expansion joints and bridge bearings condition and assess requirements for replacements
- ✓ Shall be examining expansion joints visually to the extent possible. Shall use high binoculars/ pictures from accessible points. Shall review all photographs closely and come to a conclusion on same.
- ✓ Identify any critical issues / red flags in relation to the quality or condition of the projects; Identify any structural integrity issues that require rectification / re-mediation;

E) Rehabilitation Plans & Designs

- ✓ Check the adequacy of designs carried out for execution based on available reports
- ✓ Undertake designs for immediate rehabilitation requirements based on CA specifications using FWD data and condition assessment surveys
- ✓ Assess the requirements of rehabilitation to bridges/CD structures by structure based on visual inspections and compare with Sch-B requirements of the draft CA
- ✓ Assess the requirements including BOQ and cost estimates of repair and replacements for various elements and ancillary works

F) Major Maintenance

- ✓ Review of current maintenance system.
- ✓ Preparation of the maintenance costs to be incurred over the period of the concession keeping in mind the maintenance requirements of the Concession Agreement.
- ✓ Detailed assessment of maintenance cycles for pavements using HDM4 analysis and estimation of maintenance cost for the concession period
- ✓ To understand the current maintenance strategy for each of the project and review the BOQ to be provided by the DPR consultant for adequacy in relation to Major Maintenance work of Highways, structures, Road Furniture and other site-specific requirements as per respective CA
- ✓ Minor maintenance will be included in routine maintenance and estimated year wise based on assumed percentages based on present condition.
- ✓ Identify any impacts on revenue due to Major Maintenance.

- ✓ Maintenance requirements for approaches/OP/Underpass forming part of CA would also be assessed.

G) Cost of Improvement Works and Operations

- ✓ Preparation of O&M cost for the concession period.
- ✓ Assess the adequacy of costs assumed in the vendor model are adequate to meet the major maintenance, stage construction and routine maintenance requirements.
- ✓ Independently develop a bottom-up forecast of Operating expenses for project, with detailed break-up of each type of operating expense, along with underlying assumptions

H) BOQ and Cost Estimates

- ✓ Preparation of BOQ & Cost for Improvement works as per Sch-B of the CA
- ✓ Preparation of BOQ and Costs for Major Maintenance
- ✓ Preparation of BOQ and cost for Routine maintenance and Route Patrolling
- ✓ Preparation of BOQ and Cost for Operations
- ✓ Preparation of year-by-year O&M cost
- ✓ The costs would be provided till the end of the concession period including any expected extension of Concession periods as informed by the Client.
- ✓ Benchmarking of costs against other similar Indian toll roads where available (using available data)
- ✓ Historical trend analysis on the maintenance program based on the existing pavement condition and review of all relevant maintenance plans/ documents of NHAI or its concessionaires or contractors.
- ✓ Review and comment on the current organizational structure from an O&M perspective at each asset. Also suggest an indicative organization structure based on project / CA requirements.

1.4 DATA COLLECTION AND REVIEW

In brief, following were covered

- ✓ Review of Concession Agreement & Schedules,
- ✓ Review of Detailed Project Report prepared by NHAI
- ✓ Review of As-built drawings, Plan and profiles, Structural drawings & Detailed Project Reports and Designs where available
- ✓ Review of O&M costs as presented in DPR reports
- ✓ Review of MPR provided by NHAI
- ✓ Review of Latest NSV and FWD data provided by PIU, NHAI

1.5 KEY PROJECT DETAILS

National Highways Authority of India (NHAI) originally awarded the Project to M/S ERA infra in 2010. The project was intended for completion within a few years but continued to face setbacks due to funding challenges, execution delays, and financial troubles within Era Infra.. As a result, construction lagged well beyond the scheduled deadline, leading NHAI to cancel the contract and seek alternative avenues to complete the project efficiently. Accordingly, Era Infra's contract for the Muzaffarnagar-Haridwar project was terminated in 2018. The delays and incomplete work prompted NHAI to seek a new contractor to complete the project.

Thus, the balance works were awarded in two packages in the year 2019 on item rate contract with following details as highlighted below.

S No.	Description	Package-I	Package-II & III
	Name of Work	Balance works on item rate basis for 4-lane works between Km. 130.560 to Km. 167.200	Balance works on item rate basis for 4-lane works between Pkg-II: Km. 167.200 to Km. 180.300 Pkg-III: Km. 180.300 to Km. 209.120
1.	Employer	National Highways Authority of India	National Highways Authority of India
2.	Independent Engineer	K and J Projects Private Limited	K and J Projects Private Limited
3.	Contractor	M/s RSCPL-SKC-ABIPL J.V. (Km. 130.560 to Km. 167.200)	M/s Sam (India) Built-well Pvt. Ltd. (Km. 167.200 to Km. 209.120)
4.	Contract type	Item Rate	Item Rate
5.	Appointed Date	25.11.2019	25.11.2019
6.	Schedule Completion Date	24.08.2020	24.12.2020
7.	COD	16.06.2021	16.06.2021
8.	DLP Period (3 years)	16.09.2024	16.09.2024
10.	Present Contracting Agency for O&M	Sri Krishna constructions	Kaushal Infra
11.	Present Toll Collection Agency	Jandu Constructions	Jandu Constructions

As per schedule-A, Clause-2, the exclusions to the project handover dates are as follow

S No	Description	Handover Date
1	From Km 182+070 to Km 188+900 (Haridwar spur construction in progress) ➢ Awarded to M/s KCPL Pvt. Ltd. under HAM with scheduled completion date on 19 Feb 2025 and O&M period is 15 yrs from COD **Haridwar Bypass:** Interchange at Km 189+300 including construction of Haridwar Bypass	FY 2040 (expected)

	➢ Awarded to M/s IRCON Haridwar Bypass Limited. under HAM with scheduled completion date on 21 Aug 2025	
2	**Elevated Corridor**: from Km 206+220 to Km 209+120 including Ramps ➢ Awarded to M/s SEC Buildtech Pvt Ltd. under EPC and completed on Feb 2024 with DLP period Feb 2034	FY 2034
3	**Based on Prebid replies:** Sch-A, Clause-19 for Additional works to be undertaken by NHAI:, New EPC Works including SR and Flyover will be completed in 2 years and the DLP 5 Years. Will be handover in May 2032 say FY2033	FY 2033
4	**Based on Prebid replies:** Initial overlay sections (to be undertaken by NHAI on EPC basis in FY 2026 with 5 years DLP	FY 2032

Client intimated the Capacity Augmentation period is FY 2035/FY2036 and 5 years DLP upto FY 2041

1.6 O&M REQUIREMENTS

Few important O&M requirements as per schedules/manuals are described as below.

- ✓ Applicable Manual is IRC: SP:84-2019
- ✓ Applicable Schedule for O&M period is Schedule-F.
- ✓ Schedule-F, performance parameters indicate the desirable limit of Roughness values should not exceed 2000 mm/km, whereas its acceptable limits Is 2400 mm/km and needs to be corrected within 180 days. Roughness Surveys shall be carried out Bi-Annually.
- ✓ Schedule-F, performance parameters indicate the FWD survey shall be carried out Annually as per IRC: 115-2014 for flexible pavement and needs to be corrected within 180 days
- ✓ No specific Handing Over (Divestment) requirements are mentioned under CA. It shall be same as Schedule-F.

1.7 KEY OBSERVATIONS

General project Key observations are as presented below.

- Project Road can be divided into 3 sections as:
  - ➢ Muzaffarnagar-Roorkee Bypass Start Km 130.56-Km 167.3
  - ➢ Roorkee Bypass Section till Spur Road KM 167.3-Km 180.4
  - ➢ Spur Road Junction-Haridwar (Km 180.4-209.120)
- Amongst above, 3rd section near Haridwar is more critical as it has more number of structures and continuous developments with slow moving traffic.
- Section 3 has a common length with Spur Road package between Km 182-187 and Haridwar Bypass package between Km 187-189.9. Within this length Toll Plaza falls at Km 187.5.



- 3 major at-grade signalised intersection exist in this section which cause some safety hazards. May require grade separation to avoid safety issues
- 3rd section has Ganga canal running on LHS side for substantial length in the end section. There is not much scope for improvement on LHS side. Predominant length in section 3 runs on elevated level with traffic segregation to local traffic. Poor entry exists cause some safety issues.
- Narrow median exists without any anti-glare screens at some sections.
- Poor Vertical geometry is noticed at new flyovers/ROB at structure location. This may need regrading to correct profile.
- Low height crash barriers were noticed on approaches to Flyovers. This may need Pipe railing to increase the height.
- Safety Hazard noticed at Km 198-199 near exit point due to poor landing/approach start.
- RE wall bulging noticed at Km 199-200 flyover on A1 side. Poor Vertical geometry on flyover structure approach
- Uni directional flyover at 201-202 on RHS carriageway: At-grade Signalised Intersection for LHS Carriageway. Safety hazard
- End Point at Km 209.120 falls on the approach of a new flyover built as a part of next package. Requires confirmation of exact end point.
- Section 2 Roorkee bypass is having good number of structures in terms of underpasses/bridges. Roorkee Bypass has different chainage system on ground. It starts at KM 22(Km 181) and ends at KM 36 (Km 167). Roorkee Bypass Ends at Km 180.4
- Finishing of some structures at approaches appears to be poor with improper line and level (Km 169-170)
- Water Stagnation is noticed between MCW/SR, need median drainage (Km 168-170) RHS
- First section between Km 130-167 is simple 4 lane rural section without much complications.

- Manglour Urban Area (Km 165): Lot of Ribbon Developments without Grade separation. May require a flyover to reduce safety issues
- 200m Service is required at KM 157.8 for continuity of service Roads. Mandauli Urban Area at Km 157. Requires improvement of drainage measures. Narrow Median Without Anti-Glare
- Gurkul Narsan urban area at Km 153-154, local traffic, FOB provided. Requires drainage measures (Rishab Pant Accident at Canal Bridge at Km 154.4)
- Purkazi bypass appears to be most recently constructed in this package with a wide median of 12m and appears to be in fair condition. Purkazi Bypass requires grade separation at both ends (Km 151 & Km 144)
- Drainage issues particularly at curved sections were noticed at start of Purkazi bypass with lot of water stagnation. There is no water outfall nearby and RWH pits were done at this location but not functional.
- Staggered Toll Plaza at Km 138.6: PQC length is more on Exit Side on either direction.
- Chhapar Urban Area at Km 137: Submergence of Service Road observed along with Sewage Water.
- Safety issues related placement of safety barriers (MCB) at approach sections were noticed. MCB is placed much inside the shoulder with kerb outside.
- Median openings required to be provided with proper signage/markings/TBM and standing lanes
- Project Road Structures exhibit several distresses and appears to be rehabilitated in the recent past. Some newly constructed structures also got distress and rehabilitated.
- Pavement exhibits poor to fair condition over the entire length with predominant surface cracking and severe ravelling in Inner lanes OWP. Rutting along wheel path is also observed at distress location. No major undulations/depressions are noticed
- Tilting of wells were noted in couple of major bridges
- RE wall: Soil nailing done at couple of locations
- Deck Slab of bridge at Km 164 is completely damaged
- Narrow median and without Anti-Glare
- Most of the major bridges have been retained on the left side, while new bridges have been constructed on the right side, parallel to the existing ones.
- A New major bridge at 164+100 on the right-hand side is experienced severe cracks & leaching issues on the soffit of the Deck slab in all spans and additionally, evidence of previous repair works is observed on the soffit of the slab. Based on the identified distress, a complete replacement of the deck slab may be required as a remedial measure to ensure continuous and reliable service.
- Although this project stretch lies in Seismic zone –IV, the old bridges at Ch: 164+100, 181+160, 186+000, 193+160, 203+945, 204+300, 204+500 and 205+790 not provided with seismic arrestor's/ stoppers. To enhance the seismic resilience of these structures, it is recommended to implement seismic enhancements, such as the installation of seismic stoppers or dampers, at these specific locations.

- A couple of old bridges, specifically the Major Bridge at Ch: 193+160 on the left-hand side and the Minor Bridge at Ch: 133+340 on the left-hand side, are constructed with brick masonry substructures and have an overall width of 8.5m. These bridges may require reconstruction to accommodate future capacity augmentation.
- Based on the visual inspection of bearings conducted using the MBIU, no major distress was observed, and the bearings appear to be in fair condition. However, the rocker and roller bearings on the older bridges require cleaning and greasing to ensure their proper functioning.
- An old major bridge at 205+790 on the left-hand side has experienced a collapse of the Footpath slab along the entire length on the median side in Span 2. No rectification has been carried out yet.
- All the old major bridges have structural cracks on the girders, spalling, and issues with reinforcement exposure. Since these are all old structures, NDT (non-destructive testing) is required to assess their current condition and propose suitable repair methodologies.
- Some box-type structures in the underpass and minor bridges have structural cracks on the slabs and walls.
- Steel frame strengthening arrangements were observed on the pier cap (P1) on the left side of the flyover at km 185+400. Currently, no significant damage has been observed on the pier cap. Confirmation from the contractor is required to verify the implementation of these arrangements.
- Bulging of the RE walls observed at several locations of the ROB, flyover and underpass.
- Expansion joints and sealants are damaged at several locations.

CHAPTER 2. SURVEYS AND INVESTIGATIONS

2.1 INTRODUCTION

The main objective of undertaking Surveys and Investigations is to appreciate the existing engineering features along the project corridor and to understand the present condition of the various elements of the project road and to prepare required inputs for various rehabilitation and maintenance strategies.

Following Survey and Investigations have been undertaken as a part of study with an objective to understand the present condition of the road and there by access the quality of construction and as well to prepare requisite rehabilitation/corrective designs where necessary.

- Road Inventory Surveys
- Pavement Condition using NSV
- FWD Surveys
- Roughness Surveys using NSV
- Pavement Composition surveys (Test Pits)
- Subgrade Investigations & Laboratory testing
- Material Investigations
- Axle Load Survey
- Structure Inventory and Condition Surveys

These surveys have been performed in the month of August/September 2024.

2.2 ROAD INVENTORY

The project corridor features a 4-lane/6-lane divided carriageway for most of its length. Generally, the carriageway width of flexible pavement is 7.5m/11m wide, including shyness, and is flanked by 1.5m paved shoulders and 1 to 2 meters of earthen shoulders on each side of the median. These widths vary at structure locations and approaches to major junctions. At Toll Plaza location rigid pavement is provided. The 4lane/6-lane lengths as available.

Lane		LHS, km	RHS, km	LHS+RHS, km
2-Lane	Actual Length	53.75	52.16	105.91
	Lane length	107.5	104.32	211.82
3-Lane	Actual Length	24.81	26.4	51.21
	Lane length	74.43	79.2	153.63
Total lane Kms		**181.93**	**183.52**	**365.45**

The median is typically 4.5 meters wide for the majority of the corridor. At median openings, the width reduces to 1 meter to accommodate storage lanes. In built-up sections, 1-to-2-meter median is observed. However, a depressed median is observed on the Purkazi bypass, extending from Km 143+800 to Km 151+000, where the median width is 11 meters.

In general, road embankments heights are in the range of 0.5m-3m. However, embankment heights higher than 3m are observed mainly in the approaches to CD-Structures and Underpass locations.

The project corridor mainly traverses through plain terrain. The land use along the project road is predominantly agricultural and built-up areas. It passes through urban settlements like Chhappar, Manglaur, Roorkee, Bahadrabad.

Typical View of Project Road is shown below:



A view of the Project Road at km 130.560-LHS



A view of the Project Road at km 146.000-RHS



A view of the Project Road at km 197.000-LHS



A view of the Project Road at km 173.530 LHS

The Project Road has both major and minor junctions along its length. Photographs showing the Major Junctions and minor junctions are presented below:



Major Junction at km 143.800 RHS



Minor Junction at km 159.550 LHS



Major Junction at km 191.830 LHS



Minor Junction at km 192.670-RHS

Highway lighting is observed near urban locations and at-grade separators, whereas High-masts are provided at Toll Plazas and Major junctions. Few photos showing High mast and highway lighting are presented below:



A view of High Mast Lighting at km 143.800 RHS



A view of Double arm Lighting at Km 175.000 Median



A view of Double arm Lighting at Km 157.000 Median



A view of Single arm Lighting at Km 155.620-LHS

Project Road consists of Road user facilities like Bus bays with shelters and only Bus shelters. Few photos taken at the Bus Bays and Bus Shelters are presented below:

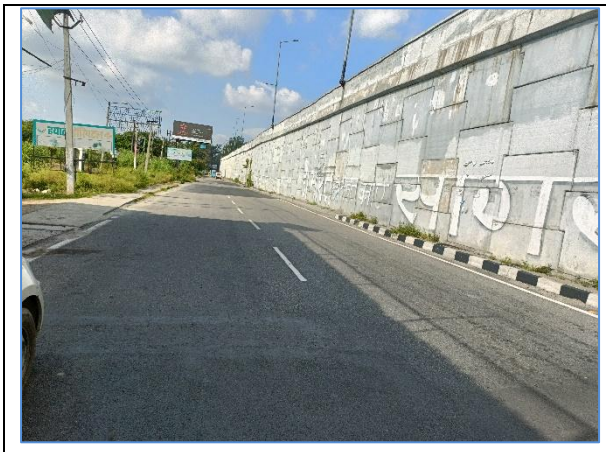


Bus Bay with Shelter at Km 159.500-RHS



Bus Shelter @ Km 180.700 RHS

Service/slip roads are constructed with flexible pavement and have varying carriageway widths ranging from 3.5 meters to 7 meters. Photos depicting the service road pavement surface type, Condition and the other associated features like drain. Few photos taken at service/slip road locations are presented below.



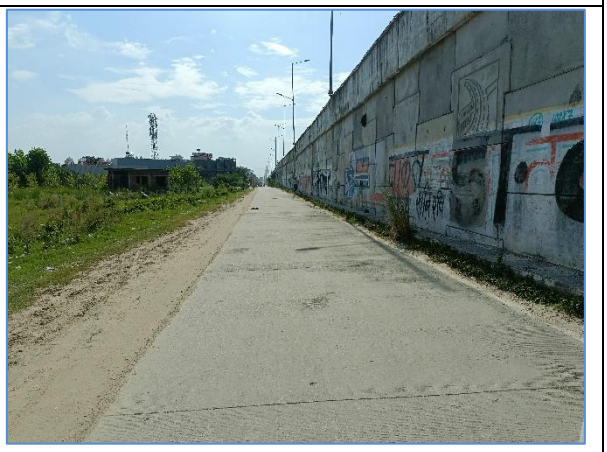
Service Road 7 m width @ km 166.690 LHS



Service Road 5.0m width @ km 176.900 LHS



Service Road 5 m width @ km 159.150 RHS



Service Road 5 m width @ Km 185.750 RHS

The Project Road has 2 Nos of staggered Toll Plaza at Km 138.700 (Chhapar Toll Plaza) and at Km 187+500 (Bahadrabad Toll Plaza). Rigid pavement is provided at toll plaza location and condition appears to be fair. It has 6+1 lanes on each side of both Toll plazas. In total 12 Nos. of High mast lights are provided at both Toll Plazas.

S No	Toll Plaza Details		
1	Chainage (Km)	**Km 138.700**	**Km 187+500**
2	Toll plaza name	Chhapar Toll Plaza	Bahadrabad Toll Plaza
3	No of lanes	6+1 lanes (staggered lanes)	6+1 lanes (staggered lanes)
4	Canopy	Yes	Yes
5	Admin Building	Yes	Yes
6	Static Weigh Bridges (SWB)	1	1
7	Toilets	1	1
8	High mast lights	6 Nos	6 Nos
9	Toll Booths	14 Nos	14 Nos
10	Ambulance	1 Nos	1 Nos
11	Crane	1 Nos	1 Nos
12	Highway Patrolling Vehicles	1 Nos	1 Nos
13	Fast tag lanes	14 Nos	14 No

S No	Toll Plaza Details		
14	Medical-Aid Post	1	1
15	Total Toll Plaza length (m)	100m Rigid	200m Rigid
16	Toll plaza width (m)	40	40
19	Separator width at Toll booths (m)	1.5	1.5
20	Toll lanes width (m)	3.5	3.5
21	Extra Wide Lane width (m)	4.5	4.5
22	Tunnel	Yes	Yes
23	Weigh in Motion (WIM)	14	14
24	Highway Nest Mini	-	-



A view of the Toll Plaza near Km 138.700



A view of the admin building at km 138.700 RHS



A view of the Toll Plaza near Km 187.500



A view of the admin building at Km 187.500 RHS

The collected Road Inventory Data is presented in **Appendix 1** of this Report

2.3 PAVEMENT CONDITION SURVEYS

The collected Pavement Condition Data using NSV surveys for main carriageway is presented in **Appendix 2** of this Report.

The photographs showing the pavement condition of the Project Road is presented below.

 **Delamination @ km 151.000 RHS**	 **Fair condition @ Km 154.550 LHS**	 **Crack sealing done @ km 157.300 RHS**
 **SR Damage Km 159.150 RHS-SR**	 **Rutting & Cracking at Km-160.000 RHS**	 **Wheel path cracking @ km 161.500 RHS**
 **Cracks in wheel path @ Km-166.600 RHS**	 **SR shoulder damage @ km 170.150 LHS**	 **Pot hole at SR @ km 175.000 LHS**

 Delamination @ Km 185.100 LHS	 Fair condition @ km 197.000 LHS-SR	 Pot holes @ km 201.080 LHS- SR
 Ravelling @ km 201.080 LHS-SR	 Cracks in wheel path @ km 202.650 LHS- SR	 Ravelling at Km 203.000 LHS

2.4 FALLING WEIGHT DEFLECTOMETER (FWD) SURVEYS

2.4.1 Falling Weight Deflectometer Survey (Flexible Pavement)

In order to evaluate the structural strength of the existing pavement, Falling Weight Deflectometer (FWD) survey has been carried out along the project road in line with IRC: 115-2014.

- ✓ Prior to the start the surveys, Load repeatability tests are performed on each day
- ✓ The target Peak Load of 40 KN (+/- 4 KN) is maintained during survey.
- ✓ At Regular intervals of time Pavement temperature is noted.
- ✓ For every 1 Km of stretch 5 test Points (2 pts- Outer, 3 pts-inner) were taken on Main Carriageway in each direction. Additional points also taken on extra-lane locations.
- ✓ Temperature correction equation is applied for back calculated modulus of BT and no seasonal correction factor is applied for the back calculated modulus of granular and Subgrade considering the Winter Season (September Month).

The collected FWD Data and Analysis is presented in **Appendix 3** of this Report.

Few photos taken during the progress of FWD Surveys are presented below:



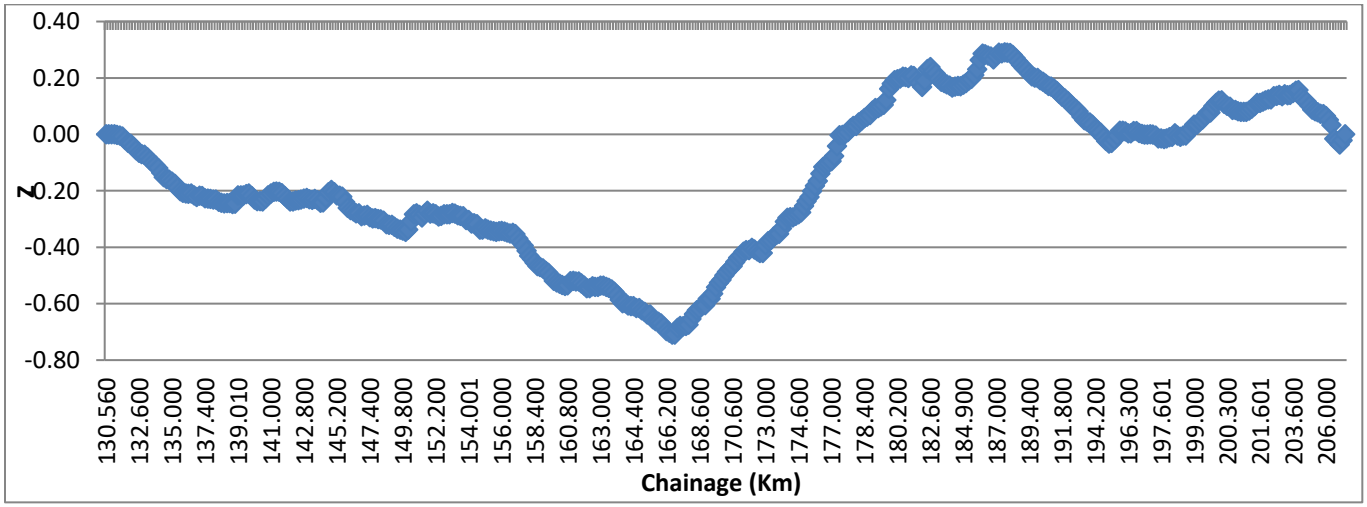
FWD Survey in progress



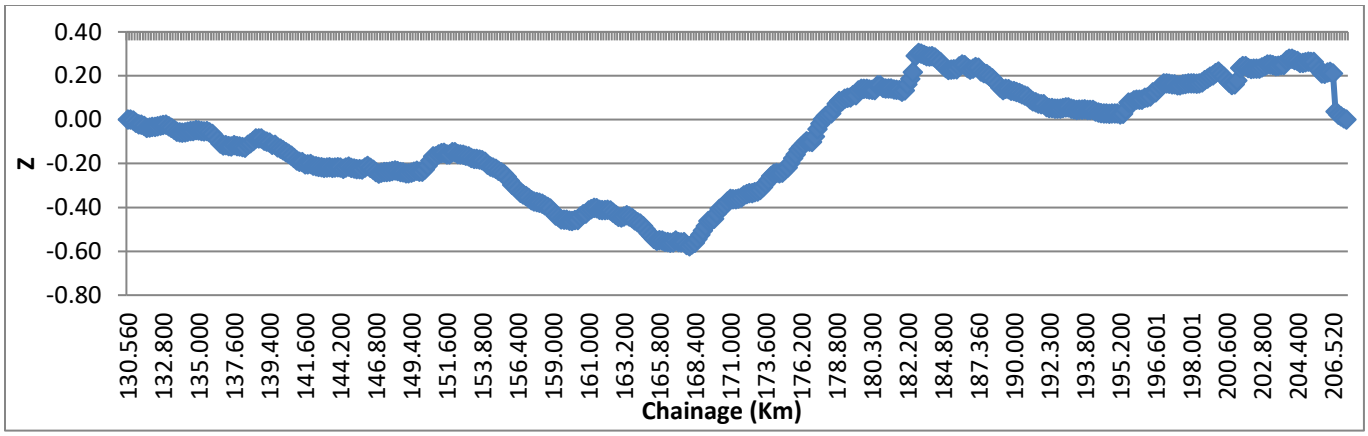
Temperature checking

Cumulative Difference Approach (CDA) has been used for the identification of homogeneous sections on the basis of Surface Curvature Index (SCI). SCI is calculated as the difference between D_0 and D_{300}, where D_0 and D_{300} are the peak deflections (mm) measured at the center of loading plate and at a radial distance of 300mm.

The homogenous sections in each direction of traffic (i.e., LHS & RHS) for the project stretch have been identified for Main carriageway is presented in graphical representation of followed by tables.



Delineation of Homogeneous Section – LHS



Delineation of Homogeneous Section - RHS

Based on the above graphs, the flexible pavement section has been sub-divided into homogeneous section for LHS and RHS direction as given below.

Table 2: FWD Data -Homogenous Section of MCW – LHS

S. No	From	To	Length (Km)	Remarks
1	130.560	132.800	2.24	
2	132.800	135.600	2.80	
3	135.600	138.730	3.13	
4	138.730	139.010	0.28	Toll Plaza
5	139.010	140.800	1.79	
6	140.800	143.600	2.80	
7	143.600	146.200	2.60	
8	146.200	148.400	2.20	
9	148.400	151.000	2.60	
10	151.000	153.200	2.20	
11	153.200	155.400	2.20	
12	155.400	158.200	2.80	
13	158.200	160.600	2.40	
14	160.600	162.800	2.20	
15	162.800	164.400	1.60	
16	164.400	167.300	2.90	
17	167.300	170.000	2.70	
18	170.000	173.000	3.00	
19	173.000	174.800	1.80	
20	174.800	177.601	2.80	
21	177.601	180.300	2.70	
22	180.300	182.900	2.60	
23	182.900	185.100	2.20	
24	185.100	187.360	2.26	
25	187.360	187.640	0.28	Toll Plaza
26	187.640	189.900	2.26	
27	189.900	192.400	2.50	
28	192.400	195.400	3.00	
29	195.400	197.001	1.60	
30	197.001	198.400	1.40	
31	198.400	199.900	1.50	
32	199.900	201.600	1.70	
33	201.600	203.880	2.28	
34	203.880	204.210	0.33	MJB
35	204.210	206.520	2.31	

S. No	From	To	Length (Km)	Remarks
	206.520	208.450	1.93	Viaduct
	208.450	209.120	0.67	
Total Length			78.560	

Table 3: FWD Data -Homogenous Section of MCW – RHS

S. No	From	To	Length (Km)	Remarks
1	130.560	132.600	2.04	
2	132.600	135.000	2.40	
3	135.000	138.380	3.38	
4	138.380	138.690	0.31	Toll Plaza
5	138.690	140.600	1.91	
6	140.600	143.600	3.00	
7	143.600	147.000	3.40	
8	147.000	151.000	4.00	
9	151.000	153.000	2.00	
10	153.000	155.600	2.60	
11	155.600	158.000	2.40	
12	158.000	160.000	2.00	
13	160.000	161.800	1.80	
14	161.800	164.400	2.60	
15	164.400	167.300	2.90	
16	167.300	170.600	3.30	
17	170.600	173.600	3.00	
18	173.600	177.000	3.40	
19	177.000	180.300	3.30	
20	180.300	182.900	2.60	
21	182.900	187.360	4.46	
22	187.360	187.640	0.28	Toll Plaza
23	187.640	189.900	2.26	
24	189.900	192.400	2.50	
25	192.400	193.900	1.50	
26	193.900	195.400	1.50	
27	195.400	196.900	1.50	
28	196.900	198.600	1.70	
29	198.600	201.380	2.78	
30	201.380	201.880	0.50	MJB
31	201.880	203.880	2.00	
32	203.880	204.210	0.33	MJB
33	204.210	206.520	2.31	
	206.520	208.450	1.93	Viaduct
	208.450	209.120	0.67	
Total Length			78.560	

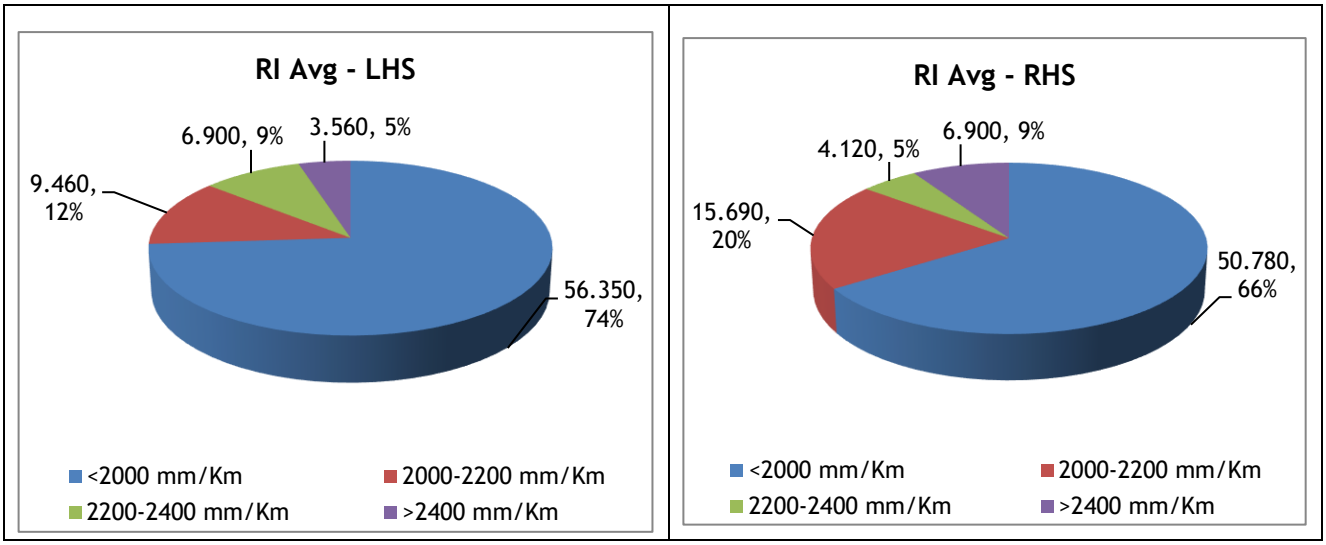
2.5 ROUGHNESS SURVEYS

The Roughness data has been collected using **Network Survey Vehicle** and analyzed in terms of International Roughness Index (IRI), separately for each lane, for both direction of travel. Pavement

Roughness data collection and computation of IRI for each km length in each direction is presented in **Appendix 4** of this Report.

As per Schedule-F of INVIT, the desirable level of service for Roughness values for bituminous pavement surface is considered to less than 2000 mm/Km and the acceptable limits are less than 2400mm/Km.

Average Roughness Index (RI) values along the corridor were grouped in to four categories, Pie chart showing the range of RI values in each carriageway of the project road have been presented below:



It can be seen from the above pie charts, that about 74% in LHS & 66% in RHS of the length of the Project Road has good riding quality (RI<2000 mm/km) respectively.

2.6 PAVEMENT COMPOSITION SURVEYS (TEST PITS)

The composition of the existing pavement crust has been noted from test pit surveys. A total of 18 Nos. of pits have been dug along the corridor and its pavement composition has been noted.

Results of the test pit survey showing average thickness of pavement layers are presented in the Table below.

Table 4: Pavement Composition of Existing Pavement along Project Road

S No	Test Pit Number	Existing Chainage	Direction	BT (mm)	WMM (mm)	GSB (mm)	Total (mm)
1	MH-TP-1	173+300	LHS	180	250	200	630
2	MH-TP-2	180+750	LHS	250	250	350	850
3	MH-TP-3	191+900	LHS	220	200	300	720
4	MH-TP-4	204+760	LHS	150	200	210	560
5	MH-TP-5	205+700	RHS	230	250	250	730
6	MH-TP-6	194+700	RHS	230	250	150	630

S No	Test Pit Number	Existing Chainage	Direction	BT (mm)	WMM (mm)	GSB (mm)	Total (mm)
7	MH-TP-7	186+850	RHS	160	250	250	660
8	MH-TP-8	177+200	RHS	170	200	200	570
9	MH-TP-9	166+500	RHS	170	200	200	570
10	MH-TP-10	156+400	RHS	200	200	150	550
11	MH-TP-11	145+550	RHS	240	200	150	590
12	MH-TP-12	136+100	RHS	160	200	220	580
13	MH-TP-13	130+920	LHS	170	200	250	620
14	MH-TP-14	140+530	LHS	180	250	250	680
15	MH-TP-15	150+200	LHS	160	200	200	560
16	MH-TP-16	160+900	LHS	160	250	200	610
17	MH-SR-TP-1	168+170	LHS	120	200	200	520
18	MH-SR-TP-2	170+250	RHS	100	250	300	650

Further, to understand the extent of GSB layer in the median, 4 pits have been dug in the median. The GSB layer thickness found in the median is as shown below.

Table 5: Existing GSB Layer Thickness in Median

S No	Median Pit No	Chainage	Side	Offset from Kerb (m)	GSB Thickness (mm)
1	MH-GSB-1	170+800	Centre	1.5	200
2	MH-GSB-2	190+800	Centre	1.5	100
3	MH-GSB-3	150+100	Centre	1.5	150
4	MH-GSB-4	140+020	Centre	1.5	150

2.7 SUBGRADE INVESTIGATIONS & LABORATORY TESTING

Sub-grade Investigations have been conducted to assess the subgrade soil characteristics along the project road. A total of 18 test pits were carefully dug from the pavement surface down to sub-grade level. Of these, 16 Nos. were on main carriageway, while the remaining 2 were on Service Road. Field density tests were carried out on the sub-grade samples, and a small quantity of each sample was collected in airtight containers to determine the field moisture content. After completing the field density tests, representative bulk samples of sub-grade soil were collected from each test pit in gunny bags for laboratory testing.

The soil samples collected have been tested for the following properties to assess the existing sub-grade soil properties.

- Sieve analysis
- Atterberg limits
- Heavy compaction
- Four (4) days soaked CBR as per IS standards at 97% of MDD as applicable for sub-grade (Heavy Compaction)
- Free swelling index

Few sample photos of the test pit locations where the subgrade samples collected are as presented below.



MH-TP-1



MH-TP-2



MH -TP-3



MH-TP-4



MH-TP-5



MH-TP-6



MH-TP-7



MH-TP-8



MH-TP-09



MH-TP-10



MH-TP-11



MH-TP-12



MH-TP-13



MH-TP-14



MH-TP-15



MH-TP-16



MH-SR-TP-1



MH-SR-TP-2

2.8 GSB EXTENSION IN MEDIAN

Investigations of the GSB (Granular Sub-Base) layer have been conducted to assess its thickness along the project road. A total of 4 pits were carefully excavated in the median down to the top level of the sub-grade.



MH-GSB-1



MH-GSB-2



MH-GSB-3



MH-GSB-4

2.9 BORROW AREAS

Potential borrow area identified at 7 locations for the use of embankment/subgrade construction works within economic haulage leads. The sources identified as potential borrow areas along with certain useful information such as distance from the project road, location, village name, etc., have also been presented in this table below.

Table 6: Borrow Area Samples Details

S No	Borrow Area No	Existing Chainage	Side	Offset	Village and contact person	Quantity	Rate	Remarks	Coordinates
1	MH-BP-1	198+800	RHS	5.2 km	Vill- Jetpur	20 Acres*5 feet	Premission for Tashilar Only Royality	Govt. Land	29.891418 78.133229
2	MH-BP-2	180+700	LHS	2.7 km	Vill:Rahmatpur Name-Naseem Ahmad mob-9012235428	15 Acres* 5 feet	one Acre per one feet R/-2.5 Lakh	Pvt. Land	29.908783 77.949665
3	MH-BP-3	172+700	RHS	0.3 km	Vill-Jurachi (Ngala) Name-Abad ali mob-9897917086	8 Bighas* 3 feet	One bigha R/-2.4 Lakh per one feet	Pvt. Land	29.827846 77.927991

S No	Borrow Area No	Existing Chainage	Side	Offset	Village and contact person	Quantity	Rate	Remarks	Coordinates
4	MH-BP-4	162+900	LHS	2.2 km	Vill- Name- Macho (Jintendra Tayagi) mob- 9759283086	150 Bighas* 3 feet	One bigha R/- 2.4 Lakh per One feet	Pvt. Land	29.769345 77.843978
5	MH-BP-5	153+700	LHS	3.3 km	Vill- Narsam Kala Name-Anil Kumar mob- 9536979139	20 Bighas 5 feet	One bigha R/- 2.4 Lakh per One feet	Pvt. Land	29.710662 77.837605
6	MH-BP-6	143+750	RHS	5.2 km	Vill- Barla Name-Javad mob- 9027485030 Name-Anurag Tyagi mob- 9927761890	5 Acres* 6 feet	Bigha R/- 20000 per one meter	Pvt. Land	29.607081 77.846444
7	MH-BP-7	134+800	LHS	2.2 km	Vill: Mahraipur Name: Ajeeth Singh Mob-78305 86060	6 Acres* 5 feet	Bigha R/- 15000 per 3 feet	Pvt. Land	29.572923 77.744505

Soil samples from these borrow sources have been collected in bulk by excavating test pits down up to 1.0m depth from the existing ground surface. The top organic soil layer of approximately 150mm thickness has been removed before sampling. The samples collected from these identified borrow pits/ gravel quarries have been tested for the suitability of utilizing them as embankment fill/ sub-grade. Few sample photos of borrow area locations are as presented below.



MH-BP-1



MH-BP-2



MH-BP-3



MH-BP-4



MH-BP-5



MH-BP-6



MH-BP-7

2.10 AGGREGATE SAMPLES

Aggregates samples of 5 Nos. from crusher have identified for the use of sub-base, base, surface courses and concrete works has been collected. The locations, estimated quantity, basic cost of material and the approximate distance from each source to the nearest point on the project corridor are compiled in Tables below.

Table 7: Aggregate Samples Details.

Sl No.	Sample No.	Ex.Chainage (Km.)	Left/ Right	Name of Village	Name of Source/ Crusher	Lead from Nearest Ex.Chainage (Km.)	Approximate Quantity (ton)	Basic cost of the material (Rs.)	Remarks	Coordinates
1	MH-AQ-1	192+700	RHS	Ibrahimpur	Sri Rama stone crusher Name: Ishmeet singh Mob: 7618111313	1.1 km	Plenty	40mm-Rs 850/- per ton 20mm-Rs.850/- per ton 10mm-Rs.850/- per ton 6mm-Rs.850/- per ton dust - Rs 850/- per ton including loading	Extra : with out Royalty & GST-5%	29.906927 78.072239
2	MH-AQ-2	192+700	RHS	Ibrahimpur	Rishabh Stone Crusher Name: Akbar khan Mob:9837041331	1.5 Km	Plenty	40mm-Rs 800/- per ton 20mm-Rs.800/- per ton 10mm-Rs.800/- per ton 6mm-Rs.800/- per ton dust - Rs 800/- per ton including loading	Extra : with out Royalty & GST-5%	29.905972 78.074613
3	MH-AQ-3	171+600	RHS	Bhogpur	Sreeji Stone Crusher Name- Arjun Mob-9690577204	40.3 km	Plenty	60mm-Rs 700/- per ton 40mm-Rs 700/- per ton 20mm-Rs.700/- per ton 10mm-Rs.700/- per ton 6mm-Rs.700/- per ton dust - Rs 700/- per ton including loading	Extra : with out Royalty & GST-5%	29.799893 78.151585
4	MH-AQ-4	171+600	RHS	Bhogpur	Tirupathi Stone Crusher Name- Sanjay Mob-9358221632	41.3 km	Plenty	60mm-Rs 680/- per ton 40mm-Rs 680/- per ton 20mm-Rs.700/- per ton 10mm-Rs.700/- per ton 6mm-Rs.700/- per ton dust - Rs 740/- per ton including loading	Extra : Royalty Rs-140/- Per tonr & GST-5%	29.8045589 78.151116

Sl No.	Sample No.	Ex.Chainage (Km.)	Left/ Right	Name of Village	Name of Source/ Crusher	Lead from Nearest Ex.Chainage (Km.)	Approximate Quantity (ton)	Basic cost of the material (Rs.)	Remarks	Coordinates
5	MH-AQ-5	171+600	RHS	Bhogpur	Shiva Ganga Stone Crusher Name- Yogesh Gupta Mob-9837096251	40.5km	Plenty	60mm-Rs 720/- per ton 40mm-Rs 720/- per ton 20mm-Rs.740/- per ton 10mm-Rs.720/- per ton 6mm-Rs.700/- per ton dust - Rs 740/- per ton including loading	Extra : with out Royalty & GST-5%	29.800461 78.149755

Few sample photos of aggregate quarry locations are as presented below.



MH-AQ-1



MH-AQ-2



MH-AQ-3



MH-AQ-4



MH-AQ-5

2.11 SAND SAMPLES

River Sand samples of 3 Nos. have been collected from the source and tested. The location of this sand quarry along with lead to the Project Road is presented in the following table.

Table 8: Sand Samples Details

Sl No	Sand Source	Village & Name	Name of River	Chainage	Side	Offset	Rate	Coordinates	Remarks
1	MH-SQ-1	Vill-Imbrahimpur Name: Akbar khan Mob:9837041331	Ganga	192+700	RHS	5 km	Rs 920-/ ton	29.905972 78.074613	
2	MH-SQ-2	Vill-Bhogpur Name-Arjun Mob-9690577204	Ganga	171+600	RHS	43 km	Rs 700-/ ton	29.799893 78.151585	
3	MH-SQ-3	Vill-Bhogpur Name- Sanjay Mob-93582 21632	Ganga	171+600	RHS	43.5 km	Rs 700-/ ton	29.804558 78.151116	

Few sample photos of Sand quarry locations are as presented below.



MH-SQ-1



MH-SQ-2



MH-SQ-3

2.12 AXLE LOAD SURVEYS

Traffic loading plays a critical role in pavement performance and design due to the strong correlation between vehicle axle loads and road wear. This relationship can vary depending on the road structure and the specific deterioration processes involved, but the "fourth power" law serves as a useful approximation, illustrating how increases in axle load exponentially amplify road damage.

Axle load study has been conducted using portable axle load pads at two locations: near toll plaza at km 138.700 from 22-23 August 2024 and at km 187.500 from 23-24 August 2024. Further, again 7 days axle load survey has been conducted at the same locations from 24.10.2024 to 31.10.2024. The survey has been conducted in both the directions, and data captured on random sampling basis. The collected axle load data and analysis is presented in **Appendix 5** of this Report. The vehicle damage factors have been calculated using the standard axle loadings given in IRC: 37-2018. The adopted standard axle loadings are presented in the following table.

Table 9: Details of Standard Axles Used

Axle Configuration	Standard Axle load (Tonnes)*/ KN	Remarks
Single Wheel, Single Axle	6.60/65	As per IRC 37-2018
Dual Wheel, Single Axle	8.16/80	As per IRC 37-2018
Dual Wheel, Tandem Axle group	15.10/148	As per IRC 37-2018
Dual Wheel, Tridem Axle group	22.90/224	As per IRC 37-2018

Few photographs illustrating the survey locations and axle load measurements are presented below.



Survey conducted @ Km 138.700



Survey conducted @ Km 138.700



Survey conducted @ Km 187.500



Survey conducted @ Km 187.500

The combined 24 hrs axle load data and 7-day axle load data are used to arrive VDF. The Direction wise VDF for each mode of commercial traffic has been estimated. Results of axle load surveys have been presented in the following table.

Table 10: VDF Values Estimated at the Toll Plaza

Vehicle Type	Chhapar Toll Plaza-1 (138+700)		Bahadrabad Toll Plaza-2 (187+500)	
	UP	DN	UP	DN
BUS	1.07	1.07	0.82	0.69
2-Axle	2.07	1.94	2.86	2.63
3-Axle	5.04	4.60	5.13	4.62
M Axle	13.84	10.46	6.24	5.31
LCV	1.31	1.38	1.05	0.72

CHAPTER 3. VALIDATION OF EXECUTED WORKS

3.1 ROAD WORKS

The project road has been closely inspected to verify the executed works on ground. The scope works to be executed by the Concessionaire/Contractor as envisaged in CA is compared with the executed work on the Ground. As a part of the validation, the available as-built drawings, inventory data and Detailed Reports as received from the NHAI were also referred. Each structure has been inspected to note down its structural configuration and condition. The following table highlights the scope comparison of the executed works on ground.

The project corridor appears to have been constructed with the cross-sectional elements matching to those given in the manual at the time of execution. The carriageway width varying from 7.0m to 10.5m plus paved shoulders of 1.5m and a shyness strip of 0.5m has been provided over the entire length except at structures. Earthen shoulders of 0m to 2.0m on either side of carriageway have also been provided.

Table 11: Scope Comparison of Executed works

S. No.	Particulars	Length/ Nos	Total for O&M Estimation	As per Site	As per Schedule-A	As per Schedule-B	As Per Sch-A (Cl-19) Improvements	As Per Sch (Spur Road+Haridwar Bypass)	As per DPR Report
1	**Start Chainage (Km)**	Km	130.560	130.560	130.560	130.560	130.560	182.100	130.560
2	**End Chainage (Km)**	Km	209.120	209.120	209.120	209.120	209.120	189.400	209.120
3	Length of the Project Corridor	Kms	78.560	78.560	78.560	78.560	78.560	7.300	78.560
4	Service Road / Slip Road	Kms	106.204	82.235	81.540		12.984		7.810
6	Connecting Roads	Kms	2.200				2.200		
10	ROBs	Nos	2	2	2				
13	Flyovers	Nos	10	5	6		4		
14	Elevated Structure	Nos	3	3	3				
15	VOP	Nos	1	1	1				
16	VUPs	Nos	4	2	1		1	1	
17	LVUP's	Nos	8	8	8				
18	PUP's/CUP's	Nos	21	21	21				
20	FOBs	Nos	7	5	5		2		
22	Major Bridges	Nos	10	10	10				
23	Minor Bridges	Nos	11	11	11				
25	Culverts (Pipe)	Nos	38	38	13				
26	Culvert (Box)	Nos	54	52	41				2
29	Major Junctions	Nos	14	10	14				
30	Minor junctions	Nos	133	54	133				
31	High Embankments	Kms	9.590	9.590					
32	Stone Pitching	Sqm	99,997	99,997					
34	Concrete Lining	Kms	0.160	0.160					
35	Chutes	Nos	463	463					
37	RCC Wall-Full Height	Kms	2.930	2.930					
38	RCC Wall + Soil Emb	Kms	0.440	0.440					
40	RCC Wall + Stone Pitching	Kms	0.120	0.120					

S. No.	Particulars	Length/ Nos	Total for O&M Estimation	As per Site	As per Schedule-A	As per Schedule-B	As Per Sch-A (CI-19) Improvements	As Per Sch (Spur Road+Haridwar Bypass)	As per DPR Report
41	RE Panels - Full height	Kms	15.010	15.010					
42	RE Blocks- Full height	Kms	0.925	0.925					
43	RE Panels / Blocks Area	Sqm	1,39,994	71,708			37286	31000	
49	Gabion Wall	Kms	0.250	0.250					
51	RCC Cover Drain	Kms	51.356	39.320	44.666		6.690		
52	RCC Open Lined Drain	Kms	13.060					13.060	
56	Earthen Drain	Kms	9.098	0.500	-		8.598		
57	Median drain	Kms	7.570	5.360	7.570				
58	Median Cuts	Nos	129	129	-				
61	Toll Plaza	Nos	4	4	4				
62	No. of Lanes (Both side)	Nos	28	28	28				
68	Varying Message Signs (VMS)	Nos	7	7					
69	Emergency Call Box	Nos	10	10					
71	High Mast Lights	Nos	37	23			14		
73	Low Mast Lights	Nos	1	1					
74	Highway Lighting (length only)	Kms	57.750	57.750					
75	Single Arm Lightnings	Nos	754	395			287	72	
76	Double Arm Lightnings	Nos	2,158	1,649			124	385	
78	Lights below underpass/FO	Nos	28	28					
79	Solar Blinkers	Nos	218	60		158			
80	Solar Lights with Panel	Nos	390						390
81	Bus Bays with Shelter	Nos	15	12	13		2		
83	Bus Shelters	Nos	1	1					
84	Truck Lay bye	Nos	5	5	5				
87	Median Opening	Nos	37	34	37				
88	Median Plantation_Functional	Kms	38.160	38.160					
89	Median Plantation_ Non Functional	Kms	26.250	26.250					
90	Median Plantation	Nos.	65,310	65,310					
91	Avenue Plantation	Nos.	15,000				15000		
92	Road Markings	Kms	78.560	78.560					
93	Delineators	Nos	4,427	753			3674		
94	Kilometre Stones	Nos	120	120					
95	Hectometre Stones	Nos	602	602					
96	5th Km Stone	Nos	30	30					
98	Edge Kerb in High embankment locations	Kms	5.450	5.450					
99	Traffic Attenuators	Nos	117			28	77		12
100	Studs	Nos	73,660	59,483		11210	2967		
101	End Terminals at culverts, Structures, other hazards	Nos	30				30		
102	Road Signs	Nos	4,621	1,241		1076	326		1978
103	4-Lane Gantry Sign Boards	Nos	27	27					
105	2-Lane Gantry Sign Boards	Nos	28			28			
106	Cantilever Sign Boards	Nos	43	43					
107	Toll Plaza Sign Boards	Nos	12	12					

S. No.	Particulars	Length/ Nos	Total for O&M Estimation	As per Site	As per Schedule-A	As per Schedule-B	As Per Sch-A (Cl-19) Improvements	As Per Sch (Spur Road+Haridwar Bypass)	As per DPR Report
108	Antiglare	Nos	27,894	10,725			3594	2865	10710
109	View Cutters	Nos	10,860						10860
110	Single Face W-Beam Safety Barriers	Kms	82.142	82.142					
112	Thri beam crash barrier	Kms	4.583				4.583		
115	Rigid Concrete Barriers	Kms	87.389	24.125			22.154	19.690	21.420
116	Concrete Railing	Kms	2.220	2.220					
119	Pedestrian Guard Rails	Kms	24.290	24.290					
120	Boundary Stones	Nos	3,160			3160			

Note: The DPR mentioned service roads, lighting and structures etc. are not considered in the present Capex as these works will be executed by Authority in the due course of time. However, the same has be considered in Opex for future maintenance.

The location-wise details of service roads and slip roads are presented in in **Appendix 6** are listed as below:

Table 12: Summary of Service Roads/Slip Roads along Project Road

Description	LHS			RHS			Total (excluding Tapering)
	Flexible	Rigid	Paver Block	Flexible	Rigid	Earthen	
Units	**Kms**	**Kms**	**Kms**	**Kms**	**Kms**	**Kms**	**Kms**
Service Road	38.130	0.700	0.050	40.420	0.760	0.000	80.06
Slip Road	0.970	0.000	0.000	1.205	0.000	0.000	2.175
Total	**39.100**	**0.700**	**0.050**	**41.625**	**0.760**	**0.000**	**82.235**

RCC covered drains are constructed over a length of 39.32 km at various locations along the project corridor. Additionally, open lined drains cover a length of 5.36 km, are provided in the median at curves. The locations and conditions of these drains are detailed in Appendix 6, with a summary presented in the table below.

Table 13: Summary of Drains along the project road

Drains	LHS	RHS	Median	Total
	Kms	Kms	Kms	Kms
RCC Cover Drain	15.450	23.870	-	39.320
RCC Open Lined Drain	-	-	5.360	5.360

RE walls, RCC Wall full height and partial walls with soil embankments are found in approaches to the grade separator locations, high embankment locations and at CD-structures locations along the Project Corridor which account for a total length of 35.015 km. The detailed list is presented in **Appendix 6** and its summary is presented below:

Table 14: Summary of Slope Protection along Project Road

S No	Slope Protection Type	LHS	RHS	Total
		Kms	Kms	Kms
1	High Soil Embankment	3.230	6.360	9.590
2	Stone Pitching	3.320	2.270	5.590
3	RCC Wall Full Height	1.540	1.390	2.930
4	RCC Wall + Soil Emb	0.290	0.150	0.440
5	RCC Wall + Stone Pitching	0.000	0.120	0.120
6	RE Wall Full Height (Blocks)	0.440	0.485	0.925
7	RE Wall Full Height (Panels)	7.250	7.760	15.010
8	Gabion Wall	0.120	0.130	0.250
9	Concrete Lining	0.050	0.110	0.160
	Total	**16.240**	**18.775**	**35.015**

A total of 34 median openings were observed on-site, consisting of 16 normal openings and 18 with reserved lanes. Additionally, 10 unauthorized openings were noted. For median openings with a reserved lane provision, the 4.5m median width is reduced to 1.0 meter. Detailed location-wise information is provided in **Appendix 6**, and a summary of the openings is presented below.

Table 15: Summary of Median Openings along Project Road

Median Openings	Total
	Nos
Normal Lane	16
Reserve lane	18
Un-Authorized	10
Total	**44**

The project road has a total of 64 junctions. A comprehensive list of major and minor junctions is provided in **Appendix 6** of this report.

Safety barriers have been installed along the project road at high embankments, sharp curves and approaches of grade-separated and cross-drainage Structures. Details of safety barriers provided along the corridor are as follows:

- Single-Face W-barrier (MBCB): Observed in a length of 82.142 kms. Further details are provided in **Appendix 6** of this report. It is noted that face of crash barrier is much behind the face of kerb especially at Purkazi bypass. These require replacement of MCB as per codal specifications.

- Concrete crash barriers (CCBs) are installed at structure locations, covering a total length of 24.125 km, while New Jersey barriers span approximately 2.220 km. Further details are available in **Appendix 6** of this report.

- Pedestrian Guard Rails (PGR): Observed in a length of 24.290 kms. Further details are provided in **Appendix 6** of this report.

Table 16: Summary of Safety Barriers

Safety Barriers	Length	Missing	Damage
	Kms	m	m
CCB	24.125	272	87
Metal Handrail	-	-	-
New jersey barrier	2.220	-	-
MCB	82.142	395	294
Pedestrian Guard Rails	24.290	290	136
Fencing	-	-	-

Road furniture, including high masts, highway lighting, and signboards, has been installed along the project road. The summary of the lighting and signboards is presented below, with detailed lists provided in **Appendix 6** of this report.

Table 17: Summary of Highway lighting and High mast

Description	LHS	Median	RHS	Total
	Nos	Nos	Nos	Nos
High mast Pole	3	18	2	23
High mast Fixture	34	214	24	272
Low mast Pole	1	0	0	1
Low mast Fixture	4	0	0	4
Single Arm Pole	165	0	230	395
Double Arm Pole	906	0	743	1649
Underpass Lighting	-	-	-	28

Table 18: Road Signs along Project Road

Description	LHS	RHS	Junctions	Total
Unit	Nos	Nos	Nos	Nos
Overhead Gantry	12	13	2	27
Cantilever Gantry	17	20	6	43
Toll Boards	6	6	-	12
ADS/RAS	5	7	-	12
Rectangular	75	76	9	160
Triangular	121	112	20	253
Circular	77	74	4	155
Octagonal	-	-	7	7
Flag Type	7	4	-	11
Chevron	186	197	-	383
Hazard	111	117	10	238
Route marker	9	3	-	12
Cluster	-	5	5	10
Total	**626**	**634**	**63**	**1323**

The project road has total 12 Nos. of Bus Bays with shelter, 01 Nos. are bus shelters are observed on both sides of Highway the details are presented in **Appendix 6** of this report.

Table 19: Bus Bays with Shelters

Side	Bus Shelter	Bus Bay with Bus Shelter	Total
	Nos	Nos	Nos
LHS	-	4	4
RHS	1	8	9
Total	**1**	**12**	**13**

Solar Blinkers, 60 No's provided. The table below represents the summary of the Solar Blinker and their condition details are presented in **Appendix 6** of this report.

Table 20: Solar Blinkers

Description	Working	Not Working	Total
	Nos	Nos	Nos
Total	**52**	**8**	**60**

3.2 STRUCTURES

List of all Structures found during the inventory surveys along the corridor are as follows:

Table 21: Summary of Structures

S.No	Type of Str	No.of Str's as per CA	No.of Str's as per Site	Remarks
1	ROB	2	2	-
2	MJB	10	10	✓ Major bridge at Ch: 186+000: Widening proposed in separate schedules of Haridwar spur road section, and construction work is in progress at the site. ✓ Major bridge at Ch: 164+100: Additional new bridge proposed on LHS in clause 19 of Schedule-A
3	MNB	11	11	-
4	Flyover	10	5	✓ Flyover at Ch: 187+900 (Unidirectional, RHS) : indicated as 'under construction' in Clause 8.10 of Schedule-A; however, the span arrangements and other structural details have provided in separate schedules of Haridwar spur road section, and construction work has not yet commenced at the site. ✓ 4 No's of flyovers, located at Ch: 163+000, 165+300, 191+760, and 195+400, are proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced and structural details, apart from span arrangements, have not provided in the CA.
5	Elevated Structure	3	3	✓ Elevated structure at Ch: 182+230: indicated as 'under construction' in Clause 8.11 of Schedule-A. However, the span arrangements and other structural details have provided in separate schedules of Haridwar spur road section. The structure is currently under construction at the site.
6	VUP	4	2	✓ VUP at Ch: 141+398: additionally found at site but not mentioned in CA. This structure location considered in CA summary. ✓ VUP at Ch: 183+100: not mentioned in CA, but it is given in separate schedules of Haridwar spur road section and the same has been considered in CA summary.

S.No	Type of Str	No.of Str's as per CA	No.of Str's as per Site	Remarks
				✓ VUP at Ch: 143+740: proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced, and the structural details have provided in the CA.
7	LVUP	8	8	-
8	PUP	21	21	-
9	VOP	1	1	✓ VOP at Ch: 189+250: indicated as 'under construction' in Clause 8.6 of Schedule-A. Construction work is in progress at the site.
10	FOB	7	5	✓ FOB at Ch: 157+150 & 180+650: proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced.
11	BC	41	52	✓ Box culverts 11 No's: additionally found at site but not given CA.
12	PC	13	38	✓ Pipe culverts 25 No's: additional found at site but not given CA.

Table 22: Age of Structures

S.No	Type of Str	LHS		RHS		BHS		Total No's		Total No.of Str's	Remarks
		Old	New	Old	New	Old	New	Old	New		
1	ROB	-	2	-	2	-	-	-	4	4	-
2	MJB	9	2	-	11	-	-	9	13	22	✓ Widening of the Major Bridge at Ch: 186+000 proposed in separate schedules of Haridwar spur road section, and construction work is in progress at the site. This location considered in the summary for maintenance purpose. ✓ Major bridge at Ch: 164+100: Additional new bridge proposed on LHS in clause 19 of Schedule-A. This location considered in the summary for maintenance purpose.
3	MNB	2	11	1	12	-	-	3	23	26	-
4	Flyover	-	9	-	10	-	-	-	19	19	✓ 1 No of flyover (Unidirectional, RHS) at Ch: 187+900 is indicated as 'under construction' in Clause 8.10 of Schedule-A; however, the span arrangements and other structural details have provided in separate schedules of Haridwar spur road section, and construction work has not yet commenced at the site. ✓ 4 No's of flyovers, located at Ch: 163+000, 165+300, 191+760, and 195+400, are proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced and structural details, apart from span arrangements, have not provided in the CA. The above-mentioned structures now considered in the summary for maintenance purpose at these locations.
5	Elevated Structure	-	-	-	1	-	11	-	12	12	✓ 1 No of Elevated structure at Ch: 182+230 is indicated as 'under construction' in Clause 8.11 of Schedule-A. However, the span arrangements and other structural details have provided in separate schedules of Haridwar spur road section. The structure is currently under construction at the site. This location considered in the summary for maintenance purpose.
6	VUP	-	4	-	4	-	-	-	8	8	✓ 1 No of VUP at Ch: 141+398 additional found at site but not mentioned in CA. This structure location considered in CA summary. ✓ 1 No of VUP at Ch: 183+100 not mentioned in CA, but it is given in separate schedules of Haridwar spur road section and the same has been considered in CA summary. ✓ 1 No of VUP at Ch: 143+740 is proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced, and the structural details have provided in the CA. The above-mentioned structures now considered in the summary for maintenance purpose at these locations.
7	LVUP	1	7	-	7	-	-	1	14	15	-
8	PUP	2	19	1	19	-	-	3	38	41	-
9	VOP	-	1	-	-	-	-	-	1	1	✓ 1 No of VOP at Ch: 189+250 is indicated as 'under construction' in Clause 8.6 of Schedule-A. The structure is currently under construction at the site. This location considered in the summary for maintenance purpose.
10	FOB	-	-	-	-	-	7	-	7	7	✓ FOB at Ch: 157+150 & 180+650: proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced. These locations considered in the summary for maintenance purpose-
Total No's		14	55	2	66	0	18	16	139	155	

Table 23: Summary of Expansion Joints & Bearings

S.No	Type of Str	Expansion joints		Bearings								Remarks
				Pot PTFE		Elastomeric		Metallic		Rocker Roller		
		Old	New	Old	New	Old	New	Old	New	Old	New	
1	ROB	-	8	-	52	-	-	-	-	-	-	-
2	MJB	39	78	-	478	24	54	-	-	105	-	✓ Widening of the Major Bridge at Ch: 186+000 proposed in separate schedules of Haridwar spur road section, and construction work is in progress at the site. 8 No's of Expansion Joints and 54 No's of Pot Elastomeric Bearings considered for maintenance purpose at this location. ✓ Major bridge at Ch: 164+100: Additional new bridge proposed on LHS in clause 19 of Schedule-A. 7 No's of Expansion Joints and 48 No's of Pot Elastomeric Bearings considered for maintenance purpose at this location
3	MNB	4	8	-	24	-	-	8	-	-	-	-
4	Flyover	-	138	-	952	-	-	-	-	-	-	✓ 1 No of flyover (Unidirectional, RHS) at Ch: 187+900 is indicated as 'under construction' in Clause 8.10 of Schedule-A; however, the span arrangements and other structural details have provided in separate schedules of Haridwar spur road section, and construction work has not yet commenced at the site. 6 No's of Expansion Joints and 40 No's of Pot PTFE Bearings considered for maintenance purpose at this location. ✓ 4 No's of flyovers, located at Ch: 163+000, 165+300, 191+760, and 195+400, are proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced and structural details, apart from span arrangements, have not provided in the CA. 86 No's of Expansion Joints and 624 No's of Pot PTFE Bearings considered for maintenance purpose at these locations.
5	Elevated Structure	-	58	-	386	-	-	-	-	-	-	✓ 1 No of Elevated structure at Ch: 182+230 is indicated as 'under construction' in Clause 8.11 of Schedule-A. However, the span arrangements and other structural details have provided in separate schedules of Haridwar spur road section. The structure is currently under construction at the site. 8 No's of Expansion Joints and 40 No's of Pot PTFE Bearings considered for maintenance purpose at this location.
6	VUP	-	4	-	16	-	-	-	-	-	-	✓ 1 No of VUP at Ch: 143+740 is proposed under the additional scope in Clause 19 of Schedule-A. . However, construction work has not yet commenced and structural details, apart from span arrangements, have not provided in the CA. 2 No's of Expansion Joints and 16 No's of Pot PTFE Bearings considered for maintenance purpose at this location.
7	VOP	-	5	-	32	-	-	-	-	-	-	✓ 1 No of VOP at Ch: 189+250 is indicated as 'under construction' in Clause 8.6 of Schedule-A. The structure is currently under construction at the site. 5 No's of Expansion Joints and 32 No's of Pot PTFE Bearings considered for maintenance purpose at this location.
Total No's		43	299	0	1940	24	54	8	0	105	0	
		342		1940		78		8		105		
				2131								

Table 24: Summary of Superstructures

S.No	Type of Str	Steel Girder	RCC Girder	Balanced Cantilever	RCC Slab	RCC Box	PSC Girder	Steel Truss	Total No.of Structures	Remarks
1	ROB	4	-	-	-	-	-	-	4	-
2	MJB	11	7	1	1	-	2	-	22	✓ Widening of the Major Bridge at Ch: 186+000 proposed in separate schedules of Haridwar spur road section, and construction work is in progress at the site. This location considered in the summary for maintenance purpose. ✓ Major bridge at Ch: 164+100: Additional new bridge proposed on LHS in clause 19 of Schedule-A. This location considered in the summary for maintenance purpose.
3	MNB	-	6	-	1	19	-	-	26	-
4	Flyover	10	-	-	-	-	9	-	19	✓ 1 No of flyover (Unidirectional, RHS) at Ch: 187+900 is indicated as 'under construction' in Clause 8.10 of Schedule-A; however, the span arrangements and other structural details have provided in separate schedules of Haridwar spur road section, and construction work has not yet commenced at the site. ✓ 4 No's of flyovers, located at Ch: 163+000, 165+300, 191+760, and 195+400, are proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced and structural details, apart from span arrangements, have not provided in the CA. The above-mentioned structures now considered in the summary for maintenance purpose at these locations.
5	Elevated Structure	3	-	-	2	3	4	-	12	✓ 1 No of Elevated structure at Ch: 182+230 is indicated as 'under construction' in Clause 8.11 of Schedule-A. However, the span arrangements and other structural details have provided in separate schedules of Haridwar spur road section. The structure is currently under construction at the site. This location considered in the summary for maintenance purpose.
6	VUP	-	2	-	-	6	-	-	8	✓ 1 No of VUP at Ch: 141+398 additional found at site but not mentioned in CA. ✓ 1 No of VUP at Ch: 183+100 not mentioned in CA, but it is given in separate schedules of Haridwar spur road section. ✓ 1 No of VUP at Ch: 143+740 is proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced, and the structural details have provided in the CA. The above-mentioned structures now considered in the summary for maintenance purpose at these locations.
7	LVUP	-	-	-	1	14	-	-	15	-
8	PUP	-	-	-	1	40	-	-	41	-
9	VOP	-	-	-	-	-	1	-	1	✓ 1 No of VOP at Ch: 189+250 is indicated as 'under construction' in Clause 8.6 of Schedule-A. The structure is currently under construction at the site. This location considered in the summary for maintenance purpose.
10	FOB	-	-	-	-	-	-	7	7	✓ FOB at Ch: 157+150 & 180+650: proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced. These location considered in the summary for maintenance purpose.
Total No's		28	15	1	6	82	16	7	155	

Table 25: Summary of Substructures (Abutment)

S.No	Type of Str	ABUTMENT										Remarks
		Twin circular column type	Three Circular column type	Single circular column type	RCC wall type	Spill Through type	Brick masonry wall type	Single Rectangular column type	Single Circular & Rectangular column type	Single Circular column type	Steel column frame	
1	ROB	2	2	-	-	-	-	-	-	-	-	-
2	MJB	-	-	3	16	2	1	-	-	-	-	✓ Widening of the Major Bridge at Ch: 186+000 proposed in separate schedules of Haridwar spur road section, and construction work is in progress at the site. This location considered in the summary for maintenance purpose. ✓ Major bridge at Ch: 164+100: Additional new bridge proposed on LHS in clause 19 of Schedule-A. This location considered in the summary for maintenance purpose
3	MNB	-	-	-	6	-	1	-	-	-	-	-
4	Flyover	-	-	19	-	-	-	-	-	-	-	✓ 1 No of flyover (Unidirectional, RHS) at Ch: 187+900 is indicated as 'under construction' in Clause 8.10 of Schedule-A; however, the span arrangements and other structural details have provided in separate schedules of Haridwar spur road section, and construction work has not yet commenced at the site. ✓ 4 No's of flyovers, located at Ch: 163+000, 165+300, 191+760, and 195+400, are proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced and structural details, apart from span arrangements, have not provided in the CA. The above-mentioned structures now considered in the summary for maintenance purpose at these locations.
5	Elevated Structure	-	-	2	1	-	-	4	2	-	-	✓ 1 No of Elevated structure at Ch: 182+230 is indicated as 'under construction' in Clause 8.11 of Schedule-A. However, the span arrangements and other structural details have provided in separate schedules of Haridwar spur road section. The structure is currently under construction at the site. This location considered in the summary for maintenance purpose.
6	VUP	-	-	-	-	-	-	-	-	2	-	✓ 1 No of VUP at Ch: 141+398 additional found at site but not mentioned in CA. ✓ 1 No of VUP at Ch: 183+100 not mentioned in CA, but it is given in separate schedules of Haridwar spur road section. ✓ 1 No of VUP at Ch: 143+740 is proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced, and the structural details have provided in the CA. The above-mentioned structures now considered in the summary for maintenance purpose at these locations.
7	LVUP	1	-	-	-	-	-	-	-	-	-	-
8	PUP	-	-	-	-	-	1	-	-	-	-	-
9	VOP	-	-	-	-	-	-	-	-	1	-	✓ 1 No of VOP at Ch: 189+250 is indicated as 'under construction' in Clause 8.6 of Schedule-A. The structure is currently under construction at the site. This location considered in the summary for maintenance purpose.
10	FOB	-	-	-	-	-	-	-	-	-	7	✓ FOB at Ch: 157+150 & 180+650: proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced. These location considered in the summary for maintenance purpose.
Total No's		3	2	24	23	2	3	4	2	3	7	

Table 26: Summary of Substructures (Pier)

S.No	Type of Str	Single circular column type	Twin Circular Column type	Brick masonry wall type	RCC wall type	Single Rectangular column type	Single Circular column type	Steel column frame	Remarks
1	ROB	-	-	-	-	-	-	-	-
2	MJB	18	2	1	1	-	-	-	✓ Widening of the Major Bridge at Ch: 186+000 proposed in separate schedules of Haridwar spur road section, and construction work is in progress at the site. This location considered in the summary for maintenance purpose. ✓ Major bridge at Ch: 164+100: Additional new bridge proposed on LHS in clause 19 of Schedule-A. This location considered in the summary for maintenance purpose
3	MNB	-	-	1	-	-	-	-	-
4	Flyover	17	-	-	-	-	-	-	✓ 1 No of flyover (Unidirectional, RHS) at Ch: 187+900 is indicated as 'under construction' in Clause 8.10 of Schedule-A; however, the span arrangements and other structural details have provided in separate schedules of Haridwar spur road section, and construction work has not yet commenced at the site. ✓ 4 No's of flyovers, located at Ch: 163+000, 165+300, 191+760, and 195+400, are proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced and structural details, apart from span arrangements, have not provided in the CA. The above-mentioned structures now considered in the summary for maintenance purpose at these locations.
5	Elevated Structure	2	-	-	1	4	-	-	✓ 1 No of Elevated structure at Ch: 182+230 is indicated as 'under construction' in Clause 8.11 of Schedule-A. However, the span arrangements and other structural details have provided in separate schedules of Haridwar spur road section. The structure is currently under construction at the site. This location considered in the summary for maintenance purpose.
6	VUP	-	-	-	-	-	-	-	✓ 1 No of VUP at Ch: 141+398 additional found at site but not mentioned in CA. ✓ 1 No of VUP at Ch: 183+100 not mentioned in CA, but it is given in separate schedules of Haridwar spur road section. ✓ 1 No of VUP at Ch: 143+740 is proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced, and the structural details have provided in the CA. The above-mentioned structures now considered in the summary for maintenance purpose at these locations.
7	LVUP	-	1	-	-	-	-	-	-
8	PUP	-	-	-	-	-	-	-	-
9	VOP	-	-	-	-	-	1	-	✓ 1 No of VOP at Ch: 189+250 is indicated as 'under construction' in Clause 8.6 of Schedule-A. The structure is currently under construction at the site. This location considered in the summary for maintenance purpose.
10	FOB	-	-	-	-	-	-	7	✓ FOB at Ch: 157+150 & 180+650: proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced. This location considered in the summary for maintenance purpose.
Total No's		37	3	2	2	4	1	7	

At high level bridges and water flow structures where accessibility is a concern in that locations MBIU Inspection has been carried out at the following locations.

Table 27: Summary of Structures Inspected with MBIU

S.No.	Site Chainage (Km)	Type of Structure	Side	Age of Structure	Span Arrangement (No x Length)	Deck Width (m)
1	164+100	MJB	LHS	Old	3 x 26.8	10.50
2	164+100	MJB	RHS	New	1 x 35 + 1 x 33 + 1 x 32 + 1 x 33 + 1 x 35	13.50
3	167+150	Flyover	RHS	New	1 x 30 + 1 x 40 + 1 x 30	12.00
4	174+345	MJB	LHS	New	7 x 39.425	13.50
5	174+345	MJB	RHS	New	7 x 39.425	13.50
6	181+160	MJB	LHS	Old	1 x 16 + 3 x 41 + 1 x 16	8.50
7	181+160	MJB	RHS	New	1 x 16 + 3 x 41 + 1 x 16	13.50
8	185+400	Flyover	LHS	New	3 x 30	12.00
9	186+000	MJB	LHS	Old	3 x 27	8.50
10	186+000	MJB	RHS	New	3 x 26.8	13.50
11	193+160	MJB	LHS	Old	3 x 22.5	8.50
12	193+160	MJB	RHS	New	4 x 22.5 + 1 x 24	13.50
13	198+650	Flyover	LHS	New	1 x 20 + 2 x 30 + 1 x 20	12.00
14	198+650	Flyover	RHS	New	1 x 20 + 2 x 30 + 1 x 20	12.00
15	199+350	Flyover	LHS	New	1 x 40 + 1 x 30 + 1 x 40 + 1 x 30	12.00
16	199+350	Flyover	RHS	New	1 x 40 + 1 x 30 + 1 x 40 + 1 x 30	12.00
17	201+500	Elevated Structure	RHS	New	2 x 34 + 13 x 30 + 2 x 34	13.50
18	203+945	MJB	LHS	Old	11 x 30	11.00
19	203+945	MJB	RHS	New	1 x 19 + 10 x 30	13.50
20	204+300	MJB	RHS	New	3 x 43.5	13.50
21	204+500	MJB	LHS	Old	3 x 30	11.00
22	204+500	MJB	RHS	New	3 x 30	13.50
23	205+790	MJB	LHS	Old	4 x 30	11.00
24	205+790	MJB	RHS	New	4 x 30	13.50

Sample photos of structures inspected with MBIU:



MJB @ 164+100 - LHS - OLD



MJB @ 164+100 - RHS - NEW



MJB @ 174+345 - LHS - New



MJB @ 181+160 - LHS - OLD



MJB @ 203+945 - LHS - OLD



MJB @ 204+500 - LHS – OLD

The structures at the following locations are indicated as '**under construction**' in various Clauses of Schedule-A mentioned below. However, the span arrangements and other structural details have not provided in CA, and construction work has not yet commenced at the site. The below mentioned details apart from span arrangements are assumed for O&M purpose.

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings	Remarks
											Abutment	Pier			
1	187+900	Flyover	RHS	MCW	New	1 x 30 + 3 x 40 + 1 x 30	11.00	12.00	No	Pile	Single circular column type	Single circular column type	PSC Girder	Pot PTFE	The structure indicated as 'under construction' in Clause 8.10 of Schedule-A; however, the span arrangements and other structural details have not provided, and construction work has not yet commenced at the site.
2	182+230	Elevated Structure	BHS	MCW	New	29 x 30	23.82	24.82	No	NA	RCC wall type	RCC wall type	PSC Girder	Pot PTFE	**The structures** indicated as 'under construction' in Clause 8.11 of Schedule-A. However, the span arrangements and other structural details have not provided. The structure is currently under construction at the site
4	189+250	VOP	LHS	MCW	New	3 x 30 + 1 x 40	10.25	12.00	No	NA	Single Circular column type	Single Circular column type	PSC Girder	Pot PTFE	**The structure** is indicated as 'under construction' in Clause 8.6 of Schedule-A. The structure is currently under construction at the site

Sample Photos of Under Construction Structures



Elevated Str. @ 182+230- Under progress



VOP@ 189+250- Under progress



Flyover @ 187+900: Construction Not Started yet

The structures at the following locations are proposed under the additional scope in Clause 19 of Schedule-A. However, construction work has not yet commenced and structural details, apart from span arrangements, have not provided in the CA. The below mentioned details apart from span arrangements are assumed for O&M purpose.

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
											Abutment	Pier		
1	163+000	Flyover	LHS	MCW	New	22 x 30	11.00	12.00	No	NA	Single circular column type	Single circular column type	PSC Girder	Pot PTFE
2	163+000	Flyover	RHS	MCW	New	22 x 30	11.00	12.00	No	NA	Single circular column type	Single circular column type	PSC Girder	Pot PTFE
3	165+300	Flyover	LHS	MCW	New	13 x 30	11.00	12.00	No	NA	Single circular column type	Single circular column type	PSC Girder	Pot PTFE
4	165+300	Flyover	RHS	MCW	New	13 x 30	11.00	12.00	No	NA	Single circular	Single circular	PSC Girder	Pot PTFE

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
											Abutment	Pier		
											column type	column type		
5	191+760	Flyover	LHS	MCW	New	1 x 30	11.00	12.00	No	NA	Single circular column type	-	PSC Girder	Pot PTFE
6	191+760	Flyover	RHS	MCW	New	1 x 30	11.00	12.00	No	NA	Single circular column type	-	PSC Girder	Pot PTFE
7	195+400	Flyover	LHS	MCW	New	3 x 30	11.00	12.00	No	NA	Single circular column type	Single circular column type	PSC Girder	Pot PTFE
8	195+400	Flyover	RHS	MCW	New	3 x 30	11.00	12.00	No	NA	Single circular column type	Single circular column type	PSC Girder	Pot PTFE
9	143+740	VUP	LHS	MCW	New	1 x 20	9.50	11.00	No	NA	Single circular column type	Single circular column type	RCC Girder	Pot PTFE
10	143+740	VUP	LHS	MCW	New	1 x 20	9.50	11.00	No	NA	Single circular column type	Single circular column type	RCC Girder	Pot PTFE
11	183+100	VUP	LHS	MCW	New	2 x 15	11	12.00	No	RCC Box				-
12	183+100	VUP	LHS	MCW	New	2 x 15	11	12.00	No	RCC Box				-

Sample photo's of structures proposed under additional scope



Flyover @ 163+000



Flyover @165+300



Flyover @ 191+760



Flyover @ 195+400



VUP @ 143+740

4.1 MATERIAL INVESTIGATION INFERENCES

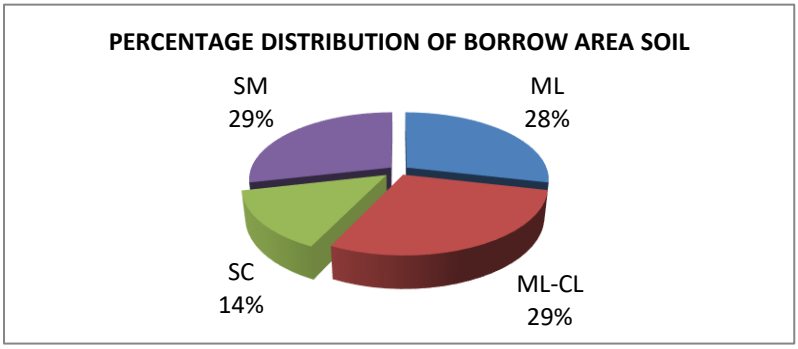
4.1.1 EMBANKMENT & SUBGRADE

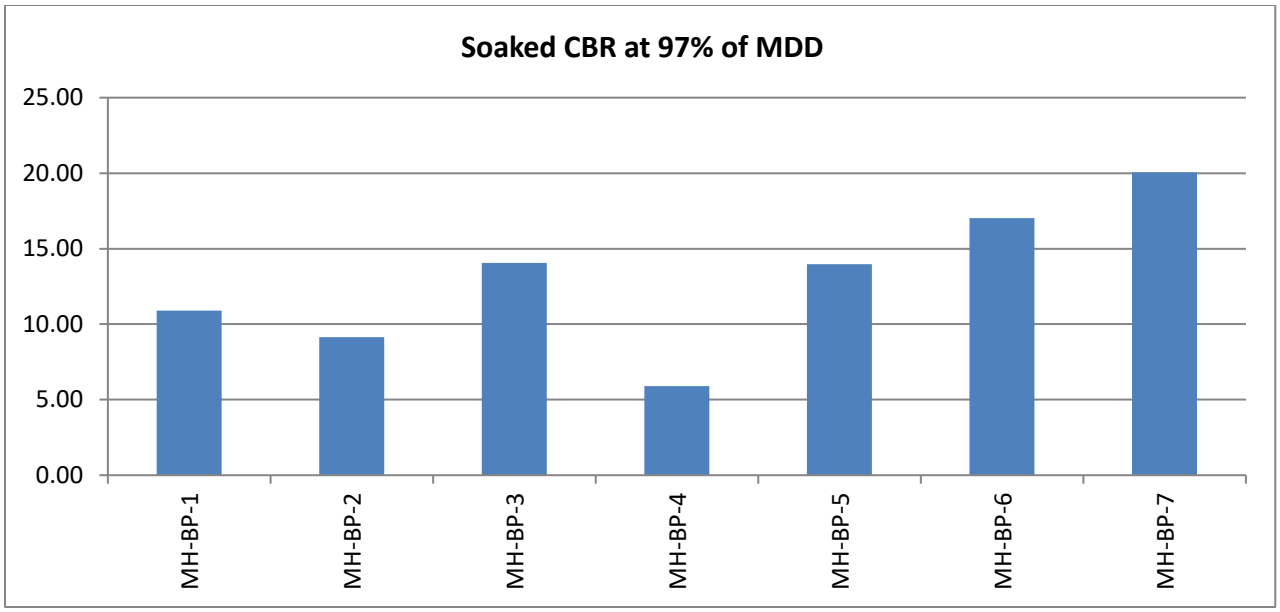
The embankment for project road has been constructed with available soils from nearby areas. The majority of the soil samples appears to be Fine grained type in nature and embankment appears to be in fair condition over the entire length of project. No major settlements or depressions have been noted even at high embankment locations. Out of 7 samples, 2 samples belong to ML type, 2 samples belong to ML-CL type, 2 samples belong to SM type and 1 sample belongs to SC type of soil.

Summary of the test results carried out on these samples are presented in the following tables whilst the complete details are presented as an **Appendix 7** of this report.

Table 28: Test Results of Borrow area Samples

Lab Sample No	Site Identification		Grain Size Analysis					Atterberg Limits (%)			Soil Class	MDD (gm/cc)	OMC (%)	Dry Density at 97% MDD	Soaked CBR 97% MDD	Free Swelling Index (%)
	Location (km)	Up/Dn	Percentage passing from					LL	PL	PI						
			4.75 mm IS Sieve	425 mic IS Sieve	75 mic IS Sieve	Gravel %	Sand %									
MH-BP-1	198+800	RHS	100	98.51	89.39	0	10.61	23	17	6	ML-CL	1.88	13.50	1.82	10.90	10
MH-BP-2	180+700	LHS	99.72	98.08	91.41	0.28	8.31	-	NP	-	ML	1.87	13.60	1.81	9.15	12
MH-BP-3	172+700	RHS	100	98.97	31.66	0	68.34	31	19	12	SC	1.90	12.70	1.84	14.06	19
MH-BP-4	162+900	LHS	99.83	99.26	95.3	0.17	4.53	25	18	7	ML-CL	1.97	12.00	1.91	5.89	10
MH-BP-5	153+700	LHS	100	96.51	48.55	0	51.45	-	NP	-	SM	2.00	11.50	1.94	13.97	10
MH-BP-6	143+750	RHS	100	98.63	48.75	0	51.25	-	NP	-	SM	1.91	10.40	1.85	17.03	0
MH-BP-7	134+800	LHS	100	99.73	66.47	0	33.53	-	NP	-	ML	1.98	9.00	1.92	20.05	0





➢ **SUBGRADE**

The subgrade samples collected from the test pits taken from project road appears to be in fair condition as revealed by test pit investigations. Soil classification has been done according to IS Classification of Soils (ISC) as detailed in IS 1498 - 1978.

Laboratory test results indicate that majority of the Subgrade soil samples collected belongs to Fine Grained Soils. Out of 18 Nos. of samples, 9 No. of samples belongs to ML type, 3 No. of sample belongs to SM type and ML-CL type and 6 No. of samples belongs to SM type of soils.

Pie Chart showing the percentage distribution of soil classification of existing subgrade sample is presented below:

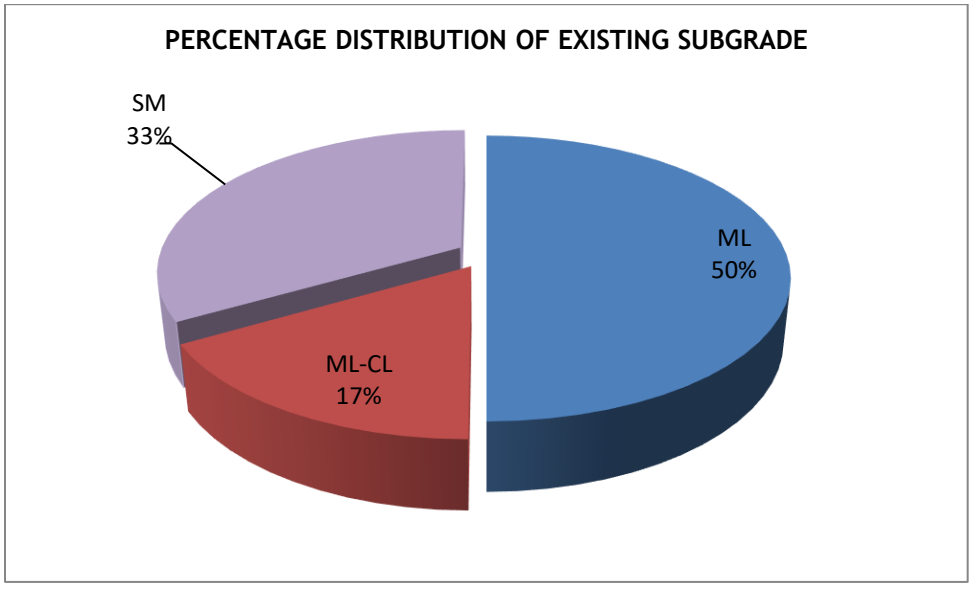
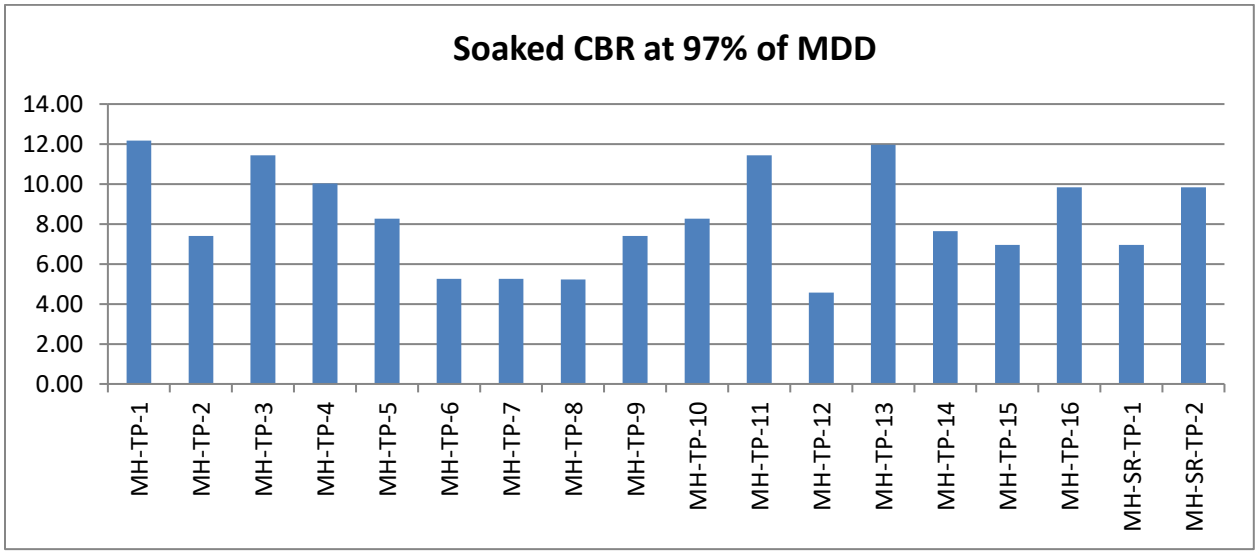


Table 29: Test results of Existing Subgrade Soils

Lab Sample No	Site Identification		Grain Size Analysis					Atterberg Limits (%)			Soil Class	MDD (gm/cc)	OMC (%)	Dry Density at 97% MDD	Final Soaked CBR 97% MDD	Free Swelling Index (%)
	Location (km)	Up/Dn	Percentage passing from					LL	PL	PI						
			4.75 mm IS Sieve	425 mic IS Sieve	75 mic IS Sieve	Gravel %	Sand %									
MH-TP-1	173+300	LHS	90.18	83.93	51.47	9.82	38.71	-	NP	-	ML	2.11	8.50	2.05	12.17	10
MH-TP-2	180+750	LHS	96.60	93.18	77.03	3.40	19.57	-	NP	-	ML	1.98	12.10	1.92	7.40	10
MH-TP-3	191+900	LHS	71.27	54.97	33.50	28.73	37.77	-	NP	-	SM	2.05	9.00	1.99	11.44	10
MH-TP-4	204+760	LHS	87.02	70.16	38.15	12.98	48.87	-	NP	-	SM	2.00	8.60	1.94	10.02	0
MH-TP-5	205+700	RHS	100.00	95.68	42.86	0	57.14	-	NP	-	SM	1.96	9.40	1.90	8.27	10
MH-TP-6	194+700	RHS	98.33	97.71	88.73	1.67	9.60	27	23	4	ML-CL	1.88	11.40	1.82	5.26	14
MH-TP-7	186+850	RHS	99.65	98.85	91.45	0.35	8.20	24	20	4	ML-CL	1.87	13.00	1.81	5.26	10
MH-TP-8	177+200	RHS	100.00	99.62	83.99	0	16.01	-	NP	-	ML	1.97	10.60	1.91	5.23	5
MH-TP-9	166+500	RHS	98.40	97.27	71.36	1.6	27.04	-	NP	-	ML	1.99	11.00	1.93	7.40	0
MH-TP-10	156+400	RHS	95.19	89.67	36.96	4.81	58.23	-	NP	-	SM	1.96	11.50	1.90	8.27	0
MH-TP-11	145+550	RHS	99.79	98.7	41.41	0.21	58.38	-	NP	-	SM	2.04	9.30	1.98	11.44	10
MH-TP-12	136+100	RHS	100.00	98.11	48.99	0	51.01	-	NP	-	SM	1.92	10.40	1.86	4.57	5
MH-TP-13	130+920	LHS	97.92	96.29	93.19	2.08	4.73	22	17	5	ML-CL	1.90	12.20	1.84	11.97	13
MH-TP-14	140+530	LHS	100.00	94.98	50.97	0	49.03	-	NP	-	ML	1.89	7.90	1.83	7.64	10
MH-TP-15	150+200	LHS	99.26	98.13	76.17	0.74	23.09	-	NP	-	ML	1.96	11.20	1.90	6.96	9
MH-TP-16	160+900	LHS	100.00	95.4	53.39	0	46.61	-	NP	-	ML	2.04	9.70	1.98	9.83	10
MH-SR-TP-1	168+170	LHS	98.08	91.1	59.26	1.92	38.82	-	NP	-	ML	1.95	11.10	1.89	6.96	10
MH-SR-TP-2	170+250	RHS	99.85	98.47	66.57	0.15	33.28	-	NP	-	ML	2.01	9.50	1.95	9.83	10



The following observations can be made from the above test results conducted on of existing subgrade samples

- Liquid Limit are in the range of <27%, satisfying LL<50% criteria.
- Plasticity Index are in the range of 15no. of samples are non-plastic and 3 samples having the PI value of 17% to 23%, Satisfying PI<25 criteria.
- Maximum Dry Density for all subgrade samples varies between 1.87 and 2.11 gm/cc. All the samples satisfying MDD criterion (MDD>=1.75 gm/cc).
- OMC for existing subgrade samples varies in between 7.90% to 13.00%.
- Free Swelling Index for existing subgrade samples varies in between 0% to 14%. All samples satisfying the FSI criterion (FSI<=50%)
- CBR Values are varying from 4.57% to 12.17%.

All Subgrade samples are satisfying the MORTH specification criteria.

Material related tests reports are provided in **Appendix-7** of this report.

4.1.2 AGGREGATES

Aggregates collected from the source have been tested for Aggregate Impact Value (AlV), water absorption and specific gravity tests. The Table below represents the test results of the Aggregate and Sand Samples.

Table 30: Test Results of Aggregate Samples Details

S. No	Sample	Location (km)	Up/Dn	Size of Aggregate	A.I.V (%)	Water Absorption (%)	Specific Gravity	Remark
1	MH-AQ-1	192+700	RHS	20 mm	21	0.82	2.61	
2	MH-AQ-2	192+700	RHS	20 mm	19	1.06	2.63	
3	MH-AQ-3	171+600	RHS	20mm	18	0.55	2.63	
				10mm		0.61	2.63	
4	MH-AQ-4	171+600	RHS	20mm	18	0.64	2.62	
				10mm		0.85	2.61	
5	MH-AQ-5	171+600	RHS	20mm	18	0.53	2.62	
				10mm		0.57	2.63	

Note: The above Aggregate samples are satisfying MoRTH requirements i.e., AIV (max. limit is 24% for BC-layer), Water Absorption (max. limit is 2%).

4.1.3 SAND

The test results of the sand samples are as presented below.

Table 31: Test Results of Sand Samples Details

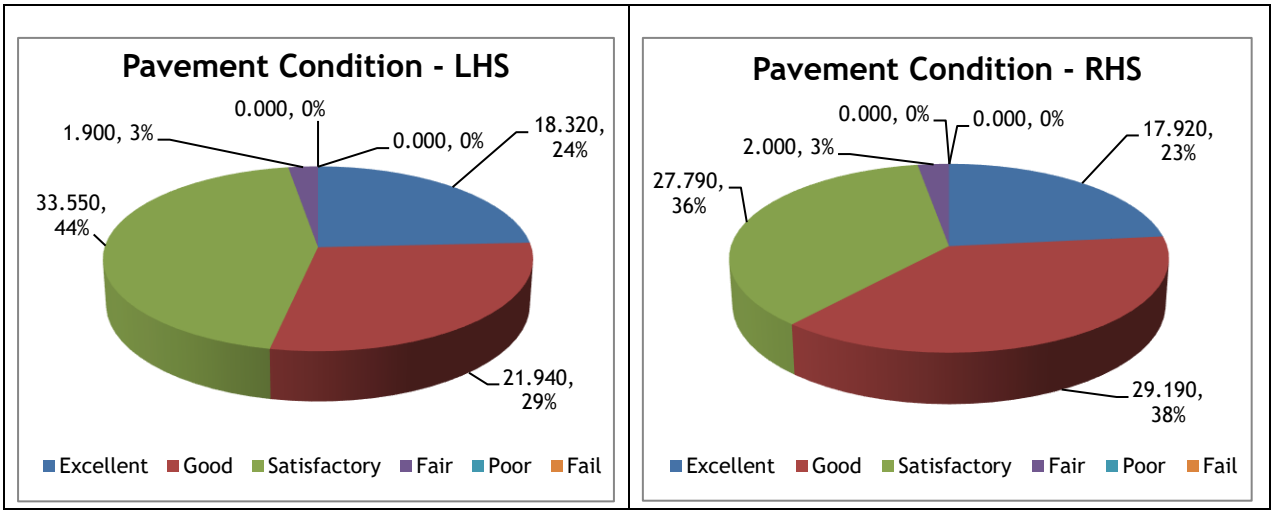
S No	Sample No	CHAINAGE (KM)	SIDE	10 mm Passing %	4.75 mm Passing %	2.36 mm Passing %	1.18mm Passing %	600mic Passing %	300mic Passing %	150mic Passing %	FM	ZONE
1	MH-SQ-1	192+700	RHS	100	91	69	42	27	14	2	3.60	ZONE-I
2	MH-SQ-2	171+600	RHS	100	91	86	78	69	34	3	2.40	ZONE-III
3	MH-SQ-3	171+600	RHS	100	90	80	71	58	27	2	2.73	ZONE-II

4.2 PAVEMENT CONDITION

The distresses in bituminous surface have been captured on Main carriageway for each lane separately by NSV survey. Pavement Condition rating (PCI) as per IRC:82-2023 from the data collected for each km length in each direction has been presented in the **Annexure-2** of this report.

The project corridor has been provided with flexible pavement over entire length including service roads. Rigid pavement is only provided at Toll Plaza. The present surface condition appears to be fair to satisfactory. The type of distresses cracking, patching, Raveling, Rutting are observed at isolated locations. Predominant cracking is noted in the inner lane in both carriageways. Ravelling and delamination of surface layer is also seen along the inner lanes of pavement.

The Pavement condition rating (PCI) is presented in Pie-chart from Excellent to Fail are as below:



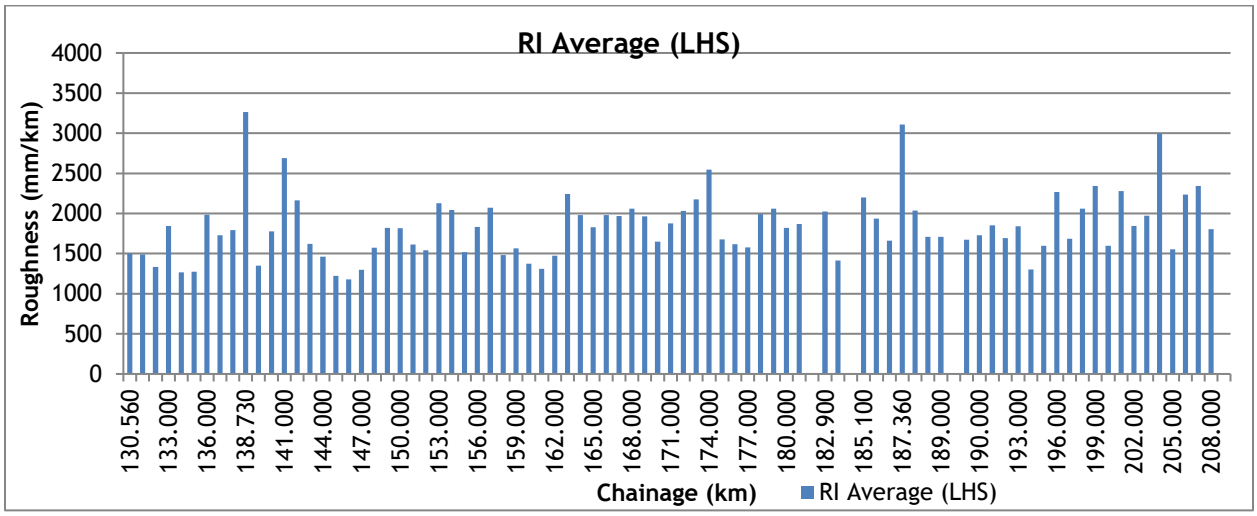
The tabulated data is as presented below:

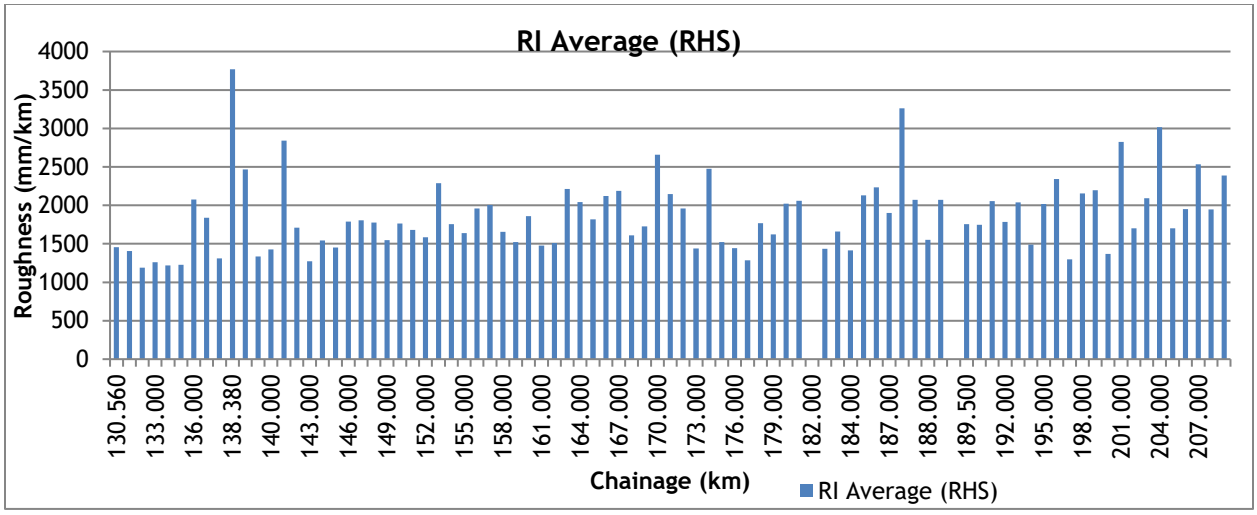
Overall PCI		Rating as per IRC 82	Length (km)	Length (km)
>	<=			
90	100	Excellent	18.320	17.920
80	90	Good	21.940	29.190
60	80	Satisfactory	33.550	27.790
40	60	Fair	1.900	2.000
20	40	Poor	0.000	0.000
0	20	Fail	0.000	0.000
No Data (due to diversions/Toll Plaza/Under construction)			2.850	1.660
Total Length			78.560	78.560

From NSV pavement condition (PCI) analysis, an renewal coat (overlay), is warranted for a length of 35.45 kms in LHS and 29.79 kms in RHS for the rating satisfactory to Fail.

4.3 ROUGHNESS

The Roughness represented in Bar charts are as presented below.





Based on the above, considering the Km-stone reference system the summary of direction-wise km lengths having varying roughness values are as presented below.

>=Roughness (mm/km)	<Roughness (mm/km)	LHS (Km)	RHS (Km)
0	2000	56.350	50.780
2000	2200	9.460	15.690
2200	2400	6.900	4.120
2400		3.560	6.900
Under construction (No data)		2.290	1.070
Total Length		**78.560**	**78.560**

It can be noted from the above that, the 3.56 kms in LHS and 6.90 kms in RHS are having roughness values greater than Schedule-F, specified limit of 2400mm/km and thus warrants for functional overlay. Sections between 2200-2400 range may also require a roughness correction course within short period of time. Thus, it is imperative to consider roughness correction layer for such sections also.

4.4 FWD ANALYSIS

4.4.1 FWD ANALYSIS AND ASSESSMENT OF OVERLAY REQUIREMENT

By looking at the age and condition and performance of the pavement following different set of ranges have been used while finalizing the modulus values:

Layer	Bituminous Layers	Granular Layer Modulus	Subgrade
Modulus Value (MPa)	400-1500 750-3000	100-500	50-75

Range for subgrade is carefully selected after evaluation 4 days soaked CBR of existing subgrade in laboratory. Bituminous layer Moduli obtained from back calculations shall be corrected for a standard pavement temperature of 35ºC using given equations. Whereas, for back calculated moduli values obtained for granular and subgrade layer shall be corrected for seasonal variations (using winter and summer equations). For this FWD results, winter seasonal correction factor is applied for granular and subgrade layer as these tests are performed in winter season (September Month). The design moduli (15^{th} percentile moduli) of in-service layers for each homogenous section are given in table below.

Table 32: Summary of Design Moduli of different layers - LHS CW

S.No	Side	From	To	Length (Km)	15th Percentile MR values		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)
1	LHS	130.56	132.80	2.24	1551	384	64
2	LHS	132.80	135.60	2.80	1545	391	64
3	LHS	135.60	138.73	3.13	1512	376	64
4	LHS	138.73	139.01	0.28			Toll Plaza
5	LHS	139.01	140.80	1.79	1533	369	64
6	LHS	140.80	143.60	2.80	1507	313	64
7	LHS	143.60	146.20	2.60	2984	390	64

S.No	Side	From	To	Length (Km)	15th Percentile MR values		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)
8	LHS	146.20	148.40	2.20	2908	387	64
9	LHS	148.40	151.00	2.60	2511	354	64
10	LHS	151.00	153.20	2.20	1433	282	64
11	LHS	153.20	155.40	2.20	1449	357	64
12	LHS	155.40	158.20	2.80	1430	390	64
13	LHS	158.20	160.60	2.40	1475	376	64
14	LHS	160.60	162.80	2.20	1506	364	64
15	LHS	162.80	164.40	1.60	1585	387	64
16	LHS	164.40	167.30	2.90	1584	390	64
17	LHS	167.30	170.00	2.70	932	113	64
18	LHS	170.00	173.00	3.00	1513	147	64
19	LHS	173.00	174.80	1.80	1452	198	64
20	LHS	174.80	177.60	2.80	708	76	64
21	LHS	177.60	180.30	2.70	488	156	64
22	LHS	180.30	182.90	2.60	1761	393	64
23	LHS	182.90	185.10	2.20	1744	390	64
24	LHS	185.10	187.36	2.26	524	344	64
25	LHS	187.36	187.64	0.28			Toll Plaza
26	LHS	187.64	189.90	2.26	1582	390	64
27	LHS	189.90	192.40	2.50	1635	385	64
28	LHS	192.40	195.40	3.00	1659	393	64
29	LHS	195.40	197.00	1.60	1383	233	64
30	LHS	197.00	198.40	1.40	1424	131	64
31	LHS	198.40	199.90	1.50	1017	121	64
32	LHS	199.90	201.60	1.70	1511	341	64
33	LHS	201.60	203.88	2.28	1613	200	64
34	LHS	203.88	204.21	0.33			Structure
35	LHS	204.21	206.52	2.31	1470	386	64
36	LHS	206.52	208.45	1.93			
37	LHS	208.45	209.12	0.67			
Total length				78.560			

Table 33: Summary of Design Moduli of different layers – RHS CW

S.No	Side	From	To	Length (Km)	15th Percentile MR values		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)
1	RHS	130.56	132.60	2.04	1416	342	64
2	RHS	132.60	135.00	2.40	1457	265	64
3	RHS	135.00	138.38	3.38	1459	386	64
4	RHS	138.38	138.69	0.31			Toll Plaza
5	RHS	138.69	140.60	1.91	1449	390	64
6	RHS	140.60	143.60	3.00	1399	384	64
7	RHS	143.60	147.00	3.40	2747	391	64
8	RHS	147.00	151.00	4.00	2731	392	64
9	RHS	151.00	153.00	2.00	1332	384	64
10	RHS	153.00	155.60	2.60	1381	391	64
11	RHS	155.60	158.00	2.40	1389	389	64
12	RHS	158.00	160.00	2.00	1366	392	64
13	RHS	160.00	161.80	1.80	1349	385	64
14	RHS	161.80	164.40	2.60	1446	388	64
15	RHS	164.40	167.30	2.90	1480	384	64

S.No	Side	From	To	Length (Km)	15th Percentile MR values		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)
16	RHS	167.30	170.60	3.30	1417	139	64
17	RHS	170.60	173.60	3.00	1432	150	64
18	RHS	173.60	177.00	3.40	1363	157	64
19	RHS	177.00	180.30	3.30	1172	105	64
20	RHS	180.30	182.90	2.60	1493	372	64
21	RHS	182.90	187.36	4.46	1544	368	64
22	RHS	187.36	187.64	0.28			Toll Plaza
23	RHS	187.64	189.90	2.26	1564	390	64
24	RHS	189.90	192.40	2.50	1563	384	64
25	RHS	192.40	193.90	1.50	1449	377	64
26	RHS	193.90	195.40	1.50	1480	393	64
27	RHS	195.40	196.90	1.50	1379	117	64
28	RHS	196.90	198.60	1.70	1490	301	64
29	RHS	198.60	201.38	2.78	1510	390	64
30	RHS	201.38	201.88	0.50			Structure
31	RHS	201.88	203.88	2.00	1448	153	64
32	RHS	203.88	204.21	0.33			Structure
33	RHS	204.21	206.52	2.31	1481	388	64
34	RHS	206.52	208.45	1.93			
35	RHS	208.45	209.12	0.67			
Total length				78.560			

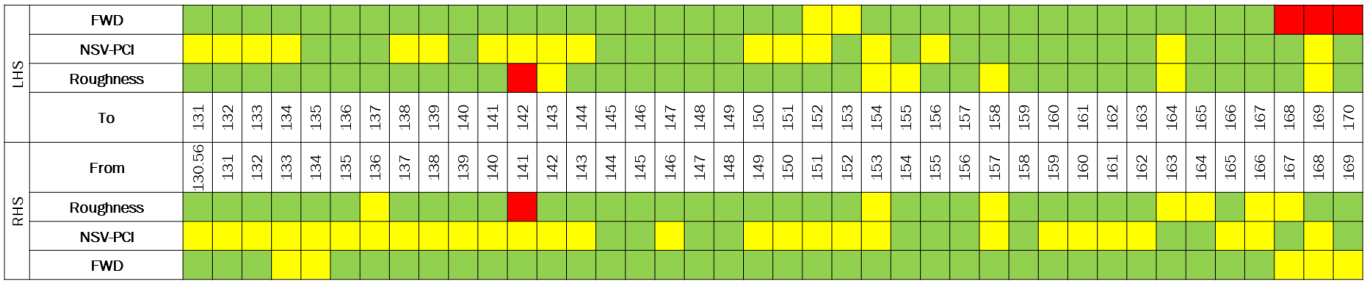
Observations on FWD Results

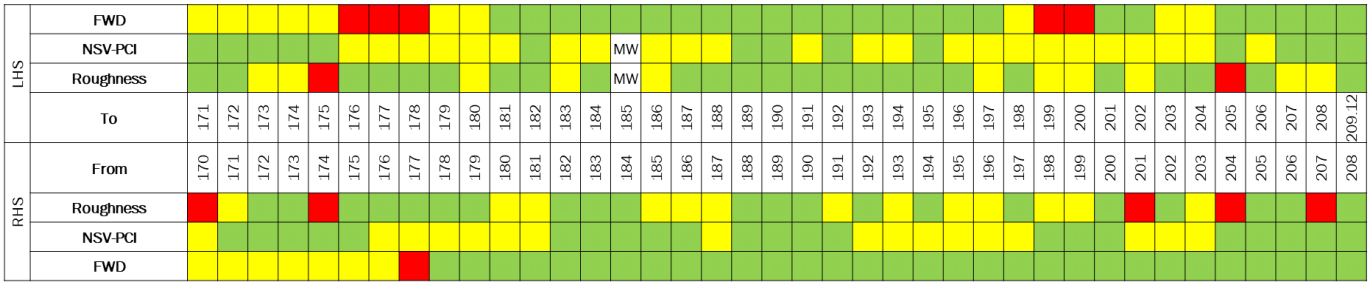
It can be noticed from the above table that the layer moduli for the three layers are varying along the length and direction. The MR value for BT layer is 2984 MPa to 488 MPa in LHS Carriageway & 2747 MPa to 1172 MPa in RHS Carriageway. The MR value for Granular Layers is above 300 for majority of length except for few sections where it is less than 200 varying between 393 MPa to 76 MPa in LHS Carriageway & 393 MPa to 105 MPa in RHS Carriageway. Similarly, the MR value for Subgrade Layer is 64Mpa in both LHS and RHS Carriageways.

4.5 PAVEMENT RATING CHART

Pavement is rated for Roughness/PCI/FWD as good, fair and poor based on the following criteria along with strip-chart is presented as below:

Condition		FWD	Roughness	PCI
	Poor	OL Thick of 90mm and above	>2400 mm/Km	0 > PCI ≤ 40
	Fair	OL Thick of 50 mm	2000 - 2400 mm/Km	40 > PCI ≤ 80
	Good	No Overlay	≤ 2000 mm/Km	80 > PCI ≤ 100





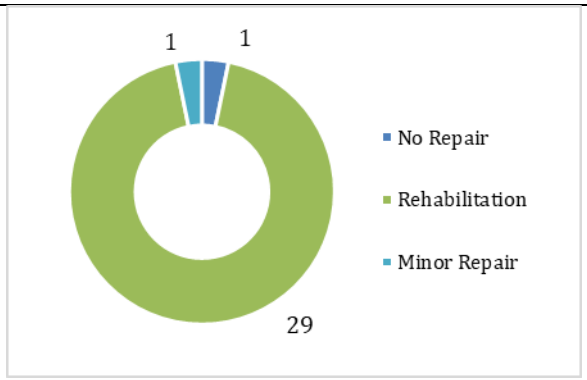
Note: Milling work (MW) under progress at Km. 184.000 to Km. 185.000

4.6 STRUCTURES

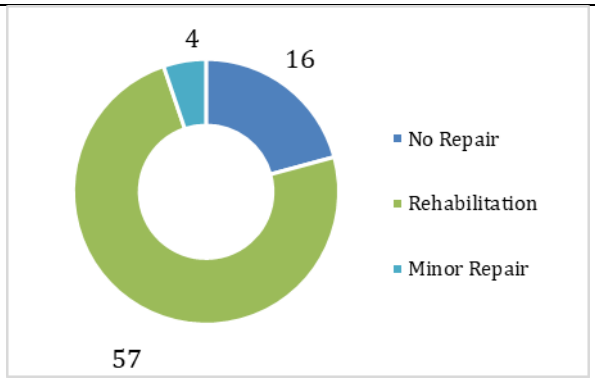
Inventory and asset condition of all the existing structures falling within project road have been verified as per IRC: SP-35 procedures and guidelines with following field surveys

- Inventory of existing highway bridges / structures
- Visual condition survey of existing highway bridges / structures
- MBIU investigation at inaccessible structures

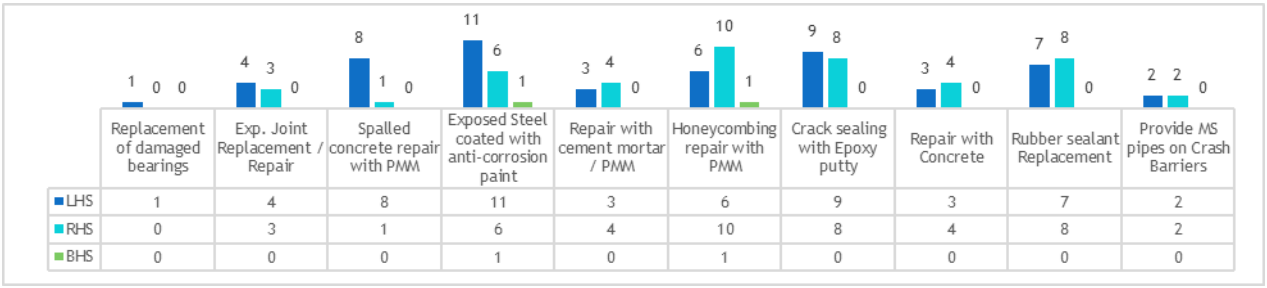
Each and every structure has been verified at site and detailed inventory and condition survey is presented in **Appendix-8** of this report.



Maintenance of major structures (Length >60m)

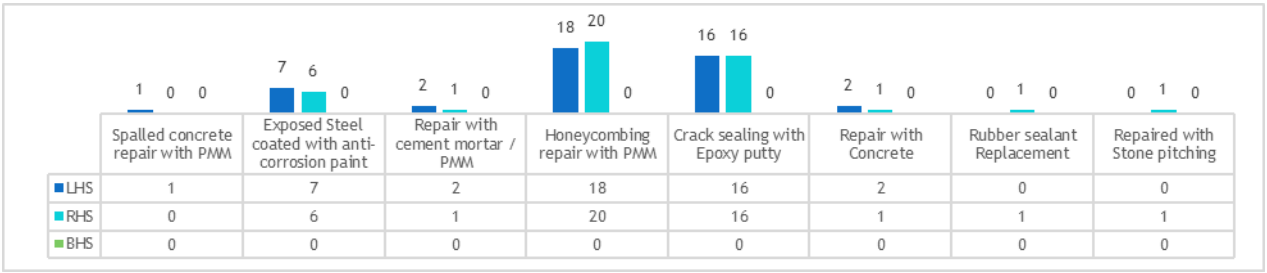


Maintenance of minor structures (Length <60m)



	Replacement of damaged bearings	Exp. Joint Replacement / Repair	Spalled concrete repair with PMM	Exposed Steel coated with anti-corrosion paint	Repair with cement mortar / PMM	Honeycombing repair with PMM	Crack sealing with Epoxy putty	Repair with Concrete	Rubber sealant Replacement	Provide MS pipes on Crash Barriers
LHS	1	4	8	11	3	6	9	3	7	2
RHS	0	3	1	6	4	10	8	4	8	2
BHS	0	0	0	1	0	1	0	0	0	0

Maintenance of major structures (Length >60m)



	Spalled concrete repair with PMM	Exposed Steel coated with anti-corrosion paint	Repair with cement mortar / PMM	Honeycombing repair with PMM	Crack sealing with Epoxy putty	Repair with Concrete	Rubber sealant Replacement	Repaired with Stone pitching
LHS	1	7	2	18	16	2	0	0
RHS	0	6	1	20	16	1	1	1
BHS	0	0	0	0	0	0	0	0

Maintenance of minor structures (Length <60m)

Overall condition of few of the major structures are presented on sample basis of below. However, each and every structure detail are presented in **Appendix-8** of this report.

Chainage: 172+380
General Description
LHS MCW (New)

- Type of Structure : ROB
- Span Arrangement : 1 x 28 m
- Total length of Structure : 28 m
- Total deck width of Structure : 13.5 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : Twin circular column type
- Type of Superstructure : Steel Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash barrier cum MS railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Cracks observed on the Abutment A2 column.
> Honeycombing observed on the Dirt wall at A1.
> Wide gap observed between the RE panels behind Abutment A1&A2.
> Vegetation growth observed on the RE wall.
> Settlement of the crash barrier observed at approach slab locations.






Chainage: 196+500
General Description
RHS MCW (New)

- Type of Structure : ROB
- Span Arrangement : 1 x 40 m
- Total length of Structure : 40 m
- Total deck width of Structure : 13.5 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : Three Circular column type
- Type of Superstructure : Steel Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash barrier cum MS railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Rubber sealant damaged at Expansion Joint-2.
> Honeycombing observed on the soffit of the slab at cantilever portion.
> Reinforcement exposure observed on the soffit of the slab at A2.






Chainage: 164+100
General Description
LHS MCW (Old)

- Type of Structure : MJB
- Span Arrangement : 3 x 26.8 m
- Total length of Structure : 80.4 m
- Total deck width of Structure : 10.5 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : Single circular column type
- Type of Superstructure : RCC Girder
- Type of Bearing : Rocker Roller
- Type of Railing / Crash Barrier : MS railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Spalling and Reinforcement exposure observed on the cantilever slab supporting beam in span-1 2 & 3.
> Leaching observed on the soffit of the deck slab in span-1 & 3.
> Cracks and leaching observed on the end cross girders at P2 in span-2.
> Reinforcement exposure observed on the intermediate cross girder in span-2.
> Delamination observed on the end cross girder at A2 in span-3.
> Pedestal damaged at Abutment A1.
> Expansion Joint damaged at EJ-1 & 2.
> Expansion Joint EJ-3 & 4 buried under wearing course.
> Cracks observed on the cantilever supporting stay members in span-1 & 3.






Chainage: 193+160
General Description
RHS MCW (New)

- Type of Structure : MJB
- Span Arrangement : 4 x 22.5 + 1 x 24 m
- Total length of Structure : 115 m
- Total deck width of Structure : 13.5 m
- Type of Foundation : Well
- Type of Substructure (Abutment & Pier) : RCC wall type & Single circular column type
- Type of Superstructure : Steel Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash barrier cum MS railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Expansion Joint damaged at EJ-6
> Rubber sealant damaged at Expansion Joint-2 & 3.
> Concrete edge beam damaged at Expansion Joint-2 & 5.
> Honeycombing observed on the Dirt wall at A1.






Chainage: 204+300
General Description
LHS MCW (Old)

- Type of Structure : MJB
- Span Arrangement : 2 x 65 m
- Total length of Structure : 130 m
- Total deck width of Structure : 11 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : RCC wall type
- Type of Superstructure : RCC Girder
- Type of Bearing : Rocker Roller
- Type of Railing / Crash Barrier : MS railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Spalling and Reinforcement exposure observed on the end cross girder at A1.
> Spalling and Reinforcement exposure observed on the end main girders in span-1 and span-2.
> Drainage spouts down take pipes damaged due to corrosion.
> Expansion Joint damaged at EJ-1.
> Rubber sealant damaged at Expansion Joint-2.






Chainage: 133+340
General Description
LHS MCW (Old)

- Type of Structure : MNB
- Span Arrangement : 2 x 7.8 m
- Total length of Structure : 15.6 m
- Total deck width of Structure : 8.5 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : Brick masonry wall type
- Type of Superstructure : RCC Slab
- Type of Bearing : Not Applicable
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Spalling and Reinforcement exposure on the soffit of the slab in span-1 & 2.
> Concrete portion damage and Reinforcement exposure observed on the face of the slab.
> Pointing damaged on the brick masonry Abutments and Pier.
> Tilting of the brick masonry guide wall observed at A1.
> Brick masonry return wall damaged at Abutment A1.
> Vegetation growth observed on the Abutments and Pier.






Chainage: 167+150
General Description
LHS MCW (New)

- Type of Structure : Flyover
- Span Arrangement : 1 x 30 + 1 x 40 + 1 x 30 m
- Total length of Structure : 100 m
- Total deck width of Structure : 12 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : Single circular column type
- Type of Superstructure : Steel Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Rubber sealant damaged at Expansion Joint -1.
> Slight bulging of RE wall observed near Abutment A1.
> Cracks observed on the RE panels (around 10 No's) near coping on A1 side.
> Honeycombing and Reinforcement exposure observed on the soffit of the deck slab in span-2.
> Cracks observed on the Pier P1 cap.
> Settlement of the crash barrier observed at approach slab locations.
> MS Pipe over crash barrier is missing.






Chainage: 207+150 (Part1 out 10 parts)
General Description
BHS MCW (New)

- Type of Structure : Elevated Structure
- Span Arrangement : 18 x 30 m
- Total length of Structure : 540 m
- Total deck width of Structure : 23.75 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : Single Rectangular column type
- Type of Superstructure : PSC Girder
- Type of Bearing : Not Applicable
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Reinforcement exposure observed on the soffit of the deck slab plank in span-1.
> Honeycombing observed on the intermediate cross girder in span-3.






Chainage: 141+398
General Description
LHS MCW (New)

- Type of Structure : VUP
- Span Arrangement : 1 x 12 m
- Total length of Structure : 12 m
- Total deck width of Structure : 11 m
- Type of Superstructure : RCC Box
- Type of Bearing : Not Applicable
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Cracks observed on the soffit of the slab.
> Slight bulging of RE wall observed on A1 &A2 side.









Chainage: 171+450
General Description
LHS MCW (New)

- Type of Structure : VUP
- Span Arrangement : 2 x 10 m
- Total length of Structure : 20 m
- Total deck width of Structure : 12 m
- Type of Superstructure : RCC Box
- Type of Bearing : Not Applicable
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Cracks observed on the soffit of the slab in span-1 & span-2.
> Cracks observed on the sidewall A2 & intermediate wall in span-2.
> Reinforcement exposure observed on the intermediate wall in span-2.
> PVC down take pipes not provided for drainage spouts.






Chainage: 141+620
General Description
LHS MCW (New)

- Type of Structure : LVUP
- Span Arrangement : 1 x 7 m
- Total length of Structure : 7 m
- Total deck width of Structure : 12 m
- Type of Superstructure : RCC Box
- Type of Bearing : Not Applicable
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Soil nailing done on the RE Wall at A1 & A2.
> Cracks observed on the soffit of the deck slab.









Chainage: 147+120
General Description
LHS MCW (New)

- Type of Structure : PUP
- Span Arrangement : 1 x 7 m
- Total length of Structure : 7 m
- Total deck width of Structure : 11 m
- Type of Superstructure : RCC Box
- Type of Bearing : Not Applicable
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Honeycombing observed on the sidewall A1.
> Cracks observed on side walls A1 & A2.









Chainage: 136+950
General Description
BHS MCW (New)

- Type of Structure : FOB
- Span Arrangement : 2 x 20 m
- Total length of Structure : 40 m
- Total deck width of Structure : 3.2 m
- Type of Foundation : Open
- Type of Substructure (Abutment & Pier) : Steel column frame
- Type of Superstructure : Steel Truss
- Type of Bearing : Not Applicable
- Type of Railing / Crash Barrier : MS railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Concrete pedestal damaged.
> Corrosion / Rusting observed on all steel components like Truss, columns, bracings and staircase. Painting needs to be done.









Table 34:Details of ROB's

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
											Abutment	Pier		
1	172+380	ROB	LHS	MCW	New	1 x 28	10.50	13.50	No	Not visible	Twin circular column type	-	Steel Girder	Pot PTFE
2	172+380	ROB	RHS	MCW	New	1 x 28	10.50	13.50	No	Not visible	Twin circular column type	-	Steel Girder	Pot PTFE
3	196+500	ROB	LHS	MCW	New	1 x 40	10.50	13.50	Yes	Not visible	Three Circular column type	-	Steel Girder	Pot PTFE
4	196+500	ROB	RHS	MCW	New	1 x 40	10.50	13.50	Yes	Not visible	Three Circular column type	-	Steel Girder	Pot PTFE

Table 35 Details of Major Bridges

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
											Abutment	Pier		
1	164+100	MJB	LHS	MCW	Old	3 x 26.8	7.50	10.50	No	Not visible	Single circular column type	Single circular column type	RCC Girder	Rocker Roller
2	164+100	MJB	RHS	MCW	New	1 x 35 + 1 x 33 + 1 x 32 + 1 x 33 + 1 x 35	10.50	13.50	No	Not visible	Single circular column type	Single circular column type	Steel Girder	Pot PTFE
3	174+345	MJB	LHS	MCW	New	7 x 39.425	10.50	13.50	No	Well	RCC wall type	Single circular column type	Steel Girder	Pot PTFE
4	174+345	MJB	RHS	MCW	New	7 x 39.425	10.50	13.50	No	Well	RCC wall type	Single circular column type	Steel Girder	Pot PTFE
5	181+160	MJB	LHS	MCW	Old	1 x 16 + 3 x 41 + 1 x 16	7.50	8.50	No	Not visible	RCC wall type	Twin Circular Column type	Balanced Cantilever	Rocker Roller
6	181+160	MJB	RHS	MCW	New	1 x 16 + 3 x 41 + 1 x 16	10.50	13.50	No	Not visible	RCC wall type	Single circular column type	Steel Girder	Pot PTFE
7	186+000	MJB	LHS	MCW	Old	3 x 27	7.50	8.50	No	Pile	Spill Through type	Single circular column type	RCC Girder	Elastomeric
8	186+000	MJB	RHS	MCW	New	3 x 26.8	10.50	13.50	No	Well	RCC wall type	Single circular column type	Steel Girder	Pot PTFE

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
											Abutment	Pier		
9	193+160	MJB	LHS	MCW	Old	3 x 22.5	7.50	8.50	No	Well	Brick masonry wall type	Brick masonry wall type	RCC Girder	Elastomeric
10	193+160	MJB	RHS	MCW	New	4 x 22.5 + 1 x 24	10.50	13.50	No	Well	RCC wall type	Single circular column type	Steel Girder	Pot PTFE
11	201+580	MJB	LHS	MCW	Old	17 x 8	7.50	11.00	No	Not visible	RCC wall type	Twin Circular Column type	RCC Slab	-
12	203+945	MJB	LHS	MCW	Old	11 x 30	7.50	11.00	No	Not visible	Spill Through type	Single circular column type	RCC Girder	Rocker Roller
13	203+945	MJB	RHS	MCW	New	1 x 19 + 10 x 30	10.50	13.50	No	Well	RCC wall type	Single circular column type	Steel Girder	Pot PTFE
14	204+300	MJB	LHS	MCW	Old	2 x 65	7.50	11.00	No	Not visible	RCC wall type	RCC wall type	RCC Girder	Rocker Roller
15	204+300	MJB	RHS	MCW	New	3 x 43.5	10.50	13.50	No	Not visible	RCC wall type	Single circular column type	Steel Girder	Pot PTFE
16	204+500	MJB	LHS	MCW	Old	3 x 30	7.50	11.00	No	Not visible	RCC wall type	Single circular column type	RCC Girder	Rocker Roller
17	204+500	MJB	RHS	MCW	New	3 x 30	10.50	13.50	No	Well	RCC wall type	Single circular column type	Steel Girder	Pot PTFE
18	205+790	MJB	LHS	MCW	Old	4 x 30	7.50	11.00	No	Well	RCC wall type	Single circular column type	RCC Girder	Rocker Roller
19	205+790	MJB	RHS	MCW	New	4 x 30	10.50	13.50	No	Well	RCC wall type	Single circular column type	Steel Girder	Pot PTFE

Table 36 Details of Minor Bridges

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
											Abutment	Pier		
1	133+340	MNB	LHS	MCW	Old	2 x 7.8	7.50	8.50	No	Not visible	Brick masonry wall type	Brick masonry wall type	RCC Slab	-
2	133+340	MNB	RHS	MCW	New	2 x 7.8	9.50	12.50	No	-	-	-	RCC Box	-
3	142+400	MNB	LHS	MCW	New	2 x 6.5	9.00	12.50	Yes	-	-	-	RCC Box	-

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
											Abutment	Pier		
4	142+400	MNB	RHS	MCW	New	2 x 6.5	9.00	12.50	Yes	-	-	-	RCC Box	-
5	144+190	MNB	LHS	MCW	New	1 x 10 + 1 x 5	9.00	11.25	Yes	-	-	-	RCC Box	-
6	144+190	MNB	RHS	MCW	New	1 x 10 + 1 x 5	9.00	11.25	Yes	-	-	-	RCC Box	-
7	146+260	MNB	LHS	MCW	New	1 x 10 + 1 x 5	9.00	11.25	Yes	-	-	-	RCC Box	-
8	146+260	MNB	RHS	MCW	New	1 x 10 + 1 x 5	9.00	10.25	Yes	-	-	-	RCC Box	-
9	148+260	MNB	LHS	MCW	New	1 x 6.5	9.00	11.25	Yes	-	-	-	RCC Box	-
10	148+260	MNB	RHS	MCW	New	1 x 6.5	9.00	10.25	Yes	-	-	-	RCC Box	-
11	153+420	MNB	LHS	MCW	New	2 x 9	9.00	11.00	Yes	-	-	-	RCC Box	-
12	153+420	MNB	RHS	MCW	New	2 x 9	9.00	11.00	Yes	-	-	-	RCC Box	-
13	164+500	MNB	LHS	MCW	New	1 x 6.0	9.00	19.00	Yes	-	-	-	RCC Box	-
14	164+500	MNB	RHS	MCW	New	1 x 6.0	9.00	19.00	Yes	-	-	-	RCC Box	-
15	170+350	MNB	LHS	SR	New	1 x 17	5.00	6.00	Yes	Not visible	RCC wall type	-	RCC Girder	Pot PTFE
16	170+350	MNB	LHS	MCW	New	1 x 17	10.50	11.50	Yes	Not visible	RCC wall type	-	RCC Girder	Pot PTFE
17	170+350	MNB	RHS	MCW	New	1 x 17	10.50	11.50	Yes	Not visible	RCC wall type	-	RCC Girder	Pot PTFE
18	170+350	MNB	RHS	SR	New	1 x 17	5.00	6.00	Yes	Not visible	RCC wall type	-	RCC Girder	Pot PTFE
19	176+245	MNB	LHS	MCW	New	1 x 10	9.00	12.00	Yes	-	-	-	RCC Box	-
20	176+245	MNB	RHS	MCW	New	1 x 10	9.00	12.00	Yes	-	-	-	RCC Box	-
21	199+240	MNB	LHS	SR	New	1 x 7	5.50	6.00	No	-	-	-	RCC Box	-
22	199+240	MNB	LHS	MCW	New	1 x 7	11.00	14.00	No	-	-	-	RCC Box	-
23	199+240	MNB	RHS	MCW	New	1 x 7	11.00	14.00	No	-	-	-	RCC Box	-
24	199+240	MNB	RHS	SR	New	1 x 7	5.50	6.00	No	-	-	-	RCC Box	-
25	199+400	MNB	LHS	SR	Old	1 x 29.3	8.00	9.00	No	Not visible	RCC wall type	-	RCC Girder	Metallic
26	199+400	MNB	RHS	SR	Old	1 x 29.3	8.00	9.00	No	Not visible	RCC wall type	-	RCC Girder	Metallic

Table 37 Details of Flyover

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
											Abutment	Pier		
1	167+150	Flyover	LHS	MCW	New	1 x 30 + 1 x 40 + 1 x 30	11.00	12.00	No	Not visible	Single circular column type	Single circular column type	Steel Girder	Pot PTFE
2	167+150	Flyover	RHS	MCW	New	1 x 30 + 1 x 40 + 1 x 30	11.00	12.00	No	Not visible	Single circular column type	Single circular column type	Steel Girder	Pot PTFE
3	185+400	Flyover	LHS	MCW	New	3 x 30	11.00	12.00	No	Not visible	Single circular column type	Single circular column type	Steel Girder	Pot PTFE
4	185+400	Flyover	RHS	MCW	New	3 x 30	11.00	12.00	No	Not visible	Single circular column type	Single circular column type	Steel Girder	Pot PTFE

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
											Abutment	Pier		
5	198+650	Flyover	LHS	MCW	New	1 x 20 + 2 x 30 + 1 x 20	11.00	12.00	No	Not visible	Single circular column type	Single circular column type	Steel Girder	Pot PTFE
6	198+650	Flyover	RHS	MCW	New	1 x 20 + 2 x 30 + 1 x 20	11.00	12.00	No	Not visible	Single circular column type	Single circular column type	Steel Girder	Pot PTFE
7	199+350	Flyover	LHS	MCW	New	1 x 40 + 1 x 30 + 1 x 40 + 1 x 30	11.00	12.00	No	Not visible	Single circular column type	Single circular column type	Steel Girder	Pot PTFE
8	199+350	Flyover	RHS	MCW	New	1 x 40 + 1 x 30 + 1 x 40 + 1 x 30	11.00	12.00	No	Not visible	Single circular column type	Single circular column type	Steel Girder	Pot PTFE
9	202+500	Flyover	LHS	MCW	New	1 x 20 + 2 x 30 + 1 x 20	11.00	12.00	No	Not visible	Single circular column type	Single circular column type	Steel Girder	Pot PTFE
10	202+500	Flyover	RHS	MCW	New	1 x 20 + 2 x 30 + 1 x 20	11.00	12.00	No	Not visible	Single circular column type	Single circular column type	Steel Girder	Pot PTFE

Table 38 Details of Elevated Structure's.

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
											Abutment	Pier		
1	201+500	Elevated Structure	RHS	MCW	New	2 x 34 + 13 x 30 + 2 x 34	10.50	13.50	No	Not visible	Single circular column type	Single circular column type	PSC Girder	Pot PTFE
2	207+350	Elevated Structure	BHS	MCW	New	18 x 30	22.00	23.75	No	Not visible	Single Rectangular column type	Single Rectangular column type	PSC Girder	-
3	207+350	Elevated Structure	BHS	MCW	New	2 x 8.3	22.00	23.75	No	-	-	-	RCC Box	-
4	207+350	Elevated Structure	BHS	MCW	New	4 x 30	22.00	23.75	No	Not visible	Single Rectangular column type	Single Rectangular column type	Steel Girder	Pot PTFE
5	207+350	Elevated Structure	BHS	MCW	New	1 x 10	22.00	23.75	No	Not visible	Single Circular & Rectangular column type	-	RCC Slab	-
6	207+350	Elevated Structure	BHS	MCW	New	1 x 19 + 2 x 30 + 1 x 19	22.00	23.75	No	Not visible	Single circular column type	Single circular column type	Steel Girder	Pot PTFE
7	207+350	Elevated Structure	BHS	MCW	New	1 x 10	22.00	23.75	No	Not visible	Single Circular & Rectangular column type	-	RCC Slab	-
8	207+350	Elevated Structure	BHS	MCW	New	3 x 30	22.00	23.75	No	Not visible	Single Rectangular	Single Rectangular	Steel Girder	Pot PTFE

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
											Abutment	Pier		
											column type	column type		
9	207+350	Elevated Structure	BHS	MCW	New	2 x 8.3	22.00	23.75	No	-	-	-	RCC Box	-
10	207+350	Elevated Structure	BHS	MCW	New	32 x 30	22.00	23.75	No	Not visible	Single Rectangular column type	Single Rectangular column type	PSC Girder	-
11	207+350	Elevated Structure	BHS	MCW	New	2 x 8.3	22.00	23.75	No	-	-	-	RCC Box	-

Table 39 Details of VUP's

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure
											Abutment	Pier	
1	141+398	VUP	LHS	MCW	New	1 x 12	9.50	11.00	Yes	RCC Box			
2	141+398	VUP	RHS	MCW	New	1 x 12	9.50	11.00	Yes	RCC Box			
3	171+450	VUP	LHS	MCW	New	2 x 10	10.50	12.00	No	RCC Box			
4	171+450	VUP	RHS	MCW	New	2 x 10	10.50	12.00	No	RCC Box			

Table 40: Details of LVUP

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure
											Abutment	Pier	
1	141+620	LVUP	LHS	MCW	New	1 x 7	9.00	12.00	No	RCC Box			
2	141+620	LVUP	RHS	MCW	New	1 x 7	9.00	12.00	No	RCC Box			
3	159+080	LVUP	LHS	MCW	New	1 x 10	11.00	12.50	No	RCC Box			
4	159+080	LVUP	RHS	MCW	New	1 x 10	11.00	12.50	No	RCC Box			
5	180+260	LVUP	LHS	MCW	New	1 x 12	10.50	11.50	No	RCC Box			
6	195+640	LVUP	LHS	MCW	New	1 x 10	10.50	12.00	No	RCC Box			
7	195+640	LVUP	RHS	MCW	New	1 x 10	10.50	12.00	No	RCC Box			
8	195+860	LVUP	LHS	MCW	New	1 x 7	10.50	12.00	No	RCC Box			
9	195+860	LVUP	RHS	MCW	New	1 x 7	10.50	12.00	No	RCC Box			
10	196+470	LVUP	LHS	MCW	New	1 x 12	10.50	12.50	Yes	RCC Box			
11	196+470	LVUP	RHS	MCW	New	1 x 12	10.50	12.50	Yes	RCC Box			
12	188+790	LVUP	LHS	MCW	New	1 x 10	9.50	11.00	No	RCC Box			
13	188+790	LVUP	RHS	MCW	New	1 x 10	9.50	11.00	No	RCC Box			
14	203+520	LVUP	LHS	MCW	Old	2 x 7	11.50	12.50	No	Not visible	Twin circular column type	Twin circular column type	RCC Slab
15	203+520	LVUP	RHS	MCW	New	2 x 7	11.50	12.50	No	RCC Box			

Table 41 Details of PUP's

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure
											Abutment	Pier	
1	144+920	PUP	LHS	MCW	New	1 x 7	10.00	11.00	Yes	RCC Box			
2	144+920	PUP	RHS	MCW	New	1 x 7	10.00	11.00	Yes	RCC Box			
3	147+120	PUP	LHS	MCW	New	1 x 7	10.00	11.00	No	RCC Box			
4	147+120	PUP	RHS	MCW	New	1 x 7	10.00	11.00	No	RCC Box			
5	148+210	PUP	LHS	MCW	New	1 x 7	10.00	11.00	Yes	RCC Box			
6	148+210	PUP	RHS	MCW	New	1 x 7	10.00	11.00	Yes	RCC Box			
7	149+160	PUP	LHS	MCW	New	1 x 7	10.00	11.00	Yes	RCC Box			
8	149+160	PUP	RHS	MCW	New	1 x 7	10.00	11.00	Yes	RCC Box			
9	160+130	PUP	LHS	MCW	New	1 x 7	8.00	11.50	Yes	RCC Box			
10	160+130	PUP	RHS	MCW	New	1 x 7	8.00	11.50	Yes	RCC Box			
11	167+590	PUP	LHS	MCW	New	1 x 7	10.50	12.00	Yes	RCC Box			
12	167+590	PUP	RHS	MCW	New	1 x 7	10.50	12.00	Yes	RCC Box			
13	169+540	PUP	LHS	MCW	New	1 x 7	10.50	12.00	No	RCC Box			
14	169+540	PUP	RHS	MCW	New	1 x 7	10.50	12.00	No	RCC Box			
15	172+580	PUP	LHS	MCW	New	1 x 7	10.00	13.50	No	RCC Box			
16	172+580	PUP	RHS	MCW	New	1 x 7	10.00	13.50	No	RCC Box			
17	173+580	PUP	LHS	MCW	New	1 x 7	9.50	11.50	Yes	RCC Box			
18	173+580	PUP	RHS	MCW	New	1 x 7	9.50	11.50	Yes	RCC Box			
19	177+980	PUP	LHS	MCW	New	1 x 7	10.50	12.00	Yes	RCC Box			
20	177+980	PUP	RHS	MCW	New	1 x 7	10.50	12.00	Yes	RCC Box			
21	179+080	PUP	LHS	MCW	New	1 x 7	8.00	10.00	Yes	RCC Box			
22	179+080	PUP	RHS	MCW	New	1 x 7	8.00	10.00	Yes	RCC Box			
23	185+305	PUP	LHS	MCW	Old	1 x 7	10.00	11.50	No	RCC Box			
24	185+305	PUP	RHS	MCW	Old	1 x 7	10.00	11.50	No	RCC Box			
25	189+880	PUP	LHS	MCW	New	1 x 10	9.00	11.00	No	RCC Box			
26	189+880	PUP	RHS	MCW	New	1 x 10	9.00	11.00	No	RCC Box			
27	196+710	PUP	LHS	MCW	New	1 x 7	10.50	12.00	Yes	RCC Box			
28	196+710	PUP	RHS	MCW	New	1 x 7	10.50	12.00	Yes	RCC Box			
29	197+525	PUP	LHS	MCW	New	1 x 2	3.50	6.00	No	RCC Box			
30	198+120	PUP	LHS	MCW	New	1 x 7	10.50	12.00	No	RCC Box			
31	198+120	PUP	RHS	MCW	New	1 x 7	10.50	12.00	No	RCC Box			
32	198+820	PUP	LHS	MCW	New	1 x 7	10.50	12.00	No	RCC Box			
33	198+820	PUP	RHS	MCW	New	1 x 7	10.50	12.00	No	RCC Box			
34	200+360	PUP	LHS	MCW	New	1 x 4	15.50	17.00	No	RCC Box			
35	200+360	PUP	RHS	MCW	New	1 x 4	15.50	17.00	No	RCC Box			
36	200+620	PUP	LHS	MCW	New	1 x 4	15.50	17.00	No	RCC Box			
37	200+620	PUP	RHS	MCW	New	1 x 4	15.50	17.00	No	RCC Box			
38	204+140	PUP	LHS	MCW	Old	1 x 7	9.00	10.00	No	Not visible	Brick masonry wall type	-	RCC Slab
39	204+140	PUP	RHS	MCW	New	1 x 7	10.50	11.50	No	RCC Box			
40	204+820	PUP	LHS	MCW	New	1 x 7	9.00	12.00	No	RCC Box			
41	204+820	PUP	RHS	MCW	New	1 x 7	9.00	12.00	No	RCC Box			

Table 42: Details of FOB.

S.No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Carriageway Width (m)	Deck Width (m)	Skew	Type of Foundation	Type of Substructure		Type of Superstructure
											Abutment	Pier	
1	136+950	FOB	BHS	MCW	New	2 x 20	2.50	3.20	No	Open	Steel column frame	Steel column frame	Steel Truss
2	140+400	FOB	BHS	MCW	New	2 x 20	2.50	3.20	No	Open	Steel column frame	Steel column frame	Steel Truss
3	153+780	FOB	BHS	MCW	New	2 x 20	2.50	3.20	No	Open	Steel column frame	Steel column frame	Steel Truss
4	197+530	FOB	BHS	MCW	New	2 x 20	1.20	3.20	No	Open	Steel column frame	Steel column frame	Steel Truss
5	203+300	FOB	BHS	MCW	New	2 x 20	1.20	3.20	No	Open	Steel column frame	Steel column frame	Steel Truss

Observations:

- ✓ The site having 66 No's of Major structures which includes 2 ROB's, 10 MJB's, 11 MNB's, 2 Elevated structures, 5 Flyovers, 2 VUP's, 8 LVUP's, 21 PUP's & 5 FOB's. In addition to this 5 No's of Flyovers, 1 VOP, 1 VUP, 1 Elevated structure,2-FOBs additional proposed in Schedule-A and construction of these structures not completed at site.
- ✓ The Project stretch has various super structure types for various structures such as Steel Girder, RCC Girder, Balanced Cantilever, RCC Solid Slab, PSC Girder, RCC Box and Steel Truss.
- ✓ There are Pot PTFE (New-1140No's), Rocker Roller (Old-105 No's), Elastomeric (Old-24 No's) & Metallic (Old-8 No's) Observed in Girder type Structures. In addition to this 800 No's (New) of Pot PTFE Bearings considered for Elevated structure, Flyover, VUP, VOP, MJB and 54 No's (New) of Elastomeric Bearings considered for MJB.
- ✓ Structures are having 218 No's of Expansion joints in that 43 No's on old structures and 175 No's on new structures. In addition to this 124 No's (New) of Expansion joints considered for Elevated structure, Flyover, VUP, VOP and MJB.
- ✓ Most of the major bridges have been retained on the left side, while new bridges have been constructed on the right side, parallel to the existing ones.
- ✓ A New major bridge at 164+100 on the right-hand side is experienced severe cracks & leaching issues on the soffit of the Deck slab in all spans and additionally, evidence of previous repair works is observed on the soffit of the slab. Based on the identified distress, a complete replacement of the deck slab is proposed as a remedial measure to ensure continuous and reliable service.
- ✓ Although this project stretch lies in Seismic zone –IV, the old bridges at Ch: 164+100, 181+160, 186+000, 193+160, 203+945, 204+300, 204+500 and 205+790 not provided with seismic arrestor's/ stopper's. To enhance the seismic resilience of these structures, it is recommended to implement seismic enhancements, such as the installation of seismic stoppers or dampers, at these specific locations.
- ✓ A couple of old bridges, specifically the Major Bridge at Ch: 193+160 on the left-hand side and the Minor Bridge at Ch: 133+340 on the left-hand side, are constructed with brick masonry substructures and have an overall width of 8.5m. These bridges may require reconstruction to accommodate future capacity augmentation.

- ✓ Based on the visual inspection of bearings conducted using the MBIU, no major distress was observed, and the bearings appear to be in fair condition. However, the rocker and roller bearings on the older bridges require cleaning and greasing to ensure their proper functioning.
- ✓ An old major bridge at 205+790 on the left-hand side has experienced a collapse of the Footpath slab along the entire length on the median side in Span 2. No rectification has been carried out yet.
- ✓ All the old major bridges have structural cracks on the girders, spalling, and issues with reinforcement exposure. Since these are all old structures, NDT (non-destructive testing) is required to assess their current condition and propose suitable repair methodologies.
- ✓ Some box-type structures in the underpass and minor bridges have structural cracks on the slabs and walls.
- ✓ Steel frame strengthening arrangements were observed on the pier cap (P1) on the left side of the flyover at km 185+400. Currently, no significant damage has been observed on the pier cap. Confirmation from the contractor is required to verify the implementation of these arrangements.
- ✓ Bulging of the RE walls observed at several locations of the ROB, flyover and underpass.



Flyover @202+500 RHS RE-wall Bulging



Flyover @167+150 LHS RE-wall Bulging



ROB @172+380 LHS RE-wall Bulging



VUP @141+398 LHS RE-wall Bulging

- ✓ Expansion joints and sealants are damaged at several locations.

Photos depicting existing Box Culverts/Slab Culverts are presented below:



Box Culvert at 132+220



Box Culvert at 142+700



Box Culvert at 152+260



Box Culvert at 160+420



Box Culvert at 176+410



Box Culvert at 183+450

Photos depicting existing Pipe Culverts are presented below:



Pipe Culvert at 140+546



Pipe Culvert at 158+334



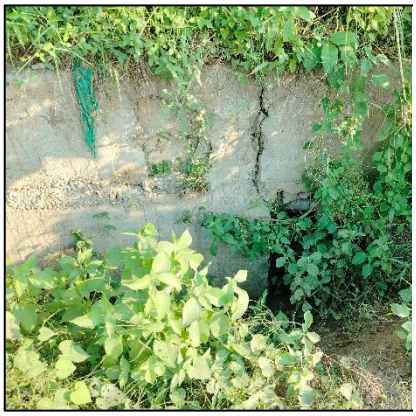
Pipe Culvert at 168+590



Pipe Culvert at 171+580



Pipe Culvert at 180+510



Pipe Culvert at 190+000

4.7 DRAINAGE AND SLOPE PROTECTION

- ✓ At few locations, Slope protection works are to be done, mainly at 174+500 major bridge.
- ✓ RCC covered drains were observed at urban locations and along service roads.
- ✓ No significant damage was observed at the covered drain locations.

4.8 TRAFFIC SAFETY AND ROAD FURNITURE

- ✓ The metal beam crash barriers along the project road are provided at curve and High embankment locations, appears to be intact except for a few areas where they have experienced damage and poorly placed.
- ✓ The pedestrian guardrails installed on the separator are largely intact along their entire length, with the exception of a few locations where damage has occurred.
- ✓ The median opening locations are in fair to poor condition, and all unauthorized median openings should be closed.
- ✓ Street lighting and high masts are present at urban locations, toll plazas, and junctions.

4.9 ROAD USER FACILITIES

- ✓ The Bus Bay with Shelters and truck lay byes were provided along the corridor.

CHAPTER 5. REHABILITATION PLANS AND DESIGNS

5.1 DESIGN TRAFFIC LOADING

Design Traffic loading has been estimated by considering the latest traffic (given) and VDFs as estimated from the latest axle load survey data and with min. 5% growth rates for 10 years, 15 years and 20 years design period as below:

Table 43: Traffic Volume (AADT)

Vehicle/Mode	Toll Plaza-1 Km 138+700 (Chhapar Toll Plaza)		Toll Plaza-2 Km 187+500 (Bahadrabad Toll Plaza)	
	LHS	RHS	LHS	RHS
BUS	410	410	391	391
2A axle	956	956	912	912
3A axle	218	218	181	181
MAV axle	732	732	349	349
LCV	467	467	367	367

Note: *As Bus data is not available, it is assumed that 30% of 2-axle data is considered for Buses and balance 70% for 2-axle.*

The MSA calculated considering the above scenario is as follows.

Table 44: Estimated Design traffic loading

Description	Section-1 (Chhapar plaza km 138+700)		Section-2 (Bahadrabad 187+500)	
	UP	DN	UP	DN
10th year from Now	52	43	24	21
15th year from Now	90	73	41	36
20th year from Now	138	112	63	55

The computation of traffic loadings is presented in **Appendix 9** of this Report. Design traffic corresponding to 10 years period has been considered for overlay design.

5.2 PAVEMENT REHABILITATION AND STRENGTHENING

5.2.1 Flexible Pavement Strengthening

For Design the Overlay Thickness the following method as suggested in IRC: 115 has been used

- The existing pavement is considered as a 3-layer system consisting of subgrade, granular and bituminous layer. The remaining life of exiting pavement in terms of Fatigue and Rutting life (MSA) are estimated
- The remaining life is compared with design traffic loading. An overlay with assumed thickness is considered on exiting pavement where required.

- The Total system including the proposed Overlay (Trial thickness) is assumed as a four-layer system and considered the relevant MR values for all the four layers namely New BT layer, existing bituminous surface, total existing Granular layers and Subgrade layers.
- The MR value for the New BT is assumed as 3000 MPA (considering VG40 Bituminous grade) for Main Carriageway and for all the remaining three layers, the MR Values derived and finalized from the FWD Analysis are considered
- Critical Tensile strains and Vertical strains are found out by using the IIT PAVE Software at the bottom of existing bituminous layer and at the top of the subgrade layer respectively.
- The Fatigue and Rutting equations (equation given in the IRC: 115) have been used to estimate the Fatigue and Rutting Life of The Pavement system considering 90% reliability equations.
- The Obtained Fatigue and Rutting Life are compared with the required life for the assumed trial overlay thickness.

Remaining life of the existing pavement from the above analysis is presented in the following tables:

Table 45: Remaining life of the existing pavement on LHS Carriageway

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC -115 Equations for 90% Reliability			
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf- Fatigue life, mSA	Rutting life,mSA	Target MSA	Remarks
1	LHS	130.56	132.80	2.24	1551	384	64	170	450	620	1551	0.0002623	0.0001532	93	243	52	No Overlay
2	LHS	132.80	135.60	2.80	1545	391	64	170	450	620	1545	0.0002606	0.0001516	97	250	52	No Overlay
3	LHS	135.60	138.73	3.13	1512	376	64	180	500	680	1512	0.0002270	0.0001483	107	468	52	No Overlay
4	LHS	138.73	139.01	0.28													Toll Plaza
5	LHS	139.01	140.80	1.79	1533	369	64	180	500	680	1533	0.0002282	0.0001496	103	457	52	No Overlay
6	LHS	140.80	143.60	2.80	1507	313	64	180	500	680	1507	0.0002438	0.0001680	66	338	52	No Overlay
7	LHS	143.60	146.20	2.60	2984	390	64	172	462	634	2984	0.0002226	0.0001183	145	511	52	No Overlay
8	LHS	146.20	148.40	2.20	2908	387	64	160	400	560	2908	0.0002749	0.0001299	103	196	52	No Overlay
9	LHS	148.40	151.00	2.60	2511	354	64	160	400	560	2511	0.0002925	0.0001449	76	148	52	No Overlay
10	LHS	151.00	153.20	2.20	1433	282	64	160	400	560	1433	0.0003524	0.0002061	31	64	52	Overlay
11	LHS	153.20	155.40	2.20	1449	357	64	160	400	560	1449	0.0003233	0.0001756	58	94	52	No Overlay
12	LHS	155.40	158.20	2.80	1430	390	64	160	450	610	1430	0.0002743	0.0001640	76	198	52	No Overlay
13	LHS	158.20	160.60	2.40	1475	376	64	160	450	610	1475	0.0002770	0.0001668	69	190	52	No Overlay
14	LHS	160.60	162.80	2.20	1506	364	64	160	450	610	1506	0.0002797	0.0001696	64	181	52	No Overlay
15	LHS	162.80	164.40	1.60	1585	387	64	160	450	610	1585	0.0002706	0.0001601	77	211	52	No Overlay
16	LHS	164.40	167.30	2.90	1584	390	64	161	450	611	1584	0.0002688	0.0001581	80	217	52	No Overlay
17	LHS	167.30	170.00	2.70	932	113	64	180	450	630	932	0.0003925	0.0003683	5	39	24	Overlay
18	LHS	170.00	173.00	3.00	1513	147	64	180	450	630	1513	0.0003370	0.0002554	13	78	24	Overlay
19	LHS	173.00	174.80	1.80	1452	198	64	180	450	630	1452	0.0003181	0.0002252	22	101	24	Overlay
20	LHS	174.80	177.60	2.80	708	76	64	199	463	662	708	0.0003904	0.0004585	3	40	24	Overlay
21	LHS	177.60	180.30	2.70	488	156	64	250	500	750	488	0.0002949	0.0002864	22	143	24	Overlay
22	LHS	180.30	182.90	2.60	1761	393	64	250	500	750	1761	0.0001711	0.0001008	423	1685	24	No Overlay
23	LHS	182.90	185.10	2.20	1744	390	64	250	500	750	1744	0.0001719	0.0001017	412	1649	24	No Overlay
24	LHS	185.10	187.36	2.26	524	344	64	235	500	735	524	0.0002390	0.0001613	191	370	24	No Overlay
25	LHS	187.36	187.64	0.28													Toll Plaza
26	LHS	187.64	189.90	2.26	1582	390	64	220	500	720	1582	0.0001937	0.0001200	235	960	24	No Overlay

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC -115 Equations for 90% Reliability			
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf- Fatigue life, mSA	Rutting life,mSA	Target MSA	Remarks
27	LHS	189.90	192.40	2.50	1635	385	64	220	500	720	1635	0.0001934	0.0001196	232	967	24	No Overlay
28	LHS	192.40	195.40	3.00	1659	393	64	220	500	720	1659	0.0001913	0.0001175	245	1016	24	No Overlay
29	LHS	195.40	197.00	1.60	1383	233	64	220	500	720	1383	0.0002362	0.0001718	65	391	24	No Overlay
30	LHS	197.00	198.40	1.40	1424	131	64	214	493	707	1424	0.0002754	0.0002288	21	195	24	Overlay
31	LHS	198.40	199.90	1.50	1017	121	64	150	410	560	1017	0.0004790	0.0004061	3	16	24	Overlay
32	LHS	199.90	201.60	1.70	1511	341	64	150	410	560	1511	0.0003312	0.0001885	42	84	24	No Overlay
33	LHS	201.60	203.88	2.28	1613	200	64	150	410	560	1613	0.0003907	0.0002534	13	40	24	Overlay
34	LHS	203.88	204.21	0.33													Structure
35	LHS	204.21	206.52	2.31	1470	386	64	150	410	560	1470	0.0003170	0.0001742	59	103	24	No Overlay
36	LHS	206.52	208.45	1.93													Structure
37	LHS	208.45	209.12	0.67										59	103	24	No Overlay
Total length				78.560													

Table 46: Remaining life of the existing pavement on RHS Carriageway

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC -115 Equations for 90% Reliability			
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf- Fatigue life, mSA	Rutting life,mSA	Target MSA	Remarks
1	RHS	130.56	132.60	2.04	1416	342	64	160	420	580	1416	0.0003128	0.0001813	52	109	43	No Overlay
2	RHS	132.60	135.00	2.40	1457	265	64	160	420	580	1457	0.0003408	0.0002119	28	74	43	Overlay
3	RHS	135.00	138.38	3.38	1459	386	64	160	420	580	1459	0.0002970	0.0001650	73	138	43	No Overlay
4	RHS	138.38	138.69	0.31													Toll Plaza
5	RHS	138.69	140.60	1.91	1449	390	64	160	420	580	1449	0.0002961	0.0001643	75	140	43	No Overlay
6	RHS	140.60	143.60	3.00	1399	384	64	235	401	636	1399	0.0002383	0.0001216	248	375	43	No Overlay
7	RHS	143.60	147.00	3.40	2747	391	64	240	400	640	2747	0.0001958	0.00009047	441	914	43	No Overlay
8	RHS	147.00	151.00	4.00	2731	392	64	236	400	636	2731	0.0001992	0.00009229	410	846	43	No Overlay
9	RHS	151.00	153.00	2.00	1332	384	64	200	400	600	1332	0.0002740	0.0001425	140	199	43	No Overlay

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC -115 Equations for 90% Reliability			
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA	Remarks
10	RHS	153.00	155.60	2.60	1381	391	64	200	400	600	1381	0.0002702	0.0001393	148	212	43	No Overlay
11	RHS	155.60	158.00	2.40	1389	389	64	200	400	600	1389	0.0002704	0.0001396	146	212	43	No Overlay
12	RHS	158.00	160.00	2.00	1366	392	64	200	400	600	1366	0.0002706	0.0001395	149	211	43	No Overlay
13	RHS	160.00	161.80	1.80	1349	385	64	195	400	595	1349	0.0002781	0.0001447	130	186	43	No Overlay
14	RHS	161.80	164.40	2.60	1446	388	64	170	400	570	1446	0.0003011	0.0001574	88	130	43	No Overlay
15	RHS	164.40	167.30	2.90	1480	384	64	170	400	570	1480	0.0003010	0.0001573	87	130	43	No Overlay
16	RHS	167.30	170.60	3.30	1417	139	64	170	400	570	1417	0.0004044	0.0002886	9	34	21	Overlay
17	RHS	170.60	173.60	3.00	1432	150	64	170	400	570	1432	0.0003981	0.0002771	10	37	21	Overlay
18	RHS	173.60	177.00	3.40	1363	157	64	170	400	570	1363	0.0003990	0.0002775	10	36	21	Overlay
19	RHS	177.00	180.30	3.30	1172	105	64	170	400	570	1172	0.0004399	0.0003605	4	23	21	Overlay
20	RHS	180.30	182.90	2.60	1493	372	64	168	425	593	1493	0.0002871	0.0001612	78	161	21	No Overlay
21	RHS	182.90	187.36	4.46	1544	368	64	160	500	660	1544	0.0002450	0.0001657	68	331	21	No Overlay
22	RHS	187.36	187.64	0.28													Toll Plaza
23	RHS	187.64	189.90	2.26	1564	390	64	160	500	660	1564	0.0002387	0.0001584	81	372	21	No Overlay
24	RHS	189.90	192.40	2.50	1563	384	64	211	427	638	1563	0.0002381	0.0001287	181	377	21	No Overlay
25	RHS	192.40	193.90	1.50	1449	377	64	230	400	630	1449	0.0002426	0.0001243	221	346	21	No Overlay
26	RHS	193.90	195.40	1.50	1480	393	64	230	400	630	1480	0.0002381	0.0001201	248	377	21	No Overlay
27	RHS	195.40	196.90	1.50	1379	117	64	230	400	630	1379	0.0003133	0.0002257	23	109	21	No Overlay
28	RHS	196.90	198.60	1.70	1490	301	64	230	400	630	1490	0.0002583	0.0001411	132	260	21	No Overlay
29	RHS	198.60	201.38	2.78	1510	390	64	230	450	680	1510	0.0002115	0.0001181	261	644	21	No Overlay
30	RHS	201.38	201.88	0.50													Structure
31	RHS	201.88	203.88	2.00	1448	153	64	230	500	730	1448	0.0002475	0.0001953	38	316	21	No Overlay
32	RHS	203.88	204.21	0.33													Structure
33	RHS	204.21	206.52	2.31	1481	388	64	230	500	730	1481	0.0001904	0.0001179	267	1038	21	No Overlay
34	RHS	206.52	208.45	1.93													Structure
35	RHS	208.45	209.12	0.67										267	1038	21	No Overlay
Total length				78.560													

From the above, overlay is warranted when remaining life is lesser than Target Traffic. Accordingly, based on this criterion, an overlay is warranted for a length of 20.37 km in LHS and 15.40 km in RHS.

The overlay required sections are further analyzed as per IRC: 37 guidelines with assumed overlay thicknesses to obtain the strains (vertical and horizontal) and then fatigue and rutting life in terms of MSAs. In this process, it is too been sure that the obtained remaining life (MSA) of the existing pavement should be always more than calculated 10yrs design MSA.

The following tables indicates the proposed overlay thicknesses in LHS and RHS directions respectively.

Table 47: Design of overlay for LHS MCW

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		VG40-3000 Mpa	Total BT (mm)	Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC - 115 Equations for 90% Reliability		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)	Proposed BT (mm)				Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA
10	LHS	151.00	153.20	2.20	1433	282	64	160	400	50	210	610	1433	0.0002647	0.0001576	89	233	52
17	LHS	167.30	170.00	2.70	932	113	64	180	450	90	270	720	932	0.0002320	0.0002013	49	424	24
18	LHS	170.00	173.00	3.00	1513	147	64	180	450	50	230	680	1513	0.0002486	0.0001854	45	310	24
19	LHS	173.00	174.80	1.80	1452	198	64	180	450	50	230	680	1452	0.0002388	0.0001675	69	372	24
20	LHS	174.80	177.60	2.80	708	76	64	199	463	90	289	752	708	0.0002260	0.0002392	32	477	24
21	LHS	177.60	180.30	2.70	488	156	64	250	500	50	300	800	488	0.0002198	0.0002120	70	541	24
30	LHS	197.00	198.40	1.40	1424	131	64	214	493	50	264	757	1424	0.0002062	0.0001668	72	723	24
31	LHS	198.40	199.90	1.50	1017	121	64	150	410	90	240	650	1017	0.0002740	0.0002189	33	199	24
33	LHS	201.60	203.88	2.28	1613	200	64	150	410	50	200	610	1613	0.0002881	0.0001869	41	159	24
Total length				20.37														

Table 48: Design of overlay for RHS MCW

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		VG40-3000 Mpa	Total BT (mm)	Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC - 115 Equations for 90% Reliability		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)	Proposed BT (mm)				Vertical strain at bottom, epZ	Tensile strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA
2	RHS	132.60	135.00	2.40	1457	265	64	160	420	50	210	630	1457	0.0002567	0.0001611	80	268	43
16	RHS	167.30	170.60	3.30	1417	139	64	170	400	50	220	620	1417	0.0002908	0.0002077	31	152	21
17	RHS	170.60	173.60	3.00	1432	150	64	170	400	50	220	620	1432	0.0002879	0.0002008	35	159	21
18	RHS	173.60	177.00	3.40	1363	157	64	170	400	50	220	620	1363	0.0002888	0.0002020	35	157	21
19	RHS	177.00	180.30	3.3	1172	105	64	170	400	90	260	660	1172	0.0002516	0.0001958	45	293	21
Total length				15.400														

Input data used and the output from the IIT Pave software has been presented as screen shots for ready reference as **Appendix 10** of this Report.

Summary of Overlay thickness from FWD analysis is as follows:

Overlay Thickness (mm)	Length (km)	
	LHS	RHS
50	13.27	12.10
90	7.10	3.30

Overall summary of overlay/renewal requirement of project corridor arrived from comibining PCI (Pavement Condition Index), Roughness (IRI>2200mm/Km) and FWD analysis is as below:

Recommendation	Length (Km)	
	LHS	RHS
Overlay as per FWD survey	20.37	15.40
Overlay based on Roughness index/PCI	22.61	25.38
Total	42.98	40.78
No overlay	35.65	37.78

5.3 STRUCTURAL REHABILITATION

All the structure found to be in fair condition except minor treatment like repair of stone pitching, cleaning of drainage spouts, cleaning of vegetation etc. may be required. Detailed structural rehabilitation quantities have been worked out based on the prevailing condition of existing structures. This methodology describes in detail the procedure for the execution of each item of rehabilitation work of the Existing Bridges of the project.

The scope of this methodology covers the items mentioned below for rehabilitation work of all the existing Bridges.

- Repair/ Replacement of Existing Bearings
- Repair / Replacement of Existing Expansion Joints
- Repair / Replacement of Existing Wearing Coat
- Profile Correction for Existing Deck Slab by Cement Concrete
- Sealing of Cracks for Bridges by Epoxy Resin
- Replacement of Spalled Concrete of ECW by Epoxy Mortar
- Cement Grouting for Repair of Existing Bridges
- Guniting / Shotcrete for Repair of Existing Bridges
- Providing & Fixing of Drainage Spouts
- Repair of Substructure Component
- Repair / Replacement of Railing & Crash Barrier
- Epoxy Bonding between New and Old Concrete.

5.4 SCHEDULE-B SCOPE

Few major items of Schedule-B are required to be constructed are as below.

Clause	Description	Scope	Remarks
Clause 4.1.a(ii)	**At-grade Intersections:** **Major Junctions** **ii) Existing Major Junction to be retained with Safety Enhancement**	2 Number at Km 200.4 at Km 201.3	Safety enhancement of these junctions by providing signage, road marking, blinkers, pedestrian crossing facility etc. as per relevant IRC Codes and Standards need to be provided in accordance with IRC SP: 84 -2019 and as per **Annexure I and Annexure II**
Clause 4.1.b (i)	**Minor Junctions:** All junctions below are to be retained with Safety Enhancement **i. Junctions with MCW**	84 numbers	
Clause 4.2	**b) Existing Major Junction to be retained with Safety Enhancement:**	At 4 numbers	Safety enhancement of above junctions (existing and New Junction) by providing signage, road marking, blinkers, pedestrian crossing facility etc. as per relevant IRC Codes and Standards need to be provided in accordance with IRC SP: 84 -2019 and as per **Annexure III and IV** of Schedule B.
Clause 4.2	**c) Existing Minor Junction to be retained with Safety Enhancement:**	At 18 numbers	
Clause 6.1	**6.1 Repair and Rehabilitation of Pavement**	As per FWD and NSV Report. But as per Clause 61.1. to 6.1.3 the scope is Nil	But in the DPR Cost, provision of about 85 crores towards overlay of existing CW is provided
Clause 7.1	**7. Roadside Drainage** **(a) RCC Covered Drain** **(b) Unlined Drain** **© Median Drains**	Nil	
Clause 7.1	**7 (d) Drainage where Embankment Height is more than 3m (Clause No. 6.4 IRC: SP:84-2019)**	New -Nil, As there is no modification of main carriageway is envisaged	But Existing Drainage chutes, stone pitching and any other measures as provided shall be repaired and restored in working conditions.
Clause 7.1	**e) Drainage for Structures (Clause No. 6.8 IRC: SP:84-2019)**	Minimum HPVC 200 mm dia. shall be provided for disposal of rainwater with PCC encasing	Apart from this pavement cost and chamber arrayment cost shall be considered
Clause 7.1	**f) Drainage for Underpass**	A suitable drainage arrangement for draining storm water from Underpass shall be provided	If required, need to consider pumping system
Clause 7.1	**g) Drainage arrangements of Retaining Structures**	Drainage fixtures and dropdown pipes shall be of rigid, corrosion resistant material not less than 100 mm dia	
Clause 8.3.3	**8. Structures:** **8.3.3 Culverts on Crossroads:**	**existing crossroads culvert shall be repair and maintained**	
Clause 8.4.9	8.4.9	Refer: **Annexure VI** for Repair & Rehabilitation of Structures	Any other additional Items which are required shall also be executed and NO Change of Scope is admissible for any extra items

Clause	Description	Scope	Remarks
Clause 9.	**9 Repair and Rehabilitation of Embankment/Earthen Shoulders/Paved Shoulders / Stone Pitching**	Nil	Existing stone pitching and other slope protection measures shall be repaired
Clause 12	**12 Project Facilities**		
Clause 13.1	**13.1 Toll Plaza**	TMS System shall be upgraded if required	
Clause 13.2.2	**13.2.2 Traffic Signs**	Additional signs as per this clause shall be provided	
Clause 13.2.5	**13.2.5 Reflective Pavement Markers & Solar Studs**	Nil **Solar studs shall be provided on the structures and its approaches and built-up section. Color of solar studs shall be kept same as per IRC specifications**	
Clause 13.2.6	**Solar Blinkers**	Solar Blinkers shall be provided median openings and entry/exit ramps	
Clause 13.2.7	**13.2.7 Traffic Impact Attenuators**	16 numbers on flyover/grade separated structure at exit from main carriageway	
Clause 13.2.7	**13.2.7 Traffic Impact Attenuators**	12 numbers Infront of Islands of Toll Plaza	
Clause 13.2.7	**13.2.7 Traffic Impact Attenuators**	Any other location	
Clause 13.2.8	**13.2.8 Transverse Bar Marking**	1. Median openings (U-Turn Facilities) 2. Toll Plaza approaches 3. Approaches to At-Grade junctions 4. Exit ramps and downside of the approach of the flyovers 5. approach of narrow bridges	Refer: **Annexure VII** for Transverse Bar Marking
Clause 13.2.10	**13.2.10 Antiglare at Narrow Median Location**	**Nil** **In** addition to above --- Antiglare is to be provided as per site requirement	
Clause 13.3	**13.3 Operation and Maintenance centers**	The minimum land for O & M center shall be 2000 sq.m and shall be acquired by the Concessionaire at his own cost and risk	
Clause 13.4	**13.4 Rest Areas / Wayside Amenities**	**Nil**	
Clause 13.5	**13.5 Truck Lay Bye**	**New truck lay byes-----** **--Nil**	At existing---Rest area with toilets, drinking water and Telephone facility to be provided

Clause	Description	Scope	Remarks
		Additional Facilities at existing Truc lay byes---5 numbers	Traffic Signs board / marking / road studs / lighting are to be provided at Truck Laybys as per IRC SP: 84-2019
Clause 13.6	**13.6 Bus Bay and Bus Shelter**	bays and Bus shelters---13 locations	Existing Bus Shelter is to be repaired/ rehabilitated
Clause 13.7	**13.7 Highway Lighting**	Solar lighting at Bus Bays and Shelters etc.	
Clause 13.8	**13.8 Landscaping and Median Plantation**	ii. Median Plantation is to be provided throughout the project stretch where not available	The Concessionaire shall carryout its own due diligence of the existing plantation (avenue / median) and shall provide deficient avenue planation / landscaping / median plantation to ensure 100 % saturation of plantation
Clause 13.9	**13.9 ATMS**	**Video Surveillance System—72 Km** **PTZ Camera ----------61 Numbers** **Video Incident Detection and Enforcement System (VIDES)---12 Nos** **Vehicle Actuated Speed Display System----4 Numbers** **VMS Systems Displays (Full Gantry 4 Lane)----8 Nos** **VMS Portable type-------2 Nos** **Network / Communication Infrastructure----72 km** **ATMS Control Centre—01 Nos** **Provision of Electronic Call Boxes-78**	The ATMS system shall provide and maintain as per NHAI / Policy Guidelines / Standard Documents 2023, Policy Circular No. 11.53/2023 dated 10th October 2023, also implement the circular issued from time to time
Clause 13.10	**13.10 Highway Patrol**	1 per every 50Km	2 number as the project length is more than 50 and less than 100Km
Clause 13.11	**13.11 Emergency Medical Services**	1 per every 50Km	2 number as the project length is more than 50 and less than 100Km
Clause 13.12	**13.12 Cranes**	1 per every 50Km	2 number as the project length is more than 50 and less than 100Km

CHAPTER 6. OPERATION AND MAINTENANCE

6.1 INTRODUCTION

Looking at the contractual requirements of maintaining project road under specified level of roughness it is felt that roughness is the most important criterion for finalizing the O&M schedule for the project. Accordingly, the methodology adopted by present consultants includes predicting the roughness year by year under the traffic using a well acknowledged HDM-4 model developed for developing countries like India after lot of research by World Bank. The said model is widely prescribed by MORTH and NHAI during the preparation of detailed project reports for several projects in doing economic analysis for the projects. The economic analysis mainly consists of two parts:

1. Predicting the road deterioration and estimating VOC
2. Estimating Benefits

Considering its importance and present use in India, consultants felt prudent to use the first part, i.e. estimating road deterioration and predicting roughness in HDM 4 model to finalize the O&M schedule for the project. This approach is more scientific as it does not assume hypothetical deflection values at 10^{th} and 20^{th} year and includes main criterion of maintaining roughness at 2400mm/Km as per Schedule F.

6.2 CA SPECIFICATIONS FOR MAJOR MAINTENANCE

Schedule F prescribe the maintenance standards to be adopted for project. Summary of same is presented below.

- Appliable Manual: Four lane manual IRC SP 84-2019 published by IRC
- Applicable Schedule for O&M: Schedule-F and Manual
- Maximum Roughness Allowed: 2400mm/km
- Frequency of Roughness Test: 2 times per year
- Frequency of FWD Test: once in a year
- Schedule-B, Clause 6.1: minimum overlay thickness of BC on the main carriageway shall be 50mm

6.3 INPUTS FOR M&M SCHEDULE

6.3.1 Project Sections

The project road is divided into two main sections based on traffic characteristics viz.,

- Section-1: Muzaffarnagar to Roorkee section- km130.560 to km 167.300, length 36.74 km
- Section-2: Roorkee to Haridwar section- km167.300 to km 209.120, length 41.82 km

Each section is further categorized based on the findings from FWD (Falling Weight Deflectometer), Roughness, and PCI (Pavement Condition Index) into two sub-sections as

- Overlay Sections (with 50mm OL and 90mm OL) and
- No-Overlay Sections

Then, taking the consideration of Roughness as a key criterion for major maintenance, further the above sub-sections categorized in to four cases below:

- Case 1: Roughness value <2000 mm/Km
- Case 2: Roughness values >2000<2200 mm/Km
- Case 3: Roughness>2200<2400 mm/Km
- Case 4: Roughness>2400 mm/Km

Direction wise analysis has been done separately for LHS (UP)/RHS (DN) and each direction length has been divided into sections based on above.

6.3.2 Traffic (AADT)

The following traffic data has been used in the analysis:

Vehicle/Mode	Toll Plaza-1 Km 138+700 (Chhapar Toll Plaza)		Toll Plaza-2 Km 187+500 (Bahadrabad Toll Plaza)	
	LHS	RHS	LHS	RHS
CAR	8669	8669	7385	7385
BUS	410	410	391	391
2A truck	956	956	912	912
3A truck	218	218	181	181
MAV truck	732	732	349	349
LCV	467	467	367	367

Note: - This traffic has been projected with actual growth rates to run the model

6.3.3 Vehicle Damage Factors (VDF)

The VDFs obtained from axle load analysis are used for various sections are as given below:

Vehicle Type	Chhapar Toll plaza-1 (138+700)		Bahadrabad Toll plaza-2 (187+500)	
	UP	DN	UP	DN
BUS	1.07	1.07	0.82	0.69
2-Axle	2.07	1.94	2.86	2.63
3-Axle	5.04	4.60	5.13	4.62
M Axle	13.84	10.46	6.24	5.31
LCV	1.31	1.38	1.05	0.72

6.3.4 HDM Inputs

FWD, Roughness, Pavement condition values are used as obtained from surveys and investigations for various sections and different cases as below:

Section-1: No Overlay

Section-1 No OL	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, mts	21.430	1.000	-	-	23.420	1.000	-	-
Roughness, mm/km	1477	2071	-	-	1575	2044	-	-
IRI. m/km	2.14	2.89	-	-	2.26	2.86	-	-
Deflection, mm	0.46	0.34	-	-	0.41	0.34	-	-
Cracking %	4.68	1.70	-	-	7.27	2.46	-	-
Raveling %	-	-	-	-	0.01	0.03	-	-
Rut Depth, mm	4.34	4.79	-	-	4.43	3.92	-	-
Patching, %	0.09	-	-	-	0.14	-	-	-
Potholes, %	-	-	-	-	-	-	-	-
BT Crust, mm	166	160	-	-	199	170	-	-
Granular Crust, mm	449	450	-	-	406	400	-	-

Section-1: 50mm Overlay

Section-1 50mm OL	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, mts	9.030	3.000	1.000	1.280	5.400	3.300	2.000	1.620
Roughness, mm/km	1820	2111	2244	2822	1529	2079	2252	3037
IRI. m/km	2.58	2.94	3.11	3.81	2.20	2.90	3.12	4.07
Deflection, mm	0.47	0.49	0.41	0.55	0.52	0.40	0.43	0.50
Cracking %	7.94	9.31	11.10	3.60	19.67	7.44	9.39	17.01
Raveling %	0.01	0.01	0.09	0.00	0.03	0.03	0.01	0.03
Rut Depth, mm	4.30	4.35	2.71	7.76	4.51	4.15	3.89	6.09
Patching, %	0.94	0.22	0.03	0.05	0.52	0.02	-	0.47
Potholes, %	0.04	0.07	-	0.08	0.02	-	-	-
BT Crust, mm	167	167	160	180	189	176	185	204
Granular Crust, mm	450	435	450	500	409	406	400	409

Section-2: No Overlay

Section-1 No OL	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, mts	13.220	-	-	-	13.360	-	-	-
Roughness, mm/km	1711	-	-	-	1670	-	-	-
IRI. m/km	2.44	-	-	-	2.39	-	-	-
Deflection, mm	0.41	-	-	-	0.39	-	-	-
Cracking %	6.89	-	-	-	3.94	-	-	-

Section-1 No OL	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Raveling %	0.01	-	-	-	0.02	-	-	-
Rut Depth, mm	3.31	-	-	-	3.10	-	-	-
Patching, %	0.55	-	-	-	0.54	-	-	-
Potholes, %	-	-	-	-	-	-	-	-
BT Crust, mm	217	-	-	-	199	-	-	-
Granular Crust, mm	484	-	-	-	475	-	-	-

Section-2: 50mm Overlay

Section-2 50mm OL	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, mts	10.560	3.860	5.000	2.080	7.960	10.700	2.120	5.280
Roughness, mm/km	1807	2079	2268	2853	1653	2097	2296	2743
IRI. m/km	2.56	2.90	3.14	3.85	2.36	2.93	3.17	3.72
Deflection, mm	0.55	0.54	0.55	0.51	0.59	0.48	0.51	0.56
Cracking %	11.03	11.56	9.10	4.98	7.95	7.06	7.60	5.28
Raveling %	0.01	0.02	0.02	0.03	-	0.03	0.05	0.02
Rut Depth, mm	4.67	5.58	4.03	2.39	5.20	3.79	3.36	3.32
Patching, %	0.59	1.77	0.60	2.67	0.60	1.07	1.55	0.75
Potholes, %	0.01	-	-	-	-	-	-	-
BT Crust, mm	204	209	193	173	179	204	203	198
Granular Crust, mm	468	475	457	440	405	418	446	452

Section-2: 90mm Overlay

Section-2 90mm OL	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, mts	4.400	1.600	1.100	-	2.400	-	-	-
Roughness, mm/km	1758	2061	2350	-	1544	-	-	-
IRI. m/km	2.50	2.88	3.24	-	2.22	-	-	-
Deflection, mm	0.76	0.71	0.68	-	0.65	-	-	-
Cracking %	13.57	12.76	10.69	-	11.85	-	-	-
Raveling %	-	-	0.02	-	0.02	-	-	-
Rut Depth, mm	6.45	6.34	4.77	-	6.61	-	-	-
Patching, %	0.39	3.28	0.32	-	0.42	-	-	-
Potholes, %	-	-	-	-	-	-	-	-
BT Crust, mm	189	167	154	-	170	-	-	-
Granular Crust, mm	457	432	416	-	400	-	-	-

6.3.5 Options for MM Schedule

Based on the requirements of CA, various options have been considered to be used as responsive overlays triggered at specified level of roughness of 2400mm/km. MCS as a base option been considered to examine its feasibility for major maintenance.

Following options were considered in the analysis:

- ✓ Base Case: MCS at Roughness of 2400mm/Km with regular maintenance
- ✓ Opt-1: Responsive Mill & Overlay of 40mm BC whenever roughness is >2400mm/KM with regular maintenance
- ✓ Opt-2: Responsive Mill & Overlay of 50mm BC whenever roughness is >2400mm/KM with regular maintenance

6.4 ROUHGNESS PROGRESSION

Roughness progression for each section under each alternative maintenance option has been done using the deterioration models in HDM-4. Following sample graphs represents the roughness progression for each alternative:

HDM-4
HIGHWAY DEVELOPMENT & MANAGEMENT

Average Roughness by Section (Graph)

Study Name: Haridwar_LHS1 50-75
Run Date: 13-12-2024

Section Details:

ID: Haridwar LHS1<2000-5 Road Class: Primary or Trunk Rise + Fall: 1.00m/km
Description: Haridwar LHS1<2000-50mm_OL Length: 9.03km Curvature: 3.00deg/km
Width: 8.75m

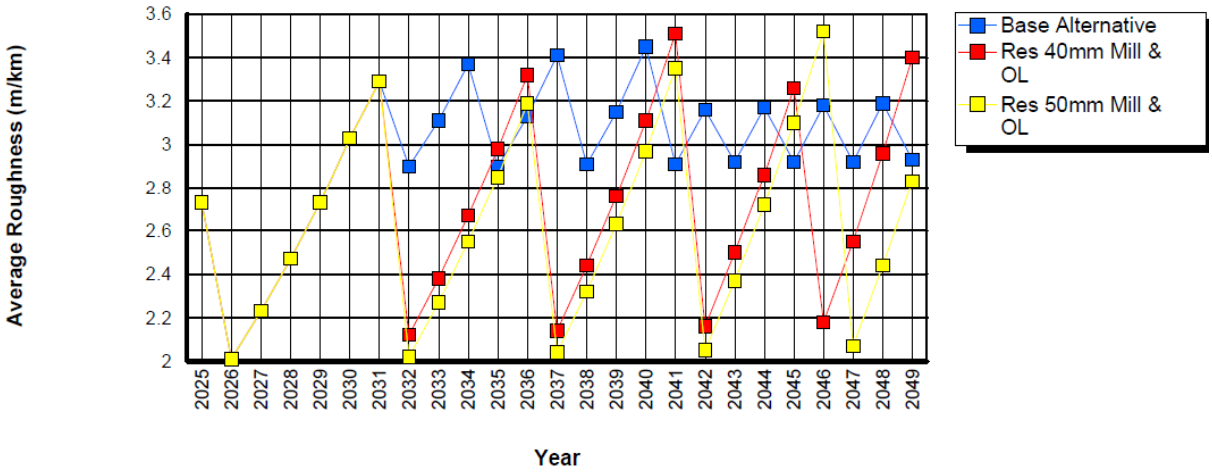


Figure 1: Average Roughness in LHS (UP) Carriageway (Sec-1) 50mm Overlay<2000

HDM-4 Average Roughness by Section (Graph)

Section Details:

ID: Haridwar RHS1<2400-5 Road Class: Primary or Trunk Rise + Fall: 1.00m/km
Description: Haridwar RHS1<2400-50mm_OL Length: 2.00km Curvature: 3.00deg/km
Width: 8.75m

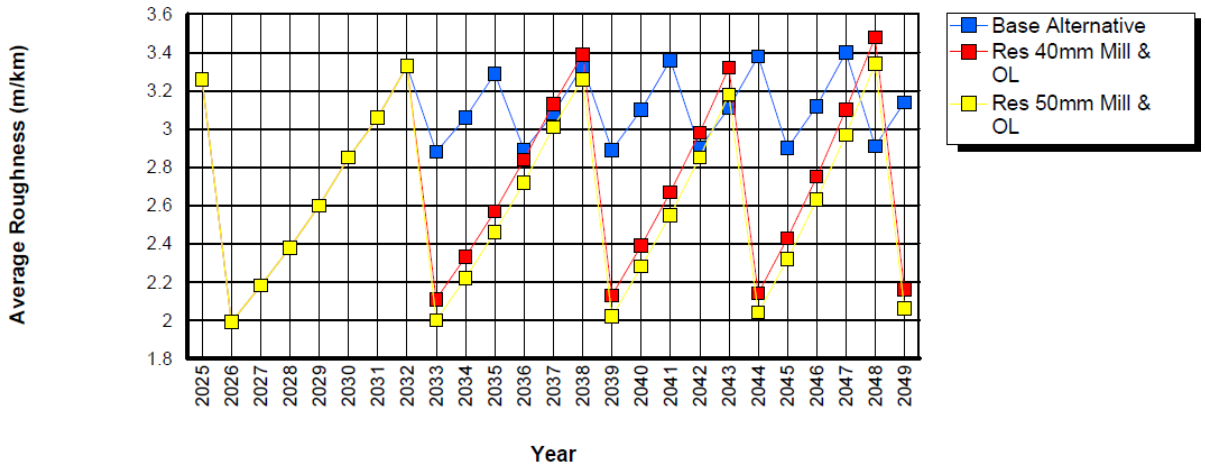


Figure 2: Average Roughness in RHS (DN) Carriageway (Sec-1) 50mm Overlay<2400

HDM-4 Average Roughness by Section (Graph)

Section Details:

ID: Haridwar LHS2<2200-5 Road Class: Primary or Trunk Rise + Fall: 1.00m/km
Description: Haridwar LHS2<2200-50mm_OL Length: 3.86km Curvature: 3.00deg/km
Width: 8.75m

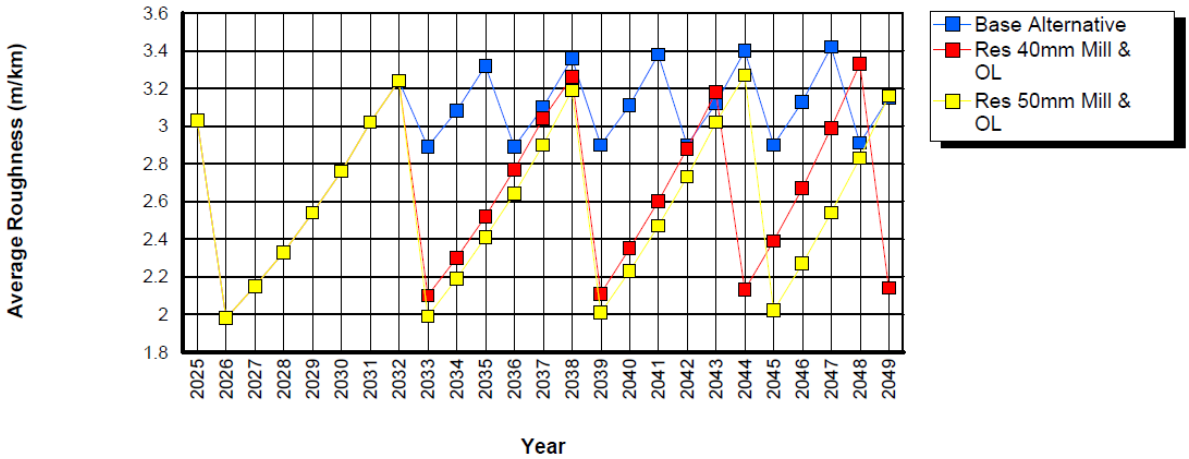


Figure 3: Average Roughness in LHS (UP) Carriageway (Sec-2) 50mm Overlay<2200

HDM-4 Average Roughness by Section (Graph)

Section Details:

ID: Haridwar RHS2<2000-9 Road Class: Primary or Trunk Rise + Fall: 1.00m/km
Description: Haridwar RHS2<2000-90mm_OL Length: 2.40km Curvature: 3.00deg/km
Width: 8.75m

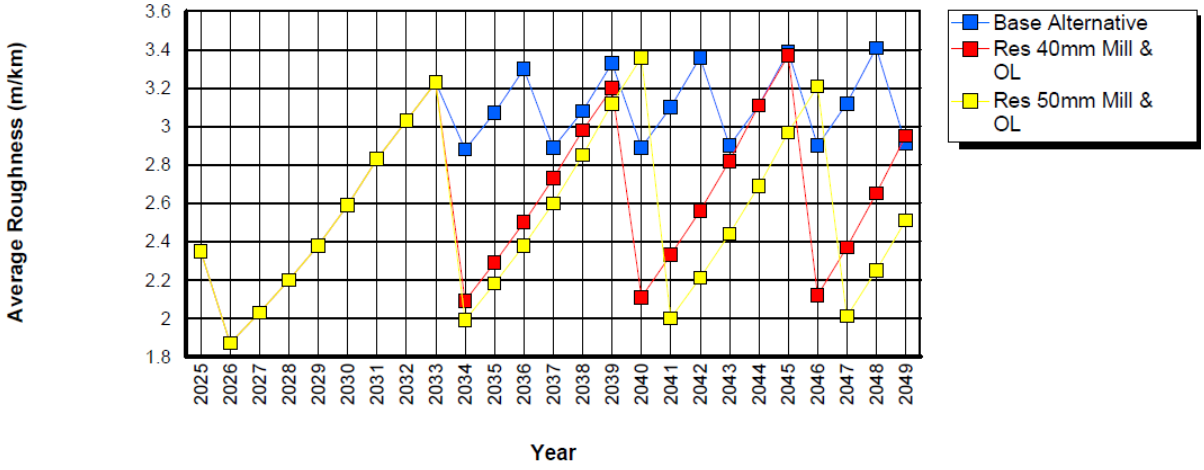


Figure 4: Average Roughness in RHS (DN) Carriageway (Sec-2) 90mm Overlay<2000

6.5 M&M SCHEDULE

Looking at the present condition, progression of traffic with actual traffic growth rates, it is felt prudent to consider 50mm OL as the preferred option, with certain percentage of additional DBM where required.

Before release of schedules without considering the capacity augmentation, HDM model has been run to understand the requirement of MMR cycle and thus 4 cycles are envisaged after considering the initial overlays.

Upon obtaining the schedules, the adopted MM schedule for the project is as below:

Table 49: Adopted MM schedule LHS & RHS

Section-1: LHS (Obtained Vs Adjusted)

- **50mm Overlay**

	Obtained			Adjusted			Obtained				Adjusted				
	No Overlay			No Overlay			50mm No Overlay				50mm No Overlay				
LHS	<2000	>=2000 and <2200		<2000	>=2000 and <2200		<2000	>=2000 and <2200	>=2200 and <2400mm	>=2400	<2000	>=2000 and <2200	>=2200 and <2400mm	>=2400	
Length:	21.430	1.000		21.430	1.000		9.030	3.000	1.000	1.280	9.030	3.000	1.000	1.280	
Year															
2025							50	50	50	50					
2026		50			50						50	50	50	50	
2027															
2028															
2029	50			MCS											
2030										50					
2031							50	50							
2032				50	50	10% DBM			50		50	50	50	50	10 %DBM
2033		50													
2034															
2035	50					Cap				50					Cap
2036						Cap	50	50							Cap
2037						DLP									DLP
2038						DLP			50						DLP
2039		50				DLP									DLP
2040	50					DLP				50					DLP
2041						DLP	50	50							DLP
2042															
2043									50						
2044		50		50	50					50	50	50	50	50	
2045	50							50							
2046							50								

Section-1: RHS (Obtained Vs Adjusted)

- **50mm Overlay**

	Obtained		Adjusted			Obtained				Adjusted				
	No Overlay		No Overlay			50mm Overlay				50mm Overlay				
RHS	<2000	>=2000 and <2200	<2000	>=2000 and <2200		<2000	>=2000 and <2200	>=2200 and <2400mm	>=2400	<2000	>=2000 and <2200	>=2200 and <2400mm	>=2400	
Length:	**23.420**	**1.000**	**23.420**	**1.000**		**5.400**	**3.300**	**2.000**	**1.620**	**5.400**	**3.300**	**2.000**	**1.620**	
2025						50	50	50	50					
2026		50		50						50	50	50	50	
2027														
2028														
2029	50		MCS											
2030														
2031						50								
2032							50	50	50					
2033		50	50	50	10% DBM					50	50	50	50	10% DBM
2034														
2035	50				Cap									Cap
2036					Cap	50								Cap
2037					DLP									DLP
2038					DLP		50	50	50					DLP
2039		50			DLP									DLP
2040					DLP									DLP
2041	50				DLP	50								DLP
2042														
2043								50						
2044			50	50			50		50	50	50	50	50	
2045		50												
2046	50					50								

Section-2: LHS (Obtained Vs Adjusted)

- **50mm Overlay**

	Obtained	Adjusted		Obtained				Adjusted					Obtained			Adjusted			
	No Overlay	No Overlay		50mm Overlay				50mm Overlay					90mm Overlay			90mm Overlay			
LHS	<2000	<2000		No Overlay	>=2000 and <2200	>=2200 and <2400	>=2400	<2000	>=2000 and <2200	>=2200 and <2400	>=2400		<2000	>=2000 and <2200	>=2200 and <2400mm	<2000	>=2000 and <2200	>=2200 and <2400mm	
Length:	13.22	13.22		10.56	3.86	5.00	2.08	10.56	3.86	5.00	2.08		4.40	1.60	1.10	4.40	1.60	1.10	
Year																			
2025				50	50	50	50						90	90	90				
2026								50	50	50	50					90	90	90	
2027																			
2028	50																		
2029		MCS																	
2030																			
2031																			
2032		50	10% DBM	50	50	50		50	50	50	50	10% DBM	50	50		50	50	50	10% DBM
2033							50								50				
2034																			
2035			Cap				Cap					Cap							Cap
2036	50		Cap				Cap					Cap							Cap
2037			DLP				DLP					DLP							DLP
2038			DLP		50		DLP					DLP	50	50					DLP
2039			DLP	50		50	DLP					DLP			50				DLP
2040			DLP				DLP					DLP							DLP
2041			DLP				DLP					DLP							DLP
2042																			
2043	50	50						50	50	50	50		50			50	50	50	
2044					50									50					
2045				50		50									50				
2046							50												

Section-2: RHS (Obtained Vs Adjusted)

➢ 50mm Overlay

	Obtained	Adjusted		Obtained				Adjusted					Obtained	Adjusted	
	No Overlay	No Overlay		50mm Overlay				50mm Overlay					90mm Overlay	90mm Overlay	
RHS	**<2000**	**<2000**		**<2000**	**>=2000 and <2200**	**>=2200 and <2400mm**	**>=2400**	**<2000**	**>=2000 and <2200**	**>=2200 and <2400mm**	**>=2400**		**<2000**	**<2000**	
Length:	**13.360**	**13.360**		**7.960**	**10.700**	**2.120**	**5.280**	**7.960**	**10.700**	**2.120**	**5.280**		**2.400**	**2.400**	
2025				50	50	50	50						90		
2026								50	50	50	50			90	
2027															
2028															
2029	50	MCS													
2030															
2031				50											
2032					50	50	50								
2033		50	10%DBM					50	50	50	50	10%DBM	50	50	10%DBM
2034															
2035			Cap									Cap			Cap
2036			Cap	50								Cap			Cap
2037	50		DLP									DLP			DLP
2038			DLP		50	50	50					DLP			DLP
2039			DLP									DLP			DLP
2040			DLP									DLP	50		DLP
2041			DLP	50								DLP			DLP
2042															
2043		50				50		50	50	50	50			50	
2044	50				50		50								
2045															
2046				50									50		

Section-1: LHS & RHS (Adjusted)

➢ 50mm Overlay

	LHS Adjusted- No Overlay			LHS Adjusted 50mm Overlay					RHS Adjusted No Overlay			RHS Adjusted 50mm Overlay				
LHS	<2000	>=2000 and <2200		<2000	>=2000 and <2200	>=2200 and <2400mm	>=2400		<2000	>=2000 and <2200		<2000	>=2000 and <2200	>=2200 and <2400mm	>=2400	
Length:	21.43	1.000		9.030	3.000	1.000	1.280		23.42	1.000		5.400	3.300	2.000	1.620	
Year																
2025																
2026		50		50	50	50	50			50		50	50	50	50	
2027																
2028																
2029	MCS								MCS							
2030																
2031																
2032	50	50		50	50	50	50									
2033									50	50		50	50	50	50	
2034																
2035			Cap					Cap			Cap					Cap
2036			Cap					Cap			Cap					Cap
2037			DLP					DLP			DLP					DLP
2038			DLP					DLP			DLP					DLP
2039			DLP					DLP			DLP					DLP
2040			DLP					DLP			DLP					DLP
2041			DLP					DLP			DLP					DLP
2042																
2043																
2044	50	50		50	50	50	50		50	50		50	50	50	50	
2045																
2046																

Section-2: LHS & RHS (Adjusted)

➢ 50mm Overlay

	Adjusted LHS No Overlay		Adjusted LHS 50mm Overlay					Adjusted LHS 90mm Overlay				Adjusted RHS No Overlay		Adjusted RHS 50mm Overlay					Adjusted RHS 90mm Overlay	
LHS	**<2000**		**<2000**	**>=2000 and <2200**	**>=2200 and <2400**	**>=2400**		**<2000**	**>=2000 and <2200**	**>=2200 and <2400**		**<2000**		**<2000**	**>=2000 and <2200**	**>=2200 and <2400**	**>=2400**		**<2000**	
Length:	**13.22**		**10.56**	**3.86**	**5.00**	**2.08**		**4.40**	**1.60**	**1.10**		**13.36**		**7.96**	**10.70**	**2.12**	**5.28**		**2.40**	
Year																				
2025																				
2026			50	50	50	50		90	90	90				50	50	50	50		90	
2027																				
2028																				
2029	MCS											MCS								
2030																				
2031																				
2032	50		50	50	50	50		50	50	50										
2033												50		50	50	50	50		50	
2034																				
2035		Cap					Cap				Cap		Cap					Cap		Cap
2036		Cap					Cap				Cap		Cap					Cap		Cap
2037		DLP					DLP				DLP		DLP					DLP		DLP
2038		DLP					DLP				DLP		DLP					DLP		DLP
2039		DLP					DLP				DLP		DLP					DLP		DLP
2040		DLP					DLP				DLP		DLP					DLP		DLP
2041		DLP					DLP				DLP		DLP					DLP		DLP
2042																				
2043	50		50	50	50	50		50	50	50		50		50	50	50	50		50	
2044																				
2045																				
2046																				

6.6 STRUCTURAL PERIODIC MAINTENANCE STRATEGY

Expansion joints:

- Visual inspection is carried out to check for seal breakages, Armor angle, Weld failures, cracks between deck & Expansion joints concrete and Joints filled with debris. Such joints replaced immediately.
- Joint buried with debris shall be inspected for any distress, if any distress is shown it shall be replays immediately.
- During visual inspection it is seen that some Expansion joints are bad where as some are not showing any defects.
- Due to this it is considered provident to change the Expansion joints which are visibly damaged in initial stage.
- In the absence of records pertaining to Expansion joint replacements it is highly difficult to predict the date of replacement needed for compliance to IRC codal requirements. Balance joints which are not replaced initially will be replaced as on when defects are shown in the joints. This aspect is considered in BOQ.

Bearings:

- In order to identify the bearings requiring immediate replacement, the following strategy is adopted.
- Girder Bridges showing diagonal cracks at support, distress in the Pedestals and any form of distress in support location is regarded as a candidate for replacement. By visual inspection there are only a handful of such situations.
- Wherever pedestals are damaged either by cracking or spalling poisons confinement is proposed by Jacketing/MS plate bonding such procedure is very effective and common.
- All Metallic Bearings need to be taken up for servicing.

Wearing Coat:

It is necessary to replace the wearing coat at every 15years interval, as wearing coat is a very weak component of the bridge structure which is subjected to severe deterioration due to loading, environment etc. As of now, we have considered sealing of cracks by Fog Seal and for which does not show any distress other than cracking by viz. Pot holes, abrading etc. Based on this aspect, this cost has been considered in highway O&M cost.

Periodic Maintenance strategy for Replacement of Bearings & Expansion joint:

Below strategy has been considered for periodic major maintenance of the structures.

S No	Description	Bridge components
1	Old structure	Retained at the time of 4/6 laning
2	New Structure	Constructed during the 4/6 laning

Age	Description	Item	structures-Assumption-MMR	
			% of Replacement of Major components	
			2032	2044
New	Super structure lifting with Pot bearings	Pot	25%	25%
New	Super structure lifting with Elastomeric bearings	Ela	25%	25%
New	Super structure lifting with Rocker bearings	Rocker	0%	0%
Old	Super structure lifting with Pot bearings	Pot	65%	25%
Old	Super structure lifting with Elastomeric bearings	Ela	65%	25%
Old	Super structure lifting with Rocker bearings	Rocker	65%	25%
New	Pot bearing cost	Pot	25%	25%
New	Elastomeric bearing cost	Ela	25%	25%
New	Rocker bearing cost	0	0%	0%
Old	Pot bearing cost	Pot	65%	25%
Old	Elastomeric bearing cost	Ela	65%	25%
Old	Rocker bearing cost	0	65%	25%
New	Expansion joint Replacement	0	31%	31%
Old	Expansion joint Replacement	0	81%	31%
New	Others	0	31%	31%
Old	Others	0	81%	31%

Cost Component for various items and activities have been worked out by considering the Best Industry practice and most appropriate methods. Detailed quantities for work items have been estimated based on the details presented in previous chapters for various heads.

The gist of the cost components considered are presented below:

- Immediate Repair's Cost
- Routine Maintenance Cost
- Incident Management Cost
- Periodic Maintenance Cost
- Operations Cost
- Year by Year total O&M Costs

7.1 RATE ANALYSIS

Detailed rate analysis has been carried out based on MORTH guidelines to arrive at the unit rates of various items. Material rates and their leads from the project corridor are considered as per the material investigations done on the project road. Summary of unit rates arrived at are presented in table below:

Table 50: Unit Rates of Basic Material

S.no	Description	Units	Source	Basic rate excluding Transportation & GST	Lead in Kms
1	VG-40 (CAPEX)	MT	Panipat	50,602	165
2	VG-40 (MMR) *	MT	Panipat	47,147	165
3	Good earth	Cu.m	BA	186	6
4	40 mm	Cu.m	Crusher	1,125	40
5	20 mm	Cu.m	Crusher	1,137	40
6	12 mm	Cu.m	Crusher	1,131	40
7	6 mm	Cu.m	Crusher	1,125	40
8	Dust	Cu.m	Crusher	1,149	40
9	M sand	Cu.m	Crusher	1,379	40
10	CRMB-55	MT	Panipat	48,752	165
11	CRMB-55-MMR	MT	Panipat	47,147	165
12	SS1	MT	Panipat	48,000	165
13	Steel	MT	Haridwar	50,000	61
14	HTS Strands	MT	Haridwar	75,000	61
15	Cement	MT	Haridwar	7,300	61

Note: *For future asphalt pavement rehabilitation works, a normative standardized cost for Bitumen (VG-40 & PMB) has been determined based on historical bitumen rates from August 2020 to December 2024

Table 51: Unit Rates of Major Material excluding GST

S.no	Item	Unit	Rate (INR) Excluding GST
1	BC - G1-VG-40-CAPEX	Cum	12,592
2	BC - G1-VG40/CRMB-MMR	Cum	12,069
3	BC – G2-VG40/CRMB-MMR	Cum	12,417
4	DBM G-2-VG-40- MMR	Cum	9,831
5	Tack coat on bituminous surface	Sqm	14
6	DBM G-1-VG-40	Cum	10,509
7	Tack coat on granular	Sqm	16
8	Prime Coat	Sqm	47
9	WMM	Cum	3,432
10	GSB G-2	Cum	3,333
11	CTSB	Cum	3,929
12	CTB	Cum	4,490
13	PQC	Cum	9,095
14	DLC	Cum	5,149
15	SG	Cum	711
16	Road Marking	Sqm	585
17	HYSD	MT	73,498
18	HT strand	MT	1,53,161

NOTE: 1. Item rates considered for Small projects

2. Labour: Central Minimum Wages as on Oct'2024 for "C Area" Category of construction workers

7.2 INITIAL IMPROVEMENT WORKS

Costs associated with initial improvements are estimated based on the detailed asset inventory and condition assessment surveys, Pavement condition and structural condition assessment surveys. Items which are not executed as part of scope or in damaged condition have been considered for immediate costs as a part of 1-year capex. Following items are mainly considered for Initial Improvement costs:

- Scope given in schedule-B
- Scope which is not executed
- Road work items
- Bridge Work Items
- Pavement Rehabilitation works
- Structural Rehabilitation works
- Drainage Works
- Slope Protection works
- Safety Works

On review of the contemporary records and on ground assessment, the cost to complete is given below.

Table 52: Initial Capex Cost FY26

S. No.	Particulars	Amount Rs
1	Immediate Repair's (Highway)	16,90,64,424
2	Immediate Repair's - Structures	13,98,17,561
3	Schedule-B Scope (Highway&misc)	14,88,92,612
4	TMS	7,42,55,511
5	ATMS	19,91,75,758
6	Revalidation surveys	78,32,400
7	Emergency Repair Cost during Monsoon	5,00,00,000
8	Toll plaza renovation cost including replacement of Office Furniture, all building, Canopy, all misc items etc	5,00,70,146
	Total Cost (in Rs.)	83,91,08,412
	Total Cost Including GST @ 18% (in Rs.)	99,01,47,926
	Total Amount (in Rs. Crore)------ (A)	99.02
9	Rigid pavement repair cost including GST@ 18% in Crore—(B)	0.97
	Total Amount (in Rs. Crore)	**99.99**

Even though overlay requirement is warranted based on FWD/NSV/PCI surveys and the same is not considered in the initial Capex as project is handed over TOT-Concessionaire in FY2032/ FY 2033/ FY2034/ FY2040 (EPC overlaid sections/ Additional works as per Sch-A, Clause-19/ elevated corridor/ spur road).

(A) Immediate Repairs (Highway)

S. No.	Description	Unit	Total Quantity	Rate in Rs	Amount in Rs	Remarks
1	Embankment	Cum	1480	672	9,95,093	Damage
2	RE wall	Sqm	6180	5400	3,33,72,000	Bulging
3	RCC Cover Drain	Rmt	64	2860	1,83,009	Cover Damage
4	Median Openings	Kms	0.306	6208800	18,99,893	Un-Athorized MO Length
5	Kerb	Rmt	4.2	367	1,542	Damage
6	Kerb Paint	Sqm	400	142	56,640	Poor/Faded Paint
7	Kerb	Rmt	23.52	367	8,637	To be raised
8	Median Plantation	Kms	26.25	200000	52,50,000	Missing / Non-Functional
9	Delineators	Nos	60	684	41,040	Missing / Damage
10	Solar Blinkers	Nos	8	7500	60,000	Not working
11	Solar Blinkers	Nos	4	15000	60,000	Blinker Missing / Damage
12	5th Km Stone	Nos	16	8417	1,34,669	Missing
13	Km Stones	Nos	71	4918	3,49,150	Missing
14	Hectometre Stone	Nos	602	1312	7,89,583	Missing
15	Antiglares	Nos	2633	300	7,89,900	Missing / Damage / Poor
16	Concrete Crash Barrier (CCB)	Rmt	272	6208.8	16,88,794	Missing
17	Concrete Crash Barrier (CCB)	Rmt	87	1863	1,62,050	Damage
18	Metal Beam Crash Barrier (MCB)	Rmt	395	2897	11,44,236	Missing
19	Metal Beam Crash Barrier (MCB)	Rmt	294	1159	3,40,664	Damage
20	Padestrain Guard Railing (PGR)	Rmt	290	2897	8,40,072	Missing
21	Padestrain Guard Railing (PGR)	Rmt	136	5041	6,85,603	Damage
22	Cantilever Gantry	Nos	2	10000	20,000	Damage & Poor
23	Recangular	Nos	3	6306	18,919	Damage & Poor
24	Triangular	Nos	1	5998	5,998	Damage & Poor
25	Circular	Nos	3	9032	27,095	Damage & Poor
26	Octagonal	Nos	1	9402	9,402	Damage & Poor
27	Chevron	Nos	2	6306	12,613	Damage & Poor
28	Hazard	Nos	1	6306	6,306	Damage & Poor
29	Cluster	Nos	1	6306	6,306	Damage & Poor
30	Normal Studs	Nos	325	303.60	98,670	Damage / Missing
31	Bus Shelter - Side Wall - Concrete Slab	Cum	2.16	7000	15,120	Missing / Damage

S. No.	Description	Unit	Total Quantity	Rate in Rs	Amount in Rs	Remarks
32	Light Poles - Single Arm	Nos	2	71207	1,42,414	Full Pole Damage
33	Light Poles - Double Arm	Nos	3	76399	2,29,198	Full Pole Damage
34	Underpass Lighting	Nos	14	750	10,500	Missing / Damage
35	ECB	Nos	1	7995	7,995	Railing Damage
36	Construction of Retaining wall	Rmt	90	63730.88	57,35,779	
37	Stone Pitching	Cum	80.50	3735.00	3,00,662	
Sub-Total					5,54,99,550	
For the safety improvement works not covered in DPR & Schedule-B (includes median drain, Median Opening improvement, Chutes, median cuts, Vertical improvements, MCB shifting, Bollards, chute confinements handrail on CCB etc)					11,35,64,874	
Immediate Repair's (Highway) in Rs (without GST)					16,90,64,424	

(B) Immediate Repairs (Structures)

S. No.	Description	Unit	Total Quantity	Rate in Rs	Amount in Rs
1	wearing coat comprising of 53 mm thick BC including Water proofing compound	sqm	810	1119	9,06,188
2	Cleaning and adding rubber sealant near expansion joints	Rm	268	451	1,21,100
3	Replacement of Damaged Concrete Railing all complete as per technical specifications and as directed by the Engineer	Rm	25	4546	1,13,656
4	Provision of an RCC crash barrier (0.35sqm cross sectional area) constructed with M-40 grade concrete including reinforcement	cum	59.1	14730	8,70,374
5	Lifting of superstructure by providing necessary hydraulic jacks, mechanical jacks, sleepers, packing etc complete including cost of labour, equipment, tools, consumables etc complete.	Nos	5	129630	6,48,150
6	Elastomeric bearings	Cum	13	1.40	18
7	Cutting of groove of 15 mm x 15 mm along crack and sealing the same with epoxy putty including cost of material , labour etc.	RM	994	1010	10,03,940
8	Carrying out 30 to 50 mm thick shotcreting using a mix proportion of 1:2:2 (cement: sand:6 mm down aggregate) added with Polypropylene fibers at a dosage rate of 125 gms/bag of cement including cost of labour, material, scaffolding, equipment etc complete,	sqm	183	873	1,59,695
9	RCC (Super Structures)	cum	181	1738	3,14,844
10	Approach slab dismantling	cum	241	1738	4,18,631
11	Construction of Approach slab on Both side of approaches including reinforcement	cum	241	20894	50,34,117
12	Providing of New Drainage spouts	No.s	35	4894	1,72,260
13	Weed removal (Vegetation)	Man days	264	2594	6,84,750
14	Anti-corrosion paint for Steel 45 microns primer with Zinc bonding coat	Lit	586	656	3,84,234
15	Micro Concrete	Cum	1.35	75600	1,02,223
16	Concrete	Cum	483	14633	70,61,371

S. No.	Description	Unit	Total Quantity	Rate in Rs	Amount in Rs
17	HYSD Bars	MT	19	96081	18,59,877
18	Epoxy coating / injection inclusive all. Sealing of cracks/porous concrete by injection process through nipples/Grouting complete as per Technical Specification.	Sqm	973	1508	14,66,044
19	Patching of damaged concrete surface with polymer Modified mortar upto maximum thickness of 45mm thickness in layer not exceeding 15mm and curing compounds, available in present formulations, to be applied including bond coat.	sqm	514	2969	15,25,938
20	Sealing of crack / porous concrete with Epoxy Grout by injection through nipples complete as per clause 2803.1.	Kg	20	1508	30,150
21	Providing and laying Plain cement concrete M15 grade, mechanically mixed and compacted, including centering and shuttering all complete.	cum	120	11015	13,26,971
22	Providing and laying Filter material underneath pitching in slopes.	cum	21	4801	98,942
23	Providing and laying Pitching on slopes laid over prepared filter media including boulder apron laid dry in front of toe of embankments.	cum	42	4843	2,05,395
24	Steel pipe	Rm	32	908	29,040
25	Removal of existing asphaltic wearing coat comprising of 50 mm thick asphaltic concert laid over 12 mm thick mastic asphalt including disposal with all lift and lead upto 1000 m		810	254	2,05,538
26	Repair of Drainage spouts including down take pipe & etc	Rm	414	260	1,07,640
27	Replacement of existing damaged Expansion joints by providing and laying of Strip Seal Expansion Joint System, including removal of existing damaged expansion joints by dismantling of deck slab, wearing coat etc. and back filling of the recess up to final finish level with Micro conc, complete as per M.O.R. T&H specification.	Rm	117	26180	30,49,970
28	Structural steel	MT	263	88149	2,31,67,497
29	Sand blasting	Sq.m	50	221	11,063
30	Pointing with cement mortar (1:3) / commercially available material on brick / stone work in substructure as per Technical specifications	Sq.m	138	2816	3,87,516
31	Epoxy paint (4 mic)	Sq.m	1536	1815	27,87,840
32	Guniting spraying a mix or mortar or concrete to a surface of application with the help of a spray gun"	Nos	133	1849	2,45,144
	Total Amount in Rs (A)				5,45,00,115
	RE- wall bulging cost (B)				65,84,463
	As per Schedule B Immediate Str Rehabilitation cost in Rs (C)				7,87,32,983
	Immediate Repair's - Structures, without GST (A)+(B) +(C)				13,98,17,561

(C) Schedule-B scope for Highway and Misc. works

S. No	Description	Amount
1	Road furniture	13,35,70,459
2	Bus-bay	13,00,000
3	Truck parking	59,82,028
4	Toll Plaza	2,00,000
5	Miscellaneous	7,50,000
	Sub-Total	14,18,02,487
	Contingencies, 5%	70,90,124
	TOTAL	14,88,92,612

(C) TMS Cost

The TMS cost arrived are based quotes obtained by NHIT, from different vendors such as Comvision, Devaditya and Efkon for the amount Rs 7,42,55,511.

(D) ATMS Cost

ATMS cost computed with reference to MoRTH 2023 circular for installation of TMCS, VIDS, VASDS, VMS system, DTS/OFC etc.

7.3 ROUTINE MAINTENANCE & INCIDENT MANAGEMENT COSTS

Routine maintenance costs include general maintenance costs of road elements, bridge elements and road furniture and appurtenances. This can be mainly divided into two parts as:

- ✓ General Maintenance of Works
- ✓ Repairs to Highway & Bridge Elements

7.3.1 General Routine Maintenance

General Routine Maintenance of Roads generally include following items:

- Cleaning of Project facilities
- Structures cleaning,
- Cleaning of ROW
- Cleaning and Maintenance of Toll Plaza
- Unlined Drain Maintenance
- Lined Drain Maintenance
- Maintenance of Highway Lighting at Toll Plaza and other project locations
- Median Plantation maintenance & Avenue plantation maintenance:
- Maintenance of Road Furniture
- Maintenance of Road Safety Items

The above items are estimated by considering the detailed break-up of following items:

- Manpower including Managers/Labour etc.
- Vehicles for Labour Transport/Water Tankers/Sweeping Machines etc.
- Resources/Equipment's such as grass cutters, tools, jet sprayers, hydraulic trimmers etc.

7.3.2 Repairs to Highway & Bridge Works

Repairs to highway and bridge works have been estimated based on the assumed quantities (Percentage basis) of execution for every year.

These items include the following:

1	Providing treatment for sealing of road surface / isolated cracks at scattered locations
	i) Covered with 6.7 mm size stone chipping @ 0.1 cum/ 10 sqm.
	ii) covered with dry coarse sand passing through 2.36 mm sieve and retained on 180-micron sieve @ 0.03 cum/10 sqm heated to 600 C
	iii) filling discrete cracks with slow curing bitumen emulsion as per Technical Specification Clause 3004.3.3
2	Providing treatment to bleeding bituminous surface at scattered locations
3	Providing localized repair to rutted portion and edge breaking of bituminous surface
4	Providing treatment and repair to pot-holes and patch work
5	Providing and laying dense bituminous macadam using bitumen grade VG 40 complete as per Technical Specification Clause 507
6	Proving and laying bituminous concrete (asphaltic concrete)
	(a) Using bitumen (VG-40) as per IRC: SP: 53
7	Road Roughness survey
8	Turfing on embankment slopes and at all other Project Facilities
9	Providing repair to stone pitching/apron at scattered locations
10	Rain Cuts Maintenance: Restoration of rain cuts soil, morrum, gravel or a mixture of these
11	Providing and laying apron/ stone pitching on slopes of guide bunds/ road embankment / other location
12	Providing and laying stone aggregate filter material (150 mm compacted thickness) underneath pitching
13	Unlined drain
14	Filling in median island with approved materials with all leads and lifts complete as per TS Clause No. 407
15	Replacing damaged / broken railing with new pre-cast / cast-in-situ, concrete railing to match with existing design and pattern.
24	Carrying out repair to road signs including strengthening resetting or otherwise repairing signs and delineators
	a) Road sign board mounted on single post
	b) Road sign board mounted on double post
	c) Overhead/ Gantry Sign boards
	d) Delineator
25	Supplying and fixing at site retro-reflectorized type **sign boards/signs**
	90cm Equilateral triangle
	60cm circular
	90 cm circular
	90cm high octagon
	80cm x 60cm rectangle
	Chevron signs 60cm x 45cm
	Place identification signs (Fig 15.7 of IRC 67)
	Providing and fixing Object Markers
	Providing and fixing of retro-reflectorized Route Marker signs (size 450mm x 600mm)

26	**Hazard Marker Sign:**
	a) size 90 x 30 cm
	b) size 30cm triangular side cluster of red reflectors (screen printed)
27	Cats Eyes/Raised pavement marker (NMC Nails Less)
28	Painting two coats on old surface after minor repairs to give an even and smooth surface and printing letters and figures with synthetic enamel paint
	a) Hectometer stones
	b) Kilometer Stone
	c) 5 Kilometer stone
	d) Boundary stone
	e) Guard stone
29	Providing painting lettering and fixing of distance measurement stones including dismantling of old damaged/ broken ones, confirming to TS Clause 804
	a) Hectometer stones
	b) Kilometer Stone
	c) 5 Kilometer stone
	d) Boundary stone
	e) Guard stone
30	Providing and fixing road delineators conforming to TS Clause No. 805 as directed by the Engineer.
31	Repainting the kerb stones and separation barrier with first quality synthetic enamel paint of approved brand
32	Painting all types of pavement markings including lines, dashes, arrows etc. on roads as per relevant IRC/MOST standards after cleaning the surface complete in all respects as directed by the Engineer.
	a) Hot applied Thermoplastic compound
	(i) Lane / Centre Line / Edge Line
	(ii) Direction Arrows
	(iii) Diagonal Chevrons Markings
33	Supplying and laying cast-in-situ cement concrete kerb without channel section
	a) by Manual/machine including formwork
34	Major repair / replacement of metal beam crash barrier (W profile guard rails)
35	Providing and fixing chain link/ welded mesh fencing / square bars fencing
36	Dismantling the old damaged chain link/welded mesh / square bars fencing and replacing it with new chain link/ welded mesh/square bars fencing
37	Provision of rumble strips
38	Shoulder Maintenance:
39	synthetic enamel paint of approved brand on metal pedestrian guard rail
40	Dismantling of wearing course

B. Structures

1. Wearing coat comprising of 50 mm thick BC.
2. Cleaning and adding rubber sealant near expansion joints.
3. Modular Expansion joints.
4. Replacement of Damaged Concrete Railing all complete as per technical specifications and as directed by the Engineer
5. Provision of an RCC crash barrier (0.35sqm cross sectional area) constructed with M-40 grade concrete including reinforcement
6. Cleaning of rocker & roller bearing using high pressure water jet, free from rust scales, re-setting & greasing the bearings using graphite grease including cost of materials, labour etc., complete.
7. POT PTF Bearings greasing and maintaining (sand plastering).
8. Elastomeric Bearings and maintaining.

9. Cutting of groove of 15 mm x 15 mm along crack and sealing the same with epoxy putty including cost of material, labour etc.
10. Carrying out 50 to 60 mm thick shortsheeting using a mix proportion of 1:2:2 (cement: sand:6 mm down aggregate) added with Polypropylene fibers at a dosage rate of 125 gms/bag of cement including cost of labour, material, scaffolding, equipment etc. complete.
11. Repair of Floor Aprons, pitching and other protection works
12. Cleaning of Drainage Spouts
13. M-25 Concrete

7.3.3 Incident Management Cost

Incident Management & Safety items include the following:

- ✓ ATMS control room operations,
- ✓ Regular patrolling & reaching accident/incident site,
- ✓ providing relief to injured persons including taking them to nearest hospital and attending to the safety requirements at the location (putting cones, safely guide & manage the traffic using signs, safety barricades, etc.),
- ✓ removal of accident /breakdown vehicles, removing of dead animals/birds lying on the highway and loading, unloading, transportation & disposal of surplus material left over by accidental vehicle or otherwise lying on road (on carriageway) and
- ✓ Encroachment prevention & removal with all lead & lifts complete with proper communication equipment,
- ✓ consumables, materials, suitable Towing vehicles, Ambulance, patrolling vehicles and manpower like drivers, helpers, para-medical staff, labour including deployment of crane and all works shall be done as per requirement and as directed by Client representative and as per Relevant Specifications as applicable.

7.4 OPERATIONS COSTS

In addition to the above-mentioned General Routine maintenance, Repair & Rehabilitation cost for Road and structures, Incident management cost the following the Cost towards Operations include:

- Electricity Charges
- Toll Plaza Operation cost
- Insurance Charges
- Road Asset Management System (RAMS), Bridge Management System (BMS) & Surveys
- Other Office Expense (Admin, SPV, IE and Other)

Table 53: O&M Cost for various Years in Crores (including GST)- FY2026

FY	Operation & Maintenance Cost (in INR Cr.)								
	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
2025-2026	4.18	2.11	0.00	4.26	3.32	11.62	2.98	2.98	4.69
2026-2027	4.18	2.11	2.93	4.26	3.32	11.62	2.98	1.60	5.30
2027-2028	4.18	2.11	2.93	4.26	3.32	11.62	2.98	1.60	5.39
2028-2029	4.18	2.11	2.93	4.26	3.32	11.53	2.98	1.60	5.31
2029-2030	4.18	2.11	2.93	4.26	3.32	11.53	2.98	2.30	5.39
2030-2031	4.18	2.11	2.93	4.26	3.32	10.64	2.98	1.60	5.40
2031-2032	4.18	3.03	2.93	4.26	3.32	9.75	2.98	1.60	5.28
2032-2033	4.18	3.51	2.93	4.26	3.93	9.30	3.37	1.60	5.95
2033-2034	4.18	3.67	2.93	4.26	4.14	9.30	3.37	2.30	5.54
2034-2035	0.60	-	-	-	-	9.30	3.37	0.00	4.39
2035-2036	0.60	-	-	-	-	9.30	3.37	0.00	4.48
2036-2037	0.60	-	-	-	-	9.30	3.88	0.00	4.53
2037-2038	0.60	-	-	-	-	9.30	3.88	0.70	4.61
2038-2039	0.60	-	-	-	-	9.30	3.88	0.00	4.49
2039-2040	0.60	-	-	-	-	9.30	3.88	0.00	5.20
2040-2041	0.60	-	-	-	-	9.30	3.88	0.00	4.70
2041-2042	6.18	5.90	3.17	4.26	6.49	9.30	3.88	2.71	5.84
2042-2043	6.18	5.90	3.17	4.26	6.49	9.30	3.88	2.01	5.77
2043-2044	6.18	5.90	3.17	4.26	6.49	9.30	3.88	2.01	5.80
2044-2045	6.18	5.90	3.17	4.26	6.49	9.30	3.88	2.01	5.80
Total	**66.51**	**46.47**	**36.11**	**55.37**	**57.23**	**199.25**	**69.30**	**26.63**	**103.85**

Note:

1) The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation.

2) All other remaining costs are based on FY 2025 with GST and without escalation.

3) The amount is Crores inclusive of GST and without escalation

7.5 PERIODIC MAINTENANCE COSTS

Cost towards major maintenance include following:

- ✓ Cost of Periodic maintenance of Pavement based on Finalized MM schedule
- ✓ Cost of Periodic Maintenance of Structures
- ✓ Cost of Periodic replacement of Toll Equipment's & Software

Table 54: Major Maintenance Cost

FY	Major Maintenance Cost (in INR Cr.)			
	Road (MCW,SR, Toll Plaza)	Structure	ATMS	TMS
2025-2026	-	-	-	-
2026-2027	-	-	-	-
2027-2028	-	-	-	-
2028-2029	0.02	-	-	-
2029-2030	-	-	-	-
2030-2031	-	-	-	-
2031-2032	73.37	20.00	10.65	4.38
2032-2033	69.57	-	-	-
2033-2034	-	-	-	-
2034-2035	-	-	-	-
2035-2036	-	-	-	-
2036-2037	-	-	-	-
2037-2038	-	-	-	-
2038-2039	-	-	-	8.76
2039-2040	-	-	-	-
2040-2041	-	-	-	-
2041-2042	-	-	-	-
2042-2043	113.86	-	-	-
2043-2044	96.02	46.54	11.53	-
2044-2045	2.55	-	-	-
Total	**355.39**	**66.55**	**22.18**	**13.14**

Note: The amount is Crores inclusive of GST and without escalation, considering FY2025 rates

7.6 CAPACITY AUGMENTATION

The capacity augmentation is envisaged for full project length in the year FY2035 &FY 2036 with 5-year DLP up to FY2041.

- The capacity augmentation is envisaged in this project in the year FY2035 &FY 2036 with 5-year DLP up to FY2041.
- The MSA estimated for 10years, LHS: 52MSA and RHS: 43MSA for Toll Plaza-1 at km 138.700 and LHS: 24MSA and RHS: 21MSA for Toll Plaza-2 at km 187.500
- From FWD analysis, strengthening overlay is warranted for a length of 20.37 km in LHS and 15.4 km in RHS.
- FWD, roughness and PCI lengths are superimposed in order to eliminate the overlapped sections and final considerations are as presented below

Recommendation	Length (Km)	
	LHS	RHS
Overlay as per FWD survey	20.37	15.40
Overlay based on Roughness index/PCI	22.61	25.38
Total	42.98	40.78
No overlay	35.65	37.78

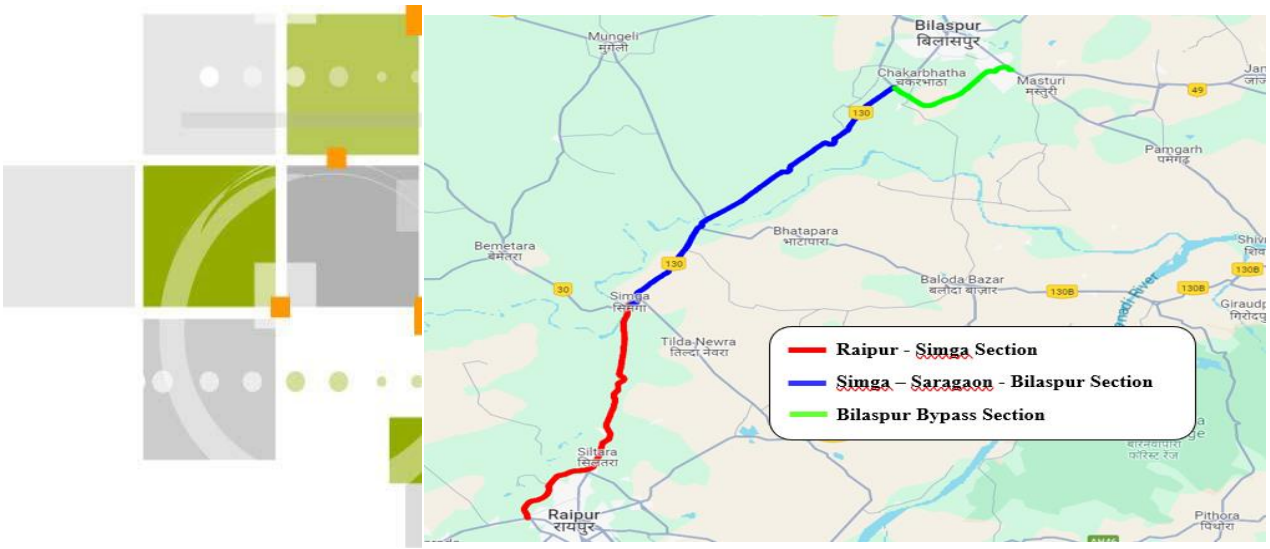
- Project road exhibits varying condition of pavement for fair to poor. Majority of inner lanes exhibit higher distress when compared with outer lanes.
- Several locations at-grade junctions/urban sections require improvement of safety measures by providing grade separators/service roads
- A New major bridge at 164+100 on the right-hand side is experienced severe cracks & leaching issues on the soffit of the Deck slab in all spans and additionally, evidence of previous repair works is observed on the soffit of the slab. Based on the identified distress, a complete replacement of the deck slab is proposed as a remedial measure to ensure continuous and reliable service. However, NHAI is going to take reconstruction as per Schedule-A, Clause-19 with an expected date of completion by May 2027.
- Although this project stretch lies in Seismic zone –IV, the old bridges at Ch: 164+100, 181+190, 186+100, 193+250, 203+746, 204+385, 204+590 and 205+880 not provided with seismic arrestor's/ stoppers. To enhance the seismic resilience of these structures, it is recommended to implement seismic enhancements, such as the installation of seismic stoppers or dampers, at these specific locations
- Couple of old bridges, specifically the Major Bridge at Ch: 193+250 on the left-hand side and the Minor Bridge at Ch: 133+300 on the left-hand side, are constructed with brick masonry substructures and have an overall width of 8.5m. These bridges may require reconstruction to accommodate future capacity augmentation.
- Based on the visual inspection of bearings conducted using the MBIU, no major distress was observed, and the bearings appear to be in fair condition. However, the rocker and roller

bearings on the older bridges require cleaning and greasing to ensure their proper functioning.

- All the old major bridges have structural cracks on the girders, spalling, and issues with reinforcement exposure. Since these are all old structures, NDT (non-destructive testing) is required to assess their current condition and propose suitable repair methodologies
- Steel frame strengthening arrangements were observed on the pier cap (P1) on the left side of the flyover at km 185+428. Currently, no significant damage has been observed on the pier cap. Confirmation from the contractor is required to verify the implementation of these arrangements.
- Shifting to Bahadrabad toll plaza at 187.370 is envisaged on account of overlapping of Dehradun-Haridwar spur road construction. However, this Plaza shall be maintained till operation of new Plaza.
- Bulging of the RE walls observed at several locations of the ROB, flyover and underpass.
- Minimum Central Wages for labour is considered for Category “C” as of OCT’2024 with 0% escalation considered.
- Overheads and Contractor’s profits are considered from MORTH Standard data book -2019 for “Small Project” category.
- The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

FINAL TECHNICAL DUE-DILIGENCE REPORT

Technical Consultant Services for National Highways Infra Trust for Raipur to Simga Section of NH-30 (Old NH-200) from Km.0/000 to Km.48/580 in the State of Chhattisgarh



February 2025

egis India
Consulting engineers pvt. ltd.

Document Name	Final Technical Due-Diligence Report
Document Number	EIRH1HR011/VO11/FR/01A
Project Name	Technical Consultant Services for National Highways Infra Trust for Raipur to Simga Section of NH-30 (Old NH-200) from Km.0/000 to Km.48/580 in the State of Chhattisgarh
Project Number	EIRH1HR011

Document Authentication

	Name	Designation
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Acronyms and Abbreviations

BC	Bituminous Concrete
BOQ	Bill of Quantities
C/W	Carriageway
CA	Concession Agreement
COD	Commercial Operation Date
CVPD	Commercial Vehicles Per Day
DLP	Digital Laser Profile
EGIS	Egis India Consulting Engineers Pvt. Ltd.
EPC	Engineering Procurement and Construction
FWD	Falling Weight Deflectometer
IM	Investment Manager
InvIT	National Highways Infra Trust
IRC	Indian Road Congress
Km	Kilometer (Chainage)
km	Kilometer (Length)
LHS	Left Hand Side
MBIU	Mobile Bridge Inspection Unit
MJB	Major Bridge
MNB	Minor Bridge
MPD	Mean Profile Depth
MSA	Million Standard Axles
NH	National Highway
NHAI	National Highways Authority of India
NHIIMPL	National Highways Infra Investment Managers Private Limited
NSV	Network Survey Vehicle
O&M	Operation and Maintenance
RCC	Reinforced Cement Concrete
RHS	Right Hand Side
ROB	Road over Bridge
SH	Stage Highway
SMTD	Sensor Measured Texture Depth
SPV	Special Purpose Vehicle
VDF	Vehicle Damage Factor
VUP	Vehicular Underpass

Section 1: Executive Summary

1.1 Introduction

1.1.1 Background

NHAI has set up an Infrastructure Investment Trust namely National Highways Infra Trust ("InvIT") and is acting as its Sponsor to the said InvIT. National Highways Infra Investment Managers Private Limited ("NHIIMPL") has been appointed as the Investment Manager to the InvIT.

NHIIMPL appointed M/s Egis India Consulting Engineers Private Limited, as Technical Consultant to conduct the due diligence on the proposed Assets. The Letter of Empanelment (LOE) was received on 3rd November 2022 and Letter of Award (LoA) for the subject Project was received on 14th October 2024 by Egis India and the services commenced immediately thereafter.

The project stretches detail as per LoA are listed below.

Table 1-1: Detail of Project Stretches

Sr. No.	Stretches	Toll Plaza	Lane	Length (km)
1	**Raipur – Simga**	**Tarpongi**	**4/6 Lane**	**48.580**
2	Simga - Saragaon - Bilaspur	Bhojpuri	4 Lane	57.400
3	Bilaspur Bypass	Mudipar	4 Lane	20.545
Total				**126.525**

This report pertains to Raipur to Simga Section.

1.1.2 Objectives

The main objective of the present assignment is to

1. review project documents and understanding schedule B and schedule F requirements for improvement works for the assessment of Capex and Opex during the concession period.
2. conduct field investigations to assess the existing asset condition and future deterioration.
3. validate executed works with respect to schedule A and assessment of improvement Works
4. review quality of construction based on available data, design and drawings.
5. undertake designs for rehabilitation requirements of different assets based on field investigation data and available documents.
6. assess operation and maintenance cost including major maintenance expected to be incurred during the concession period.

1.2 Site Visit

The Technical Consultant visited site from 20th October 2024 to 14th November 2024. The important aspects of the project road were noted in the detailed site reconnaissance along with various field investigations. These included general description about the project road, site features, structures, junctions, pavement characteristics, road safety. Field investigation for NSV, FWD test, axle load survey, trail pits, MBIU and drone videography survey were also conducted by Technical Consultant to assess the present condition of the project road.

1.2.1 Salient Features

Sr. No.	Name of Stretches	Toll Plaza	Ground Chainage* (Km)			Chainage as per Sch A (4/6 laning)		Lane Config.	Length (km)	Details for 4/6-lane widening		
			From	To	NH	From	To			Contractor	Implementation Mode	Status
1	Raipur – Simga	Tarpongi (32+010) 10 lanes (staggered)	00+000	14+800	NH-30	00+000	14+800	4-Lane	14.8	Punj Lloyd	EPC	1.PCOD - 17-12-2021 2.Maintenance period: 4 yrs from PCOD 3.Contractor is undertaking the remedial measures for the defects. 4.Service road construction under COS was undergoing.
			14+800	48+580		14+800	48+580	6-Lane	33.78			
		(4+800) 16 lanes										

Asset-wise details of Project assets are given below:

Table 1-2: Detail of Assets

S. No.	Description			Raipur – Simga section	
				Schedule-A	At Site
1	Total Project Length (km)			48.580	48.580
2	Service Roads/ Slip Roads (km)			28.230	28.290[1]
3	Pavement (km)	Flexible	LHS		
			RHS		
		Rigid	LHS	48.580	48.580
			RHS	48.580	48.580
4	Bus Shelters (no.)			4	4
	Bus bays with Shelters (no.)			10	10
5	Truck Lay-bays/Parking (no.)			2	2
6	Toll Plaza (no.)			1	1
7	Rest Area (no.)			1	1
8	Major Bridges (no.)			2	2
9	Minor bridges (no.)			8	8
10	ROB's (no.)				
11	Flyover (no.)			2	2
12	VUP's (no.)			10	10
13	PUP/CUP (no.)			1	1
14	Culverts (no.)	Pipe Culvert		81	81
		Box Culvert		31	31

1.3 Surveys and Investigations

1.3.1 Network Survey Vehicle (NSV)

The Network Survey Vehicle, which is the latest survey technique which utilizes Lasers, Global Positioning System and Video image processing tools, is used for automatic data collection pertains to pavement condition and road inventory data. The NSV survey has been carried out along the project corridor from 20/10/2024 to 25/10/2024 for collection of field data pertains to pavement condition and road inventory. Summary of findings of NSV survey is given in preceding sections.

1.3.1.1 Pavement Type

Entire main carriageway and service roads along the project road are consist of rigid pavement. Anandapuram – Anakapalli stretch is having rigid pavement.

[1] Service road length differs by 60m from Sch A as minor variation in end chainage of service road is observed at site. Moreover, in terms of start-end chainages, there are errors in Sch A in sl no 6 and 9, making actual difference as 40m.

1.3.1.2 Pavement Conditions

Km-wise pavement condition is shown below as strip chart:

Raipur - Simga

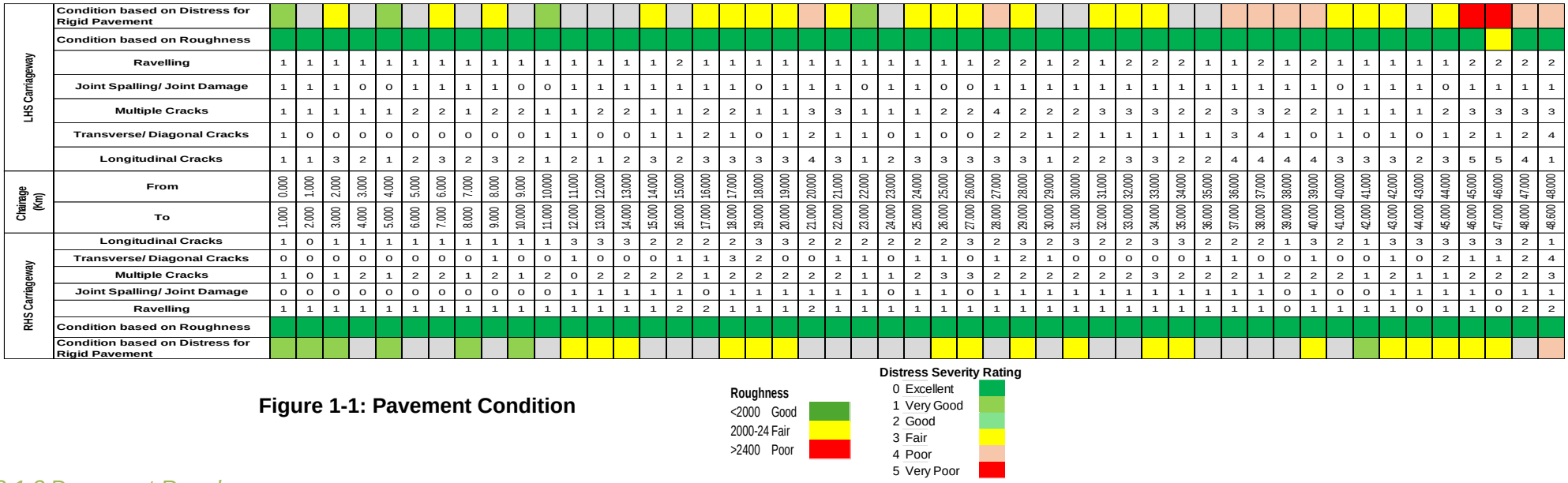


Figure 1-1: Pavement Condition

1.3.1.3 Pavement Roughness

Roughness value measured for each lane of main carriageway using NSV. The summary of direction-wise roughness distribution for each lane in term of percentage length are presented below.

Table 1-3: Raipur Simga Section: Summary of Pavement Roughness

Condition	BI (mm/km)	LHS						RHS					
		Inner		Middle		Outer		Inner		Middle		Outer	
		Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)
Good	<2000	48.600	100.000	34.600	100.000	46.600	95.885	48.600	100.000	34.600	100.000	48.600	100.000
Fair	2000-2400	0.000	0.000	0.000	0.000	2.000	4.115	0.000	0.000	0.000	0.000	0.000	0.000
Poor	>2400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Length (km)		48.600	100.000	34.600	100.000	48.600	100.000	48.600	100.000	34.600	100.000	48.600	100.000

1.3.2 Test Pit Investigations

The designed PQC thickness is 320mm as per the pavement design report. However, thickness available at site is 300mm throughout except at the super elevation locations where thickness is found to be 330mm. The constructed thickness is a departure from design and even not within the construction tolerance limits. Whereas DLC and GSB found to be adequate considering design value of 150mm for DLC and 150mm for GSB and its tolerance limits.

During the above investigations, the existing subgrade soils samples were collected and tested in the laboratory to understand the properties of these foundation soils. The test results are presented in **Annexure 4.7.** The observations from test results are given below:

As per the pavement design report of 4-lane, the adopted design effective CBR for subgrade is 8%. The CBR values as obtained from test investigation was found to be less than design CBR. However, there no such subgrade failures related distresses found at the site but noted that earthen shoulder throughout the project has got deteriorated.

1.3.3 Axle Load Survey

Axle load survey has been conducted in compliance with IRC 37 2018 for 24 hours in both directions at the existing toll plaza locations. Obtained VDF values comparing the values adopted at the time of pavement design during construction summarized in table below.

Table 1-4: Vehicle Damage Factors (VDF)

S. No	Toll plaza	Tarpongi	
	Vehicle Type	LHS	RHS
1	Bus	0.81	0.92
2	LCV	1.03	1.13
3	2-Axle	1.93	2.08
4	3-Axle	3.20	5.24
5	MAV	2.71	14.74

** LHS: Raipur to Bilaspur, RHS: Bilaspur to Raipur*

The higher VDF on RHS side is due to movement of heavily loaded trucks carrying Coal, steel, Construction materials etc whereas, Empty Vehicles of significant proportion in LHS side. Further, 7-day axle load survey has been conducted to validate the above inconstancy and found that VDF values as obtained from these 7-day survey is less than 24 hours' survey and hence adopted the above values in the present due diligence study

1.3.4 Falling Weight Deflectometer

The range of Elastic Modulus, other PQC parameters and their percentage of length and Load Transfer Efficiency (LTE) is presented in table below.

Table 1-5:Summary of Flexural Strength and Elastic Modulus

Pavement layer	Range	Percentage of Project Road	
		LHS	RHS
Raipur Simga Section			
Elastic Modulus of PQC Layer (Mpa)	> 30000	0.00%	16.47%
	30000 - 10000	100.00%	83.53%
Flexural Strength of PQC Layer (Mpa)	> 4.5	0.00%	6.18%
	4.5 - 3.0	89.71%	83.53%
	<3.0	10.29%	10.29%

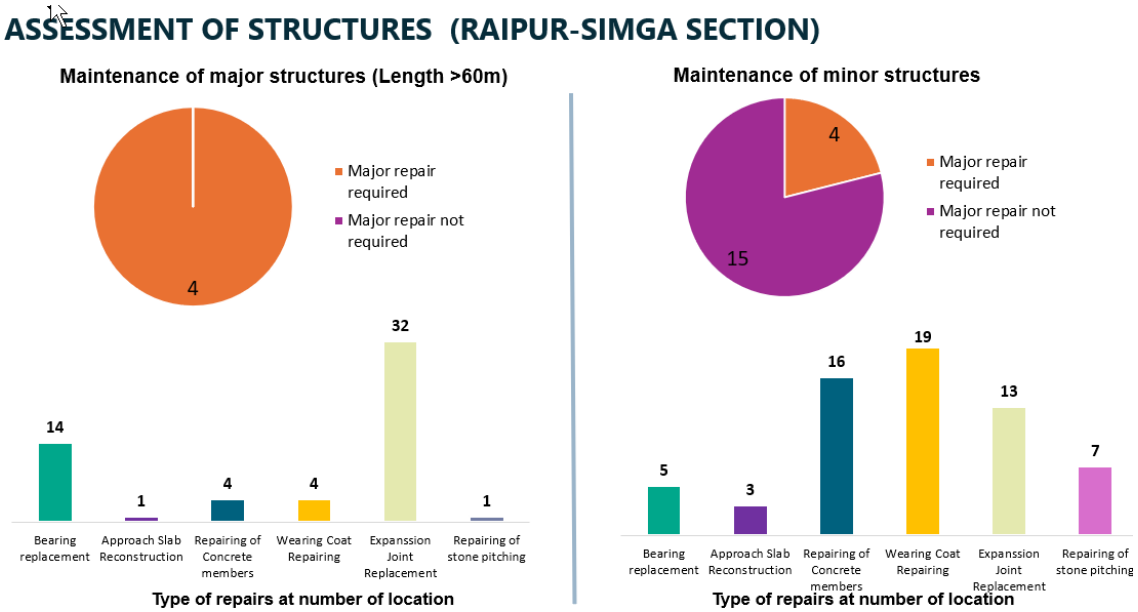
Table 1-6: Summary of Joint Load Transfer Efficiency

Direction	Load Transfer Efficiency (LTE)					
	Transverse Joint			Longitudinal Joint		
	> 90%	90%-50%	< 50%	> 90%	90%-40%	< 40%
Raipur Simga Section						
LHS	54.71%	45.29%	0.00%	56.77%	43.23%	0.00%
RHS	85.29%	14.41%	0.00%	79.42%	20.58%	0.00%

The flexural strength of concrete high for more than 80% of the test locations and even the Load transfer efficiency is high at all the joints tested and hence the joints are in good condition

1.3.5 Structure Inventory and Condition Survey

There are deficiencies noted in the structures and relevant repair-rehabilitation measures are suggested. Requirement of immediate repairs for major structures (length > 60m) and minor structures are presented below.



1.4 Key Technical Issues

1.4.1 Pavement and Road Condition

Longitudinal cracks with low-high severity are there along the project road. RHS carriageway is more distressed compared to LHS due to excessive loading. Some of the cracks are filled with

epoxy mortar and its condition is not satisfactory. There are significant number of pop outs which are repaired with epoxy mortar. It has been observed that repair and rehabilitation works in terms of crack sealing, panel replacement etc. has been done at many locations. Joint separation at the longitudinal joints was found at many of the locations of super elevation, high embankment where joints are widened by more than 30mm.

1.4.2 Structures

A proper gap between decks is not found to allow movement of expansion joints. Due to insufficient gap between decks, crushing and scaling observed in deck slab. These problems are observed at two major bridges at Ch. 14+240 and 27+350 and two flyovers at Ch. 15+400 and Ch. 48+063 in Raipur – Simga section. These are to be rectified by cutting the deck slab for a proper gap before replacing the expansion joints.

Defects at bearings are also found as detailed below:

- MJBR@14+240 (Stretch-1): cracks observed in 1 nr of bearings.
- FO@15+400 (Stretch-1): cracks observed in 2 nr of bearings and Girder not placed properly on one bearing at location.
- MJBR@27+350 (Stretch-1): - cracks observed in 2 nr of bearings.
- MNBR@36+766 (Stretch-1): - cracks observed in 1 nr of bearings. Sliding's moment observed in 2 bearings
- Flyover@48+063 (Stretch-1): - cracks observed in 6 nr of bearings. Sliding's moment observed in 1 bearing

1.5 Capital Expenditure (CapEx) Requirement

1.5.1 Improvement works as per schedule B

Schedule B specifies the requirements of improvement for the concessionaire to be done after the appointment date.

Improvement works Scope specified for each stretch is tabulated below:

Table 1-7: Schedule B Requirements during O&M Handover

S. No.	Description	Unit	Raipur Simga
1	R&R of earthen shoulder covered with granular material.	cum	28518
2	Crack sealing	Km	5.40
3	Panel replacement	Nos	399
4	Approach slabs reconstructed.	Nos	4
5	Bearing replacement	Nos	19
6	Wearing coat replacement	Sqm	5592
7	Strip seal expansion Joint	Lm	612
8	Junction improvement	Nos	23

S. No.	Description	Unit	Raipur Simga
9	Curve improvement.	Nos	50
10	Toll Plaza restoration	Nos	1
11	Truck lay bye	Nos	2
12	Bus lay bye and shelter	Nos	18
13	Landscaping and median plantation	Km	7.3
14	Transverse bar marking:	Nos	75
15	Antiglare	Km	5.93
16	Kerb stones	Km	9.716
17	W beam crash barrier	Lm	2.825

Time to complete above construction works 3/12 months from the Appointed Date.

1.5.2 Immediate Maintenance Requirements

With reference to the clarification of pre-bid queries received from the Authority, the Project is under DLP, prior to the O&M Hand-over date, EPC Contractor will undertake relevant defect rectifications as per the Agreement provisions before handing over the assets to the InvIT concessionaire.

However, toll Plaza renovation cost, revalidation of survey during hand over of O&M and TMS replacement cost has been considered under this head.

1.6 O&M Cost Estimation

1.6.1 Recommended MM Cycles for Pavement

Considering the initial pavement design period and crust, existing flexural strength of PQC and load transfer capacities of existing joints, and in compliance to the provisions of schedule B, the following cycles of Major maintenance is proposed for satisfactory performance of the pavement during operation period for both functionally and structurally.

Table 1-8: Proposed Major Maintenance Cycles for Balance Concession period

Name of Stretch	InvIT Concession (20 years)	
	Periodic Maintenance	ATMS & TMS Replacement
Raipur – Simga	**FY 31 and FY44** **MCW**:2% Panel replacement & 100 % Joint sealant replacement and retexturing **SR:** 100 % Joint sealant replacement and retexturing **Structure:** Replacement of wearing coat & painting **FY-37** **MCW:**2% Panel replacement & 100 % Joint sealant replacement **SR:** 100 % Joint sealant replacement **Structure:** Replacement of wearing coat, bearing, expansion joint & painting	**FY33-** 40% ATMS 50% TMS **FY40-** 60% ATMS 100% TMS

1.6.2 Estimate (Initial Improvement, MMR and O&M)

Year-wise estimate of Initial Improvement, MMR and O&M are given below.

Table 1-9 : Operation & Maintenance Cost (Initial Improvement, MMR and O&M) for Raipur- Simga

Sl.No.	FY	Initial Improvement Cost (in INR Cr.)	Major Maintenance Cost (in INR Cr.)				Operation & Maintenance Cost (in INR Cr.)								
			Road (MCW, SR, Toll Plaza)	Structure	ATMS	TMS	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026	33.13	-	-	-	-	3.38	2.90	2.03	4.58	0.90	6.70	1.51	1.58	3.23
2	2026-2027		-	-	-	-	3.38	2.90	2.03	4.58	0.90	6.70	1.51	1.16	3.59
3	2027-2028		9.04	-	-	-	3.38	2.90	2.03	4.58	0.90	6.70	1.51	1.16	3.65
4	2028-2029		-	-	-	-	3.38	2.90	2.03	4.58	0.90	6.54	1.51	1.16	3.59
5	2029-2030		-	-	-	-	3.38	2.90	2.03	4.58	0.90	6.54	1.51	1.34	3.64
6	2030-2031		72.26	2.26	-	-	3.38	2.90	2.03	4.58	0.90	6.08	1.51	1.16	3.65
7	2031-2032		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.62	1.51	0.96	3.58
8	2032-2033		-	-	5.47	3.13	3.02	1.81	1.71	4.55	0.64	5.40	1.51	0.96	3.99
9	2033-2034		2.89	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	1.15	3.73
10	2034-2035		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	0.96	3.64
11	2035-2036		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	0.96	3.70
12	2036-2037		18.27	9.62	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	0.96	3.73
13	2037-2038		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	1.15	3.77
14	2038-2039		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	0.96	3.70
15	2039-2040		2.89	-	8.21	6.26	3.02	1.81	1.71	4.55	0.64	5.40	1.69	0.96	4.14
16	2040-2041		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	0.96	3.83
17	2041-2042		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	1.15	3.91
18	2042-2043		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	0.96	3.87
19	2043-2044		79.94	2.94	-	-	3.73	3.17	2.12	4.58	1.17	5.40	1.69	1.23	3.89
20	2044-2045		-	-	-	-	3.73	3.17	2.12	4.58	1.17	5.40	1.69	1.23	3.89
Total		**33.13**	**185.30**	**14.81**	**13.68**	**9.39**	**63.99**	**45.40**	**36.98**	**91.29**	**15.41**	**115.04**	**32.43**	**22.14**	**74.71**

Note: The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

1.7 Conclusion

The project highway has been constructed as per the provisions of the EPC Agreement for 4/6 laning by adopting rigid pavement for both main carriageway and service roads. The traffic volume on the project is considerably high due to presence of large-scale industries within the project influence area. The project requires capacity augmentation when the average daily traffic beyond the Target traffic for any of the homogenous section. As per the latest traffic surveys, analysis and projections, the project section from km 0+000 to 14+800 trigging for capacity augmentation from four to six laning during FY 32 and FY33 with a DLP period of 10 years being the rigid pavement. The 6-lane stretch is available for full O&M by InvIT from FY 44 to till end of the concession. The cost towards the augmentation works to be borne by the Authority. The performance of the pavement is found to be satisfactory under the current traffic loading conditions. However, the longitudinal intersecting cracks generated mostly in the mid slabs to outer side has been observed. The riding quality of the surface appears to be good for the comfort of the road users though the pavement has experiencing surface defects such as cracks of low to high severity. The reasons for adequate performance of the pavement are due to strong and uniform subgrade support as required for transfer of the wheel loads to the foundation. As per the site visit, the process of primary and secondary consolidation of the pavement layers has already been achieved and therefore, the progression of cracks after the consolidation stage is not very significant.

The other significant defect is widening of the longitudinal joints. This widening is conspicuously noticed on high embankments. It does not appear to be critically influenced by the absence or misalignment of tie bars. To arrest this widening, stitching of this joint is being practised with 2-meter-long steel bars. Bars at the end to resemble a staple pin are inserted spanning across the joint in grooves cut for this purpose. Since the widening of joints was noticed in locations where the slab was poorly supported, it is not expected that all joints would widen. The needs to be monitored for taking necessary measures when the joint width will become 30mm, cross-stitching of tie bars shall be done. Further, timely repair and rehabilitation for the identified distress during the concession period is required to maintain the structural adequacy of the PQC layer and improve the overall serviceability of the pavement structure.

Based upon the site visit for assessment of condition of CD structures including MJB, MNBs, ROB, VUPs, Culverts and toll plaza buildings in the project corridor and observations submitted in various chapters of this report, it is concluded that immediate major repairs are required for few structures in terms of repairs of replacement of bearings, replacement of expansion joints and rectification of settled approach slabs. Authority has clarified that these shall be rectified by them before handing over. It is advised that a thorough check of asset condition should be done by the InvIT Concessionaire before taking over to ensure that all the defects are rectified.

The assessment of estimated cost of such improvement works repairs along with the anticipated future repair and rehabilitation cost are considered in the cost estimate of this report.

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Section 2: Introduction

2.1 Background

NHAI has set up an Infrastructure Investment Trust namely National Highways Infra Trust ("InvIT") and is acting as its Sponsor to the said InvIT. National Highways Infra Investment Managers Private Limited ("NHIIMPL") has been appointed as the Investment Manager to the InvIT.

NHIIMPL appointed M/s Egis India Consulting Engineers Private Limited, as Technical Consultant to conduct the due diligence on the proposed Assets. The Letter of Empanelment (LOE) was received on 3rd November 2022 and Letter of Award (LoA) for the subject Project was received on 14th October 2024 by Egis India and the services commenced immediately thereafter.

Project road is a continuous stretch which is divided in three sections based on the tolling length of each of the three toll plazas in each section. The project stretches detail are listed below.

Table 2-1: Detail of Project Stretches

Sr. No.	Stretches	Toll Plaza	Lane	Length (km)
1	**Raipur – Simga**	**Tarpongi**	**4/6 Lane**	**48.580**
2	Simga - Saragaon - Bilaspur	Bhojpuri	4 Lane	57.400
3	Bilaspur Bypass	Mudipar	4 Lane	20.545
Total				126.525

This report pertains to Raipur to Simga Section.

2.2 Objectives

The main objective of the present assignment is to

review project documents and understanding schedule B requirements for improvement works for the assessment of Capex and Opex during the concession period.

1. conduct field investigations to assess the existing asset condition and future deterioration.
2. validate executed works with respect to schedule A and assessment of improvement works
3. review quality of construction based on available data, design and drawings.
4. undertake designs for rehabilitation requirements of different assets based on field investigation data and available documents.
5. assess operation and maintenance cost including major maintenance expected to be incurred during the concession period.

2.3 Technical Consultant Team

The Technical Consultant commenced its services from 15th October 2024 and the team comprising of Highway, Pavement & Structure Engineers and Experts have conducted site visit from 20th October 2024 to 14th November 2024 to appreciate the project corridor characteristics. This report

highlights the findings from visual assessment, available documents shared with the consultant, discussion with Authority Engineer officials involved with the maintenance and operation of project road at site and other local enquiries. Analysis of data as obtained from various survey and investigations conducted at site are present in this report.

Date-wise various field activities at site are shown below in bar chart form in **Figure 2.1.**

Figure 2-1: Project Activities Schedule

PROJECT STRETCHES	20-Oct-24	21-Oct-24	22-Oct-24	23-Oct-24	24-Oct-24	25-Oct-24	26-Oct-24	27-Oct-24	28-Oct-24	29-Oct-24	30-Oct-24	31-Oct-24	01-Nov-24	02-Nov-24	03-Nov-24	04-Nov-24	05-Nov-24	06-Nov-24	07-Nov-24	08-Nov-24	09-Nov-24	10-Nov-24	11-Nov-24	12-Nov-24	13-Nov-24
Raipur - Simga												Diwali Holiday													
FWD Survey																									
NSV Survey																									
Inventory and Condition Survey																									
Axle Load Survey																									
Drone Survey																									
Test Pits																									
MBIU for Major Structures (Length > 60m)																									

2.4 Disclaimer

The information and documents received from the Client are being reviewed by the Consultant and have been used for preparing this report. Due care has been taken while reproduction of the information where required to avoid typographical or other errors.

2.5 Structure of the Report

The report has been structured into nine sections as follows:

Section 1: Executive Summary
Section 2: Introduction
Section 3: Inventory and Condition Assessment
Section 4: Surveys and Investigations
Section 5: Review of Documents
Section 6: Capital Expenditure (CapEx) Requirement
Section 7: Operation & Maintenance
Section 8: Conclusions

Section 3: Inventory and Condition Assessment

3.1 General

The Technical Consultant visited site from 20th October 2024 to 14th November 2024. The important aspects of the project road were noted in the detailed site reconnaissance along with various field investigations. These included general description about the project road, site features, structures, junctions, pavement characteristics, road safety. Field investigation for NSV, FWD test, axle load survey, trail pits, MBIU and drone videography survey were also conducted by Technical Consultant to assess the present condition of the project road. This chapter elaborates various findings of these surveys and studies conducted by the Technical Consultant team in different sections.

3.2 Project Corridor

Project road is a continuous stretch which is divided in three sections based on the tolling length of each of the three toll plazas in each section. The project stretches detail are listed below:

Table 3-1: Detail of Project Stretches

Sr. No.	Stretches	Toll Plaza	Lane	Length (km)
1	**Raipur – Simga**	**Tarpongi**	**4/6 Lane**	**48.580**
2	Simga - Saragaon - Bilaspur	Bhojpuri	4 Lane	57.400
3	Bilaspur Bypass	Mudipar	4 Lane	20.545
Total				126.525

This report pertains to Raipur to Simga Section.

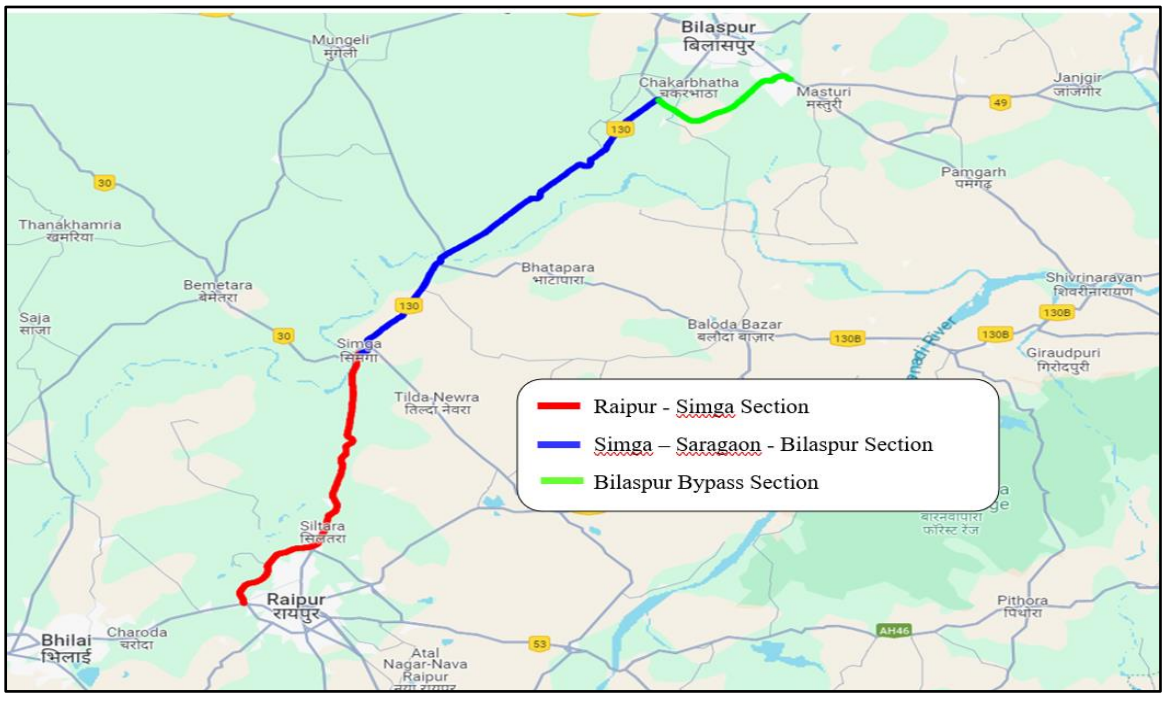


Figure 3-1: Project Location Map

3.3 Project Brief

3.3.1 Salient Features

Table 3-2: Salient Features

Sr. No.	Name of Stretches	Toll Plaza	Ground Chainage* (Km)			Chainage as per Sch A (4/6 laning)		Lane Config.	Length (km)	Details for 4/6-lane widening		
			From	To	NH	From	To			Contractor	Implementation Mode	Status
1	Raipur – Simga	Tarpongi (32+010) 10 lanes (staggered)	00+000	14+800	NH-30	00+000	14+800	4-Lane	14.8	Punj Lloyd	EPC	1.PCOD - 17-12-2021 2.Maintenance period: 4 yrs from PCOD 3.Contractor is undertaking the remedial measures for the defects. 4.Service road construction under COS was undergoing.
			14+800	48+580		14+800	48+580	6-Lane	33.78			

Details of Assets:

Table below provides the quantum of the assets and compare the same with the Schedule A stipulations:

Table 3-3: Asset Details and Comparison with Sch A

S. No.	Description			Raipur - Simga Section	
				Schedule-A	At Site
1	Total Project Length (km)			48.580	48.580
2	Service Roads/ Slip Roads (km)			28.230	28.290[2]
3	Pavement (km)	Flexible	LHS		
			RHS		
		Rigid	LHS	48.580	48.580
			RHS	48.580	48.580
4	Bus Shelters (no.)			4	4
	Bus bays with Shelters (no.)			10	10
5	Truck Lay-bays/Parking (no.)			2	2
6	Toll Plaza (no.)			1	1
7	Rest Area (no.)			1	1
8	Major Bridges (no.)			2	2
9	Minor bridges (no.)			8	8
10	ROB's (no.)				
11	Flyover (no.)			2	2
12	VUP's (no.)			10	10
13	PUP/CUP (no.)			1	1
14	Culverts (no.)	Pipe Culvert		81	81
		Box Culvert		31	31

3.4 Road Inventory and Condition Survey

3.4.1 Road Inventory

The Road Inventory is conducted to assess and list out the existing features of the project corridor and to validate that project road is conforming to the requirements of CA. It covers all the existing physical features such as terrain, land use, carriageway surfacing type, shoulder width, junctions, water bodies, roadside arboriculture, general drainage conditions, etc. It was carried out in accordance with the guidelines given in IRC: SP 19-2001, generally by visual means, and supplemented by simple tape measurement.

The road inventory data collected for the project highway is presented in the **Annexure 3.1.**

[2] Service road length differs by 60m from Sch A as minor variation in end chainage of service road is observed at site. Moreover, in terms of start-end chainages, there are errors in Sch A in sl no 6 and 9, making actual difference as 40m.

3.4.2 Terrain

The project highway falls in plain terrain.

3.4.3 Main Carriageway

Project highway is having 6-lane with paved shoulder configuration except from Raipur Bypass where it is four lane with paved shoulder. The rigid pavement is there in main carriageway and service/slip road in entire project stretch.

The carriageway width is 7.5m (with kerb shyness) with 1.5-2.0m paved shoulder for 4-lane sections and 11.0m (with kerb shyness) with 1.5-2.0m paved shoulder for 6-lane section except at toll plaza, underpasses, bridges and ROBs.

Details are show in **Table 3.4** and **Figure 3.2** below.

Table 3-4: Main Carriageway

S No.	Section	NH Section	Ground Chainage (km)		Length (Km)	Carriageway Width (MCW+PS)
			From	To		
1	Raipur - Simga section	NH-30	00+000	10+070	10.070	9.0
			10+070	11+590	1.520	9.5
			11+590	14+810	3.220	9.0
			14+810	15+900	1.090	13.0
			15+900	17+150	1.250	12.5
			17+150	18+380	1.230	13.0
			18+380	20+900	2.520	12.5
			20+900	21+730	0.830	13.0
			21+730	24+180	2.450	12.5
			24+180	25+080	0.900	13.0
			25+080	38+580	13.500	12.5
			38+580	39+530	0.950	13.0
			39+530	48+580	9.050	12.5
			Total Length (km)		***48.580***	



4 lane Carriageway (Typ)



6 lane Carriageway (Typ)

Figure 3-2: Main Carriageway

3.4.4 Service Road/Slip Roads

Total linear length (both side length) of service/slip road along the project road is 58.74 km with 27.37 km falls in Raipur-Simga section. It is noticed that a COS is issued by NHAI to the EPC Contractor for construction of service/slip roads and associated exit-entry ramps for VUPs at km 2+105, 3+605 and 8+068. Total linear length of service road given above includes the length of service road constructed/in progress under COS. It is observed that construction is completed at 8+068 whereas it is at advance stage at other two locations. Rigid pavement is there for the service/slip roads at all the locations.

Table 3-5: Service Road

Service Road (LHS)			Service Road (RHS)		
Chainage (km)		Length (km)	Chainage (km)		Length (km)
From	To		From	To	
Raipur - Simga section					
1+640	2+565	0.925	1+640	2+565	0.925
3+140	4+080	0.940	3+140	4+080	0.940
7+630	10+070	2.440	7+630	10+070	2.440
10+070	11+590	1.520	10+070	11+590	1.520
14+810	19+400	4.590	14+810	19+400	4.590
20+900	21+730	0.830	20+900	21+730	0.830
24+180	25+080	0.900	24+180	25+080	0.900
38+580	39+530	0.950	38+580	39+530	0.950
47+530	48+580	1.050	47+530	48+580	1.050
Total		**14.145**	**Total**		**14.145**



Slip Road at Km 7+625 LHS



Construction of Slip Road is in progress at Km 2+105 VUP LHS

Figure 3-3: Service/Slip Road Carriageway

3.4.5 Towns and Built-Up-Areas

Chainage-wise detail of towns and built-up areas are given below:

Table 3-6: Built Up Areas

S. No.	Chainage (km)		Length (km)	Name of Settlement
	From	To		
Raipur - Simga section				
1	16+100	16+900	0.800	Siltara
2	35+148	35+648	0.500	Saddu
3	38+698	39+298	0.600	Sankara

3.4.6 Major and Minor Junctions

3.4.6.1 Major Junction

There is 1 no. of major junction at Raipur - Simga Section and 1 no. major junction at Bilaspur Bypass Section. Details of the major junction are given in the **Table 3.7** below:

Table 3-7: List of Major Junction

Sr. No.	Chainage (km)	Side	Type of Junction (T, X, Y)	Cross Road Leads To	
				LHS	RHS
Raipur - Simga Section					
1	0+090	-	Roundabout	Durg	Raipur

3.4.6.2 Minor Junction

There are 43 nos. of minor junctions at Raipur-Simga section. Summary of the minor junctions are given in the **Table 3.8** below:

Table 3-8: Summary of Minor Junction

Sr. No.	Type of Junction (T, X, Y)	Raipur - Simga Section	
		LHS	RHS
1	T Junction	16	12
2	Y Junction	6	3
3	X Junction	3	3

3.4.7 Median

Median width is predominantly 4.0m-4.5m (excluding shyness) except at few underpass locations where the width is 1.5m. Details of sections with narrow median width are given in the **Table 3.9** below:

Table 3-9: Details of Narrow Median (Width < 4.5m)

Sr. No.	Chainage (Km)		Length (km)	Median width (m)	Remarks
	From	To			
Raipur-Simga section					
1	10+070	11+000	0.93	1.5	VUP approaches
2	14+810	15+900	1.09	1.5	Flyover approaches
3	17+150	18+380	1.23	1.5	VUP approaches
4	20+900	21+730	0.83	1.5	VUP approaches
5	24+180	25+080	0.9	1.5	VUP approaches
6	38+580	39+530	0.95	1.5	VUP approaches

3.4.8 Earthen / Hard Shoulder

Earthen shoulders are provided on the outer side of the main carriageway. The width of these shoulders is 1.5m to 2.5m.

3.4.9 Drainage

Details of Drainage are given in the **Table 3.10** and shown in **Figure 3.4.**

Table 3-10: Drainage System

Description	Raipur - Simga Section
Covered Lined Drain (km)	2.63
Open Lined Drain (km)	13.4

General observation of drainage conditions during the site reconnaissance are:

- Trapezoidal line drains are provided at most of the sections between main carriageway and service road. Discharge from these drains is either through the culvers or through rain water harvesting system. These trapezoidal drains are normally in good condition.
- Cleaning and maintenance of roadside drainage needs improvement. Slab at cover drain is damaged at few locations. Longitudinal lined drains are observed between main carriageway and service/slip road.
- Provision of chute drain at high embankment location is observed.
- Median cut drains (chute) are provided at super-elevation section to drain out the water from one carriageway to another at curve location.
- No overtopping of road was observed at any location during the survey work. It was further confirmed by the locals also



Cover Drain at Slip Road



Lined drain between Main Carriageway and Slip/Service Road

Figure 3-4: Drainage System

3.4.10 Road Furniture

3.4.10.1 W-Beam Crash Barrier, Concrete Crash Barrier and Pedestrian Guardrail

W-Beam Crash Barrier

W-Beam crash barrier are observed at bridges approaches, at shoulder side where embankment height above 3m and at median where width is 1.5m for entire project road. Bamboo crash barrier are also observed from km 32+390 to km 32+570 LHS at Raipur – Simga section. Length of W-Beam Crash Barrier are given in the **Table 3.11** and shown in **Figure 3.5.**

Table 3-11: W-Beam Crash Barrier

Description	Raipur - Simga Section
W-Beam Crash Barrier (km)	38.775
Bamboo Crash Barrier (km)	0.180



W-Beam at shoulder Bamboo crash barrier at shoulder

Figure 3-5: W-Beam Crash Barrier/ Bamboo Crash Barrier

Concrete Crash Barrier

Concrete Crash Barrier is provided at approaches of Flyovers and Underpasses almost all through the project road. Length of CC barrier are given in the Table 3.12 and shown in Figure 3.6.

Table 3-12: Concrete Crash Barrier

Description	Raipur - Simga Section
Concrete Crash Barrier (km)	5.55



Figure 3-6: Concrete Crash Barrier

Pedestrian Guardrails

Pedestrian guard rails are provided at the median opening location for all junctions for the entire project road. Length of Pedestrian Guardrails are given in the Table 3.13 and shown in Figure 3.7.

Table 3-13: Pedestrian Guardrails

Description	Raipur - Simga Section
Pedestrian Guardrail (km)	1.34



Figure 3-7: Pedestrian Guardrails

3.4.10.2 Sign Boards and Gantry

There are adequate number of signboards along the project road and most of them are in good condition. There are variable message signs (VMS), overhead and cantilever gantry signs as well. Location of gantry signs are shown in **Table 3.14** and **Figure 3.8** below.

Table 3-14: Variable Message Signs (VMS) / Cantilever & Overhead Gantry

S. No.	Chainage (km)	Side	Type
Raipur - Simga Section			
1	0+410	RHS	Cantilever
2	0+470	LHS	Cantilever
3	2+590	Median (LHS)	VMS
4	9+580	LHS	Cantilever
5	12+070	RHS	Cantilever
6	12+970	Median (RHS)	VMS
7	14+400	LHS	Cantilever
8	16+360	RHS	Cantilever
9	25+210	Median (LHS)	VMS
10	30+510	LHS	Cantilever
11	31+020	LHS	Cantilever
12	31+420	LHS	Cantilever
13	31+440	RHS	Cantilever
14	31+850	RHS	Cantilever

S. No.	Chainage (km)	Side	Type
15	31+900	LHS	Cantilever
16	32+300	LHS	Cantilever
17	32+330	RHS	Cantilever
18	32+740	RHS	Cantilever
19	33+240	RHS	Cantilever
20	47+100	LHS	Cantilever
21	47+410	Median (RHS)	VMS





Figure 3-8: VMS and Gantry Signboards

3.4.10.3 5 km / Km / Hectometer Stones

5Km, Km & Hectometer stones are observed at shoulder & median. Most of stones are in good condition.





Figure 3-9: Kilometer & Hectometer Stones

3.4.11 Project Facilities

3.4.11.1 Bus Bays and Shelters

Bus bays/shelters are available at main carriageway and service/slip roads. It is observed that shelters are of tin shade, and they are in fair to good condition. Package-wise numbers of these facilities are given in **Table 3.15** and shown in **Figure 3.10** below.

Table 3-15: Bus Bays and Shelters

Description	Unit	Raipur - Simga Section
Bus bay with Shelter	Nos	10
Bus Shelter	Nos	4




Figure 3-10: Bus Bay and Shelters

3.4.11.2 Truck Lay bye

01 no Tuck lay bye (both side) with toilets and 01 Rest Area facilities are available at Raipur-Simga section.

Table 3-16: Truck Lat Bye and Rest Area

Description	Unit	Raipur - Simga Section
Truck Lay Bye	Nos	2
Rest Area	Nos	1


Truck lay bye at Km 19+820 LHS


Rest Area at Km 46+900 LHS

Figure 3-11: Truck Lay bye and Rest Area

3.4.11.3 Street light

Street light in the form of single/double arm poles are provided in toll plaza, underpasses and built-up area along the project road. Package-wise length provided for street lighting is give in **Table 3.17** and few examples are shown in **Figure 3.12.**

Table 3-17: Highway Lighting

S. No.	Section	Double Arm Light		Single Arm Light	
		Kms	Nos	Kms	Nos
1	Raipur - Simga Section	10.670	304	23.820	656



Highway lighting at Underpass



Highway lighting at Bus Bay

Figure 3-12: Street Light

3.4.11.4 High Mast Light

High mast lights are observed at toll plazas, rest areas, and few junctions. Details are show in **Table 3.18** below.

Table 3-18: High Mast Light

Sr. No.	Chainage	Side	Location	Type	Quantity (nos)
Raipur-Simga section					
1	0+090	LHS	Roundabout Jn	High Mast	1
2	0+090	RHS	Roundabout Jn	High Mast	1
3	15+430	RHS	Junction	High Mast	1
4	15+430	LHS	Junction	High Mast	1
5	20+500	LHS	Junction	High Mast	1
6	29+310	RHS	Junction	High Mast	1
7	31+330	RHS	Junction	High Mast	1
8	31+680	LHS	Toll plaza	High Mast	1
9	31+820	RHS	Toll plaza	High Mast	1
10	32+000	RHS	Toll plaza	High Mast	1
11	32+060	LHS	Toll plaza	High Mast	1
12	32+620	LHS	Junction	High Mast	1
13	34+860	LHS	Junction	High Mast	1
14	46+800	LHS	Rest area	High Mast	1
15	46+850	LHS	Rest area	High Mast	1
16	48+050	LHS	Junction	High Mast	1



High mast light at Toll Plaza



High mast light at Junction

Figure 3-13: High Mast Light

3.5 Toll Plaza

The purpose of the Toll Plaza is to collect toll from road users of the Project highway with transparency in the system. There is one toll plaza at this section. Booths are available for all lanes. Administrative buildings is there at the Toll Plazas.

3.5.1 Tarpongi Toll Plaza (TP-1)

Tarpongi toll Plaza (TP-1) is located at km 32+010 of NH-30, Raipur - Simga stretch which has staggered toll plaza with 10 lanes (9+1 Lanes) in each direction. Canopy is there over all 10 lanes. Booths are available for all lanes.

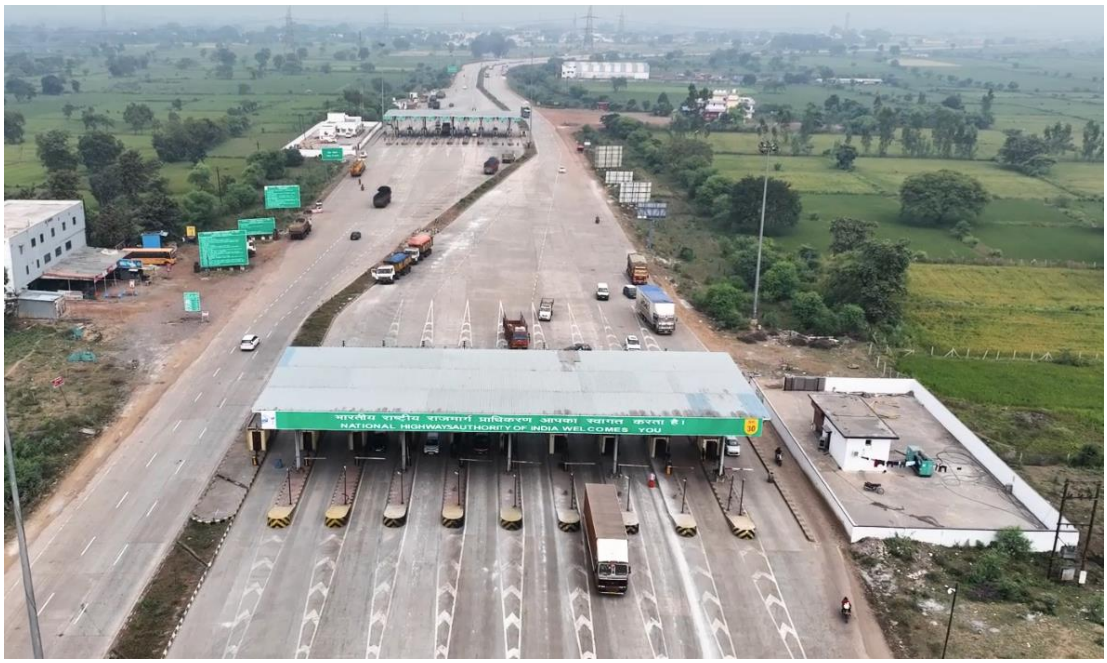


Figure 3-14: Tarpongi Toll Plaza

Table 3-19: Toll Equipment Status at Tarpongi Toll Plaza

Sr. No.	Particulars	Details
1	Toll Plaza Chainage and name	32+010 (Staggered) & Tarpongi Toll Plaza
2	Road Configuration	4/6 Lane (NH-30)
3	Number of Toll Lanes	10 Lanes (in each direction)
4	No of ETC system	10 Lanes (in each direction)
5	No of Toll Booths	10 Lanes (in each direction)
6	Canopy	Available
7	Admin Building	Available
8	Control Room	Available
9	Server Room	Available
10	Medical Aid Post	Available
11	Traffic Aid Post	Available
12	PTZ camera	Available, but temporarily not in working condition
13	UPS & Battery Room	Available
14	Plaza Manager Room	Available
15	Cash up Room	Available
16	Cashier Room	Available
17	Cash Van Garage	Not Available
18	Availability of Tunnel	Available
19	PRO Office	Available
20	Meeting Room	Available
21	Changing Room	Available
22	Toilets (Gents & Ladies)	Available
23	Weigh In Motion Facility	Available
24	Availability of Static Weigh Bridge	Available
25	Availability of loading/unloading facilities	Not Available
26	Storage facility of overloaded material	Not Available
27	Diesel Generator	Available
28	High Mast Light	Available
29	Street Lights	Available
30	Type of Pavement at Toll Lanes	Rigid
31	Highway Mini Nest – 2 no's	Available
32	Cantilever / Gantry Boards	Available



Lane Equipment



Boom barrier



TMS Equipment



Weigh In Motion

Figure 3-15: Toll Equipment, Tarpongi Toll Plaza

3.5.2 Toll Plaza Administration Building

The Plaza administration building serves as the support structure for the operation and maintenance of the toll plaza. It is from here that utilities are distributed and controlled, employee amenities are maintained, the toll collection process overseen, revenues are processed & audited. Sale of local passes and recharge is done at Plaza building. Transfer of funds from toll booth to plaza building and from plaza building to bank are being facilitated/managed by administration and financial management functions are also conducted in the building.





Figure 3-16: Toll Plaza Administration Buildings

3.6 Structure Inventory and Condition Survey

This section mainly presents the Site Inventory and Condition Survey of all existing Structures likes Culverts, Minor bridges & Major bridges, Flyovers, VUP, LVUP, PUP, RUB and ROBs along the project roads. The aim of the section is to present the details of existing structures condition of existing structures and functioning of structures. The structure inventory has been done based on visual assessment of each structure. MBIU has been used for visual assessment inspection of major structures having length greater than 60m.

Number of existing structures along the Project roads are given in the following table. Detailed inventory and condition data is presented in **Annexures – 3.2**

Table 3-20: Number of Structures

S. No.	Description		Raipur - Simga Section
1	Major Bridge (no.)		2
2	Minor Bridge (no.)		8
3	ROB/RUB (no.)		-
4	Flyover (no.)		2
5	VUP (no.)		10
6	PUP/CUP (no.)		1
7	Culverts (no.)	Box	31
		Pipe	81

Section 4: Surveys and Investigations

4.1 Visual Condition Assessment

4.1.1 Raipur – Simga Section

i) Observed the longitudinal cracks with low-high severity (predominantly inner lane & Middle lane) along the project road. RHS carriageway is more distressed compared to LHS due to excessive loading.

ii) Some of the cracks are filled with epoxy mortar and its condition is not satisfactory.

iii) As per the IE, about 1489 Concrete Panels have already replaced in the year 2023 and planned for another 1486 panel replacement works during 2024. The Panel replacement works in progress.

iv) Observed significant number of pop outs and repaired it epoxy mortar.

v) Service road construction in progress at 2+600 LHS.



Cracks in Pavement



Service Road Construction

Figure 4-1: Raipur – Simga: Visual Condition

4.2 Network Survey Vehicle (NSV)

The Network Survey Vehicle is the latest survey technique which utilizes Lasers, Global Positioning System and Video image processing tools. The survey vehicle is used for automatic data collection pertains to pavement condition and road inventory data, required for preparation of pavement maintenance and management proposals. It allows all the data to be collected in a single pass consequently minimising the time needed to complete the data collection. The measurement of surface distresses like cracking, ravelling, patching and potholes etc. is done using the calibrated image processing methods. The description of NSV and the methodology adopted is provided in **Annexure-4.1.**

The NSV survey has been carried out along the project corridor from 27/07/2024 to 01/08/2024 for collection of field data pertains to pavement condition and road inventory. The data has been collected separately for each lane of the Carriageway.

Integrated into the NSV is a Digital Laser Profiler (DLP) consisting of two-point laser (6 devices).

This inertial profiler is capable of measuring:

- Pavement Roughness (one laser in each wheel path and centre)
- Rutting (full transverse pavement measurement)
- Macro texture (outer wheel path and between wheel paths).

4.2.1.1 Determination of Roughness

- The outputs of the lasers and accelerometers located in each wheel path (750 mm either side of the centre line of the vehicle) are sampled every 25 mm of longitudinal travel and used to calculate the longitudinal profile of the road.

- The profile is then passed through the Quarter Car model to calculate the International Roughness Index (IRI) lane roughness as per the methodologies specified in the Austroads Guide to Asset Management, Part 5B - Roughness.

- Post Survey any 'spikes' in the roughness outputs will be excluded that may arise from cattle grids, railway crossings, bridge abutments etc. Automated checks in the data processing software are already incorporated to exclude any contribution to roughness from data collected below the minimum survey speed which is typically set at 10 -30 km/hr (user definable).

- The above-mentioned Roughness Digital Laser Profile System fall under the specification defined in Circular no 11041/218/2007 - admn issued by NHAI for use of Laser Profilometer in NHAI Works.

4.2.1.2 Determination of Rutting

- All data is measured and reported in accord with the recommendations contained within the Austroads Guide to Asset Management, Part 5C – Rutting.

- The DLP measures a 3-metre transverse profile across the lane using a minimum of 11 lasers. A full transverse profile is measured every 50 mm of longitudinal travel, and the processing software allows both lane and wheel path rutting to be measured using the string line and straight edge models.

4.2.1.3 Determination of Texture

- The DLP (Digital Laser Profile) is capable of measuring both flushing and texture via Sensor Measured Texture Depth (SMTD). Texture is measured continuously along the pavement length using a non-contact laser transducer.

- Macro texture can be recorded in many different ways. The most common is by using the Sensor Measured Texture Depth (SMTD). Internationally Mean Profile Depth (MPD) is more common. SMTD is more common as it can be easily correlated to a Sand Patch Texture Dept (SPTD). The DLP is able to record both types of texture to all international and national standards.

4.2.1.4 Criteria for Analysis

From the digital images, a host of information are extracted. This information is linearly (Chainage) and spatially (GPS) referenced. The information extracted is presented in the table below:

Table 4-1: Information extracted from NSV

Coding Parameters	Coding Type
General Features and Utilities	
Land use pattern	Agricultural, Urban, Commercial, Forest, Ruraletc.
Avenue plantation / Roadside arboriculture	Present/Not Present
Electric pole	Present/Not Present
Telephone	Present/Not Present
Wayside amenities, Bus bays, truck lay Bye, etc...	Present/Not Present
Main Carriageway Features	
Pavement type	Bituminous, Concrete
Junction (Major / Minor & X / T/ Y) & type of road crossing / merging	Type and Geolocation
Carriageway width (lane wise)	Width
Paved shoulder (width)	Width
Earthen shoulder (width and physical condition)	Width, Condition-Good, Fair, Poor
Footpath (physical condition)	Present/Not Present, Condition
Drain width (lined & Unlined, along with general condition)	Lined/Unlined, Condition
Median (width)	Width
Kerb Height	Height
Median opening (length)	Length
Road markings (lane wise)	Condition
Presence of Road Studs (Lane wise) - Yes / No	Yes/No
Sign boards identifications (both sides of carriageway) – Type and Physical Condition	Geo Location, Condition
Gantry boards identifications (type of gantry) – Physical Condition	Geo Location, Condition
Kilometre & hectometre stones	Present/Not present
Guard rails – Physical Condition	Geo Location, Condition
Safety barriers – Type and Physical Condition	Geolocation, Type and Condition
Delineators – Physical Condition	Present/Not present
Guard / guideposts – Physical Condition	Yes/No, Condition
Streetlight and High Mast Light	Type and Geo Location
Location of water bodies (lakes and reservoirs), at every occurrence	Type and Geo Location
Location of Structures	Type and Geo Location
Service Road	
Pavement type	Bituminous, Concrete
Carriageway width (lane wise)	Width
Drain width (lined & Unlined, along with general condition)	Lined/Unlined, Condition
Road markings (lane wise)	Condition
Sign boards identifications (both sides of carriageway) – Type and Physical Condition	Geo Location, Condition
Gantry boards identifications (type of gantry) – Physical Condition	Geo Location, Condition
Coding Parameters	**Coding Type**
Location of water bodies (lakes and reservoirs), at every occurrence	Type and Geo Location
Streetlights	Present/Not present

4.2.2 Pavement Roughness

The roughness data was collected at 100m interval using NSV on each lane in-terms of IRI (International Roughness Index) value. In Indian context, the IRI values were converted to BI as per IRC: SP:16-2019 “Guidelines on Measuring Road Roughness and Norms” with the following equation;

$BI = 630*(IRI)^{\wedge 1.12}$

Where

BI = Bump Integrator Roughness in mm/km

IRI = International Roughness Index.

Roughness data was collected through Digital Laser Profilers System (DLP) and the same is presented in **Annexure 4.3**. The summary of Roughness values is presented in tables below

Table 4-2: Raipur Simga Section: Summary of Pavement Roughness

Condition	BI (mm/km)	LHS						RHS					
		Inner		Middle		Outer		Inner		Middle		Outer	
		Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)
Good	<2000	48.600	100.000	34.600	100.000	46.600	95.885	48.600	100.000	34.600	100.000	48.600	100.000
Fair	2000-2400	0.000	0.000	0.000	0.000	2.000	4.115	0.000	0.000	0.000	0.000	0.000	0.000
Poor	>2400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Length (km)		48.600	100.000	34.600	100.000	48.600	100.000	48.600	100.000	34.600	100.000	48.600	100.000

4.2.3 Test Pit Investigations

Test pit investigations have been carried out at every 5km in a staggered manner ascertain the existing pavement composition (pavement course, material type, and thickness). The summary of existing pavement crust thickness is presented in table and some of the photographs showing the pavement crust thickness are shown as below.

Table 4-3: Summary of Existing Pavement Crust Thickness

S.No	Location (Km.)	Side (LHS/RHS)	Existing Crust details			
			Pavement Quality Concrete (PQC)	Dry Lean Concrete (DLC)	Granular Layer (GSB)	Total Thickness (mm)
Raipur Simga Section						
1	1.700	LHS	300	140	200	640
2	4.750	RHS	330	150	180	660
3	9.600	LHS	300	150	160	610
4	14.600	RHS	330	150	150	630
5	20.150	LHS	300	150	150	600
6	25.350	RHS	330	150	150	630
7	30.000	LHS	300	140	120	560
8	35.000	RHS	330	150	150	630
9	40.000	LHS	300	150	150	600
10	45.500	RHS	300	150	150	600

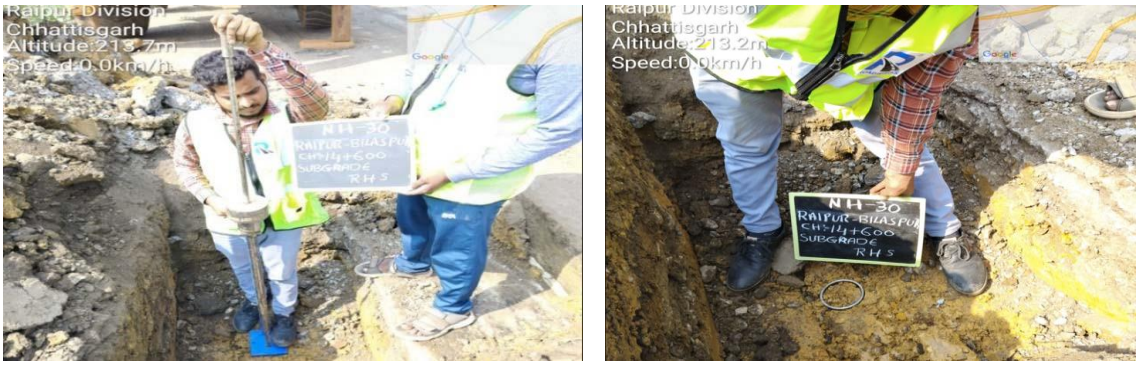


Figure 4-2: Pavement Composition & Thickness Measurement

Observations and Conclusions:

The designed PQC thickness is 320mm as per the pavement design report. However, thickness available at site is 300mm throughout except at the super elevation locations where thickness is found to be 330mm. The constructed thickness is a departure from design and even not within the construction tolerance limits. Whereas DLC and GSB found to be adequate considering design value of 150mm for DLC and 150mm for GSB and its tolerance limits.

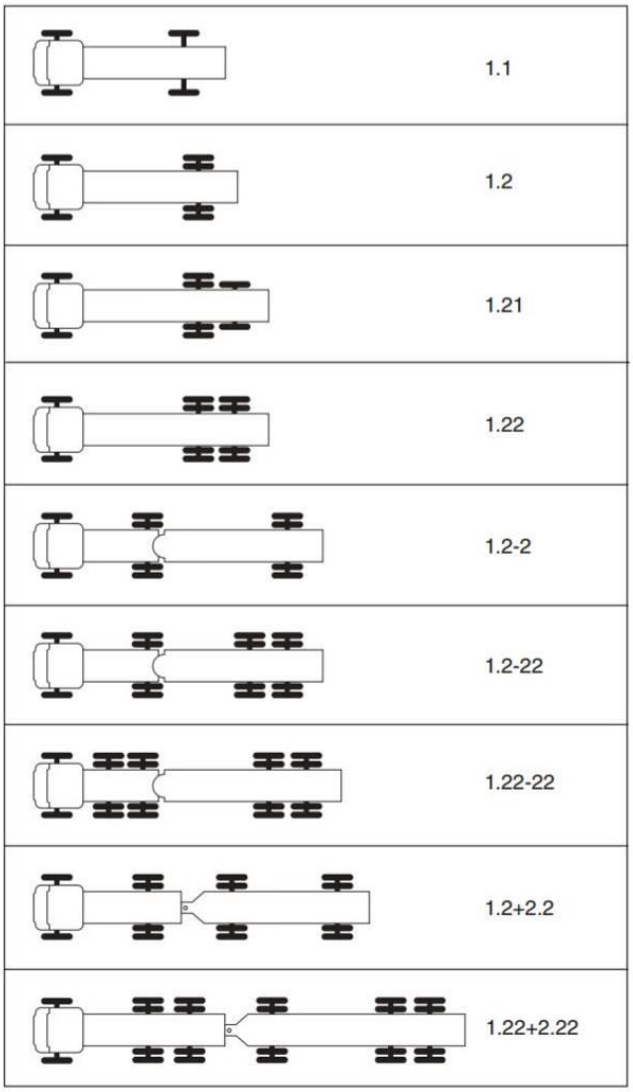
During the above investigations, the existing subgrade soils samples were collected and tested in the laboratory to understand the properties of these foundation soils. The test results are presented in **Annexure 4.7.** The observations from test results are given below:

As per the pavement design report of 4-lane, the adopted design effective CBR for subgrade is 8%. The CBR values as obtained from test investigation was found to be less than design CBR. However, there no such subgrade failures related distresses found at the site but noted that earthen shoulder throughout the project has got deteriorated.

4.3 Axle Load Survey

The axle load survey has been conducted at the Toll Plaza location on the Project Corridor. The axle load measurements were made over a 24-hour period on random sampling basis. The survey has been conducted in both the directions. The axle load pads have been placed on either side of the carriageway in a staggered manner to measure the axles in both the directions. While carrying out axle load survey enough care is taken to ensure that this survey work will not hamper the normal passage of the traffic

The type of vehicle considered for axle load survey along with its axle configurations are presented in below. Few of the survey photographs were shown in Photos as below:





Axle load survey at Tarpongi



Axle load survey at Tarpongi

Figure 4-3: Axle Load Survey

The VDF analysis was carried out in line with section 4.4 of IRC: 37-2018 based on the axle load data. The equations for computing equivalency factor for single, tandem and tridem axles given below is used as directed in the IRC:37-2018 for converting different axle load repetitions into equivalent standard axle load repetitions.

- Single axle with single wheel on either side = {axle load in kN / 65}4
- Single axle with dual wheel on either side = {axle load in kN / 80}4
- Tandem axle with single wheel on either side = {axle load in kN /148}4
- Tridem axle with dual wheel on either side = {axle load in kN /224}4

With the stated above procedure, the Vehicle Damage Factor for each class of commercial vehicle on both the directions were calculated separately for empty and loaded vehicles. The Axle load data format and VDF analysis are presented in **Annexure 4.5** and obtained VDF values comparing the values adopted at the time of pavement design during construction summarized in table below.

Table 4-4: Vehicle Damage Factors (VDF)

S. No	Toll plaza	Tarpongi	
	Vehicle Type	LHS	RHS
1	Bus	0.81	0.92
2	LCV	1.03	1.13
3	2-Axle	1.93	2.08
4	3-Axle	3.20	5.24
5	MAV	2.71	14.74

The higher VDF on RHS side is due to movement of heavily loaded trucks carrying Coal, steel, Construction materials etc whereas, Empty Vehicles of significant proportion in LHS side. Further, 7-day axle load survey values are lower than one days and hence adopted the above values in the study

4.4 Falling Weight Deflectometer (FWD)

The structural evaluation of pavement has been carried out in accordance with IRC: 115-2014, “Guidelines for Structural Evaluation and Strengthening of Flexible Road Pavements Using Falling Weight Deflectometer (FWD) Technique” to determine the remaining life of the pavement structure.

The principle and description of FWD and its methodology is provided in **Annexure 4.6.**

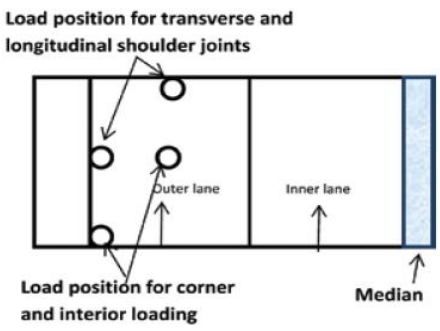
FWD deflection measurement has been carried out for each direction and the measurement has been carried out at a test point along outer wheel path of each direction which is at an offset of 1m from the outer edge of outer lane as specified in section 5.4.5 of IRC: 115-2014. At every measurement location, four drops were made, such that the first drop was the ‘**seating drop’** and with the remaining three drops deflections were recorded. Field survey photographs is shown below.



Figure 4-4: FWD Survey at Project Site

The deflection testing has been carried out on the existing pavement as per IRC Codes at the rate of 5 points per km in each direction as stipulated in TOR of the Consultant.

Adopted deflection measurement scheme is as under.

Adopted Measurement Scheme	Rigid Pavement
(i) measurement along outer wheel paths of outer lanes (3 points) (ii) measurement along the outer wheel path of inner lane (2 points)	

4.4.1 FWD data Analysis for Rigid Pavement

As per IRC: 117-2015, the collected FWD data for the rigid pavement has been analysed to determine the following parameters.

- Modulus of subgrade reaction k (MPa/m)
- Elastic modulus of concrete E_c (MPa)
- Flexural Strength of concrete f_{mr} (MPa)
- Load Transfer Efficiency (LTE) of Joints (%)

The detailed analysis of the parameter for PQC and Load Transfer Efficiency is presented in **Annexure 4.7** for both LHS and RHS directions respectively.

From the test results the observations were draw-down. The range of Elastic Modulus, other PQC parameters and their percentage of length and Load Transfer Efficiency (LTE) is presented in table **below**.

Table 4-5:Summary of Flexural Strength and Elastic Modulus

Pavement layer	Range	Percentage of Project Road	
		LHS	RHS
Raipur Simga Section			
Elastic Modulus of PQC Layer (Mpa)	> 30000	0.00%	16.47%
	30000 - 10000	100.00%	83.53%
Flexural Strength of PQC Layer (Mpa)	> 4.5	0.00%	6.18%
	4.5 - 3.0	89.71%	83.53%
	<3.0	10.29%	10.29%

Table 4-6: Summary of Joint Load Transfer Efficiency

Direction	Load Transfer Efficiency (LTE)					
	Transverse Joint			Longitudinal Joint		
	> 90%	90%-50%	< 50%	> 90%	90%-40%	< 40%
Raipur Simga Section						
LHS	54.71%	45.29%	0.00%	56.77%	43.23%	0.00%
RHS	85.29%	14.41%	0.00%	79.42%	20.58%	0.00%

The flexural strength of concrete high for more than 80% of the test locations and even the Load transfer efficiency is high at all the joints tested and hence the joints are in good condition

4.5 Mobile Bridge Inspection Unit (MBIU)

4.5.1 Specification

The Mobile Bridge Inspection Unit (referred as (MBIU) is an electro-mechanically driven articulated structure mounted on a vehicle (a truck) as an aid towards proper inspection of bridges or similar infrastructures by enabling an inspection team of 2-3 persons carrying instruments access to the underside of bridge decks overflowing rivers or gorges. The present version is the truck mounted system. As per TOR condition survey of existing structures greater than 60m shall be carried using MBIU.

The overall objective of the condition survey is to identify the need for structural maintenance, rehabilitation and replacement. Signs of distress such as spalling, scaling, cracking, leaching, excessive deflection, inadequate cover, settlement, exposed reinforcement, corrosion in the reinforcement; shear cracks etc. are identified during this exercise. Special emphasis is given on expansion joints and bearing. Also the condition of the Approaches, water way and bed protection is examined. The survey identify the bridges which are more distressed and require testing for their evaluation and rehabilitation measures. Also bridges which require general measures for rehabilitation. Inspection report is prepared in accordance with IRC: SP-35. The report provides recommendation whether a bridge is acceptable to continue in use, whether it can be repaired and/or modified e.g. widened or a new structure.

The structure inventory and condition assessment are given in **Annexure 3.2.** The following structures have been inspected using MBIU machine.

Table 4-7: List of Inspected Structures using MBIU

Sr. No.	Chainage (Km)	Side		Remark
		LHS	RHS	
Raipur Simga Section				
1	14+240	LHS	RHS	Major Bridge
2	15+400	LHS	RHS	Flyover
3	27+350	LHS	RHS	Major Bridge
4	36+766	LHS	RHS	Minor Bridge
5	48+063	LHS	RHS	Flyover

4.5.2 Working Principle

The work of condition survey requires use of Mobile Bridge Inspection Unit at the various bridge sites on the National Highways to overcome the accessibility problems. MBIU increases the accessibility for inspection of underside of high-level bridge decks and helps in continuous inspection of throughout the span of bridge. It has five folded arms. All of them are electro-mechanically operated.

Once the platform is erected by certified person, Inspection and maintenance experts can inspect underside of bridge, note observations as per IRC SP-35 & IRC SP-52 and take photographs for reference.

4.5.3 Advantages

- A large operating range
- A high level of working comfort
- Maximum operational safety
- The shortest possible setting up and dismantling times
- Full mobility in inspection operation without stabilizer supports
- An optimum weight/performance ratio



Figure 4-5: MBIU Survey

4.6 Drone Videography of Entire Stretch

Videography of entire Project Stretch is captured through Drone cameras flown at about 50m above ground. This shall be useful for observing various features of Project Stretch from bird's eye level.



Figure 4-6: Drone Videography image about 50 m

Section 5: Review of Documents

5.1 General

Technical Consultant (TC), since the start of technical due diligence study, has requested for various documents from the Client. A list of documents required were shared with the Client before TC team started the study which was appended with few more queries after the conclusion of the site visit once the project site is appraised. Most of the queries were also discussed with the Client in many meetings. This section of the report deals with the documents requested by TC and its review along with highlighting major issues found during this review.

5.2 Documents Collected and Reviewed

List of documents requested, received and reviewed are given below:

S. No.	List of Documents	Status of Documents	Remarks on Review
DOCUMENTS RELATED TO CURRENT ACQUISITION			
1.	Concession Agreement	Partially Available	Technical Schedules A, B, C and F are made available to the Consultant. These schedules are modified from the standard provisions given in manual as below: Sch A: Existing features Sch B: Scope of Work including facilities to be provided Sch C: Specifications and Standards Sch F: Maintenance Requirements Table 1 of Sch F provides maintenance criteria for pavements which has performance parameter, desirable and acceptable level of service, frequency of inspection and time limit for rectification/repair. Sch F specifies roughness value as 2200mm/km desirable and 2400 mm/km acceptable for rigid pavement. Sch B states that the concessionaire shall carry out the periodic maintenance in full length of the project stretch including main carriageway, service/slip Road, ramps and at facilities etc. in every sixth year. Further, it was clarified in the pre-bid queries reply that maintenance activities of rigid pavement shall be carried out in accordance with Sch F of the CA. Though draft CA is not available, Consultant has referred the CA of earlier rounds wherever required presuming that there shall not be any change in Contract Conditions.
2.	Detailed Project Report/ Technical Due Diligence Report	Available	Report done by M/s MSV in association with Sri Infotech for NHAI in December – 2024 are made available for Raipur – Simga. This Report is used as reference for inventory & condition of the assets and improvement proposals. cost estimates are provided for engineering and safety improvement for Rs 45.62 Cr including GST which are under the obligation of NHAI. NIL cost is considered for immediate repair under NHIT obligation. The report also provides for the O&M cost during the concession period which is used for comparison and reference purpose.

S. No.	List of Documents	Status of Documents	Remarks on Review
3.	FWD data	Available	Consultant collected the reports of FWD from respective AEs during their site visit and used it as a reference document.
4.	Latest MPRs	Available	Consultant collected recent IE-MPRs from the AEs during the site visit. Reports provide details about the Project Road and key maintenance activities undertaken at the site during that period.
5.	Maintenance History	Not available	There is no maintenance history available for the Project Road.
6.	NSV data	Available	The reports of NSV are available as a reference document for TC.
7.	AADT for each section and Growth rate	Available	AADT along with traffic projections for the project roads have been provided by Client.
8.	Concession Period	Not available	TC has adopted 20 years concession period with reference to the CA of earlier roads.
9.	Projected Escalation factor	Not available	In absence of projected escalation factor, all cost are given at the present rate as per the direction of the Client.

5.3 Key Technical Issues

5.3.1 Pavement and Road Condition

Longitudinal cracks with low-high severity are there along the project road. RHS carriageway is more distressed compared to LHS due to excessive loading. Some of the cracks are filled with epoxy mortar and its condition is not satisfactory. There are significant number of pop outs which are repaired with epoxy mortar. It has been observed that repair and rehabilitation works in terms of crack sealing, panel replacement etc. has been done at many locations. Joint separation at the longitudinal joints was found at many of the locations of super elevation, high embankment where joints are widened by more than 30mm.



Cracks in Rigid Pavement



Repairing work is in progress

Figure 5-1: Pavement Distress

5.3.2 Structures

A proper gap between decks is not found to allow movement of expansion joints. Due to insufficient gap between decks, crushing and scaling observed in deck slab. These problems are observed at two major bridges at Ch. 14+240 and 27+350 and two flyovers at Ch. 15+400 and Ch. 48+063 in Raipur – Simga section. These are to be rectified by cutting the deck slab for a proper gap before replacing the expansion joints.



Figure 5-2:Major Bridge @ 14+240 in Raipur–Simga Section



Figure 5-3: Major Bridge @ 27+350 in Raipur–Simga Section

Defects at bearings are also found as detailed below:

- ✓ MJBR@14+240 (Stretch-1): cracks observed in 1 nr of bearings.
- ✓ FO@15+400 (Stretch-1): cracks observed in 2 nr of bearings and Girder not placed properly on one bearing at location.
- ✓ MJBR@27+350 (Stretch-1): - cracks observed in 2 nr of bearings.
- ✓ MNBR@36+766 (Stretch-1): - cracks observed in 1 nr of bearings. Sliding's moment observed in 2 bearings
- ✓ Flyover@48+063 (Stretch-1): - cracks observed in 6 nr of bearings. Sliding's moment observed in 1 bearing



Figure 5-4: Crack in Bearing



Figure 5-5: Gap in Bearing and Girder

Section 6: Capital Expenditure (CapEx) Requirement

6.1 Schedule B Improvement Work

Schedule B specifies the requirements of improvement work for the concessionaire which are to be done after the appointment date. Major works with relevant references to Sch B used to quantify these construction requirements are listed below:

- R&R of earthen shoulder covered with granular material Ref Cl 3.1 I of Sch B.
- Crack sealing: Ref Cl 3.1 III of Sch B.
- Panel replacement: Ref Cl 3.1 III of Sch B.
- R&R of Structure: Ref Cl 3.2 of Sch B.
- Junction improvement. Ref Cl 3.1 III of Sch B.
- Curve improvement: Ref Cl 6 of Sch B.
- Median opening: Ref Cl 8 of Sch B.
- Toll Plaza restoration: Ref Cl 9.1 of Sch B
- Truck lay bye: Ref Cl 9.1of Sch B
- Bus lay bye and shelter: Ref Cl 9.3 of Sch B
- Landscaping and median plantation: Ref Cl 9.4 of Sch B
- Transverse bar marking: Ref Cl 10.3 of Sch B
- Antiglare: Ref Cl 10.7of Sch B
- Kerb stones: Ref Cl 10.8 of Sch B

Improvement works Scope specified for each stretch is tabulated below:

Table 6-1: Schedule B Requirements during O&M Handover

S. No.	Description	Unit	Raipur Simga
1	R&R of earthen shoulder covered with granular material.	cum	28518
2	Crack sealing	Km	5.40
3	Panel replacement	Nos	399
4	Approach slabs reconstructed.	Nos	4
5	Bearing replacement	Nos	19
6	Wearing coat replacement	Sqm	5592
7	Strip seal expansion Joint	Lm	612
8	Junction improvement	Nos	23
9	Curve improvement.	Nos	50
10	Toll Plaza restoration	Nos	1
11	Truck lay bye	Nos	2
12	Bus lay bye and shelter	Nos	18

S. No.	Description	Unit	Raipur Simga
13	Landscaping and median plantation	Km	7.3
14	Transverse bar marking:	Nos	75
15	Antiglare	Km	5.93
16	Kerb stones	Km	9.716
17	W beam crash barrier	Lm	2.825

Time to complete above improvement works are 3 months/12 months from the Appointed Date based on completion schedule for improvement proposals given in Schedule B.

6.2 Immediate Maintenance Requirements

With reference to the clarification of pre-bid queries received from the Authority, the Project is under DLP, prior to the O&M Hand-over date, EPC Contractor will undertake relevant defect rectifications as per the Agreement provisions before handing over the assets to the InvIT concessionaire.

However, toll plaza renovation cost, revalidation of survey during hand over of O&M and TMS replacement cost has been considered under this head.

6.3 Capital Expenditure (CapEx)

Cost of capital expenditure (CapEx) are presented below.

Table 6-2: Cost of Capital Expenditure (CapEx)

Description	Cost (in INR Crore)
	Raipur Simga
Revalidation of Survey	0.52
Initial Improvement Works (Schedule - B)	26.35
TCMS	6.26
ATMS	-
Total	**33.13**

Section 7: Operation & Maintenance

7.1 General

The O & M requirements for the project facilities are specified in the Concession Agreement (CA) mainly under following Articles/ Schedules:

- Article 15 - Operation and Maintenance
- Article 16 - Monitoring of Operation and Maintenance
- Article 17 – Traffic Regulation
- Article 18 and Schedule H – Safety Requirements
- Schedule F- Maintenance Requirements

7.2 Requirement as per Concession Agreement

Schedule F of the Concession Agreement sets out the Operation and Maintenance requirements for the Project. As per this schedule, scope for Operation and Maintenance includes but not limited to following obligations:

- ✓ **Improvement** – This includes improvement of the existing assets as per requirement of this Agreement and safety audit.
- ✓ **Maintenance of Civil Works and Assets**- this includes maintenance of civil works and all assets as per requirement of this agreement.
- ✓ **Road Maintenance** –This includes routine maintenance, preventive maintenance, periodic maintenance as per IRC:82-2015, Design overlay as per Manual of 4- laning/6-laning, disaster maintenance, exigencies, and inspections.
- ✓ **Traffic Management** – This includes enforcement of regulations together with the relevant authorities. This also includes hazard response, information gathering and dissemination, Road patrols and ATMS surveillance etc.
- ✓ **Safety**– This includes accident prevention, after care, user education, enforcement, data collection and analysis.
- ✓ **Facility Management** – This includes periodic inspections, routine maintenance, Rehabilitation, and expansion planning.
- ✓ **Road property management** –This includes management of access, encroachment, and ribbon development.
- ✓ **General responsibilities** –This includes budgeting, compliance with legal and accounting requirements, and public relations.
- ✓ Maintaining public relations unit to interface with and attend to suggestions from users of the highway, the media, Govt. agencies and other external agencies.

Routine Maintenance: These are maintenance needs required on daily, weekly, monthly and annual basis for the smooth and efficient running of traffic and includes the activities of minor repairs of all project elements, cleaning of road furniture's, replacement of consumables, horticulture

maintenance, keeping the project site /project facilities clean, tidy and orderly condition free of litters and debris, preventing unauthorized entry and exit including any encroachment etc.

Preventive Maintenance: Preventive maintenance shall include the activities related to each element and the system of the Project Highway to ensure that during the Concession Period and at its end is in sound, durable and functional condition. In other words, preventive maintenance are a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without significantly increasing the structural capacity).

Periodic Maintenance: These are maintenance needs required on periodic annual basis to improve the riding quality and strength of the project assets.

Factor influencing periodic maintenance: performance parameter for flexible pavement in terms of roughness as given in Schedule F is 2200 mm/km as desirable and 2400 mm/km as acceptable. Clause 3.1 (III) of Schedule B states that periodic maintenance shall be carried out in full length of the project stretch including main carriageway, service/slip road and at facilities etc. either in every six years or in the year in which roughness index exceeds the limit given in schedule F, whichever comes earlier. Further clarity on this requirement is given as Note at the same clause which states "*A Roughness of <2200 mm shall be maintained by the existing EPC Contractor prior to handing over to InvIT Concessionaire. After handover of project stretch to InVIT, the InVIT concessionaire shall maintain the roughness level at <2200mm, however after a functional overlay (Roughness exceeding 2200 mm) or structural overlay (FWD Test) is provided in any particular stretch length then that particular length shall be maintained at a roughness level mentioned in Schedule F after that overlay. For clarification, InVIT concessionaire shall maintain a roughness level (mentioned in Schedule F) in a stretch length where overlay (Structural or Functional) has been provided by InVIT concessionaire*."

7.3 O&M Cost Estimation

7.3.1 Routine maintenance

This is a day-to-day work that is necessary to preserve and keep a pavement as close to as constructed condition and to ensure smooth and functional conditions all the times. The item in this subhead includes maintenance of earthen shoulder, restoration of rain cuts, maintenance of slope protection works, cleaning of road side drains, cleaning of carriageway, maintenance of structures, repairs of road surface such as filling of potholes, repairing of cracks and patch works, carrying out of Road roughness survey, FWD test etc.

7.3.2 Repair/Maintenance

Repair/maintenance covers the minor repair which are required on day-to-day maintenance to maintain the assets in good condition. This is sub-divided in two categories as below:

a) **Preventive Maintenance:** The preventive maintenance is required to be done for further improve or extend the functional life of pavement surface whist in fair to good condition. Any of the treatment under preventive maintenance does not significantly increasing the

structural capacity of pavement rather it decreases rate of surface deterioration, which may result in saving of pavement from leading to poor condition where major maintenance could be inevitable.

Future preventive maintenance on the project road depends largely on routine inspection of the pavement with careful observation of specific distress and to take a decision at that time and suitable type of preventive maintenance treatment and its timing. All the narrow and wide surface cracks must be arrested immediately after identification with recommend preventive type maintenance measure for the in-service flexible pavement.

Based on the condition and distress identification survey as explained above paragraph, preventive maintenance treatments must be taken up immediately to reduce rate of further damage to the surface and for enhance the pavement performance to the condition similar to non-distressed surface condition.

b) **Road Property Maintenance:** The item in this subhead covers the plantation/ maintenance of shrubs, turfing, replacement/ repair of damaged railing, crash barrier, kerbs, road delineators, signage, Road marking and painting etc.

7.3.3 Toll Management System

Cost estimate for Toll Management System was worked out by TC. Same was presented and deliberated during the investor meet, after that it was decided to adopt the rationalised cost finalized by IM.

7.3.4 Corridor Management

Incident Management: The items in this subhead include minimize the effects of incident and restore normal capacity and safety levels to all affected road facilities as efficiently as possible and. repair/ replacement of removing the dead animals & broken-down vehicles etc.

7.4 Major Maintenance

The pavement deteriorates with time caused by traffic movement and weather conditions. The rate of deterioration depends on the original design and pavement type, type of maintenance being done/undertaken and time of application. Therefore, timely and appropriate maintenance using suitable materials is essential to increase the pavement service life to a greater extent. Any delay in maintenance of the pavement substantially increases severity of the distresses, which results into poor condition of pavement and thereby increase in maintenance costs to bring the surface to a good condition.

Schedule F of the Concession Agreement set out the maintenance requirements in the Project. The performance parameters are indicated in schedule F descripting the nature of defect/deficiency along with time limits for repair/rectification for roads and bridges.

Schedule F, Pavement Roughness Value (Functional Overlay): The Periodic maintenance is required to be provided as and when performance parameters in terms of cracking, roughness, surface defects, joint defects etc. exceeded the limits as indicated in the schedule F anytime during the service life of the pavement. As per the provisions of Concession agreement, Surface roughness value is the major governing factor for selection of an appropriate pavement

maintenance treatment required to bring the roughness value below the prescribed limit of 2400mm/km.

7.4.1.1 Review of Pavement Design

The Pavement design for Main Carriageway is rigid type and designed as per IRC:58-2015. Even rigid pavement is adopted for the service roads as well.

Following composition and thickness has been adopted.

Main Carriageway (MCW): Rigid Pavement
PQC: 320mm, DLC: 150mm and GSB: 150mm.
Service Roads (SR): Rigid Pavement
PQC: 260mm, DLC: 150mm and GSB: 150mm.

7.4.1.2 Review of Major Maintenance History

The 4/6 lane construction of project section from Raipur – Simga has been completed in the year 2021. As per the site visit made by the consultant and review of available documents, there is no periodic maintenance works were performed in the project so far after PCOD/COD. However, pavement repairs consist of replacement of PQC slab in full depth, crack sealing, bituminous overlays on the heavily cracked sections has been done. As noted from the site that significant number of panels are replaced to being the cracked surface to a serviceable condition.

7.4.1.3 Immediate Pavement Rehabilitation Measures

After the distress identification using the condition data collected from the NSV survey, the following immediate rehabilitation measures has been suggested to improve the rigid pavement condition to the desired level of serviceability for the present and projected traffic patterns in the project highway.

Distress Rating	Suggested Rehabilitation Measure
0	Nil
1	Crack sealing with epoxy
2	Partial depth repair/Panel replacement
3	Partial depth repair/Panel replacement
4	Panel Replacement
5	Panel Replacement

Further, the suggested repair and rehabilitation measures for each of the distress and its severity as identified for rigid pavement is provided in table below in compliance with requirements of IRC SP 83-2018.

S. No	Distress type	Distress Rating	Treatment
1	Longitudinal Cracks	0	No action, but need to be monitored
		1	Sealing with epoxy
		2	Sealing with epoxy
		3	Partial depth repair
		4	Partial depth repair
		5	Panel replacement
2	Transverse cracks	0	No action, but need to be monitored

S. No	Distress type	Distress Rating	Treatment
		1	Sealing with epoxy
		2	Sealing with epoxy
		3	Panel Replacement
		4	Panel Replacement
		5	Panel Replacement
3	Multiple Cracks	0	No action, but need to be monitored
		1	Seal with epoxy
		2	Seal with epoxy
		3	Full depth repair
		4	
		5	
4	Corner Breaks	0	No action, but need to be monitored
		1	Sealing with epoxy
		2	Sealing with epoxy
		3	Full depth repair
		4	Full depth repair
		5	Full depth repair with subbase
5	Joint Damage/Spalling	0	No action, but need to be monitored
		1	Sealing with epoxy
		2	Sealing with epoxy
		3	Repair up to 50mm thickness
		4	Repair up to 50mm thickness
		5	Repair up to 100mm thickness
6	Joint Sealant Defects	0	No action, but need to be monitored
		1	Cleaning
		2	Cleaning
		3	Sealant replacement
		4	Sealant replacement
		5	Sealant replacement
7	Joint Separation	0	No action, but need to be monitored
		1	No action, but need to be monitored
		2	No action, but need to be monitored
		3	No action, but need to be monitored
		4	No action, but need to be monitored
		5	Fill the joint with M40 concrete
8	Joint Faulting	0	No action
		1	Monitoring
		2	Diamond grinding
		3	Diamond grinding
		4	Panel replacement
		5	Panel replacement
9	Blow ups	0	No action
		1	No action
		2	No action
		3	Full depth repair
		4	Full depth repair
		5	Panel replacement
10	Ravelling	0	No action
		1	Repair with epoxy
		2	Repair with epoxy
		3	Repair with epoxy
		4	Repair with epoxy
		5	Panel replacement
11	Scaling	0	No action
		1	Repair with epoxy
		2	Repair with epoxy

S. No	Distress type	Distress Rating	Treatment
		3	Repair with epoxy
		4	Repair with epoxy
		5	Panel replacement
12	Potholes/Popouts	0	No action
		1	Partial depth repair up to 65mm
		2	Partial depth repair up to 100 mm
		3	Partial depth repair up to 100 mm
		4	Partial depth repair up to 100 mm
		5	Full depth repair

7.4.1.4 Immediate and Future Major Maintenance Requirement

Major maintenance is required in order to comply with provisions of concession agreement and to maintain performance levels as defined in schedule F throughout the operation and maintenance period.

As per schedule B, the TOT concessionaire shall carryout the periodic maintenance in full length of the project stretch including main carriageway, service roads and facilities in every 6th year or the year in which roughness index exceeds the limits given in schedule F, whichever comes earlier.

Therefore, considering the initial pavement design, pavement distresses, elastic modulus and flexural strength of PQC layer and load transfer efficiency of joints, and in compliance to the provisions of schedule B, the following cycle of Major maintenance is proposed for satisfactory performance of the pavement during operation period for both functionally and structurally.

The project section from km 0+000 to 14+800 trigging for capacity augmentation from four to six laning during FY32 and FY33 with a DLP period of 10 years being the rigid pavement. The 6-lane stretch is available for full O&M by InvIT from FY 44 to till end of the concession. The cost towards the augmentation works to be borne by the Authority.

Table 7-1: Proposed Major Maintenance Cycles for Balance Concession period

Name of Stretch	InvIT Concession (20 years)	
	Periodic Maintenance	ATMS & TMS Replacement
Raipur – Simga	**FY 31 and FY44** **MCW**:2% Panel replacement & 100 % Joint sealant replacement and retexturing **SR:** 100 % Joint sealant replacement and retexturing **Structure:** Replacement of wearing coat & painting **FY-37** **MCW:**2% Panel replacement & 100 % Joint sealant replacement **SR:** 100 % Joint sealant replacement **Structure:** Replacement of wearing coat, bearing, expansion joint & painting	**FY33-** 40% ATMS 50% TMS **FY40-** 60% ATMS 100% TMS

7.4.1.5 Cost of Operation & Maintenance

Cost of Operation & Maintenance per annum are presented below.

Table 7-2: Cost of Operation & Maintenance (per annum)

Description	Cost in Crore INR
	Raipur - Simga
Tolling & TMS Operations (Varies) Min-Max	5.40-6.70
ATMS Operation	1.71-2.12
Incident Management	4.55-4.58
Admin Expenses (Varies) Min-Max	3.23-4.14
Insurance (Varies) Min-Max	1.51-1.69
Power cost excl. Toll Plaza	5.40-6.0
RAMS, BMS & Survey	0.96-1.58

7.4.2 Estimate (Initial Improvement, MMR and O&M)

Year-wise estimate of (Initial Improvement, MMR and O&M are given below:

Table 7-3 : Operation & Maintenance Cost (Initial Improvement, MMR and O&M) for Raipur-Simga

Sl.No.	FY	Initial Improvement Cost (in INR Cr.)	Major Maintenance Cost (in INR Cr.)				Operation & Maintenance Cost (in INR Cr.)								
			Road (MCW,SR, Toll Plaza)	Structure	ATMS	TMS	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026	33.13	-	-	-	-	3.38	2.90	2.03	4.58	0.90	6.70	1.51	1.58	3.23
2	2026-2027		-	-	-	-	3.38	2.90	2.03	4.58	0.90	6.70	1.51	1.16	3.59
3	2027-2028		9.04	-	-	-	3.38	2.90	2.03	4.58	0.90	6.70	1.51	1.16	3.65
4	2028-2029		-	-	-	-	3.38	2.90	2.03	4.58	0.90	6.54	1.51	1.16	3.59
5	2029-2030		-	-	-	-	3.38	2.90	2.03	4.58	0.90	6.54	1.51	1.34	3.64
6	2030-2031		72.26	2.26	-	-	3.38	2.90	2.03	4.58	0.90	6.08	1.51	1.16	3.65
7	2031-2032		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.62	1.51	0.96	3.58
8	2032-2033		-	-	5.47	3.13	3.02	1.81	1.71	4.55	0.64	5.40	1.51	0.96	3.99
9	2033-2034		2.89	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	1.15	3.73
10	2034-2035		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	0.96	3.64
11	2035-2036		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	0.96	3.70
12	2036-2037		18.27	9.62	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	0.96	3.73
13	2037-2038		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	1.15	3.77
14	2038-2039		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	0.96	3.70
15	2039-2040		2.89	-	8.21	6.26	3.02	1.81	1.71	4.55	0.64	5.40	1.69	0.96	4.14
16	2040-2041		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	0.96	3.83
17	2041-2042		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	1.15	3.91
18	2042-2043		-	-	-	-	3.02	1.81	1.71	4.55	0.64	5.40	1.69	0.96	3.87
19	2043-2044		79.94	2.94	-	-	3.73	3.17	2.12	4.58	1.17	5.40	1.69	1.23	3.89
20	2044-2045		-	-	-	-	3.73	3.17	2.12	4.58	1.17	5.40	1.69	1.23	3.89
Total		**33.13**	**185.30**	**14.81**	**13.68**	**9.39**	**63.99**	**45.40**	**36.98**	**91.29**	**15.41**	**115.04**	**32.43**	**22.14**	**74.71**

Note: The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

Section 8: Conclusion

The project highway has been constructed as per the provisions of the EPC Agreement for 4/6 laning by adopting rigid pavement for both main carriageway and service roads. The traffic volume on the project is considerably high due to presence of large-scale industries within the project influence area. The project requires capacity augmentation when the average daily traffic beyond the Target traffic for any of the homogenous section. As per the latest traffic surveys, analysis and projections, the project section from km 0+000 to 14+800 trigging for capacity augmentation from four to six laning during FY 32 and FY33 with a DLP period of 10 years being the rigid pavement. The 6-lane stretch is available for full O&M by InvIT from FY 44 to till end of the concession. The cost towards the augmentation works to be borne by the Authority. The performance of the pavement is found to be satisfactory under the current traffic loading conditions. However, the longitudinal intersecting cracks generated mostly in the mid slabs to outer side has been observed. The riding quality of the surface appears to be good for the comfort of the road users though the pavement has experiencing surface defects such as cracks of low to high severity. The reasons for adequate performance of the pavement are due to strong and uniform subgrade support as required for transfer of the wheel loads to the foundation. As per the site visit, the process of primary and secondary consolidation of the pavement layers has already been achieved and therefore, the progression of cracks after the consolidation stage is not very significant.

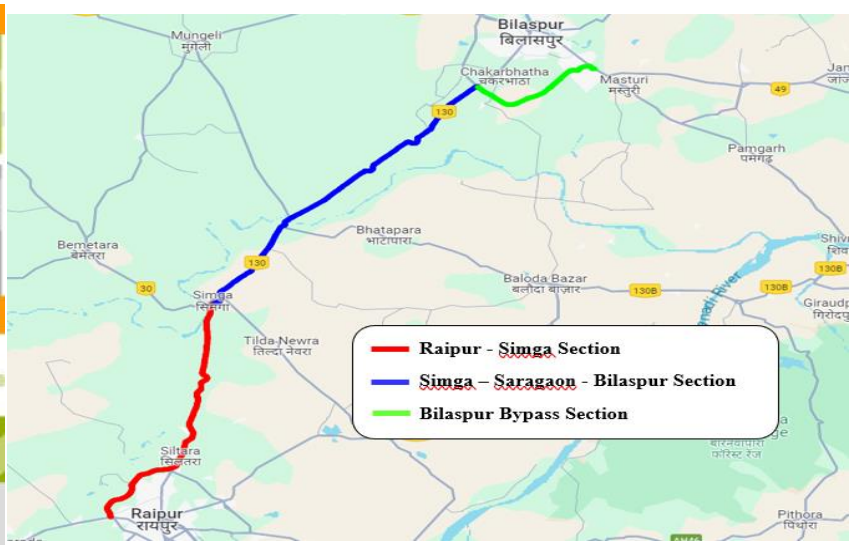
The other significant defect is widening of the longitudinal joints. This widening is conspicuously noticed on high embankments. It does not appear to be critically influenced by the absence or misalignment of tie bars. To arrest this widening, stitching of this joint is being practised with 2-meter-long steel bars. Bars at the end to resemble a staple pin are inserted spanning across the joint in grooves cut for this purpose. Since the widening of joints was noticed in locations where the slab was poorly supported, it is not expected that all joints would widen. The needs to be monitored for taking necessary measures when the joint width will become 30mm, cross-stitching of tie bars shall be done. Further, timely repair and rehabilitation for the identified distress during the concession period is required to maintain the structural adequacy of the PQC layer and improve the overall serviceability of the pavement structure.

Based upon the site visit for assessment of condition of CD structures including MJB, MNBs, ROB, VUPs, Culverts and toll plaza buildings in the project corridor and observations submitted in various chapters of this report, it is concluded that immediate major repairs are required for few structures in terms of repairs of replacement of bearings, replacement of expansion joints and rectification of settled approach slabs. Authority has clarified that these shall be rectified by them before handing over. It is advised that a thorough check of asset condition should be done by the InvIT Concessionaire before taking over to ensure that all the defects are rectified.

The assessment of estimated cost of such improvement works repairs along with the anticipated future repair and rehabilitation cost are considered in the cost estimate of this report.

FINAL TECHNICAL DUE-DILIGENCE REPORT

Technical Consultant Services for National Highways Infra Trust for Simga to Bilaspur Section of NH-130 (Old NH-200) & NH-49 from Km.48/580 to Km.126/525 in the State of Chhattisgarh



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Acronyms and Abbreviations

BC	Bituminous Concrete
BOQ	Bill of Quantities
C/W	Carriageway
CA	Concession Agreement
COD	Commercial Operation Date
CVPD	Commercial Vehicles Per Day
DLP	Digital Laser Profile
EGIS	Egis India Consulting Engineers Pvt. Ltd.
EPC	Engineering Procurement and Construction
FWD	Falling Weight Deflectometer
IM	Investment Manager
InvIT	National Highways Infra Trust
IRC	Indian Road Congress
Km	Kilometer (Chainage)
km	Kilometer (Length)
LHS	Left Hand Side
MBIU	Mobile Bridge Inspection Unit
MJB	Major Bridge
MNB	Minor Bridge
MPD	Mean Profile Depth
MSA	Million Standard Axles
NH	National Highway
NHAI	National Highways Authority of India
NHIIMPL	National Highways Infra Investment Managers Private Limited
NSV	Network Survey Vehicle
O&M	Operation and Maintenance
RCC	Reinforced Cement Concrete
RHS	Right Hand Side
ROB	Road over Bridge
SH	Stage Highway
SMTD	Sensor Measured Texture Depth
SPV	Special Purpose Vehicle
VDF	Vehicle Damage Factor
VUP	Vehicular Underpass

Section 1: Executive Summary

1.1 Introduction

1.1.1 Background

NHAI has set up an Infrastructure Investment Trust namely National Highways Infra Trust ("InvIT") and is acting as its Sponsor to the said InvIT. National Highways Infra Investment Managers Private Limited ("NHIIMPL") has been appointed as the Investment Manager to the InvIT.

NHIIMPL appointed M/s Egis India Consulting Engineers Private Limited, as Technical Consultant to conduct the due diligence on the proposed Assets. The Letter of Empanelment (LOE) was received on 3rd November 2022 and Letter of Award (LoA) for the subject Project was received on 14th October 2024 by Egis India and the services commenced immediately thereafter.

The project stretches detail as per LoA are listed below.

Table 1-1: Detail of Project Stretches

Sr. No.	Stretches	Toll Plaza	Lane	Length (km)
1	Raipur – Simga	Tarpongi	4/6 Lane	48.580
2	**Simga - Saragaon - Bilaspur**	**Bhojpuri**	**4 Lane**	**57.400**
3	**Bilaspur Bypass**	**Mudipar**	**4 Lane**	**20.545**
Total				126.525

This Report pertains to Simga - Saragaon – Bilaspur and Bilaspur Bypass Sections.

1.1.2 Objectives

The main objective of the present assignment is to

1. review project documents and understanding schedule B and schedule F requirements for improvement works for the assessment of Capex and Opex during the concession period.
2. conduct field investigations to assess the existing asset condition and future deterioration.
3. validate executed works with respect to schedule A and assessment of improvement Works
4. review quality of construction based on available data, design and drawings.
5. undertake designs for rehabilitation requirements of different assets based on field investigation data and available documents.
6. assess operation and maintenance cost including major maintenance expected to be incurred during the concession period.

1.2 Site Visit

The Technical Consultant visited site from 20th October 2024 to 14th November 2024. The important aspects of the project road were noted in the detailed site reconnaissance along with various field investigations. These included general description about the project road, site features, structures, junctions, pavement characteristics, road safety. Field investigation for NSV, FWD test, axle load survey, trail pits, MBIU and drone videography survey were also conducted by Technical Consultant to assess the present condition of the project road.

1.2.1 Salient Features

Sr. No.	Name of Stretches	Toll Plaza	Ground Chainage* (Km)			Chainage as per Sch A (4/6 laning)		Lane Config.	Length (km)	Details for 4/6-lane widening		
			From	To	NH	From	To			Contractor	Implementation Mode	Status
1	Simga – Saragaon – Bilaspur	Bhojpuri (49+970) 16 lanes	01+030	43+466	NH-130	48+580	91+026	4-Lane	42.436	L&T	EPC	1.PCOD - 28-01-2020 2.Maintenance period: 4 yrs from PCOD 3.Completion Expected: 31-01-2025 (Data Lake)
			43+466	58+430		91+026	105+980		14.964	Dilip Buildcon	EPC	1.Completion Certificate issued on 01-11-2018 2.Maintenance Period of 4 years after completion is over and Contractor is demobilised from the site. 3.As per AE, PBG of the Contractor is not yet released by NHAI.
2	Bilaspur Bypass	Mudipar (4+800) 16 lanes	00+525	21+070	NH-49	105+980	126+525		20.545			

Asset-wise details of Project assets are given below:

Table 1-2: Detail of Assets

S. No.	Description			Simga - Saragaon - Bilaspur Section		Bilaspur Bypass Section	
				Schedule-A	At Site	Schedule-A	At Site
1	Total Project Length (km)			57.400	57.400	20.545	20.545
2	Service Roads/ Slip Roads (km)			28.940	28.940	2.990	2.430[1]
3	Pavement (km)	Flexible	LHS				
			RHS				
		Rigid	LHS	57.400	57.400	20.545	20.545
			RHS	57.400	57.400	20.545	20.545
4	Bus Shelters (no.)			21	26[2]		
	Bus bays with Shelters (no.)			6	6		
5	Truck Lay-bays/Parking (no.)			2	2		
6	Toll Plaza (no.)			1	1	1	1
7	Rest Area (no.)			1	1		
8	Major Bridges (no.)			2	2		
9	Minor bridges (no.)			7	7	4	4
10	ROB's (no.)					1	1
11	Flyover (no.)					1	1
12	VUP's (no.)			8	8	4	4
13	PUP/CUP (no.)			6	6	3	3
14	Culverts (no.)	Pipe Culvert		72	72	28	28
		Box Culvert		26	26	11	11

1.3 Surveys and Investigations

1.3.1 Network Survey Vehicle (NSV)

The Network Survey Vehicle, which is the latest survey technique which utilizes Lasers, Global Positioning System and Video image processing tools, is used for automatic data collection pertains to pavement condition and road inventory data. The NSV survey has been carried out along the project corridor from 20/10/2024 to 25/10/2024 for collection of field data pertains to pavement condition and road inventory. Summary of findings of NSV survey is given in preceding sections.

1.3.1.1 Pavement Type

Entire main carriageway and service roads along the project road are consist of rigid pavement.

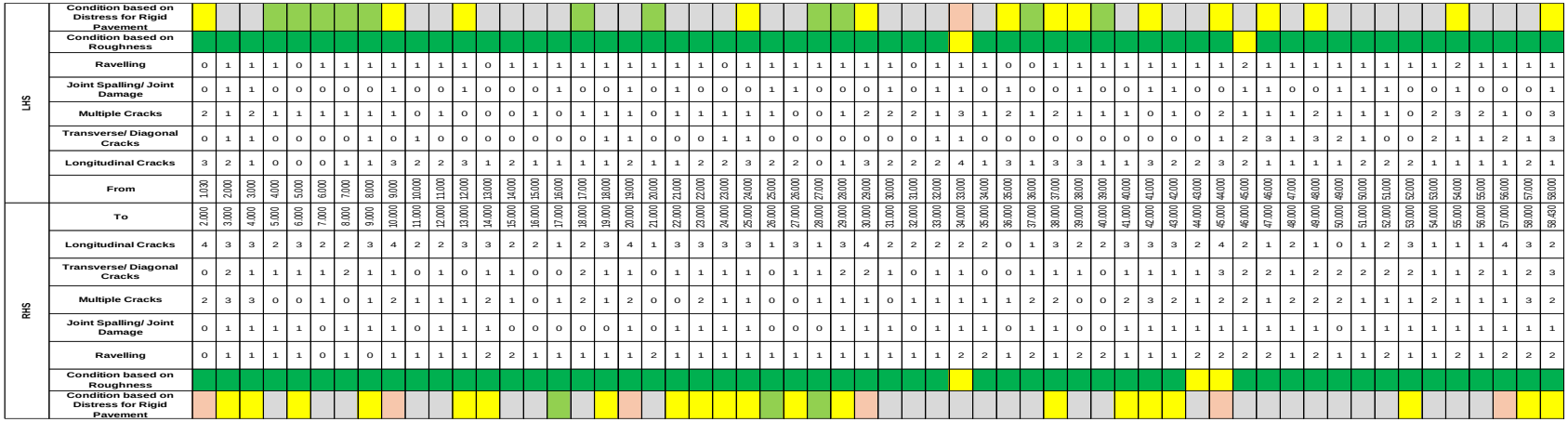
[1] LHS service road along the ramp entering Bilaspur bypass from Raipur side, i.e. from Ch 106+200 to 106+760, is abundant, after the improvement of Bilaspur junction. This length is not considered in our assessment.

[2] There are few passenger shelters constructed by the local civic body. Consultant has considered all the shelters found adjacent to the project road.

1.3.1.2 Pavement Conditions

Km-wise pavement condition is shown below as strip chart:

Simga – Bilaspur



Bilaspur Bypass

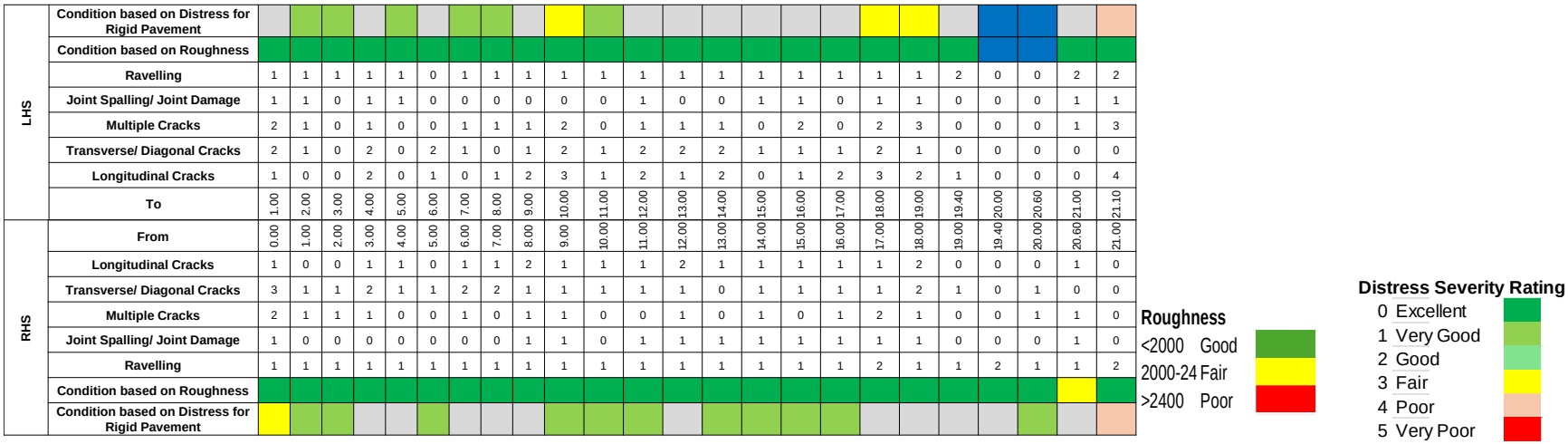


Figure 1-1: Pavement Condition

1.3.1.3 Pavement Roughness

Roughness value measured for each lane of main carriageway using NSV. The summary of direction-wise roughness distribution for each lane in term of percentage length are presented below.

Table 1-3: Simga - Bilaspur Section: Summary of Pavement Roughness

Condition	BI (mm/km)	LHS				RHS			
		Inner		Outer		Inner		Outer	
		Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)
Good	<2000	55.400	96.516	54.400	94.774	51.400	89.547	52.970	92.282
Fair	2000-2400	2.000	3.484	3.000	5.226	5.000	8.711	4.430	7.718
Poor	>2400	0.000	0.000	0.000	0.000	1.000	1.742	0.000	0.000
Length (km)		57.400	100.000	57.400	100.000	57.400	100.000	57.400	100.000

Table 1-4: Bilaspur Bypass Section: Summary of Pavement Roughness

Condition	BI (mm/km)	LHS				RHS			
		Inner		Outer		Inner		Outer	
		Length (km)*	Length (%)	Length (km)*	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)
Good	<2000	19.900	100.000	19.900	100.000	21.100	100.000	20.700	98.104
Fair	2000-2400	0.000	0.000	0.000	0.000	0.000	0.000	0.400	1.896
Poor	>2400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Length (km)		19.900	100.000	19.900	100.000	21.100	100.000	21.100	100.000

** 1.2 km on LHS is under construction stretch of Bilaspur – Urga section for Raipur – Dhanbad Economic Corridor*

1.3.2 Test Pit Investigations

- For Simga – Bilaspur section, the designed PQC thickness is 310mm as per the pavement design report. However, thickness available at site is 300mm throughout except at the super elevation locations where thickness is found to be 330mm. The constructed thickness is a departure from design and even not within the construction tolerance limits of +-6mm. Whereas DLC and GSB found to be adequate considering design value of 150mm for DLC and 150mm for GSB and its tolerance limits.

- For Bilaspur Bypass section, the designed PQC thickness is 310mm as per the pavement design report. However, thickness available at site is 300mm throughout the length. The constructed thickness is a departure from design and even not within the construction tolerance limits of +-6mm. Whereas DLC and GSB found to be adequate considering design value of 150mm for DLC and 150mm for GSB and its tolerance limits.

During the above investigations, the existing subgrade soils samples were collected and tested in the laboratory to understand the properties of these foundation soils. The test results are presented in **Annexure 4.7.** The observations from test results are given below for each of the section:

- Simga Bilaspur; As per the pavement design report of 4-lane, the adopted design effective CBR for subgrade is 5.8%. Most of the test results for CBR are in compliance with design values except few locations. But noted that there is no such subgrade failures related distresses found at the site however it is observed that earthen shoulder throughout the project has got deteriorated.

- Bilaspur Bypass; As per the pavement design report of 4-lane, the adopted design effective CBR for subgrade is 7%. The test results for CBR are non-compliance with design values except one location. But noted that, there is no such subgrade failures related distresses found at the site however it is observed that earthen shoulder throughout the project has got deteriorated.

1.3.3 Axle Load Survey

Axle load survey has been conducted in compliance with IRC 37 2018 for 24 hours in both directions at the existing toll plaza locations. Obtained VDF values comparing the values adopted at the time of pavement design during construction summarized in table below.

Table 1-5: Vehicle Damage Factors (VDF)

S. No	Toll plaza	Bhojpuri		Mudhipar	
	Vehicle Type	LHS	RHS	LHS	RHS
1	Bus	0.95	1.13	-	-
2	LCV	1.02	0.70	0.76	0.32
3	2-Axle	2.32	1.22	1.95	1.11
4	3-Axle	2.47	5.03	3.35	7.78
5	MAV	4.20	16.57	3.45	14.05

** LHS: Raipur to Bilaspur, RHS: Bilaspur to Raipur*

The higher VDF on RHS side is due to movement of heavily loaded trucks carrying Coal, steel, Construction materials etc whereas, Empty Vehicles of significant proportion in LHS side. Further,

7-day axle load survey has been conducted to validate the above inconstancy and found that VDF values as obtained from these 7-day survey is less than 24 hours' survey and hence adopted the above values in the present due diligence study

1.3.4 Falling Weight Deflectometer

The range of Elastic Modulus, other PQC parameters and their percentage of length and Load Transfer Efficiency (LTE) is presented in table below.

Table 1-6:Summary of Flexural Strength and Elastic Modulus

Pavement layer	Range	Percentage of Project Road	
		LHS	RHS
Simga Bilaspur Section			
Elastic Modulus of PQC Layer (Mpa)	> 30000	6.96%	6.96%
	30000 - 10000	93.04%	93.04%
Flexural Strength of PQC Layer (Mpa)	> 4.5	1.74%	5.22%
	4.5 - 3.0	91.31%	89.57%
	<3.0	6.96%	5.22%
Bilaspur Bypass Section			
Elastic Modulus of PQC Layer (Mpa)	> 30000	9.73%	14.60%
	30000 - 10000	90.27%	85.40%
Flexural Strength of PQC Layer (Mpa)	> 4.5	0.00%	0.00%
	4.5 - 3.0	100.00%	95.13%
	<3.0	0.00%	4.87%

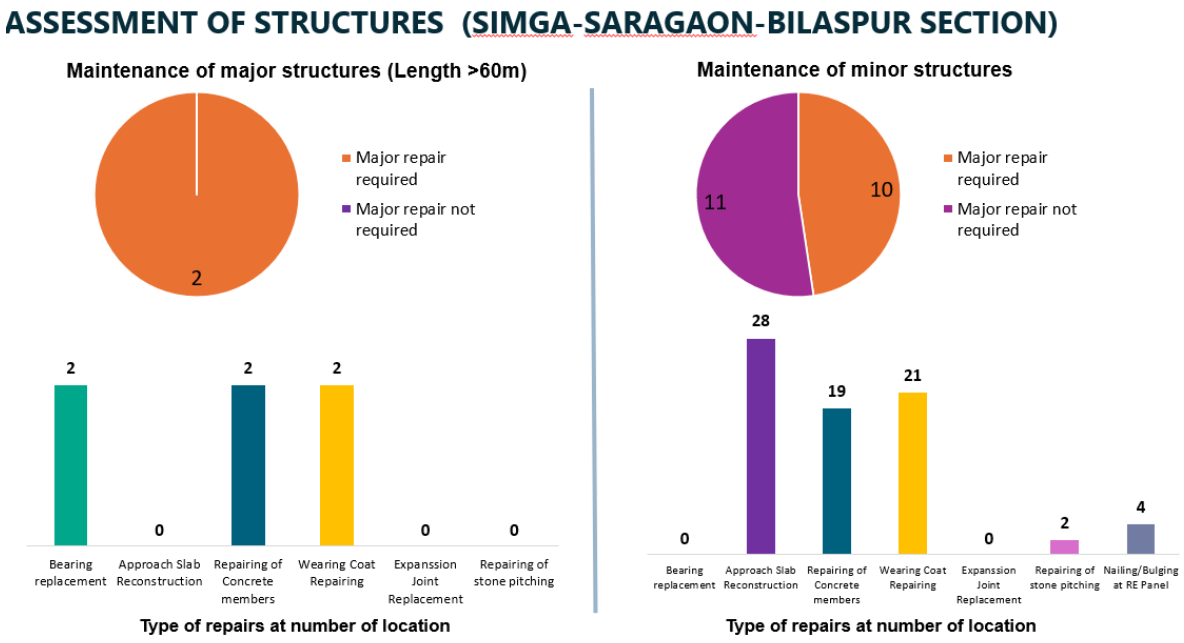
Table 1-7: Summary of Joint Load Transfer Efficiency

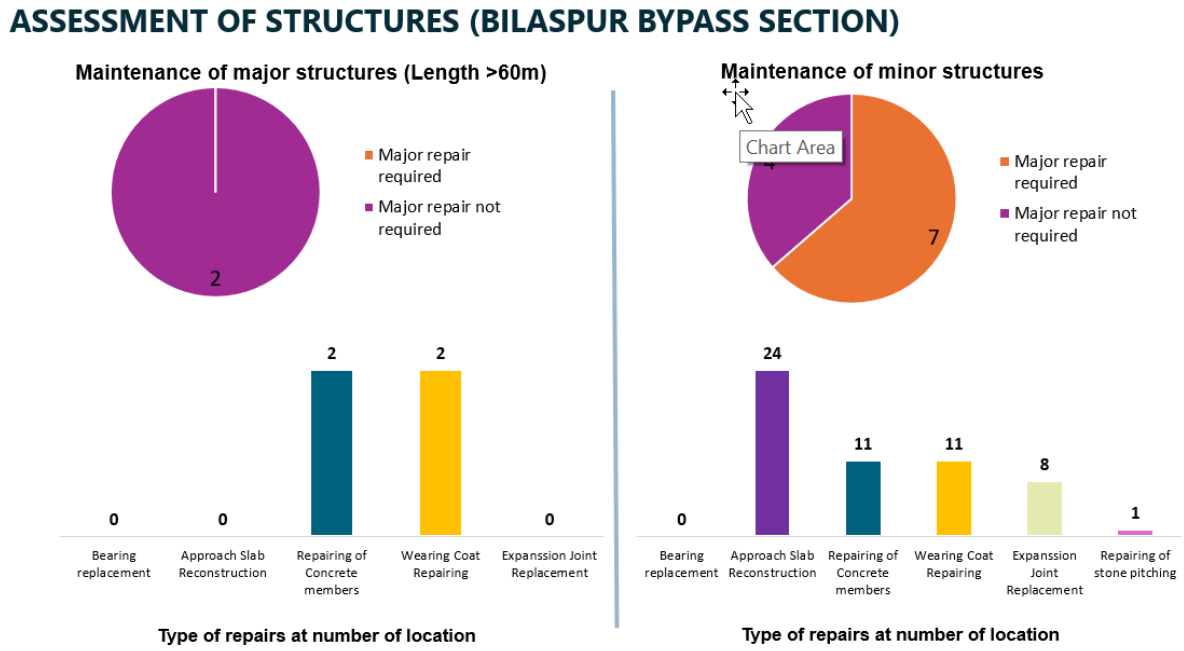
Direction	Load Transfer Efficiency (LTE)					
	Transverse Joint			Longitudinal Joint		
	> 90%	90%-50%	< 50%	> 90%	90%-40%	< 40%
Simga Bilaspur Section						
LHS	68.70%	31.30%	0.00%	62.48%	37.52%	0.00%
RHS	52.16%	47.84%	0.00%	65.58%	34.72%	0.00%
Bilaspur Bypass Section						
LHS	51.33%	48.67%	0.00%	31.52%	68.48%	0.00%
RHS	70.80%	29.20%	0.00%	73.01%	26.99%	0.00%

- Simga Bilaspur; The flexural strength of concrete high for more than 90% of the test locations and even the Load transfer efficiency is high at all the joints tested and hence the joints are in good condition.
- Bilaspur Bypass; The flexural strength of concrete high for more than 95% of the test locations and even the Load transfer efficiency is high at all the joints tested and hence the joints are in good condition.

1.3.5 Structure Inventory and Condition Survey

There are deficiencies noted in the structures and relevant repair-rehabilitation measures are suggested. Requirement of immediate repairs for major structures (length > 60m) and minor structures are presented below.





1.4 Key Technical Issues

1.4.1 Pavement and Road Condition

Longitudinal cracks with low-high severity are there along the project road. RHS carriageway is more distressed compared to LHS due to excessive loading. Some of the cracks are filled with epoxy mortar and its condition is not satisfactory. It has been observed that repair and rehabilitation works in terms of crack sealing, panel replacement etc. has been done at many locations. Joint

separation at the longitudinal joints was found at many of the locations of super elevation, high embankment where joints are widened by more than 30mm.

1.4.2 Reinforced Earth Wall

Bulging of RE wall panels observed at the approaches of structures between Saragon and Bilaspur. Also noted that nailing has been done at these bulged locations of VUP at Ch.-44+280, VUP at Ch.- 48+850, VUP at Ch.-55+050 of Sigma-Saragaon-Bilaspur section and Flyover at 0+750 of Bilaspur Bypass. Though no details available regarding its assessment, rehabilitation design adopted to avoid such bulging's, Consultant found nailing done in considerable number of panels. Approximate assessment in this regard is presented below:

Table 1-8: Nailing Details in RE wall Panel

Type of Structure	Chainage	Nos of Panel
Simga-Saragaon-Bilaspur section		
VUP	44+280	03
VUP	48+850	83
VUP	55+050	52
Bilaspur Bypass section		
Flyover	0+750	02

1.1 Structures

Defects at bearings are also found as detailed below:

- MJBR@20+875 (Stretch-2): - Bearing plate is damaged at one Location. Sliding's moment observed in 1 bearing
- MJBR@47+966 (Stretch-2): - cracks observed in 1 nr of bearings.

1.2 Retaining Walls

- Retaining Wall is damaged on RHS at PUP Ch.44+280 in Saragaon – Bilaspur section
- Cracks are observed at Retaining wall and Toe Wall at few structures and needs immediate repair/rehabilitation.

1.5 Capital Expenditure (CapEx) Requirement

1.5.1 Improvement works as per schedule B

Schedule B specifies the requirements of improvement for the concessionaire to be done after the appointment date.

Improvement works Scope specified for each stretch is tabulated below:

Table 1-9: Schedule B Requirements during O&M Handover

S. No.	Description	Unit	Simga Bilaspur	Bilaspur Bypass
1	R&R of earthen shoulder covered with granular material.	cum	26,208	11,223
2	Crack sealing	Km	5.91	3.65
3	Panel replacement	Nos	485	368
4	Approach slabs reconstructed.	Nos	28	24
5	Bearing replacement	Nos	2	-
6	Wearing coat replacement	Sqm	9541	10569
7	Strip seal expansion Joint	Lm	-	100
8	Toll Plaza restoration	Nos	1	1
9	Truck lay bye	Nos	3	-
10	Bus lay bye and shelter	Nos	27	-
11	Landscaping and median plantation	Km	11	3.3
12	Transverse bar marking:	Nos	75	14
13	Highway Lighting	Nos	120	34
14	ATMS	Km	57.4	22
15	Solar Blinkers	Nos	18	-
16	W beam crash barrier	Lm	3.29	1.87
17	Pedestrian Guard Rail	Lm	460	-
18	RCC crash barrier	Lm	290	920
19	Rainwater harvesting	Nos	116	44

Time to complete above construction works 3/12 months from the Appointed Date.

1.5.2 Immediate Maintenance Requirements

With reference to the clarification of pre-bid queries received from the Authority, prior to the O&M Hand-over to InvIT concessionaire, Authority will undertake relevant defect rectifications through its EPC contractors before handing over the assets in roadworthy condition to the InvIT concessionaire.

However, toll Plaza renovation cost, revalidation of survey during hand over of O&M and TMS replacement cost has been considered under this head.

1.6 O&M Cost Estimation

1.6.1 Recommended MM Cycles for Pavement

Considering the initial pavement design period and crust, existing flexural strength of PQC and load transfer capacities of existing joints, and in compliance to the provisions of schedule B, the following cycles of Major maintenance is proposed for satisfactory performance of the pavement during operation period for both functionally and structurally.

Table 1-10: Proposed Major Maintenance Cycles for Balance Concession period

Name of Stretch	InvIT Concession (20 years)	
	Periodic Maintenance	ATMS & TMS Replacement
Simga – Saragaon - Bilaspur	**FY 31 and FY44** **MCW**:2% Panel replacement & 100 % Joint sealant replacement and retexturing **SR:** 100 % Joint sealant replacement and retexturing **Structure:** Replacement of wearing coat & painting	**FY33-** 50% TMS **FY41-** 100% TMS
Bilaspur Bypass	**FY 31 and FY43** **MCW**:2% Panel replacement & 100 % Joint sealant replacement and retexturing **SR:** 100 % Joint sealant replacement and retexturing **Structure:** Replacement of wearing coat & painting **FY-37** **MCW:**2% Panel replacement & 100 % Joint sealant replacement **SR:** 100 % Joint sealant replacement **Structure:** Replacement of wearing coat, bearing, expansion joint & painting	**FY33-** 40% ATMS 50% TMS **FY40-** 60% ATMS 100% TMS

1.6.2 Estimate (Initial Improvement, MMR and O&M)

Year-wise estimate of Initial Improvement, MMR and O&M are given below.

Table 1-11 : Operation & Maintenance Cost (Initial Improvement, MMR and O&M) for Simga – Saragaon – Bilaspur bypass

Sl.No.	FY	Initial Improvement Cost (in INR Cr.)	Major Maintenance Cost (in INR Cr.)				Operation & Maintenance Cost (in INR Cr.)								
			Road (MCW,SR, Toll Plaza)	Structure	ATMS	TMS	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026	89.32	-	-	-	-	5.03	4.37	-	9.92	1.25	10.65	1.91	2.17	3.81
2	2026-2027	-	-	-	-	-	5.03	4.37	2.95	9.92	1.25	10.65	1.91	1.63	4.47
3	2027-2028	-	10.98	-	-	-	5.03	4.37	2.95	9.92	1.25	10.65	1.91	1.63	4.57
4	2028-2029	-	-	-	-	-	5.03	4.37	2.95	9.92	1.25	10.32	1.91	1.63	4.49
5	2029-2030	-	-	-	-	-	5.03	4.37	2.95	9.92	1.25	10.32	1.91	1.86	4.57
6	2030-2031	-	97.64	3.60	-	-	5.03	4.37	2.95	9.92	1.25	9.64	1.91	1.63	4.58
7	2031-2032	-	-	-	-	-	1.52	1.27	0.61	4.91	0.24	8.97	1.91	0.31	4.46
8	2032-2033	-	-	-	2.21	5.01	1.52	1.27	0.61	4.91	0.24	8.63	1.91	0.31	5.13
9	2033-2034	-	1.23	-	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.72
10	2034-2035	-	-	-	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.58
11	2035-2036	-	-	-	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.67
12	2036-2037	-	10.12	3.63	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.73
13	2037-2038	-	-	-	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.80
14	2038-2039	-	-	-	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.68
15	2039-2040	-	1.23	-	3.32	5.01	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	5.40
16	2040-2041	-	-	-	-	5.01	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.90
17	2041-2042	-	-	-	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	5.04
18	2042-2043	-	26.81	1.08	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.98
19	2043-2044	-	92.90	3.28	-	-	6.35	4.89	3.14	9.92	1.75	8.63	2.49	1.79	5.01
20	2044-2045	-	-	-	-	-	6.35	4.89	3.14	9.92	1.75	8.63	2.49	1.79	5.01
Total		**89.32**	**240.92**	**11.59**	**5.53**	**15.02**	**61.06**	**51.22**	**28.34**	**138.31**	**13.93**	**183.45**	**45.18**	**17.81**	**94.60**

Note: The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

1.7 Conclusion

The project highway has been constructed as per the provisions of the EPC Agreement for 4-laning by adopting rigid pavement for both main carriageway and service roads. The traffic volume on the project is considerably high due to presence of large-scale industries within the project influence area. The project requires capacity augmentation when the average daily traffic beyond the Target traffic for any of the homogenous section. As per the latest traffic surveys, analysis and projections, the project section from km 48+580 to 105+980 trigging for capacity augmentation from four to six laning during FY 32 and FY33 with a DLP period of 10 years being the rigid pavement. The 6-lane stretch is available for full O&M by InvIT from FY 44 to till end of the concession. The cost towards the augmentation works to be borne by the Authority. The performance of the pavement is found to be satisfactory under the current traffic loading conditions. However, the longitudinal intersecting cracks generated mostly in the mid slabs to outer side has been observed. The riding quality of the surface appears to be good for the comfort of the road users though the pavement has experiencing surface defects such as cracks of low to high severity. The reasons for adequate performance of the pavement is due to strong and uniform subgrade support as required for transfer of the wheel loads to the foundation. As per the site visit, the process of primary and secondary consolidation of the pavement layers has already been achieved and therefore, the progression of cracks after the consolidation stage is not very significant.

The other significant defect is widening of the longitudinal joints. This widening is conspicuously noticed on high embankments. It does not appear to be critically influenced by the absence or misalignment of tie bars. To arrest this widening, stitching of this joint is being practised with 2-meter-long steel bars. Bars at the end to resemble a staple pin are inserted spanning across the joint in grooves cut for this purpose. Since the widening of joints was noticed in locations where the slab was poorly supported, it is not expected that all joints would widen. This needs to be monitored for taking necessary measures when the joint width will become 30mm, cross-stitching of tie bars shall be done. Further, timely repair and rehabilitation for the identified distress during the concession period is required to maintain the structural adequacy of the PQC layer and improve the overall serviceability of the pavement structure.

Based upon the site visit for assessment of condition of CD structures including MJB, MNBs, ROB, VUPs, Culverts and toll plaza buildings in the project corridor and observations submitted in various chapters of this report it is concluded that immediate major repairs are required in few structures in terms of repairs of replacement of bearings, replacement of expansion joints and rectification of settled approach slabs. Significant bulging is noticed in RE wall panels, mainly at the structure approaches from the ground chainage km 43+466 (CA chainage km 91+026) onwards. Authority has clarified that these shall be rectified by them before handing over. It is advised that a thorough check of asset condition should be done by the InvIT Concessionaire before taking over to ensure that all the defects are rectified.

The assessment of estimated cost of such improvement works repairs along with the anticipated future repair and rehabilitation cost are considered in the cost estimate of this report.

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Section 2: Introduction

2.1 Background

NHAI has set up an Infrastructure Investment Trust namely National Highways Infra Trust ("InvIT") and is acting as its Sponsor to the said InvIT. National Highways Infra Investment Managers Private Limited ("NHIIMPL") has been appointed as the Investment Manager to the InvIT.

NHIIMPL appointed M/s Egis India Consulting Engineers Private Limited, as Technical Consultant to conduct the due diligence on the proposed Assets. The Letter of Empanelment (LOE) was received on 3rd November 2022 and Letter of Award (LoA) for the subject Project was received on 14th October 2024 by Egis India and the services commenced immediately thereafter.

Project road is a continuous stretch which is divided in three sections based on the tolling length of each of the three toll plazas in each section. The project stretches detail are listed below.

Table 2-1: Detail of Project Stretches

Sr. No.	Stretches	Toll Plaza	Lane	Length (km)
1	Raipur – Simga	Tarpongi	4/6 Lane	48.580
2	**Simga - Saragaon - Bilaspur**	**Bhojpuri**	**4 Lane**	**57.400**
3	**Bilaspur Bypass**	**Mudipar**	**4 Lane**	**20.545**
Total				126.525

This Report pertains to Simga - Saragaon – Bilaspur and Bilaspur Bypass Sections.

2.2 Objectives

The main objective of the present assignment is to

review project documents and understanding schedule B requirements for improvement works for the assessment of Capex and Opex during the concession period.

1. conduct field investigations to assess the existing asset condition and future deterioration.
2. validate executed works with respect to schedule A and assessment of improvement works
3. review quality of construction based on available data, design and drawings.
4. undertake designs for rehabilitation requirements of different assets based on field investigation data and available documents.
5. assess operation and maintenance cost including major maintenance expected to be incurred during the concession period.

2.3 Technical Consultant Team

The Technical Consultant commenced its services from 15th October 2024 and the team comprising of Highway, Pavement & Structure Engineers and Experts have conducted site visit from 20th October 2024 to 14th November 2024 to appreciate the project corridor characteristics. This report

highlights the findings from visual assessment, available documents shared with the consultant, discussion with Authority Engineer officials involved with the maintenance and operation of project road at site and other local enquiries. Analysis of data as obtained from various survey and investigations conducted at site are present in this report.

Date-wise various field activities at site are shown below in bar chart form in **Figure 2.1.**

Figure 2-1: Project Activities Schedule

PROJECT STRETCHES	20-Oct-24	21-Oct-24	22-Oct-24	23-Oct-24	24-Oct-24	25-Oct-24	26-Oct-24	27-Oct-24	28-Oct-24	29-Oct-24	30-Oct-24	31-Oct-24	01-Nov-24	02-Nov-24	03-Nov-24	04-Nov-24	05-Nov-24	06-Nov-24	07-Nov-24	08-Nov-24	09-Nov-24	10-Nov-24	11-Nov-24	12-Nov-24	13-Nov-24
Simga-Saragaon-Bilaspur																									
FWD Survey																									
NSV Survey																									
Inventory and Condition Survey																									
Axle Load Survey																									
Drone Survey																									
Test Pits																									
MBIU for Major Structures (Length > 60m)																									
Bilaspur Bypass																									
FWD Survey																									
NSV Survey																									
Inventory and Condition Survey																									
Axle Load Survey																									
Drone Survey																									
Test Pits																									
MBIU for Major Structures (Length > 60m)																									

2.4 Disclaimer

The information and documents received from the Client are being reviewed by the Consultant and have been used for preparing this report. Due care has been taken while reproduction of the information where required to avoid typographical or other errors.

2.5 Structure of the Report

The report has been structured into nine sections as follows:

Section 1: Executive Summary
Section 2: Introduction
Section 3: Inventory and Condition Assessment
Section 4: Surveys and Investigations
Section 5: Review of Documents
Section 6: Capital Expenditure (CapEx) Requirement
Section 7: Operation & Maintenance
Section 8: Conclusions

Section 3: Inventory and Condition Assessment

3.1 General

The Technical Consultant visited site from 20th October 2024 to 14th November 2024. The important aspects of the project road were noted in the detailed site reconnaissance along with various field investigations. These included general description about the project road, site features, structures, junctions, pavement characteristics, road safety. Field investigation for NSV, FWD test, axle load survey, trail pits, MBIU and drone videography survey were also conducted by Technical Consultant to assess the present condition of the project road. This chapter elaborates various findings of these surveys and studies conducted by the Technical Consultant team in different sections.

3.2 Project Corridor

Project road is a continuous stretch which is divided in three sections based on the tolling length of each of the three toll plazas in each section. The project stretches detail are listed below:

Table 3-1: Detail of Project Stretches

Sr. No.	Stretches	Toll Plaza	Lane	Length (km)
1	Raipur – Simga	Tarpongi	4/6 Lane	48.580
2	**Simga - Saragaon - Bilaspur**	**Bhojpuri**	**4 Lane**	**57.400**
3	**Bilaspur Bypass**	**Mudipar**	**4 Lane**	**20.545**
Total				126.525

This Report pertains to Simga - Saragaon – Bilaspur and Bilaspur Bypass Sections.

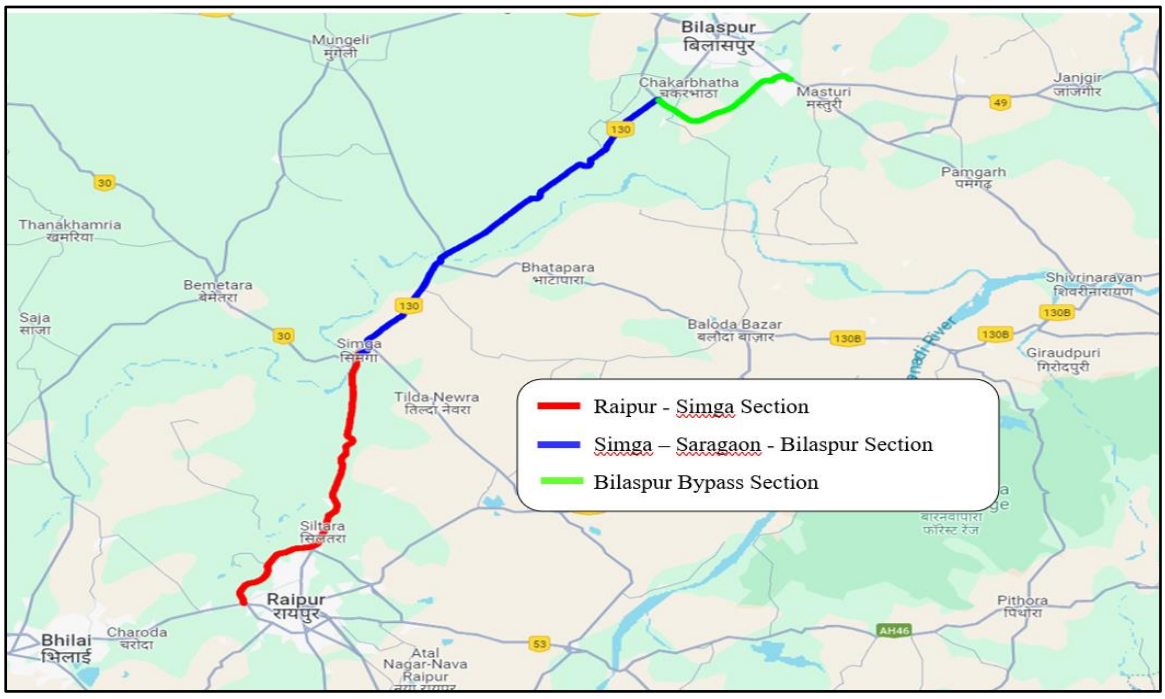


Figure 3-1: Project Location Map

3.3 Project Brief

3.3.1 Salient Features

Table 3-2: Salient Features

Sr. No.	Name of Stretches	Toll Plaza	Ground Chainage* (Km)			Chainage as per Sch A (4/6 laning)		Lane Config.	Length (km)	Details for 4/6-lane widening		
			From	To	NH	From	To			Contractor	Implementation Mode	Status
1	Simga – Saragaon – Bilaspur	Bhojpuri (49+970) 16 lanes	01+030	43+466	NH-130	48+580	91+026	4-Lane	42.436	L&T	EPC	1.PCOD - 28-01-2020 2.Maintenance period: 4 yrs from PCOD 3.Completion Expected: 31-01-2025 (Data Lake)
			43+466	58+430		91+026	105+980		14.964	Dilip Buildcon	EPC	1.Completion Certificate issued on 01-11-2018 2.Maintenance Period of 4 years after completion is over and Contractor is demobilised from the site. 3.As per AE, PBG of the Contractor is not yet released by NHAI.
2	Bilaspur Bypass	Mudipar (4+800) 16 lanes	00+525	21+070	NH-49	105+980	126+525		20.545			

During the inventory survey, Consultant found that Km-stones at site are corresponding to the new NH numbers. All the data in this report is presented in co-relation with ground chainage at the site. Relation between ground chiange and the chainage given in Sch A are also presented in above table for reference.

Details of Assets:

Table below provides the quantum of the assets and compare the same with the Schedule A stipulations:

Table 3-3: Asset Details and Comparison with Sch A

S. No.	Description			Simga - Saragaon - Bilaspur Section		Bilaspur Bypass Section	
				Schedule-A	At Site	Schedule-A	At Site
1	Total Project Length (km)			57.400	57.400	20.545	20.545
2	Service Roads/ Slip Roads (km)			28.940	28.940	2.990	2.430[3]
3	Pavement (km)	Flexible	LHS				
			RHS				
		Rigid	LHS	57.400	57.400	20.545	20.545
			RHS	57.400	57.400	20.545	20.545
4	Bus Shelters (no.)			21	26[4]		
	Bus bays with Shelters (no.)			6	6		
5	Truck Lay-bays/Parking (no.)			2	2		
6	Toll Plaza (no.)			1	1	1	1
7	Rest Area (no.)			1	1		
8	Major Bridges (no.)			2	2		
9	Minor bridges (no.)			7	7	4	4
10	ROB's (no.)					1	1
11	Flyover (no.)					1	1
12	VUP's (no.)			8	8	4	4
13	PUP/CUP (no.)			6	6	3	3
14	Culverts (no.)	Pipe Culvert		72	72	28	28
		Box Culvert		26	26	11	11

3.4 Road Inventory and Condition Survey

3.4.1 Road Inventory

The Road Inventory is conducted to assess and list out the existing features of the project corridor and to validate that project road is conforming to the requirements of CA. It covers all the existing physical features such as terrain, land use, carriageway surfacing type, shoulder width, junctions, water bodies, roadside arboriculture, general drainage conditions, etc. It was carried out in accordance with the guidelines given in IRC: SP 19-2001, generally by visual means, and supplemented by simple tape measurement.

The road inventory data collected for the project highway is presented in the **Annexure 3.1.**

[3] LHS service road along the ramp entering Bilaspur bypass from Raipur side, i.e. from Ch 106+200 to 106+760, is abundant, after the improvement of Bilaspur junction. This length is not considered in our assessment.

[4] There are few passenger shelters constructed by the local civic body. Consultant has considered all the shelters found adjacent to the project road.

3.4.2 Terrain

The project highway falls in plain terrain.

3.4.3 Main Carriageway

Project highway is having 4-lane with paved shoulder configuration. The rigid pavement is there in main carriageway and service/slip road in entire project stretch.

The carriageway width is 7.5m (with kerb shyness) with 1.5-2.0m paved shoulder except at toll plaza, underpasses, bridges and ROBs.

Details are show in **Table 3.4** and **Figure 3.2** below.

Table 3-4: Main Carriageway

S No.	Section	NH Section	Ground Chainage (km)		Length (Km)	Carriageway Width (MCW+PS)
			From	To		
2	Simga - Saragaon - Bilaspur section	NH-130	01+030	01+840	0.810	9.0
			01+840	02+650	0.810	9.5
			02+650	06+180	3.530	9.0
			06+180	07+310	1.130	9.5
			07+310	08+970	1.660	9.0
			08+970	09+970	1.000	9.5
			09+970	11+650	1.680	9.0
			11+650	12+640	0.990	9.5
			12+640	17+070	4.430	9.0
			17+070	17+870	0.800	9.5
			17+870	27+510	9.640	9.0
			27+510	28+210	0.700	9.5
			28+210	32+850	4.640	9.0
			32+850	33+950	1.100	9.5
			33+950	36+250	2.300	9.0
			36+250	37+040	0.790	9.5
			37+040	39+320	2.280	9.0
			39+320	40+200	0.880	9.5
			40+200	48+320	8.120	9.0
			48+320	49+370	1.050	9.5
			49+370	53+210	3.840	9.0
			53+210	54+020	0.810	9.5
			54+020	54+530	0.510	9.0
			54+530	55+510	0.980	9.5
			55+510	57+950	2.440	9.0
			57+950	58+430	0.480	9.5
			Total Length (km)		***57.400***	
3	Bilaspur Bypass section	NH-49	00+525	01+275	0.750	9.5
			01+275	21+070	19.795	9.0
			Total Length (km)		***20.545***	
			Project Length (km)		***126.525***	



4 lane Carriageway (Typ)



4 lane Carriageway (Typ)

Figure 3-2: Main Carriageway

3.4.4 Service Road/Slip Roads

Total linear length (both side length) of service/slip road along the project road is 31.37 km with 28.94 km in Simga-Saragaon-Bilaspur section and 2.43 km in Bilaspur bypass. Rigid pavement is there for the service/slip roads at all the locations.

Table 3-5: Service Road

Service Road (LHS)			Service Road (RHS)		
Chainage (km)		Length (km)	Chainage (km)		Length (km)
From	To		From	To	
Simga - Saragaon - Bilaspur section					
1+840	2+650	0.810	1+840	2+650	0.810
6+280	7+410	1.130	6+280	7+410	1.130
8+970	9+970	1.000	8+970	9+970	1.000
11+690	12+680	0.990	11+690	12+680	0.990
17+070	17+870	0.800	17+070	17+870	0.800
27+510	28+210	0.700	27+510	28+210	0.700
32+850	33+950	1.100	32+850	33+950	1.100
36+250	37+040	0.790	36+250	37+040	0.790
39+320	40+200	0.880	39+320	40+200	0.880
48+320	49+370	1.050	48+320	49+370	1.050
53+210	54+020	0.810	53+210	54+020	0.810
54+020	54+530	0.510	54+020	54+530	0.510
54+530	55+510	0.980	54+530	55+510	0.980
55+510	57+950	2.440	55+510	57+950	2.440
57+950	58+430	0.480	57+950	58+430	0.480
Total		**14.470**	**Total**		**14.470**
Bilaspur Bypass section					
0+525	0+755	0.230	0+525	1+275	0.750
3+485	4+035	0.550	2+650	2+920	0.270
			3+485	4+115	0.630
Total		**0.780**	**Total**		**1.650**



Slip Road at Km 49+370 RHS (NH-130)



Service Road at Km Km 2+700 RHS (NH-49)

Figure 3-3: Service/Slip Road Carriageway

3.4.5 Towns and Built-Up-Areas

Chainage-wise detail of towns and built-up areas are given below:

Table 3-6: Built Up Areas

S. No.	Chainage (km)		Length (km)	Name of Settlement
	From	To		
Simga - Saragaon - Bilaspur section				
1	6+448	7+148	0.700	Bansankara
2	9+248	9+948	0.700	Chanderi
3	11+948	12+348	0.400	Dhamakeda
4	17+248	17+448	0.200	Bisrampura
5	21+846	22+146	0.300	Khapri
6	33+146	33+546	0.400	Narayanpura
7	39+446	40+146	0.700	Kirna
8	48+650	49+050	0.400	Bhojpuri
9	53+250	53+850	0.600	Dhaurabhatha
10	54+750	55+150	0.400	Bilha
11	55+650	56+250	0.600	Hirri

3.4.6 Major and Minor Junctions

3.4.6.1 Major Junction

There is 1 no. major junction at Bilaspur Bypass Section. Details of the major junction are given in the **Table 3.7** below:

Table 3-7: List of Major Junction

Sr. No.	Chainage (km)	Side	Type of Junction (T, X, Y)	Cross Road Leads To	
				LHS	RHS
Bilaspur Bypass Section					
1	20+770	LHS	Y	Dhenka	-

3.4.6.2 Minor Junction

There are 47 nos. and 5 nos. of minor junctions at Simga-Saragaon-Bilaspur section and Bilaspur Bypass section respectively. Summary of the minor junctions are given in the **Table 3.8** below:

Table 3-8: Summary of Minor Junction

Sr. No.	Type of Junction (T, X, Y)	Simga - Saragaon - Bilaspur Section		Bilaspur Bypass Section	
		LHS	RHS	LHS	RHS
1	T Junction	11	9	1	2
2	Y Junction	14	9	0	0
3	X Junction	2	2	1	1

3.4.7 Median

Median width is predominantly 4.0m-4.5m (excluding shyness) except at few underpass locations where the width is 1.5m. Details of sections with narrow median width are given in the **Table 3.9** below:

Table 3-9: Details of Narrow Median (Width < 4.5m)

Sr. No.	Chainage (Km)		Length (km)	Median width (m)	Remarks
	From	To			
Simga-Saragaon-Bilaspur section					
1	1+840	2+650	0.81	1.5	VUP approaches
2	6+180	7+310	1.13	1.5	PUP/CUP approaches
3	8+970	9+970	1	1.5	PUP/CUP approaches
4	11+650	12+640	0.99	1.5	VUP approaches
5	17+070	17+870	0.8	1.5	PUP/CUP approaches
6	27+510	28+210	0.7	1.5	PUP/CUP approaches
7	32+850	33+950	1.1	1.5	VUP approaches
8	36+250	37+040	0.79	1.5	VUP approaches
9	39+320	40+200	0.88	1.5	PUP/CUP approaches
10	48+320	49+370	1.05	1.5	VUP approaches
11	53+210	54+020	0.81	1.5	PUP/CUP approaches
12	54+530	55+510	0.98	1.5	VUP approaches
13	57+950	58+430	0.48	1.5	Flyover approaches
Bilaspur Bypass section					
1	0+525	1+275	750	1.5	Flyover approaches

3.4.8 Earthen / Hard Shoulder

Earthen shoulders are provided on the outer side of the main carriageway. The width of these shoulders is 1.5m to 2.5m.

3.4.9 Drainage

Details of Drainage are given in the **Table 3.10** and shown in **Figure 3.4.**

Table 3-10: Drainage System

Description	Simga - Saragaon - Bilaspur Section	Bilaspur Bypass Section
Covered Lined Drain (km)	23.34	-
Open Lined Drain (km)	14.72	-

General observation of drainage conditions during the site reconnaissance are:

- Trapezoidal line drains are provided at most of the sections between main carriageway and service road. Discharge from these drains are either through the culvers or through rain water harvesting system. These trapezoidal drains are normally in good condition.
- Cleaning and maintenance of roadside drainage needs improvement. Slab at cover drain is damaged at few locations. Longitudinal lined drains are observed between main carriageway and service/slip road.
- Provision of chute drain at high embankment location is observed.
- Median cut drains (chute) are provided at super-elevation section to drain out the water from one carriageway to another at curve location. Longitudinal lined drain at median is observed near Major Bridge location.
- No overtopping of road was observed at any location during the survey work. It was further confirmed by the locals also



Longiditudinal lined drain near RE Panel



Median Cut drain damaged at Median

Figure 3-4: Drainage System

3.4.10 Road Furniture

3.4.10.1 W-Beam Crash Barrier, Concrete Crash Barrier and Pedestrian Guardrail

W-Beam Crash Barrier

W-Beam crash barrier are observed at bridges approaches, at shoulder side where embankment height above 3m and at median where width is 1.5m for entire project road. Section-wise length of W-Beam Crash Barrier are given in the **Table 3.11** and shown in **Figure 3.5.**

Table 3-11: W-Beam Crash Barrier

Description	Simga - Saragaon - Bilaspur Section	Bilaspur Bypass Section
W-Beam Crash Barrier (km)	49.405	11.01
Bamboo Crash Barrier (km)	-	-



W-Beam at shoulder



W-Beam at Median

Figure 3-5: W-Beam Crash Barrier/ Bamboo Crash Barrier

Concrete Crash Barrier

Concrete Crash Barrier is provided at approaches of Flyovers and Underpasses almost all through the project road. Length of CC barrier are given in the Table 3.12 and shown in Figure 3.6.

Table 3-12: Concrete Crash Barrier

Description	Simga - Saragaon - Bilaspur Section	Bilaspur Bypass Section
Concrete Crash Barrier (km)	9.61	4.03





Figure 3-6: Concrete Crash Barrier

Pedestrian Guardrails

Pedestrian guard rails are provided at the median opening location for all junctions for the entire project road. Pedestrian guard rail between the main carriageway and the service road is also observed. Length of Pedestrian Guardrails are given in the Table 3.13 and shown in Figure 3.7.

Table 3-13: Pedestrian Guardrails

Description	Simga - Saragaon - Bilaspur Section	Bilaspur Bypass Section
Pedestrian Guardrail (km)	7.1	0.14




Figure 3-7: Pedestrian Guardrails

3.4.10.2 Sign Boards and Gantry

There are adequate number of signboards along the project road and most of them are in good condition. There are variable message signs (VMS), overhead and cantilever gantry signs as well. Location of gantry signs are shown in **Table 3.14** and **Figure 3.8** below.

Table 3-14: Variable Message Signs (VMS) / Cantilever & Overhead Gantry

S. No.	Chainage (km)	Side	Type
Simga - Saragaon - Bilaspur Section			
1	1+240	RHS	Portal
2	1+560	LHS	VMS
3	1+610	LHS	Portal
4	2+930	RHS	Portal
5	11+460	LHS	Portal
6	12+910	RHS	Portal
7	32+620	LHS	Portal
8	34+160	RHS	Portal
9	36+020	LHS	Portal
10	37+250	RHS	Portal
11	43+870	LHS	VMS
12	47+350	LHS	Cantilever
13	47+360	RHS	Cantilever
14	48+250	LHS	Cantilever
15	49+590	Both Side	Portal
16	50+940	LHS	Cantilever
17	50+960	RHS	Cantilever
18	51+000	RHS	Cantilever
19	52+900	LHS	Cantilever
20	56+950	Median (RHS)	VMS
Bilaspur Bypass Section			
1	3+880	LHS	Cantilever
2	20+390	LHS	Cantilever
3	20+980	RHS	Cantilever

S. No.	Chainage (km)	Side	Type
4	20+890	RHS	VMS
5	5+710	RHS	Cantilever
6	1+910	RHS	Cantilever
7	1+450	Median (RHS)	VMS



Figure 3-8: VMS and Gantry Signboards

3.4.10.3 5 km / Km / Hectometer Stones

5Km, Km & Hectometer stones are observed at shoulder & median. Most of stones are in good condition.



Figure 3-9: Kilometer & Hectometer Stones

3.4.11 Project Facilities

3.4.11.1 Bus Bays and Shelters

Bus bays/shelters are available at main carriageway and service/slip roads. It is observed that shelters are of tin shade, and they are in fair to good condition. Package-wise numbers of these facilities are given in **Table 3.15** and shown in **Figure 3.10** below.

Table 3-15: Bus Bays and Shelters

Description	Unit	Simga - Saragaon - Bilaspur Section	Bilaspur Bypass Section
Bus bay with Shelter	Nos	6	-
Bus Shelter	Nos	26	-



Figure 3-10: Bus Bay and Shelters

3.4.11.2 Truck Lay bye

There is 01 no Tuck lay bye (both side) with toilets and 01 Rest Area facility.

Table 3-16: Truck Lat Bye and Rest Area

Description	Unit	Simga - Saragaon - Bilaspur Section	Bilaspur Bypass Section
Truck Lay Bye	Nos	2	-
Rest Area	Nos	1	-



Truck parking at Km 16+350 LHS Rest Area at Km 42+700 RHS

Figure 3-11: Truck Lay bye and Rest Area

3.4.11.3 Streetlight

Street light in the form of single/double arm poles are provided in toll plaza, underpasses and built-up area along the project road. Package-wise length provided for street lighting is give in **Table 3.17** and few examples are shown in **Figure 3.12.**

Table 3-17: Highway Lighting

S. No.	Section	Double Arm Light		Single Arm Light	
		Kms	Nos	Kms	Nos
2	Simga - Saragaon - Bilaspur Section	24.470	702	10.600	351
3	Bilaspur Bypass Section	4.770	155	0.930	31



Highway lighting at Underpass



Highway lighting at Major Bridge

Figure 3-12: Street Light

3.4.11.4 High Mast Light

High mast lights are observed at toll plazas, rest areas, and few junctions. There are also 10 nos solar high mast light in few junctions & starting/ending of slip/service road. Details are show in **Table 3.18** below.

Table 3-18: High Mast Light

Sr. No.	Chainage	Side	Location	Type	Quantity (nos)
Simga-Saragaon-Bilaspur section					
1	33+400	LHS	Junction	Solar High Mast	1
2	33+970	LHS	Shoulder	Solar High Mast	1
3	36+650	LHS	Junction	Solar High Mast	1
4	36+650	RHS	Junction	Solar High Mast	1
5	39+310	LHS	Shoulder	Solar High Mast	1
6	39+320	RHS	Shoulder	Solar High Mast	1
7	42+320	RHS	Shoulder	Solar High Mast	1
8	42+420	RHS	Shoulder	Solar High Mast	1
9	42+730	RHS	Rest Area	High Mast	5
10	43+600	RHS	Shoulder	Solar High Mast	1
11	43+650	LHS	Junction	High Mast	1
12	45+720	LHS	Junction	Solar High Mast	1
13	45+800	LHS	Junction	High Mast	1
14	47+130	LHS	Shoulder	High Mast	1
15	49+870	RHS	Toll Plaza	High Mast	1
16	49+880	LHS	Toll Plaza	High Mast	1
17	50+060	LHS	Toll Plaza	High Mast	1
18	50+080	RHS	Toll Plaza	High Mast	1
Bilaspur Bypass section					
1	0+650	LHS	Junction	High Mast	1
2	4+680	RHS	Toll Plaza	High Mast	1
3	4+700	LHS	Toll Plaza	High Mast	1
4	4+860	RHS	Toll Plaza	High Mast	1
5	4+880	LHS	Toll Plaza	High Mast	1



High mast light at Junction



Solor High Mast at Junction

Figure 3-13: High Mast / Solor High Mast Light

3.5 Toll Plaza

The purpose of the Toll Plaza is to collect toll from road users of the Project highway with transparency in the system. There are two toll plazas along the project road. Booths are available for all lanes. Administrative buildings are there at all three Toll Plazas.

3.5.1 Bhojpuri Toll Plaza (TP-2)

Bhojpuri Toll Plaza (TP-2) is located at km 49+970 of NH-130, Simga-Saragaon-Bilaspur stretch which has 16 lanes [2 x (7 + 1 extra wide lane)]. Canopy is there over all 16 lanes. Booths are available for all lanes.

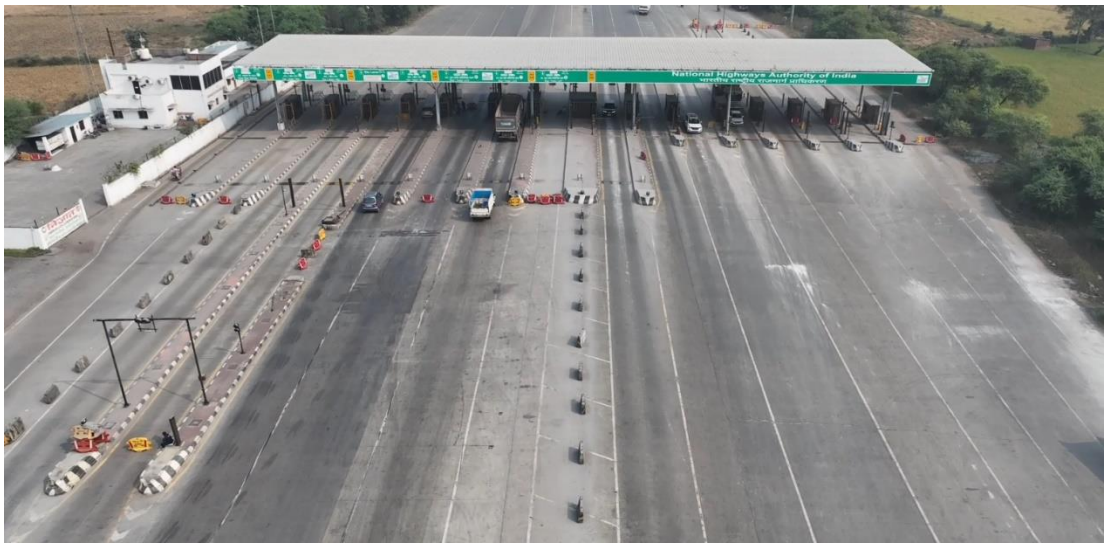


Figure 3-14: Bhojpuri Toll Plaza

Table 3-19: Toll Equipment Status at Bhojpuri Toll Plaza

Sr. No.	Particulars	Details
1	Toll Plaza Chainage and name	49+970 & Bhojpuri Toll Plaza
2	Road Configuration	4 Lane (NH-130)
3	Number of Toll Lanes	16 Lanes
4	No of ETC system	16 Lanes
5	No of Toll Booths	15 Lanes

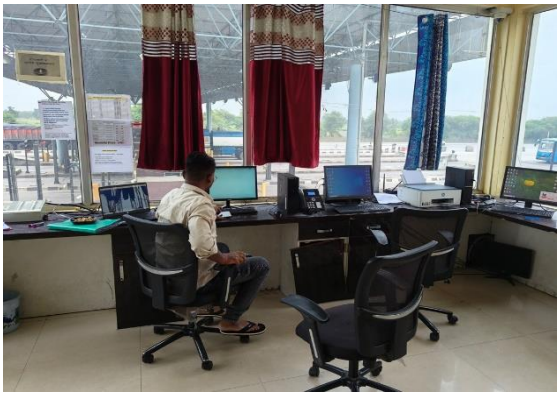
Sr. No.	Particulars	Details
6	Canopy	Available
7	Admin Building	Available
8	Control Room	Available
9	Server Room	Available
10	Medical Aid Post	Available
11	Traffic Aid Post	Available
12	PTZ camera	Available
13	UPS & Battery Room	Available
14	Plaza Manager Room	Available
15	Cash up Room	Available
16	Cashier Room	Available
17	Cash Van Garage	Available
18	Availability of Tunnel	Available
19	PRO Office	Available
20	Meeting Room	Available
21	Changing Room	Available
22	Toilets (Gents & Ladies)	Available
23	Weigh In Motion Facility	Available
24	Availability of Static Weigh Bridge	Available
25	Availability of loading/unloading facilities	Not Available
26	Storage facility of overloaded material	Not Available
27	Diesel Generator	Available
28	High Mast Light	Available
29	Streetlights	Available
30	Type of Pavement at Toll Lanes	Rigid
31	Highway Mini Nest – 2 no's	Available
32	Cantilever / Gantry Boards	Available



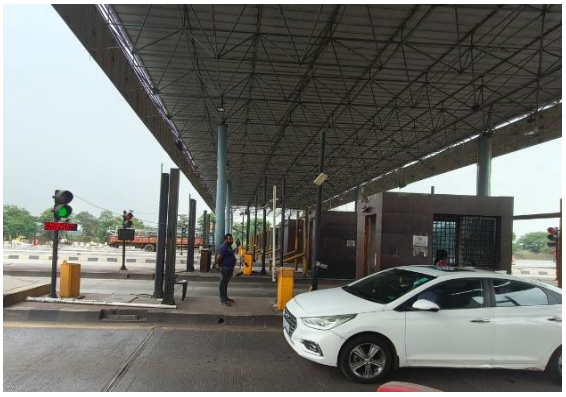
Lane Equipment



Lane Equipment



TMS Equipment



Canopy

Figure 3-15: Toll Equipment, Bhojpuri Toll Plaza

3.5.2 Mudipar Toll Plaza (TP-3)

Mudipar Toll Plaza (TP-3) is located at km 4+800 of NH-49, Bilaspur bypass stretch stretch which has 16 lanes [2 x (7 + 1 extra wide lane)]. Canopy is there over all 16 lanes. Booths are available for all lanes.



Figure 3-16: Mudipar Toll Plaza

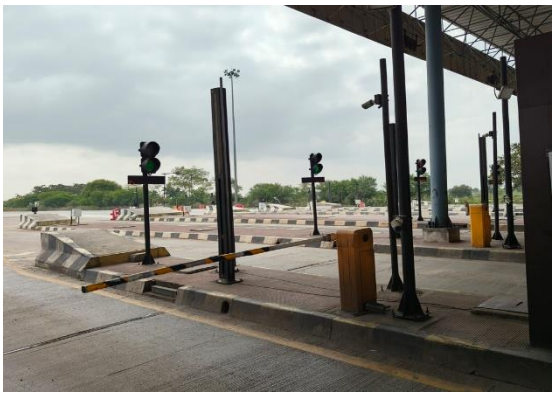
Table 3-20: Toll Equipment Status, Mudipar Toll Plaza

Sr. No.	Particulars	Details
1	Toll Plaza Chainage and name	4+800 & Mudipar Toll Plaza
2	Road Configuration	4 Lane (NH-49)
3	Number of Toll Lanes	16 Lanes
4	No of ETC system	16 Lanes
5	No of Toll Booths	15 Lanes
6	Canopy	Available
7	Admin Building	Available
8	Control Room	Available
9	Server Room	Available
10	Medical Aid Post	Available
11	Traffic Aid Post	Available
12	PTZ camera	Available
13	UPS & Battery Room	Available
14	Plaza Manager Room	Available
15	Cash up Room	Available
16	Cashier Room	Available
17	Cash Van Garage	Available
18	Availability of Tunnel	Available
19	PRO Office	Available
20	Meeting Room	Available
21	Changing Room	Available
22	Toilets (Gents & Ladies)	Available
23	Weigh In Motion Facility	Available
24	Availability of Static Weigh Bridge	Available
25	Availability of loading/unloading facilities	Not Available

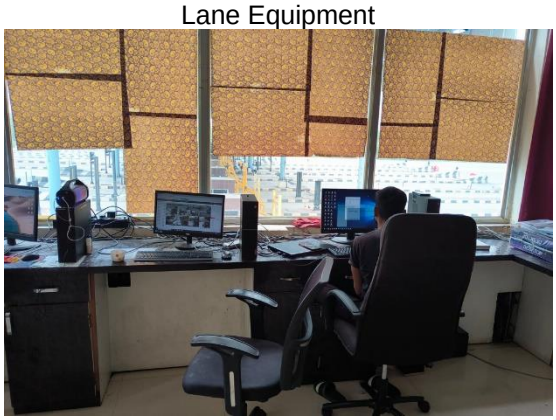
Sr. No.	Particulars	Details
26	Storage facility of overloaded material	Not Available
27	Diesel Generator	Available
28	High Mast Light	Available
29	Streetlights	Available
30	Type of Pavement at Toll Lanes	Rigid
31	Highway Mini Nest – 2 no's	Available
32	Cantilever / Gantry Boards	Available



Lane Equipment



Lane Equipment



TMS Equipment



Diesel Generator

Figure 3-17: Toll Equipment at Mudipar Toll Plaza

3.5.3 Toll Plaza Administration Building

The Plaza administration building serves as the support structure for the operation and maintenance of the toll plaza. It is from here that utilities are distributed and controlled, employee amenities are maintained, the toll collection process overseen, revenues are processed & audited. Sale of local passes and recharge is done at Plaza building. Transfer of funds from toll booth to plaza building and from plaza building to bank are being facilitated/managed by administration and financial management functions are also conducted in the building.



Bhojpuri Toll Plaza



Mudipar Toll Plaza

Figure 3-18: Toll Plaza Administration Buildings

3.6 Structure Inventory and Condition Survey

This section mainly presents the Site Inventory and Condition Survey of all existing Structures likes Culverts, Minor bridges & Major bridges, Flyovers, VUP, LVUP, PUP, RUB and ROBs along the project roads. The aim of the section is to present the details of existing structures condition of existing structures and functioning of structures. The structure inventory has been done on the basis of visual assessment of each structure. MBIU has been used for visual assessment inspection of major structures having length greater than 60m.

Number of existing structures along the Project roads are given in the following table. Detailed inventory and condition data is presented in **Annexures – 3.2**

Table 3-21: Number of Structures

S. No.	Description		Simga - Saragaon - Bilaspur Section	Bilaspur Bypass Section
1	Major Bridge (no.)		2	-
2	Minor Bridge (no.)		7	4
3	ROB/RUB (no.)		-	1
4	Flyover (no.)		-	1
5	VUP (no.)		8	4
6	PUP/CUP (no.)		6	3
7	Culverts (no.)	Box	26	11
		Pipe	72	28

Section 4: Surveys and Investigations

4.1 Visual Condition Assessment

4.1.1 Simga – Saragaon - Bilaspur Section

i) RE wall at the stretch constructed by L&T, i.e. up to Ch 43+466, is in sound condition whereas bulging and nailing are observed at many locations in the stretch constructed by DBL.

ii) Wide longitudinal cracks with very high severity found along the project road. RHS carriageway is more distressed compared to LHS due to excessive loading. Intersecting cracks with one or more joints has also been observed with poor survivability condition.

iii) These wide cracks are filled with epoxy mortar and its condition is not satisfactory. Some of the cracks are still open.

iv) Joint spalling is also more in the section

v) Few of the wide cracks observed by slot stitching, but its function is not effective.

vi) High severity settlements at the approaches of the structures

vii) There is no maintenance in progress at site during consultant site visit



RE wall in Good Condition @ VUP 2+300



Nailing at Bulging RE Panel at Ch.55+050 VUP



Repairing work is in progress at Main Carriageway RHS at Ch.55+050 VUP approaches



Intersecting Cracks with one or more joints

Figure 4-1: Simga – Saragaon - Bilaspur: Visual Condition

4.1.2 Bilaspur Bypass Section

i) Observed the longitudinal cracks with low to high severity on RHS. Intersecting cracks/multiple cracks along with Shrinkage cracks have been observed.

ii) Few of the distressed sections laid with asphalt overlay

iii) Longitudinal joint has got widened to the extent of 30-40mm in some of the locations, particularly in super elevation sections and bridge approaches

iv) High severity Joint spalling observed at many locations

v) Settlement at the structure approaches causing poor riding quality

vi) No maintenance works in progress at site. Significant drop in asset quality due to lack of timely maintenance

vii) Construction of Bilaspur – Urga section for Raipur – Dhanbad Economic Corridor under HAM is undergoing. This road is taking off from the Project Road at Ch 19+550 and LHS carriageway is dismantled from this point to construct approach road of the Flyover.



Rigid Pavement in poor condition



Reflection in the Asphalt overlay on the cracked PQC



FO – Bilaspur Urga Section



LHS c'way dismantled for FO approach at 19+550

Figure 4-2: Bilaspur Bypass: Visual Condition

4.2 Network Survey Vehicle (NSV)

The Network Survey Vehicle is the latest survey technique which utilizes Lasers, Global Positioning System and Video image processing tools. The survey vehicle is used for automatic data collection pertains to pavement condition and road inventory data, required for preparation of pavement maintenance and management proposals. It allows all the data to be collected in a single pass

consequently minimising the time needed to complete the data collection. The measurement of surface distresses like cracking, ravelling, patching and potholes etc. is done using the calibrated image processing methods. The description of NSV and the methodology adopted is provided in **Annexure-4.1.**

The NSV survey has been carried out along the project corridor from 27/07/2024 to 01/08/2024 for collection of field data pertains to pavement condition and road inventory. The data has been collected separately for each lane of the Carriageway.

Integrated into the NSV is a Digital Laser Profiler (DLP) consisting of two-point laser (6 devices). This inertial profiler is capable of measuring:

- Pavement Roughness (one laser in each wheel path and centre)
- Rutting (full transverse pavement measurement)
- Macro texture (outer wheel path and between wheel paths).

4.2.1.1 Determination of Roughness

- The outputs of the lasers and accelerometers located in each wheel path (750 mm either side of the centre line of the vehicle) are sampled every 25 mm of longitudinal travel and used to calculate the longitudinal profile of the road.

- The profile is then passed through the Quarter Car model to calculate the International Roughness Index (IRI) lane roughness as per the methodologies specified in the Austroads Guide to Asset Management, Part 5B - Roughness.

- Post Survey any 'spikes' in the roughness outputs will be excluded that may arise from cattle grids, railway crossings, bridge abutments etc. Automated checks in the data processing software are already incorporated to exclude any contribution to roughness from data collected below the minimum survey speed which is typically set at 10 -30 km/hr (user definable).

- The above-mentioned Roughness Digital Laser Profile System fall under the specification defined in Circular no 11041/218/2007 - admen issued by NHAI for use of Laser Profilometer in NHAI Works.

4.2.1.2 Determination of Rutting

- All data is measured and reported in accord with the recommendations contained within the Austroads Guide to Asset Management, Part 5C – Rutting.

- The DLP measures a 3-metre transverse profile across the lane using a minimum of 11 lasers. A full transverse profile is measured every 50 mm of longitudinal travel, and the processing software allows both lane and wheel path rutting to be measured using the string line and straight edge models.

4.2.1.3 Determination of Texture

- The DLP (Digital Laser Profile) is capable of measuring both flushing and texture via Sensor Measured Texture Depth (SMTD). Texture is measured continuously along the pavement

length using a non-contact laser transducer.

- Macro texture can be recorded in many different ways. The most common is by using the Sensor Measured Texture Depth (SMTD). Internationally Mean Profile Depth (MPD) is more common. SMTD is more common as it can be easily correlated to a Sand Patch Texture Dept (SPTD). The DLP is able to record both types of texture to all international and national standards.

4.2.1.4 Criteria for Analysis

From the digital images, a host of information are extracted. This information is linearly (Chainage) and spatially (GPS) referenced. The information extracted is presented in the table below:

Table 4-1: Information extracted from NSV

Coding Parameters	Coding Type
General Features and Utilities	
Land use pattern	Agricultural, Urban, Commercial, Forest, Ruraletc.
Avenue plantation / Roadside arboriculture	Present/Not Present
Electric pole	Present/Not Present
Telephone	Present/Not Present
Wayside amenities, Bus bays, truck lay Bye, etc...	Present/Not Present
Main Carriageway Features	
Pavement type	Bituminous, Concrete
Junction (Major / Minor & X / T/ Y) & type of road crossing / merging	Type and Geolocation
Carriageway width (lane wise)	Width
Paved shoulder (width)	Width
Earthen shoulder (width and physical condition)	Width, Condition-Good, Fair, Poor
Footpath (physical condition)	Present/Not Present, Condition
Drain width (lined & Unlined, along with general condition)	Lined/Unlined, Condition
Median (width)	Width
Kerb Height	Height
Median opening (length)	Length
Road markings (lane wise)	Condition
Presence of Road Studs (Lane wise) - Yes / No	Yes/No
Sign boards identifications (both sides of carriageway) – Type and Physical Condition	Geo Location, Condition
Gantry boards identifications (type of gantry) – Physical Condition	Geo Location, Condition
Kilometre & hectometre stones	Present/Not present
Guard rails – Physical Condition	Geo Location, Condition
Safety barriers – Type and Physical Condition	Geolocation, Type and Condition
Delineators – Physical Condition	Present/Not present
Guard / guideposts – Physical Condition	Yes/No, Condition
Streetlight and High Mast Light	Type and Geo Location
Location of water bodies (lakes and reservoirs), at every occurrence	Type and Geo Location
Location of Structures	Type and Geo Location
Service Road	
Pavement type	Bituminous, Concrete
Carriageway width (lane wise)	Width

Coding Parameters	Coding Type
Drain width (lined & Unlined, along with general condition)	Lined/Unlined, Condition
Road markings (lane wise)	Condition
Sign boards identifications (both sides of carriageway) – Type and Physical Condition	Geo Location, Condition
Gantry boards identifications (type of gantry) – Physical Condition	Geo Location, Condition
Coding Parameters	**Coding Type**
Location of water bodies (lakes and reservoirs), at every occurrence	Type and Geo Location
Streetlights	Present/Not present

4.2.2 Pavement Roughness

The roughness data was collected at 100m interval using NSV on each lane in-terms of IRI (International Roughness Index) value. In Indian context, the IRI values were converted to BI as per IRC: SP:16-2019 “Guidelines on Measuring Road Roughness and Norms” with the following equation;

$BI = 630*(IRI)^{\wedge 1.12}$

Where

BI = Bump Integrator Roughness in mm/km

IRI = International Roughness Index.

Roughness data was collected through Digital Laser Profilers System (DLP) and the same is presented in **Annexure 4.3**. The summary of Roughness values is presented in tables below

Table 4-2: Simga - Bilaspur Section: Summary of Pavement Roughness

Condition	BI (mm/km)	LHS				RHS			
		Inner		Outer		Inner		Outer	
		Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)
Good	<2000	55.400	96.516	54.400	94.774	51.400	89.547	52.970	92.282
Fair	2000-2400	2.000	3.484	3.000	5.226	5.000	8.711	4.430	7.718
Poor	>2400	0.000	0.000	0.000	0.000	1.000	1.742	0.000	0.000
Length (km)		57.400	100.000	57.400	100.000	57.400	100.000	57.400	100.000

Table 4-3: Bilaspur Bypass Section: Summary of Pavement Roughness

Condition	BI (mm/km)	LHS				RHS			
		Inner		Outer		Inner		Outer	
		Length (km)*	Length (%)	Length (km)*	Length (%)	Length (km)	Length (%)	Length (km)	Length (%)
Good	<2000	19.900	100.000	19.900	100.000	21.100	100.000	20.700	98.104
Fair	2000-2400	0.000	0.000	0.000	0.000	0.000	0.000	0.400	1.896
Poor	>2400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Length (km)		19.900	100.000	19.900	100.000	21.100	100.000	21.100	100.000

** 1.2 km on LHS is under construction stretch of Bilaspur – Urga section for Raipur – Dhanbad Economic Corridor*

4.2.3 Test Pit Investigations

Test pit investigations have been carried out at every 5km in a staggered manner ascertain the existing pavement composition (pavement course, material type, and thickness). The summary of existing pavement crust thickness is presented in table and some of the photographs showing the pavement crust thickness are shown as below.

Table 4-4: Summary of Existing Pavement Crust Thickness

S.No	Location (Km.)	Side (LHS/RHS)	Existing Crust details			
			Pavement Quality Concrete (PQC)	Dry Lean Concrete (DLC)	Granular Layer (GSB)	Total Thickness (mm)
Simga Bilaspur Section						
1	3.200	LHS	300	150	150	600
2	8.000	RHS	300	150	140	590
3	13.000	LHS	300	150	150	600
4	18.000	RHS	300	150	150	600
5	23.000	LHS	300	150	150	600
6	28.300	RHS	300	150	150	600
7	32.500	LHS	300	150	160	610
8	38.000	RHS	300	150	150	600
9	43.000	LHS	300	150	140	590
10	48.000	RHS	300	150	150	600
11	53.000	LHS	300	150	150	600
Bilaspur Bypass Section						
1	4.000	LHS	300	150	150	600
2	9.300	RHS	300	150	150	600
3	15.200	LHS	300	150	150	600
4	20.000	RHS	300	150	150	600





Figure 4-3: Pavement Composition & Thickness Measurement

Observations and Conclusions:

- For Simga – Bilaspur section, the designed PQC thickness is 310mm as per the pavement design report. However, thickness available at site is 300mm throughout except at the super elevation locations where thickness is found to be 330mm. The constructed thickness is a departure from design and even not within the construction tolerance limits of +-6mm. Whereas DLC and GSB found to be adequate considering design value of 150mm for DLC and 150mm for GSB and its tolerance limits.

- For Bilaspur Bypass section, the designed PQC thickness is 310mm as per the pavement design report. However, thickness available at site is 300mm throughout the length. The constructed thickness is a departure from design and even not within the construction tolerance limits of +-6mm. Whereas DLC and GSB found to be adequate considering design value of 150mm for DLC and 150mm for GSB and its tolerance limits.

During the above investigations, the existing subgrade soils samples were collected and tested in the laboratory to understand the properties of these foundation soils. The test results are presented in **Annexure 4.7.** The observations from test results are given below for each of the section:

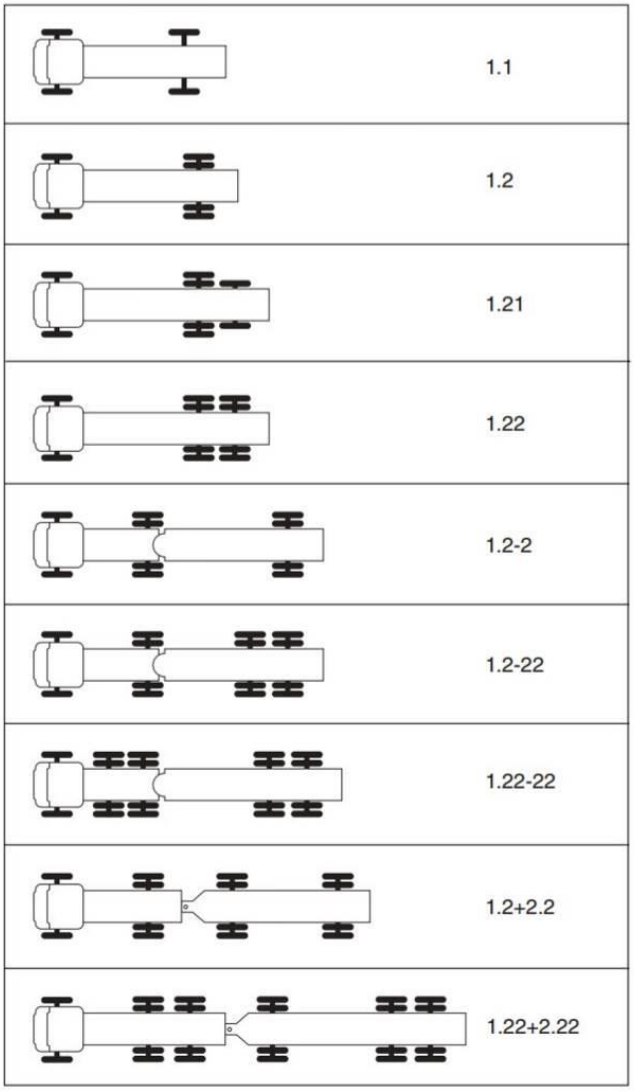
- Simga Bilaspur; As per the pavement design report of 4-lane, the adopted design effective CBR for subgrade is 5.8%. Most of the test results for CBR are in compliance with design values except few locations. But noted that there is no such subgrade failures related distresses found at the site however it is observed that earthen shoulder throughout the project has got deteriorated.

- Bilaspur Bypass; As per the pavement design report of 4-lane, the adopted design effective CBR for subgrade is 7%. The test results for CBR are non-compliance with design values except one location. But noted that, there is no such subgrade failures related distresses found at the site however it is observed that earthen shoulder throughout the project has got deteriorated.

4.3 Axle Load Survey

The axle load survey has been conducted at the Toll Plaza locations on the Project Corridor. The axle load measurements were made over a 24-hour period on random sampling basis. The survey has been conducted in both the directions. The axle load pads have been placed on either side of the carriageway in a staggered manner to measure the axles in both the directions. While carrying out axle load survey enough care is taken to ensure that this survey work will not hamper the normal passage of the traffic

The type of vehicle considered for axle load survey along with its axle configurations are presented in below. Few of the survey photographs were shown in Photos as below:





Axle load survey at Bhojpuri



Axle load survey at Mudipar

Figure 4-4: Axle Load Survey

The VDF analysis was carried out in line with section 4.4 of IRC: 37-2018 based on the axle load data. The equations for computing equivalency factor for single, tandem and tridem axles given below is used as directed in the IRC:37-2018 for converting different axle load repetitions into equivalent standard axle load repetitions.

- Single axle with single wheel on either side = {axle load in kN / 65}4
- Single axle with dual wheel on either side = {axle load in kN / 80}4
- Tandem axle with single wheel on either side = {axle load in kN /148}4
- Tridem axle with dual wheel on either side = {axle load in kN /224}4

With the stated above procedure, the Vehicle Damage Factor for each class of commercial vehicle on both the directions were calculated separately for empty and loaded vehicles. The Axle load data format and VDF analysis are presented in **Annexure 4.5** and obtained VDF values comparing the values adopted at the time of pavement design during construction summarized in table below.

Table 4-5: Vehicle Damage Factors (VDF)

S. No	Toll plaza	Bhojpuri		Mudhipar	
	Vehicle Type	LHS	RHS	LHS	RHS
1	Bus	0.95	1.13	-	-
2	LCV	1.02	0.70	0.76	0.32
3	2-Axle	2.32	1.22	1.95	1.11
4	3-Axle	2.47	5.03	3.35	7.78
5	MAV	4.20	16.57	3.45	14.05

The higher VDF on RHS side is due to movement of heavily loaded trucks carrying Coal, steel, Construction materials etc whereas, Empty Vehicles of significant proportion in LHS side. Further, 7-day axle load survey values are lower than one days and hence adopted the above values in the study.

4.4 Falling Weight Deflectometer (FWD)

The structural evaluation of pavement has been carried out in accordance with IRC: 115-2014, “Guidelines for Structural Evaluation and Strengthening of Flexible Road Pavements Using Falling Weight Deflectometer (FWD) Technique” to determine the remaining life of the pavement structure.

The principle and description of FWD and its methodology is provided in **Annexure 4.6.**

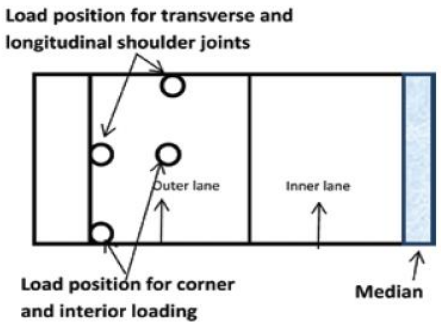
FWD deflection measurement has been carried out for each direction and the measurement has been carried out at a test point along outer wheel path of each direction which is at an offset of 1m from the outer edge of outer lane as specified in section 5.4.5 of IRC: 115-2014. At every measurement location, four drops were made, such that the first drop was the ‘**seating drop’** and with the remaining three drops deflections were recorded. Field survey photographs is shown below.



Figure 4-5: FWD Survey at Project Site

The deflection testing has been carried out on the existing pavement as per IRC Codes at the rate of 5 points per km in each direction as stipulated in TOR of the Consultant.

Adopted deflection measurement scheme is as under.

Adopted Measurement Scheme	Rigid Pavement
(i) measurement along outer wheel paths of outer lanes (3 points) (ii) measurement along the outer wheel path of inner lane (2 points)	

4.4.1 FWD data Analysis for Rigid Pavement

As per IRC: 117-2015, the collected FWD data for the rigid pavement has been analysed to determine the following parameters.

- Modulus of subgrade reaction k (MPa/m)
- Elastic modulus of concrete E_c (MPa)
- Flexural Strength of concrete f_{mr} (MPa)
- Load Transfer Efficiency (LTE) of Joints (%)

The detailed analysis of the parameter for PQC and Load Transfer Efficiency is presented in **Annexure 4.7** for both LHS and RHS directions respectively.

From the test results the observations were draw-down. The range of Elastic Modulus, other PQC parameters and their percentage of length and Load Transfer Efficiency (LTE) is presented in table below.

Table 4-6:Summary of Flexural Strength and Elastic Modulus

Pavement layer	Range	Percentage of Project Road	
		LHS	RHS
Simga Bilaspur Section			
Elastic Modulus of PQC Layer (Mpa)	> 30000	6.96%	6.96%
	30000 - 10000	93.04%	93.04%
Flexural Strength of PQC Layer (Mpa)	> 4.5	1.74%	5.22%
	4.5 - 3.0	91.31%	89.57%
	<3.0	6.96%	5.22%
Bilaspur Bypass Section			
Elastic Modulus of PQC Layer (Mpa)	> 30000	9.73%	14.60%
	30000 - 10000	90.27%	85.40%
Flexural Strength of PQC Layer (Mpa)	> 4.5	0.00%	0.00%
	4.5 - 3.0	100.00%	95.13%
	<3.0	0.00%	4.87%

Table 4-7: Summary of Joint Load Transfer Efficiency

Direction	Load Transfer Efficiency (LTE)					
	Transverse Joint			Longitudinal Joint		
	> 90%	90%-50%	< 50%	> 90%	90%-40%	< 40%
Simga Bilaspur Section						
LHS	68.70%	31.30%	0.00%	62.48%	37.52%	0.00%
RHS	52.16%	47.84%	0.00%	65.58%	34.72%	0.00%
Bilaspur Bypass Section						
LHS	51.33%	48.67%	0.00%	31.52%	68.48%	0.00%
RHS	70.80%	29.20%	0.00%	73.01%	26.99%	0.00%

- Simga Bilaspur; The flexural strength of concrete high for more than 90% of the test locations and even the Load transfer efficiency is high at all the joints tested and hence the joints are in good condition.
- Bilaspur Bypass; The flexural strength of concrete high for more than 95% of the test locations and even the Load transfer efficiency is high at all the joints tested and hence the joints are in good condition.

4.5 Mobile Bridge Inspection Unit (MBIU)

4.5.1 Specification

The Mobile Bridge Inspection Unit (referred as (MBIU) is an electro-mechanically driven articulated structure mounted on a vehicle (a truck) as an aid towards proper inspection of bridges or similar infrastructures by enabling an inspection team of 2-3 persons carrying instruments access to the underside of bridge decks overflowing rivers or gorges. The present version is the truck mounted system. As per TOR condition survey of existing structures greater than 60m shall be carried using MBIU.

The overall objective of the condition survey is to identify the need for structural maintenance, rehabilitation and replacement. Signs of distress such as spalling, scaling, cracking, leaching, excessive deflection, inadequate cover, settlement, exposed reinforcement, corrosion in the reinforcement; shear cracks etc. are identified during this exercise. Special emphasis is given on expansion joints and bearing. Also, the condition of the Approaches, water way and bed protection is examined. The survey identifies the bridges which are more distressed and require testing for their evaluation and rehabilitation measures. Also bridges which require general measures for rehabilitation. Inspection report is prepared in accordance with IRC: SP-35. The report provides recommendation whether a bridge is acceptable to continue in use, whether it can be repaired and/or modified e.g. widened or a new structure.

The structure inventory and condition assessment are given in **Annexure 3.2.** The following structures have been inspected using MBIU machine.

Table 4-8: List of Inspected Structures using MBIU

Sr. No.	Chainage (Km)	Side		Remark
		LHS	RHS	
Simga Bilaspur Section				
1	20+835	LHS	RHS	Major Bridge
2	47+966	LHS	RHS	Major Bridge
Bilaspur Bypass Section				
1	0+750	LHS	RHS	Flyover
2	3+440	LHS	RHS	ROB

4.5.2 Working Principle

The work of condition survey requires use of Mobile Bridge Inspection Unit at the various bridge sites on the National Highways to overcome the accessibility problems. MBIU increases the accessibility for inspection of underside of high-level bridge decks and helps in continuous inspection of throughout the span of bridge. It has five folded arms. All of them are electro-mechanically operated.

Once the platform is erected by certified person, Inspection and maintenance experts can inspect underside of bridge, note observations as per IRC SP-35 & IRC SP-52 and take photographs for reference.

4.5.3 Advantages

- A large operating range
- A high level of working comfort
- Maximum operational safety
- The shortest possible setting up and dismantling times
- Full mobility in inspection operation without stabilizer supports
- An optimum weight/performance ratio




Figure 4-6: MBIU Survey

4.6 Drone Videography of Entire Stretch

Videography of entire Project Stretch is captured through Drone cameras flown at about 50m above ground. This shall be useful for observing various features of Project Stretch from bird's eye level.



Figure 4-7: Drone Videography image about 40 m

Section 5: Review of Documents

5.1 General

Technical Consultant (TC), since the start of technical due diligence study, has requested for various documents from the Client. A list of documents required were shared with the Client before TC team started the study which was appended with few more queries after the conclusion of the site visit once the project site is appraised. Most of the queries were also discussed with the Client in many meetings. This section of the report deals with the documents requested by TC and its review along with highlighting major issues found during this review.

5.2 Documents Collected and Reviewed

List of documents requested, received and reviewed are given below:

S. No.	List of Documents	Status of Documents	Remarks on Review
DOCUMENTS RELATED TO CURRENT ACQUISITION			
1.	Concession Agreement	Partially Available	Technical Schedules A, B, C and F are made available to the Consultant. These schedules are modified from the standard provisions given in manual as below: Sch A: Existing features Sch B: Scope of Work including facilities to be provided Sch C: Specifications and Standards Sch F: Maintenance Requirements Table 1 of Sch F provides maintenance criteria for pavements which has performance parameter, desirable and acceptable level of service, frequency of inspection and time limit for rectification/repair. Sch F specifies roughness value as 2200mm/km desirable and 2400 mm/km acceptable for rigid pavement. Sch B states that the concessionaire shall carry out the periodic maintenance in full length of the project stretch including main carriageway, service/slip Road, ramps and at facilities etc. in every sixth year. Further, it was clarified in the pre-bid queries reply that maintenance activities of rigid pavement shall be carried out in accordance with Sch F of the CA. Though draft CA is not available, Consultant has referred the CA of earlier rounds wherever required presuming that there shall not be any change in Contract Conditions.
2.	Detailed Project Report/ Technical Due Diligence Report	Available	Report done by M/s MSV in association with Sri Infotech for NHAI in December – 2024 is made available for Simga – Bilaspur sections. This Report is used as reference for inventory & condition of the assets and improvement proposals. Cost estimates are provided for engineering and safety improvement for Rs 60.315 Cr including GST which are under the obligation of NHAI. Cost of Rs 27.74 Crore including GST is considered for immediate repair for rehabilitation of structures, road safety works, lighting, traffic impact attenuators bus shelter refurbishing and ATMS under the obligation of NHIT. The report also provides for the O&M cost during the concession period which is used for comparison and reference purpose.

S. No.	List of Documents	Status of Documents	Remarks on Review
3.	FWD data	Available	Consultant collected the reports of FWD from respective AEs during their site visit and used it as a reference document.
4.	Latest MPRs	Available	Consultant collected recent IE-MPRs from the AEs during the site visit. Reports provide details about the Project Road and key maintenance activities undertaken at the site during that period.
5.	Maintenance History	Not available	There is no maintenance history available for the Project Road.
6.	NSV data	Available	The reports of NSV are available as a reference document for TC.
7.	AADT for each section and Growth rate	Available	AADT along with traffic projections for the project roads have been provided by Client.
8.	Concession Period	Not available	TC has adopted 20 years concession period with reference to the CA of earlier roads.
9.	Projected Escalation factor	Not available	In absence of projected escalation factor, all cost are given at the present rate as per the direction of the Client.

5.3 Key Technical Issues

1.3 Pavement and Road Condition

Longitudinal cracks with low-high severity are there along the project road. RHS carriageway is more distressed compared to LHS due to excessive loading. Some of the cracks are filled with epoxy mortar and its condition is not satisfactory. It has been observed that repair and rehabilitation works in terms of crack sealing, panel replacement etc. has been done at many locations. Joint separation at the longitudinal joints was found at many of the locations of super elevation, high embankment where joints are widened by more than 30mm.



Repairing work is in progress



Cracks in Rigid Pavement

Figure 5-1: Pavement Distress

1.4 Reinforced Earth Wall

Bulging of RE wall panels observed at the approaches of structures between Saragon and Bilaspur. Also noted that nailing has been done at these bulged locations of VUP at Ch.-44+280, VUP at Ch.- 48+850, VUP at Ch.-55+050 of Sigma-Saragaon-Bilaspur section and Flyover at 0+750 of Bilaspur Bypass. Though no details available regarding its assessment, rehabilitation design adopted to avoid such bulging's, Consultant found nailing done in considerable number of panels. Approximate assessment in this regard is presented below:

Table 5-1: Nailing Details in RE wall Panel

Type of Structure	Chainage	Nos of Panel
Simga-Saragaon-Bilaspur section		
VUP	44+280	03
VUP	48+850	83
VUP	55+050	52
Bilaspur Bypass section		
Flyover	0+750	02



Figure 5-2: Bulging of RE wall @ 55+050



Figure 5-3: Nailing in Wing wall @ 44+280

1.1 Structures

Defects at bearings are also found as detailed below:

- ✓ MJBR@20+875 (Stretch-2): - Bearing plate is damaged at one Location. Sliding's moment observed in 1 bearing
- ✓ MJBR@47+966 (Stretch-2): - cracks observed in 1 nr of bearings.

1.2 Retaining Walls

- ✓ Retaining Wall is damaged at PUP Ch.44+280 in Saragaon – Bilaspur section
- ✓ Cracks are observed at Retaining wall and Toe Wall at few structures and needs immediate repair/rehabilitation



Figure 5-4: Damaged Retaining Wall @ 44+280 RHS



Figure 5-5: Cracks in Retaining Wall

Section 6: Capital Expenditure (CapEx) Requirement

6.1 Schedule B Improvement Work

Schedule B specifies the requirements of improvement work for the concessionaire which are to be done after the appointment date. Major works with relevant references to Sch B used to quantify these construction requirements are listed below:

- R&R of earthen shoulder covered with granular material Ref Cl 4.1 I of Sch B.
- Crack sealing: Ref Cl 4.1 III of Sch B.
- Panel replacement: Ref Cl 4.1 III of Sch B.
- R&R of Structure: Ref Cl 4.2 of Sch B.
- Junction improvement. Ref Cl 7.1 III of Sch B.
- Service road improvement Ref Cl 5 of Sch B
- Traffic Impact Attenuators Ref Cl 5 of Sch B
- Curve improvement: Ref Cl 6/ Cl 9 of Sch B.
- Median opening: Ref Cl 8 of Sch B.
- Rainwater Harvesting Ref Cl 11 of Sch B.
- Toll Plaza restoration: Ref Cl 12.1 of Sch B
- Truck lay bye: Ref Cl 9.1of Sch B
- Bus lay bye and shelter: Ref Cl 12.3 of Sch B
- Landscaping and median plantation: Ref Cl Cl 12.4 of Sch B
- Transverse bar marking: Ref Cl Cl 13.3 of Sch B
- Antiglare: Ref Cl Cl 13.6 of Sch B
- Kerb stones: Ref Cl Cl 13.7 of Sch B
- Highway Lighting Ref Cl 12.6 of Sch B
- ATMS Ref Cl 12.11 of Sch B
- Solar Blinkers Ref Cl 13.2 of Sch B

Improvement works Scope specified for each stretch is tabulated below:

Table 6-1: Schedule B Requirements during O&M Handover

S. No.	Description	Unit	Simga Bilaspur	Bilaspur Bypass
1	R&R of earthen shoulder covered with granular material.	cum	26,208	11,223
2	Crack sealing	Km	5.91	3.65
3	Panel replacement	Nos	485	368
4	Approach slabs reconstructed.	Nos	28	24
5	Bearing replacement	Nos	2	-

S. No.	Description	Unit	Simga Bilaspur	Bilaspur Bypass
6	Wearing coat replacement	Sqm	9541	10569
7	Strip seal expansion Joint	Lm	-	100
8	Toll Plaza restoration	Nos	1	1
9	Truck lay bye	Nos	3	-
10	Bus lay bye and shelter	Nos	27	-
11	Landscaping and median plantation	Km	11	3.3
12	Transverse bar marking:	Nos	75	14
13	Highway Lighting	Nos	120	34
14	ATMS	Km	57.4	22
15	Solar Blinkers	Nos	18	-
16	W beam crash barrier	Lm	3.29	1.87
17	Pedestrian Guard Rail	Lm	460	-
18	RCC crash barrier	Lm	290	920
19	Rainwater harvesting	Nos	116	44

Time to complete above improvement works are 3 months/12 months from the Appointed Date based on completion schedule for improvement proposals given in Schedule B.

6.2 Immediate Maintenance Requirements

With reference to the clarification of pre-bid queries received from the Authority, prior to the O&M Hand-over to InvIT concessionaire, Authority will undertake relevant defect rectifications through its EPC contractors before handing over the assets in roadworthy condition to the InvIT concessionaire.

However, toll plaza renovation cost, revalidation of survey during hand over of O&M and TMS replacement cost has been considered under this head.

6.3 Capital Expenditure (CapEx)

Cost of capital expenditure (CapEx) are presented below.

Table 6-2: Cost of Capital Expenditure (CapEx)

Description	Cost (INR)	
	Simga Bilaspur	Bilaspur Bypass
Revalidation of Survey	0.45	0.20
Initial Improvement Works (Schedule - B)	35.42	16.40
TCMS	5.01	5.01
ATMS	21.30	5.53
Total	**62.18**	**27.14**

Section 7: Operation & Maintenance

7.1 General

The O & M requirements for the project facilities are specified in the Concession Agreement (CA) mainly under following Articles/ Schedules:

- Article 15 - Operation and Maintenance
- Article 16 - Monitoring of Operation and Maintenance
- Article 17 – Traffic Regulation
- Article 18 and Schedule H – Safety Requirements
- Schedule F- Maintenance Requirements

7.2 Requirement as per Concession Agreement

Schedule F of the Concession Agreement sets out the Operation and Maintenance requirements for the Project. As per this schedule, scope for Operation and Maintenance includes but not limited to following obligations:

- ✓ **Improvement** – This includes improvement of the existing assets as per requirement of this Agreement and safety audit.
- ✓ **Maintenance of Civil Works and Assets**- this includes maintenance of civil works and all assets as per requirement of this agreement.
- ✓ **Road Maintenance** –This includes routine maintenance, preventive maintenance, periodic maintenance as per IRC:82-2015, Design overlay as per Manual of 4- laning/6-laning, disaster maintenance, exigencies, and inspections.
- ✓ **Traffic Management** – This includes enforcement of regulations together with the relevant authorities. This also includes hazard response, information gathering and dissemination, Road patrols and ATMS surveillance etc.
- ✓ **Safety**– This includes accident prevention, after care, user education, enforcement, data collection and analysis.
- ✓ **Facility Management** – This includes periodic inspections, routine maintenance, Rehabilitation, and expansion planning.
- ✓ **Road property management** –This includes management of access, encroachment, and ribbon development.
- ✓ **General responsibilities** –This includes budgeting, compliance with legal and accounting requirements, and public relations.
- ✓ Maintaining public relations unit to interface with and attend to suggestions from users of the highway, the media, Govt. agencies and other external agencies.

Routine Maintenance: These are maintenance needs required on daily, weekly, monthly and annual basis for the smooth and efficient running of traffic and includes the activities of minor repairs of all project elements, cleaning of road furniture's, replacement of consumables, horticulture

maintenance, keeping the project site /project facilities clean, tidy and orderly condition free of litters and debris, preventing unauthorized entry and exit including any encroachment etc.

Preventive Maintenance: Preventive maintenance shall include the activities related to each element and the system of the Project Highway to ensure that during the Concession Period and at its end is in sound, durable and functional condition. In other words, preventive maintenance are a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without significantly increasing the structural capacity).

Periodic Maintenance: These are maintenance needs required on periodic annual basis to improve the riding quality and strength of the project assets.

Factor influencing periodic maintenance: performance parameter for flexible pavement in terms of roughness as given in Schedule F is 2200 mm/km as desirable and 2400 mm/km as acceptable. Clause 3.1 (III) of Schedule B states that periodic maintenance shall be carried out in full length of the project stretch including main carriageway, service/slip road and at facilities etc. either in every six years or in the year in which roughness index exceeds the limit given in schedule F, whichever comes earlier. Further clarity on this requirement is given as Note at the same clause which states "*A Roughness of <2200 mm shall be maintained by the existing EPC Contractor prior to handing over to InvIT Concessionaire. After handover of project stretch to InVIT, the InVIT concessionaire shall maintain the roughness level at <2200mm, however after a functional overlay (Roughness exceeding 2200 mm) or structural overlay (FWD Test) is provided in any particular stretch length then that particular length shall be maintained at a roughness level mentioned in Schedule F after that overlay. For clarification, InVIT concessionaire shall maintain a roughness level (mentioned in Schedule F) in a stretch length where overlay (Structural or Functional) has been provided by InVIT concessionaire*."

7.3 O&M Cost Estimation

7.3.1 Routine maintenance

This is a day-to-day work that is necessary to preserve and keep a pavement as close to as constructed condition and to ensure smooth and functional conditions all the time. The item in this subhead includes maintenance of earthen shoulder, restoration of rain cuts, maintenance of slope protection works, cleaning of road side drains, cleaning of carriageway, maintenance of structures, repairs of road surface such as filling of potholes, repairing of cracks and patch works, carrying out of Road roughness survey, FWD test etc.

7.3.2 Repair/Maintenance

Repair/maintenance covers the minor repair which are required on day-to-day maintenance to maintain the assets in good condition. This is sub-divided in two categories as below:

a) **Preventive Maintenance:** The preventive maintenance is required to be done for further improve or extend the functional life of pavement surface whist in fair to good condition. Any of the treatment under preventive maintenance does not significantly increasing the

structural capacity of pavement rather it decreases rate of surface deterioration, which may result in saving of pavement from leading to poor condition where major maintenance could be inevitable.

Future preventive maintenance on the project road depends largely on routine inspection of the pavement with careful observation of specific distress and to take a decision at that time and suitable type of preventive maintenance treatment and its timing. All the narrow and wide surface cracks must be arrested immediately after identification with recommend preventive type maintenance measure for the in-service flexible pavement.

Based on the condition and distress identification survey as explained above paragraph, preventive maintenance treatments must be taken up immediately to reduce rate of further damage to the surface and for enhance the pavement performance to the condition similar to non-distressed surface condition.

b) **Road Property Maintenance:** The item in this subhead covers the plantation/ maintenance of shrubs, turfing, replacement/ repair of damaged railing, crash barrier, kerbs, road delineators, signage, Road marking and painting etc.

7.3.3 Toll Management System

Cost estimate for Toll Management System was worked out by TC. Same was presented and deliberated during the investor meet, after that it was decided to adopt the rationalised cost finalized by IM.

7.3.4 Corridor Management

Incident Management: The items in this subhead include minimize the effects of incident and restore normal capacity and safety levels to all affected road facilities as efficiently as possible and. repair/ replacement of removing the dead animals & broken-down vehicles etc.

7.4 Major Maintenance

The pavement deteriorates with time caused by traffic movement and weather conditions. The rate of deterioration depends on the original design and pavement type, type of maintenance being done/undertaken and time of application. Therefore, timely and appropriate maintenance using suitable materials is essential to increase the pavement service life to a greater extent. Any delay in maintenance of the pavement substantially increases severity of the distresses, which results into poor condition of pavement and thereby increase in maintenance costs to bring the surface to a good condition.

Schedule F of the Concession Agreement set out the maintenance requirements in the Project. The performance parameters are indicated in schedule F descripting the nature of defect/deficiency along with time limits for repair/rectification for roads and bridges.

Schedule F, Pavement Roughness Value (Functional Overlay): The Periodic maintenance is required to be provided as and when performance parameters in terms of cracking, roughness, surface defects, joint defects etc. exceeded the limits as indicated in the schedule F anytime during the service life of the pavement. As per the provisions of Concession agreement, Surface roughness value is the major governing factor for selection of an appropriate pavement

maintenance treatment required to bring the roughness value below the prescribed limit of 2400mm/km.

7.4.1.1 Review of Pavement Design

The Pavement design for Main Carriageway is rigid type and designed as per IRC:58-2015. Even rigid pavement is adopted for the service roads as well.

Following composition and thickness has been adopted.

Main Carriageway (MCW): Rigid Pavement
PQC: 310mm, DLC: 150mm and GSB: 150mm.
Service Roads (SR): Rigid Pavement
PQC: 260mm, DLC: 150mm and GSB: 150mm.

7.4.1.2 Review of Major Maintenance History

The 4-lane construction of project section from Simga to Saragaon in the year 2020 and 4 laning of Saragaon – Bilaspur & Bilaspur Bypass sections completed in the year 2018. As per the site visit made by the consultant and review of available documents, there is no periodic maintenance works were performed in the project so far after PCOD/COD. However, pavement repairs consist of replacement of PQC slab in full depth, crack sealing, bituminous overlays on the heavily cracked sections have been done. As noted from the site that significant number of panels are replaced to being the cracked surface to a serviceable condition.

7.4.1.3 Immediate Pavement Rehabilitation Measures

After the distress identification using the condition data collected from the NSV survey, the following immediate rehabilitation measures has been suggested to improve the rigid pavement condition to the desired level of serviceability for the present and projected traffic patterns in the project highway.

Distress Rating	Suggested Rehabilitation Measure
0	Nil
1	Crack sealing with epoxy
2	Partial depth repair/Panel replacement
3	Partial depth repair/Panel replacement
4	Panel Replacement
5	Panel Replacement

Further, the suggested repair and rehabilitation measures for each of the distress and its severity as identified for rigid pavement is provided in table below in compliance with requirements of IRC SP 83-2018.

S. No	Distress type	Distress Rating	Treatment
1	Longitudinal Cracks	0	No action, but need to be monitored
		1	Sealing with epoxy
		2	Sealing with epoxy
		3	Partial depth repair

S. No	Distress type	Distress Rating	Treatment
		4	Partial depth repair
		5	Panel replacement
2	Transverse cracks	0	No action, but need to be monitored
		1	Sealing with epoxy
		2	Sealing with epoxy
		3	Panel Replacement
		4	Panel Replacement
		5	Panel Replacement
3	Multiple Cracks	0	No action, but need to be monitored
		1	Seal with epoxy
		2	Seal with epoxy
		3	Full depth repair
		4	
		5	
4	Corner Breaks	0	No action, but need to be monitored
		1	Sealing with epoxy
		2	Sealing with epoxy
		3	Full depth repair
		4	Full depth repair
		5	Full depth repair with subbase
5	Joint Damage/Spalling	0	No action, but need to be monitored
		1	Sealing with epoxy
		2	Sealing with epoxy
		3	Repair up to 50mm thickness
		4	Repair up to 50mm thickness
		5	Repair up to 100mm thickness
6	Joint Sealant Defects	0	No action, but need to be monitored
		1	Cleaning
		2	Cleaning
		3	Sealant replacement
		4	Sealant replacement
		5	Sealant replacement
7	Joint Separation	0	No action, but need to be monitored
		1	No action, but need to be monitored
		2	No action, but need to be monitored
		3	No action, but need to be monitored
		4	No action, but need to be monitored
		5	Fill the joint with M40 concrete
8	Joint Faulting	0	No action
		1	Monitoring
		2	Diamond grinding
		3	Diamond grinding
		4	Panel replacement
		5	Panel replacement
9	Blow ups	0	No action
		1	No action
		2	No action
		3	Full depth repair
		4	Full depth repair
		5	Panel replacement
10	Ravelling	0	No action
		1	Repair with epoxy
		2	Repair with epoxy
		3	Repair with epoxy
		4	Repair with epoxy
		5	Panel replacement

S. No	Distress type	Distress Rating	Treatment
11	Scaling	0	No action
		1	Repair with epoxy
		2	Repair with epoxy
		3	Repair with epoxy
		4	Repair with epoxy
		5	Panel replacement
12	Potholes/Popouts	0	No action
		1	Partial depth repair up to 65mm
		2	Partial depth repair up to 100 mm
		3	Partial depth repair up to 100 mm
		4	Partial depth repair up to 100 mm
		5	Full depth repair

7.4.1.4 Immediate and Future Major Maintenance Requirement

Major maintenance is required to comply with provisions of concession agreement and to maintain performance levels as defined in schedule F throughout the operation and maintenance period.

As per schedule B, the TOT concessionaire shall carryout the periodic maintenance in full length of the project stretch including main carriageway, service roads and facilities in every 6th year or the year in which roughness index exceeds the limits given in schedule F, whichever comes earlier.

Therefore, considering the initial pavement design, pavement distresses, elastic modulus and flexural strength of PQC layer and load transfer efficiency of joints, and in compliance to the provisions of schedule B, the following cycle of Major maintenance is proposed for satisfactory performance of the pavement during operation period for both functionally and structurally.

The project section from km 48+580 to 105+980 trigging for capacity augmentation from four to six laning during FY 32 and FY33 with a DLP period of 10 years being the rigid pavement. The 6-lane stretch is available for full O&M by InvIT from FY 44 to till end of the concession. The cost towards the augmentation works to be borne by the Authority

Table 7-1: Proposed Major Maintenance Cycles for Balance Concession period

Name of Stretch	InvIT Concession (20 years)	
	Periodic Maintenance	ATMS & TMS Replacement
Simga – Saragaon - Bilaspur	**FY 31 and FY44** **MCW**:2% Panel replacement & 100 % Joint sealant replacement and retexturing **SR:** 100 % Joint sealant replacement and retexturing **Structure:** Replacement of wearing coat & painting	**FY33-** 50% TMS **FY41-** 100% TMS
Bilaspur Bypass	**FY 31 and FY43** **MCW**:2% Panel replacement & 100 % Joint sealant replacement and retexturing **SR:** 100 % Joint sealant replacement and retexturing **Structure:** Replacement of wearing coat & painting **FY-37** **MCW:**2% Panel replacement & 100 % Joint sealant replacement **SR:** 100 % Joint sealant replacement **Structure:** Replacement of wearing coat, bearing, expansion joint & painting	**FY33-** 40% ATMS 50% TMS **FY40-** 60% ATMS 100% TMS

7.4.1.5 Cost of Operation & Maintenance

Cost of Operation & Maintenance per annum are presented below.

Table 7-2: Cost of Operation & Maintenance (per annum)

Description	Cost in Crore INR	
	Simga - Bilaspur	Bilashpur Bypass
Tolling & TMS Operations (Varies) Min-Max	4.70-5.84	3.93-4.81
ATMS Operation	2.34-2.54	0.61
Incident Management	5.00	4.91
Admin Expenses (Varies) Min-Max	3.81-5.40	
Insurance (Varies) Min-Max	1.91-2.49	
Power cost excl. Toll Plaza	1.01-1.51	0.24
RAMS, BMS & Survey	1.33-1.86	0.31

7.4.2 Estimate (Initial Improvement, MMR and O&M)

Year-wise estimate of (Initial Improvement, MMR and O&M are given below:

Table 7-3 : Operation & Maintenance Cost (Initial Improvement, MMR and O&M) for Simga – Saragaon – Bilaspur bypass

Sl.No.	FY	Initial Improvement Cost (in INR Cr.)	Major Maintenance Cost (in INR Cr.)				Operation & Maintenance Cost (in INR Cr.)								
			Road (MCW, SR, Toll Plaza)	Structure	ATMS	TMS	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
1	2025-2026	89.32	-	-	-	-	5.03	4.37	-	9.92	1.25	10.65	1.91	2.17	3.81
2	2026-2027	-	-	-	-	-	5.03	4.37	2.95	9.92	1.25	10.65	1.91	1.63	4.47
3	2027-2028	-	10.98	-	-	-	5.03	4.37	2.95	9.92	1.25	10.65	1.91	1.63	4.57
4	2028-2029	-	-	-	-	-	5.03	4.37	2.95	9.92	1.25	10.32	1.91	1.63	4.49
5	2029-2030	-	-	-	-	-	5.03	4.37	2.95	9.92	1.25	10.32	1.91	1.86	4.57
6	2030-2031	-	97.64	3.60	-	-	5.03	4.37	2.95	9.92	1.25	9.64	1.91	1.63	4.58
7	2031-2032	-	-	-	-	-	1.52	1.27	0.61	4.91	0.24	8.97	1.91	0.31	4.46
8	2032-2033	-	-	-	2.21	5.01	1.52	1.27	0.61	4.91	0.24	8.63	1.91	0.31	5.13
9	2033-2034	-	1.23	-	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.72
10	2034-2035	-	-	-	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.58
11	2035-2036	-	-	-	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.67
12	2036-2037	-	10.12	3.63	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.73
13	2037-2038	-	-	-	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.80
14	2038-2039	-	-	-	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.68
15	2039-2040	-	1.23	-	3.32	5.01	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	5.40
16	2040-2041	-	-	-	-	5.01	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.90
17	2041-2042	-	-	-	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	5.04
18	2042-2043	-	26.81	1.08	-	-	1.52	1.27	0.61	4.91	0.24	8.63	2.49	0.31	4.98
19	2043-2044	-	92.90	3.28	-	-	6.35	4.89	3.14	9.92	1.75	8.63	2.49	1.79	5.01
20	2044-2045	-	-	-	-	-	6.35	4.89	3.14	9.92	1.75	8.63	2.49	1.79	5.01
Total		**89.32**	**240.92**	**11.59**	**5.53**	**15.02**	**61.06**	**51.22**	**28.34**	**138.31**	**13.93**	**183.45**	**45.18**	**17.81**	**94.60**

Note: The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. All other costs are based on FY 2025 with GST and without escalation.

Section 8: Conclusion

The project highway has been constructed as per the provisions of the EPC Agreement for 4-laning by adopting rigid pavement for both main carriageway and service roads. The traffic volume on the project is considerably high due to presence of large-scale industries within the project influence area. The project requires capacity augmentation when the average daily traffic beyond the Target traffic for any of the homogenous section. As per the latest traffic surveys, analysis and projections, the project section from km 48+580 to 105+980 trigging for capacity augmentation from four to six laning during FY 32 and FY33 with a DLP period of 10 years being the rigid pavement. The 6-lane stretch is available for full O&M by InvIT from FY 44 to till end of the concession. The cost towards the augmentation works to be borne by the Authority. The performance of the pavement is found to be satisfactory under the current traffic loading conditions. However, the longitudinal intersecting cracks generated mostly in the mid slabs to outer side has been observed. The riding quality of the surface appears to be good for the comfort of the road users though the pavement has experiencing surface defects such as cracks of low to high severity. The reasons for adequate performance of the pavement is due to strong and uniform subgrade support as required for transfer of the wheel loads to the foundation. As per the site visit, the process of primary and secondary consolidation of the pavement layers has already been achieved and therefore, the progression of cracks after the consolidation stage is not very significant.

The other significant defect is widening of the longitudinal joints. This widening is conspicuously noticed on high embankments. It does not appear to be critically influenced by the absence or misalignment of tie bars. To arrest this widening, stitching of this joint is being practised with 2-meter-long steel bars. Bars at the end to resemble a staple pin are inserted spanning across the joint in grooves cut for this purpose. Since the widening of joints was noticed in locations where the slab was poorly supported, it is not expected that all joints would widen. This needs to be monitored for taking necessary measures when the joint width will become 30mm, cross-stitching of tie bars shall be done. Further, timely repair and rehabilitation for the identified distress during the concession period is required to maintain the structural adequacy of the PQC layer and improve the overall serviceability of the pavement structure.

Based upon the site visit for assessment of condition of CD structures including MJB, MNBs, ROB, VUPs, Culverts and toll plaza buildings in the project corridor and observations submitted in various chapters of this report it is concluded that immediate major repairs are required in few structures in terms of repairs of replacement of bearings, replacement of expansion joints and rectification of settled approach slabs. Significant bulging is noticed in RE wall panels, mainly at the structure approaches from the ground chainage km 43+466 (CA chainage km 91+026) onwards. Authority has clarified that these shall be rectified by them before handing over. It is advised that a thorough check of asset condition should be done by the InvIT Concessionaire before taking over to ensure that all the defects are rectified.

The assessment of estimated cost of such improvement works repairs along with the anticipated future repair and rehabilitation cost are considered in the cost estimate of this report.

NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED

FINAL REPORT

Tolling, Operation, Maintenance & Transfer of Four/Six Lane Gandhidham (Kadla) – Mundra Port Section of NH-41 from km 0+000 to km 71+400 in the state of Gujarat

SAMARTH INFRAENGG Technocrats Private Limited

February 2024

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LIST OF ABBREVIATIONS AND SYMBOLS

AADT	-Average Annual Daily Traffic
AE	-Authority Engineer
AMC	-Annual Maintenance Contract
ATMS	-Advanced Traffic Management System
BC	-Bituminous Concrete
BOQ	-Bill of Quantities
BOT	-Build, Operate & Transfer
CA	-Concession Agreement
CBR	-California Bearing Ratio
CCB	-Concrete Crash Barrier
CCR	-Cement Concrete Railing
COD	-Commercial Operation Date
COS	-Change of Scope
CPI	-Consumer Price Index
CUP	-Cattle Underpass
CVC	-Classified Volume Count
CVPD	-Commercial Vehicles per Day
DBM	-Dense Bituminous Concrete
DPR	-Detailed Project Report
ECB	-Emergency Call Box
EPC	-Engineering, Procurement and Construction
ESI	- Employees' State Insurance
FDD	-Filed Dry Density
FOB	-Foot Over Bridge
FRL	-Finished Road Level
FSI	-Free Swell Index
FWD	-Falling Weight Deflectometer

FY	-Financial Year
GOI	- Government of India
GR	-Growth Rates
GS	-Grade Separated
GSB	-Granular Sub Base
GST	-Goods and Services Tax
HCPT	-Half cell Potential Test
HPC	-Hume Pipe Culvert
HR	- Human Resources
HTMS	-Highway Traffic Management Systems
IE	-Independent Engineer
IRC	- Indian Roads Congress
IRC SP	- Indian Roads Congress Special Publications
IRI	-International Roughness Index
Km	-kilometer
LHS	-Left Hand Side
LL	-Liquid Limit
LS	-Lumpsum
m	-Meter
MBIU	-Mobile Bridge Inspection Unit
MCB	-Metal Beam Crash Barrier
MCS	-Micro Surfacing
MCW	-Main Carriageway
MDD	-Maximum Dry Density
MHR	-Metallic Hand Rail
MJB	-Major Bridge
mm	-Millimeter
MM	-Major Maintenance
MNB	-Minor Bridge
MoRTH	- Ministry of Road Transport & Highways
Mpa	-Mega Pascal
MR	-Resilient Modulus
MSA	-Million Standard Axle
NDT	-Non-Destructive Testing
NHAI	- National Highways Authority of India
NSV	-Network survey Vehicle
O&M	- Operation and Maintenance
OL	-Overlay
PF	-Provident Fund
PGR	-Pedestrian Guard Rail
PI	-Plasticity Index
PL	-Plastic Limit

PM	-Periodic Maintenance
PUP	-Pedestrian Under pass
R&R	-Repair and Rehabilitation
RCC	-Reinforced Cement Concrete
RE Wall	-Reinforced Earth Wall
RHS	-Right Hand Side
RHT	-Rebound Hammer Test
RI	-Roughness Index
RM	-Routine Maintenance
ROB	-Road Over Bridge
RPO	-Route Patrol Officer
RUB	-Road Under Bridge
SDBC	-Semi-Dense Bituminous Concrete
SPV	-Special Purpose Vehicle
SR	-Service Road
SWB	-Static Weigh Bridge
TCS	-Typical cross Section
TDRT	-Transient Dynamic Response test
TMS	-Toll Management System
UPVT	-Ultra Pulse Velocity test
VDF	-Vehicle Damage Factor
VG	-Viscosity Grade
VUP	-Vehicular Underpass
WBM	-Water Bound Macadam
WMM	-Wet Mix Macadam
WPI	-Wholesale Price Index

CHAPTER 1. INTRODUCTION

1.1 INTRODUCTION

National Highways Authority of India ("NHAI"/ "Authority") is an autonomous body of the Government of India ("GoI") under the Ministry of Road Transport and Highways ("MoRTH") and was constituted on June 15, 1989 by an Act of Parliament titled - The National Highways Authority of India Act, 1988 ("NHAI Act"). NHAI was operationalized in February 1995 with the appointment of full time Chairman and other Members. The functioning of NHAI is governed by NHAI Act and rules, and regulations framed thereunder.

NHAI has set up an Infrastructure Investment Trust Namely **National Highways Infra Trust ("InvIT")** and is acting as its Sponsor to the said InvIT.

National Highways Infra Investment Managers Private Limited ("NHIIMPL") has been appointed as the Investment Manager to the InvIT. Accordingly, Investment Manager has awarded the following works to M/s SAMARTH INFRAENGG Technocrats Pvt Ltd vide their letter ref: NHIIMPL/FY2024-25/RFP/Technical Consultant/LOA/02 dated 15.07.2024.

Project	Length (km)	No. of Plazas	Lane km
Gandhidham (Kandla) Mundra Port (Gujarat)	**71.400**	**1**	**285.600**
Gundugolanu-Devarapalli-Kovvuru (Andhra Pradesh)	69.880	1	356.800

Presently the project stretch, "Gandhidham (Kandla) Mundra Port" is under Operation and Maintenance stage and the fee is being collected from Toll Plazas at km 44+630 near Mokha village for a length of 71.400 km.

The concession period is 20 years commencing from Appointed Date for TOT Concessionaire to demand and collect appropriate Fee, operate, manage and maintain the Project Highway.

M/s SAMARTH INFRAENGG Technocrats Pvt Ltd has undertaken Technical Due Diligence study for the said project to estimate initial capex including improvements and immediate requirements for repair & rehabilitation of various elements of project highway and also to make an assessment of Major maintenance requirements and Operation & Maintenance costs for entire concession period.

This report highlights the findings of Technical Due Diligence Services for Tolling, Operation, Maintenance & Transfer of Four/Six Lane Gandhidham (Kadla) – Mundra Port Section of NH-41 (old NH-8A) from km 0+000 to km 71+400 in the state of Gujarat"

1.2 PROJECT AT A GLANCE

National Highway 41 (NH 41) plays a significant role in connecting key ports in Gujarat, particularly Kandla Port. NH 41 directly links Kandla Port to the hinterland, facilitating efficient transportation of goods. For Mundra Port, while NH 41 does not provide a direct connection, the port is accessible

via other major highways. Mundra Port is connected to the National Highway network through State Highways 48 via Anjar and SH-6.

The site of the project highway covers a section of national highway 41. It begins at the kandla interchange, existing km 0+000 of NH-41, and runs up to km 71+400, near moti khakhar village, in the utch district of Gujarat. As part of this highway section, the alignment also incorporates 8.730 km of the Anjar bypass.



Map Showing the Project Corridor

The start and end of the project chainage system with respect to CA and Site are as presented below.

Table 1: Project Corridor Chainage System

Referencing system	Start Point (km)	End Point (km)	Length (km)	Remarks
As per CA Chainage	0.000	71.400	71.400	NH-41
As per Site	0.000	71.400	71.400	NH-41

Photograph showing the start and end point of the project road are presented below:

	
A view of the Start Point of Project Road at km 0.000	**A view of the End Point of Project Road at km 71.400**

1.3 OBJECTIVE AND SCOPE OF SERVICES

The main objective of the study is to evaluate the current status of project corridor including details pertaining to identify requirements of initial repair & rehabilitation and estimate major maintenance needs and operation and maintenance costs over the concession period and provide requisite technical information for processing the acquisition of said project by client. Objective of the study can be broadly defined with following tasks:

A) Review of Project Document

- ✓ Review of DPRs/ draft CA/ Schedules pertaining to the scope of work and understand the Sch-B requirements for improvement works for the assessment of capex and Opex during the concession period.
- ✓ Review of Asbuilt drawings and Designs
- ✓ Collection of relevant records and documents and review of same
- ✓ Review of correspondences with IE, if any, on technical issues.
- ✓ Review of EPC, Operation, Maintenance and Systems Contracts
- ✓ Review of Progress Reports, if any Prepare head of terms (highlight the key commercial, technical terms of the contracts) for the reviewed Contracts - EPC, O&M, Asset Management, Operational Agreements (if any), CAs (key technical items) etc.
- ✓ Review of Asset Management Contracts to understand the maintenance of asset from the Concession agreement perspective
- ✓ Review the technical approvals / consents from IE or another agency required under the CA

B) Field Investigations

- ✓ Undertake detailed reconnaissance to appreciate the project corridor characteristics

- ✓ Undertake field investigations to collect first-hand information on present condition of project road and establish the requirements for rehabilitation and up gradation
- ✓ Carrying out inventory and condition surveys for Project Road;
- ✓ Carrying out Inventory and detailed condition surveys for bridges & cross drainage structures (along with Photographs thereof) including recommendation for either strengthening/rehabilitation or reconstruction; Identify requirements of NDT tests if any (to be executed if required and commissioned by client with separate mutually agreed payments).
- ✓ For Major Structures (length of structure>60m), detailed Visual inspection shall be undertaken with MBIU.
- ✓ Video-graphic survey of the entire Project corridor/s.
- ✓ Axle load survey for 24 Hrs in both directions of traffic at toll plaza location (7-day traffic count to be provided by client).
- ✓ Test pits required @ every 5 km interval (staggered) along the Project corridor and carrying out necessary laboratory tests to determine the CBR value of the sub grade materials.
- ✓ Carrying out deflection test by Falling Weight Deflect meter (FWD) for existing pavement as per relevant IRC code at the rate of 5 points in km in each direction making it 10 points for both directions.
- ✓ Carrying out Roughness Survey on each lane of Project Corridors using NSV.
- ✓ Availability of construction materials.
- ✓ Assess drainage adequacy: Review of available hydrological reports and assess the availability and condition of existing road side drainage along the corridors.
- ✓ The outputs of investigations are basically used to identify the strengthening requirements for project sections and also used to form the inputs for deterioration modelling.

C) Validation of Executed Works and Assessment of Improvement Works

- ✓ Validation of executed works with respect to Schedule A of the CA by physical verification at site
- ✓ Assess the present status of the projects with relevant standards and confirm that works are meeting the requirements and have been accepted by the authorities.
- ✓ Understand the scope requirements for Improvement works from the Sch-B of the CA
- ✓ Where project stretch / structures / service roads / ancillary works are pending and if not covered in the Sch-B scope of the draft CA, then assessment of details relating to land acquisition, approvals, timelines for completion, etc. along with cost forecast
- ✓ Cost estimates for any missing items and all works included in the Sch-B of the draft CA
- ✓ Make an assessment of any risks associated with already executed works

D) Quality Audit

- ✓ Review quality of construction based on available data, available design and drawings.
- ✓ Review of Quality of materials from Laboratory testing for aggregates & soil
- ✓ Check compaction and quality of subgrade material used vide test pits
- ✓ Visual inspection of bridges for any visible distress and anomalies. Identify requirements of NDT testing based on same.
- ✓ Examine Expansion joints and bridge bearings condition and assess requirements for replacements
- ✓ Shall be examining expansion joints visually to the extent possible. Shall use high binoculars/ pictures from accessible points. Shall review all photographs closely and come to a conclusion on same.
- ✓ Identify any critical issues / red flags in relation to the quality or condition of the projects; Identify any structural integrity issues that require rectification / re-mediation;

E) Rehabilitation Plans & Designs

- ✓ Check the adequacy of designs carried out for execution based on available reports
- ✓ Undertake designs for immediate rehabilitation requirements based on CA specifications using FWD data and condition assessment surveys
- ✓ Assess the requirements of rehabilitation to bridges/CD structures by structure based on visual inspections and compare with Sch-B requirements of the draft CA
- ✓ Assess the requirements including BOQ and cost estimates of repair and replacements for various elements and ancillary works

F) Major Maintenance

- ✓ Review of current maintenance system.
- ✓ Preparation of the maintenance costs to be incurred over the period of the concession keeping in mind the maintenance requirements of the Concession Agreement.
- ✓ Detailed assessment of maintenance cycles for pavements using HDM4 analysis and estimation of maintenance cost for the concession period
- ✓ To understand the current maintenance strategy for each of the project and review the BOQ to be provided by the DPR consultant for adequacy in relation to Major Maintenance work of Highways, structures, Road Furniture and other site-specific requirements as per respective CA
- ✓ Minor maintenance will be included in routine maintenance and estimated year wise based on assumed percentages based on present condition.
- ✓ Identify any impacts on revenue due to Major Maintenance.

- ✓ Maintenance requirements for approachesA/OP/Underpass forming part of CA would also be assessed.

G) Cost of Improvement Works and Operations

- ✓ Preparation of O&M cost for the concession period.
- ✓ Assess the adequacy of costs assumed in the vendor model are adequate to meet the major maintenance, stage construction and routine maintenance requirements.
- ✓ Independently develop a bottom-up forecast of Operating expenses for project, with detailed break-up of each type of operating expense, along with underlying assumptions

H) BOQ and Cost Estimates

- ✓ Preparation of BOQ & Cost for Improvement works as per Sch-B of the CA
- ✓ Preparation of BOQ and Costs for Major Maintenance
- ✓ Preparation of BOQ and cost for Routine maintenance and Route Patrolling
- ✓ Preparation of BOQ and Cost for Operations
- ✓ Preparation of year-by-year O&M cost
- ✓ The costs would be provided till the end of the concession period including any expected extension of Concession periods as informed by the Client.
- ✓ Benchmarking of costs against other similar Indian toll roads where available (using available data)
- ✓ Historical trend analysis on the maintenance program based on the existing pavement condition and review of all relevant maintenance plans/ documents of NHAI or its concessionaires or contractors.

Review and comment on the current organizational structure from an O&M perspective at each asset. Also suggest an indicative organization structure based on project / CA requirements:

1.4 DATA COLLECTION AND REVIEW

In brief, following were covered

- ✓ Review of Concession Agreement & Schedules,
- ✓ Review of Detailed Project Report prepared by NHAI
- ✓ Review of As-built drawings, Plan and profiles, Structural drawings & Detailed Project Reports and Designs where available
- ✓ Review of O&M costs as presented in DPR reports
- ✓ Review of MPR provided by NHAI
- ✓ Review of Latest NSV and FWD data provided by PIU, NHAI

1.5 KEY PROJECT DETAILS

Following Table highlights the important timelines of the existing concessionaire contract details of the project corridor at a glance:

S No.	Description	Remarks/Date
1.	Employer	National Highways Authority of India
2.	Independent Engineer	Feedback Infra Pvt Ltd w.e.f 1st March 2019
	Mode	DBFOT basis
3.	Concessionaire	M/s KM Toll Road Pvt Ltd (Terminated)
4.	EPC Contractor	Reliance Infrastructure Ltd
5.	Letter of Award	12.01.2010
6.	Date of Signing the Concession Agreement	10.03.2010
7.	Appointed Date	19.01.2011
8.	COD	07.11.2015
9.	Termination of Concessionaire by Authority	25.07.2019
10	Construction of Left Out Works (Item Rate Basis)	Contractor: M/s Shiva Build Tech and Hardik (JV)
		Commencement: 12/03/2020
		Completed: 15/12/2022
11.	Concession Period	12 years (for 4-lane) & 25 years (for 6-lane)
12.	Total Project Cost (INR-Cr.)	Rs. 953.58 Crore
13.	New Contracting Agency for O&M	M/s Laxmi Builders
13	Toll Collection Agency	A K Construction Company

1.6 O&M REQUIREMENTS

Few important O&M requirements as per schedules/manuals are described as below.

- ✓ Applicable Manual is IRC: SP:84-2019
- ✓ Applicable Schedule for O&M period is Schedule-F.
- ✓ Schedule-F, performance parameters indicate the desirable limit of Roughness values should not exceed 2000 mm/km, whereas its acceptable limits Is 2400 mm/km and needs to be corrected within 180 days. Roughness Surveys shall be carried out Bi-Annually.
- ✓ Schedule-F, performance parameters indicate the desirable limit of Pavement Condition Index (PCI) values should be above 85, whereas its acceptable limits is 70 and needs to be corrected within 180 days. Condition Surveys shall be carried out Bi-Annually.
- ✓ Schedule-F, performance parameters indicate the FWD survey shall be carried out Annually as per IRC: 115-2014 for flexible pavement and needs to be corrected within 180 days

- ✓ No specific Handing Over (Divestment) requirements are mentioned under CA. It shall be same as Schedule-F.

1.7 KEY FINDING

Few Key finding in the project road are as follows.

- DPR preparation works for 6-laning are undertaken by Authority in FY2026. Thus, Capacity augmentation for 6-lane construction works are envisaged in FY 27 & FY28 under HAM mode with 15 year concession period until FY43.
- Poor Pavement Condition: Project road exhibits poor pavement condition for 30% of aggregate length with isolated pot holes on surface. Severe Ravelling & Delamination are main contributors to pot hole formation. These distresses are found at isolated locations along the road.
- No major deformation, depressions and undulations are noticed. Indicates no major issue with inner crust. Majority of distress relates to surface and seems water stagnated locations mostly.
- Raising of LHS carriageway may be required for small length of 600m in Km 22.3-Km 22.9 To avoid ponding. Presently pavement is completely damaged in this location due low level and accumulation of water
- Median Drainage is required to be provided at several curved approaches
- Median drainage is also required at separator between MCW/SR where SR is at higher elevation
- Safety Barriers are also required to be provided at separator where Guard rail is not available
- Crash barriers on approaches to structures seem to be low height. Require to be provided with MS Pipe on top.
- MCB at substantial length damaged and requires replacement.
- Safety at Sharp Entry Exit at few locations, Requirement of improved safety measures
- Slope protection may be required at some sloped embankment approaches. Erosion of Service Road slope is also noticed at some locations. Require immediate repairs.
- Improved Cleaning and Routine Maintenance is required
- Project Road Structures exhibit several distress and appears to be rehabilitated in the recent past. Some newly constructed structures also got distress and rehabilitated.
- Design Loading used in structures may not satisfy Special Vehicle loading conditions as per present standards
- Severe loading conditions are noticed due to heavy vehicle movement on structures (Extra Large Vehicle movement due to port-based traffic)
- Old retained major/minor bridges may require further strengthening which needs to be evaluated with detailed investigations

- A few old Major bridges have Stone masonry substructure i.e. Ch: 27+497 (RHS) & 35+039 (RHS)
- Major rehabilitation in terms of CFRP laminates and warping of girders is observed on New Major bridges @ 35+039 & 42+417
- Similar major rehabilitation is observed at VUP 57+239 on the soffit of slab & inner wall
- Drainage spouts in most of the structure locations are ineffective since the unraised footpath is completely chocked. This is leading to leaching action on few slabs
- Crash Barriers for Unraised Footpaths at Grade Separators are Safety Hazards. Need to be corrected by placing crash barrier at end and removing footpath
- Major bridges at Ch: 58+795 (RHS) & 65+421 (RHS) have been provided with only Hand railing. Might have to replace with crash barrier.
- NDT is under progress and as per the preliminary findings carbonation & poor concrete quality is found on the superstructure of MJB @ 65+421, 58+759, 54+697, 42+417 & VUP @ 57+239.
- Bulging is observed in RE walls is observed at couple of locations

CHAPTER 2.SURVEYS AND INVESTIGATIONS

2.1 INTRODUCTION

The main objective of undertaking Surveys and Investigations is to appreciate the existing engineering features along the project corridor and to understand the present condition of the various elements of the project road and to prepare required inputs for various rehabilitation and maintenance strategies.

Following Survey and Investigations have been undertaken as a part of study with an objective to understand the present condition of the road and there by access the quality of construction and as well to prepare requisite rehabilitation/corrective designs where necessary.

- Road Inventory Surveys
- Pavement Condition using NSV
- FWD Surveys
- Roughness Surveys using NSV
- Pavement Composition surveys (Test Pits)
- Subgrade Investigations & Laboratory testing
- Material Investigations
- Axle Load Survey
- Structure Inventory and Condition Surveys

These surveys are performed in the month July/August,2024.

2.2 ROAD INVENTORY

The project corridor has Flexible pavement, with 7.5m wide carriageway including shyness flanked by 1.5m paved shoulder plus 0 to 2.0 m earthen shoulder on each side expect at Structure Approach locations.

In general, most of the length observed depressed median except approaches locations. in these locations median width is 4.5 to 9.0m.

The project corridor generally runs in plain to rolling terrain. The land use along the project road in the initial 12 km is of built-up sections and balance length is mostly barren and Agricultural. It passes through urban settlements like, Meghpar & Galpadar, Anjar, Khedoi, Samagoga, Maheswari nagar.

In general, road embankments are in the range of 0.5m-3.5m height. Embankment heights higher than 3.5m are observed mainly in the approaches of CD-Structures and Underpass locations.

Typical View of Project Road is shown below:



A view of the Project Road at km 0.500-LHS



A view of the Project Road at km 24.000-LHS



A view of the Project Road at km 34.000-RHS



A view of the Project Road at km 57.100

The Project Road has 81 Nos. of junctions along its length. Photographs showing the Major Junctions and minor junctions are presented below:



Major Junction at km 70.690 LHS



Minor Junction at km 33.900 RHS



Minor Junction at km 50.200 RHS

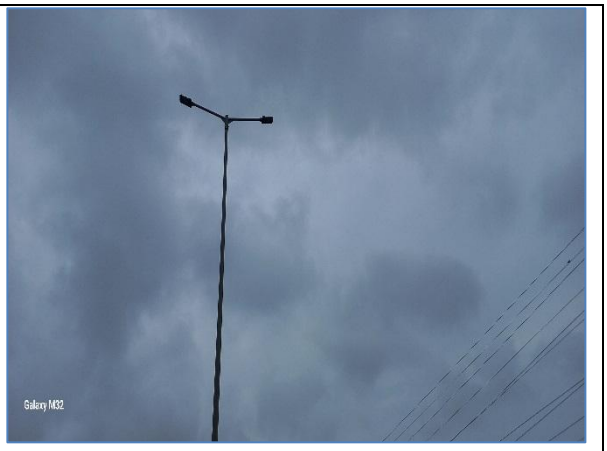


Minor Junction at km 69.200-LHS

There are 35 Nos. of High masts located near junctions and Toll Plaza locations. Highway lighting for length of 32.300 kms is observed near urban locations. Few photos showing High mast and highway lighting are presented below:



A view of High Mast Lighting at km 4.500 LHS SR



A view of Double arm Lighting at Km 6.000 RHS



A view of Double arm Lighting at Km 7.500-RHS



A view of Double arm Lighting at Km 8.900-LHS

Project Road consists of 24 Nos. of Bus bays with shelters and 01 Nos. of Bus shelter. Few photos taken at the Bus Bays and Bus Shelters are presented below:



Bus Bay with Shelter at km 20.370-LHS



Bus Shelter Damage @ Km 44.000 LHS

The Project Road has 1 No. of Toll Plaza at Km 44+630 (Mokha Toll Plaza). Rigid pavement is provided at toll plaza location and condition appears to be fair. It has 6+1 lanes on each side and in total 4 Nos. of High mast lights are provided on either side of the Toll Plaza.



A view of the Toll Plaza near km 44.630



A view of the admin building at km 44.630



A view of Weigh bridge at km 44.630

Service/slip roads are provided with varying carriageway widths from 3.5m to 9.0m with Flexible pavement for a length of 39.8 km along the Project Corridor. Photos depicting the service road pavement surface type, Condition and the other associated features like drain. Few photos taken at service/slip road locations are presented below.



Service Road 7 m width @ km 2.000 LHS



Service Road 7.0m width @ km 46.350 LHS



Service Road 7.0m width @ km 60.300 RHS



Service Road 7.0m width @ km 69.600 RHS

The collected Road Inventory Data is presented in **Appendix 1** of this Report

2.3 PAVEMENT CONDITION SURVEYS

The collected Pavement Condition Data using NSV surveys for main carriageway is presented in **Appendix 2** of this Report.

The photographs showing the pavement condition of the Project Road is presented below.

 Damaged Road @ km 2.000 LHS	 Rutting & Cracking @ km 2.850 LHS	 Delamination @ Km 5.950 RHS
 Pot hole at SR @ km 15.800 RHS-SR	 SR Damage Km 15.950 LHS-SR	 Damaged Road at Km-22.650 LHS
 Cracking @ Km 23.950 LHS	 Rutting @ km 24.600 RHS	 Rutting @ km 24.600 LHS

 Fair condition @ km 29.350 LHS	 Fair Condition @ Km-36.950 RHS	 Delamination @ km 54.620 RHS
 Ravelling @ km 62.050 LHS	 SR Damage @ km 62.600 RHS-SR	 Fair @ km 69.200 LHS

2.4 FALLING WEIGHT DEFLECTOMETER (FWD) SURVEYS

2.4.1 Falling Weight Deflectometer Survey (Flexible Pavement)

In order to evaluate the structural strength of the existing pavement, Falling Weight Deflectometer (FWD) survey has been carried out along the project road in line with IRC: 115-2014.

- ✓ Prior to the start the surveys, Load repeatability tests are performed on each day
- ✓ The target Peak Load of 40 KN (+/- 4 KN) is maintained during survey.
- ✓ At Regular intervals of time Pavement temperature is noted.
- ✓ For every 1 Km of stretch 5 test Points (2 pts- Outer, 3 pts-inner) were taken on Main Carriageway in each direction.
- ✓ Temperature correction equation is applied for back calculated modulus of BT and no seasonal correction factor is applied for the back calculated modulus of granular and Subgrade considering the Monsoon Season (July Month, 2024).

The collected FWD Data and Analysis is presented in **Appendix 3** of this Report.

Few photos taken during the progress of FWD Surveys are presented below:



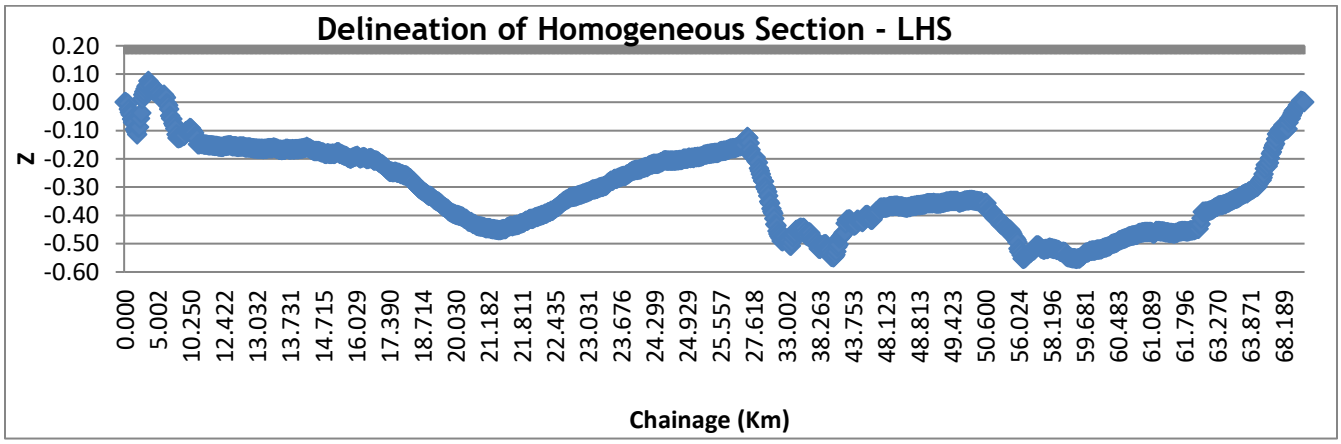
FWD Survey in progress



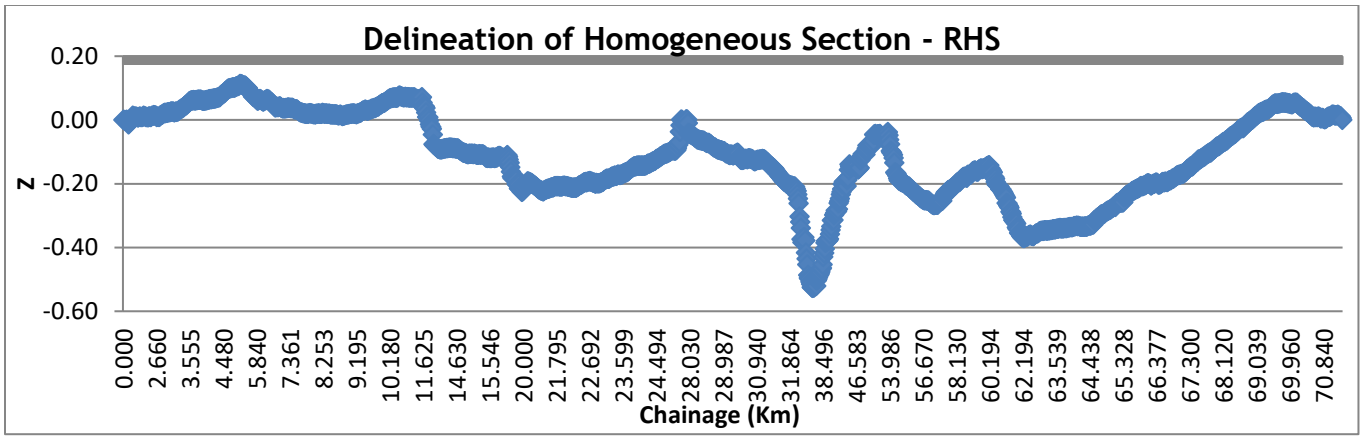
Temperature checking

Cumulative Difference Approach (CDA) has been used for the identification of homogeneous sections on the basis of Surface Curvature Index (SCI). SCI is calculated as the difference between D_0 and D_{300}, where D_0 and D_{300} are the peak deflections (mm) measured at the center of loading plate and at a radial distance of 300mm

The homogenous sections in each direction of traffic (i.e., LHS & RHS) for the project stretch have been identified for Main carriageway and service Road are presented in graphical representation of followed by tables.



Delineation of Homogeneous Section - LHS



Delineation of Homogeneous Section - RHS

Based on the above graphs, the flexible pavement section has been sub-divided into homogeneous section for LHS and RHS direction as given below.

Table 2: FWD Data - Summary of Homogenous Section of Main Carriageway - LHS

S.No	From	To	Length (Km)	Remarks
1	0.000	1.754	1.75	
2	1.754	3.600	1.85	
3	3.600	5.751	2.15	
4	5.751	8.000	2.25	
5	8.000	10.000	2.00	
6	10.000	11.998	2.00	
7	11.998	13.007	1.01	
8	13.007	14.018	1.01	
9	14.018	15.259	1.24	
10	15.259	16.575	1.32	
11	16.575	18.196	1.62	
12	18.196	19.292	1.10	
13	19.292	20.326	1.03	
14	20.326	21.360	1.03	
15	21.360	22.544	1.18	
16	22.544	23.720	1.18	
17	23.720	24.839	1.12	
18	24.839	25.978	1.14	
19	25.978	28.499	2.52	
20	28.499	31.007	2.51	
21	31.007	33.480	2.47	
22	33.480	35.499	2.02	
23	35.499	37.750	2.25	
24	37.750	40.207	2.46	
25	40.207	42.249	2.04	
26	42.249	44.400	2.15	
27	44.400	44.860	0.46	Toll Plaza
28	44.860	47.771	2.91	
29	47.771	48.813	1.04	
30	48.813	49.977	1.16	
31	49.977	52.212	2.24	
32	52.212	54.250	2.04	
33	54.250	56.950	2.70	

S.No	From	To	Length (Km)	Remarks
34	56.950	57.647	0.70	
35	57.647	59.266	1.62	
36	59.266	60.393	1.13	
37	60.393	61.990	1.60	
38	61.990	63.136	1.15	
39	63.136	63.991	0.85	
40	63.991	66.255	2.26	
41	66.255	69.003	2.75	
42	69.003	71.400	2.40	
Total Length			**71.400**	

Table 3: FWD Data - Summary of Homogenous Section of Main Carriageway - RHS

S.No	From	To	Length (Km)	Remarks
1	0.000	1.998	2.00	
2	1.998	3.931	1.93	
3	3.931	4.990	1.06	
4	4.990	6.970	1.98	
5	6.970	8.690	1.72	
6	8.690	10.990	2.30	
7	10.990	13.754	2.76	
8	13.754	15.985	2.23	
9	15.985	18.247	2.26	
10	18.247	20.728	2.48	
11	20.728	22.240	1.51	
12	22.240	23.975	1.74	
13	23.975	24.990	1.02	
14	24.990	27.770	2.78	
15	27.770	28.987	1.22	
16	28.987	30.974	1.99	
17	30.974	31.990	1.02	
18	31.990	33.750	1.76	
19	33.750	35.793	2.04	
20	35.793	38.749	2.96	
21	38.749	41.674	2.93	
22	41.674	44.400	2.73	
23	44.400	44.860	0.46	Toll Plaza
24	44.860	47.610	2.75	
25	47.610	50.249	2.64	
26	50.249	52.391	2.14	
27	52.391	55.986	3.60	
28	55.986	56.950	0.96	
29	56.950	59.967	3.02	
30	59.967	61.034	1.07	
31	61.034	62.059	1.03	
32	62.059	63.143	1.08	
33	63.143	64.239	1.10	
34	64.239	66.200	1.96	

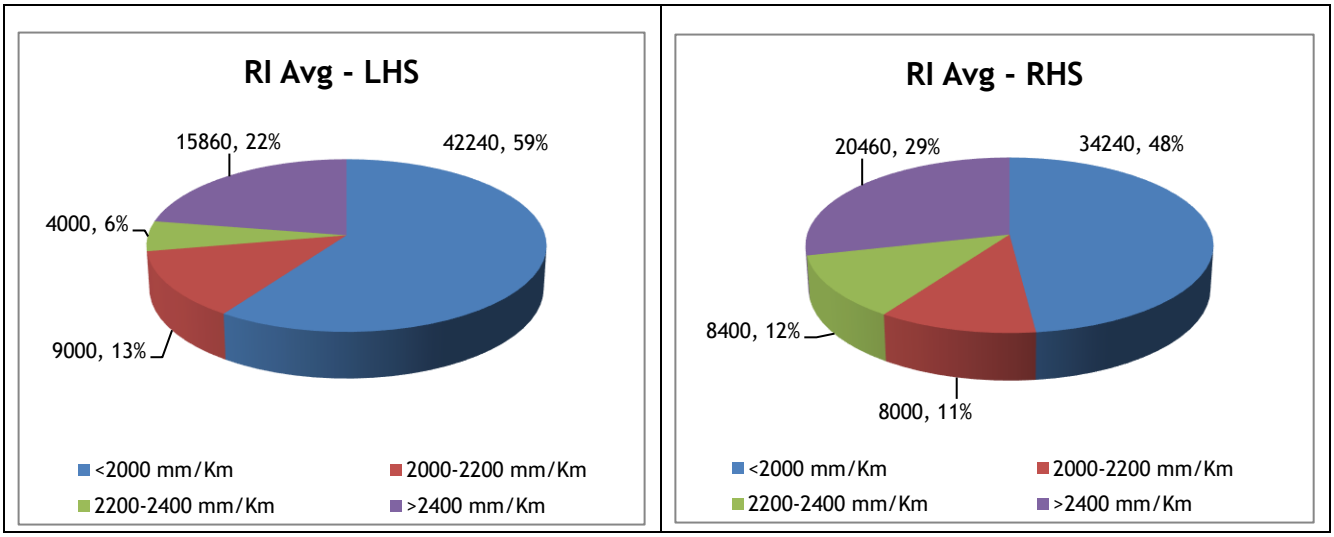
S.No	From	To	Length (Km)	Remarks
35	66.200	68.031	1.83	
36	68.031	69.420	1.39	
37	69.420	71.400	1.98	
Total Length			71.400	

2.5 ROUGHNESS SURVEYS

The Roughness data has been collected using **Network Survey Vehicle** and analyzed in terms of International Roughness Index (IRI), separately for each lane, for both direction of travel. Pavement Roughness data collection and computation of IRI for each km length in each direction is presented in **Appendix 4** of this Report.

As per Schedule-F of TOT, the desirable level of service for Roughness values for bituminous pavement surface is considered to less than 2000 mm/Km and the acceptable limits are less than 2400mm/Km.

Average Roughness Index (RI) values along the corridor were grouped in to four categories, Pie chart showing the range of RI values in each carriageway of the project road have been presented below:



It can be seen from the above pie charts, that about 59% in LHS & 48% in RHS of the length of the Project Road has good riding quality (RI<2000 mm/km) respectively.

2.6 PAVEMENT COMPOSITION SURVEYS (TEST PITS)

The composition of the existing pavement crust has been noted from test pit surveys. Thus, a total of 25 Nos. of pits have been dug along the corridor and its pavement composition has been noted.

Results of the test pit survey showing average thickness of pavement layers are presented in the Table below.

Table 4: Pavement Composition of Existing Pavement along Project Road

S.No	Test Pit Number	Design Chainage	Direction	BT (mm)	WMM (mm)	PQC (mm)	DLC (mm)	GSB (mm)	OLD BT (mm)	OLD WMM (mm)	OLD GSB (mm)	Total (mm)	Remarks
1	GM-TP-1	11+900	LHS	220	200			200				620	
2	GM-TP-2	20+560	LHS	220	230			330				780	
3	GM-TP-3	30+050	LHS	280	250			160				690	
4	GM-TP-4	40+060	LHS	230	250			200				680	
5	GM-TP-5	50+050	LHS	240	250			200				690	
6	GM-TP-6	59+800	LHS	170	200			200				570	
7	GM-TP-7	70+000	LHS	180	250			230				660	
8	GM-TP-8	65+000	RHS	140	220			200				560	
9	GM-TP-9	54+970	RHS	180	270			200				650	
10	GM-TP-10	44+050	RHS	220	230			240				690	
11	GM-TP-11	35+400	RHS	200	220			200				620	
12	GM-TP-12	24+800	RHS	100	200			220				520	
13	GM-TP-13	15+200	RHS	200	240			200				640	
14	GM-TP-14	5+300	RHS	210	200			100	80	180	150	920	
15	GM-TP-15	8+000	RHS	200	220			490				910	Potholes and Rutting
16	GM-TP-16	22+600	LHS	100	170			200				470	Potholes and water Stagnant area
17	GM-TP-17	28+700	RHS	220	200			200				620	Rutting section
18	GM-TP-18	30+150	RHS	230	240			250				720	Potholes and water Stagnant area
19	GM-TP-19	63+600	LHS	160	250			170				580	Ravelling section
20	GM-TP-20	70+000	RHS	160	230			250				640	Ravelling section
21	GM-TP-21	68+200	RHS	150	220			200				570	Ravelling section
22	GM-SR-TP-1	63+050	LHS	100	200			200				500	
23	GM-SR-TP-2	20+100	RHS	100	350			200				650	
24	GM-SR-TP-3	56+700	LHS	280	240			200				720	Mundra port diversion chainage 56+700(VUP location) Test pit done at service Road
25	GM-TOLL-1	44+800	RHS			400	100	200				700	

2.7 SUBGRADE INVESTIGATIONS & LABORATORY TESTING

Sub-grade Investigations have been carried out to examine the subgrade soil characteristics along the project road. A total 25 Nos. of test pits have been carefully dug from the pavement surface up to sub-grade level. Out of 25 Nos., 21 Nos. are done on main carriageway and remaining 03nos are done in Service Road, 01nos are done in Toll Plaza. Field density tests have been conducted for subgrade samples and a small quantity of sample has also been collected in airtight containers for

determining the field moisture content. Upon completion of the field density test, representative sample of sub-grade soil has been collected in bulk, in gunny bags from each test pit for laboratory testing.

The soil samples collected have been tested for the following properties to assess the existing sub-grade soil properties.

- Sieve analysis
- Atterberg limits
- Heavy compaction
- Four (4) days soaked CBR as per IS standards at 97% of MDD as applicable for sub-grade (Heavy Compaction)
- Free swelling index

Few sample photos of the test pit locations where the subgrade samples collected are as presented below.



GM-TP-1



GM-TP-2



GM -TP-3



GM -TP-4



GM-TP-5



GM-TP-6



GM-TP-7



GM-TP-8



GM-TP-09



GM-TP-10



GM-TP-11



GM-TP-12



GM-TP-13



GM-TP-14



GM-TP-15



GM-TP-16



GM-TP-17



GM-TP-18



GM-TP-19



GM-TP-20



GM-TP-21



GM-SR-TP-01



GM-SR-TP-02



GM -TP- Toll-1

2.8 BORROW AREAS

Potential borrow area identified at 8 Nos. of locations for the use of embankment/subgrade construction works within economic haulage leads. The sources identified as potential borrow areas along with certain useful information such as distance from the project road, location, village name, etc., have also been presented in this table below.

Table 5: Borrow Area Samples Details

Sl.No	Borrow Area No	Chainage	Side	Offset	Village and contact person	Area	Rate	Remarks	Co-ordinate
1	GM-BP-1	11+300	LHS	3.8 km	Village: Shinay Name: Viren Arvind jani Contact no: 9924464054 Rajeev Sorathia 9825227359	25Acre X1m (Pond)	Rate not told	Govt.Land	23.065319 70.058178
2	GM-BP-2	17+300	RHS	0.85 km	Village: Vidi Name: Vijesh Contact no: 9825596410	10 Acr X 6feet	Rs 120/tonne	Pvt.land	23.085169 69.984264
3	GM-BP-3	26+400	RHS	0.5km	Village: Khedoi Name: Jaydeep Singh Jadeja Contact no: 9825441081	30Acre X1.5m (Pond)	Rs 150/tonne	Govt.Land	23.054528 69.913036
4	GM-BP-4	38+300	LHS	Road Side	Village: Chharsa Name: Pradeep Contact no: 7990270449	5 Acr X 6feet	Rs 90/tonne	Pvt.land	22.980818 69.838192
5	GM-BP-5	54+800	LHS	1.4 km	Village: Bhorara Name: Shakthi Singh Contact no: 9879471777	25 Acr X 1.5m	Rs 120/tonne	Pvt.land	22.899331 69.716067
6	GM-BP-6	65+100	RHS	0.5 km	Village: Bhujpur Name: Manek Gilva Contact no: 9426454476	15 Acr X 5feet	Rate not told	Govt.Land	22.893256 69.630272
7	GM-BP-7	71+400	RHS	2.1 km	Village: Moti kharar Name: Ratan Contact no: 9979329036	25Acre X1m (Pond)	Rs 130/tonne	Govt.Land	22.896036 69.542989
8	GM-BP-8	43+300	RHS	3.6 km	Village: kudrodi Name: Namori Bhoiya Contact no: 8758924707	30Acre X 1.5 (Pond)	Rate not told	Govt.Land	22.963803 69.795522

Soil samples from these borrow sources have been collected in bulk by excavating test pits down up to 1.0m depth from the existing ground surface. The top organic soil layer of approximately 150mm thickness was removed before sampling. The samples collected from these identified borrow pits/ gravel quarries have been tested for the suitability of utilizing them as embankment fill/ sub-grade. Few sample photos of borrow area locations are as presented below.

	
GM-BP-1	GM-BP-2
	
GM-BP-3	GM-BP-4
	
GM-BP-5	GM-BP-6

	
GM-BP-7	GM-BP-8

2.9 AGGREGATE SAMPLES

Aggregates samples 4 Nos. from crusher/quarry have identified for the use of sub-base, base, surface courses and concrete works has been collected. The locations, estimated quantity, basic cost of material and the approximate distance from each source to the nearest point on the project corridor are compiled in Tables below.

Table 6: Aggregate Samples Details

sample No.	Ex.Chainage (Km.)	Left/ Right	Name of Village	Name of Source/ Crusher	Lead from Nearest Ex.Chainage (Km.)	Approximate Quantity (ton)	Basic cost of the material (Rs.)	Remarks	Co-ordinat
GM-AQ-1	15+950	LHS	Village: Vidi	Dwaraka Stone Crusher Owner- Amritlal Manjadia Cont. no- 9824284935	2.1 km	Plenty	40mm-Rs 360/- per tonne 20mm-Rs 400/- per tonne 10mm-Rs 360/- per tonne 6mm-Rs 260/- per tonne Dust-Rs 210/- per tonne	Extra Royalty Rs 60/- per tonne GST Extra 5%	10.144347 78.127769
GM-AQ-2	17+300	RHS	Village: Vidi	Shiivam Earth movers Owner- Vijesh Cont. no- 9825596410	0.85 km	Plenty	40mm-Rs 360/- per tonne 20mm-Rs 400/- per tonne 10mm-Rs 360/- per tonne 6mm-Rs 260/- per tonne Dust-Rs 210/- per tonne Wmm-Rs 160/- per tonne GSB-Rs 160/- per tonne	Extra Royalty Rs 60/- per tonne GST Extra 5%	23.087675 69.981497
GM-AQ-3	65+300	RHS	Village: Nani thumbdi	Ranawat infra pvt.Ltd Owner- Dheera singh Ravawat Cont. no- 8817138010	19.3 km	Plenty	40mm-Rs 300/- per tonne 20mm-Rs 370/- per tonne 10mm-Rs 370/- per tonne 6mm-Rs 200/- per tonne Dust-Rs 200/- per tonne Wmm-Rs 300/- per tonne GSB-Rs 300/- per tonne	Rates are including Royalty GST Extra 5%	23.027206 69.537525
GM-AQ-4	65+300	RHS	Village: Nani thumbdi	Samay Enterprises Owner- Suresh vada Cont. no- 8160986304	19.3 km	Plenty	40mm-Rs 250/- per tonne 20mm-Rs 300/- per tonne 10mm-Rs 300/- per tonne 6mm-Rs 210/- per tonne Dust-Rs 160/- per tonne M-Sand-Rs 450/- per tonne Wmm-Rs 300/- per tonne GSB-Rs 300/- per tonne	Extra Royalty Rs 60/- per tonne GST Extra 5%	23.024106 69.539497

Few sample photos of aggregate quarry locations are as presented below.



GM-AQ-1



GM-AQ-2



GM-AQ-3



GM -AQ-4

2.10 SAND SAMPLES

River Sand samples of 3 Nos. have been collected from the source and tested. The location of this sand quarry along with lead to the Project Road is presented in the following table.

Table 7: Sand Samples Details

sample No.	Ex.Chainage (Km.)	Left/ Right	Name of Village	Name of Source/ Crusher	Lead from Nearest Ex.Chainage (Km.)	Approximate Quantity (ton)	Basic cost of the material (Rs.)	Remarks	Co-ordinat
GM-SQ-1	0+600	RHS	Chobari	Supplier-Vijesh Cont. no-9825596410	60.0 km	Plenty	River Sand-Rs 550/- per Tonne		23.548519 70.292966
GM-SQ-2	65+300	RHS	Gelda	Supplier-Jagadeesh Garhi Cont. no-9016482938	4.3 km	Plenty	River Sand-Rs 450/- per Tonne		22.916081 69.601903

sample No.	Ex.Chainage (Km.)	Left/ Right	Name of Village	Name of Source/ Crusher	Lead from Nearest Ex.Chainage (Km.)	Approximate Quantity (ton)	Basic cost of the material (Rs.)	Remarks	Co-ordinat
GM-SQ-3	65+300	RHS	Village: Nani thumbdi	Samay Enterprises Owner- Suresh vada Cont. no- 8160986304	19.3 km	Plenty	M-Sand-Rs 450/- per tonne	Extra Royalty Rs 60/- per tonne GST Extra 5%	23.024106 69.539497



GM-SQ-1



GM-SQ-2



GM-SQ-3

2.11 AXLE LOAD SURVEYS

Traffic loading has a significant impact on pavement performance and design. This is because the damage that vehicles create to a road depends very strongly on the axle loads of the vehicles. The exact relationship is influenced by the type of road structure and the way the road deteriorates but a “fourth power” damage law gives a good approximation.

Axle load study has been conducted using portable axle load pads near toll plaza at km 44+630 on date 06.08.2024 to 13.08.2024 for 7-days. The survey has been conducted in both the directions and data captured on random sampling basis. The collected axle load data and analysis is presented in **Appendix 5** of this Report. The vehicle damage factors have been calculated using the standard

axle loadings given in IRC: 37-2018. The standard axle loadings adopted have been presented in the following table.

Table 8: Details of Standard Axles Used

Axle Configuration	Standard Axle load (Tonnes)*/ KN	Remarks
Single Wheel, Single Axle	6.60/65	As per IRC 37-2018
Dual Wheel, Single Axle	8.16/80	As per IRC 37-2018
Dual Wheel, Tandem Axle group	15.10/148	As per IRC 37-2018
Dual Wheel, Tridem Axle group	22.90/224	As per IRC 37-2018

Few photographs illustrating the survey locations and axle load measurements are presented below.



Survey in Progress



Survey in Progress

Direction wise VDF for each mode of commercial traffic has been estimated. Results of axle load surveys have been presented in the following table.

Table 9: VDF Values Estimated at the Toll Plaza

Vehicle Type	Mokha Toll plaza (44+630)	
	UP	DN
BUS	0.71	0.97
2-Axle	3.25	2.76
3-Axle	8.72	3.57
M Axle	13.24	14.94
LCV	1.23	1.33

CHAPTER 3. VALIDATION OF EXECUTED WORKS

3.1 ROAD WORKS

The project road has been closely inspected to verify the executed works on ground. The scope works to be executed by the Concessionaire/Contractor as envisaged in CA is compared with the executed work on the Ground. As a part of the validation, the available as-built drawings, inventory data and Detailed Reports as received from the NHAI were also referred. Each structure has been inspected to note down its structural configuration and condition. The following table highlights the scope comparison of the executed works on ground.

The project corridor appears to have been constructed with the cross-sectional elements matching to those given in the manual at the time of execution. The carriageway width of 7.0m plus paved shoulders of 1.5m and a shyness of 0.5m has been provided over the entire length except at structures. Earthen shoulders of 0m to 2.0m on either side of carriageway have also been provided.

Table 10: Scope Comparison of Executed works

S. No.	Particulars	Length/ Nos	Total for O&M Estimation	As per Schedule-A	As per	
					Site	Sch-B/ DPR
1	**Start Chainage (Km)**	Km	0.000	0.000	0.000	
2	**End Chainage (Km)**	Km	71.400	71.400	71.400	
3	Length of the Project Corridor	Kms	71.400	71.400	71.400	
4	Service Road / Slip Road (Including Taper Length)	Kms	39.998	39.998	39.800	
5	ROBs	Nos	1.000	1	1.00	
6	VUPs	Nos	13.000	13.00	13.00	
7	PUP's/CUP's	Nos	3.000	3.00	3.00	
8	Major Bridges	Nos	6.000	6.00	6.00	
9	Minor Bridges	Nos	22.000	21.00	22.00	
10	Culverts (Pipe)	Nos	121.0	121.00	120.00	
11	Culvert (Box)	Nos	29.0	29.00	20.00	
12	Culvert (Slab)	Nos	10.0		10.00	
13	Major Junctions	Nos	3.0	3.00	1.00	
14	Minor junctions	Nos	90.0	57.00	90.00	
15	High Embankments	Kms	13.5		13.49	
16	Stone Pitching	Sqm	11706		2952	8754
17	Concrete Lining	Kms	0.63		0.63	
18	Chutes	Nos	294		294.00	
19	RE Panels - Full Height	Kms	13.10		13.10	
20	RE Panels / Blocks Area	Sqm	63,520		63,520	
21	Partial RE Wall with Embankment	Kms	1.50		1.50	
22	Partial RE Wall with Concrete Lining	Kms	1.28		1.28	
23	RCC Cover Drain	Kms	21.06	20.15	21.06	

S. No.	Particulars	Length/ Nos	Total for O&M Estimation	As per Schedule-A	As per	
					Site	Sch-B/ DPR
24	Median drain	Kms	4.15		-	4.15
25	Median Cuts	Nos	62		-	62
26	Chutes	Nos	294.00		294.00	
27	Rain water Harvesting pits	Nos	13		13	
28	Chute Drain	Kms	9.03	4.05	9.03	
29	Toll Plaza	Nos	1	1	1	
30	No.of Lanes (Both side)	Nos	14	14	14	
31	Emergency Call Box	Nos	42	39	42	
32	High Mast Lights	Nos	37	37	35	
33	Highway Lighting (length only)	Kms	32.30	17.70	32.30	
34	Single Arm Lightnings	Nos	144		-	144
35	Double Arm Lightnings	Nos	298	498	95	203
36	Lights below underpass/FO	Nos	68		68	
37	Solar Blinkers	Nos	30	4	2	26
38	Solar Lights with Panel	Nos	361		361	
39	Bus Bays with Shelter	Nos	26	18	26	
40	Bus Shelters	Nos	14	14	6	
41	Truck Lay bye	Nos	4			4
42	Median Opening	Nos	40	17	40	
43	Median Plantation_Functional	Kms	1.70		1.70	
44	Median Plantation_Non Functional	Kms	68.32		68.32	
45	Road Markings	Kms	71.40		71.40	
46	Delineators	Nos	321	321	108	
47	Kilometre Stones	Nos	114		114	
48	Hectometre Stones	Nos	572		572	
49	5th Km Stone	Nos	30		30	
50	Edge Kerb in High embankment locations	Kms	17.57		17.57	
51	Traffic Attenuators	Nos	20			20
52	Road Signs	Nos	1,760	655	695	1,065
53	Cantilever Sign Boards	Nos	6	4	3	2
54	Single Face W-Beam Safety Barriers	Kms	176	78.48	66.15	97.86
55	Rigid Concrete Barriers	Kms	21	11.26	18.13	2.85
56	Concrete Railing	Kms	0.77		0.77	
57	Pedestrian Guard Rails	Kms	16.73	16.73	15.76	
58	Entry/Exits	Nos	65		65	

In the project stretch, the Service/Slip Roads having 3.5m to 9.0m carriageway width with an overall both side length of 39.80 km has been observed. Location wise details of service roads and slip roads presented in **Appendix 6** are listed as below:

Table 11: Summary of Service Roads/Slip Roads along Project Road

Description	LHS			RHS			Total
	Flexible	Rigid	Earthen	Flexible	Rigid	Earthen	
Units	Kms	Kms	Kms	Kms	Kms	Kms	Kms
Service Road	19.6	0	0	20.2	0	0	39.8

RCC Lined Covered drains are provided in a length of 21.060 km at various locations the location and condition of the same are presented in **Appendix 6**. The summary of the same is tabulated below.

Table 12: Summary of Drains

Drains	LHS	RHS	Median	Total
	Kms	Kms	Kms	Kms
RCC Cover Drain	9.810	11.250	0.000	21.060
Total				21.060

High embankment locations are noticed at approaches to the Grade-separators and CD-structures locations accounting for a total length of 30.435 km. The details are presented in **Appendix 6** of this report. The summary of slope protection details are as presented in table below:

Table 13: Summary of Slope Protection

S.No	Slope Protection Type	LHS (Kms)	RHS (Kms)	Total (Kms)
1	High Soil Embankment	6.13	7.355	13.485
2	Stone Pitching	0.44	0	0.44
3	RE Wall Full Height (Panels)	6.325	6.775	13.1
4	RE Wall + Soil Emb	1.06	0.44	1.5
5	RE Wall + Grouting	0.64	0.64	1.28
6	Concrete Lining	0.33	0.3	0.63
	Total	14.925	15.51	**30.435**

A total of 40 median openings were observed on-site, consisting of 28 normal openings and 12 with reserved lanes. Additionally, 34 unauthorized openings were noted. For median openings with a reserved lane provision, the 4.5m median width is reduced to 1.0 meter. Detailed location-wise information is provided in **Appendix 6**, and a summary of the openings is presented below

Table 14: Summary of Median Openings along Project Road

Median Openings	Total
	Nos
With Reserve lane	12
With Normal lane	28
Un-Authorized	34

The project road has a total of 91 junctions. A comprehensive list of major and minor junctions is provided in **Appendix 6** of this report.

Safety barriers have been provided along the project road at high embankments and at sharp curve locations, at approaches of grade separated and cross drainage Structures. Details of safety barriers provided along the corridor include the following.

- Single face w-barrier is observed for a length of 66.145 Kms along the project corridor. Details of Metal Beam Crash Barrier are provided in the **Appendix 6** of this report.
- Concrete crash barrier (CCB) and Concrete Railing are observed at Structure locations along the project corridor. Length of Concrete crash barrier is about 18.134 Kms and Concrete hand railing are about 0.770 kms. Provided in the **Appendix 6** of this report.
- Pedestrian Guard Rails (PGR) are observed for a length of 15.760 Kms In between service road and MCW. Details are presented in the **Appendix -6** of this report.

Table 15: Summary of Safety Barriers

Safety Barriers	Length	Missing	Damage
	Kms	m	m
CCB	18.134	20	108
Metal Handrail	-	-	-
concrete railing	0.770		-
MCB	66.145	400	22385
Pedestrian Guard Rails	15.760	300	1960
Fencing	-	-	-

Road furniture in the form of High masts, Highway Lighting and Sign boards have been provided along the project road. The summary of lighting and Signboards presented below and details list are provided in **Appendix 6** of this report.

Table 16: Summary of Highway lighting and High mast

S.no	Description	LHS	Median	RHS	Total
		Nos	Nos	Nos	Nos
1	High mast Pole	18	0	17	35
2	High mast Fixture	72	0	68	140
3	Low mast Pole	-	-	-	-
4	Low mast Fixture	-	-	-	-
5	Single Arm Pole	-	-	-	-
6	Double Arm Pole	71	0	24	95
7	Triple Arm Pole	-	-	-	-
8	Underpass Lighting	-	-	-	68
9	Solar Light	134	0	227	361

Table 17: Road Signs along Project Road

Description	LHS	RHS	Junctions	Total
Unit →	Nos	Nos	Nos	Nos
Overhead Gantry	2	1	0	3
Cantilever Gantry	3	0	0	3
Toll Boards	7	7	0	14
ADS/RAS	1	1	0	2
Rectangular	12	26	8	46
Triangular	24	21	16	61
Circular	112	111	11	234
Octagonal	0	0	16	16
Flag Type	5	4	0	9
Chevron	104	79	0	183
Hazard	57	51	0	108
Route marker	7	9	0	16
Cluster	0	0	0	0
Total	334	310	51	**695**

The project road has total 26 Nos. of Bus Bays with shelter,06 Nos. are bus shelters are observed on both sides of Highway the details are presented in **Appendix 6** of this report.

Table 18: Bus Bays with Shelters

Side	Bus Shelter	Bus Bay with Bus Shelter	Total
	Nos	Nos	Nos
LHS	2	14	16
RHS	4	12	16
Total	**6**	**26**	**32**

Solar Blinkers of 2 No's are provided and their condition details are presented in **Appendix 6** of this report. The details are as presented below.

Table 19: Solar Blinkers

Description	Working	Not Working	Total
	Nos	Nos	Nos
Total	**1**	**1**	**2**

3.2 STRUCTURES

List of all Structures found during the inventory surveys along the corridor are as follows:

Table 20: Summary of Structures

S. No	Type of Str	As per Schedule-A	As per site					Remarks
			No. of Structures			Total No.of Str's	Total No.of Locations	
			LHS	RHS	BHS			
1	Road Over Bridge	1	1	1	-	2	1	
2	Major Bridge	6	6	6	-	12	6	
3	Minor Bridge	22	25	25	-	50	22	Includes service road structure.
4	Vehicular Underpass	13	13	13	-	26	13	
5	Pedestrian Underpass	2	2	2	-	4	2	
6	Cattle Underpass	1	1	1	-	2	1	
7	Box Culvert	29	-	-	19	19	19	LHS-Box & RHS-Slab Type at site Considered as a Slab Culvert
9	Slab Culvert	-	-	-	10	10	10	
8	Pipe Culvert	121	-	-	120	120	120	

Table 21: Age of Structures

S.No	Type of Str	LHS		RHS		BHS		Total (Nos)		Total no. of Str's
		Old	New	Old	New	Old	New	Old	New	
1	Road Over Bridge	-	1	-	1	-	-	-	2	2
2	Major Bridge	-	6	4	2	-	-	4	8	12
3	Minor Bridge	-	25	5	20	-	-	5	45	50
4	Vehicular Underpass	-	13	-	13	-	-	-	26	26
5	Pedestrian Underpass	-	2	-	2	-	-	-	4	4
6	Cattle Underpass	-	1	-	1	-	-	-	2	2
7	BC	-	-	-		-	20	-	20	20
8	PC	-	-	-		-	120	-	120	120
9	SC	-	-	-		-	10	-	10	10
Total No's		**0**	**48**	**9**	**39**	**0**	**150**	**9**	**237**	**246**

Table 22: Summary of Expansion Joints & Bearings

S. No	Type of Str	Expansion joints		Bearings			
				Pot PTFE		Elastomeric	
		Old	New	Old	New	Old	New
1	ROB	-	8	-	72	-	-
2	MJB	17	60	-	516	120	-
Total		17	68	-	588	120	-
		85		**588**		**120**	-
				708			

Table 23: Summary of Superstructures

S. No	Type of Str	RCC Box	RCC Slab	RCC Pipe	RCC Girder	RCC Girder & RCC Slab	Steel Girder	Total no. of Structures
1	Road Over Bridge	-	-	-	-	-	2	2
2	Major Bridge	-	2	-	9	1	-	12
3	Minor Bridge	33	13	4	-	-	-	50
4	Vehicular Underpass	26	-	-	-	-	-	26
5	Pedestrian Underpass	4	-	-	-	-	-	4
6	Cattle Underpass	2	-	-	-	-	-	2
Total		**65**	**15**	**4**	**9**	**1**	**2**	**96**

Table 24: Summary of Substructures

S.No	Type of Str	ABUTMENT				PIER		
		RCC Box	RCC Wall type	Stone Masonry Wall Type	RCC Pipe	RCC Box	RCC Wall type	Stone Masonry Wall Type
1	ROB	-	2	-	-	-	2	-
2	MJB	-	10	2	-	-	11	1
3	MNB	33	12	1	4	33	12	1
4	VUP	26	-	-	-	26	-	-
5	PUP	4	-	-	-	4	-	-
6	CUP	2	-	-	-	2	-	-
Total		**65**	**24**	**3**	**4**	**65**	**25**	**2**
		96				**92**		

At high level bridges and water flow structures where accessibility is a concern in that locations MBIU Inspection has been carried out at the following locations.

Table 25: Summary of Structures Inspected with MBIU

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Str	Span Arrangement (m)	Deck Width (m)	Type of Superstructure
1	27+497	MJB	LHS	MCW	New	5 x 16 + 1 x 8	14	RCC Girder + RCC Slab
2	35+039	MJB	LHS	MCW	New	5 x 16.6	14	RCC Girder
3	42+417	MJB	LHS	MCW	New	5 x 20.0	14	RCC Girder
4	42+417	MJB	RHS	MCW	New	5 x 20.0	14	RCC Girder
5	54+697	MJB	LHS	MCW	New	8 x 21	14	RCC Girder
6	54+697	MJB	RHS	MCW	New	8 x 21	14	RCC Girder
7	58+795	MJB	LHS	MCW	New	7 x 18.5	14	RCC Girder
8	58+795	MJB	RHS	MCW	Old	7 x 18.5	12	RCC Girder
9	65+421	MJB	LHS	MCW	New	8 x 18.5	14	RCC Girder
10	65+421	MJB	RHS	MCW	Old	8 x 18.5	12	RCC Girder

In view of the extensive rehabilitation works already done, majority of the structures have various distresses viz. cracks, reinforcement exposed, leaching etc. To assess the condition of the structures, the following Non-destructive tests were conducted on selected major structures.

- Carbonation test
- Half-Cell potential test
- UPV test
- Chemical test (Acid/water soluble chlorides, Sulphates, PH, & Alkalinity)

At distress identified structure locations, NDT tests have been suggested in the structure locations as below.

Table 26: NDT Test Required Structure locations

S.no	Chainage (km)	Type of Structure	Side	Age of Str	Span Arrangement (m)	Type of Superstructure
1	27+497	MJB	LHS	New	5 x 16 + 1 x 8	RCC Girder & RCC Slab
2	27+497	MJB	RHS	Old	11 x 8	RCC Slab
3	35+039	MJB	LHS	New	5 x 16.6	RCC Girder
4	35+039	MJB	RHS	Old	10 x 8.0	RCC Slab
5	42+417	MJB	LHS	New	5 x 20.0	RCC Girder
6	42+417	MJB	RHS	New	5 x 20.0	RCC Girder
7	54+697	MJB	LHS	New	8 x 21	RCC Girder
8	54+697	MJB	RHS	New	8 x 21	RCC Girder
9	58+795	MJB	LHS	New	7 x 18.5	RCC Girder
10	58+795	MJB	RHS	Old	7 x 18.5	RCC Girder
11	65+421	MJB	LHS	New	8 x 18.5	RCC Girder
12	65+421	MJB	RHS	Old	8 x 18.5	RCC Girder
13	13+457	MNB	LHS	New	3 x 13.0	RCC Box
14	13+457	MNB	RHS	New	3 x 13.0	RCC Box
15	4+630	VUP	LHS	New	2 x 10.0	RCC Box
16	4+630	VUP	RHS	New	2 x 10.0	RCC Box
17	11+267	VUP	LHS	New	2 x 10.5	RCC Box
18	11+267	VUP	RHS	New	2 x 10.5	RCC Box
19	15+899	VUP	LHS	New	1 x 10.5	RCC Box
20	15+899	VUP	RHS	New	1 x 10.5	RCC Box
21	19+870	VUP	LHS	New	2 x 10.0	RCC Box
22	19+870	VUP	RHS	New	2 x 10.0	RCC Box
23	43+382	VUP	LHS	New	2 x 10.5	RCC Box
24	43+382	VUP	RHS	New	2 x 10.5	RCC Box
25	51+300	VUP	LHS	New	1 x 10	RCC Box
26	51+300	VUP	RHS	New	1 x 10	RCC Box
27	57+239	VUP	LHS	New	2 x 10.6	RCC Box
28	57+239	VUP	RHS	New	2 x 10.6	RCC Box

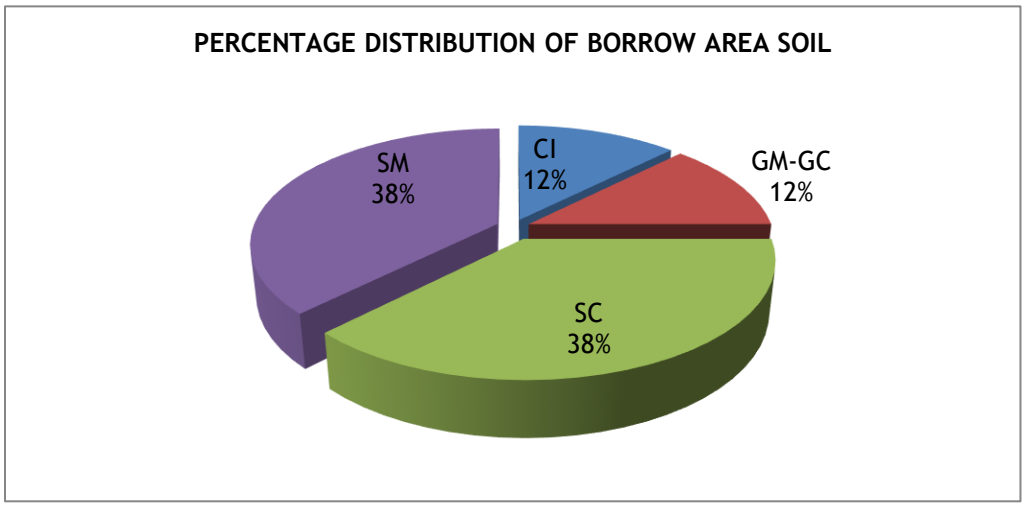
4.1 EMBANKMENT & SUBGRADE

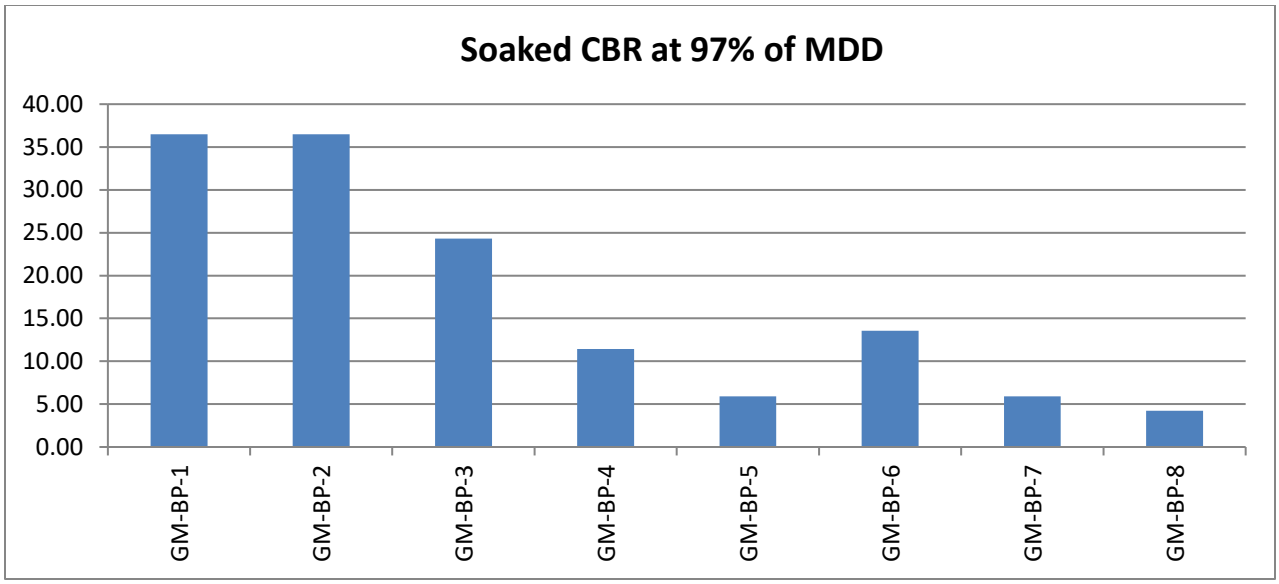
The embankment for project road has been constructed with available soils from nearby areas. The soil appears to be Coarse grained type in nature and embankment appears to be in Fair condition over the entire length of project. No major settlements or depressions have been noted even at high embankment locations. Out of 8 samples 3 samples belongs to SC type of soil, 3 sample belongs to SM type of soil, 1 sample belongs to GM-GC type of soil and 1 sample belongs to CI type of soil.

Summary of the test results carried out on these samples are presented in the following tables whilst the complete details are presented as an **Appendix 7** of this report.

Table 27: Test Results of Borrow area Samples Details

Lab Sample No	Site Identification		Grain Size Analysis					Atterberg Limits (%)			Soil Class	MDD (gm/cc)	OMC (%)	Dry Density at 97% MDD	Soaked CBR 97% MDD	Free Swelling Index (%)
	Location (km)	LHS/RHS	Percentage passing from					LL	PL	PI						
			4.75 mm IS Sieve	425 mic IS Sieve	75 mic IS Sieve	Gravel %	Sand %									
GM-BP-1	11+300	LHS	82.64	29.99	22.08	17.36	60.56	-	NP	NP	SM	2.17	10.20	2.10	36.50	36.50
GM-BP-2	17+300	RHS	87.67	67.88	47.58	12.33	40.09	-	NP	NP	SM	2.16	10.40	2.10	36.50	36.50
GM-BP-3	26+400	RHS	51.00	19.18	12.74	49.00	38.26	28	21	7	GM-GC	2.10	10.00	2.04	27.18	24.33
GM-BP-4	38+300	LHS	74.62	51.87	45.05	25.38	29.57	38	25	13	SC	2.00	13.20	1.94	11.82	11.42
GM-BP-5	54+800	LHS	87.28	35.94	20.82	12.72	66.46	45	27	18	SC	1.98	12.30	1.92	6.28	5.89
GM-BP-6	65+100	RHS	85.24	60.62	30.26	14.76	54.98	-	NP	NP	SM	2.13	7.10	2.07	14.31	13.58
GM-BP-7	71+400	RHS	96.26	69.87	46.14	3.74	50.12	43	19	24	SC	1.98	12.30	1.92	6.28	5.89
GM-BP-8	43+300	RHS	94.50	67.26	54.24	5.5	40.26	38	24	14	CI	1.85	15.80	1.79	4.23	4.23





➢ **SUBGRADE**

The subgrade samples collected from the test pits taken from project road appears to be in fair condition as revealed by test pit investigations. Soil classification has been done according to IS Classification of Soils (ISC) as detailed in IS 1498 - 1978.

Laboratory test results indicate that majority of the Subgrade soil samples collected belongs to Coarse Grained Soil out of 25 Nos. of samples 11 Nos. of samples belongs to SC type of soil, 5 Nos. of sample belongs to SM type of soil and SM-SC type ,1 Nos of samples belongs to SW-SM, CI, GC and GM type.

Pie Chart showing the percentage distribution of soil classification of existing subgrade sample is presented below:

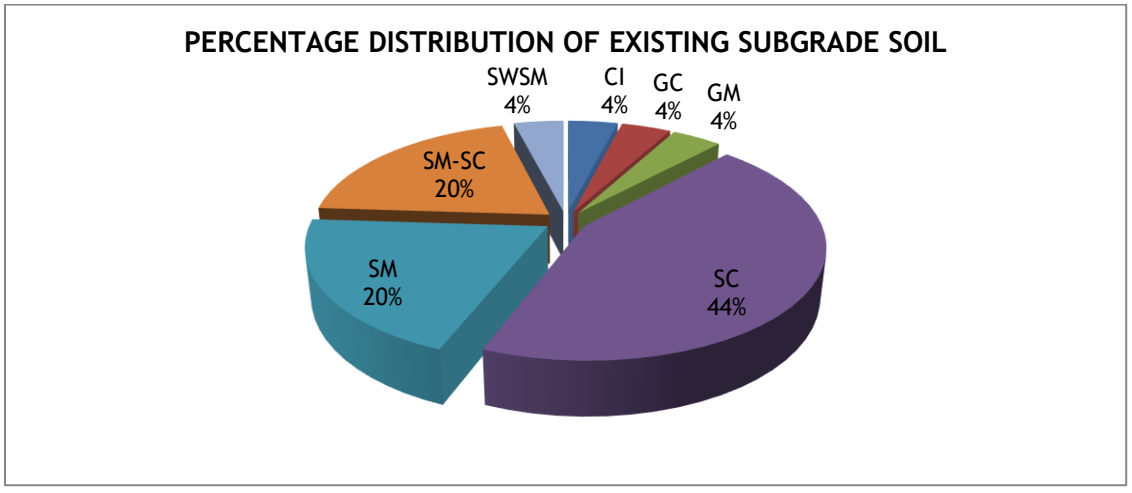
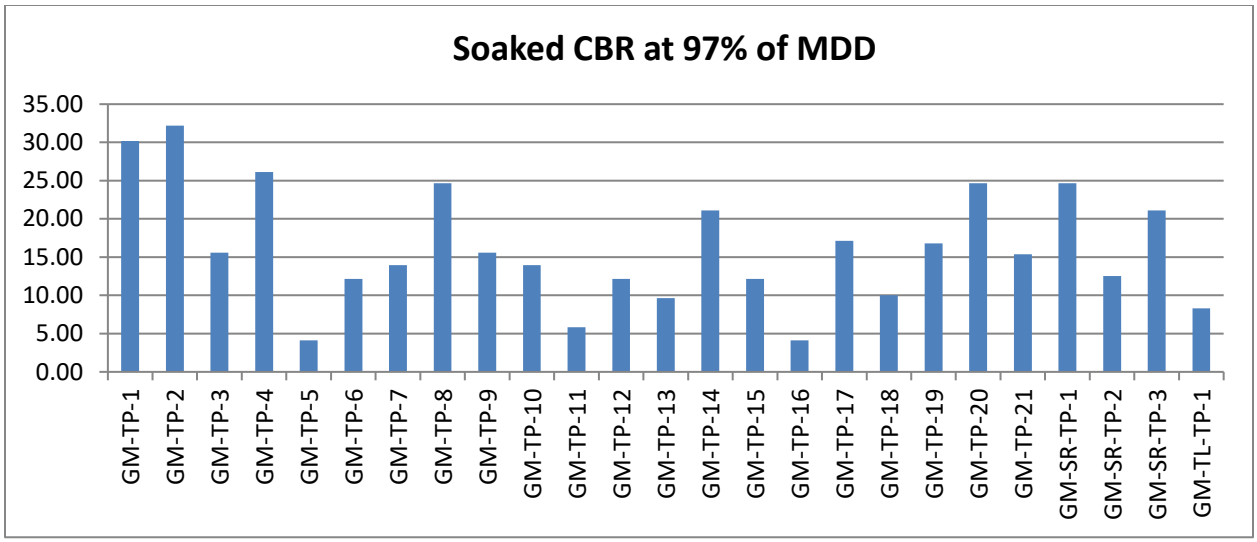


Table 28: Test results of Existing Subgrade Soils

Lab Sample No	Site Identification		Grain Size Analysis					Atterberg Limits (%)			Soil Class	MDD (gm/cc)	OMC (%)	Soaked CBR 97% MDD	Free Swelling Index (%)
			Percentage passing from												
	Location (km)	Up/Dn	4.75 mm IS Sieve	425 mic IS Sieve	75 mic IS Sieve	Gravel %	Sand %	LL	PL	PI					
GM-TP-1	11+900	LHS	48.44	18.97	10.91	51.56	37.53	-	NP	NP	GM	2.21	8.30	30.17	40
GM-TP-2	20+560	LHS	73.13	32.69	19.93	26.87	53.20	27	19	8	SC	2.17	9.60	32.21	40
GM-TP-3	30+050	LHS	72.00	34.97	19.17	28.00	52.83	26	21	5	SM-SC	2.13	10.70	15.57	10
GM-TP-4	40+060	LHS	60.86	33.83	27.63	39.14	33.23	36	25	11	GC	2.15	10.30	26.13	0
GM-TP-5	50+050	LHS	91.54	71.5	40.98	8.46	50.56	35	20	15	SC	1.97	12.10	4.14	15
GM-TP-6	59+800	LHS	82.42	30.46	17.93	17.58	64.49	30	18	12	SC	2.07	11.20	12.17	10
GM-TP-7	70+000	LHS	68.95	44.49	22.75	31.05	46.20	25	18	7	SM-SC	2.03	12.80	13.95	20
GM-TP-8	65+000	RHS	66.59	31.96	20.07	33.41	46.52	29	21	8	SC	2.14	10.50	24.67	10
GM-TP-9	54+970	RHS	89.29	59.36	47.57	10.71	41.72	23	16	7	SM-SC	2.12	8.20	15.57	10
GM-TP-10	44+050	RHS	77.19	39.79	18.94	22.81	58.25	29	24	5	SM-SC	2.03	13.20	13.95	10
GM-TP-11	35+400	RHS	85.26	66.69	38.91	14.74	46.35	34	24	10	SC	1.89	17.30	5.84	45
GM-TP-12	24+800	RHS	84.58	40.83	24.84	15.42	59.74	28	20	8	SC	2.06	10.70	12.17	40
GM-TP-13	15+200	RHS	73.70	32.27	24.09	26.3	49.61	29	20	9	SC	2.02	14.30	9.66	40
GM-TP-14	5+300	RHS	88.11	63.14	36.54	11.89	51.57	-	NP	NP	SM	2.14	7.30	21.12	10
GM-TP-15	8+000	RHS	70.17	45.95	32.14	29.83	38.03	37	22	15	SC	2.07	10.80	12.17	0
GM-TP-16	22+600	LHS	83.21	66.19	50.36	16.79	32.85	46	27	19	CI	1.70	18.90	4.14	15
GM-TP-17	28+700	RHS	62.19	21.31	11.10	37.81	51.09	25	21	4	SW-SM	2.12	9.40	17.13	10
GM-TP-18	30+150	RHS	94.62	64.43	36.80	5.38	57.82	-	NP	NP	SM	1.95	13.50	10.02	20
GM-TP-19	63+600	LHS	90.54	34.52	13.44	9.46	77.10	-	NP	NP	SM	2.10	8.50	16.79	10
GM-TP-20	70+000	RHS	69.01	41.79	16.18	30.99	52.83	23	15	8	SC	2.14	8.00	24.67	10
GM-TP-21	68+200	RHS	76.02	41.41	21.27	23.98	54.75	24	17	7	SM-SC	2.15	8.00	15.38	10
GM-SR-TP-1	63+050	LHS	91.16	58.47	36.64	8.84	54.52	30	17	13	SC	2.10	7.70	24.67	45
GM-SR-TP-2	20+100	RHS	61.97	29.93	18.91	38.03	43.06	-	NP	NP	SM	2.13	12.40	12.52	40
GM-SR-TP-3	56+700	LHS	97.53	58.39	28.76	2.47	68.77	-	NP	NP	SM	2.14	7.90	21.12	40
GM-TL-TP-1	44+800	RHS	66.53	38.33	26.89	33.47	39.64	55	28	27	SC	1.92	12.40	8.29	10



The following observations can be made from the above test results conducted on of existing subgrade samples

- Liquid Limit are in the range of 23% to 50% satisfying LL<50% criteria except 1 sample.
- Plasticity Index are in the range of 4% to 25% satisfying PI<25 criteria except 1 sample.
- Maximum Dry Density for all subgrade samples varies between 1.65 and 2.14 gm/cc. 01 No of samples not satisfying the MDD criterion and remaining 24 Nos of samples satisfying MDD criterion (MDD>=1.75 gm/cc).
- OMC for existing subgrade samples varies in between 7.3% to 18.90%.
- Free Swelling Index for existing subgrade samples varies in between 0% to 45%. All samples satisfying the FSI criterion (FSI<=50%)
- CBR Values are varying from 4.14% to 32.21%.

Majority of Subgrade samples are satisfying the MORTH specification criteria.

Material related tests reports are provided in **Appendix-7** of this report.

Aggregates to be used for sub-base, base, surface courses and concrete works have been collected from the crushers under operation from the existing quarries. All samples have been tested for Aggregate Impact Value (AlV), water absorption and specific gravity tests. The Tables below represents the test results of the Aggregate and Sand Samples.

Table 29: Test Results of Aggregate Samples Details

S. No	Sample	Location (km)	Up/Dn	A.I. V	Water Absorption (20MM)	Specific Gravity (20MM)
1	GM-AQ-1	15+950	LHS	12	0.15	2.72
					0.34	2.85
2	GM-AQ-2	17+300	RHS	7.00	0.55	2.92
					0.66	2.79
3	GM-AQ-3	65+300	RHS	6.00	1.52	2.85
					1.29	2.87
4	GM-AQ-4	65+300	RHS	8.00	1.69	2.88
					1.28	2.91

Note: All Aggregate samples are satisfying MoRTH requirements i.e., AIV (max. limit is 24% for BC-layer), Water Absorption (max. limit is 2%).

Table 30: Test Results of Sand Samples Details

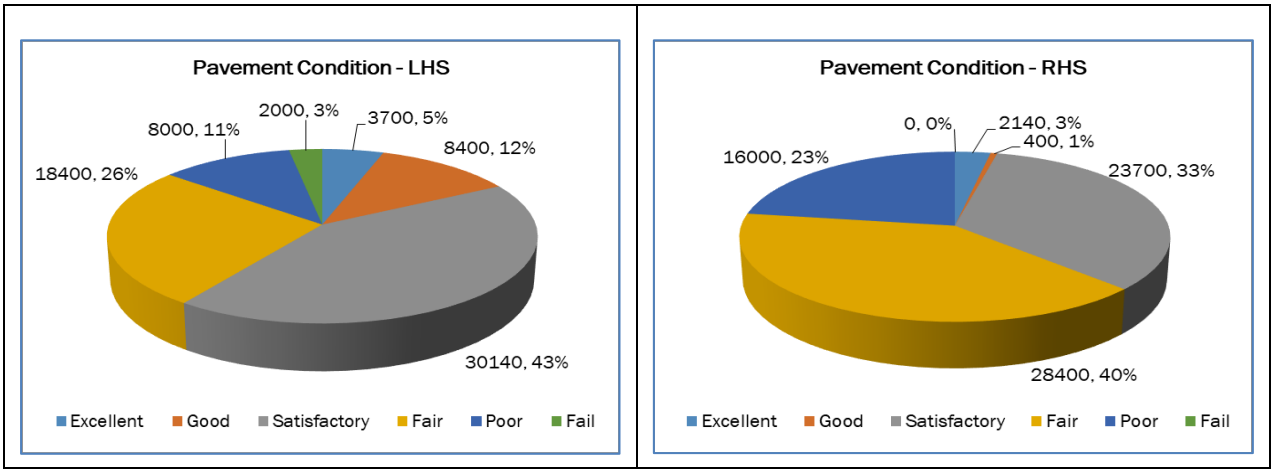
Sl No	Sample No	CHAINAGE (KM)	SIDE	10 mm Passing %	4.75 mm Passing %	2.36 mm Passing %	1.18mm Passing %	600mm Passing %	300mm Passing %	150mm Passing %	FM	ZONE
1	GM-SQ-1	0+600	RHS	100	91	85	77	62	35	5	2.42	ZONE -III
2	GM-SQ-2 (M sand)	65+200	RHS	100	94	89	78	38	12	3	2.86	ZONE -II
3	GM-SQ-4 (M sand)	65+300	RHS	100	98	62	31	12	5	2	3.90	NO-ZONE

4.2 PAVEMENT CONDITION

The distresses in bituminous surface have been captured on Main carriageway for each lane separately by NSV survey. Pavement Condition rating (PCI) as per IRC:82-2023 from the data collected for each km length in each direction has been presented in the **Annexure-2** of this report.

The project corridor has been provided with flexible pavement over entire length and even on service roads also. Rigid pavement is only provided at Toll Plaza. The present surface condition appears to be fair to Poor and at isolated locations it is poor. The type of distresses observed are cracking, Raveling, Pothole, Rutting and Delamination.

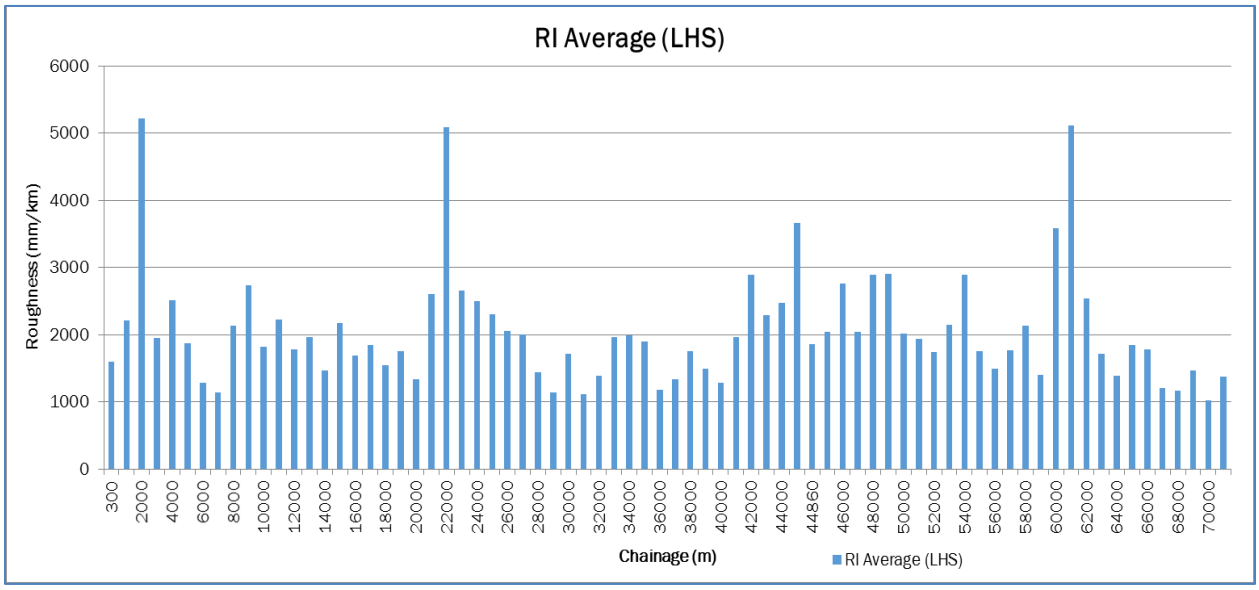
The Pavement condition rating is presented in Pie-chart from Excellent to Fail are as below:

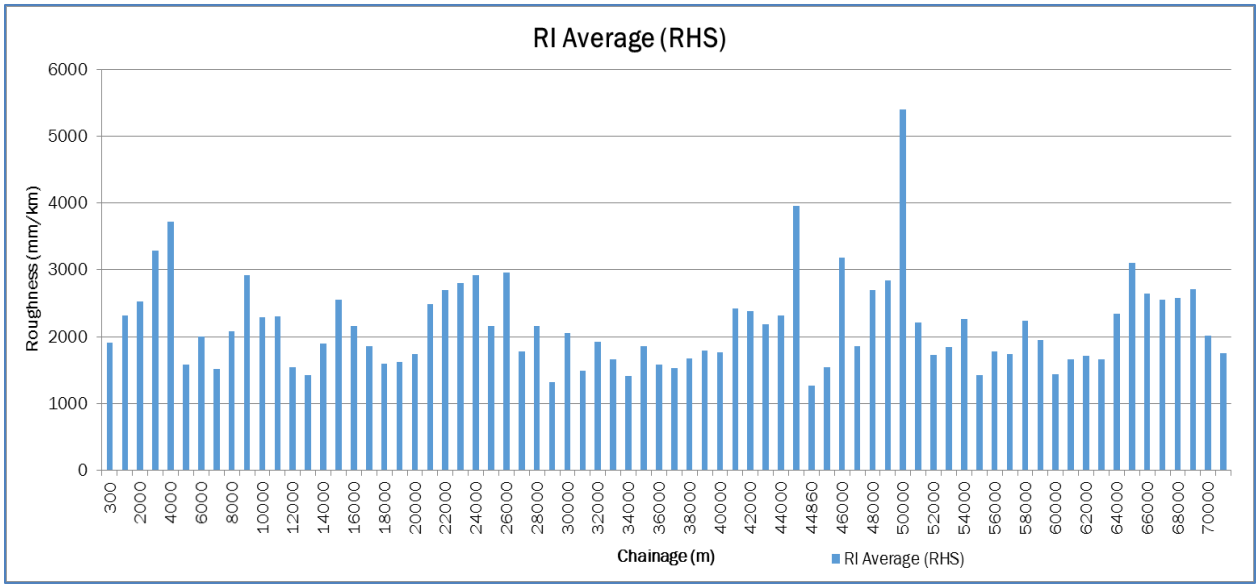


The pavement condition is observed to be poor in a length of about 10km in LHS and 16km RHS. However, the same is not considered for quantification as project stretch is going for 6-lane capacity augmentation by Authority in FY27 and FY28 under HAM mode.

4.3 ROUGHNESS

The Roughness represented in Bar charts are as presented below.





Based on the above, considering the Km-stone reference system the summary of direction-wise km lengths having varying roughness values are as presented below.

>=Roughness (mm/km)	<Roughness (mm/km)	LHS (Km)	RHS (Km)
0	2000	42240	34240
2000	2200	9000	8000
2200	2400	4000	8400
2400		15860	20460

It can be noted from the above that, the roughness values are greater than Schedule-F, specified limit of 2400mm/km for about 15.86 km length in LHS & and 20.46 km length in RHS it requires functional. Sections between 2200-2400 range may also require a roughness correction course within short period of time. Thus, it is imperative to consider roughness correction layer for such sections also. However, the same is not considered for quantification as project stretch is going for 6-lane capacity augmentation by Authority in FY27 and FY28 under HAM mode.

4.4 FWD ANALYSIS

4.4.1 FWD ANALYSIS AND ASSESSMENT OF OVERLAY REQUIREMENT

By looking at the age and condition and performance of the pavement following different set of ranges have been used while finalizing the modulus values:

Layer	Bituminous Layers	Granular Layer Modulus	Subgrade
Modulus Value (MPa)	400-1500 750-3000	100-500	50-100

Bituminous layer Moduli obtained from back calculations shall be corrected for a standard pavement temperature of 35^{o}C using given equations. Whereas, for back calculated moduli values obtained for granular and subgrade layer shall be corrected for seasonal variations (using winter and summer equations). For this FWD results, no seasonal correction factor is applied for granular and subgrade

layer as these tests are performed in Monsoon season (July Month, 2024). The design moduli (15th percentile moduli) of in-service layers for each homogenous section are given in table below.

Table 31: Summary of Design Moduli of different layers – LHS CW

S.No	Side	From	To	Length (Km)	15th Percentile MR values		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)
1	LHS	0	1.75	1.75	1365	443	100
2	LHS	1.75	3.6	1.85	893	101	100
3	LHS	3.6	5.75	2.15	1694	231	99
4	LHS	5.75	8	2.25	2858	471	100
5	LHS	8	10	2	941	101	99
6	LHS	10	12	2	1733	100	100
7	LHS	12	13.01	1.01	820	192	100
8	LHS	13.01	14.02	1.01	451	102	100
9	LHS	14.02	15.26	1.24	752	195	100
10	LHS	15.26	16.58	1.32	541	104	100
11	LHS	16.58	18.2	1.62	1222	251	100
12	LHS	18.2	19.29	1.1	1271	487	100
13	LHS	19.29	20.33	1.03	1325	473	100
14	LHS	20.33	21.36	1.03	1120	295	100
15	LHS	21.36	22.54	1.18	1287	124	100
16	LHS	22.54	23.72	1.18	1434	128	100
17	LHS	23.72	24.84	1.12	1495	183	100
18	LHS	24.84	25.98	1.14	1505	154	98
19	LHS	25.98	28.5	2.52	3068	489	100
20	LHS	28.5	31.01	2.51	3093	406	100
21	LHS	31.01	33.48	2.47	884	196	100
22	LHS	33.48	35.5	2.02	860	101	99
23	LHS	35.5	37.75	2.25	1664	358	100
24	LHS	37.75	40.21	2.46	1134	127	99
25	LHS	40.21	42.25	2.04	718	122	100
26	LHS	42.25	44.4	2.15	739	203	100
27	LHS	44.4	44.86	0.46	Toll plaza		
28	LHS	44.86	47.77	2.91	779	101	100
29	LHS	47.77	48.81	1.04	646	101	100
30	LHS	48.81	49.98	1.16	610	100	98
31	LHS	49.98	52.21	2.24	876	219	100
32	LHS	52.21	54.25	2.04	1271	219	97
33	LHS	54.25	56.950	2.70	3066	488	100
34	LHS	56.950	57.65	0.70	1060	101	100
35	LHS	57.65	59.27	1.62	1585	229	100

S.No	Side	From	To	Length (Km)	15th Percentile MR values		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)
36	LHS	59.27	60.39	1.13	1005	154	100
37	LHS	60.39	61.99	1.6	840	108	100
38	LHS	61.99	63.14	1.15	1267	392	100
39	LHS	63.14	63.99	0.85	1103	183	100
40	LHS	63.99	66.26	2.26	2458	327	100
41	LHS	66.26	69	2.75	2423	276	100
42	LHS	69	71.4	2.4	2923	486	100

Table 32: Summary of Design Moduli of different layers – RHS CW

S. No	Side	From	To	Length (Km)	15th Percentile MR values		
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)
1	RHS	0	2	2	736	102	99
2	RHS	2	3.93	1.93	548	101	100
3	RHS	3.93	4.99	1.06	453	100	99
4	RHS	4.99	6.97	1.98	1445	462	100
5	RHS	6.97	8.69	1.72	883	198	100
6	RHS	8.69	10.99	2.3	588	100	99
7	RHS	10.99	13.75	2.76	2409	343	100
8	RHS	13.75	15.99	2.23	737	101	100
9	RHS	15.99	18.25	2.26	2670	345	100
10	RHS	18.25	20.73	2.48	849	205	100
11	RHS	20.73	22.24	1.51	1378	273	100
12	RHS	22.24	23.98	1.74	1281	109	97
13	RHS	23.98	24.99	1.02	1230	112	89
14	RHS	24.99	27.77	2.78	2051	102	99
15	RHS	27.77	28.99	1.22	708	190	100
16	RHS	28.99	30.97	1.99	591	105	100
17	RHS	30.97	31.99	1.02	1103	489	100
18	RHS	31.99	33.75	1.76	2435	488	100
19	RHS	33.75	35.79	2.04	2585	323	99
20	RHS	35.79	38.75	2.96	879	100	74
21	RHS	38.75	41.67	2.93	774	101	99
22	RHS	41.67	44.4	2.73	884	100	99
23	RHS	44.4	44.86	0.46	Toll plaza		
24	RHS	44.86	47.61	2.75	744	101	99
25	RHS	47.61	50.25	2.64	878	101	99
26	RHS	50.25	52.39	2.14	1373	178	93
27	RHS	52.39	55.99	3.6	1227	373	100
28	RHS	55.99	56.95	0.96	1420	470	100
29	RHS	56.95	59.97	3.02	807	117	100
30	RHS	59.97	61.03	1.07	1557	489	100
31	RHS	61.03	62.06	1.03	1676	492	100
32	RHS	62.06	63.14	1.08	1446	100	100
33	RHS	63.14	64.24	1.1	1660	474	100
34	RHS	64.24	66.2	1.96	1463	152	100
35	RHS	66.2	68.03	1.83	1084	131	100
36	RHS	68.03	69.42	1.39	930	117	100
37	RHS	69.42	71.4	1.98	1182	138	100

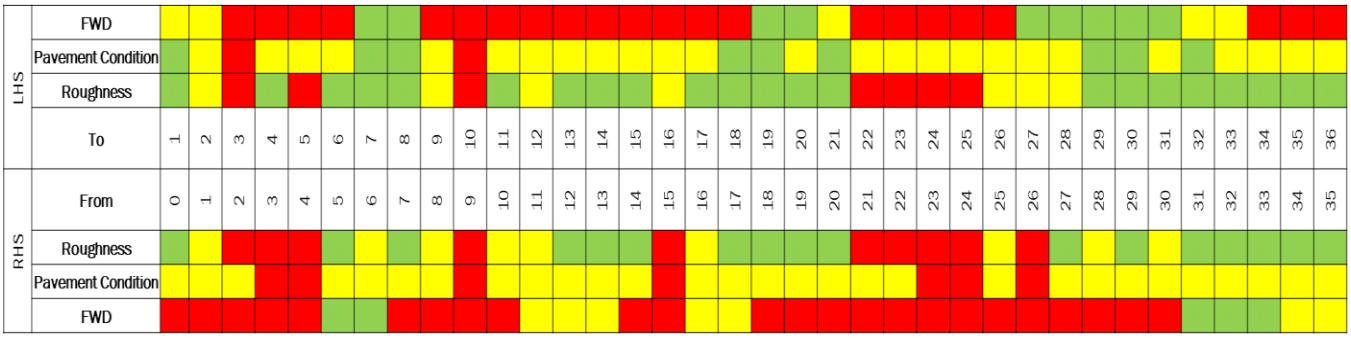
Observations on FWD Results

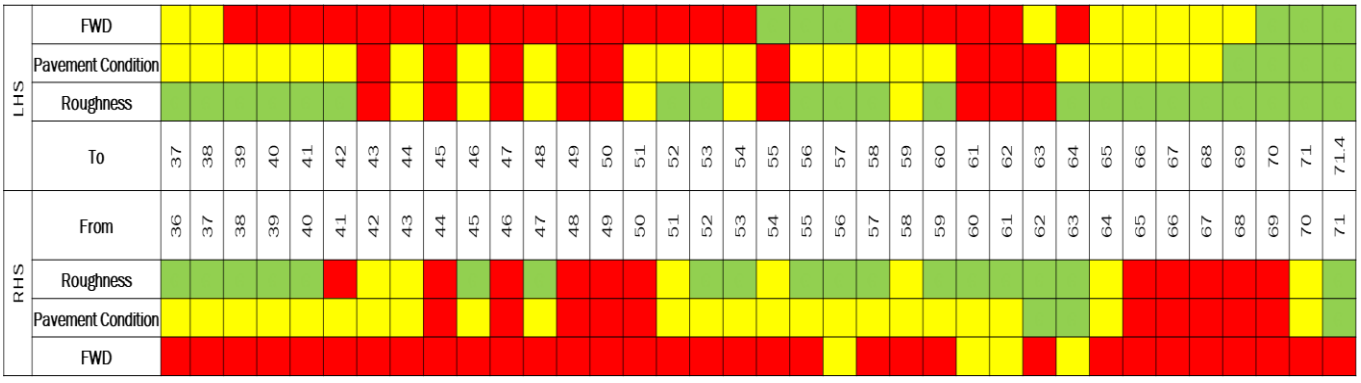
It can be noticed from the above table that the layer moduli for the three layers are varying along the length and direction. The MR value for BT layer is 3093 MPa to 451 MPa in LHS Carriageway & 2670 MPa to 453 MPa in RHS Carriageway. The MR value for Granular Layers is 489 MPa to 100 MPa in LHS Carriageway & 492 MPa to 100 MPa in RHS Carriageway. Similarly, the MR value for Subgrade Layer is 100 MPa to 97 Map in LHS Carriageway and 100 Map to 74 Map in RHS Carriageway.

4.5 PAVEMENT RATING CHART

Pavement is rated for Roughness/PCI/FWD as good, fair and poor based on the following criteria along with strip-chart is presented as below:

Condition		FWD	Roughness	Pavement Condition
	Poor	OL Thk of 80mm and above	>2400 mm/Km	PCI ≤ 40
	Fair	OL Thk of 40 mm/50 mm	2000 - 2400 mm/Km	PCI of 40 to 80
	Good	No Overlay	≤ 2000 mm/Km	PCI > 80





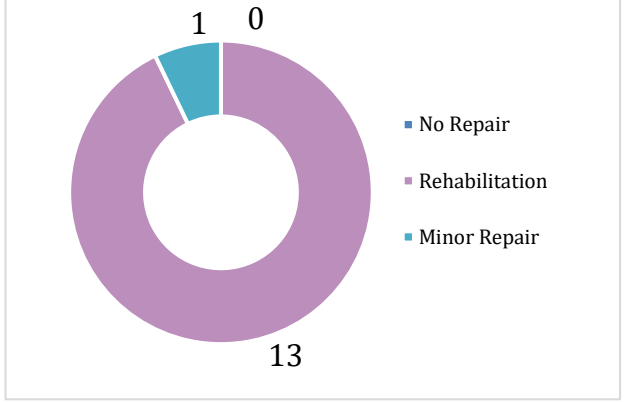
Note: No cost towards rectification of the pavement distresses is considered as project stretch is going for 6-lane capacity augmentation by Authority in FY27 and FY28 under HAM mode

4.6 STRUCTURES

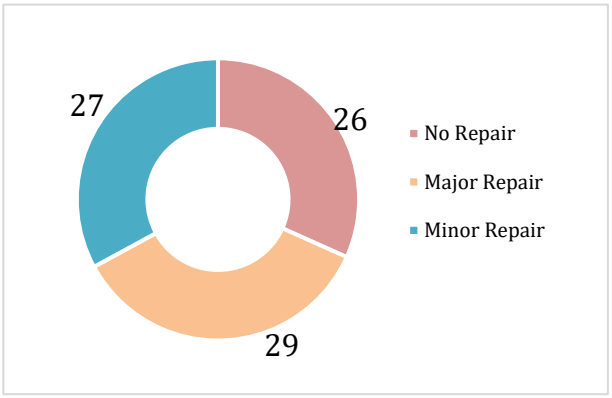
Inventory and asset condition of all the existing structures falling within project road have been verified as per IRC: SP-35 procedures and guidelines with following field surveys

- Inventory of existing highway bridges / structures
- Visual condition survey of existing highway bridges / structures

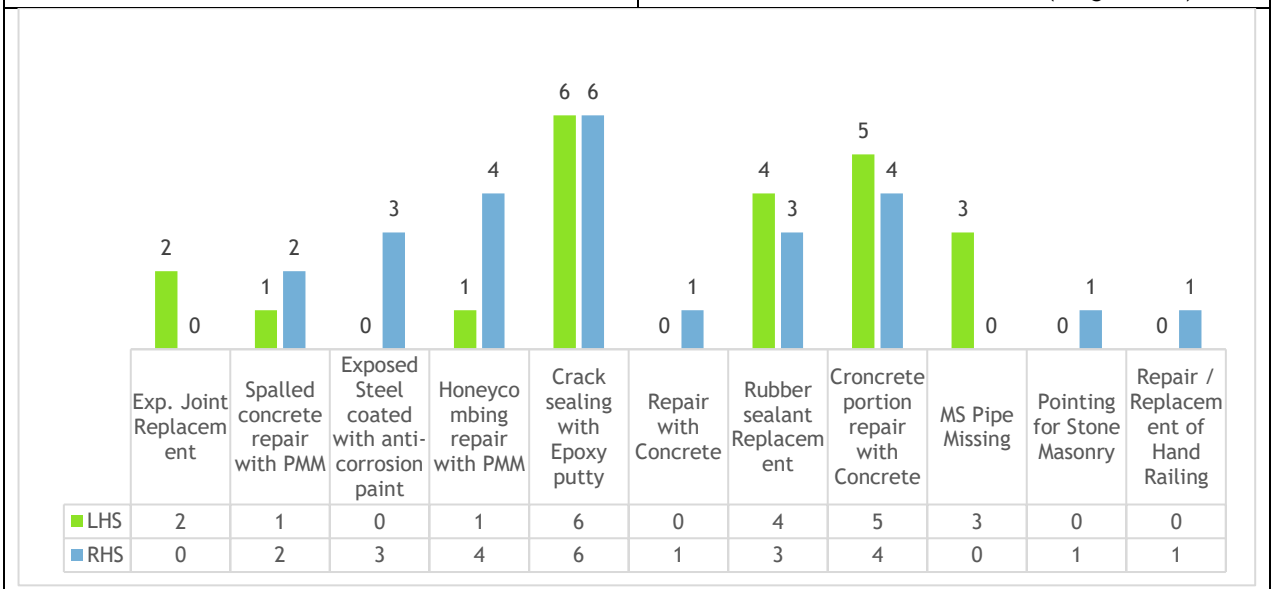
Each and every structure has been verified at site and detailed inventory and condition survey is presented in **Appendix-8** of this report.



Maintenance of major structures (Length >60m)

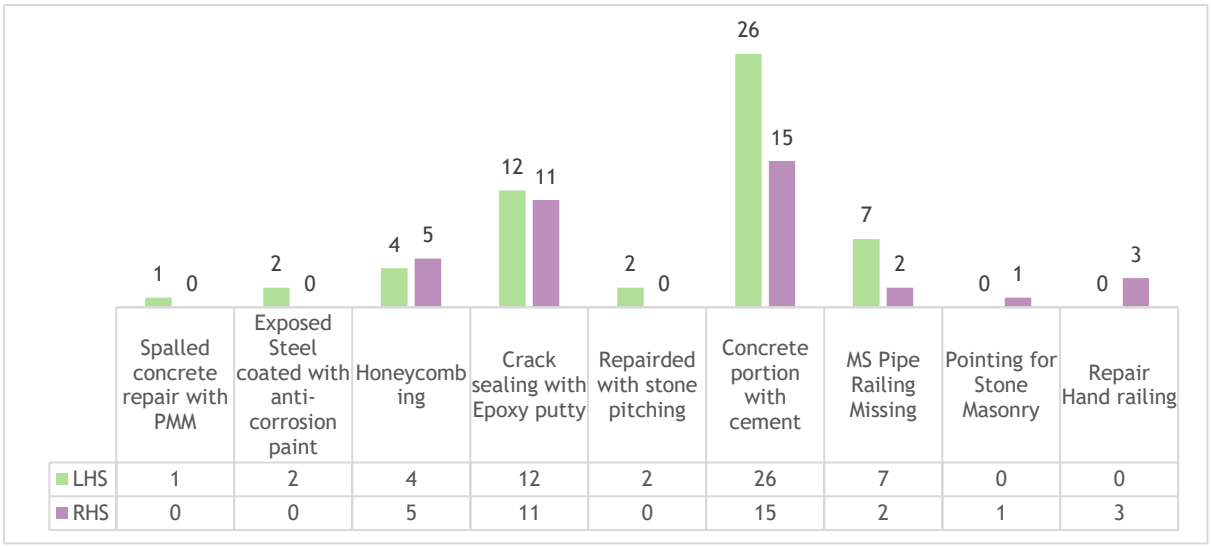


Maintenance of minor structures (Length <60m)



	Exp. Joint Replacement	Spalled concrete repair with PMM	Exposed Steel coated with anti-corrosion paint	Honeycombing repair with PMM	Crack sealing with Epoxy putty	Repair with Concrete	Rubber sealant Replacement	Croncrete portion repair with Concrete	MS Pipe Missing	Pointing for Stone Masonry	Repair / Replacement of Hand Railing
LHS	2	1	0	1	6	0	4	5	3	0	0
RHS	0	2	3	4	6	1	3	4	0	1	1

Type of repairs at number of locations Major structures (Length >60m)



Type of repairs at number of locations -Minor structures (Length <60m)

Overall condition of few of the major structures are presented on sample basis of below. However, each and every structure detail are presented in **Appendix-8** of this report

Chainage: 9+950
General Description
LHS MCW (New)

- Type of Structure : ROB
- Span Arrangement : 2 x 19.3 + 1 x 32.3 m
- Total length of Structure : 70.9 m
- Total deck width of Structure : 14 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : RCC Wall type
- Type of Superstructure : Steel Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash barrier & MS Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- Spalling observed on Pier P2 at left side.
- Vegetation growth observed on RE wall.
- No painting for MS pipe on the stair case at A2.
- Rubber Sealant damaged on expansion joint no.1.
- Potholes are observed on Main carriageway.
- Expansion Joints are filled with debris.









Chainage: 9+950
General Description
RHS MCW (New)

- Type of Structure : ROB
- Span Arrangement : 2 x 19.3 + 1 x 32.3 m
- Total length of Structure : 70.9 m
- Total deck width of Structure : 14 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : RCC Wall type
- Type of Superstructure : Steel Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash barrier & MS Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- No painting for MS pipe on the stair case at A1 & A2.
- Crash barrier Concrete portion damaged on Abutment A1.
- Potholes are observed on Main carriageway.
- Expansion Joints are filled with debris.






Chainage: 27+497
General Description
LHS MCW (New)

- Type of Structure : MJB
- Span Arrangement : 5 x 16 + 1 x 8 m
- Total length of Structure : 88 m
- Total deck width of Structure : 14 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : RCC Wall type
- Type of Superstructure : RCC Girder & RCC Slab
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash barrier & MS Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

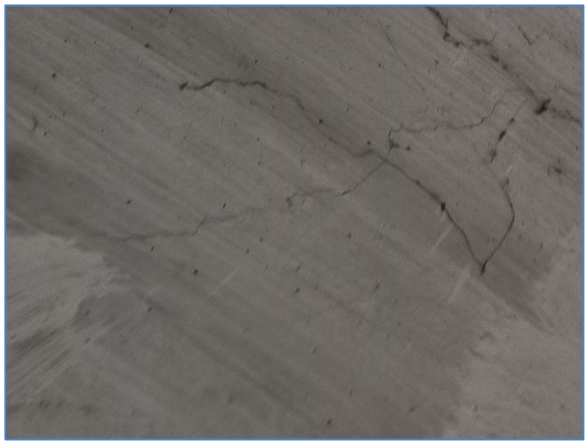
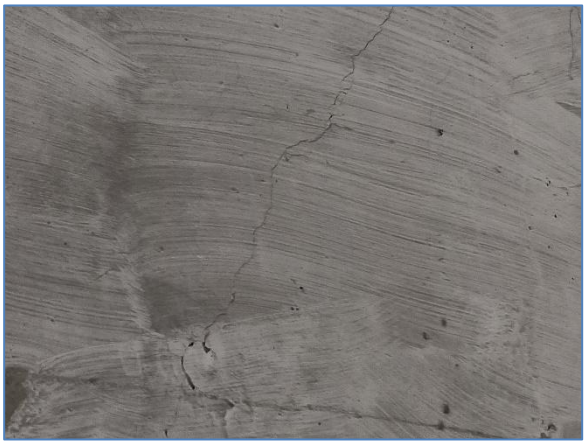
- Crash barrier Concrete portion damaged on abutment A1 side.
- MS pipe railing pipes missing on footpath.
- Cracks observed on girder G3 bottom flange in span-1.
- Cracks observed on Girders G1 & G4 web and bottom flange in Span-1.
- Cracks observed on Girders G2, G3 & G4 web in span-3.
- Cracks observed on Girders G1, G2, G3 & G4 web in span-4.
- Cracks observed on Girders G1, G2, G3 & G4 web in span-5
- Cracks observed on Abutment A2.
- Potholes observed on main carriageway.









Chainage: 27+497
General Description
RHS MCW (Old)

- Type of Structure : MJB
- Span Arrangement : 11 x 8 m
- Total length of Structure : 88 m
- Total deck width of Structure : 8.5 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : Stone Masonry Wall Type
- Type of Superstructure : RCC Slab
- Type of Bearing : Not Applicable
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- Cracks observed on Pier Cap P1, P2, P3 & P4.
- Steel exposed on top slab in span-5.
- Pointing missing for the stone masonry piers in Span-4, 5, 6 & 8.
- Shotcrete done for the structures and Grouting also done for the slab.






Chainage: 35+039
General Description
LHS MCW (New)

- Type of Structure : MJB
- Span Arrangement : 5 x 16.6 m
- Total length of Structure : 83 m
- Total deck width of Structure : 14 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : RCC Wall type
- Type of Superstructure : RCC Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash barrier & MS Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- Expansion joints no.5 damaged.
- Expansion Joints are filled with debris.
- Potholes observed on main carriageway.
- Cracks observed on centre of girders web G1, G3 & bottom flange of G4 in span-1.
- Cracks observed on soffit of cantilever slab at median side in span-1.
- Cracks observed on girder G2, G3 & G4 in span-2.
- Cracks observed on soffit of deck slab between G3 & G4 in span-2.
- Cracks observed on girder G3 & G4 bottom flange in span-2.
- Cracks observed on girders G4 bottom flange in span-3.
- Cracks observed on soffit of deck slab in span-4.
- Cracks observed on girder G4 web in span-4.
- Cracks observed on girder G4 web in span-5.
- Honeycomb observed on soffit of girder G4 in span-5.
- Cracks repaired on soffit of deck slab in span all spans.
- CFRP laminates and warping for girders is observed.












Chainage: 35+039
General Description
RHS MCW (Old)

- Type of Structure : MJB
- Span Arrangement : 10 x 8.0 m
- Total length of Structure : 80 m
- Total deck width of Structure : 8.5 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : Stone Masonry Wall Type & RCC Wall type
- Type of Superstructure : RCC Slab
- Type of Bearing : Not Applicable
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- Crash barrier damaged at median side on span-8 & 9.
- Crash barrier Concrete portion damaged on abutment A1.
- Concrete portion damaged on Pier P1 in Span-1.
- Honeycomb and Steel exposed on Pier cap P2 in Span-2.
- Steel exposed on top slab in span-2, 4 & 5.
- Cracks observed on few Piers of P1, P3, P4, P6, P7, P8 and P9.
- Concrete portion damaged on pier cap-7 in span-8.
- Spalling observed on Soffit of deck slab in Span-8.














Chainage: 42+417
General Description
LHS MCW (New)

- Type of Structure : MJB
- Span Arrangement : 5 x 20.0 m
- Total length of Structure : 100 m
- Total deck width of Structure : 14 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : RCC Wall type
- Type of Superstructure : RCC Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash barrier & MS Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- Crash barrier Concrete portion damaged on Abutment A1 side.
- Rubber Sealant damaged on Ej-1.
- Potholes observed on main carriageway.
- All expansion joints are filled with debris.
- Crack observed on Abutment A1.
- Cracks observed on girders web G1, G2, G3 & G4 in span-1.
- Cracks observed on soffit of deck slab between G2 & G1 in span-1.
- Cracks observed on girder G3 bottom flange in span-2.
- Cracks observed on girder G4 web and bottom flange in span-2.
- Cracks observed on girder G1, G2, G3 & G4 in span-3.
- Cracks observed on soffit of deck slab between G2 & G3 in span-3.
- Cracks observed on soffit of deck slab in span-4.
- Cracks observed on girders G3 & G4 web in span-5.
- CFRP laminates and warping for girders.












Chainage: 42+417
General Description
RHS MCW (New)

- Type of Structure : MJB
- Span Arrangement : 5 x 20.0 m
- Total length of Structure : 100 m
- Total deck width of Structure : 14 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : RCC Wall type
- Type of Superstructure : RCC Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash barrier & MS Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- Crash barrier Concrete portion damaged on Abutment A1.
- Rubber Sealant damaged on EJ-2.
- All expansion joints are filled with debris.
- Potholes observed on main carriageway.
- Cracks observed on Abutment A1.
- Cracks observed on soffit of deck slab between G2, G3 and G3, G4 in span-1.
- Cracks observed on girders G1, G2, G3 & G4 web in span-1.
- Bottom of pier cap P1 Concrete portion damage in span-2.
- Crack observed on pier cap P2 in span-2.
- Cracks observed on soffit of deck slab in span-2.
- Crack observed on girder G4 web in span-2.
- Crack observed on pier cap P2 at median side and middle of pier cap in span-3.
- Cracks observed on soffit of deck slab between G2, G3 and G3, G4 in span-3.
- Cracks observed on girder G1, G2, G3 & G4 web in span-3.
- Cracks observed on bottom flange of girder G3 in span-3.
- Crack observed on cross girder between G2 & G3 in span-3.
- Crack observed on seismic arrester at median side in span-3.
- Crack observed on pier cap P4 in span-4.
- Cracks observed on girders G2, G3, G4 web in span-4.
- Cracks observed on girder G4 bottom flange in span-4.
- Cracks observed on soffit of deck slab between G2 & G3 in span-4.
- Crack observed on pier cap P4 at bridge left side in span-5.
- Crack observed on pier P4 at median side in span-5.
- Cracks observed on soffit of cantilever slab at median side in span-5.
- Cracks observed on girders G2, G3 & G4 web in span-5.








Chainage: 54+697
General Description
LHS MCW (New)

- Type of Structure : MJB
- Span Arrangement : 8 x 21 m
- Total length of Structure : 168 m
- Total deck width of Structure : 14 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : RCC Wall type
- Type of Superstructure : RCC Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash barrier & MS Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- Crash barrier Concrete portion damaged on Abutment A1 left side and median side.
- Rubber Sealant damaged on Expansion joint no.2, 3, 7, & 9.
- Expansion joints damaged on Expansion joint no. 5 & 8.
- All expansion joints are clogged with debris.
- Crash barrier Concrete portion damaged on Abutment A2.
- MS pipe railing missing on footpath.
- Cracks observed on abutment A1.
- Cracks observed on girder G1, G2, G3 & G4 web in span-1.
- Cracks observed on soffit of deck slab between G3 & G4 in span-1.
- Cracks observed on soffit of all girders in span-1.
- Cracks observed on girder G1, G2, G3 & G4 web in span-2.
- Cracks observed on soffit of all girders in span-2.
- Cracks observed on girder G1, G3 & G4 web in span-3.
- Cracks observed on girder G1 & G4 web in span-4.
- Cracks observed on soffit of deck slab between G2, G3 & G3, G4 in span-4.
- Cracks observed on girder G2, G3 & G4 web in span-5.
- Cracks observed on soffit of deck slab between G2, G3 & G3, G4 in span-5.
- Cracks observed on girder G2, G3 & G4 web & G3 bottom flange in span-6.
- Cracks observed on soffit of deck slab between G2, G3 & G3, G4 in span-6.
- Cracks observed on girder G3 & G4 web in span-7.
- Cracks observed on girder G3 bottom flange in span-7.
- Cracks observed on girder G3 & G4 web in span-8.
- Cracks observed on Abutment A2.








Chainage: 54+697
General Description
RHS MCW (New)

- Type of Structure : MJB
- Span Arrangement : 8 x 21 m
- Total length of Structure : 168 m
- Total deck width of Structure : 14 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : RCC Wall type
- Type of Superstructure : RCC Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash barrier & MS Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- Crash barrier Concrete portion damaged at Abutment A2.
- Rubber Sealant damaged on Expansion joint no.3, 5, 6, 7, 8 & 9.
- Cracks observed on girders G1 web in span-1.
- Cracks observed on soffit of deck slab in span-1.
- Cracks observed on soffit of all girders in span-1.
- Cracks observed on girder G1, G2, G3 & G4 in span-2.
- Crack observed on soffit of deck slab in span-2.
- Honeycomb observed on soffit of cross girder between G1 & G2 in span-2.
- Cracks observed on bottom flange of girder G3 & G4 in span-3.
- Cracks observed on girders G3 & G4 web in span-3.
- Crack observed on soffit of deck slab between G2, G3 and G3, G4 in span-3.
- Cracks observed on girders G2, G3 & G4 web in span-4.
- Cracks observed on soffit of deck slab between G2 & G3 in span-4.
- Crack observed on pier P5 in span-5.
- Cracks observed on G2, G3 & G4 web in span-5.
- Cracks observed on soffit of deck slab between G2 & G3 in span-5.
- Crack observed on bottom flange of girder G3 in span-6
- Cracks observed on G2, G3 & G4 web in span-6.
- Cracks observed on soffit of deck slab between G2 & G3 in span-6.
- Cracks observed on G2, G3 & G4 web in span-7.
- Crack observed on bottom flange of girder G2, G3 & G4 in span-7.
- Crack observed on soffit of cantilever slab at median side in span-7
- Cracks observed on G3 & G4 web in span-8.
- Cracks observed on bottom flange of girder G3 in span-8.








Chainage: 65+421
General Description
LHS MCW (New)

- Type of Structure : MJB
- Span Arrangement : 8 x 18.5 m
- Total length of Structure : 148 m
- Total deck width of Structure : 14 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : RCC Wall type
- Type of Superstructure : RCC Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash barrier & MS Railing
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:

- MS pipe railing missing on footpath at Abutment A1.
- Crash barrier Concrete portion damaged on Abutment A1.
- Rubber Sealant damaged on expansion joint no.2
- Expansion Joints are clogged with debris.
- Cracks observed on girders G2, G3, G4 web in span-1.
- Cracks observed on girders G2, G3, G4 web in span-2.
- Cracks observed on soffit of deck slab between G2 & G3 in span-2.
- Cracks observed on girders G2, G3, G4 web in span-3.
- Cracks observed on girders G2, G3, G4 web in span-4.
- Cracks observed on girders G2, G3, G4 web in span-5.
- Cracks observed on girders G2, G3, G4 web in span-6.
- Cracks observed on soffit of deck slab between G3 & G4 in span-6.
- Cracks observed on girders G2, G3, G4 web in span-7.
- Cracks observed on girders G2, G3, G4 web in span-8.












Table 33:Details of ROB's

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Str	Span Arrangement (m)	Deck Width (m)	Skew (Y/N)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
										Abutment	Pier		
1	9+950	ROB	LHS	MCW	New	2 x 19.3 + 1 x 32.3	14	Yes	Not visible	RCC Wall type	RCC Wall type	Steel Girder	Pot PTFE
2	9+950	ROB	RHS	MCW	New	2 x 19.3 + 1 x 32.3	14	Yes	Not visible	RCC Wall type	RCC Wall type	Steel Girder	Pot PTFE

Table 34 Details of Major Bridges

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Str	Span Arrangement (m)	Deck Width (m)	Skew (Y/N)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
										Abutment	Pier		
1	27+497	MJB	LHS	MCW	New	5 x 16 + 1 x 8	14	No	Not visible	RCC Wall type	RCC Wall type	RCC Girder & RCC Slab	Pot PTFE
2	27+497	MJB	RHS	MCW	Old	11 x 8	8.5	No	Not visible	Stone Masonry Wall Type	Stone Masonry Wall Type	RCC Slab	0
3	35+039	MJB	LHS	MCW	New	5 x 16.6	14	No	Not visible	RCC Wall type	RCC Wall type	RCC Girder	Pot PTFE
4	35+039	MJB	RHS	MCW	Old	10 x 8.0	8.5	No	Not visible	Stone Masonry Wall Type	RCC Wall type	RCC Slab	0
5	42+417	MJB	LHS	MCW	New	5 x 20.0	14	No	Not visible	RCC Wall type	RCC Wall type	RCC Girder	Pot PTFE
6	42+417	MJB	RHS	MCW	New	5 x 20.0	14	No	Not visible	RCC Wall type	RCC Wall type	RCC Girder	Pot PTFE
7	54+697	MJB	LHS	MCW	New	8 x 21	14	No	Not visible	RCC Wall type	RCC Wall type	RCC Girder	Pot PTFE
8	54+697	MJB	RHS	MCW	New	8 x 21	14	No	Not visible	RCC Wall type	RCC Wall type	RCC Girder	Pot PTFE
9	58+795	MJB	LHS	MCW	New	7 x 18.5	14	No	Not visible	RCC Wall type	RCC Wall type	RCC Girder	Pot PTFE
10	58+795	MJB	RHS	MCW	Old	7 x 18.5	12	No	Well	RCC Wall type	RCC Wall type	RCC Girder	Elastomeric
11	65+421	MJB	LHS	MCW	New	8 x 18.5	14	No	Not visible	RCC Wall type	RCC Wall type	RCC Girder	Pot PTFE
12	65+421	MJB	RHS	MCW	Old	8 x 18.5	12	No	Well	RCC Wall type	RCC Wall type	RCC Girder	Elastomeric

Table 35 Details of Minor Bridges

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Str	Span Arrangement (m)	Deck Width (m)	Skew (Y/N)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
										Abutment	Pier		
1	8+720	MNB	LHS	SR	New	4 x 7	13.7	No	Not visible	RCC Wall type	RCC Wall type	RCC Slab	-
2	8+720	MNB	LHS	MCW	New	4 x 7	15.75	No	Not visible	RCC Wall type	RCC Wall type	RCC Slab	-
3	8+720	MNB	RHS	MCW	New	4 x 7	15.75	No	Not visible	RCC Wall type	RCC Wall type	RCC Slab	-
4	8+720	MNB	RHS	SR	New	4 x 7	14.7	No	Not visible	RCC Wall type	RCC Wall type	RCC Slab	-

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Str	Span Arrangement (m)	Deck Width (m)	Skew (Y/N)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
										Abutment	Pier		
5	13+547	MNB	LHS	MCW	New	3 x 13.0	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
6	13+547	MNB	RHS	MCW	New	3 x 13.0	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
7	15+407	MNB	LHS	MCW	New	1 x 13.9	18.7	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
8	15+407	MNB	RHS	MCW	New	1 x 13.9	18.7	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
9	15+752	MNB	LHS	SR	New	10 x 1.2	10	No	Not visible	RCC Pipe	0	RCC Pipe	-
10	15+752	MNB	LHS	MCW	New	2 x 10.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
11	15+752	MNB	RHS	MCW	New	2 x 10.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
12	15+752	MNB	RHS	SR	New	10 x 1.2	10	No	Not visible	RCC Pipe	0	RCC Pipe	-
13	17+227	MNB	LHS	MCW	New	1 x 10.3	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
14	17+227	MNB	RHS	MCW	New	1 x 10.3	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
15	28+566	MNB	LHS	MCW	New	2 x 10.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
16	28+566	MNB	RHS	MCW	New	2 x 10.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
17	30+513	MNB	LHS	SR	New	15 x 1.2	12	No	-	RCC Pipe	-	RCC Pipe	-
18	30+513	MNB	LHS	MCW	New	3 x 10.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
19	30+513	MNB	RHS	MCW	New	3 x 10.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
20	30+513	MNB	RHS	SR	New	19 x 1.2	12	No	-	RCC Pipe	-	RCC Pipe	-
21	31+996	MNB	LHS	MCW	New	3 x 6	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
22	31+996	MNB	RHS	MCW	Old	3 x 6	8	No	Not visible	Stone Masonry Wall Type	Stone Masonry Wall Type	RCC Slab	-
23	38+109	MNB	LHS	MCW	New	2 x 10.5	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
24	38+109	MNB	RHS	MCW	New	2 x 10.5	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
25	48+428	MNB	LHS	MCW	New	3 x 11.5	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
26	48+428	MNB	RHS	MCW	New	3 x 11.5	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
27	49+519	MNB	LHS	MCW	New	1 x 16	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
28	49+519	MNB	RHS	MCW	New	1 x 16	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
29	57+845	MNB	LHS	MCW	New	1 x 10	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
30	57+845	MNB	RHS	MCW	New	1 x 10	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
31	59+420	MNB	LHS	MCW	New	1 x 10	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
32	59+420	MNB	RHS	MCW	New	1 x 10	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
33	59+606	MNB	LHS	MCW	New	1 x 7.5	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
34	59+606	MNB	RHS	MCW	New	1 x 7.5	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
35	61+148	MNB	LHS	MCW	New	4 x 10.4	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
36	61+148	MNB	RHS	MCW	Old	4 x 10.4	12	No	Not visible	RCC Wall type	RCC Wall type	RCC Slab	-
37	61+250	MNB	LHS	MCW	New	1 x 9.92 + 1 x 10.0 + 1 x 9.92	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
38	61+250	MNB	RHS	MCW	Old	1 x 9.65 + 1 x 10 + 1 x 9.65	12	No	Not visible	RCC Wall type	RCC Wall type	RCC Slab	-
39	61+950	MNB	LHS	MCW	New	3 x 4.34	8.5	Yes	Not visible	RCC Wall type	RCC Wall type	RCC Slab	-

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Str	Span Arrangement (m)	Deck Width (m)	Skew (Y/N)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
										Abutment	Pier		
40	61+950	MNB	RHS	MCW	New	3 x 4.34	8.5	Yes	Not visible	RCC Wall type	RCC Wall type	RCC Slab	-
41	62+116	MNB	LHS	MCW	New	1 x 10 + 2 x 10.5	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
42	62+116	MNB	RHS	MCW	Old	9.6 + 10.5 + 9.6	12	No	Not visible	RCC Wall type	RCC Wall type	RCC Slab	-
43	64+326	MNB	LHS	MCW	New	1 x 14.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
44	64+326	MNB	RHS	MCW	New	1 x 14.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
45	64+513	MNB	LHS	MCW	New	3 x 9.5	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
46	64+513	MNB	RHS	MCW	New	3 x 9.5	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
47	66+650	MNB	LHS	MCW	New	1 x 5.9 + 1 x 6.3 + 1x 6.3 + 1x 5.9	18.5	No	Not visible	RCC Wall type	RCC Wall type	RCC Slab	-
48	66+650	MNB	RHS	MCW	New	1 x 5.9 + 1 x 6.3 + 1x 6.3 + 1x 5.9	18.5	No	Not visible	RCC Wall type	RCC Wall type	RCC Slab	-
49	69+024	MNB	LHS	MCW	New	1 x 10.4 + 1 x 10 + 1 x 10.4	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
50	69+024	MNB	RHS	MCW	Old	1 x 9.9 + 1 x 10.4 + 1 x 9.9	12	No	Not visible	RCC Wall type	RCC Wall type	RCC Slab	-

Table 36 Details of VUP's

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Str	Span Arrangement (m)	Deck Width (m)	Skew (Y/N)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
										Abutment	Pier		
1	2+815	VUP	LHS	MCW	New	1 x 10.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
2	2+815	VUP	RHS	MCW	New	1 x 10.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
3	4+630	VUP	LHS	MCW	New	2 x 10.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
4	4+630	VUP	RHS	MCW	New	2 x 10.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
5	8+840	VUP	LHS	MCW	New	1 x 10.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
6	8+840	VUP	RHS	MCW	New	1 x 10.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
7	11+267	VUP	LHS	MCW	New	2 x 10.5	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
8	11+267	VUP	RHS	MCW	New	2 x 10.5	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
9	15+899	VUP	LHS	MCW	New	1 x 10.5	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
10	15+899	VUP	RHS	MCW	New	1 x 10.5	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
11	19+870	VUP	LHS	MCW	New	2 x 10.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
12	19+870	VUP	RHS	MCW	New	2 x 10.0	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
13	25+410	VUP	LHS	MCW	New	1 x 10.7	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
14	25+410	VUP	RHS	MCW	New	1 x 10.7	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
15	30+659	VUP	LHS	MCW	New	1 x 10.7	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
16	30+659	VUP	RHS	MCW	New	1 x 10.7	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
17	43+382	VUP	LHS	MCW	New	2 x 10.5	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
18	43+382	VUP	RHS	MCW	New	2 x 10.5	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
19	46+688	VUP	LHS	MCW	New	1 x 10	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
20	46+688	VUP	RHS	MCW	New	1 x 10	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
21	51+300	VUP	LHS	MCW	New	1 x 10	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
22	51+300	VUP	RHS	MCW	New	1 x 10	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
23	57+239	VUP	LHS	MCW	New	2 x 10.6	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
24	57+239	VUP	RHS	MCW	New	2 x 10.6	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
25	62+579	VUP	LHS	MCW	New	1 x 12.2	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-
26	62+579	VUP	RHS	MCW	New	1 x 12.2	14	Yes	RCC Raft	RCC Box	RCC Box	RCC Box	-

Table 37 Details of PUP's

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Str	Span Arrangement (m)	Deck Width (m)	Skew (Y/N)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
										Abutment	Pier		
1	16+654	PUP	LHS	MCW	New	1 x 10	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
2	16+654	PUP	RHS	MCW	New	1 x 10	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
3	67+440	PUP	LHS	MCW	New	1 x 10	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
4	67+440	PUP	RHS	MCW	New	1 x 10	14	No	RCC Raft	RCC Box	RCC Box	RCC Box	-

Table 38 Details of CUP's

Sl. No.	Site Chainage (Km)	Type of Structure	Side	Str on	Age of Str	Span Arrangement (m)	Deck Width (m)	Skew (Y/N)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
										Abutment	Pier		
1	26+390	CUP	LHS	MCW	New	1 x 3.0	21	No	RCC Raft	RCC Box	RCC Box	RCC Box	-
2	26+390	CUP	RHS	MCW	New	1 x 3.0	21	No	RCC Raft	RCC Box	RCC Box	RCC Box	-

NDT Tests: Out of 28 Nos. of NDT test suggested locations. The following tests have been performed

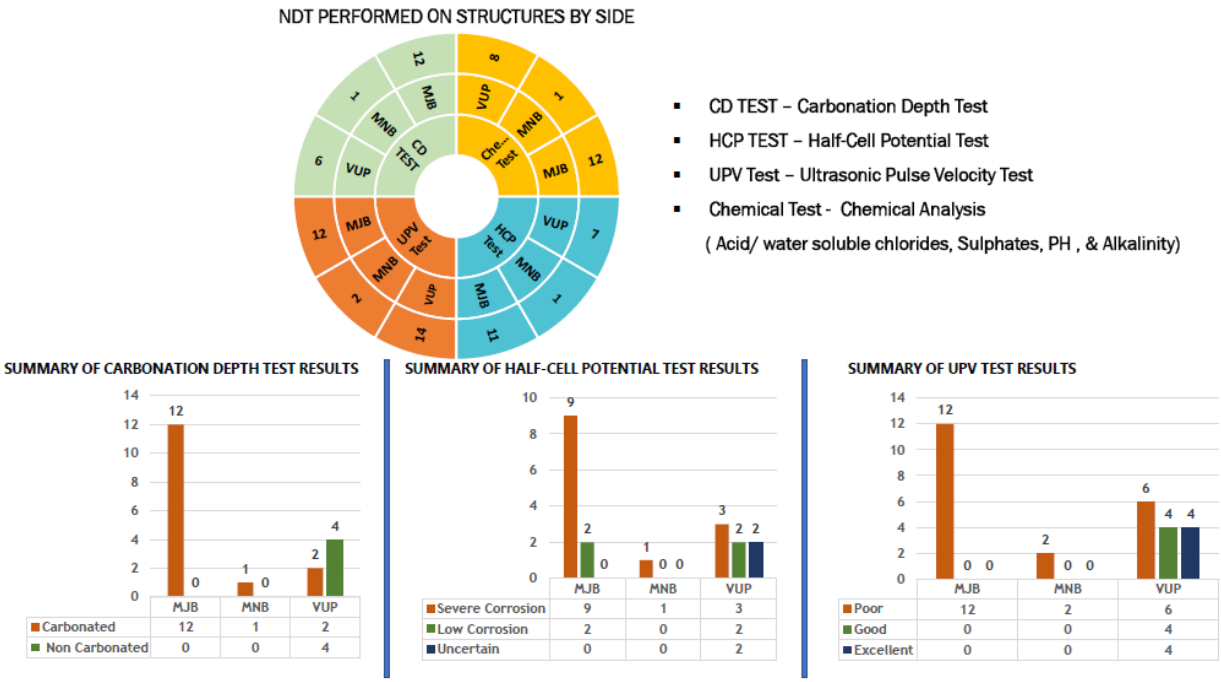


Table 39:Depth of Carbonation Details

- **Depth of Carbonation:**

S. No	Chainage (km)	Type of Str	Side	Age of Str	Location of test	Depth of Carbonation (mm)	Year of Construction	Years elapsed since construction	K Value	Cover Depth (mm)	Time for carbonation to progress fully into cover	Remarks
1	27+497	MJB	LHS	New	Span-2 (Cantilever Slab) & Span-4 (Slab btw G3-G4 near P4)	30	2012	12	8.660	40	21	
2	27+497	MJB	RHS	Old	Span-3 (Deck slab at Centre) Span-6 Cantilever slab)	30	2000	24	6.124	40	43	
3	35+039	MJB	LHS	New	Span-3 (G4 Web near P2) & (Deck slab btw G3-G4)	10	2012	12	2.887	40	192	
4	35+039	MJB	RHS	Old	Span-7 (Slab) & Span-9 (Slab)	40	2000	24	8.165	40	24	
5	42+417	MJB	LHS	New	Span-1 (G3 web Centre & Cantilever Slab near A1) Span-4 (Cantilever slab near P4)	20	2012	12	5.774	40	48	
6	42+417	MJB	RHS	New	Span-3 (G3 web Centre & Cantilever Slab)	30	2012	12	8.660	40	21	
7	54+697	MJB	LHS	New	Span-6 (Deck slab btw G3-G4 near P6)	10	2012	12	2.887	40	192	
8	54+697	MJB	RHS	New	Span-8 Cantilever slabne near A2	20	2012	12	5.774	40	48	
9	57+239	MJB	LHS	New	Span-1 (Deck slab Centre)	30	2012	12	8.660	40	21	
10	57+239	MJB	RHS	New	Span-1 (Deck slab Centre)	30	2012	12	8.660	40	21	
11	58+795	MJB	LHS	New	Span-3 (Deck slab Centre btw G3-G4) Span-5 (Deck slab Centre btw G3-G4	20	2013	11	6.030	40	44	
12	65+421	MJB	RHS	Old	Span-6 (Deck slab Btw G2 & G3)	20	2011	13	5.547	40	52	

S. No	Chainage (km)	Type of Str	Side	Age of Str	Location of test	Depth of Carbonation (mm)	Year of Construction	Years elapsed since construction	K Value	Cover Depth (mm)	Time for carbonation to progress fully into cover	Remarks
					& Span-7 (Deck slab btw G3 & G4)							
13	13+457	MNB	LHS	New	Span-1 (A1 centre)	20	2013	11	6.030	75	155	
14	4+625	VUP	RHS	New	Span-1 (Intermediate wall shoulder side)	10	2013	11	3.01511345	75	618.75	
15	11+267	VUP	RHS	New	Span-1 (Intermediate wall centre)	10	2013	11	3.01511345	75	618.75	
16	15+899	VUP	RHS	New	Span-1 (A1 centre)	-	2013	11	-	75	-	No Carbonation
17	19+870	VUP	RHS	New	Span-1 (Intermediate wall)	-	2013	11	-	75	-	No Carbonation
18	43+382	VUP	RHS	New	Span-1 (A1 Centre)	-	2013	11	-	75	-	No Carbonation
19	51+300	VUP	RHS	New	Span-1 (Abutment A1 centre)	-	2013	11	-	75	-	No Carbonation

- **Chloride Content Test:**

S.no	Chainage (km)	Type of Str	Side	Age of Str.	Test Location	Maximum Total Acid Soluble kg/m3	Actual Total Acid Soluble	Result	Chloride Contains (Yes/No)
1	27+497	MJB	LHS	New	P3 - P4 Span Cantilever mid - (End - P4)	0.6	0.016	0.40	No
2	27+497	MJB	RHS	Old	P7 - P8 Span (Shoulder)	0.6	0.02	0.50	No
3	35+039	MJB	LHS	New	P4 - A2 Span Cantilever mid - (Centre)	0.6	0.024	0.60	Yes
4	35+039	MJB	RHS	Old	P6 - P7 Span - Centre	0.6	0.026	0.65	Yes
5	42+417	MJB	LHS	New	A1 - P1 Span G3 - (Centre)	0.6	0.028	0.70	Yes
6	42+417	MJB	RHS	Old	P3 - P4 Span Cantilever mid - (Centre)	0.6	0.015	0.38	No
7	54+697	MJB	LHS	New	P7 - A2 Span Cantilever mid - (Start - P7)	0.6	0.019	0.48	No
8	54+697	MJB	RHS	New	P6 - P7 Span Cantilever mid - (Start - P6)	0.6	0.022	0.55	No
9	58+795	MJB	LHS	New	P2 - P3 Span (G3 - G4) - (End - near P2)	0.6	0.026	0.65	Yes
10	58+795	MJB	RHS	Old	P1 - P2 Span G2 - (End - near P2)	0.6	0.016	0.40	No

S.no	Chainage (km)	Type of Str	Side	Age of Str.	Test Location	Maximum Total Acid Soluble kg/m3	Actual Total Acid Soluble	Result	Chloride Contains (Yes/No)
11	65+421	MJB	LHS	New	P3 - P4 Span Cantilever mid - (End - near P4)	0.6	0.013	0.33	No
12	65+421	MJB	RHS	Old	A1 - P1 Span G4 - (Centre)	0.6	0.028	0.70	Yes
13	13+457	MNB	LHS	New	P1 - A2 Span A2 - (Cantilever Mid)	0.6	0.017	0.43	No
14	4+625	VUP	RHS	New	A1 - P1 Span - P1 - (Shoulder)	0.6	0.012	0.30	No
15	11+267	VUP	RHS	New	A1 - P1 Span - P1 - (Centre)	0.6	0.021	0.53	No
16	15+899	VUP	RHS	New	A1 - A2 Span - A1 - (Centre)	0.6	0.018	0.45	No
17	19+870	VUP	RHS	New	A1 - P1 Span - P1 - (Shoulder)	0.6	0.013	0.33	No
18	43+382	VUP	RHS	New	A1 - P1 Span - A1 (Centre)	0.6	0.009	0.23	No
19	51+300	VUP	RHS	New	A1 - A2 Span - A1 (Centre)	0.6	0.014	0.35	No
20	57+239	VUP	LHS	New	A1 - P1 Span (Centre)	0.6	0.026	0.65	Yes
21	57+239	VUP	RHS	New	A1 - P1 Span - A1 (Shoulder)	0.6	0.01	0.25	No

❖ **Comments on NDT Tests**

- Carbonation Depth:
  - ✓ The cover is seen to have lost its efficiency in protecting the rebar. An estimate has been attempted to assess the time required for the carbonation to breach the full cover.
  - ✓ This prediction is done by applying FICKS second law.
  - ✓ As an example, the structure in which the carbonation front as progressed to the maximum extent 30mm into the cover, this suggest that, the efficiency of cover, in reducing corrosion of rebar is practically nil. In the case with 30mm carbonation depth, the time period likely during which the carbonation front is likely to reach rebar is 25 years as per FICKS second law of diffusion. It is to be kept in mind that FICKS law gives an over estimate of the time period required for the carbonation front to reach the rebar, hence the life of the cover concrete cannot be more than 25 years. Protective coating may delay the progress of carbonation front. This aspect can be seen to be true, if there is no synergistic attack of chloride and carbonation.

- **Half-Cell potential Test:**
  - ✓ The results of these tests indicate out of 27 test locations,10 locations show Low Corrosion, 6 locations show high corrosion, 9 locations show severe corrosion and another 02 locations shows it is uncertain. The results indicate that reinforcing steel is under active corrosion.

- **Ultrasonic Pulse Velocity Test:**
  - ✓ The concrete quality is suspect as reflected from the abnormally high standard deviation values. It can be said that premature deterioration values. It can be said that premature deterioration of concrete at a rapid rate is most likely.
  - ✓ The large range of UPV values support the above fact.
  - ✓ Characteristic value of concrete quality grading varies poor to excellent. In the large number of observed values, the test observations with value poor or substantially more than the observations indicating the good quality.
  - ✓ Those there is likelihood of fast deterioration of concrete parameters of strength durability and integrity.

Observations:

- ✓ The Project stretch have 45 no's of major structures, in that 1 ROB's, 6 MJB's, 22 MNB's, 13 VUP's, 2 PUP's & 1 CUP's.
- ✓ The Project Road has various types of super structure types for various structures such as Steel Girder, RCC Girder & RCC Slab, RCC Girder, RCC Slab, RCC Box.
- ✓ In this Project stretch, there are Elastomeric (Old-120 No's), Pot PTFE (New-588No's) Bearings observed in Structures.
- ✓ Structures are having 85 No's of expansion joints in that 17 No's on old structure and 68 No's on new structure.
- ✓ There are a total of 9 old bridges, with 9 no's on the right side. (5 MNB's, 4 MJB's)
- ✓ Some structures are already repaired and it would be necessary to closely examine these structures for further distress during the maintenance period/Project duration, by way of close inspection and testing.
- ✓ Debris observed on Abutment & pier cap at couple of locations, Cleaning of expansion joints, drainage spouts need to be done regularly.
- ✓ Keeping in view the Half cell potential; & carbonation test results, applying anti-carbonation paint on the concrete surface to slow down the carbonation progress may be considered.
- ✓ The UPV results indicate poor workmanship / uneven concrete surface. Regular monitoring and maintenance is required in terms of crack sealing, jacketing , etc.

Photos depicting existing Box Culverts/Slab Culverts are presented below:



Box Culvert at Km 10+940



Slab Culvert at Km 29+200



Slab Culvert at Km 34+670



Box Culvert at Km 40+361



Box Culvert at Km 47+090



Box Culvert at Km 69+488

Photos depicting existing Pipe Culverts are presented below:



Pipe Culvert at Km 2+700



Pipe Culvert at Km 18+787



Pipe Culvert at Km 23+706



Pipe Culvert at Km 30+267



Pipe Culvert at Km 36+074



Pipe Culvert at Km 38+814

4.7 DRAINAGE AND SLOPE PROTECTION

- ✓ Lined Covered drains observed at urban locations and at service road Locations along the corridor.
- ✓ No major damages observed at covered drain locations.

4.8 TRAFFIC SAFETY AND ROAD FURNITURE

- ✓ Metal beam crash barriers provided along the project road appear to be intact over entire length except for few locations where it got damaged.
- ✓ Pedestrian guard rails installed on the Separator & appear to be intact over length except for few locations where it got damaged.
- ✓ Median Opening locations appear to be in fair to Poor condition. All unauthorized Median Openings to be Closed.
- ✓ New Solar blinkers to be Provided at median openings in the entire project corridor.
- ✓ Street lightings and High masts are observed at urban locations, Toll Plaza & Junction Locations. At few locations street lightings are got damaged/ not functioning well and those items are addressed in the initial cost.

4.9 ROAD USER FACILITIES

- ✓ The Bus Bay with Shelters and truck lay byes were provided along the corridor.

CHAPTER 5. REHABILITATION PLANS AND DESIGNS

5.1 DESIGN TRAFFIC LOADING

Design Traffic loading has been estimated by considering the latest traffic numbers (FY2025) as supplied by client, VDFs as estimated from the latest axle load survey data and with 5% growth rates for 10 years, 15 years and 20 years design period as below:

Table 40: Traffic Volume (AADT)

Vehicle/Mode	Toll Plaza-1 Km 44+630 (Mokha Toll Plaza)	
	HS-1	HS-2
LCV	120	42
BUS	76	26
2A	404	141
3A	638	223
MAV	10576	3702

Note: The given AADT of 2-axle data is combination of buses and 2-axle trucks, thus, it is considered as 30% for buses and the rest for 2axle trucks.

As there is substantial amount of traffic is deviating from the Project Road from km 56.600 nearer to Mundra. Accordingly, about 35% of the traffic is considered for section-2.

Table 41: Estimated Design traffic loading

Description	Section-1 (Mokha plaza km 44+630)		Section-2 (Mundra 56+600)	
	UP	DN	UP	DN
10th year from Now	265	292	93	102
15th year from Now	455	500	159	175
20th year from Now	697	767	244	268

In view of the higher design traffic loading i.e., 20 years MSA is more than 700 MSA. Thus, it may be required to design Perpetual Pavement for capacity Augmentation it is essential to consider either:

- *Higher Grade Materials like HIPER MIXES for DBM and SMA for Wearing Course*
- *Short Slab Concrete Panels is alternative*
- *Even for Overlay it is recommended to consider HIPER Mix and SMA in place of DBM and BC*

The computation of traffic loadings is presented in **Appendix 9** of this Report. Design traffic corresponding to 10 years period has been considered for overlay design.

5.2 PAVEMENT REHABILITATION AND STRENGTHENING

5.2.1 Flexible Pavement Strengthening

For Design the Overlay Thickness the following method as suggested in IRC: 115 has been used

- The existing pavement is considered as a 3-layer system consisting of subgrade, granular and bituminous layer. The remaining life of exiting pavement in terms of Fatigue and Rutting life (MSA) are estimated
- The remaining life is compared with design traffic loading. An overlay with assumed thickness is considered on exiting pavement where required.
- The Total system including the proposed Overlay (Trial thickness) is assumed as a four-layer system and considered the relevant MR values for all the four layers namely New BT layer, existing bituminous surface, total existing Granular layers and Subgrade layers.
- The MR value for the New BT is assumed as 3000 MPA (considering VG40 Bituminous grade) for Main Carriageway and for all the remaining three layers, the MR Values derived and finalized from the FWD Analysis are considered
- Critical Tensile strains and Vertical strains are found out by using the IIT PAVE Software at the bottom of existing bituminous layer and at the top of the subgrade layer respectively.
- The Fatigue and Rutting equations (equation given in the IRC: 115) have been used to estimate the Fatigue and Rutting Life of The Pavement system.
- The Obtained Fatigue and Rutting Life are compared with the required life for the assumed trial overlay thickness.

Remaining life of the existing pavement from the above analysis is presented in the following tables:

Table 42: Remaining life of the existing pavement on LHS Carriageway

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC - 115 Equations for 90% Reliability			Remarks
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tangential strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA	
1	LHS	0.00	1.75	1.75	1365	443	100	220	400	620	1365	0.0002040	0.0001267	216	759	265	Overlay
2	LHS	1.75	3.60	1.85	893	101	100	220	400	620	893	0.0002763	0.0003153	9	192	265	Overlay
3	LHS	3.60	5.75	2.15	1694	231	99	220	400	620	1694	0.0002199	0.0001575	77	540	265	Overlay
4	LHS	5.75	8.00	2.25	2858	471	100	220	400	620	2858	0.0001632	0.0000869	500	2087	265	No Overlay
5	LHS	8.00	10.00	2.00	941	101	99	220	400	620	941	0.0002743	0.0003064	10	198	265	Overlay
6	LHS	10.00	12.00	2.00	1733	100	100	220	400	620	1733	0.0002258	0.0002125	24	479	265	Overlay
7	LHS	12.00	13.01	1.01	820	192	100	220	400	620	820	0.0002684	0.0002390	28	219	265	Overlay
8	LHS	13.01	14.02	1.01	451	102	100	220	400	620	451	0.0003263	0.0004384	4	90	265	Overlay
9	LHS	14.02	15.26	1.24	752	195	100	220	400	620	752	0.0002728	0.0002447	28	203	265	Overlay
10	LHS	15.26	16.58	1.32	541	104	100	220	426	646	541	0.0002954	0.0004004	5	142	265	Overlay
11	LHS	16.58	18.20	1.62	1222	251	100	220	500	720	1222	0.0001875	0.0001725	72	1113	265	Overlay
12	LHS	18.20	19.29	1.10	1271	487	100	220	500	720	1271	0.0001528	0.0001096	404	2814	265	No Overlay
13	LHS	19.29	20.33	1.03	1325	473	100	220	500	720	1325	0.0001533	0.0001108	373	2772	265	No Overlay
14	LHS	20.33	21.36	1.03	1120	295	100	220	500	720	1120	0.0001832	0.0001617	99	1236	265	Overlay
15	LHS	21.36	22.54	1.18	1287	124	100	122	418	540	1287	0.0003830	0.0004281	2	44	265	Overlay
16	LHS	22.54	23.72	1.18	1434	128	100	100	400	500	1434	0.0004417	0.0004677	1	23	265	Overlay
17	LHS	23.72	24.84	1.12	1495	183	100	100	400	500	1495	0.0004093	0.0003747	3	32	265	Overlay
18	LHS	24.84	25.98	1.14	1505	154	98	100	400	500	1505	0.0004304	0.0004135	2	26	265	Overlay
19	LHS	25.98	28.50	2.52	3068	489	100	244	408	652	3000	0.0001426	0.0000745	872	3848	265	No Overlay
20	LHS	28.50	31.01	2.51	3093	406	100	280	410	690	3000	0.0001294	0.0000689	1179	5978	265	No Overlay
21	LHS	31.01	33.48	2.47	884	196	100	280	410	690	884	0.0002087	0.0001740	91	685	265	Overlay
22	LHS	33.48	35.50	2.02	860	101	99	268	420	688	860	0.0002236	0.0002516	22	501	265	Overlay
23	LHS	35.50	37.75	2.25	1664	358	100	230	450	680	1664	0.0001727	0.0001192	231	1615	265	Overlay
24	LHS	37.75	40.21	2.46	1134	127	99	230	450	680	1134	0.0002253	0.0002384	22	484	265	Overlay
25	LHS	40.21	42.25	2.04	718	122	100	230	450	680	718	0.0002514	0.0003075	12	294	265	Overlay
26	LHS	42.25	44.40	2.15	739	203	100	230	450	680	739	0.0002341	0.0002286	37	407	265	Overlay

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC - 115 Equations for 90% Reliability			Remarks
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tangential strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA	
27	LHS	44.40	44.86	0.46	Toll Plaza												
28	LHS	44.86	47.77	2.91	779	101	100	239	450	689	779	0.0002400	0.0003077	11	363	265	Overlay
29	LHS	47.77	48.81	1.04	646	101	100	240	450	690	646	0.0002507	0.0003377	9	298	265	Overlay
30	LHS	48.81	49.98	1.16	610	100	98	240	450	690	610	0.0002581	0.0003494	8	261	265	Overlay
31	LHS	49.98	52.21	2.24	876	219	100	240	450	690	876	0.0002154	0.0001957	58	593	265	Overlay
32	LHS	52.21	54.25	2.04	1271	219	97	240	450	690	1271	0.0002012	0.0001670	78	808	265	Overlay
33	LHS	54.25	56.95	2.70	3066	488	100	185	411	596	3000	0.0001799	0.0000980	299	1342	265	No Overlay
34	LHS	56.95	57.65	0.70	1060	101	100	170	400	570	1060	0.0003315	0.0003803	4	84	93	Overlay
35	LHS	57.65	59.27	1.62	1585	229	100	170	400	570	1585	0.0002760	0.0002102	27	193	93	Overlay
36	LHS	59.27	60.39	1.13	1005	154	100	170	400	570	1005	0.0003240	0.0003174	8	93	93	Overlay
37	LHS	60.39	61.99	1.60	840	108	100	168	404	572	840	0.0003480	0.0004189	3	67	93	Overlay
38	LHS	61.99	63.14	1.15	1267	392	100	160	420	580	1267	0.0002453	0.0001706	72	329	93	Overlay
39	LHS	63.14	63.99	0.85	1103	183	100	160	420	580	1103	0.0003079	0.0002925	10	117	93	Overlay
40	LHS	63.99	66.26	2.26	2458	327	100	160	420	580	2458	0.0002311	0.0001504	67	431	93	Overlay
41	LHS	66.26	69.00	2.75	2423	276	100	176	469	645	2423	0.0002016	0.0001509	67	801	93	Overlay
42	LHS	69.00	71.40	2.40	2923	486	100	180	480	660	2923	0.0001574	0.0001000	284	2460	93	No Overlay
Total Length				71.40													

Table 43: Remaining life of the existing pavement on RHS Carriageway

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC - 115 Equations for 90% Reliability			Remarks
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tangential strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA	
1	RHS	0.00	2.00	2.00	736	102	99	210	500	710	736	0.0002472	0.0003667	6	318	292	Overlay
2	RHS	2.00	3.93	1.93	548	101	100	210	500	710	548	0.0002608	0.0004248	4	249	292	Overlay
3	RHS	3.93	4.99	1.06	453	100	99	210	500	710	453	0.0002726	0.0004644	4	204	292	Overlay
4	RHS	4.99	6.97	1.98	1445	462	100	208	500	708	1445	0.0001579	0.0001157	293	2424	292	No Overlay
5	RHS	6.97	8.69	1.72	883	198	100	200	500	700	883	0.0002251	0.0002483	23	486	292	Overlay
6	RHS	8.69	10.99	2.30	588	100	99	200	500	700	588	0.0002688	0.0004350	4	217	292	Overlay
7	RHS	10.99	13.75	2.76	2409	343	100	200	453	653	2409	0.0001788	0.0001201	164	1380	292	Overlay
8	RHS	13.75	15.99	2.23	737	101	100	200	440	640	737	0.0002891	0.0003881	5	156	292	Overlay
9	RHS	15.99	18.25	2.26	2670	345	100	200	440	640	2670	0.0001793	0.0001145	181	1363	292	Overlay
10	RHS	18.25	20.73	2.48	849	205	100	160	432	592	849	0.0003050	0.0003029	11	123	292	Overlay
11	RHS	20.73	22.24	1.51	1378	273	100	100	420	520	1378	0.0003484	0.0002945	8	67	292	Overlay
12	RHS	22.24	23.98	1.74	1281	109	97	100	420	520	1281	0.0004454	0.0005363	1	22	292	Overlay
13	RHS	23.98	24.99	1.02	1230	112	89	100	420	520	1230	0.0004744	0.0005389	1	17	292	Overlay
14	RHS	24.99	27.77	2.78	2051	102	99	140	413	553	2051	0.0003256	0.0003180	4	91	292	Overlay
15	RHS	27.77	28.99	1.22	708	190	100	220	400	620	708	0.0002775	0.0002542	25	188	292	Overlay
16	RHS	28.99	30.97	1.99	591	105	100	228	471	699	591	0.0002555	0.0003675	7	274	292	Overlay
17	RHS	30.97	31.99	1.02	1103	489	100	230	490	720	1103	0.0001556	0.0001085	474	2591	292	No Overlay
18	RHS	31.99	33.75	1.76	2435	488	100	215	455	670	2435	0.0001511	0.0000915	467	2960	292	No Overlay
19	RHS	33.75	35.79	2.04	2585	323	99	200	420	620	2585	0.0001928	0.0001206	152	980	292	Overlay
20	RHS	35.79	38.75	2.96	879	100	74	200	420	620	879	0.0003585	0.0003595	5	59	292	Overlay
21	RHS	38.75	41.67	2.93	774	101	99	214	456	671	774	0.0002634	0.0003516	7	238	292	Overlay
22	RHS	41.67	44.40	2.73	884	100	99	220	470	690	884	0.0002421	0.0003185	9	349	292	Overlay
23	RHS	44.40	44.86	0.46	Toll Plaza												
24	RHS	44.86	47.61	2.75	744	101	99	220	470	690	744	0.0002524	0.0003478	7	289	292	Overlay
25	RHS	47.61	50.25	2.64	878	101	99	208	470	678	878	0.0002544	0.0003396	7	279	292	Overlay
26	RHS	50.25	52.39	2.14	1373	178	93	180	470	650	1373	0.0002544	0.0002415	17	279	292	Overlay
27	RHS	52.39	55.99	3.60	1227	373	100	180	470	650	1227	0.0002056	0.0001595	97	733	292	Overlay
28	RHS	55.99	56.95	0.96	1420	470	100	180	470	650	1420	0.0001852	0.0001292	194	1177	292	Overlay

S.No	Side	From	To	Length (Km)	15th Percentile MR values			Average Existing Crust		Total Crust (mm)	Adopted MR for BT (Mpa)	Strains From IITPAVE		Remaining Life as per IRC - 115 Equations for 90% Reliability			Remarks
					MR for BT (Mpa)	MR for Granular (Mpa)	MR for Subgrade (Mpa)	BT (mm)	Granular (mm)			Vertical strain at bottom, epZ	Tangential strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	Target MSA	
29	RHS	56.95	59.97	3.02	807	117	100	180	470	650	807	0.0002852	0.0003838	5	166	102	Overlay
30	RHS	59.97	61.03	1.07	1557	489	100	140	420	560	1557	0.0002366	0.0001515	96	388	102	Overlay
31	RHS	61.03	62.06	1.03	1676	492	100	140	420	560	1676	0.0002335	0.0001481	99	411	102	Overlay
32	RHS	62.06	63.14	1.08	1446	100	100	140	420	560	1446	0.0003451	0.0003896	3	70	102	Overlay
33	RHS	63.14	64.24	1.10	1660	474	100	140	420	560	1660	0.0002372	0.0001527	88	383	102	Overlay
34	RHS	64.24	66.20	1.96	1463	152	100	140	420	560	1463	0.0003309	0.0003211	5	85	102	Overlay
35	RHS	66.20	68.03	1.83	1084	131	100	148	420	568	1084	0.0003433	0.0003797	4	72	102	Overlay
36	RHS	68.03	69.42	1.39	930	117	100	152	434	587	930	0.0003395	0.0004212	3	75	102	Overlay
37	RHS	69.42	71.40	1.98	1182	138	100	160	480	640	1182	0.0002770	0.0003282	6	190	102	Overlay
Total Length				**71.40**													

From the above, overlay is warranted when remaining life is lesser than Target Traffic. Accordingly, based on this criterion, an overlay is warranted for a length of 56.435 km in LHS and 66.184 km in RHS.

The overlay required sections are further analyzed as per IRC: 37 guidelines with assumed overlay thicknesses to obtain the strains (vertical and horizontal) and then fatigue and rutting life in terms of MSAs. In this process, it is to been sure that the obtained remaining life (MSA) of the existing pavement should be always more than calculated 10yrs design MSA.

However, as per schedule-B scope states that "Capacity augmentation, strengthening, and improvement of the entire project highway shall be taken up by NHAI under HAM concession and other modes. Few immediate improvement requirements shall be executed by NHAI and rest of improvement proposals as per standards and specifications will be considered under the scope of HAM concessionaire. For avoidance of doubt, the TOT/INVIT Concessionaire shall be responsible for toll collections and operations (w.e.f. Appointed Date), without attracting any financial/contractual obligation towards NHAI". **In view of the same, the above overlay requirement has not been considered** even though it is worked out as below.

The following tables indicates the proposed overlay thicknesses in LHS and RHS directions respectively.

Table 44: Design of overlay for LHS MCW

S No	Side	From (km)	To (km)	Length (km)	15th Percentile MR values, MPa			Avg. Existing Crust, mm		FWD-2024	Total BT, mm	Total Crust mm	MR for BT, Mpa	Strains From IITPAVE		90%		Target MSA
					MR for BT	MR for Granular	MR for Subgrade	BT	Granular	Proposed BT				Vertical strain at bottom, epZ	Tangential strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	
1	LHS	0.00	1.75	1.75	1365	443	100	220	400	50	270	670	1365	0.0001554	0.0000926	732	2606	265
2	LHS	1.75	3.60	1.85	893	101	100	220	400	140	360	760	893	0.0001352	0.0001293	287	4900	265
3	LHS	3.60	5.75	2.15	1694	231	99	220	400	100	320	720	1694	0.0001382	0.0000923	617	4436	265
5	LHS	8.00	10.00	2.00	941	101	99	220	400	135	355	755	941	0.0001371	0.0001301	268	4600	265
6	LHS	10.00	12.00	2.00	1733	100	100	220	400	105	325	725	1733	0.0001310	0.0001132	273	5654	265
7	LHS	12.00	13.01	1.01	820	192	100	220	400	100	320	720	820	0.0001632	0.0001319	286	2087	265
8	LHS	13.01	14.02	1.01	451	102	100	220	400	150	370	770	451	0.0001522	0.0001514	278	2864	265
9	LHS	14.02	15.26	1.24	752	195	100	220	400	100	320	720	752	0.0001660	0.0001346	284	1932	265
10	LHS	15.26	16.58	1.32	541	104	100	220	426	150	370	796	541	0.0001403	0.0001436	293	4143	265
11	LHS	16.58	18.20	1.62	1222	251	100	220	500	100	320	820	1222	0.0001215	0.0001000	597	7954	265
14	LHS	20.33	21.36	1.03	1120	295	100	220	500	50	270	770	1120	0.0001436	0.0001237	281	3728	265
15	LHS	21.36	22.54	1.18	1287	124	100	122	418	190	312	730	1287	0.0001379	0.0001192	288	4480	265
16	LHS	22.54	23.72	1.18	1434	128	100	100	400	200	300	700	1434	0.0001446	0.0001184	270	3613	265
17	LHS	23.72	24.84	1.12	1495	183	100	100	400	180	280	680	1495	0.0001571	0.0001168	274	2481	265
18	LHS	24.84	25.98	1.14	1505	154	98	100	400	190	290	690	1505	0.0001528	0.0001170	271	2814	265
21	LHS	31.01	33.48	2.47	884	196	100	280	410	50	330	740	884	0.0001592	0.0001310	275	2336	265
22	LHS	33.48	35.50	2.02	860	101	99	268	420	105	373	793	860	0.0001320	0.0001328	267	5462	265
23	LHS	35.50	37.75	2.25	1664	358	100	230	450	50	280	730	1664	0.0001377	0.0000926	618	4510	265
24	LHS	37.75	40.21	2.46	1134	127	99	230	450	110	340	790	1134	0.0001310	0.0001229	285	5654	265
25	LHS	40.21	42.25	2.04	718	122	100	230	450	130	360	810	718	0.0001342	0.0001344	297	5068	265
26	LHS	42.25	44.40	2.15	739	203	100	230	450	100	330	780	739	0.0001465	0.0001267	365	3405	265
28	LHS	44.86	47.77	2.91	779	101	100	239	450	130	369	819	779	0.0001269	0.0001346	276	6531	265
29	LHS	47.77	48.81	1.04	646	101	100	240	450	135	375	825	646	0.0001300	0.0001400	278	5854	265

S No	Side	From (km)	To (km)	Length (km)	15th Percentile MR values, MPa			Avg. Existing Crust, mm		FWD-2024	Total BT, mm	Total Crust mm	MR for BT, Mpa	Strains From IITPAVE		90%		Target MSA
					MR for BT	MR for Granular	MR for Subgrade	BT	Granular	Proposed BT				Vertical strain at bottom, epZ	Tangential strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	
30	LHS	48.81	49.98	1.16	610	100	98	240	450	140	380	830	610	0.0001310	0.0001394	296	5654	265
31	LHS	49.98	52.21	2.24	876	219	100	240	450	100	340	790	876	0.0001365	0.0001113	522	4692	265
32	LHS	52.21	54.25	2.04	1271	219	97	240	450	100	340	790	1271	0.0001282	0.0000972	644	6236	265
34	LHS	56.60	57.95	0.70	1060	101	100	170	400	125	295	695	1060	0.0001627	0.0001615	104	2117	93
35	LHS	57.65	59.27	1.62	1585	229	100	170	400	100	270	670	1585	0.0001662	0.0001188	244	1922	93
36	LHS	59.27	60.39	1.13	1005	154	100	170	400	100	270	670	1005	0.0001859	0.0001666	97	1157	93
37	LHS	60.39	61.99	1.60	840	108	100	168	404	125	293	697	840	0.0001718	0.0001749	93	1654	93
38	LHS	61.99	63.14	1.15	1267	392	100	160	420	50	210	630	1267	0.0001892	0.0001319	197	1068	93
39	LHS	63.14	63.99	0.85	1103	183	100	160	420	100	260	680	1103	0.0001803	0.0001565	114	1329	93
40	LHS	63.99	66.26	2.26	2458	327	100	160	420	50	210	630	2458	0.0001814	0.0001153	189	1293	93
41	LHS	66.26	69.00	2.75	2423	276	100	176	469	50	226	695	2423	0.0001596	0.0001145	196	2310	93

Table 45: Design of overlay for RHS MCW

S No	Side	From (km)	To (km)	Length (km)	15th Percentile MR values, MPa			Avg. Existing Crust, mm		FWD 2024	Total BT, mm	Total Crust, mm	MR for BT, MPa	Strains From IITPAVE		90%		Target MSA
					MR for BT	MR for Granular	MR for Subgrade	BC	Granular	Proposed BT				Vertical strain at bottom, epZ	Tangential strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	
1	RHS	0.00	2.00	2.00	736	102	99	210	500	155	365	865	736	0.0001182	0.0001322	311	9011	292
2	RHS	2.00	3.93	1.93	548	101	100	210	500	160	370	870	548	0.0001221	0.0001408	312	7778	292
3	RHS	3.93	4.99	1.06	453	100	99	210	500	160	370	870	453	0.0001275	0.0001479	303	6392	292
5	RHS	6.97	8.69	1.72	883	198	100	200	500	110	310	810	883	0.0001358	0.0001283	299	4803	292
6	RHS	8.69	10.99	2.30	588	100	99	200	500	165	365	865	588	0.0001220	0.0001393	307	7807	292
7	RHS	10.99	13.75	2.76	2409	343	100	200	453	50	250	703	2409	0.0001438	0.0000930	444	3705	292
8	RHS	13.75	15.99	2.23	737	101	100	200	440	160	360	800	737	0.0001297	0.0001335	298	5915	292
9	RHS	15.99	18.25	2.26	2670	345	100	200	440	50	250	690	2670	0.0001447	0.0000889	485	3602	292
10	RHS	18.25	20.73	2.48	849	205	100	160	432	135	295	727	849	0.0001577	0.0001300	293	2438	292

S No	Side	From (km)	To (km)	Length (km)	15th Percentile MR values, MPa			Avg. Existing Crust, mm		FWD 2024	Total BT, mm	Total Crust, mm	MR for BT, MPa	Strains From IITPAVE		90%		Target MSA
					MR for BT	MR for Granular	MR for Subgrade	BC	Granular	Proposed BT				Vertical strain at bottom, epZ	Tangential strain at top, epT	Nf-Fatigue life, mSA	Rutting life,mSA	
11	RHS	20.73	22.24	1.51	1378	273	100	100	420	155	255	675	1378	0.0001626	0.0001159	303	2123	292
12	RHS	22.24	23.98	1.74	1281	109	97	100	420	215	315	735	1281	0.0001347	0.0001180	301	4983	292
13	RHS	23.98	24.99	1.02	1230	112	89	100	420	215	315	735	1230	0.0001439	0.0001194	298	3693	292
14	RHS	24.99	27.77	2.78	2051	102	99	140	413	170	310	723	2051	0.0001291	0.0001069	296	6041	292
15	RHS	27.77	28.99	1.22	708	190	100	220	400	105	325	725	708	0.0001653	0.0001347	298	1970	292
16	RHS	28.99	30.97	1.99	591	105	100	228	471	145	373	844	591	0.0001278	0.0001398	301	6325	292
19	RHS	33.75	35.79	2.04	2585	323	99	200	420	50	250	670	2585	0.0001541	0.0000933	413	2708	292
20	RHS	35.79	38.75	2.96	879	100	74	200	420	160	360	780	879	0.0001575	0.0001290	293	2452	292
21	RHS	38.75	41.67	2.93	774	101	99	214	456	150	364	821	774	0.0001260	0.0001322	297	6745	292
22	RHS	41.67	44.40	2.73	884	100	99	220	470	145	365	835	884	0.0001198	0.0001267	313	8479	292
24	RHS	44.86	47.61	2.75	744	101	99	220	470	150	370	840	744	0.0001224	0.0001312	317	7692	292
25	RHS	47.61	50.25	2.64	878	101	99	208	470	150	358	828	878	0.0001220	0.0001289	295	7807	292
26	RHS	50.25	52.39	2.14	1373	178	93	180	470	125	305	775	1373	0.0001399	0.0001152	311	4197	292
27	RHS	52.39	55.99	3.60	1227	373	100	180	470	100	280	750	1227	0.0001336	0.0000958	703	5172	292
28	RHS	55.99	56.95	0.96	1420	470	100	180	470	50	230	700	1420	0.0001472	0.0001027	473	3333	292
29	RHS	56.95	59.97	3.02	807	117	100	180	470	125	305	775	807	0.0001490	0.0001639	124	3154	102
30	RHS	59.97	61.03	1.07	1557	489	100	140	420	50	190	610	1557	0.0001849	0.0001169	264	1185	102
31	RHS	61.03	62.06	1.03	1676	492	100	140	420	50	190	610	1676	0.0001831	0.0001141	273	1239	102
32	RHS	62.06	63.14	1.08	1446	100	100	140	420	140	280	700	1446	0.0001544	0.0001484	111	2684	102
33	RHS	63.14	64.24	1.10	1660	474	100	140	420	50	190	610	1660	0.0001855	0.0001174	246	1168	102
34	RHS	64.24	66.20	1.96	1463	152	100	140	420	115	255	675	1463	0.0001751	0.0001510	103	1517	102
35	RHS	66.20	68.03	1.83	1084	131	100	148	420	130	278	698	1084	0.0001677	0.0001574	113	1845	102
36	RHS	68.03	69.42	1.39	930	117	100	152	434	135	287	722	930	0.0001619	0.0001647	108	2164	102
37	RHS	69.42	71.40	1.98	1182	138	100	160	480	115	275	755	1182	0.0001520	0.0001546	113	2881	102

Input data used and the output from the IIT Pave software has been presented as screen shots for ready reference as **Appendix 10** of this Report.

5.3 STRUCTURAL REHABILITATION

All the structure found to be in fair condition except minor treatment like repair of stone pitching, cleaning of drainage spouts, cleaning of vegetation etc. may be required. Detailed structural rehabilitation quantities have been worked out based on the prevailing condition of existing structures. This methodology describes in detail the procedure for the execution of each item of rehabilitation work of the Existing Bridges of the project.

The scope of this methodology covers the items mentioned below for rehabilitation work of all the existing Bridges.

- Repair/ Replacement of Existing Bearings
- Repair / Replacement of Existing Expansion Joints
- Repair / Replacement of Existing Wearing Coat
- Profile Correction for Existing Deck Slab by Cement Concrete
- Sealing of Cracks for Bridges by Epoxy Resin
- Replacement of Spalled Concrete of ECW by Epoxy Mortar
- Cement Grouting for Repair of Existing Bridges
- Guniting / Shotcrete for Repair of Existing Bridges
- Providing & Fixing of Drainage Spouts
- Repair of Substructure Component
- Repair / Replacement of Railing & Crash Barrier
- Epoxy Bonding between New and Old Concrete.

CHAPTER 6. OPERATION AND MAINTENANCE

6.1 INTRODUCTION

Looking at the contractual requirements of maintaining project road under specified level of roughness it is felt that roughness is the most important criterion for finalizing the O&M schedule for the project. Accordingly, the methodology adopted by present consultants includes predicting the roughness year by year under the traffic using a well acknowledged HDM-4 model developed for developing countries like India after lot of research by World Bank. The said model is widely prescribed by MORTH and NHAI during the preparation of detailed project reports for several projects in doing economic analysis for the projects. The economic analysis mainly consists of two parts:

1. Predicting the road deterioration and estimating VOC
2. Estimating Benefits

Considering its importance and present use in India, consultants felt prudent to use the first part, i.e estimating road deterioration and predicting roughness in HDM 4 model to finalize the O&M schedule for the project. This approach is more scientific as it does not assume hypothetical deflection values at 10^{th} and 20^{th} year and includes main criterion of maintaining roughness at 2400mm/Km as per Schedule F.

6.2 CA SPECIFICATIONS FOR MAJOR MAINTENANCE

Schedule F prescribe the maintenance standards to be adopted for project. Summary of same is presented below.

- Appliable Manual: Four lane manual IRC SP 84-2019 published by IRC
- Applicable Schedule for O&M: Schedule-F and Manual
- Schedule-F, performance parameters indicate the desirable limit of Roughness values should not exceed 2000 mm/km, whereas its acceptable limits Is 2400 mm/km and needs to be corrected within 180 days. Roughness Surveys shall be carried out Bi-Annually.
- Schedule-F, performance parameters indicate the desirable limit of Pavement Condition Index (PCI) values should be above 85, whereas its acceptable limits is 70 and needs to be corrected within 180 days. Condition Surveys shall be carried out Bi-Annually.
- Schedule-F, performance parameters indicate the FWD survey shall be carried out Annually as per IRC: 115-2014 for flexible pavement and needs to be corrected within 180 days.

6.3 INPUTS FOR M&M SCHEDULE

6.3.1 Project Sections

Considering traffic scenario and structural condition (FWD), project road has been divided into two sections viz.,

Section-1: km0.000 to 56.600 (Kandla-Mundra) with 50mm Overlay
Section-2: km56.600 to 71.400 (Mundra-End of 4 Laning) with 50mm Overlay

Further, taking the consideration of roughness values as a key criterion for major maintenance four cases are as shown below:

- Case 1: Roughness value <2000 mm/Km
- Case 2: Roughness values >2000<2200 mm/Km
- Case 3: Roughness>2200<2400 mm/Km
- Case 4: Roughness>2400 mm/Km

Direction wise analysis has been done separately for LHS (UP)/RHS (DN) and each direction length has been divided into sections based on above.

6.3.2 Traffic (AADT)

The following traffic data has been used in the analysis is as below:

Vehicle/Mode	Toll Plaza-1 Km 44+630 (Mokha Toll Plaza)	
	HS-1	HS-2
LCV	120	42
BUS	76	26
2A	404	141
3A	638	223
MAV	10576	3702

Note: The given AADT of 2-axle data is combination of buses and 2-axle trucks, thus, it is considered as 30% for buses and the rest for 2axle trucks.

6.3.3 Vehicle Damage Factors (VDF)

VDF values as obtained from axle load surveys are used for various sections are as given below:

Vehicle Type	Mokha Toll plaza (44+630)	
	UP	DN
BUS	0.71	0.97
2-Axle	3.25	2.76
3-Axle	8.72	3.57
M Axle	13.24	14.94
LCV	1.23	1.33

6.3.4 HDM Inputs

FWD and Roughness values are used as obtained from surveys and investigations as below:

Section-1: From km 0 to km 56.600

Section-1 50mm OL	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, mts	31600	8000	4000	13000	27600	7000	6000	16000
Roughness, mm/km	1622	2078	2258	3124	1667	2113	2298	3020
IRI. m/km	2.32	2.90	3.13	4.16	2.38	2.95	3.17	4.04
Deflection, mm	0.43	0.52	0.49	0.58	0.51	0.56	0.61	0.64
Cracking %	0.24	0.93	0.81	1.05	0.73	1.11	2.13	9.24
Raveling %	0.07	0.20	0.23	0.34	0.19	0.27	0.47	1.03
Rut Depth, mm	5.78	5.48	6.52	8.51	6.27	8.19	9.09	11.94
Patching, %	0.35	0.53	0.38	1.59	1.32	2.56	1.60	1.60
Potholes, %	58.50	96.25	145.50	263.85	142.32	192.00	184.67	158.81
BT Crust, mm	233	235	193	195	196	197	198	174
Granular Crust, mm	431	427	413	427	449	460	482	457

Section-2: From km 56.600 to km 71.400

Section-2 50mm OL	LHS				RHS			
	<2000	>=2000 and <2200	>=2200 and <2400	>2400	<2000	>=2000 and <2200	>=2200 and <2400	>2400
Length, mts	10800	1000	0	3000	6800	1000	2000	5000
Roughness, mm/km	1441	2139	0	3745	1702	2017	2287	2715
IRI. m/km	2.09	2.98	0.00	4.89	2.43	2.83	3.16	3.68
Deflection, mm	0.51	0.41	0.00	0.57	0.46	0.46	0.60	0.63
Cracking %	1.58	0.20	0.00	0.82	0.20	0.46	0.21	0.25
Raveling %	0.56	0.07	0.00	1.93	0.30	1.64	1.00	1.90
Rut Depth, mm	5.72	3.74	0.00	8.56	4.04	4.80	5.98	7.01
Patching, %	2.30	1.55	0.00	12.58	0.38	8.52	5.37	19.77
Potholes, %	26.67	9.00	0.00	857.67	11.38	143.00	33.50	149.20
BT Crust, mm	171	170	0	166	158	160	160	149
Granular Crust, mm	441	400	0	409	446	480	445	431

6.3.5 Options for MM Schedule

Based on the requirements of CA, various options have been considered to be used as responsive overlays triggered at specified level of roughness of 2400mm/km. Micro surfacing has also been considered to examine its feasibility for major maintenance.

Following options were considered in the analysis:

- ✓ Base Case: MCS at Roughness of 2400mm/Km with regular maintenance
- ✓ Opt-1: Responsive Mill & Overlay of 50mm BC whenever roughness is >2400mm/KM with regular maintenance

- ✓ Opt-2: Responsive Mill & Overlay of 100mm BC whenever roughness is >2400mm/KM with regular maintenance

6.4 ROUHGNESS PROGRESSION

Roughness progression for each section under each alternative maintenance option has been done using the deterioration models in HDM-4. Following sample graphs represents the roughness progression for each alternative:

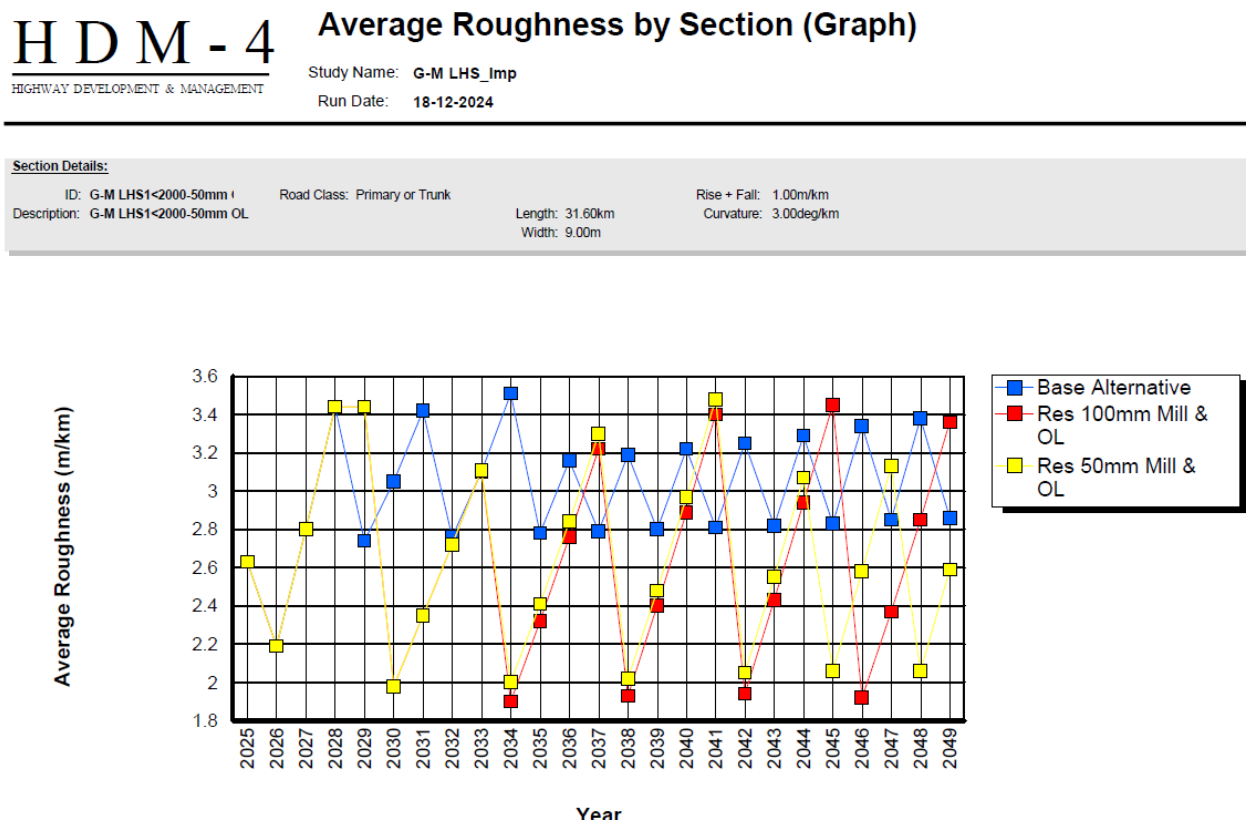


Figure 1: Average Roughness in LHS (UP) Carriageway (Sec-1) 50mm Overlay<2000

HDM-4 Average Roughness by Section (Graph)

Section Details:

ID: G-M RHS2<2000 50mm
Description: G-M RHS2<2000 50mm OL
Road Class: Primary or Trunk
Length: 6.80km
Width: 9.00m
Rise + Fall: 1.00m/km
Curvature: 3.00deg/km

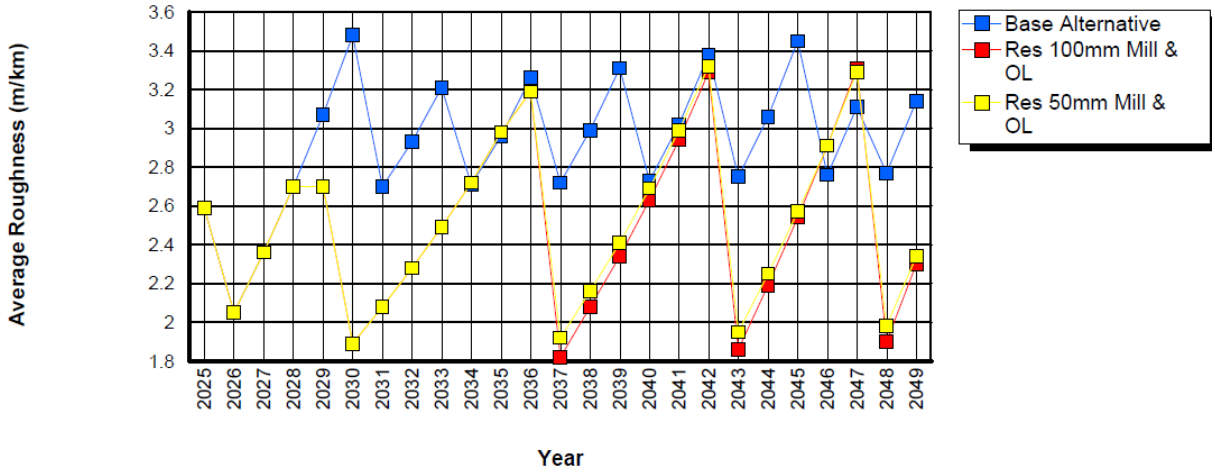


Figure 2: Average Roughness in RHS (DN) Carriageway (Sec-2) 50mm Overlay<2000

6.5 M&M SCHEDULE

Looking at the present condition, progression of traffic, capacity augmentation(6-lane) is envisaged by Authority under HAM mode in FY2027 & 28. it is felt prudent to consider the 50mm OL as the preferred option, with certain percentage of additional DBM. Adopted MM schedule for the project is as below:

Table 46: Adopted MM schedule for the project for LHS & RHS

Section-1: LHS (Km.0.000 to Km.56.600)

- **50mm Overlay**

	GM Sec-1_50 Overlay								
	LHS-obtained					LHS-Adjusted			
	Option-1 (Responsive 50mm)					Option-1 (Responsive 50mm)			
Criteria:	IRI<2000	2000-2200	2200-2400	>=2400		IRI<2000	2000-2200	2200-2400	>=2400
Length:	31.600	8.000	4.000	13.000		31.600	8.000	4.000	13.000
Year	Case-1	Case-2	Case-3	Case-4		Case-1	Case-2	Case-3	Case-4
2025	50	50	50	50					
2026									
2027		1			6-lane				
2028					6-lane				
2029					HAM				
2030					HAM				
2031					HAM				
2032					HAM				
2033	1	1		1	HAM				
2034			1		HAM				
2035					HAM				
2036					HAM				
2037	1	1		1	HAM				
2038			1		HAM				
2039					HAM				
2040					HAM				
2041	1	1		1	HAM				
2042			1		HAM				
2043					HAM				
2044	1	1		1	10% DBM	50 mm BC in 50% length is considered			
2045			1		10% DBM	50 mm BC in 50% length is considered			
2046									
2047	1	1		1					
2048			1						
2049									

Section-1: RHS (Km.0.000 to Km.56.600)

- **50mm Overlay**

	GM Sec-1_50 Overlay								
	RHS-obtained					RHS-Adjusted			
	Option-1 (Responsive 50mm)					Option-1 (Responsive 50mm)			
Criteria:	IRI<2000	2000-2200	2200-2400	>=2400		IRI<2000	2000-2200	2200-2400	>=2400
Length:	27.600	7.000	6.000	16.000		27.600	7.000	6.000	16.000
Year	Case-1	Case-2	Case-3	Case-4		Case-1	Case-2	Case-3	Case-4
2025	50	50	50	50					
2026									
2027	1	1	1	1	6-lane				
2028					6-lane				
2029					HAM				
2030					HAM				
2031					HAM				
2032					HAM				
2033	1	1	1	1	HAM				
2034					HAM				
2035					HAM				
2036					HAM				
2037	1	1	1	1	HAM				
2038					HAM				
2039					HAM				
2040			1		HAM				
2041	1	1		1	HAM				
2042					HAM				
2043			1		HAM				
2044	1	1		1	10% DBM	50 mm BC in 50% length is considered			
2045					10% DBM	50 mm BC in 50% length is considered			
2046			1						
2047	1	1		1					
2048									
2049			1						

Section-2: LHS (Km.56.600 to Km.71.400)

- **50mm Overlay**

	GM Sec-2_50 Overlay								
	LHS-obtained					LHS-Adjusted			
	Option-1 (Responsive 50mm)					Option-1 (Responsive 50mm)			
Criteria:	IRI<2000	2000-2200	2200-2400	>=2400		IRI<2000	2000-2200	2200-2400	>=2400
Length:	10.800	1.000		3.000		10.800	1.000	0.000	3.000
Year	Case-1	Case-2	Case-3	Case-4		Case-1	Case-2	Case-3	Case-4
2025	50	50		50					
2026									
2027					6-lane				
2028					6-lane				
2029					HAM				
2030					HAM				
2031					HAM				
2032					HAM				
2033					HAM				
2034					HAM				
2035					HAM				
2036					HAM				
2037	1	1		1	HAM				
2038					HAM				
2039					HAM				
2040					HAM				
2041					HAM				
2042					HAM				
2043	1	1		1	HAM				
2044						50 mm BC in 50% length is considered			
2045						50 mm BC in 50% length is considered			
2046									
2047									
2048	1	1		1					
2049									

Section-2: RHS (Km.56.600 to Km.71.400)

- **50mm Overlay**

	GM Sec-2_50 Overlay								
	RHS-obtained					RHS-Adjusted			
	Option-1 (Responsive 50mm)					Option-1 (Responsive 50mm)			
Criteria:	IRI<2000	2000-2200	2200-2400	>=2400		IRI<2000	2000-2200	2200-2400	>=2400
Length:	6.800	1.000	2.000	5.000		6.800	1.000	2.000	5.000
Year	Case-1	Case-2	Case-3	Case-4		Case-1	Case-2	Case-3	Case-4
2025	50	50	50	50					
2026									
2027					6-lane				
2028					6-lane				
2029					HAM				
2030					HAM				
2031					HAM				
2032					HAM				
2033					HAM				
2034					HAM				
2035					HAM				
2036	1	1	1	1	HAM				
2037					HAM				
2038					HAM				
2039					HAM				
2040					HAM				
2041					HAM				
2042	1	1	1	1	HAM				
2043					HAM				
2044						50 mm BC in 50% length is considered			
2045						50 mm BC in 50% length is considered			
2046									
2047	1	1	1	1					
2048									

In a nutshell, final recommendations are as summarized below.

Section	Side:	Cycle-1-
Sec-1	LHS	FY44: 50% length with 50mm BC+ 10% DBM FY45: 50% length with 50mm BC+ 10% DBM
Sec-2		FY44: 50% length with 50mm BC FY45: 50% length with 50mm BC
Sec-1	RHS	FY44: 50% length with 50mm BC+ 10% DBM FY45: 50% length with 50mm BC+ 10% DBM
Sec-2		FY44: 50% length with 50mm BC FY45: 50% length with 50mm BC

6.6 STRUCTURAL PERIODIC MAINTENANCE STRATEGY

Expansion joints:

- Visual inspection is carried out to check for seal breakages, Armor angle, Weld failures, cracks between deck & Expansion joints concrete and Joints filled with debris. Such joints replaced immediately.
- Joint buried with debris shall be inspected for any distress, if any distress is shown it shall be replays immediately.
- During visual inspection it is seen that some Expansion joints are bad where as some are not showing any defects.
- Due to this it is considered provident to change the Expansion joints which are visibly damaged in initial stage.
- In the absence of records pertaining to Expansion joint replacements it is highly difficult to predict the date of replacement needed for compliance to IRC codal requirements. Balance joints which are not replaced initially will be replaced as on when defects are shown in the joints. This aspect is considered in BOQ.

Bearings:

- In order to identify the bearings requiring immediate replacement, the following strategy is adopted.
- Girder Bridges showing diagonal cracks at support, distress in the Pedestals and any form of distress in support location is regarded as a candidate for replacement. By visual inspection there are only a handful of such situations.
- Wherever pedestals are damaged either by cracking or spalling poisons confinement is proposed by Jacketing/MS plate bonding such procedure is very effective and common.
- All Metallic Bearings need to be taken up for servicing.

Wearing Coat:

It is necessary to replace the wearing coat at every 15years interval, as wearing coat is a very weak component of the bridge structure which is subjected to severe deterioration due to loading, environment etc. As of now, we have considered sealing of cracks by Fog Seal and for which does not show any distress other than cracking by viz. Pot holes, abrading etc. Based on this aspect, this cost has been considered in highway O&M cost.

Periodic Maintenance strategy for Replacement of Bearings & Expansion joint:

Below strategy has been considered for periodic major maintenance of the structures.

S No	Description	Bridge components
1	Old structure	Retained at the time of 4/6 laning
2	New Structure	Constructed during the 4/6 laning

Age	Description	Item	structures-Assumption-MMR

			% of Replacement of Major components
			2044
New	Super structure lifting with Pot bearings	Pot	40%
New	Super structure lifting with Elastomeric bearings	Ela	54%
New	Super structure lifting with Rocker bearings	Rocker	0%
Old	Super structure lifting with Pot bearings	Pot	50%
Old	Super structure lifting with Elastomeric bearings	Ela	50%
Old	Super structure lifting with Rocker bearings	Rocker	0%
New	Pot bearing cost	Pot	40%
New	Elastomeric bearing cost	Ela	54%
New	Rocker bearing cost	0	0%
Old	Pot bearing cost	Pot	50%
Old	Elastomeric bearing cost	Ela	50%
Old	Rocker bearing cost	0	0%
New	Expansion joint Replacement	0	50%
Old	Expansion joint Replacement	0	63%
New	Others	0	50%
Old	Others	0	63%

Note:

Apart from the above Cost, prior to issuance of schedules the following additional Costs were worked out for Structures MMR Cost.

- Carbonation Depth : Based on the results Anti carbon paint for all structures proposed and which cost approx. 4.44 Cr.
- NDT: Based on the results, strengthening with CFRP laminates and wrapping for super structure are proposed. Which cost appx. 19.71 Cr.

However, all these costs are not considered as the project stretch is going for 6-lane capacity augmentation by Authority in FY27 and FY28 under HAM mode.

Cost Component for various items and activities have been worked out by considering the Best Industry practice and most appropriate methods. Detailed quantities for work items have been estimated based on the details presented in previous chapters for various heads.

The gist of the cost components considered are presented below:

- Immediate Repair's Cost
- Routine Maintenance Cost
- Incident Management Cost
- Periodic Maintenance Cost
- Operations Cost
- Year by Year total O&M Costs

7.1 RATE ANALYSIS

Detailed rate analysis has been carried out based on MORTH guidelines to arrive at the unit rates of various items. Material rates and their leads from the project corridor are considered as per the material investigations done on the project road. Summary of unit rates arrived at are presented in table below:

Table 47: Unit Rates of Basic Material

Sl.no	Description	Units	Source	Basic rate excluding Transportston & GST	Lead in Kms
1	VG-40 (CAPEX)	MT	Vadodara	50,722	519
2	VG-40 (MMR) *	MT	Vadodara	47,147	519
3	Modified-MMR	MT	Vadodara	47,147	519
4	Good earth	Cum	BA	177	6
5	40 mm	Cum	Crusher	615	19
6	20 mm	Cum	Crusher	671	19
7	12 mm	Cum	Crusher	652	19
8	6 mm	Cum	Crusher	436	19
9	Dust	Cum	Crusher	366	19
10	M sand	Cum	Crusher	720	19
11	SS1	MT	Vadodara	50,000	519
12	Steel	MT	Gandhidham	54,000	67
13	HTS Strands	MT	Gandhidham	75,000	62
14	Cement	MT	Gandhidham	7,600	67

Note: *For future asphalt pavement rehabilitation works, a normative standardized cost for Bitumen (VG-40) has been determined based on historical bitumen rates from August 2020 to December 2024

Table 48: Unit Rates of Major Material excluding GST

S.no	Item	Unit	Rate (INR) Excluding GST
1	Embankment - borrow	Cum	686
2	Embankment - Excavation	Cum	126
3	SG	Cum	706
4	GSB G-2	Cum	2365
5	WMM	Cum	2409
6	Prime Coat	Sqm	51
7	Tack coat on granular	Sqm	17
8	DBM G-1-VG-40	Cum	9832
9	Tack coat on bituminous surface	Sqm	16
10	BC - G1-VG40/CRMB-CAPEX	Cum	12,028
11	Road Marking	Sqm	593
12	RE wall	Sqm	3850
13	Select Fill	Cum	776
14	Filter Media	Cum	1245
15	HYSD	MT	79577
16	HT strand	MT	155854
17	CTSB	Cu.m	3132
18	CTB	Cu.m	3521
19	PQC	Cu.m	8588
20	DLC	Cu.m	4484
21	BC - G1-VG40/ CRMB-MMR	Cu.m	11488

Note: Item Rates are considered for Small Projects.

Labour: Central Minimum Wages as on Oct'2024 for "C Area" Category for construction workers.

7.2 Initial improvement works (SCHEDULE-B)

Costs associated with initial improvements are estimated based on the detailed asset inventory and condition assessment surveys, Pavement condition and structural condition assessment surveys. Items which are not executed as part of scope or in damaged condition have been considered for immediate costs as a part of 1-year capex. Following items are mainly considered for Initial Improvement costs:

- Scope given in schedule-B
- Scope which is not executed
- Road work items
- Bridge Work Items
- Pavement Rehabilitation works
- Structural Rehabilitation works
- Drainage Works
- Slope Protection works
- Safety Works

However, considering capacity augmentation following items are worked out as below.

Table 49: CAPEX Cost FY26

S.no	Description	Unit	Amount (Rs.)
1	TMS	LS	4,24,31,721
2	Toll plaza renovation cost including replacement of Office Furniture, all building, Canopy, all misc. items etc.	LS	2,50,35,073
3	Initial Capex for emergency repair works during monsoon	LS	12,70,00,000
Total			19,44,66,794
Total including GST @18%			22,94,70,816
Total EPC Cost including GST in Crores			22.95

Note: The TMS cost arrived are based quotes obtained by NHIT, from different vendors such as Comvision, Devaditya and Efkon.

The cost considered in MMR in the year FY2044 under Flexible Road works.

S.no	Description	Unit	Amount (Rs.)
1	Revalidation surveys	LS	72,46,625
Total including GST @18%			85,51,018
Total EPC Cost including GST in Crores			0.86

7.3 ROUTINE MAINTENANCE & INCIDENT MANAGEMENT COSTS

Routine maintenance costs include general maintenance costs of road elements, bridge elements and road furniture and appurtenances. This can be mainly divided into two parts as:

- ✓ General Maintenance of Works
- ✓ Repairs to Highway & Bridge Elements

7.3.1 General Routine Maintenance

General Routine Maintenance of Roads generally include following items:

- Cleaning of Project facilities
- Structures cleaning,
- Cleaning of ROW
- Cleaning and Maintenance of Toll Plaza
- Unlined Drain Maintenance
- Lined Drain Maintenance
- Maintenance of Highway Lighting at Toll Plaza and other project locations
- Median Plantation maintenance & Avenue plantation maintenance:
- Maintenance of Road Furniture
- Maintenance of Road Safety Items

The above items are estimated by considering the detailed break-up of following items:

- Manpower including Managers/Labour etc.
- Vehicles for Labour Transport/Water Tankers/Sweeping Machines etc.
- Resources/Equipment's such as grass cutters, tools, jet sprayers, hydraulic trimmers etc.

7.3.2 Repairs to Highway & Bridge Works

Repairs to highway and bridge works have been estimated based on the assumed quantities (Percentage basis) of execution for every year.

These items include the following:

1	Providing treatment for sealing of road surface / isolated cracks at scattered locations
	i) Covered with 6.7 mm size stone chipping @ 0.1 cum/ 10 sqm.
	ii) covered with dry coarse sand passing through 2.36 mm sieve and retained on 180 micron sieve @ 0.03 cum/10 sqm heated to 600 C
	iii) filling discrete cracks with slow curing bitumen emulsion as per Technical Specification Clause 3004.3.3
2	Providing treatment to bleeding bituminous surface at scattered locations
3	Providing localized repair to rutted portion and edge breaking of bituminous surface
4	Providing treatment and repair to pot-holes and patch work
5	Providing and laying dense bituminous macadam using bitumen grade VG 40 complete as per Technical Specification Clause 507
6	Proving and laying bituminous concrete (asphaltic concrete)
	(a) Using bitumen (VG-40) as per IRC: SP: 53
7	Road Roughness survey
8	Turfing on embankment slopes and at all other Project Facilities
9	Providing repair to stone pitching/apron at scattered locations
10	Rain Cuts Maintenance: Restoration of rain cuts soil, moorum, gravel or a mixture of these
11	Providing and laying apron/ stone pitching on slopes of guide bunds/ road embankment / other location
12	Providing and laying stone aggregate filter material (150 mm compacted thickness) underneath pitching
13	Unlined drain
14	Filling in median island with approved materials with all leads and lifts complete as per TS Clause No. 407
15	Replacing damaged / broken railing with new pre-cast / cast-in-situ, concrete railing to match with existing design and pattern.
24	Carrying out repair to road signs including strengthening resetting or otherwise repairing signs and delineators
	a) Road sign board mounted on single post
	b) Road sign board mounted on double post
	c) Overhead/ Gantry Sign boards
	d) Delineator
25	Supplying and fixing at site retro-reflectorized type **sign boards/signs**
	90cm Equilateral triangle
	60cm circular
	90 cm circular
	90cm high octagon

	80cm x 60cm rectangle
	Chevron signs 60cm x 45cm
	Place identification signs (Fig 15.7 of IRC 67)
	Providing and fixing Object Markers
	Providing and fixing of retro-reflectorized Route Marker signs (size 450mm x 600mm)
26	**Hazard Marker Sign :**
	a) size 90 x 30 cm
	b) size 30cm triangular side cluster of red reflectors (screen printed)
27	Cats Eyes/Raised pavement marker (NMC Nails Less)
28	Painting two coats on old surface after minor repairs to give an even and smooth surface and printing letters and figures with synthetic enamel paint
	a) Hectometer stones
	b) Kilometer Stone
	c) 5 Kilometer stone
	d) Boundary stone
	e) Guard stone
29	Providing painting lettering and fixing of distance measurement stones including dismantling of old damaged/ broken ones, confirming to TS Clause 804
	a) Hectometer stones
	b) Kilometer Stone
	c) 5 Kilometer stone
	d) Boundary stone
	e) Guard stone
30	Providing and fixing road delineators conforming to TS Clause No. 805 as directed by the Engineer.
31	Repainting the kerb stones and separation barrier with first quality synthetic enamel paint of approved brand
32	Painting all types of pavement markings including lines, dashes, arrows etc. on roads as per relevant IRC/MOST standards after cleaning the surface complete in all respects as directed by the Engineer.
	a) Hot applied Thermoplastic compound
	(i) Lane / Centre Line / Edge Line
	(ii) Direction Arrows
	(iii) Diagonal Chevrons Markings
33	Supplying and laying cast-in-situ cement concrete kerb without channel section
	a) by Manual/machine including formwork
34	Major repair / replacement of metal beam crash barrier (W profile guard rails)
35	Providing and fixing chain link/ welded mesh fencing / square bars fencing
36	Dismantling the old damaged chain link/welded mesh / square bars fencing and replacing it with new chain link/ welded mesh/square bars fencing
37	Provision of rumble strips
38	Shoulder Maintenance:
39	synthetic enamel paint of approved brand on metal pedestrian guard rail
40	Dismantling of wearing course

B. Structures

1. Wearing coat comprising of 50 mm thick BC.
2. Cleaning and adding rubber sealant near expansion joints.
3. Modular Expansion joints.
4. Replacement of Damaged Concrete Railing all complete as per Technical specifications and as directed by the Engineer
5. Provision of an RCC crash barrier (0.35sqm cross sectional area) constructed with M-40 grade concrete including reinforcement
6. Cleaning of rocker & roller bearing using high pressure water jet, free from rust scales, re-setting & greasing the bearings using graphite grease including cost of materials, labour etc., complete.
7. POT PTF Bearings greasing and maintaining (sand plastering).
8. Elastomeric Bearings and maintaining.
9. Cutting of groove of 15 mm x 15 mm along crack and sealing the same with epoxy putty including cost of material, labour etc.
10. Carrying out 50 to 60 mm thick shortsheeting using a mix proportion of 1:2:2 (cement: sand:6 mm down aggregate) added with Polypropylene fibers at a dosage rate of 125 gms/bag of cement including cost of labour, material, scaffolding, equipment etc complete.
11. Repair of Floor Aprons, pitching and other protection works
12. Cleaning of Drainage Spouts
13. M-25 Concrete

7.3.3 Incident Management Cost

Incident Management & Safety items include the following:

- ✓ ATMS control room operations,
- ✓ Regular patrolling & reaching accident/incident site,
- ✓ providing relief to injured persons including taking them to nearest hospital and attending to the safety requirements at the location (putting cones, safely guide & manage the traffic using signs, safety barricades, etc.),
- ✓ removal of accident /breakdown vehicles, removing of dead animals/birds lying on the highway and loading, unloading, transportation & disposal of surplus material left over by accidental vehicle or otherwise lying on road (on carriageway) and
- ✓ Encroachment prevention & removal with all lead & lifts complete with proper communication equipment,
- ✓ consumables, materials, suitable Towing vehicles, Ambulance, patrolling vehicles and manpower like drivers, helpers, para-medical staff, labour including deployment of crane and all works shall be done as per requirement and as directed by Client representative and as per Relevant Specifications as applicable.

7.4 OPERATIONS COSTS

In addition to the above-mentioned General Routine maintenance, Repair & Rehabilitation cost for Road and structures, Incident management cost the following the Cost towards Operations include:

- Electricity Charges
- Toll Plaza Operation cost
- Insurance Charges
- Road Asset Management System (RAMS), Bridge Management System (BMS) & Surveys
- Other Office Expense (Admin, SPV, IE and Other)

Table 50: O&M Cost for various Years in Crores (including GST)

FY	Operation & Maintenance Cost (in INR Cr.)								
	Routine Maintenance	R&R of Road and Structure	ATMS AMC	Incident Management	Electricity of Highway Lighting	Toll Plaza Operation	Insurance	RAMS, BMS & Survey	Other Office Expense (Admin, SPV, IE and Other)
2025-2026	0.60	-	-	-	-	5.78	0.13	-	3.53
2026-2027	0.60	-	-	-	-	5.78	0.13	-	4.13
2027-2028	0.60	-	-	-	-	5.78	0.13	-	4.22
2028-2029	0.60	-	-	-	-	7.15	0.17	-	4.15
2029-2030	0.60	-	-	-	-	7.15	0.17	-	4.22
2030-2031	0.60	-	-	-	-	6.65	0.17	-	4.23
2031-2032	0.60	-	-	-	-	6.15	0.17	-	4.13
2032-2033	0.60	-	-	-	-	5.90	0.17	-	4.74
2033-2034	0.60	-	-	-	-	5.90	0.17	-	4.37
2034-2035	0.60	-	-	-	-	5.90	0.17	-	4.24
2035-2036	0.60	-	-	-	-	5.90	0.17	-	4.32
2036-2037	0.60	-	-	-	-	5.90	0.17	-	4.37
2037-2038	0.60	-	-	-	-	5.90	0.17	-	4.44
2038-2039	0.60	-	-	-	-	5.90	0.17	-	4.33
2039-2040	0.60	-	-	-	-	5.90	0.17	-	4.98
2040-2041	0.60	-	-	-	-	5.90	0.17	-	4.53
2041-2042	0.60	-	-	-	-	5.90	0.17	-	4.66
2042-2043	0.60	-	-	-	-	5.90	0.17	-	4.60
2043-2044	5.43	5.58	2.95	5.01	2.09	5.90	4.11	2.60	5.70
2044-2045	5.43	5.58	2.95	5.01	2.09	5.90	4.11	1.84	5.70
Total	**21.58**	**11.16**	**5.90**	**10.02**	**4.18**	**121.22**	**11.19**	**4.43**	**89.58**

Note:

1) The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation.

2) All other remaining costs are based on FY 2025 with GST and without escalation.

3) The amount is Crores inclusive of GST and without escalation,

7.5 PERIODIC MAINTENANCE COSTS

Cost towards major maintenance include following:

- ✓ Cost of Periodic maintenance of Pavement based on Finalized MM schedule
- ✓ Cost of Periodic Maintenance of Structures
- ✓ Cost of Periodic replacement of Toll Equipment's & Software

Table 51: Major Maintenance Cost

Year	Road (MCW, SR, Toll Plaza)	Structure	ATMS	TMS
2025-2026				
2026-2027	-	-	-	-
2027-2028	-	-	-	-
2028-2029	-	-	-	-
2029-2030	-	-	-	-
2030-2031	-	-	-	-
2031-2032	-	-	-	3.00
2032-2033	-	-	-	-
2033-2034	-	-	-	-
2034-2035	-	-	-	-
2035-2036	-	-	-	-
2036-2037	-	-	-	-
2037-2038	-	-	-	-
2038-2039	-	-	-	6.00
2039-2040	-	-	-	-
2040-2041	-	-	-	-
2041-2042	-	-	-	-
2042-2043	-	-	-	-
2043-2044	79.05	10.58	15.01	-
2044-2045	76.28	-	-	-
Total	**155.33**	**10.58**	**15.01**	**9.00**

Note: The amount is Crores inclusive of GST and without escalation, considering FY2025 rates

7.6 CAPACITY AUGMENTATION

The capacity augmentation is envisaged in FY 2027& FY2028 for the project on HAM mode with concession period of 15 years until FY2043.

- Only one cycle of MMR has been considered in FY2044 and the same is distributed in two years i.e., 50% length in in FY 2044 and 50% length in in FY 2045 with 50mm BC and 50mm DBM in 10% for section-1 and for section-2 no DBM is considered for MCW and for Service Road 30mm BC is considered.
- Even though Structural and Functional Overlay requirement are envisaged based on the performed tests and the same is not considered as the capacity augmentation HAM Concessionaire will maintain until FY2043.
- The 6-lane capacity augmentation is envisaged in FY 2027& FY2028 and works will be executed on HAM basis with 15 years of concession period until FY2043.
- Minimum Central Wages for labour is considered for Category "C" as of OCt'2024 with 0% escalation considered.
- Overheads and Contractor's profits are considered from MORTH Standard data book -2019 for "Small Project" category.
- The costs for Other Office Expense (Admin, SPV, IE, and other) are based on FY 2026 with GST and without escalation. Whereas, all other remaining costs are based on FY 2025 with GST and without escalation. The Cost is given in Crores inclusive of GST and without escalation, considering FY2025

ANNEXURE E

LIMITED REVIEW FINANCIAL INFORMATION

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A. R. & Co.
Chartered Accountant

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INDEPENDENT AUDITOR'S REVIEW REPORT ON THE UNAUDITED CONSOLIDATED INTERIM FINANCIAL INFORMATION OF THE TRUST FOR THE QUARTER AND NINE MONTH ENDED ON 31ST DECEMBER, 2024 PURSUANT TO THE. REGULATION 23 OF THE SECURITIES AND EXCHANGE BOARD OF INDIA (INFRASTRUCTURE INVESTMENT TRUSTS) REGULATIONS, 2014 AS AMENDED

To,
The Board of Directors
National Highways Infra Investment Managers Private Limited
(Investment Manager of National Highways Infra Trust)
G-5 & 6, Sector-10,
Dwarka, Delhi - 110075

1. We have reviewed the accompanying Statement of Unaudited Consolidated Interim financial Information of National Highways Infra Trust (the 'Trust') and its subsidiaries (together referred to as "the Group") (consisting of Unaudited Consolidated Interim Balance Sheet, Unaudited Consolidated Interim Statement of profit and loss (Including Other Comprehensive Income), Cash Flow Statement and other explanatory notes thereto including Net Distributable Cash Flows (NDCFs) and the additional disclosures as required in chapter 4 of the SEBI Circular No. SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024 ("SEBI Circular" for the quarter and Nine Month ended 31.12.2024 (hereinafter referred to as "the Statement") attached herewith, being prepared by National Highways Infra Investment Managers Private Limited (the 'Investment Manager') pursuant to the requirements of Regulation 23 of the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014 as amended, read with the SEBI Circular.

2. The Statement which is the responsibility of the Investment Manager and has been approved by the Board of Directors of the Investment Manager, has been prepared in accordance with the recognition and measurement principles laid down in Indian Accounting Standard 34, "Interim Financial Reporting" prescribed under Section 133 of the Companies Act, 2013 as amended, read with Rule 2(1)(a) of Companies (Indian Accounting Standards) Rules, 2015, as amended, read with the SEBI Circular and other accounting principles generally accepted in India. Our responsibility is to express a conclusion on the Statement based on our review.

3. We conducted our review of the Statement in accordance with the Standard on Review Engagements (SRE) 2410, "Review of interim Financial Information Performed by the Independent Auditor of the Entity" issued by the Institute of Chartered Accountants of India. This standard requires that we plan and perform the review to obtain moderate assurance as to whether the Statement is free of

A.R. & Co. FRN: 02744C NEW DELHI Chartered Accountants

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material misstatement. A review of interim financial information consists of making inquiries, primarily of Investment manager personnel responsible for financial and accounting matters, and applying analytical and other review procedures. A review is substantially less in scope than an audit conducted in accordance with Standards on Auditing and consequently does not enable us to obtain assurance that we would become aware of all significant matters that might be identified in an audit. Accordingly, we do not express an audit opinion.

4. The Statement includes the results of the National Highways Infra Trust and the following subsidiaries:

   a. NHIT Western Projects Private Limited
   b. NHIT Eastern Projects Private Limited

5. Based on our review conducted as above, nothing has come to our attention that causes us to believe that the accompanying Statement, prepared in accordance with the recognition and measurement principles laid down in the applicable Indian Accounting Standards ('Ind AS') specified under section 133 of the Companies Act, 2013, as amended, read with Rule 2(1)(a) of the Companies (Indian Accounting Standards) Rules, 2015, as amended, and other accounting principles generally accepted in India has not disclosed the information required to be disclosed in terms of Regulation 23 of the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014 as amended, read with the SEBI Circular, including the manner in which it is to be disclosed, or that it contains any material misstatement.

For A. R. & Co.
Chartered Accountants
FRN. 002744C

A.R. & Co. FRN: 02744C NEW DELHI Chartered Accountants

CA Mohd Azam Ansari
Partner
Membership No: 511623
UDIN: 25511623BMGYKQ5175
Place: New Delhi
Date: 12.02.2025

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :-IN/InvIT/20-21/0014

Unaudited Consolidated Balance Sheet as at December 31, 2024

(All amounts in ₹ lakh unless otherwise stated)

Particulars	As at 31 December 2024 (Unaudited)	As at 31 March 2024 (Audited)
ASSETS		
1) Non - Current Assets		
(a) Property, Plant and Equipment	639.52	219.29
(b) Capital work in Progress (CWIP)	59.77	19.76
(c) Goodwill	10,144.46	10,144.46
(d) Other Intangible Assets	26,32,125.26	10,88,670.84
(e) Right of Use Assets	951.77	-
(f) Financial Assets		
(i) Other Financial Assets	31,271.33	10,177.86
(g) Deferred Tax Assets (Net)	27,130.30	11,523.20
(h) Other Non - Current Assets	602.34	15,70,649.18
Total Non - Current Assets	**27,02,924.75**	**26,91,404.59**
2) Current Assets		
(a) Financial Assets		
(i) Trade Receivables	1,025.77	385.20
(ii) Cash & Cash Equivalents	48,941.57	46,400.78
(iii) Bank Balances other than Cash & Cash Equivalents	-	512.98
(iv) Other Financial Assets	75.96	4.54
(b) Current Tax Assets (Net)	54.52	22.38
(c) Other Current Assets	1,810.89	2,303.89
Total Current Assets	**51,908.71**	**49,629.77**
TOTAL ASSETS	**27,54,833.46**	**27,41,034.36**
EQUITY AND LIABILITIES		
EQUITY		
1) Unit Capital	14,66,133.53	14,67,093.47
2) Initial Settlement Amount	0.10	0.10
3) Other Equity	(66,032.49)	(27,541.44)
Total Equity	**14,00,101.14**	**14,39,552.13**
LIABILITIES		
1) Non-Current Liabilities		
(a) Financial Liabilities		
(i) Borrowings	11,99,086.58	11,63,394.94
(ii) Lease Liabilities	850.71	-
(iii) Other Financial Liabilities	161.34	80.90
(b) Provisions	46,963.05	35,923.32
Total Non - Current Liabilities	**12,47,061.68**	**11,99,399.16**
2) Current Liabilities		
(a) Financial Liabilities		
(i) Borrowings	12,156.75	10,054.00
(ii) Lease Liabilities	89.68	-
(iii) Trade Payables		
(a) Total Outstanding, dues of micro and small enterprises	318.67	275.99
(b) Total outstanding, dues of creditors other than micro and small enterprises	8,300.39	4,479.00
(iv) Other Financial Liabilities	4,566.40	7,224.53
(b) Provisions	82,058.57	79,404.66
(c) Current Tax Liabilities (Net)	-	181.66
(d) Other Current Liabilities	180.18	463.23
Total Current Liabilities	1,07,670.64	1,02,083.07
Total Liabilities	**13,54,732.32**	**13,01,482.23**
TOTAL EQUITY & LIABILITIES	**27,54,833.46**	**27,41,034.36**

National Highways Infra Trust New Delhi

A.R. & Co. FRN: 02744C NEW DELHI Chartered Accountants

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :-IN/InvIT/20-21/0014

Unaudited Consolidated Statement of Profit & Loss for the Quarter and Nine Month ended December 31, 2024

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Quarter ended			Nine Month Ended		Year ended
	31 December 2024	30 September 2024	31 December 2023	31 December 2024	31 December 2023	31 March 2024
	(Unaudited)	*(Unaudited)*	*(Unaudited)*	*(Unaudited)*	*(Unaudited)*	*(Audited)*
INCOME						
Revenue from Operations	58,650.41	56,676.97	23,160.66	1,71,683.43	70,334.10	94,390.77
Interest Income	759.72	675.05	197.74	1,707.91	667.77	871.71
Profit on sale of investments	719.24	398.25	321.22	1,615.50	797.49	2,141.16
Other Income	69.02	33.09	12.08	105.06	26.35	59.53
Total Income	**60,198.39**	**57,783.35**	**23,691.70**	**1,75,111.90**	**71,825.71**	**97,463.17**
EXPENSES						
Investment Manger Fees	584.10	495.00	453.69	1,574.10	1,356.16	1,800.00
Trustee Fees	2.40	2.40	3.92	7.20	8.73	9.60
Valuation expenses	12.15	14.73	2.16	46.59	5.40	11.07
Annual listing fees	13.56	13.52	13.56	40.53	40.53	53.80
Rating fees	6.09	1.72	6.25	8.90	6.35	7.73
Insurance Expenses	419.79	474.69	180.24	1,355.69	573.32	737.91
Custodian Fees	0.75	0.75	0.80	2.24	2.38	3.15
Project Management Fees	354.00	354.00	247.80	1,062.00	743.40	1,168.20
Operating Expenses	9,908.29	8,055.58	2,962.00	26,179.31	10,770.38	13,665.60
Employee Benefit Expenses	762.41	650.34	380.04	1,803.89	843.96	1,156.60
Finance Cost	27,204.46	25,900.27	7,047.34	78,593.62	19,565.51	28,023.17
Depreciation & Amortization Expenses	20,130.79	18,147.11	6,196.62	57,810.97	17,660.65	24,771.04
Audit Fees						
- Statutory audit fees	3.53	4.26	4.25	11.30	13.44	18.49
- Other audit services (including certification)	0.45	0.84	0.64	1.41	1.04	1.72
Other Expenses	1,343.42	820.76	580.58	2,951.98	1,602.61	2,569.62
Total Expenses	**60,746.19**	**54,935.96**	**18,079.89**	**1,71,449.73**	**53,193.86**	**73,997.70**
Profit/(Loss) before Exceptional Items and Tax	**(547.80)**	**2,847.39**	**5,611.81**	**3,662.17**	**18,631.85**	**23,465.47**
Exceptional Items (net)		-		-	-	-
Profit / (Loss) for the period/year before Tax	**(547.80)**	**2,847.39**	**5,611.81**	**3,662.17**	**18,631.85**	**23,465.47**
Tax Expenses						
Current Tax	358.87	215.20	155.80	819.36	408.31	886.30
Provision for Tax for Earlier Years	-	-	(2.84)	-	(2.52)	(2.52)
Deferred Tax expense/(credit)	(5,503.78)	(4,817.49)	(1,734.90)	(15,607.10)	(4,620.23)	(6,837.88)
Total Tax	**(5,144.91)**	**(4,602.30)**	**(1,581.94)**	**(14,787.74)**	**(4,214.44)**	**(5,954.10)**
Profit/ (loss) for the period/year after tax	**4,597.11**	**7,449.69**	**7,193.75**	**18,449.91**	**22,846.29**	**29,419.57**

National Highways Infra Trust New Delhi

A.R. & Co. Chartered Accountants FRN: 02744C NEW DELHI

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :-IN/InvIT/20-21/0014

Unaudited Consolidated Statement of Profit & Loss for the Quarter and Nine Month ended December 31, 2024

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Quarter ended			Nine Month Ended		Year ended
	31 December 2024	30 September 2024	31 December 2023	31 December 2024	31 December 2023	31 March 2024
	(Unaudited)	*(Unaudited)*	*(Unaudited)*	*(Unaudited)*	*(Unaudited)*	*(Audited)*
Other Comprehensive Income						
Items that will not be reclassified to Profit and Loss	-	(5.44)	-	(5.69)	(2.24)	0.10
Income tax relating to items that will not be reclassified to profit or loss	-	1.18	-	1.14	0.45	0.03
Total Other Comprehensive Income	-	(4.27)	-	(4.55)	(1.79)	0.13
Total Comprehensive Income for the period/year	**4,597.11**	**7,445.42**	**7,193.75**	**18,445.36**	**22,844.50**	**29,419.70**
Earnings per Unit						
- Basic	0.35	0.57	0.99	1.41	3.14	3.90
- Diluted	0.35	0.57	0.99	1.41	3.14	3.90
Debt- Equity Ratio	0.87	0.85	0.41	0.87	0.41	0.82
Debt Service coverage ratio	2.27	2.31	3.64	2.02	3.28	3.54
Interest Service coverage ratio	0.98	1.11	1.80	1.05	1.95	1.84
Security Cover ratio*	2.37	2.03	3.30	2.37	3.30	2.01
Outstanding redeemable preference shares (quantity and value)	-	-	-	-	-	-
Capital redemption reserve/debenture redemption reserve	-	-	-	-	-	-
Networth	14,00,101.14	14,20,318.45	7,24,387.65	14,00,101.14	7,24,387.65	14,39,552.13
Net Profit after tax	4,597.11	7,445.42	7,193.75	18,445.36	22,844.50	29,419.70
Current Ratio	0.48	0.58	0.30	0.48	0.30	0.49
Long term debt to working capital	(27.78)	(41.68)	(5.06)	(27.78)	(5.06)	(27.66)
Bad debts to Accounts receivable ratio	-	-	-	-	-	-
Current liability ratio	0.08	0.07	0.21	0.08	0.21	0.08
Total debts to total assets	0.44	0.44	0.26	0.44	0.26	0.43
Debtors turnover	167.37	12.07	43.99	167.37	139.15	245.04
Inventory turnover	N.A	N.A	N.A	N.A	N.A	N.A
Operating margin %	77.13%	80.79%	79.12%	79.59%	77.30%	77.54%
Net profit margin %	7.84%	13.14%	31.06%	10.74%	32.48%	31.17%

* The Security Cover Ratio is computed as per Standalone Financial Results of Trust which is as per the requirements of Debenture Trustee.

National Highways Infra Trust New Delhi

A.R. & Co. FRN: 02744C NEW DELHI Chartered Accountants

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :-IN/InvIT/20-21/0014

Unaudited Consolidated Statement of Cash Flows for Nine Month ended December 31, 2024

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Nine Month ended December 31, 2024	Year ended March 31, 2024
	(Unaudited)	*(Audited)*
A. Cash flows from operating activities		
Net Profit/(Loss) Before Tax	3,662.17	23,465.47
Adjustments:		
Depreciation and Amortization	57,810.97	24,771.04
Profit on redemption of Mutual Funds	(1,615.50)	(2,141.16)
Interest income from FDR	(1,707.92)	(871.71)
Finance Cost (net)	72,986.86	25,015.90
Provision for major maintenance expenses	15,775.20	8,444.05
Unwinding interest on major maintenance provision	5,570.00	2,867.62
Unwinding interest on lease Liability	24.81	-
Provision for Leave encashment and Gratuity	80.87	52.43
Operating cash flows before Working Capital Changes	**1,52,587.46**	**81,603.64**
Movements in Working Capital		
Decrease / (Increase) in Trade & Other Receivables	(640.56)	(34.34)
Decrease / (Increase) in Other Non Current/Current Assets	(99.61)	(516.99)
Decrease / (Increase) in Other Non Current/Current Financial Assets	184.08	(296.44)
Increase / (Decrease) in Trade & Other Payables	4,493.48	12.68
Increase / (Decrease) in Other Financial Liabilities	286.46	188.39
Increase / (Decrease) in Provisions	(1.98)	(3.57)
Increase / (Decrease) in Other Current Liabilities	(283.06)	229.27
Cash used in operating activities	**1,56,526.27**	**81,182.64**
Income Tax paid	(1,033.15)	(721.42)
Net Cash Flows used in operating activities -A	**1,55,493.12**	**80,461.22**
B. Cash flows from investing activities		
Purchase of Property, Plant & Equipment, including CWIP, capital creditors and capital advances	(39,000.69)	(15,82,977.68)
(Investment)/Redemption in FDR	(19,728.79)	(951.26)
Interest received on maturity of FDR	892.85	810.99
Profit on redemption of mutual funds	1,615.50	2,141.16
Net Cash Flows used in investing activities - B	**(56,221.13)**	**(15,80,976.79)**
C. Cash flows from financing activities		
Proceeds from Issue of Unit Capital	-	7,27,206.41
Expense incurred towards institutional unit allotment	(1,226.08)	(1,471.46)
Precessing Fee paid	(489.70)	(1,482.16)
Distribution to Unit Holders	(56,936.38)	(54,491.29)
Proceeds from Long Term Borrowings (net of processing fees)	45,266.00	8,84,700.00
Payment of rent	(58.62)	-
Financing charges paid	(75,761.12)	(24,909.51)
Repayment of Long Term Borrowings	(7,525.30)	(3,759.73)
Net Cash Flows from financing activities - C	**(96,731.20)**	**15,25,792.26**
Net Increase/Decrease in Cash and Cash equivalents (A+B+C)	2,540.79	25,276.69
Cash and Cash Equivalents at the Beginning of the period/year	46,400.78	21,124.08
Cash and Cash Equivalents at the end of the period/year	**48,941.57**	**46,400.78**

National Highways Infra Trust New Delhi

A.R. & Co. FRN: 02744C NEW DELHI Chartered Accountants

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :- IN/InvIT/20-21/0014

Statement of Net Distributable Cash Flow for Nine Month ended December 31, 2024

Additional disclosures as required by paragraph 6 of chapter 4 to the SEBI Master Circular No.SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024

a) Statement of Net Distributable Cash Flows (NDCF) at Trust Level (NHIT)

(All amounts are in ₹ lakh unless otherwise stated)

S.No.	Particulars	Amount
1	**Cashflows from operating activities of the Trust**	(2,967.96)
2	(+) Cash flows received from SPV's / Investment entities which represent distributions of NDCF computed as per relevant framework (Refer Notes Below)	1,61,846.00
3	(+) Treasury income / income from investing activities of the Trust (interest income received from FD, any investment entities as defined in Regulation 18(5), tax refund, any other income in the nature of interest, profit on sale of Mutual funds, investments, assets etc., dividend income etc., excluding any Ind AS adjustments)	1,098.74
4	(+) Proceeds from sale of infrastructure / real estate investments, infrastructure / real estate assets or shares of SPVs/Holdcos or Investment Entity adjusted for the following	-
	• Applicable capital gains and other taxes	-
	• Related debts settled or due to be settled from sale proceeds	-
	• Directly attributable transaction costs	-
	• Proceeds reinvested or planned to be reinvested as per Regulation 18(16)(d) of REIT Regulations or Regulation 18(7) of InvIT Regulations or any other relevant provisions of the REIT/InvIT Regulations	-
5	(+) Proceeds from sale of infrastructure / real estate investments, infrastructure / real estate assets or sale of shares of SPVs/ Hold cos or Investment Entity not distributed pursuant to an earlier plan to re-invest as per Regulation 18(16)(d) of REIT Regulations or Regulation 18(7) of InvIT Regulations or any other relevant provisions of the REIT/InvIT Regulations, if such proceeds are not intended to be invested subsequently	-
6	(-) Finance cost on Borrowings, excluding amortisation of any transaction costs, recognized in Profit and Loss account of the Trust	(72,806.74)
7	(-) Debt repayment at Trust level (to include principal repayments as per scheduled EMI's except if refinanced through new debt including overdraft facilities and to exclude any debt repayments / debt refinanced through new debt in any form or equity raise)	(7,525.29)
8	(-) any reserve required to be created under the terms of, or pursuant to the obligations arising in accordance with, any: (i). loan agreement entered with lenders, or (ii). agreement pursuant to which the Trust operates or owns the infrastructure or real estate asset, or generates revenue or cashflows from such asset (such as, concession agreement, transmission services agreement, power purchase agreement, lease agreement, and any other agreement of a like nature, by whatever name called); or (iii). statutory, judicial, regulatory, or governmental stipulations; or (iv). such mandatory terms or conditions, which if breached (or not complied with) would result in the Trust losing the right to own or operate the relevant infrastructure asset or real estate asset	(5,233.04)
9	(-) any capital expenditure to the extent not funded by debt / equity or from reserves created in the earlier years	-
10	**NDCF at Trust level as on 31st December 2024**	**74,411.72**
11	**NDCF Distributed in June 2024 & September 2024 Quarter**	**47,685.37**
12	**Balance NDCF for December 2024**	**26,726.35**
13	**NDCF Recommended fot the Distribution**	**26,112.79**

Notes:

1 In accordance with the SEBI circular no. SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024, the framework for computation of Net Distributable cash flows ("NDCF") is revised with effect from April 01, 2024. Accordingly, NDCF for the period April 01, 2024 to December 31, 2024 has been calculated and presented in accordance with the revised framework. NDCF for the periods on or before March 31, 2024, has been calculated and presented as per the earlier framework and has been disclosed/reproduced in Annexure 1 to the unaudited consolidated financial information.

2 This NDCF includes cash flows received from SPV after 31st December 2024 but before the date of the Board Meeting of the InvIT i.e. 5th February 2025. Rs. 105.64 Crores received from NWPPL and Rs. 134.33 Crores received from NEPPL.

National Highways Infra Trust New Delhi

A.R. & Co. FRN: 02744C NEW DELHI Chartered Accountants

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :- IN/InvIT/20-21/0014

Disclosure as required by SEBI Master Circular No.SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024

b) Statement of Net Distributable Cash Flows (NDCF) at SPV Level (NWPPL) for Nine Month ended December 31, 2024.

(All amounts in ₹ lakh unless otherwise stated)

S. No	Particulars	Amount
1	Cash flow from operating activities as per Cash Flow Statement.	63,408.23
2	(+) Treasury income / income from investing activities (interest income received from FD, tax refund, any other income in the nature of interest, profit on sale of Mutual funds, investments, assets etc., dividend income etc., excluding any Ind AS adjustments)	1,014.05
3	(+) Proceeds from sale of infrastructure / real estate investments, infrastructure / real estate assets or shares of SPVs or Investment Entity adjusted for the following	-
	• Applicable capital gains and other taxes	-
	• Related debts settled or due to be settled from sale proceeds	-
	• Directly attributable transaction costs	-
	• Proceeds reinvested or planned to be reinvested as per Regulation 18(16)(d) of REIT Regulations or Regulation 18(7) of InvIT Regulations or any other relevant provisions of the REIT/InvIT Regulations	-
4	(+) Proceeds from sale of infrastructure/ real estate investments, infrastructure/ real estate assets or sale of shares of SPVs or Investment Entity not distributed pursuant to an earlier plan to re-invest as per Regulation 18(16)(d) of REIT Regulations or Regulation 18(7) of InvIT Regulations or any other relevant provisions of the REIT/InvIT Regulations, if such proceeds are not intended to be invested subsequently	-
5	(-) Finance cost on Borrowings, excluding amortisation of any transaction costs as per Profit and Loss Account and any shareholder debt / loan from Trust	-
6	(-) Debt repayment (to include principal repayments as per scheduled EMI's and to exclude any debt refinanced through new debt or equity raise as well as repayment of any shareholder debt / loan from Trust)	-
7	(-) any reserve required to be created under the terms of, or pursuant to the obligations arising in accordance with, any: (i). loan agreement entered with banks / financial institution from whom the Trust or any of its SPVs/ HoldCos have availed debt, or (ii). terms and conditions, covenants or any other stipulations applicable to debt securities issued by the Trust or any of its SPVs/ HoldCos, or (iii). terms and conditions, covenants or any other stipulations applicable to external commercial borrowings availed by the Trust or any of its SPVs/ HoldCos, (iv). agreement pursuant to which the SPV/ HoldCo operates or owns the infrastructure asset, or generates revenue or cashflows from such asset (such as, concession agreement, transmission services agreement, power purchase agreement, lease agreement, and any other agreement of a like nature, by whatever name called); or (v). statutory, judicial, regulatory, or governmental stipulations; or	-
8	(-) any capital expenditure to the extent not funded by debt / equity or from reserves created in the earlier years	(310.27)
9	**Net Distributable Cash Flow for the period ended December 2024**	**64,112.01**

Adjustment to Net Distributable Cash Flows

S. No.	Particulars	Amount
1	**Net Distributable Cash flow for the period (From (9) Above)**	**64,112.01**
2	Less: NDCF Already Distributed during the period ended December 2024	(58,964.09)
3	Less: Retained for additional Working Capital	(250.00)
4	Add: Reserve Created in earlier years now released	504.26
5	Add: NDCF pertaining to March 2024 distributed during the period ended June 2024	5,162.05
6	**Balance Distributable Cash Flow for the period ended December 2024**	**10,564.24**

Notes:

1 In accordance with the SEBI circular no. SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024, the framework for computation of Net Distributable cash flows ("NDCF") is revised with effect from April 01, 2024. Accordingly, NDCF for the period April 01, 2024 to December 31, 2024 has been calculated and presented in accordance with the revised framework. NDCF for the periods on or before March 31, 2024, has been calculated and presented as per the earlier framework and has been disclosed/reproduced in Annexure 2(i) to the unaudited consolidated financial information.

National Highways Infra Trust New Delhi

A.R. & Co. FRN: 02744C NEW DELHI Chartered Accountants

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :- IN/InvIT/20-21/0014

Disclosure as required by SEBI Master Circular No.SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024

c) Statement of Net Distributable Cash Flows (NDCF) at SPV Level (NEPPL) for Nine Month ended December 31, 2024.

(All amounts in ₹ lakh unless otherwise stated)

S. No	Particulars	Amount
1	Cash flow from operating activities as per Cash Flow Statement.	95,052.86
2	(+) Treasury income / income from investing activities (interest income received from FD, tax refund, any other income in the nature of interest, profit on sale of Mutual funds, investments, assets etc., dividend income etc., excluding any Ind AS adjustments)	395.55
3	(+) Proceeds from sale of infrastructure / real estate investments, infrastructure / real estate assets or shares of SPVs or Investment Entity adjusted for the following	-
	• Applicable capital gains and other taxes	-
	• Related debts settled or due to be settled from sale proceeds	-
	• Directly attributable transaction costs	-
	• Proceeds reinvested or planned to be reinvested as per Regulation 18(16)(d) of REIT Regulations or Regulation 18(7) of InvIT Regulations or any other relevant provisions of the REIT/InvIT Regulations	-
4	(+) Proceeds from sale of infrastructure/ real estate investments, infrastructure/ real estate assets or sale of shares of SPVs or Investment Entity not distributed pursuant to an earlier plan to re-invest as per Regulation 18(16)(d) of REIT Regulations or Regulation 18(7) of InvIT Regulations or any other relevant provisions of the REIT/InvIT Regulations, if such proceeds are not intended to be invested subsequently	-
5	(-) Finance cost on Borrowings, excluding amortisation of any transaction costs as per Profit and Loss Account and any shareholder debt / loan from Trust	-
6	(-) Debt repayment (to include principal repayments as per scheduled EMI's and to exclude any debt refinanced through new debt or equity raise as well as repayment of any shareholder debt / loan from Trust)	-
7	(-) any reserve required to be created under the terms of, or pursuant to the obligations arising in accordance with, any: (i). loan agreement entered with banks / financial institution from whom the Trust or any of its SPVs/ HoldCos have availed debt, or (ii). terms and conditions, covenants or any other stipulations applicable to debt securities issued by the Trust or any of its SPVs/ HoldCos, or (iii). terms and conditions, covenants or any other stipulations applicable to external commercial borrowings availed by the Trust or any of its SPVs/ HoldCos, (iv). agreement pursuant to which the SPV/ HoldCo operates or owns the infrastructure asset, or generates revenue or cashflows from such asset (such as, concession agreement, transmission services agreement, power purchase agreement, lease agreement, and any other agreement of a like nature, by whatever name called); or (v). statutory, judicial, regulatory, or governmental stipulations; or	-
8	(-) any capital expenditure to the extent not funded by debt / equity or from reserves created in the earlier years	(230.73)
9	**Net Distributable Cash Flow for the period ended December 2024**	**95,217.68**

Adjustment to Net Distributable Cash Flows

S. No.	Particulars	Amount
1	**Net Distributable Cash flow for the year (From (9) Above)**	**95,217.68**
2	Less: NDCF Already Distributed during the period ended December 2024	(78,884.64)
3	Less: Retained for Working Capital Requirement	(2,900.00)
4	**Balance Distributable Cash Flow for the period ended December 2024**	**13,433.04**

Notes:

1 In accordance with the SEBI circular no. SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024, the framework for computation of Net Distributable cash flows ("NDCF") is revised with effect from April 01, 2024. Accordingly, NDCF for the period April 01, 2024 to December 31, 2024 has been calculated and presented in accordance with the revised framework. NDCF for the periods on or before March 31, 2024, has been calculated and presented as per the earlier framework and has been disclosed/reproduced in Annexure 2(ii) to the unaudited Consolidated financial information.

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Disclosures pursuant to SEBI circulars (SEBI Master Circular No.SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024 issued under the InvIT regulations)

d. Project Management Fees :-

The project manager National Highways InVIT Project Managers Private Limited ('NHIPMPL') for NWPPL (R1 & R2 assets) and is entitled to fixed fees based on the Project Implementation and Management Agreement (PIMA) signed by both the parties dated 30th March 2021 as amended on 6th March 2024. NHIPMPL is also Project Manager for NEPPL (R3 assets) w.e.f 1st April 2024 as per deed of adherence signed on 7th March 2024. PM fee for NWPPL is Rs. 53.10 Lakhs per month including GST and for NEPPL is Rs. 64.90 Lakhs per month including GST w.e.f. 01.04.2024.

e. Investment Manager fees

i) The Investment Management Agreement is revised and the fee with effect from 1st April 2023 has been agreed at Rs 1,800 Lakhs (Rupees Eighteen hundred lakhs) for the Financial Year 2023-24.

ii) The management fee set out in paragraph (i) above shall be subject to escalation on an annual basis at the rate of 10% of the management fee for the previous year.

iii) The Investment Management Agreement is revised and the fee with effect from 1st April 2024 has been agreed at Rs 1,980 Lakhs (Rupees Nineteen hundred and Eighty Lakhs) for the Financial Year 2024-25

iv) Any applicable taxes, cess or charges, as the case may be, shall be in addition to the management fee and shall be payable by National Highways Infra Trust (NHIT) to the Investment Manager (NHIIMPL).

Frequency of Payment: Payment of management fee shall be made by National Highways Infra Trust (NHIT) to the Investment Manager (NHIIMPL) in advance on a quarterly basis at the beginning of each quarter of a financial year.

f. Statement of earnings per unit ('EPU')

Basic EPU amounts are calculated by dividing the profit for the period/ year attributable to Unit holders by the weighted average number of units outstanding during the period/ year. Diluted EPU amounts are calculated by dividing the profit/(loss) attributable to unit holders by the weighted average number of units outstanding during the period/ year plus the weighted average number of units that would be issued on conversion of all the dilutive potential units into unit capital.

Particulars	For Nine Month ended December 31, 2024	For the Year ended March 31, 2024
	(Unaudited)	(Audited)
Profit for the period / year (₹ lakhs)	18,445.36	29,419.70
Weighted average number of units outstanding for computation of basic and diluted earning per unit.	1,31,22,00,600	75,36,14,276
Earning per unit (basic and diluted) (₹)	**1.41**	**3.90**

g. Statement of Contingent Liabilities/Contingent Assets

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	For Nine Month ended December 31, 2024	For the Year ended March 31, 2024
i) Contingent Liabilities		
Stamp Duty on Concession agreement on Belgaum Kagal Project (refer note (a) below)	6,990.00	6,990.00
Stamp Duty on Concession agreement on Hubli Haveri Project (refer note (a) below)	9,935.33	-
Corporate Guarantee issued to senior lenders (refer note (c) below)	-	2,87,700.00
Corporate Guarantee issued to Debenture Trustee on behalf of Non Convertible Debenture Holders (refer note (c) below)	-	1,50,000.00
Damages levied by Authority (NHAI) (refer note (d) below)	1,213.86	-
ii) Contingent Assets		
Stamp Duty on Concession agreement on Belgaum Kagal Project (refer note (b) below)	6,990.00	6,990.00
Stamp Duty on Concession agreement on Hubli Haveri Project (refer note (b) below)	9,935.33	-

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Disclosures pursuant to SEBI circulars (SEBI Master Circular No.SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024 issued under the InvIT regulations)

Note : (a) Stamp Duty on Concession agreement on Belgaum Kagal Project - The Group has received notice from Office of Deputy Registrar of Stamps, Government of Karnataka. As per this notice additional stamp duty of Rs 69.90 crore has been imposed on the company for the concession agreement entered into for Belgaum-Kagal road.

Stamp legislation in certain states (including Karnataka) also specifies that copy of the main document in respect of any property, or any business within the state also needs to be stamped with original amount of stamp duty, if the original document has not been stamped with full amount of the stamp duty applicable for place of business .

As regards to the applicability of stamp duty on Concession Agreement, it may please be noted that there is no specific entry in respect of the concession agreement. Such agreements are stamped under the residuary category of the agreements and a nominal amount was paid on such agreements. We are given to understand that the Karnataka State Govt. has given instructions to procure copies of licence /Agreement of toll collecting agencies in respect of roads passing through state of Karnataka. We have further been issued a notice for recovery of shortfall in stamp duty.

Various judicial pronouncements by various high courts have divergent views and the issue is debatable and there is no clarity on the same.

The Group is contesting this imposition of deficit stamp duty on concession agreement notice with Government of Karnataka. We are also in receipt of copies of letters sent by NHAI to the Karnataka State Govt clarifying the issue. The Group is in the process of filing injuction with the Dharwad bench of Karnataka High Court.

Stamp Duty on Concession agreement on Hubli Haveri Project - The Group has received notice from Office of Deputy Registrar of Stamps, Government of Karnataka. As per this notice additional stamp duty of Rs 99.35 crore has been imposed on the company for the concession agreement entered into for Hubli-Haveri Project. The Group has contested this levy of stamp duty.

(b) Contingent Assets

Stamp Duty on Concession agreement on Belgaum Kagal Project- In the event of the stamp duty becoming payable, it shall be reimbursed by NHAI as confirmed by them vide letter No. NHAI/F&A/InVIT/2021-22/CLFN_GST&SD(E-106870) dated 28.09.2021. Since no provision has been recognised in the books with respect to stamp duty, the reimbursement has not been recognised as an asset considering the guidance in Ind AS 37.

Further on the same line, in the event if stamp duty becoming payable on Concession agreement on Hubli Haveri Project, the same shall be reimbursed by NHAI. Hence stamp duty has been disclosed as contingent asset.

(c) Corporate Guarantees

31st December 2024	Nil
31st March 2024	Rs 4,37,700.00 Lakh

The Project SPV Company (NWPPL) issued corporate guarantees amounting Rs. 1500 crore on October 21, 2022, to secure obligations in favor of the Debenture Trustee for the benefit of NCD holders. Following approval from the SBI Trustee for the waiver and cancellation of these corporate guarantees, an application was submitted to the stock exchange on September 27, 2024, seeking approval for the waiver and cancellation. The corporate guarantees were officially waived and cancelled, as approved by both BSE and NSE on October 11, 2024. Additionally, the corporate guarantees provided to the banks were released after March 31, 2024.

(d) Damages levied by Authority

Damages has been levied by NHAI for not carrying out items mandated in Schedule B of Concession agreement vide letter no. 21021/InvIT/2024/ABP/3196 dated 25/11/2024.

The same has been contested by the group and request for withdrawal of damages has been submitted to NHAI vide letter no. NHIPPL/OPS/SITE/PIU/AB/24-25/163 dated 27/11/2024. In light of the above same has been disclosed as Contingent liability in Financial statements.

h. Capital Commitments as on 31.12.2024

(All amounts are in ₹ lakh unless otherwise stated)

Particular	For Nine Month ended December 31, 2024	For the Year ended March 31, 2024
The estimated value of contracts to be executed and not provided for	41,248.38	49,698.13
Other Commitments	Nil	Nil
Total	**41,248.38**	**49,698.13**

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Additional disclosures as required by SEBI Master Circular No.SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024

Statement of Related Parties

A. List of Related Parties as per requirement of IND AS 24 – "Related Party Disclosures"

Enterprises where Control / significant influence exists	**NHIT Western Projects Private Limited ('NWPPL') (Subsidiary Company)**
	NHIT Eastern Projects Private Limited ('NEPPL') (Subsidiary Company)

B. List of additional related parties as per Regulation 2(1)(zv) of the SEBI InvIT Regulations

Parties to the Trust

National Highways Infra Investment Managers Private Limited (NHIIMPL) - Investment Manager (IM) of the Trust
IDBI Trusteeship Services Limited (ITSL) - Trustee of the Trust
National Highways Authority of India (NHAI)- Sponsor
National Highways InvIT Project Managers Private Limited (NHIPMPL)- Project Manager

Promoters of the Parties to the Trust specified above

Government of India (acting through Ministry of Road, Transport & Highways (MORTH)) - Promoter of NHIIMPL
IDBI Bank Limited (IDBI Bank) - Promoter of ITSL
Government of India (acting through Ministry of Road, Transport & Highways (MORTH)) - Promoter of NHAI
National Highways Authority of India (NHAI)- Promoter of NHIPMPL

Directors of the parties to the Trust specified above

Directors of NHIIMPL

Mr. Suresh Krishan Goyal
Mr. Shailendra Narain Roy
Mr. Mahavir Prasad Sharma
Mr. Pradeep Singh Kharola
Mr. N.R.V.V.M.K. Rajendra Kumar
Mr. Sumit Bose
Mr. Pushkar Vijay Kulkarni
Mr. Debapratim Hajara
Mr. Vinay Kumar
Ms. Usha Monari (Appointed as Woman Independent Director w.e.f. 16.04.2024)

Directors of NWPPL

Mr. Suresh Krishan Goyal
Mr. Shailendra Narain Roy
Mr. Mahavir Prasad Sharma
Mr. Muralidhara Rao Bugatha (Ceased to be Nominee Director w.e.f. 28.06.2024)
Mr. N.R.V.V.M.K. Rajendra Kumar

Directors of NEPPL

Mr. Suresh Krishan Goyal
Mr. Mathew George
Mr. Mahavir Prasad Sharma (Appointed as Director w.e.f. 15.04.2024)
Mr. Shailendra Narain Roy (Appointed as Director w.e.f. 15.04.2024)

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Additional disclosures as required by SEBI Master Circular No.SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024

Directors of ITSL

Ms. Jayashree Vijay Ranade (Ceased to be Director w.e.f. 18.04.2024)
Mr. Pradeep Kumar Jain (Ceased to be Director w.e.f. 20.12.2024)
Mr. Arun Kumar Agarwal (Appointed as Director w.e.f. 19.07.2024)
Mr. Hare Krushna Dandapani Panda (Appointed as Director w.e.f. 19.07.2024)
Mr. Pradeep Kumar Malhotra
Ms. Baljinder Kaur Mandal
Ms. Jayakumar Subramoniapillai
Mr. Balkrishna Variar (Appointed as Director w.e.f. 24.06.2024)

Directors of NHIPMPL

Mr. Akhil Khare
Mr. Ashish Kumar Singh

C. Transactions with Related Parties

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	Nine Months ended Dec 31, 2024	Year ended 31st March, 2024
	(Unaudited)	*(Audited)*
National Highways Infra Investment Managers Private Limited (NHIIMPL)		
Investment Manager Fee	1,574.10	1,800.00
Advance Investment Manager Fee Paid	-	4.93
Expense incurred by NHIIMPL on behalf of NHIT	0.90	15.35
Interest Cost Reimbursement	0.03	-
Expenses incurred on behalf of NEPPL by NHIIMPL	21.39	25.00
Other Support Services to NWPPL	103.53	22.96
Expenses incurred by NWPPL for NHIIMPL Behalf	-	0.65
National Highways Authority of India (NHAI)		
Issue of units of Trust to NHAI	-	1,09,081.07
Interest and other income distribution	8,811.29	8,641.92
O & M Expenses	102.37	96.03
Double toll fees	458.88	528.00
Reimbursement for Initial Improvement Works	19,020.34	3,146.59
Independent engineers fees	289.01	228.56
IDBI Trusteeship Services Limited (ITSL)		
Payment of Trustee Fee	7.20	9.60
Other fees related to Round 1 & 2 Assets	-	1.50
Other Fees related to Round 3 Assets ("Project Leap")	-	17.58
Other Fees related to Proposed Bonds Issuance	1.77	-
IDBI Bank Limited		
Secured Loan given to NHIT	1,078.00	10,000.00
Interest Expense incurred on Loan given to NHIT	633.44	4.38
Repayment of Principal Amount	184.06	0.00
Loan Processing Fees Paid to them	-	41.30
National Highways InVIT Project Managers Private Limited (NHIPMPL)		
Project Manager Fees for NWPPL	477.90	1,168.20
Project Manager Fees for NEPPL	584.10	-





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Additional disclosures as required by SEBI Master Circular No.SEBI/HO/DDHS-PoD-2/P/CIR/2024/44 dated May 15, 2024

D. Summary of Transactions with Key Managerial Personnel (KMP)

(Amounts in ₹ lakh)

Name of KMP and Nature of Transaction	Nine Months ended Dec 31, 2024	Year ended 31st March 2024
	(Unaudited)	*(Audited)*
Mr. Suresh Krishan Goyal - Reimbursement of Expenses	-	0.79
Mr. M.P. Sharma - Director's Sitting Fees	10.38	8.00
Mr. Shailendra Narain Roy - Director's Sitting Fees	10.38	8.00
Mr. Arun Kumar Jha - Short Term Employment Benefits	87.24	69.35
Mr. Arun Kumar Jha - Reimbursement of Expenses	0.32	3.31
Mr. Bhanu Sharma (CS) - Short Term Employment Benefits	0.89	7.49
Mr. Bhanu Sharma (CS) - Long Term Employment Benefits	0.43	-
Mr. Bhanu Sharma (CS) - Reimbursement of Expenses	-	0.47
Ms. Aashima Agarwal (CS)- Short Term Employment Benefits	6.75	6.28
Ms. Aashima Agarwal (CS)- Reimbursement of Expenses	0.08	0.58

E. Closing Balances with Related Parties

(Amounts in ₹ lakh)

Particulars	As at Dec 31, 2024	As at March 31, 2024
	(Unaudited)	*(Audited)*
National Highways Authority of India (NHAI)		
Issue of units of Trust to NHAI	2,27,003.91	2,27,003.91
O & M Expenses payable	645.58	717.98
Double toll fees payable	3.29	10.19
Independent Engineers Fees payable	568.82	451.45
Amount Payable for Initial Improvement Works	-	829.65
National Highways Infra Investment Managers Private Limited (NHIIMPL)		
Advance IM Fee	-	4.93
Payable by NWPPL for Other Support Services	40.60	16.69
Amount Payable for expenses incurred on behalf of NHIT	0.47	-
Amount Payable by NEPPL for expenses incurred on their behalf by NHIIMPL	10.32	25.00
IDBI Trusteeship Services Limited		
Trustee Fee Payable	7.20	1.73
Other Fees related to Round 3 Assets ("Project Leap")	-	2.68
IDBI Bank Limited		
Outstanding Secured Loan Amount	10,893.94	9,999.99
National Highways InVIT Project Managers Private Limited (NHIPMPL)		
Project Manager Fees Payable for NWPPL	243.32	540.00
Project Manager Fees Payable for NEPPL	229.90	-

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Notes to the consolidated financial results for the Quarter and Nine Month ended December 31, 2024

1 The investor can view the result of the National Highway Infra Trust (Trust) on the Trust's website (https://www.nhit.co.in) or on the websites of BSE (www.bseindia.com) or NSE (www.nseindia.com).

2 The consolidated Financial results of National Highways Infra Trust ('Trust') for the quarter and Nine Month ended 31st December, 2024 have been reviewed by the Audit Committee of National Highways Infra Investment Managers Private Limited ('Investment Manager' of Trust) on 12th February, 2025 and thereafter approved by the Board of Directors of the Investment Manager on 12th February, 2025.

3 The Statutory Auditors of the Trust have carried out the Limited Review of Consolidated Financial Results of Trust for the quarter and Nine Month ended 31st December 2024 and have issued an unmodified audit report on these Consolidated Financial Results.

4 The Consolidated Financial results comprise the Consolidated Balance Sheet as at 31st December, 2024, Consolidated Statement of Profit and Loss, Consolidated Statement of Cash Flows and explanatory notes thereto of the National Highways Infra Trust ('the Trust') for the quarter and Nine Month ended 31st December, 2024 ('the Statement'). The Statement has been prepared in accordance with the recognition and measurement principles laid down in Indian Accounting Standards (Ind AS) and/or any addendum thereto as defined in Rule 2 (1) (a) of the Companies (Indian Accounting Standards) Rules, 2015 and other accounting principles generally accepted in India. The Statement has been prepared solely for submissions to be made by the Investment Manager with the Stock Exchanges (both BSE and NSE) and as additional information for stakeholders of the Trust and therefore it may not be suitable for another purpose.

5 The Consolidated Financial Results incorporate the Financial Results of the Trust and its subsidiaries (Project SPV- NWPPL and NEPPL). The Consolidated Financial Results combine the financial statements of the Trust and its subsidiaries on a line-by-line basis by adding together the like items of assets, liabilities, income, and expenses. All intra-group assets, liabilities, income, expenses and unrealised profits/losses on intra-group transactions are eliminated on consolidation unless the transaction provides evidence of an impairment of transferred asset. The carrying amount of the Group's investment in each subsidiary and the Group's portion of equity in each subsidiary are offset with each other in the Consolidated Financial Results.

6 National Highway Infra Trust ("Trust" or "InvIT") is registered as an Irrevocable Trust registered under the provisions of the Indian Trusts Act, 1882 on 19th October, 2020. It was registered under the Securities and Exchange Board of India (Infrastructure Investment Trust) Regulations, 2014 on 28th October, 2020 having registration number IN/InvIT/20-21/0014.

7 The Group has outstanding secured non-convertible debentures (NCDs) amounting to Rs. 1,500 crores for STRPP A, STRPP B, and STRPP C which will mature from 8th anniversary to 13th anniversary, 13th anniversary to 18th anniversary, 18th anniversary to 25th anniversary of allotment respectively. The NCDs are listed on Bombay Stock Exchange (BSE) and National Stock Exchange (NSE). The security cover exceeds 100% of the principal and interest amount of NCD's as at 31st December 2024.

8 **Nature of Security for Non Convertible debentures:**

The debenture holders are secured by :

a) a first ranking pari passu Security Interest over the Trust's immovable assets (if any), both present and future. The Trust does not own any immovable property at the present time. In the event, the Trust acquires any immovable property in future, the Trust shall mortgage said property within 180 (one hundred eighty) days from the date of acquisition of such immovable assets. The Debenture Trustee shall be authorised to do all acts, deeds, and enter into necessary documents, agreement, amendments and/or modifications, as may be required to give effect the same, including carrying out the due diligence as may be required by Debenture Trustee;

b) a first ranking pari passu Security Interest over the Hypothecated Assets (including Receivables), both present and future;

c) a first ranking pari passu Security Interest over Project SPV Pledged Securities; and

d) Negative Lien Undertaking

9 **Subsequent Material Event**

On 30th January 2025, NHIT has done the allotment of 1,01,584 secured, rated, listed, redeemable, non-convertible debentures of face value of INR 200,000/- (Indian Rupees Two Hundred Thousand only) each ("Series I Debentures") (comprising of 2 (two) separately transferable and redeemable principal parts ("STRPP") (being 1,01,584 STRPP A Debenture of face value INR 100,000/- (Indian Rupees One Hundred Thousand only) each ("Series I STRPP A Debentures") and 1,01,584 STRPP B Debenture of face value of INR 100,000/- ("Series I STRPP B Debentures") (Indian Rupees One Hundred Thousand only) each of the National Highways Infra Trust ("Trust") (Series I STRPP A Debentures and Series I STRPP B Debentures.

The Existing debt facility obtained for aquisition of Round 1 Asset have been partly repaid from this issue to the extant of Rs. 999.99 Crore which comprise repayment to SBI Bank of Rs. 543.29 Crore, Axis Bank of Rs. 274.02 Crore and Bank of Maharashtra of Rs. 182.68 Crore.

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Notes to the consolidated financial results for the Quarter and Nine Month ended December 31, 2024

10 The Board of Directors of the Investment Manager has declared distribution for quarter ended December 2024 of Rs.1.99 per unit which comprises of Rs. 1.99 per unit as interest pass through at the Trust level in their meeting held on 5th February, 2025.

11 **Provision for Major Maintenance**

The group has a contractual obligation to maintain the performance standards of the Project Highways in respect of riding quality and allied measures as per the performance parameters stipulated under the respective Concession Agreements. Cost of such obligation is measured at the best estimate of the expenditure required to settle the obligation at the balance sheet date and recognised over the period at the end of which the overlay is estimated to be carried out using Discounted Cash Flows method with the discount rate taken as the risk-free interest rate i.e. the discounting rate used for arriving at the present value for MMR provisions is government bond rate of 30 years for projects acquired in first phase and 20 years for projects acquired in second & third phase. The group has recognised finance cost on major maintenance provision for Nine Month ended December 31, 2024 amounting to Rs 1,322.48 Lakhs (PY Rs 470.79 lakhs). The provision for Major Maintenance Obligation as at December 31, 2024 has been recognised in the financial statements at Rs. 15,775.20 Lakhs (P.Y. Rs. 8,444.05 lakhs).

12 **Initial Improvement Works**

As per the concession agreement between SPVs' and NHAI, the concessionaire is obligated to undertake initial improvement works as specified in Schedule B including certain improvement works required initially and then to extend required repairs maintenance, regular upkeep of the Project Highway. These obligations will require outflow of economic resources and will be fulfilled over the period of time. Therefore, a provision shall be recognised and measured as per Ind AS 37 for contractual obligations toward the Fair Value of future upgrade services and correspondingly the group has capitalized the present value of provision for upgrade services to the intangible asset at the time of acquisition.

Based on the concession agreement, capitalised the initial improvement works amounting to Rs. 34,207.88 lakhs (undiscounted value) on appointed date ie. 01-04-2024.

Further the group has recognised in the statement of Profit & Loss amounting Rs. 3314.19 Lakhs and Rs. 4,247.51 Lakhs on account of amortization of initial improvement work and unwinding of interest on provision of initial improvement respectively.

Actual initial improvement work done during the period ended December 2024 is Rs. 38,886.11 Lakhs.

13 The name of one of the SPV has been changed from National Highways Infra Projects Private Limited to NHIT Western Projects Private Limited w.e.f. 13th May 2024.

14 The Unaudited Consolidated Financial Information relating to the quarter ended December 31, 2024, are the balancing figures between the unaudited figures in respect of the half year ended September 30, 2024, and year-to-date figures up to Nine month ended December 31, 2024, which have been approved by the Board of Directors of Investment Manager and have been subjected to limited review by the Statutory Auditors.

15 As per Ind AS 36 'Impairment of assets', based on management review on expected future cash flows and economic conditions of the assets of the Trust, no indicators of impairment of assets exist as on the reporting date. Hence no provision for impairment has been recognized in the books on the reporting date.

16 The Group has not recognised Deferred Tax Assets on major maintainance obligation and business losses for the period, as carried forward business losses will not be available for utilisation within the time limit allowable as per the Income Tax Act based on the future projections of the profitability of the entity in accordance with provision of Ind AS 12 "Income Taxes".

17 During the Nine Month ended 31st December 2024, the Group has taken a further disbursement of amounting to Rs. 322.02 Crores from the Axis Bank Limited, Rs. 119.86 Crores from the Bank of Maharashtra and Rs. 10.78 Crores from the IDBI Bank in accordance with Facility agreement. The Group has given Rs. 437.66 Crores to Project SPV NWPPL and Rs. 15.00 Crores to Project SPV NEPPL as Loan at the rate of 12.70% p.a. for initial Improvement works.

18 The Group has followed the same accounting policies and methods in these interim financial statements. And these financial statements have been prepared on accrual basis under the historical cost convention as followed in the annual financial statements for financial year ended March 31,2024.

National Highways Infra Trust

A.R. & Co. FRN: 02744C NEW DELHI Chartered Accountants

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :-IN/InvIT/20-21/0014

Notes to the consolidated financial results for the Quarter and Nine Month ended December 31, 2024

19 All values are rounded to nearest lakh, unless otherwise indicated. Certain amounts that are required to be disclosed and do not appear due to rounding off are expressed as 0.00.

20 These consolidated financial results of group do not contain any false or misleading statement or figures and do not omit any material fact which makes the statements or the figures contained therein misleading.

21 Previous period/year figures have been reclassified/regrouped wherever necessary to confirm to current period classification.

For and on behalf of National Highways Infra Trust
(By National Highways Infra Investment Managers Private Limited)

Gunjan Singh
Compliance Officer

Mathew George
Chief Financial Officer

Suresh n Goyal
Director
DIN: 02721580

Place: New Delhi
Date: 12th February, 2025

NATIONAL HIGHWAYS INFRA TRUST

SEBI Registration Number :- IN/InvIT/20-21/0014

Annexure 1: Statement of Net Distributable Cash Flows (NDFC) of the Trust as per the earlier framework paragraph 6 of chapter 4 to the Master circular No. SEBI/HO/DDHS-PoD-2/P/CIR/2023/115 dated July 06, 2023

(All amounts in ₹ lakh unless otherwise stated)

S. No.	Particulars	For the year ended 31st March 2024
1	**Profit after tax as per Statement of profit and loss/income and expenditure (Standalone) (A)**	96,819.27
2	Add: Depreciation and amortization as per statement of profit and loss account. Incase of Impairment reversal, same needs to be deducted from profit and loss.	-
3	Add/Less: Loss/gain on sale of infrastructure assets	-
4	Add: Proceeds from sale of infrastructure assets adjusted for the following: related debts settled or due to be settled from sale proceeds; directly attributable transaction costs; proceeds reinvested or planned to be reinvested as per Regulation 18(7)(a) of the InvIT regulations	-
5	Add: Proceeds from sale of infrastructure assets not distributed pursuant to an earlier plan to re-invest, if such proceeds are not intended to be invested subsequently, net of any profit/ (loss) recognised in profit and loss account	-
6	Add/ Less: Any other item of non- cash expense/ non cash income (net of actual cash flows for these items), if deemed necessary by the Investment Manager. For example, any decrease/ increase in carrying amount of an asset or a liability recognised in profit and loss /income and expenditure on measurement of the asset or the liability at fair value; Interest cost as per effective interest rate method, deferred tax lease rents recognised on a straight line basis, etc.	(82,058.04)
7	Less: Repayment of external debt (principal) / redeemable preference shares / debentures, etc. (excluding refinancing) / net cash set aside to comply with DSRA requirement under loan agreements.	(4,206.73)
8	**Total Adjustment (B)**	**(86,264.77)**
9	**Net Surplus (C) = (A+B) (NDCF)**	**10,554.51**
10	Add: Income recognised in previous year and received in this year	46,688.43
11	Less :- Interest expenses recognised in previous year and paid in this year	(5,129.59)
12	**Distibutable Cash Flow**	**52,113.35**
13	Less: Amount already distributed to Unitholders (for the period from April 23 to Jan 24(PY for the period from April 22 to December 22))	42,843.37
14	**Balance Net Distributable Cash Flows for the year ended March 31, 2024**	**9,269.98**

National Highways Infra Trust New Delhi

A.R. & Co. FRN: 02744C NEW DELHI Chartered Accountants

NHIT Western Projects Private Limited

CIN: U45201DL2020PTC366737

Annexure 2(i): Statement of Net Distributable Cash Flows (NDFC) of the SPV as per the earlier framework paragraph 6 of chapter 4 to the Master circular No. SEBI/HO/DDHS-PoD-2/P/CIR/2023/115 dated July 06, 2023

(All amounts in ₹ lakh unless otherwise stated)

S. No.	Particulars	For the year ended March 31, 2024
1	**Profit/ (Loss) after tax as per Statement of profit and loss/income and expenditure (standalone) (A)**	**(65,433.38)**
2	**Add:** Depreciation and amortization as per statement of profit and loss account. Incase of Impairment reversal, same needs to be deducted from profit and loss.	24,770.91
3	**Add/Less:** Loss/gain on sale of infrastructure assets	-
4	**Add:** Proceeds from sale of infrastructure assests adjusted for the following: related debts settled or due to be settled from sale proceeds; directly attributable transaction costs; proceeds reinvested or planned to be reinvested as per Regulation 18(7)(a) of the InvIT regulations	-
5	**Add:** Proceeds from sale of infrastructure assets not distributed pursuant to an earlier plan to re-invest, if such proceeds are not intended to be invested subsequently, net of any profit/ (loss) recognised in profit and loss account. *	(142.72)
6	**Add/ Less:** Any other item of non- cash expense/ non cash income (net of actual cash flows for these items), if deemed necessary by the Investment Manager. For example, any decrease/ increase in carrying amount of an asset or a liability recognised in profit and loss /income and expenditure on measurement of the asset or the liability at fair value; Interest cost as per effective interest rate method, deferred tax lease rents recognised on a straight line basis, etc.	1,25,403.04
7	**Less:** Repayment of external debt (principal) / redeemable preference shares / debentures, etc. (excluding refinancing) / net cash set aside to comply with DSRA requirement under loan agreements. **	(504.26)
8	**Total Adjustments (B)**	**1,49,526.96**
9	**Net Distributable Cash Flows (C) = (A+B)**	**84,093.58**

* This includes amount utilized for purchase of Property, Plant and Equipment's and Intangible Assets

** As at 31-03-2024 this includes Fixed Deposit of Rs. 504.26 Lakhs lien marked in favor of Bank of Maharashtra against Performance Bank Guarantee issued in favour of NHAI.

Adjustment to Net Distributable Cash Flows

S. No.	Particulars	For the year ended March 31, 2024
1	**Net Distributable Cash flow for the year (From (C) Above)**	**84,093.58**
2	Less: Actual Distribution during the year	(82,549.93)
	Balance	**1,543.65**
3	Add: Opening Surplus (Opening Cash adjusted with Net working Capital as on 31-03-2023)	3,896.22
4	Less: Cash Set Aside For movemnet in net working capital as on 31-03-2024	(254.95)
	Balance Distributable Cash Flow* **	**5,184.93**

*** Rs. 5,162.05 lakhs of Cash out of Balance Distributable cash as on 31st March 2024 has been distributed to Trust in April 2024.

National Highways Infra Trust New Delhi

A.R. & Co. Chartered Accountants FRN: 02744C NEW DELHI

NHIT EASTERN PROJECTS PRIVATE LIMITED
CIN: U42101DL2023PTC412707

Annexure 2(ii): Statement of Net Distributable Cash Flows (NDFC) of the SPV as per the earlier framework paragraph 6 of chapter 4 to the Master circular No. SEBI/HO/DDHS-PoD-2/P/CIR/2023/115 dated July 06, 2023

(All amounts in ₹ lakh unless otherwise stated)

S. No.	Particulars	For the year ended March 31, 2024
1	**Profit/ (Loss) after tax as per Statement of profit and loss/income and expenditure (standalone) (A)**	**(1,693.38)**
2	**Add:** Depreciation and amortization as per statement of profit and loss account. Incase of Impairment reversal, same needs to be deducted from profit and loss.	0.13
3	**Add/Less:** Loss/gain on sale of infrastructure assets	-
4	**Add:** Proceeds from sale of infrastructure assests adjusted for the following: related debts settled or due to be settled from sale proceeds; directly attributable transaction costs; proceeds reinvested or planned to be reinvested as per Regulation 18(7)(a) of the InvIT regulations	-
5	**Add:** Proceeds from sale of infrastructure assets not distributed pursuant to an earlier plan to re-invest, if such proceeds are not intended to be invested subsequently, net of any profit/ (loss) recognised in profit and loss account. *	(0.50)
6	**Add/ Less:** Any other item of non- cash expense/ non cash income (net of actual cash flows for these items), if deemed necessary by the Investment Manager. For example, any decrease/ increase in carrying amount of an asset or a liability recognised in profit and loss /income and expenditure on measurement of the asset or the liability at fair value; Interest cost as per effective interest rate method, deferred tax lease rents recognised on a straight line basis, etc.**	2,217.93
7	**Less:** Repayment of external debt (principal) / redeemable preference shares / debentures, etc. (excluding refinancing) / net cash set aside to comply with DSRA requirement under loan agreements. ***	-
8	**Total Adjustments (B)**	**2,217.57**
9	**Net Distributable Cash Flows (C) = (A+B)****	**524.19**

* This includes amount utilized for purchase of Property, Plant and Equipment's and Intangible Assets

** The distributable cash flows are retained for working capital requirements of the Company.

National Highways Infra Trust New Delhi

A.R. & Co. FRN: 02744C NEW DELHI Chartered Accountants

NATIONAL HIGHWAYS INFRA TRUST

CONSOLIDATED BALANCE SHEET AS AT 31st MARCH, 2022

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	NOTE NO.	AS AT 31st March, 2022	AS AT 31st March, 2021
ASSETS			
1) Non - Current Assets			
(a) Property, Plant and Equipment	3	0.46	-
(b) Goodwill	4	10,144.46	-
(c) Intangible assets	5	7,33,984.39	-
(d) Financial Assets			
(i) Other Financial Assets	6	3,170.81	-
(e) Deferred Tax Assets	7	262.53	-
2) Current Assets			
(a) Financial Assets			
(i) Investments	8	992.16	-
(ii) Trade receivables	9	600.47	-
(iii) Cash and Cash Equivalents	10	5,389.78	-
(iv) Other financial assets	11	5.38	0.10
(b) Other current assets	12	347.29	-
TOTAL ASSETS		7,54,897.72	0.10
EQUITY AND LIABILITIES			
EQUITY			
1) Unit Capital	13	6,01,152.00	-
2) Initial settlement amount		0.10	0.10
3) Other Equity	14	5,059.25	(67.90)
LIABILITIES			
1) Non-Current liabilities			
(a) Financial liabilities			
(i) Borrowings	15	1,45,556.94	-
(b) Provisions	16	403.37	-
2) Current Liabilities			
(a) Financial liabilities			
(i) Borrowings	17	980.86	-
(ii) Trade Payables	18		
(a) Total Outstanding, dues of micro and small enterprises		-	-
(b) Total outstanding, dues of creditors other than micro and small enterprises		1,101.23	-
(iii) Other financial liabilities	19	241.41	67.81
(b) Other current liabilities	20	240.75	0.09
(c) Provisions	21	0.03	-
(d) Current Tax Liabilities (Net)	22	161.77	
TOTAL EQUITY & LIABILITIES		7,54,897.72	0.10

Significant Accounting Policies 1 - 2

The accompanying notes form an integral part of these consolidated financial statements. 3 - 56

This is the Consolidated Balance Sheet referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

A. R. & CO. FRN 002744 C CHARTERED ACCOUNTANTS

CA Naresh Kumar Karu
Partner
M.No.077687

Date : 23.05.2022
Place : New Delhi

National Highways Infra Trust New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gurvandeep Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

CONSOLIDATED STATEMENT OF PROFIT AND LOSS FOR THE YEAR ENDED 31ST MARCH, 2022

(All amounts in ₹ lakh unless otherwise stated)

PARTICULARS	NOTE NO.	YEAR ENDED 31st March, 2022	YEAR ENDED 31st March, 2021
INCOME			
Revenue from Operations	23	13,960.55	-
Other Income	24	1,014.53	-
TOTAL INCOME		**14,975.08**	-
EXPENSES			
Investment Manger Fee		1,931.71	-
Trusteeship Fee		3.73	4.21
Operating Expenses	25	1,140.21	-
Employee Benefits Expenses	26	2.12	-
Finance Charges	27	3,154.43	-
Depreciation & Amortization Expense	28	1,055.65	-
Other Expenses	29	676.86	63.69
TOTAL EXPENSES		**7,964.71**	67.90
Profit/(Loss) before Exceptional Items and Tax		**7,010.37**	**(67.90)**
Exceptional Items (net)		-	
Profit / (Loss) before Tax		**7,010.37**	**(67.90)**
Tax Expenses	30		
Current Tax		436.36	-
MAT Credit Utilized / (Entitlement)		-	-
Provision for Tax for Earlier Years		-	-
Deferred Tax expense/(credit)		(262.32)	-
Total Tax		174.04	-
Profit/ (loss) for the period		**6,836.33**	**(67.90)**
Other Comprehensive Income			
Items that will not be reclassified to Profit and Loss		-	-
Items that will be reclassified to Profit and Loss		-	-
		-	-
Total Comprehensive Income for the period		**6,836.33**	**(67.90)**
Earnings per Unit			
Basic	31	1.15	-
Diluted	31	1.15	-

Significant Accounting Policies 1 - 2
The accompanying notes form an integral part of these financial statements. 3 - 56

This is the Statement of Profit and Loss referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

A.R. & CO. FRN 002744 C CHARTERED ACCOUNTANTS

CA Naresh Kumar Kaul
Partner
M.No.077887

Date : 23.05.2022
Place : New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

National Highways Infra Trust New Delhi

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gurjant Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

CONSOLIDATED CASH FLOW STATEMENT FOR THE YEAR ENDED 31ST MARCH, 2022

(All amounts in ₹ lakh unless otherwise stated)

	YEAR ENDED 31st March, 2022	YEAR ENDED 31st March, 2021
A. OPERATING ACTIVITIES		
Net Profit/(Loss) Before Tax	7,010.37	
Adjustments to reconcile profit before tax to net cash flows:		
Depreciation and Amortization	1,055.65	
Loss/ (Gain) on sale of Investments (net)	(682.62)	
Loss / (Gain) on Fair Valuation of Investments	(7.38)	
Interest Accrued on Bank FD	(5.86)	
Finance Cost (net)	3,154.43	
Operating Profit/(Loss) before Working Capital Changes	**10,524.59**	
Working Capital Adjustments:		
Decrease / (Increase) in Trade & Other Receivables	(600.47)	
Decrease / (Increase) in Other Non Current Financial Assets	(3,170.81)	
Decrease / (Increase) in Other Current Financial Assets	0.59	
Decrease / (Increase) in Other Current Assets	(347.29)	
Increase / (Decrease) in Trade & Other Payables	651.07	
Increase / (Decrease) in Other Financial Liabilities	(7,34,867.55)	
Increase / (Decrease) in Provisions	403.40	
Increase / (Decrease) in Other Current Liabilities	238.59	
Increase / (Decrease) in Current Tax Liabilities	(0.59)	
	(7,37,693.06)	
Income Tax paid	(274.00)	
Net Cash Flows from/(used in) Operating Activities	**(7,27,442.47)**	
B. INVESTING ACTIVITIES		
Purchase of Property, Plant & Equipment, including CWIP, capital	(0.50)	
Purchase of Non Current Investments	(1.52)	
Purchase of Current Investments	(5,96,271.00)	
Sale of Current Investments	5,95,968.84	
Net cash flows from (used in) Investing activities	**(304.19)**	
C. FINANCING ACTIVITIES		
Proceeds from Issue of Unit Capital	5,91,000.00	
One Time Expense paid	(1,364.94)	
Proceeds from Long Term Borrowings (net of processing fees)	1,47,646.00	
Repayment of Long Term Borrowings	(1,001.59)	
Finance Costs Paid	(3,143.04)	
Net cash flows from (used in) Financing activities	7,33,136.43	
Net Increase/Decrease in Cash and Cash equivalents (A+B+C)	5,389.78	
Cash and cash equivalents at the beginning of the year	-	
Cash and cash equivalents at the end of the year	**5,389.78**	

This is the Cash Flow Statement referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

A. R. & CO FRN 002744 C CHARTERED ACCOUNTANTS

CA Naresh Kumar Karn
Partner
M.No.077887

Date : 23.05.2022

National Highways Infra Trust New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

CONSOLIDATED BALANCE SHEET AS AT MARCH 31, 2023

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Note No.	As At March 31, 2023	As At March 31, 2022
ASSETS			
1) Non - Current Assets			
(a) Property, Plant and Equipment	3	125.17	0.46
(b) Goodwill	4	10,144.46	10,144.46
(c) Intangible assets	5	10,01,400.09	7,33,984.39
(d) Financial Assets			
(i) Other Financial Assets	6	9,672.44	3,170.81
(e) Deferred Tax Assets (net)	7	4,685.32	262.53
(f) Non -Current Tax Assets (Net)	8	12.06	-
Total non-current assets		**10,26,039.54**	**7,47,562.64**
2) Current Assets			
(a) Financial Assets			
(i) Trade receivables	9	350.87	600.47
(ii) Cash and Cash Equivalents	10	21,124.08	6,381.94
(iii) Other financial assets	11	297.36	5.38
(b) Other current assets	12	1,343.35	347.29
Total current assets		**23,115.66**	**7,335.07**
TOTAL ASSETS		**10,49,155.20**	**7,54,897.72**
EQUITY AND LIABILITIES			
EQUITY			
1) Unit Capital	13	7,41,604.32	5,99,442.82
2) Initial settlement amount		0.10	0.10
3) Other Equity	14	(2,469.86)	6,768.43
Total Equity		**7,39,134.56**	**6,06,211.35**
LIABILITIES			
1) Non-Current liabilities			
(a) Financial liabilities			
(i) Borrowings	15	2,92,158.33	1,45,556.94
(b) Provisions	16	6,318.81	403.37
Total non-current liabilities		**2,98,477.14**	**1,45,960.32**
2) Current liabilities			
(a) Financial liabilities			
(i) Borrowings	17	2,000.00	980.86
(ii) Trade Payables	18		
(a) Total Outstanding, dues of micro and small enterprises		137.23	-
(b) Total outstanding, dues of creditors other than micro and small enterprises		3,871.17	1,244.79
(iii) Other financial liabilities	19	5,284.95	97.85
(b) Other current liabilities	20	240.61	240.75
(c) Provisions	21	0.56	0.03
(d) Current Tax Liabilities (Net)	22	8.98	161.77
Total current liabilities		**11,543.50**	**2,726.06**
TOTAL EQUITY & LIABILITIES		**10,49,155.20**	**7,54,897.72**
Significant Accounting Policies	1 - 2		
The accompanying notes form an integral part of these consolidated financial statements.	3 - 64		

This is the Consolidated Balance Sheet referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

CA Kailash Chand Gupta
Partner
M.No.085003

Date : 22.05.2023
Place : New Delhi

For and on behalf Board of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

CONSOLIDATED STATEMENT OF PROFIT AND LOSS FOR THE YEAR ENDED MARCH 31, 2023

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Note No.	For the year ended March 31 2023	For the year ended March 31 2022
INCOME			
Revenue from Operations	23	68,717.20	13,960.55
Interest Income	24	373.43	5.86
Profit on sale of investments	25	671.17	690.00
Other Income	26	326.11	318.67
TOTAL INCOME		**70,087.91**	**14,975.08**
EXPENSES			
Investment Manger Fee		1,263.70	1,931.71
Trusteeship Fee		9.60	3.73
Valuation expenses		4.00	-
Annual listing fees		20.00	-
Rating fees		0.20	0.57
Insurance expenses		628.74	166.04
Custodian Fees		0.84	-
Project Management Fees		991.20	290.43
Operating Expenses	27	9,025.05	849.77
Employee Benefits Expenses	28	311.33	2.12
Finance Cost	29	16,621.32	3,154.43
Depreciation & Amortization Expense	30	17,560.63	1,055.65
Other Expenses	31	1,901.95	504.87
Audit Fees	32		
- Statutory audit fees		7.73	4.86
- Other audit services (including certification)		0.93	0.52
TOTAL EXPENSES		**48,347.23**	**7,964.71**
Profit / (Loss) before Tax		**21,740.68**	**7,010.37**
Tax Expenses	33		
Current Tax		473.89	436.36
Current tax - earlier years		0.01	
Deferred Tax expense/(credit)		(4,422.79)	(262.32)
Total Tax	-	(3,948.89)	174.04
Profit/ (loss) for the year	-	**25,689.57**	**6,836.33**
Other Comprehensive Income			
Items that will not be reclassified to Profit and Loss		-	-
Items that will be reclassified to Profit and Loss		-	-
		-	-
Total Comprehensive Income for the year	-	**25,689.57**	**6,836.33**
Earnings per Unit			
Basic	34	3.91	1.15
Diluted	34	3.91	1.15
Significant Accounting Policies	1 - 2		
The accompanying notes form an integral part of these consolidated financial statements.	3 - 64		

This is the Statement of Profit and Loss referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

CA Kailash Chand Gupta
Partner
M.No.085003
Date : 22.05.2023
Place : New Delhi

For and on behalf Board of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST

CONSOLIDATED CASH FLOW STATEMENT FOR THE YEAR ENDED MARCH 31, 2023

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31 2023	For the year ended March 31 2022
A. OPERATING ACTIVITIES		
Net Profit/(Loss) Before Tax	21,740.68	7,010.37
Adjustments for :		
Depreciation and Amortization	17,560.63	1,055.65
Profit on redemption of mutual funds	(671.17)	(682.62)
Interest income from FDR	(373.43)	(5.86)
Finance Cost (net)	16,590.17	3,154.43
Provision for major maintenance expenses	5,879.20	403.29
Unwinding interest on major maintenance provision	24.95	-
Provision for Laeave encashment and Gratuity	11.93	0.11
Provision for expected credit loss	59.60	-
Bad debts written off	9.90	-
Operating Profit/(Loss) before Working Capital Changes	**60,832.46**	**10,935.37**
Working Capital Adjustments:		
Decrease / (Increase) in Trade & Other Receivables	180.10	(600.47)
Decrease / (Increase) in Other Non Current Financial Assets	(208.85)	(0.00)
Decrease / (Increase) in Other Non Current/Current Assets	(834.96)	(347.29)
Decrease / (Increase) in Other Current Financial Assets	(293.53)	0.59
Increase / (Decrease) in Trade & Other Payables	3,267.01	651.07
Increase / (Decrease) in Other Financial Liabilities	57.50	(7,34,867.55)
Increase / (Decrease) in Provisions	(0.11)	0.00
Increase / (Decrease) in Other Current Liabilities	(0.14)	238.59
Increase / (Decrease) in Current Tax Liabilities	-	(0.59)
	2,167.02	**(7,34,925.66)**
Income Tax paid	(626.67)	(274.00)
Net Cash Flows from/(used in) Operating Activities	**62,372.81**	**(7,24,264.28)**
B. INVESTING ACTIVITIES		
Purchase of Property, Plant & Equipment, including CWIP, capital	(2,85,101.04)	(0.50)
Purchase of Non Current Investments	-	(1.52)
Investment in FDR	(6,299.19)	(3,170.81)
Interest received on maturity of FDR	189.55	-
Profit on redemption of mutual funds	671.17	682.62
Net cash flows from (used in) Investing activities	**(2,90,539.51)**	**(2,490.21)**
C. FINANCING ACTIVITIES		
Proceeds from Issue of Unit Capital	1,43,013.67	5,91,000.00
Expense incurred towards initial public debt offering	(1,689.00)	-
Expense incurred towards institutional unit allotment	(1,099.13)	(1,364.94)
Distribution to Unit Holders	(34,927.86)	-
Proceeds from Long Term Borrowings (net of processing fees)	1,50,000.00	1,47,646.00
Financing charges paid	(197.00)	-
Repayment of Long Term Borrowings	(1,010.98)	(1,001.59)
Finance Costs Paid	(11,180.86)	(3,143.04)
Net cash flows from (used in) Financing activities	**2,42,908.84**	**7,33,136.43**
Net Increase/Decrease in Cash and Cash equivalents (A+B+C)	**14,742.14**	**6,381.94**
Cash and cash equivalents at the beginning of the year	6,381.94	-
Cash and cash equivalents at the end of the year	**21,124.08**	**6,381.94**

This is the Consolidated Cash Flow Statement referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

A.R. & CO. FRN 002744 C CHARTERED ACCOUNTANTS

CA Kailash Chand Gupta
Partner
M.No.085003
Date : 22.05.2023
Place : New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Sutesh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
CONSOLIDATED BALANCE SHEET AS AT MARCH 31, 2024

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Note No.	As at March 31, 2024	As at March 31, 2023
ASSETS			
1) Non - Current Assets			
(a) Property, Plant and Equipment	3	219.29	125.17
(b) Capital work in Progress (CWIP)	4	19.76	-
(c) Goodwill	5	10,144.46	10,144.46
(d) Other Intangible assets	6	10,88,670.84	10,01,400.09
(e) Financial Assets			
(i) Other Financial Assets	7	10,177.86	9,672.44
(f) Deferred Tax Assets (net)	8	11,523.20	4,685.32
(g) Non -Current Tax Assets (Net)	9	22.38	12.06
(h) Other Non Current Assets	10	15,70,649.18	-
Total non-current assets		**26,91,426.97**	**10,26,039.54**
2) Current Assets			
(a) Financial Assets			
(i) Trade receivables	11	385.20	350.87
(ii) Cash and Cash Equivalents	12	46,400.78	21,124.08
(iii) Bank Balances Other than Cash & Cash Equivalents	13	512.98	-
(iii) Other financial assets	14	4.54	6.65
(b) Other current assets	15	2,303.89	1,634.06
Total current assets		**49,607.39**	**23,115.66**
TOTAL ASSETS		**27,41,034.36**	**10,49,155.20**
EQUITY AND LIABILITIES			
EQUITY			
1) Unit Capital	16	14,67,093.47	7,41,604.32
2) Initial settlement amount		0.10	0.10
3) Other Equity	17	(27,541.44)	(2,469.86)
Total Equity		**14,39,552.13**	**7,39,134.56**
LIABILITIES			
1) Non-Current liabilities			
(a) Financial liabilities			
(i) Borrowings	18	11,63,394.94	2,92,158.33
(ii) Other Financial liabilities	19	80.90	-
(b) Provisions	20	35,923.32	6,318.81
Total non-current liabilities		**11,99,399.16**	**2,98,477.14**
2) Current liabilities			
(a) Financial liabilities			
(i) Borrowings	21	10,054.00	2,000.00
(ii) Trade Payables	22		
(a) Total Outstanding, dues of micro and small enterprises		275.99	137.23
(b) Total outstanding, dues of creditors other than micro and small enterprises		4,479.00	3,871.17
(iii) Other financial liabilities	23	7,224.53	5,284.95
(b) Provisions	24	79,404.66	0.56
(c) Current Tax Liabilities (Net)	25	181.66	8.98
(d) Other current liabilities	26	463.23	240.61
Total current liabilities		**1,02,083.07**	**11,543.50**
Total liabilities		**13,01,482.23**	**3,10,020.64**
TOTAL EQUITY & LIABILITIES		**27,41,034.36**	**10,49,155.20**

Material Accounting Policies 1 - 2

The accompanying notes form an integral part of these consolidated financial statements 3 - 66

This is the Consolidated Balance Sheet referred to in our report of even date

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

CA Mohd. Azmi Akhtari
Partner
M.No.511623

Date 27th May 2024
Place : New Delhi

For and on behalf Board of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Prasad Sharma
Director
DIN: 08158413

Mathew George
Chief Financial Officer

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
CONSOLIDATED STATEMENT OF PROFIT AND LOSS FOR THE YEAR ENDED MARCH 31, 2024

(All amounts in ₹ lakh unless otherwise stated)

Particulars	Note No.	For the year ended March 31, 2024	For the year ended March 31, 2023
INCOME			
Revenue from Operations	27	94,390.77	68,717.20
Interest Income	28	871.71	373.43
Profit on sale of investments	29	2,141.16	671.17
Other Income	30	59.53	326.11
TOTAL INCOME		**97,463.17**	**70,087.91**
EXPENSES			
Investment Manger Fee		1,800.00	1,263.70
Trusteeship Fee		9.60	9.60
Valuation expenses		11.07	4.00
Annual listing fees		53.80	20.00
Rating fees		7.73	0.20
Insurance expenses		737.91	628.74
Custodian Fees		3.15	0.84
Project Management Fees		1,168.20	991.20
Operating Expenses	31	13,665.60	9,025.05
Employee Benefits Expenses	32	1,156.60	289.01
Finance Cost	33	28,023.17	16,621.32
Depreciation & Amortization Expense	34	24,771.04	17,560.63
Audit Fees	35		
- Statutory audit fees		18.49	7.73
- Other audit services (including certification)		1.72	0.93
Other Expenses	36	2,569.62	1,924.27
TOTAL EXPENSES		**73,997.70**	**48,347.23**
Profit / (Loss) before Tax		**23,465.47**	**21,740.68**
Tax Expenses	37		
Current Tax		886.30	473.89
Current tax - earlier years		(2.52)	0.01
Deferred Tax expense/(credit)		(6,837.88)	(4,422.79)
Total Tax		**(5,954.10)**	**(3,948.89)**
Profit/ (loss) for the year		**29,419.57**	**25,689.57**
Other Comprehensive Income			
Items that will not be reclassified to Profit or Loss		0.10	-
Income tax relating to items that will not be reclassified to profit or loss		0.03	-
		0.13	-
Total Comprehensive Income for the year	-	**29,419.70**	**25,689.57**
Earnings per Unit			
Basic	38	3.90	3.91
Diluted	38	3.90	3.91

Material Accounting Policies 1 - 2

The accompanying notes form an integral part of these consolidated financial statements. 3 - 66

This is the Statement of Profit and Loss referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

CA Mohd. Azam Ansari
Partner
M.No.511623

Date : 27th May 2024
Place : New Delhi

For and on behalf Board of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gurjan Singh
Compliance Officer

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
CONSOLIDATED STATEMENT OF CASH FLOWS FOR THE YEAR ENDED MARCH 31, 2024

(All amounts in ₹ lakh unless otherwise stated)

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
A. OPERATING ACTIVITIES		
Net Profit/(Loss) Before Tax	23,465.47	21,740.68
Adjustments for :		
Depreciation and Amortization	24,771.04	17,560.63
Profit on redemption of mutual funds	(2,141.16)	(671.17)
Interest income from FDR	(871.71)	(373.43)
Finance Cost (net)	25,015.90	16,590.17
Provision for major maintenance expenses	8,444.05	5,879.20
Unwinding interest on major maintenance provision	2,867.62	24.95
Provision for Leave encashment and Gratuity	52.43	11.93
Provision for expected credit loss	-	59.60
Bad debts written off	-	9.90
Operating Profit/(Loss) before Working Capital Changes	**81,603.64**	**60,832.46**
Working Capital Adjustments:		
Decrease / (Increase) in Trade & Other Receivables	(34.34)	180.10
Decrease / (Increase) in Other Non Current Financial Assets	(2.52)	(208.85)
Decrease / (Increase) in Other Non Current/Current Assets	(516.99)	(834.96)
Decrease / (Increase) in Other Current Financial Assets	(293.92)	(293.53)
Increase / (Decrease) in Trade & Other Payables	12.68	3,267.01
Increase / (Decrease) in Other Financial Liabilities	188.39	57.50
Increase / (Decrease) in Provisions	(3.57)	(0.11)
Increase / (Decrease) in Other Current Liabilities	229.27	(0.14)
	(421.00)	**2,167.02**
Income Tax paid	(721.42)	(626.67)
Net Cash Flows from/(used in) Operating Activities	**80,461.22**	**62,372.81**
B. INVESTING ACTIVITIES		
Purchase of Property, Plant & Equipment, including CWIP, capital creditors and capital advances	(15,82,977.68)	(2,85,101.04)
Investment in FDR	(951.26)	(6,299.19)
Interest received on maturity of FDR	810.99	189.55
Profit on redemption of mutual funds	2,141.16	671.17
Net cash flows from (used in) Investing activities	**(15,80,976.79)**	**(2,90,539.51)**
C. FINANCING ACTIVITIES		
Proceeds from Issue of Unit Capital	7,27,206.41	1,43,013.67
Expense incurred towards initial public debt offering	-	(1,689.00)
Expense incurred towards institutional unit allotment	(1,471.46)	(1,099.13)
Precessing Fee paid	(1,482.16)	(197.00)
Distribution to Unit Holders	(54,491.29)	(34,927.86)
Proceeds from Long Term Borrowings (net of processing fees)	8,84,700.00	1,50,000.00
Financing charges paid	(24,909.51)	(11,180.86)
Repayment of Long Term Borrowings	(3,759.73)	(1,010.98)
Net cash flows from (used in) Financing activities	**15,25,792.26**	**2,42,908.84**
Net Increase/Decrease in Cash and Cash equivalents (A+B+C)	**25,276.69**	**14,742.14**
Cash and cash equivalents at the beginning of the year	21,124.08	6,381.94
Cash and cash equivalents at the end of the year	**46,400.78**	**21,124.08**

National Highways Infra Trust New Delhi

A R & Co Chartered Accountants New Delhi

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
CONSOLIDATED STATEMENT OF CASH FLOWS FOR THE YEAR ENDED MARCH 31, 2024

Reconciliation of liabilities arising from Financing Activities pursuant to Ind AS 7- Statement of Cash Flows.

Particulars	For the year ended March 31, 2024	For the year ended March 31, 2023
a) Carrying amount of debt at the beginning of the year	2,94,158.33	1,46,537.80
b) Additional borrowings during the year	8,84,700.00	1,50,000.00
c) Repayments during the year	(3,759.73)	(1,010.98)
d) Other adjustments/settlements during the year	-	-
e) Transaction Cost adjustment	(1,649.66)	(1,368.49)
f) Unwinding of interest	-	-
g) Carrying amount of debt at the end of the year	**11,73,448.94**	**2,94,158.33**

This is the Consolidated Cash Flows Statement referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

CA Mohd. Azam Ansari
Partner
M.No.511623

For and on behalf of the National Highways Infra Investment Managers Private Limited (Investment Manager of National Highways Infra Trust)

Suresh Krishan Goyal Director
DIN: 02721580

Mathew George
Chief Financial Officer

Gurjap Singh
Compliance Officer

Date : 27th May 2024
Place : New Delhi

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
INTERIM CONSOLIDATED BALANCE SHEET AS AT SEPTEMBER 30, 2024

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	Note No.	As at September 30, 2024	As at March 31, 2024
ASSETS			
1) Non - Current Assets			
(a) Property, Plant and Equipment	3	382.15	219.29
(b) Capital work in Progress (CWIP)	4	24.32	19.76
(c) Goodwill	5	10,144.46	10,144.46
(d) Other Intangible assets	6	26,52,182.61	10,88,670.84
(e) Right of Use Assets	7	609.95	-
(f) Financial Assets			
(i) Other Financial Assets	8	30,666.24	10,177.86
(g) Deferred Tax Assets (net)	9	21,626.53	11,523.20
(h) Non -Current Tax Assets (Net)	10	48.64	22.38
(i) Other Non Current Assets	11	212.12	15,70,649.18
Total non-current assets		**27,15,897.02**	**26,91,426.97**
2) Current Assets			
(a) Financial Assets			
(i) Trade receivables	12	4,696.79	385.20
(ii) Cash and Cash Equivalents	13	48,657.44	46,400.78
(iii) Bank Balances Other than Cash & Cash Equivalents	14	535.78	512.98
(iv) Other financial assets	15	50.84	4.54
(b) Current Tax Assets (Net)	28	47.20	-
(c) Other current assets	16	1,721.06	2,303.89
Total current assets		**55,709.11**	**49,607.39**
TOTAL ASSETS		**27,71,606.13**	**27,41,034.36**
EQUITY AND LIABILITIES			
EQUITY			
1) Unit Capital	17	14,66,947.80	14,67,093.46
2) Initial settlement amount		0.10	0.10
3) Other Equity	18	(46,629.45)	(27,541.44)
Total Equity		**14,20,318.45**	**14,39,552.13**
LIABILITIES			
1) Non-Current liabilities			
(a) Financial liabilities			
(i) Borrowings	19	11,98,463.18	11,63,394.94
(ii) Lease Liabilities	20	538.32	-
(iii) Other Financial liabilities	21	161.25	80.90
(b) Provisions	22	55,941.53	35,923.32
Total non-current liabilities		**12,55,104.28**	**11,99,399.16**
2) Current liabilities			
(a) Financial liabilities			
(i) Borrowings	23	11,442.50	10,054.00
(ii) Lease Liabilities	24	66.72	-
(iii) Trade Payables	25		
(a) Total Outstanding, dues of micro and small enterprises		216.53	275.99
(b) Total outstanding, dues of creditors other than micro and small enterprises		6,111.76	4,479.00
(iv) Other financial liabilities	26	6,900.09	7,224.53
(b) Provisions	27	71,121.24	79,404.66
(c) Current Tax Liabilities (Net)	28	-	181.66
(d) Other current liabilities	29	324.56	463.23
Total current liabilities		**96,183.40**	**1,02,083.07**
Total liabilities		**13,51,287.68**	**13,01,482.23**
TOTAL EQUITY & LIABILITIES		**27,71,606.13**	**27,41,034.36**

The accompanying notes form an integral part of these consolidated financial statements. 1 - 62

This is the Consolidated Balance Sheet referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

MOHD AZAM ANSARI
Digitally signed by MOHD AZAM ANSARI
Date: 2024.12.19 16:31:35 +05'30'

CA Mohd. Azam Ansari
Partner
M.No.511623

Place : New Delhi
Date : 19th December 2024

For and on behalf of National Highways Infra Trust
(By National Highways Infra Investment Managers Private Limited)

SURESH GOYAL
Digitally signed by SURESH GOYAL
Date: 2024.12.19 16:08:03 +05'30'

Suresh Krishan Goyal
Director
DIN: 02721580

GUNJAN SINGH
Digitally signed by GUNJAN SINGH
Date: 2024.12.19 16:13:52 +05'30'

Gunjan Singh
Compliance Officer

MATHEW GEORGE
Digitally signed by MATHEW GEORGE
Date: 2024.12.19 16:19:13 +05'30'

Mathew George
Chief Financial Officer

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
INTERIM CONSOLIDATED STATEMENT OF PROFIT AND LOSS FOR THE HALF YEAR ENDED SEPTEMBER 30, 2024

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	Note No.	For the Half Year ended	For the Half Year ended September 30, 2023	For the year ended March 31, 2024
INCOME				
Revenue from Operations	30	1,13,033.02	47,173.44	94,390.77
Interest Income	31	948.19	470.03	871.71
Profit on sale of investments	32	896.26	476.27	2,141.16
Other Income	33	36.04	14.27	59.53
TOTAL INCOME		**1,14,913.51**	**48,134.01**	**97,463.17**
EXPENSES				
Investment Manger Fee		990.00	902.47	1,800.00
Trustee Fee		4.80	4.81	9.60
Valuation expenses		34.44	3.24	11.07
Annual listing fees		26.97	26.97	53.80
Rating fees		2.81	0.10	7.73
Insurance expenses		935.90	393.08	737.91
Custodian Fees		2.82	1.58	3.15
Project Management Fees		708.00	495.60	1,168.20
Operating Expenses	34	16,271.02	7,808.38	13,665.60
Employee Benefits Expenses	35	1,041.48	463.91	1,156.60
Finance Cost	36	51,389.16	12,518.17	28,023.17
Depreciation & Amortization Expense	37	37,680.18	11,464.03	24,771.04
Audit Fees	38			
- Statutory audit fees		7.77	9.19	18.49
- Other audit services (including certification)		0.96	0.40	1.72
Other Expenses	39	1,607.23	1,022.03	2,569.62
TOTAL EXPENSES		**1,10,703.54**	**35,113.96**	**73,997.70**
Profit for the period/year before Income Tax		**4,209.97**	**13,020.05**	**23,465.47**
Tax Expenses	40			
Current Tax		460.49	252.51	886.30
Current tax - earlier years		-	0.32	(2.52)
Deferred Tax expense/(credit)		(10,103.32)	(2,885.33)	(6,837.88)
Total Tax		**(9,642.83)**	**(2,632.50)**	**(5,954.10)**
Profit for the period/year after Income Tax		**13,852.80**	**15,652.55**	**29,419.57**
Other Comprehensive Income				
Items that will not be reclassified to Profit or Loss		(5.69)	(1.79)	0.10
Income tax relating to items that will not be reclassified to profit or loss		1.15	-	0.03
		(4.54)	**(1.79)**	**0.13**
Total Comprehensive Income for the period/year		**13,848.26**	**15,650.76**	**29,419.70**
Earnings per Unit				
Basic	41	1.06	2.15	3.90
Diluted	41	1.06	2.15	3.90

The accompanying notes form an integral part of these consolidated financial statements. 1 - 62

This is the Statement of Profit and Loss referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

MOHD AZAM ANSARI
Digitally signed by MOHD AZAM ANSARI
Date: 2024.12.19 16:30:38 +05'30'

CA Mohd. Azam Ansari
Partner
M.No.511623

For and on behalf of National Highways Infra Trust
(By National Highways Infra Investment Managers Private Limited)

SURESH GOYAL
Digitally signed by SURESH GOYAL
Date: 2024.12.19 16:08:27 +05'30'

Suresh Krishan Goyal
Director
DIN: 02721580

MATHEW GEORGE
Digitally signed by MATHEW GEORGE
Date: 2024.12.19 16:18:52 +05'30'

Mathew George
Chief Financial Officer

GUNJAN SINGH
Digitally signed by GUNJAN SINGH
Date: 2024.12.19 16:14:14 +05'30'

Gunjan Singh
Compliance Officer

Place : New Delhi
Date : 19th December 2024

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
INTERIM CONSOLIDATED STATEMENT OF CASH FLOWS FOR THE HALF YEAR ENDED SEPTEMBER 30, 2024

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the year ended March 31, 2024
A. OPERATING ACTIVITIES		
Net Profit/(Loss) Before Tax	4,209.97	23,465.47
Adjustments for :		
Depreciation and Amortization	37,680.18	24,771.04
Profit on redemption of mutual funds	(896.26)	(2,141.16)
Interest income from FDR	(948.19)	(871.71)
Finance Cost (net)	48,133.54	25,015.90
Provision for major maintenance expenses	10,330.53	8,444.05
Unwinding interest on major maintenance provision	3,240.59	2,867.62
Unwinding interest on Lease Liability	7.46	-
Provision for Leave encashment and Gratuity	45.92	52.43
Operating Profit/(Loss) before Working Capital Changes	**1,01,803.74**	**81,603.64**
Working Capital Adjustments:		
Decrease / (Increase) in Trade & Other Receivables	(4,311.68)	(34.34)
Decrease / (Increase) in Other Non Current/Current Assets	(17.44)	(516.99)
Decrease / (Increase) in Other Financial Assets	189.74	(296.44)
Increase / (Decrease) in Trade & Other Payables	2,214.19	12.68
Increase / (Decrease) in Other Financial Liabilities	380.64	188.39
Increase / (Decrease) in Provisions	(1.01)	(3.57)
Increase / (Decrease) in Other Current Liabilities	(138.68)	229.27
	1,00,119.50	**81,182.64**
Income Tax paid	(715.61)	(721.42)
Net Cash Flows from/(used in) Operating Activities	**99,403.89**	**80,461.22**
B. INVESTING ACTIVITIES		
Purchase of Property, Plant & Equipment, including CWIP, capital creditors and capital advances	(33,094.06)	(15,82,977.68)
Investment in FDR	(20,247.10)	(951.26)
Interest received on maturity of FDR	716.35	810.99
Profit on redemption of mutual funds	896.26	2,141.16
Net cash flows from (used in) Investing activities	**(51,728.55)**	**(15,80,976.79)**
C. FINANCING ACTIVITIES		
Proceeds from Issue of Unit Capital	-	7,27,206.41
Expense incurred towards institutional unit allotment	(399.53)	(1,471.46)
Precessing Fee paid	(489.70)	(1,482.16)
Distribution to Unit Holders	(32,936.24)	(54,491.29)
Proceeds from Long Term Borrowings	41,466.00	8,84,700.00
Payment of Rent	(11.57)	-
Financing charges paid	(48,025.81)	(24,909.51)
Repayment of Long Term Borrowings	(5,021.83)	(3,759.73)
Net cash flows from (used in) Financing activities	**(45,418.68)**	**15,25,792.26**
Net Increase/Decrease in Cash and Cash equivalents (A+B+C)	**2,256.66**	**25,276.69**
Cash and cash equivalents at the beginning of the period/year	46,400.78	21,124.08
Cash and cash equivalents at the end of the period/ year	**48,657.44**	**46,400.78**

NATIONAL HIGHWAYS INFRA TRUST
SEBI Registration Number :- IN/InvIT/20-21/0014
INTERIM CONSOLIDATED STATEMENT OF CASH FLOWS FOR THE HALF YEAR ENDED SEPTEMBER 30, 2024

Reconciliation of liabilities arising from Financing Activities pursuant to Ind AS 7- Statement of Cash Flows.

(All amounts are in ₹ lakh unless otherwise stated)

Particulars	For the Half Year ended September 30, 2024	For the year ended March 31, 2024
a) Carrying amount of debt at the beginning of the period/year	11,73,448.94	2,94,158.33
b) Additional borrowings during the period/year	41,466.00	8,84,700.00
c) Repayments during the period/year	(5,021.83)	(3,759.73)
d) Other adjustments/settlements during the period/year	-	-
e) Transaction Cost/Unwinding interest adjustment	12.56	(1,649.66)
f) Carrying amount of debt at the end of the period/year	**12,09,905.68**	**11,73,448.94**

This is the Consolidated Cash Flows Statement referred to in our report of even date.

For A.R. & Co.
Chartered Accountants
Firm Registration no. 002744C

MOHD AZAM ANSARI
Digitally signed by MOHD AZAM ANSARI
Date: 2024.12.19 16:32:04 +05'30'

CA Mohd. Azam Ansari
Partner
M.No.511623

Date : 19th December 2024
Place : New Delhi

For and on behalf of National Highways Infra Trust (By National Highways Infra Investment Managers Private Limited)

SURESH GOYAL
Digitally signed by SURESH GOYAL
Date: 2024.12.19 16:08:46 +05'30'

Suresh Krishan Goyal
Director
DIN: 02721580

MATHEW GEORGE
Digitally signed by MATHEW GEORGE
Date: 2024.12.19 16:18:30 +05'30'

Mathew George
Chief Financial Officer

GUNJAN SINGH
Digitally signed by GUNJAN SINGH
Date: 2024.12.19 16:14:32 +05'30'

Gunjan Singh
Compliance Officer

NATIONAL HIGHWAYS AUTHORITY OF INDIA

G-5 & 6, Sector-10, Dwarka

NEW DELHI - 110 075

BALANCE SHEET AS AT 31st MARCH, 2021

S. No.		PARTICULARS	SCHEDULE	CURRENT YEAR Rs. In Lakhs	PREVIOUS YEAR Rs. In Lakhs
		(1)	(2)	(3)	(4)
I.		**SOURCES OF FUNDS**			
	1	**Shareholders' Fund**			
		a) Capital	1	26111353.19	2,19,02,669.11
		b) Reserves & Surplus	2	-	-
	2	**Grants**			
		a) Capital	3	14,08,210.33	13,98,210.33
	3	**Borrowings**	4	3,07,16,261.17	2,48,83,166.07
		TOTAL		**5,82,35,824.69**	**4,81,84,045.52**
II.		**APPLICATION OF FUNDS**			
	1	**Fixed Assets**	5		
		a) Gross Block		24,706.29	22,927.29
		b) Less: Assets created out of Grant		758.11	758.11
		c) Assets out of Own Fund		23,948.18	22,169.18
		d) Less: Depreciation		12,772.42	11,449.98
		e) Net Block		11,175.76	10,719.20
		Assets held on behalf of GoI			
		a) Completed		2,55,32,301.73	2,20,85,894.44
		b) Ongoing		3,15,38,628.77	2,42,03,759.62
		Total (a+b)		**5,70,70,930.50**	**4,62,89,654.06**
		Total		**5,70,82,106.26**	**4,63,00,373.26**
	2	**Investment**	**6**	**2,04,597.34**	**95,177.34**
	3	**Current Assets, Loans and Advance**	**7**		
		a) Inventories		-	-
		b) Deposits, Loans & Advances		46,53,984.84	45,81,634.85
		c) Interest accrued but not due on deposits		2,845.16	2,836.50
		d) Interest accrued and due on CALA deposits		6,039.20	5,888.13
		e) Cash & Bank Balance		5,23,473.33	6,34,527.58
		f) Inter Unit Account		(0.00)	-
		sub total		**51,86,342.53**	**52,24,887.07**
		Less: Current Liabilities and Provisions			
		a) Liabilities	8	42,28,508.19	34,28,401.31
		b) Reserves & Provisions	9	8,713.26	7,990.84
		sub total		**42,37,221.44**	**34,36,392.15**
		Net Current Assets		9,49,121.09	17,88,494.91
	4	**Misc. Expenditure**	10		
		(to the extent not written off)			
	5	**Profit & Loss Account**			
		(Debit balance if any)			
		TOTAL		**5,82,35,824.69**	**4,81,84,045.52**

Significant Accounting Policy (Schedule 18) and Notes on Accounts (Schedule 19) are integral part of this Financial Statements.

For and on behalf of the Board of the Authority

Place : New Delhi.

Date : 30.07.2021

Member (Finance) **Chairman**

NATIONAL HIGHWAYS AUTHORITY OF INDIA

G-5 & 6, Sector-10, Dwarka

NEW DELHI - 110 075

PROFIT AND LOSS ACCOUNT FOR THE YEAR ENDED 31st MARCH, 2021

S. No.	PARTICULARS	SCHEDULE	CURRENT YEAR Rs. In Lakhs	PREVIOUS YEAR Rs. In Lakhs
	(1)	(2)	(3)	(4)
I.	**INCOME**			
	a) Value of Work done			
	b) Other income	11	2,781.30	1,261.30
	c) Interest (Gross)	12	0.03	0.15
	d) Net Increase/Decrease in Work-in-progress (+)/(-)	13		
	TOTAL INCOME		**2,781.33**	**1,261.45**
II.	**EXPENDITURE**			
	a) Construction Stores/Material consumed			
	Other stores,spares & tools etc.consumed			
	Work Expenses	14	-	-
	Personnel & Administrative Expenses	15	48,022.67	44,246.68
	Finance Charges	16	5.10	6.51
	Depreciation		1,453.44	1,286.21
	Assets of Small Value Charged Off		26.44	25.08
	Exceptional Item			
	Provision for diminution in the value of investment		-	-
	Less: Provision transferred to Capital (Sch-1)		-	-
	TOTAL EXPENDITURE		**49,507.65**	**45,564.48**
	Profit / (Loss) for the period		**(46,726.31)**	**(44,303.04)**
	Add: Prior Period Items net(+/-) (details to be given)	17	(3,063.89)	(4,582.72)
	Transfer of Net Establishment Expenses for the year to Sch-5		**49,790.21**	**48,885.76**
	Less/Add: Provision for Taxation		-	-
	Net Profit			
	Less: Transfer to Capital Reserve			
	Less: Transfer to other specific Reserve/Fund			
	Less/Add: Transfer to/Transfer from General Reserve (+/-)			
	Less/Add: Surplus brought forward from previous year			
	Surplus carried to Balance Sheet			

For and on behalf of the Board of the Authority

Place : New Delhi.

Date : 30.07.2021

Member (Finance) **Chairman**

NATIONAL HIGHWAYS AUTHORITY OF INDIA

G-5 & 6, Sector-10, Dwarka

NEW DELHI - 110 075

CASH FLOW STATEMENT FOR THE YEAR ENDED 31st MARCH, 2021

S. No.	Particulars	CURRENT YEAR Rs. In Lakhs	PREVIOUS YEAR Rs. In Lakhs
A.	**Cash flow from operating activities:**		
	Net profit before tax	(46,726.31)	(44,303.04)
	Adjustments for:		
	Depreciation	1,453.44	1,286.21
	Profit/Loss on sale of assets	(4.89)	(5.39)
	Interest income	(0.03)	(0.15)
	Operating profit before working capital changes	**(45,277.79)**	**(43,022.36)**
	Adjustments for:		
	(Increase)/Decrease in Deposits, Loans & Advances	(72,349.99)	17,34,349.89
	Increase/(Decrease) in liabilities	8,00,106.87	(21,64,388.36)
	(Increase)/Decrease in Provision for Gratuity and Leave Encashment	722.42	889.45
	Cash flow before extraordinary item & prior period items	6,83,201.50	**(4,72,171.39)**
	Prior period items	(3,063.89)	(4,582.72)
	Net cash generated from operating activities	**6,80,137.61**	**(4,76,754.11)**
B.	**Cash flow from investing activities:**		
	Purchase of fixed assets	(1,914.00)	(5,177.24)
	Realisation from sale of assets	8.88	9.95
	(Increase)/Decrease in Capital Work in progress	(90,84,224.57)	(78,32,613.01)
	(Increase)/Decrease in investment	(1,09,420.00)	(1,560.00)
	Interest Income	1,97,477.83	2,27,263.74
	Capital Reserve (Receipts)	1,57,630.52	26,765.46
	Net cash used in investing activities	**(88,40,441.34)**	**(75,85,311.11)**
C.	**Cash flow from financing activities:**		
	Capital Base	3,260.00	-
	Cess funds received from Govt of India	23,85,000.00	11,09,100.00
	Capital additional budgetary receipts	2,80,000.00	1,00,000.00
	EAP Grant Received & utilised towards Revenue Expenditure	10,000.00	15,700.00
	Adjusted Plough back of Toll Remittance,etc	15,40,424.08	14,08,167.82
	Net decrease in loan from ADB due to Exchange Loss after Adjustment of Repayments	(9,154.20)	(2,027.66)
	Proceeds from issue of 54EC Capital Gains Tax-Free Bonds	3,42,730.60	4,45,081.30
	Proceeds from issue of Taxable bonds	45,80,260.00	49,53,600.00
	Proceeds from NSSF Loan & SBI Term Loan	15,85,000.00	21,00,000.00
	Redemption of 54EC Capital Gains Tax- Free Bonds	(6,65,741.30)	(5,57,274.20)
	Interest and other expenditure on Bond	(20,02,529.70)	(15,31,479.51)
	Net cash generated from financing activities	**80,49,249.47**	**80,40,867.75**
	Net increase/(decrease) in cash and cash equivalents (A+B+C)	**(1,11,054.26)**	**(21,197.47)**
	Opening cash and cash equivalents	6,34,527.58	6,55,725.06
	Closing cash and cash equivalents	**5,23,473.33**	**6,34,527.58**
Notes:			
	Cash and cash equivalents include:		
	Cash and cheques in hand / in transit	1.30	1.35
	Balance with banks-Current Account	1,41,972.38	78,188.52
	Balance with banks-Savings Bank Account	3,45,754.56	5,28,641.74
	Balance with banks-Fixed Deposit Account	35,745.09	27,695.98
	Balance as per books of account	**5,23,473.33**	**6,34,527.58**

For and on behalf of the Board of the Authority

Place : New Delhi.

Date : 30.07.2021

Member (Finance) **Chairman**

NATIONAL HIGHWAYS AUTHORITY OF INDIA

G-5 & 6, Sector-10, Dwarka
NEW DELHI - 110 075

BALANCE SHEET AS AT 31st MARCH 2022

S. No.		PARTICULARS	SCHEDULE	CURRENT YEAR ₹ In Lakhs	PREVIOUS YEAR ₹ In Lakhs
		(1)	(2)	(3)	(4)
I.		**SOURCES OF FUNDS**			
	1	**Shareholders' Fund**			
		a) Capital	1	3,36,59,587.67	2,61,11,353.19
		b) Reserves & Surplus	2	-	-
	2	**Grants**			
		a) Capital	3	15,08,210.33	14,08,210.33
	3	**Borrowings**			
		a) Secured Loans	4	2,06,62,866.49	2,00,31,261.17
		b) Unsecured Loans		1,42,27,857.14	1,06,85,000.00
		TOTAL		**7,00,58,521.64**	**5,82,35,824.69**
II.		**APPLICATION OF FUNDS**			
	1	**Fixed Assets**	5		
		a) Gross Block		40,983.90	24,706.29
		b) Less: Assets created out of Grant		758.11	758.11
		c) Assets out of Own Fund		40,225.79	23,948.18
		d) Less: Depreciation		14,656.16	12,772.42
		Net Block		**25,569.62**	**11,175.76**
	2	**Assets held on behalf of GoI**			
		a) Completed		3,00,51,557.50	2,55,32,301.73
		b) Ongoing		3,94,77,213.91	3,15,38,628.77
		Total (a+b)		**6,95,28,771.42**	**5,70,70,930.50**
		Total		**6,95,54,341.04**	**5,70,82,106.26**
	3	**Investment**	6	**5,09,813.34**	**2,04,597.34**
	4	**Current Assets, Loans and Advance**	7		
		a) Inventories		-	-
		b) Deposits, Loans & Advances		47,48,549.17	46,53,984.84
		c) Interest accrued but not due on deposits		63,273.22	2,845.16
		d) Interest accrued and due on CALA deposits		4,532.75	6,039.20
		e) Cash & Bank Balance		3,97,127.04	5,23,473.33
		f) Inter Unit Account		-	-
		Sub total		**52,13,482.19**	**51,86,342.53**
		Less: Current Liabilities and Provisions			
		a) Liabilities	8	52,08,604.62	42,28,508.19
		b) Reserves & Provisions	9	10,510.31	8,713.26
		Sub total		**52,19,114.93**	**42,37,221.44**
		Net Current Assets		**(5,632.75)**	**9,49,121.09**
	5	**Misc. Expenditure**	10		
		(to the extent not written off)			
		Profit & Loss Account			
		(Debit balance if any)			
		TOTAL		**7,00,58,521.64**	**5,82,35,824.69**

Place : New Delhi.
Date : 28.07.2022

For and on behalf of the Board of the Authority

Member (Finance) **Chairperson**

NATIONAL HIGHWAYS AUTHORITY OF INDIA

G-5 & 6, Sector-10, Dwarka
NEW DELHI - 110 075

STATEMENT OF PROFIT AND LOSS ACCOUNT FOR THE YEAR ENDED 31st MARCH, 2022

S. No.		PARTICULARS	SCHEDULE	CURRENT YEAR ₹ In Lakhs	PREVIOUS YEAR ₹ In Lakhs
		(1)	(2)	(3)	(4)
I.		**INCOME**			
	a)	Value of Work done		-	-
	b)	Other income	**11**	3,413.10	2,781.30
	c)	Interest (Gross)	**12**	0.15	0.03
	d)	Net Increase/Decrease in Work-in-progress (+)/(-)	**13**	-	-
		TOTAL INCOME		**3,413.25**	**2,781.33**
		EXPENDITURE			
	a)	Construction Stores/Material consumed		-	-
		Other stores,spares & tools etc. consumed			
		Work Expenses	**14**	-	-
		Personnel & Administrative Expenses	**15**	60,102.96	48,022.67
		Finance Charges	**16**	44.25	5.10
		Depreciation		2,026.19	1,453.44
		Assets of Small Value Charged Off		27.70	26.44
		Exceptional Items			
		Loss: On winding up of MTRCL		12,709.59	-
		Less:Transferred to Capital (Sch-1)		(12,709.59)	-
		Gain: On swaping of shares with units		(10,142.00)	-
		Less: Transferred to Capital (Sch-1)		10,142.00	-
		TOTAL EXPENDITURE		**62,201.10**	**49,507.65**
		Profit / (Loss) for the period		**(58,787.86)**	**(46,726.31)**
		Add: Prior Period Items net(+/-) (details to be given)	**17**	3,777.50	3,063.89
		Net Estab. Expenses transferred to Sch-5		**62,565.36**	**49,790.21**
		Less/Add: Provision for Taxation			
		Net Profit			
		Less: Transfer to Capital Reserve			
		Less: Transfer to other specific Reserve/Fund			
		Less/Add: Transfer to/Transfer from General Reserve (+/-)			
		Less/Add: Surplus brought forward from previous year			
		Surplus carried to Balance Sheet			

Significant Accounting Policy (Schedule 18) and Notes on Accounts (Schedule 19) are integral part of this Financial Statements.

For and on behalf of the Board of the Authority

Place : New Delhi.
Date : 28.07.2022

Member (Finance) **Chairperson**

NATIONAL HIGHWAYS AUTHORITY OF INDIA

G-5 & 6, Sector-10, Dwarka
NEW DELHI - 110 075

CASH FLOW STATEMENT FOR THE YEAR ENDED 31st MARCH, 2022

S. No.	PARTICULARS	CURRENT YEAR ₹ In Lakhs	PREVIOUS YEAR ₹ In Lakhs
A.	**Cash flow from operating activities:**		
	Net profit before tax	(58,787.86)	(46,726.31)
	Adjustments for:		
	Depreciation	2,026.19	1,453.44
	Profit/Loss on sale of assets	(4.34)	(4.89)
	Interest income	(0.15)	(0.03)
	Operating profit before working capital changes	**(56,766.15)**	**(45,277.79)**
	Adjustments for:		
	(Increase)/Decrease in Deposits, Loans & Advances	(94,564.33)	(72,349.99)
	Increase/(Decrease) in liabilities	9,80,096.44	8,00,106.87
	(Increase)/Decrease in Provision for Gratuity and Leave Encashment	1,797.05	722.42
	Cash flow before extraordinary item & prior period items	**8,30,563.01**	**6,83,201.50**
	Prior period items	(3,777.50)	(3,063.89)
	Net cash generated from operating activities	**8,26,785.51**	**6,80,137.61**
B.	**Cash flow from investing activities:**		
	Purchase of fixed assets	(16,423.12)	(1,914.00)
	Realisation from sale of assets	7.40	8.88
	(Increase)/Decrease in Capital Work in progress	(1,06,24,858.32)	(90,84,224.57)
	(Increase)/Decrease in investment	(3,05,216.00)	(1,09,420.00)
	Interest Income	1,52,003.34	1,97,477.83
	Capital Reserve (Receipts)	4,20,191.37	1,57,630.52
	Loss from investing activities	(2,567.59)	0.00
	Net cash used in investing activities	**(1,03,76,862.92)**	**(88,40,441.34)**
C.	**Cash flow from financing activities:**		
	Capital Base	0.00	3,260.00
	Cess funds received from Govt of India	36,21,000.00	23,85,000.00
	Capital additional budgetary receipts	16,14,218.00	2,80,000.00
	Proceeds from InvIT Projects	7,35,040.00	-
	EAP Grant Received & utilised towards Revenue Expenditure	1,00,000.00	10,000.00
	Adjusted Plough back of Toll Remittance,etc	15,80,544.07	15,40,424.08
	Net decrease in loan from ADB due to Exchange Loss after Adjustment of Repayments	(7,402.36)	(9,154.20)
	Proceeds from issue of 54EC Capital Gains Tax-Free Bonds	5,02,845.80	3,42,730.60
	Proceeds from issue of Taxable bonds	8,07,570.00	45,80,260.00
	Proceeds from NSSF Loan & Term Loans	35,42,857.14	15,85,000.00
	Redemption of 54EC Capital Gains Tax- Free Bonds	0.00	(6,65,741.30)
	Redemption of Tax Free Secured Non-Convertible Bonds (10Yr) 11-12	(6,71,408.12)	-
	Interest and other expenditure on Bond	(24,01,533.41)	(20,02,529.70)
	Net cash generated from financing activities	**94,23,731.12**	**80,49,249.47**
	Net increase/(decrease) in cash and cash equivalents (A+B+C)	**(1,26,346.29)**	**(1,11,054.26)**
	Opening cash and cash equivalents	5,23,473.33	6,34,527.58
	Closing cash and cash equivalents	**3,97,127.04**	**5,23,473.32**
	Notes:		
	Cash and cash equivalents include:		
	Cash and cheques in hand / in transit	2.32	1.30
	Balance with banks-Current Account	2,46,288.69	1,41,972.38
	Balance with banks-Savings Bank Account	1,15,740.43	3,45,754.56
	Balance with banks-Fixed Deposit Account	35,095.61	35,745.09
	Balance as per books of account	**3,97,127.04**	**5,23,473.33**

For and on behalf of the Board of the Authority

Place : New Delhi.
Date : 28.07.2022

Member (Finance) **Chairperson**

NATIONAL HIGHWAYS AUTHORITY OF INDIA

G-5 & 6, Sector-10, Dwarka
NEW DELHI - 110 075

BALANCE SHEET AS AT 31st MARCH 2023

S. No.		PARTICULARS	SCHEDULE	CURRENT YEAR ₹ In Lakhs	PREVIOUS YEAR ₹ In Lakhs
		(1)	(2)	(3)	(4)
I.		**SOURCES OF FUNDS**			
	1	**Shareholders' Fund**			
		a) Capital	1	4,95,32,132.03	3,36,59,587.67
		b) Reserves & Surplus	2	-	-
	2	**Grants**			
		a) Capital	3	15,28,210.33	15,08,210.33
	3	**Borrowings**			
		a) Secured Loans	4	2,04,97,852.12	2,06,62,866.49
		b) Unsecured Loans		1,38,13,571.43	1,42,27,857.14
		TOTAL		**8,53,71,765.91**	**7,00,58,521.64**
II.		**APPLICATION OF FUNDS**			
	1	**Fixed Assets**	5		
		a) Gross Block		42,409.43	40,983.90
		b) Less: Assets created out of Grant		758.11	758.11
		c) Assets out of Own Fund (a-b)		41,651.32	40,225.79
		d) Less: Depreciation		17,862.87	14,656.16
		Net Block (c-d)		**23,788.45**	**25,569.62**
	2	**Assets held on behalf of GoI**			
		a) Completed		3,83,41,889.16	3,00,51,557.50
		b) Ongoing and others		4,63,72,427.16	3,94,77,213.91
		Total (a+b)		**8,47,14,316.32**	**6,95,28,771.42**
		Total		**8,47,38,104.77**	**6,95,54,341.04**
	3	**Investment**	6	**6,57,280.18**	**5,09,813.34**
	4	**Current Assets, Loans and Advance**	7		
		a) Inventories			
		b) Deposits, Loans & Advances		51,65,503.45	47,48,549.17
		c) Interest accrued but not due on deposits		42,508.90	63,273.22
		d) Interest accrued and due on CALA deposits		4,594.37	4,532.75
		e) Cash & Bank Balance		3,75,705.86	3,97,127.04
		f) Inter Unit Account		0.00	0.00
		Sub total		**55,88,312.58**	**52,13,482.19**
		Less: Current Liabilities and Provisions			
		a) Liabilities	8	55,99,203.63	52,08,604.62
		b) Reserves & Provisions	9	12,727.99	10,510.31
		Sub total		**56,11,931.62**	**52,19,114.93**
		Net Current Assets		**(23,619.04)**	**(5,632.75)**
	5	**Misc. Expenditure** (to the extent not written off)	10		
		Profit & Loss Account (Debit balance if any)			
		TOTAL		**8,53,71,765.91**	**7,00,58,521.64**

For and on behalf of the Board of the Authority

Place : New Delhi.
Date : 28.07.2023

Member (Finance) **Chairman**

NATIONAL HIGHWAYS AUTHORITY OF INDIA

G-5 & 6, Sector-10, Dwarka
NEW DELHI - 110 075

STATEMENT OF PROFIT AND LOSS ACCOUNT FOR THE YEAR ENDED 31st MARCH, 2023

S. No.		PARTICULARS	SCHEDULE	CURRENT YEAR ₹ In Lakhs	PREVIOUS YEAR ₹ In Lakhs
		(1)	(2)	(3)	(4)
I.		**INCOME**			
	a)	Value of Work done		-	-
	b)	Other income	**11**	3,227.70	3,413.10
	c)	Interest (Gross)	**12**	6.02	0.15
	d)	Net Increase/Decrease in Work-in-progress (+)/(-)	**13**	-	-
		TOTAL INCOME		**3,233.72**	**3,413.25**
II.		**EXPENDITURE**			
		Construction Stores/Material consumed		-	-
		Other stores, spares & tools etc. consumed			
		Work Expenses	**14**	-	-
		Personnel & Administrative Expenses	**15**	72,362.04	60,102.96
		Finance Charges	**16**	111.84	44.25
		Depreciation		2,327.39	2,026.19
		Assets of Small Value Charged Off		27.19	27.70
		Exceptional Items			
		Loss: On winding up of MTRCL			12,709.59
		Less: Transferred to Capital (Sch-1)			(12,709.59)
		Gain: On swapping of shares with units			(10,142.00)
		Less: Transferred to Capital (Sch-1)			10,142.00
		TOTAL EXPENDITURE		**74,828.46**	**62,201.10**
		Profit / (Loss) for the period		**(71,594.74)**	**(58,787.86)**
		Add: Prior Period Items net Expenses / (Income) (details to be given)	**17**	5,367.97	3,777.50
		Net Estab. Expenses transferred to Sch-5		**76,962.71**	**62,565.36**
		Less/Add: Provision for Taxation			
		Net Profit			
		Less: Transfer to Capital Reserve			
		Less: Transfer to other specific Reserve/Fund			
		Less/Add: Transfer to/Transfer from General Reserve (+/-)			
		Less/Add: Surplus brought forward from previous year			
		Surplus carried to Balance Sheet			

Place : New Delhi.
Date : 28.07.2023

For and on behalf of the Board of the Authority

Member (Finance) **Chairman**

NATIONAL HIGHWAYS AUTHORITY OF INDIA

G-5 & 6, Sector-10, Dwarka
NEW DELHI - 110 075

CASH FLOW STATEMENT FOR THE YEAR ENDED 31st MARCH, 2023

S. No.	PARTICULARS	CURRENT YEAR ₹ In Lakhs	PREVIOUS YEAR ₹ In Lakhs
A.	**Cash flow from operating activities:**		
	Net profit before tax	(71,594.74)	(58,787.86)
	Adjustments for:		
	Depreciation	2,327.39	2,026.19
	Profit/Loss on sale of assets	(5.17)	(4.34)
	Interest income	(6.02)	(0.15)
	Operating profit before working capital changes	**(69,278.54)**	**(56,766.15)**
	Adjustments for:		
	(Increase)/Decrease in Deposits, Loans & Advances	(4,16,954.28)	(94,564.33)
	Increase/(Decrease) in liabilities	3,90,599.01	9,80,096.44
	Increase/(Decrease) in Provision for Gratuity and Leave Encashment	2,217.68	1,797.05
	Cash flow before extraordinary item & prior period items	**(93,416.13)**	**8,30,563.01**
	Prior period items	(5,367.97)	(3,777.50)
	Net cash generated from operating activities	**(98,784.10)**	**8,26,785.51**
B.	**Cash flow from investing activities:**		
	Purchase of fixed assets	(557.68)	(16,423.12)
	Realisation from sale of assets	16.61	7.40
	(Increase)/Decrease in Capital Work in progress	(1,29,40,488.59)	(1,06,24,858.32)
	(Increase)/Decrease in investment	(1,47,466.83)	(3,05,216.00)
	Interest Income	2,55,772.52	1,52,003.34
	Capital Reserve (Receipts)	1,55,013.14	4,20,191.37
	Loss from investing activities	-	(2,567.59)
	Net cash used in investing activities	**(1,26,77,710.83)**	**(1,03,76,862.92)**
C.	**Cash flow from financing activities:**		
	Capital Base	-	-
	Cess funds received from Govt of India	1,10,67,392.10	36,21,000.00
	Capital additional budgetary receipts	19,78,583.48	16,14,218.00
	Proceeds from InvIT Projects	2,84,966.66	7,35,040.00
	EAP Grant Received & utilised towards Revenue Expenditure	20,000.00	1,00,000.00
	Adjusted Plough back of Toll Remittance, etc.	25,41,602.13	15,80,544.07
	Net decrease in loan from ADB due to Exchange Loss after Adjustment of Repayments	(7,272.28)	(7,402.36)
	Proceeds from issue of 54EC Capital Gains Tax-Free Bonds	79,757.90	5,02,845.80
	Proceeds / (Repayemnt) from issue of Taxable bonds	(2,37,500.00)	8,07,570.00
	Proceeds / (Repayemnt) from NSSF Loan & Term Loans	(1,14,285.71)	35,42,857.14
	Redemption of 54EC Capital Gains Tax- Free Bonds	-	-
	Redemption of Tax Free Secured Non-Convertible Bonds (10Yr) 11-12	-	(6,71,408.12)
	Redemption of Masala Bonds	(3,00,000.00)	
	Interest and other expenditure on Bond	(25,58,170.52)	(24,01,533.41)
	Net cash generated from financing activities	**1,27,55,073.75**	**94,23,731.12**
	Net increase/(decrease) in cash and cash equivalents (A+B+C)	**(21,421.18)**	**(1,26,346.29)**
	Opening cash and cash equivalents	3,97,127.04	5,23,473.33
	Closing cash and cash equivalents	**3,75,705.86**	**3,97,127.04**
Notes:			
	Cash and cash equivalents include:		
	Cash and cheques in hand / in transit	2.65	2.32
	Balance with banks-Current Account	2,73,479.41	2,46,288.69
	Balance with banks-Savings Bank Account	69,508.61	1,15,740.43
	Balance with banks-Fixed Deposit Account	32,715.19	35,095.61
	Balance as per books of account	**3,75,705.86**	**3,97,127.04**

For and on behalf of the Board of the Authority

Place : New Delhi.
Date : 28.07.2023

Member (Finance) **Chairman**

NATIONAL HIGHWAYS AUTHORITY OF INDIA

G-5 & 6, Sector-10, Dwarka, New Delhi - 110075

STATEMENT OF UNAUDITED FINANCIAL RESULTS FOR THE QUARTER AND YEAR ENDED 31ST MARCH 2024

Rs. (in lakhs)

Particulars	Three Months Ended			Year To Date	
	31-03-2024	31-12-2023	31-03-2023	31-03-2024	31-03-2023
	Unaudited		Audited	Unaudited	Audited
INCOME					
a) Value of Work done	-	-	-	-	-
b) Other income	1,060.16	291.07	1,847.59	2,162.70	3,227.70
c) Interest (Gross)*	0.09	(13.44)	5.98	0.10	6.02
d) Net Increase/Decrease in Work-in-progress (+)/(-)	-	-	-	-	-
TOTAL INCOME	**1,060.25**	**277.63**	**1,853.57**	**2,162.80**	**3,233.72**
EXPENDITURE					
a) Construction Stores/Material consumed					
Other stores,spares & tools etc.consumed					
Work Expenses	-	-	-	-	-
Personnel & Administrative Expenses	25,318.48	21,381.47	27,163.15	78,204.62	72,362.04
Finance Charges	(0.62)	0.49	80.89	18.67	111.84
Depreciation	2,579.81	1.63	2,324.28	2,584.28	2,327.39
Assets of Small Value Charged Off	5.78	5.15	9.66	22.00	27.19
Exceptional Items					
Loss: Transfer of shares of various SPVs	-	-	-	29,300.07	-
Loss:Conversion of recoverable accrued interest of various SPVs into shares	-	-	-	1,24,068.89	-
Net loss transferred to Capital (Sch-1)	-	-		(1,53,368.96)	-
Gain: Recovery of loss from SPVs (MTRCL)	(412.50)	-	-	(412.50)	-
Less: Transferred to Capital (Sch-1)	412.50	-	-	412.50	-
TOTAL EXPENDITURE	**27,903.45**	**21,388.74**	**29,577.98**	**80,829.57**	**74,828.46**
Profit / (Loss) for the period	(26843.20)	(21111.11)	(27724.41)	(78666.77)	(71594.74)
Prior Period Items net (Expenses) / Income	5390.59	(2127.75)	(1153.84)	272.50	(5367.97)
Transfer of Net Establishment Expenses for the year to Sch-5	**(21,452.61)**	**(23,238.86)**	**(28,878.25)**	**(78,394.27)**	**(76,962.71)**

NATIONAL HIGHWAYS AUTHORITY OF INDIA
G-5 & 6, Sector-10, Dwarka, New Delhi - 110075

STAEMENT OF ASSETS & LIABILITIES AS AT

(Rs. In lakhs)

Particulars	31-03-2024 Unaudited	31-03-2023 Audited
SOURCES OF FUNDS		
Shareholders' Fund		
a) Capital	7,08,24,459.32	4,95,32,132.03
b) Reserves & Surplus	-	-
Grants		
a) Capital	15,90,738.34	15,28,210.33
Borrowings		
a) Secured Loans	1,98,93,104.95	2,04,97,852.12
b) Unsecured Loans	1,36,44,214.71	1,38,13,571.43
TOTAL	**10,59,52,517.32**	**8,53,71,765.91**
APPLICATION OF FUNDS		
Fixed Assets		
a) Gross Block	44,601.24	42,409.43
b) Less: Assets created out of Grant	758.11	758.11
c) Assets out of Own Fund	44,043.13	41,651.32
d) Less: Depreciation	20,295.19	17,862.87
e) Net Block	23,747.94	23,788.45
Assets held on behalf of GoI		
a) Completed	3,86,08,538.26	3,83,41,889.16
b) Ongoing	6,21,71,383.98	4,63,72,427.16
Total (a+b)	10,07,79,922.24	8,47,14,316.32
Total	**10,08,03,670.18**	**8,47,38,104.77**
Investment	**8,32,990.45**	**6,57,280.18**
Current Assets, Loans and Advance		
a) Inventories		
b) Deposits, Loans & Advances	55,64,739.22	52,12,606.72
e) Cash & Bank Balance	36,38,264.04	3,75,705.86
sub total	**92,03,003.26**	**55,88,312.58**
Less: Current Liabilities and Provisions		
a) Liabilities	48,74,821.58	55,99,203.63
b) Reserves & Provisions	12,324.99	12,727.99
sub total	**48,87,146.57**	**56,11,931.62**
Net Current Assets	**43,15,856.69**	**(23,619.04)**
Misc. Expenditure	-	-
(to the extent not written off)		
Profit & Loss Account	-	-
(Debit balance if any)		
TOTAL	**10,59,52,517.32**	**8,53,71,765.91**

S.K. MEHTA & CO. CHARTERED ACCOUNTANTS

NATIONAL HIGHWAYS AUTHORITY OF INDIA
G-5 & 6, Sector-10, Dwarka, New Delhi - 110075

STATEMENT OF CASH FLOWS FOR THE YEAR ENDED 31ST MARCH, 2024

Rs. in Lakhs

Particulars	31-03-2024 Unaudited	31-03-2023 Audited
Cash flow from operating activities:		
Net profit before tax	(78,666.77)	(71,594.74)
Adjustments for:		
Depreciation	2,584.28	2,327.39
Profit/Loss on sale of assets	(6.18)	(5.17)
Interest income	(0.10)	(6.02)
Operating profit before working capital changes	**(76,088.77)**	**(69,278.54)**
Adjustments for:		
(Increase)/Decrease in Deposits, Loans & Advances	(3,93,460.34)	(4,16,954.28)
Increase/(Decrease) in liabilities	(7,24,382.05)	3,90,599.01
Increase/(Decrease) in Provision for Gratuity and Leave Encashment	(403.00)	2,217.68
Cash flow before extraordinary item & prior period items	**(11,94,334.16)**	**(93,416.13)**
Loss due to conversion of receivable accrued interest into shares	(1,24,068.89)	-
Prior period items	272.50	(5,367.97)
Net cash generated from operating activities (A)	**(13,18,130.55)**	**(98,784.10)**
Cash flow from investing activities:		
Inter unit		
Purchase of fixed assets	(2,553.99)	(557.68)
Realisation from sale of assets	16.39	16.61
(Increase)/Decrease in Assets held on behalf of GoI	(1,37,28,203.66)	(1,29,40,488.59)
(Increase)/Decrease in investment	(1,75,710.27)	(1,47,466.83)
Interest Income	3,53,060.43	2,55,772.52
Capital Reserve (Receipts)	19,292.79	1,55,013.14
Net Loss from transfer of shares of various SPVs	(29,300.07)	
Recovery of loss-Winding up of MTRCL	412.50	-
Net cash used in investing activities (B)	**(1,35,62,985.88)**	**(1,26,77,710.83)**
Cash flow from financing activities:		
Cess funds received from Govt of India	1,27,72,741.78	1,10,67,392.10
Capital additional budgetary receipts	40,53,587.00	19,78,583.48
Proceeds from InvIT Projects	15,69,988.18	2,84,966.66
EAP Grant Received & utilised towards Revenue Expenditure	62,528.01	20,000.00
Adjusted Plough back of Toll Remittance,etc	30,48,966.79	25,41,602.13
Net decrease in loan from ADB due to Exchange Loss after Adjustment of Repayments	(11,255.65)	(7,272.28)
Proceeds from issue of 54EC Capital Gains Tax-Free Bonds	(4,70,634.60)	79,757.90
Proceeds / Repayment from issue of Taxable bonds	-	(2,37,500.00)
Proceeds / Repayment from NSSF Loan & SBI Term Loan	(1,69,356.72)	(1,14,285.71)
Redemption of Tax Free Secured Non-Convertible Bonds (10Yr) 11-12	-	-
Redemption of Masala Bonds	(1,22,856.92)	(3,00,000.00)
Interest and other expenditure on Bond	(25,90,033.28)	(25,58,170.52)
Net cash generated from financing activities (C)	**1,81,43,674.60**	**1,27,55,073.75**
Net increase/(decrease) in cash and cash equivalents (A+B+C)	**32,62,558.18**	**(21,421.18)**
Opening cash and cash equivalents	3,75,705.86	3,97,127.04
Closing cash and cash equivalents	**36,38,264.04**	**3,75,705.86**
Cash and cash equivalents include:		
Cash and cheques in hand / in transit	1.69	2.65
Balance with banks-Current Account	18,56,960.34	2,73,479.41
Balance with banks-Savings Bank Account	16,20,195.37	69,508.61
Balance with banks-Fixed Deposit Account	1,61,106.64	32,715.19
Balance as per books of account	**36,38,264.04**	**3,75,705.86**

S.K. MEHTA & Co.
CHARTERED ACCOUNTANTS

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LIMITED REVIEW REPORT

TO THE MEMBERS OF NATIONAL HIGHWAYS AUTHORITY OF INDIA

We have reviewed the accompanying statement of unaudited standalone financial results of National Highways Authority of India for the quarter ended 30th June, 2024. This statement is the responsibility of the Authority's management and has been approved by the Board of the National Highways Authority of India. Our responsibility is to issue a report on these standalone financial statements based on our review. We conducted our review in accordance with the Standard on Review Engagement (SRE) 2400, Engagements to Review Financial Statements issued by Institute of Chartered Accountants of India. This standard requires that we plan and perform the review to obtain moderate assurance as to whether the financial statements are free of material misstatements. A review is limited primarily to inquiries of Authority personnel and analytical procedure applied to financial data and thus provide less assurance than an audit. We have not performed an audit and accordingly, we do not express an audit opinion. As part of our review procedure, we have performed test check of five Project Implementation Units (PIUs). Based on our review conducted as above, nothing other has come to our attention that causes us to believe that the accompanying statement of unaudited standalone financial results read with the notes prepared in accordance with the applicable accounting standards and other recognized accounting practices and policies has not disclosed the information required to be disclosed in terms of Regulation 52 of the Listing Regulations including the manner in which it is to be disclosed, or that it contains any material misstatement.

For **S.K. Mehta & Co.**
Chartered Accountants
Firm Registration Number 000478N

JAYANT KUMAR
Digitally signed by JAYANT KUMAR
Date: 2024.08.13 14:32:11 +05'30'

CA Jayant Kumar
(Partner)
Membership No. 518718
UDIN: 24518718BKFYOD9205

Place: New Delhi
Date: 13-08-2024

NATIONAL HIGHWAYS AUTHORITY OF INDIA

G-5 & 6, Sector-10, Dwarka, New Delhi - 110075

STATEMENT OF UNAUDITED FINANCIAL RESULTS FOR THE QUARTER ENDED 30 JUNE 2024

(Rs. in lakhs)

Particulars	Three Months Ended			Year Ended
	30/06/2024	31/03/2024	30/06//2023	31/03/2024
	Unaudited	Unaudited	Unaudited	Unaudited
INCOME				
a) Value of Work done		-	-	
b) Other income	636.28	1,575.99	339.44	2678.53
c) Interest (Gross)*	0.29	2.54	0.02	2.55
d) Net Increase/Decrease in Work-in-progress (+)/(-)		-	-	0.00
TOTAL INCOME	**636.57**	**1,578.53**	**339.46**	**2681.08**
		-		
EXPENDITURE		-		
a) Construction Stores/Material consumed		-		
Other stores,spares & tools etc.consumed		-		
		-		
Work Expenses		-	-	
Personnel & Administrative Expenses	12,813.83	27,544.11	11,870.22	80430.25
Finance Charges	0.48	(0.46)	15.72	18.83
Depreciation	1.45	2,582.35	1.24	2586.82
Assets of Small Value Charged Off	2.15	5.79	4.60	22.01
	-	-	-	
Exceptional Items	-	-	-	
Loss: Transfer of shares of various SPVs	-		-	29300.07
Loss:Conversion of recoverable accrued interest of various SPVs into shares	-		-	124068.89
Net loss transferred to Capital (Sch-1)	-		-	(153368.96)
Gain: Recovery of loss from SPVs (MTRCL)	-	(412.50)	-	(412.50)
Less: Transferred to Capital (Sch-1)	-	412.50	-	412.50
TOTAL EXPENDITURE	**12,817.91**	**30,131.79**	**11,891.78**	**83,057.91**
Profit / (Loss) for the period	(12181.34)	(28553.26)	(11552.32)	(80376.83)
Prior Period Items net (Expenses) / Income	(2216.44)	5415.70	(2021.18)	297.61
Transfer of Net Establishment Expenses for the year to Sch-5	**(14,397.78)**	**(23,137.56)**	**(13,573.50)**	**(80,079.22)**

NATIONAL HIGHWAYS AUTHORITY OF INDIA
G-5 & 6, Sector-10, Dwarka, New Delhi - 110075

Additional disclosure as per clause 52(4) of Securities and Exchange Board of India (Listing Obligation and Disclosure Requirements) Regulation ,2015 :

	Particulars	Three Months Ended			Year Ended
		30/06/2024	31/03/2024	30/06//2023	31/03/2024
		Unaudited	Unaudited	Unaudited	Unaudited
a.	Outstanding Redeemable Preference Share	NIL	NIL	NIL	NIL
b.	Debenture Redemption Reserve	NIL	NIL	NIL	NIL
c.	Debt Equity Ratio (Times) (Total Debt / Equity)*	0.4437	0.4736	0.5914	0.4736
d.	Long Term Debt To Working Capital (Times) [(Non Current Borrowings + Current Maturity Of Long Term Debt)/Net Working Capital Excluding Current Borrowings)	5.0750	7.7350	6.6141	7.7350
e.	Total Debt To Total Asset Ratio (%) [(Short Term Debt + Long Term Debt) / Total Asset]	0.2911	0.3024	0.3503	0.3024
f.	Debt Service Coverage Ratio (Times) [(Profit After Tax + Interest + Depreciation + Loss/(Gain) On Sale Of Fixed Assets / (Gross Interest + Lease Payment + Repayment Of Long Term Debt Excluding Pre Payments)]**	NA	NA	NA	NA
g.	Interest Service Coverage Ratio (Times) [(Profit After Tax + Interest + Depreciation + Loss/(Gain) On Sale Of Fixed Assets) / Gross Interest]**	NA	NA	NA	NA
h.	Current Ratio (Times) (Current Asset / Current Liabilities Excluding Current Borrowings)	2.4785	1.8764	2.2731	1.8764
i.	Bad Debt To Account Receivable Ratio (%) (Bad Debt / Average Trade Receivable)	NIL	NIL	NIL	NIL
j.	Current Liability Ratio (%) (Current Liabilities Excluding Current Borrowings / Total Liabilities)	0.1128	0.1234	0.1020	0.1234
k.	Debtor Turnover (Times) [(Sales Of Products And Services / Average Trade Receivables)] - Annualised	NA	NA	NA	NA
l.	Inventory Turnover (Times) [(Sales Of Products And Services / Average Inventory)] - Annualised	NA	NA	NA	NA
m.	Operating Margins (In %) [(Profit Before Depreciation, Interest, Tax And Exceptional Items Less Other Income) / Sales Of Products And Services]	NA	NA	NA	NA
n.	Net Profit Margin (%) (Profit After Tax / Sale Of Products And Services)	NA	NA	NA	NA
o.	Asset coverage ratio on secured Non-convertible debentures (NCDs) in times) Total assets pledged for secured NCds/ outstanding balance of secured NCDs)	5.8032	5.5744	4.7864	5.5744

*Debt Equity Ratio= Debt Outstanding / Shareholders' Fund***
**Authority is holding Assets on behalf of Government of India, therefore has no income from operations.
**Shareholder's Fund = Capital Base, Cess Fund, Additional Budgetary Support, Net of Plough Back of Toll Remittance after deducting
NA``` - Not available



Working

Sr. No.	Particulars	Three Months Ended			Year Ended
		30/06/2024	31/03/2024	30/06//2023	31/03/2024
		Unaudited	Unaudited	Unaudited	Unaudited
1	Non Current Borrowings (A)	3,34,37,014.66	3,35,37,319.66	3,42,34,209.47	3,35,37,319.66
2	Lease Liabilities (B)	-	-	-	-
3	Current Maturities of Long Term Borrowings (C)	-	-	-	-
4	**PAID UP DEBT CAPITAL (A+B+C)**	**3,34,37,014.66**	**3,35,37,319.66**	**3,42,34,209.47**	**3,35,37,319.66**
5	Equity Share Capital (D)	-	-	-	-
6	Other Equity (E)	7,53,59,350.77	7,08,17,757.84	5,78,88,752.82	7,08,17,757.84
7	**Net Worth (D+E)**	**7,53,59,350.77**	**7,08,17,757.84**	**5,78,88,752.82**	**7,08,17,757.84**
8	Current Assets (F)	1,10,44,833.69	92,82,824.49	92,41,522.57	92,82,824.49
9	Current Liabilities (G)	44,56,315.95	49,47,037.27	40,65,573.24	49,47,037.27
10	**Working Capital (F-G)**	**65,88,517.74**	**43,35,787.22**	**51,75,949.33**	**43,35,787.22**
11	Short Term Borrowings (H)	-	-	-	-
12	**Working Capital (excluding Short Term Borrowings) (F-(G-H))**	**65,88,517.74**	**43,35,787.22**	**51,75,949.33**	**43,35,787.22**
13	**TOTAL DEBT (PAID UP DEBT CAPITAL + ST Borrowings**	**3,34,37,014.66**	**3,35,37,319.66**	**3,42,34,209.47**	**3,35,37,319.66**
14	**Total Assets**	11,48,61,419.75	11,08,92,853.11	9,77,40,745.85	11,08,92,853.11
15	**Total Liabilities**	3,95,02,068.98	4,00,75,095.27	3,98,51,993.04	4,00,75,095.27
16	**Profit After Tax**	-	-	-	-
17	**Depreciation**	1.45	2,582.35	1.24	2,586.82
18	**Finance Cost**	0.48	(0.46)	15.72	18.83
19	**Loss/(gain) on sale of fixed assets**	(1.48)	(2.48)	(0.97)	(6.25)
20	**Lease Payments**	NA	NA	NA	NA
21	**Repayments of LTD excluding pre. Payments**	NA	NA	NA	NA
22	**Revenue from Operations**	-	-	-	-
23	**Average Receivables**	NA	NA	NA	NA
24	**Average Stock**	NA	NA	NA	NA
25	**Secured Borrowings**	1,97,92,799.95	1,98,93,104.95	2,04,20,638.04	1,98,93,104.95







Notes-

a) NHAI is constituted by an Act of Parliament for development, maintenance & management of National Highways. NHAI is an "Executing Agency" of Government of India and therefore does not have its own income or expenses.

b) As per the provision of Section 23 of National Highways Authority of India, 1988 Accounts of the Authority is prepared on annual basis and audited by C&AG.

c) During the period, there is no change in the accounting policies of the Authority.

d) Capital of the Authority is provided by Government of India and the capital is not divided into shares. Highway projects are shown as Assets held on behalf of Government of India (Completed and Ongoing).

e) The unaudited figures for the previous periods are reported on the basis of the books of accounts and have been recast / regrouped/ rearranged, wherever considered necessary, to make them comparable.

f) Depreciation (except in case of disposal of assets) and provisions (except interest on borrowings) are year end excercise, therefore have not been considered during the quarter.

g) Authority does not have its own source of income; however during the 1st Quarter 2024-25, Authority has generated total income of Rs. 6.37 crores which includes income from sale of tender documents to the tune of Rs.3.42 crore

h) Figures for the quarter ended 30th June, 2024 have been subjected to "Limited Review" by a Chartered Accountant Firm and approved by Board of Authority through circulation.

i) As on 30th June, 2024, no investor complaint is pending. The credit rating of NHAI assigned at the time of issue has not been downgraded. NHAI has not defaulted in payment of interest for non-convertible debt securities and loans etc. Also, the properties charged are adequate in discharging the due repayment to debenture holders i.e. interest and redemption amount.

j) During the quarter NHAI has collected Rs. 2,252.31 crore as toll revenue and deposited Rs. 2,221.37 crore into CFI.

k) As on 31st March, 2024, there was a contingent liability of Rs.1,17,463.56 crore in Arbitration and Rs. 11,864.94 crore in Court Cases. Figures for 30th June, 2024 has not been compiled. l)

Figures for the quarter ended 31st March, 2024 represents the difference between the unaudited figures in respect of the full financial year and the published unaudited figures of nine months ended 31st December, 2023.

m) Figures for the quarter and year ended 31st March, 2024, as reported earlier, have changed due to the finalization of annual financial statements for FY 2023-24 on 25th July, 2024.

NATIONAL HIGHWAYS AUTHORITY OF INDIA

G-5 & 6, Sector-10, Dwarka, New Delhi - 110075

STATEMENT OF UNAUDITED FINANCIAL RESULTS FOR THE QUARTER AND HALF YEAR ENDED 30 SEP, 2024

(Rs. in lakhs)

Particulars	Three Months Ended			Year To Date		Year Ended
	30/09/2024	30/06/2024	30/09/2023	30/09/2024	30/09/2023	31/03/2024
	Unaudited	Unaudited	Unaudited	Unaudited	Unaudited	Unaudited
INCOME						
a) Value of Work done	-	-	-	-	-	-
b) Other income	615.34	636.28	472.03	1,251.62	811.47	2678.53
c) Interest (Gross)*	72.32	0.29	13.43	72.61	13.45	2.55
d) Net Increase/Decrease in Work-in-progress (+)/(-)	-	-	-	-	-	0.00
TOTAL INCOME	**687.66**	**636.57**	**485.46**	**1,324.23**	**824.92**	**2681.08**
EXPENDITURE						
a) Construction Stores/Material consumed		-				
Other stores,spares & tools etc.consumed		-				
Work Expenses			0.00	-	-	
Personnel & Administrative Expenses	20,292.25	12,813.83	19634.45	33,106.08	31,504.67	80430.25
Finance Charges	1.18	0.48	3.08	1.66	18.80	18.83
Depreciation	4.13	1.45	1.60	5.58	2.84	2586.82
Assets of Small Value Charged Off	8.14	2.15	6.47	10.29	11.07	22.01
Exceptional Items		-				
Loss: Transfer of shares of various SPVs		-	29,300.07		29,300.07	29300.07
Loss:Conversion of recoverable accrued interest of various SPVs into shares		-	1,24,068.89		1,24,068.89	124068.89
Net loss transferred to Capital (Sch-1)		-	(1,53,368.96)		(1,53,368.96)	(153368.96)
Gain: Recovery of loss from SPVs (MTRCL)		-				(412.50)
Less: Transferred to Capital (Sch-1)		-				412.50
TOTAL EXPENDITURE	**20,305.70**	**12,817.91**	**19,645.60**	**33,123.61**	**31,537.38**	**83,057.91**
Profit / (Loss) for the period	(19618.04)	(12181.34)	(19160.14)	(31799.38)	(30712.46)	(80376.83)
Prior Period Items net (Expenses) / Income	(1118.06)	(2216.44)	(969.15)	(3334.50)	(2990.34)	297.61
Transfer of Net Establishment Expenses for the year to Sch-5	**(20,736.10)**	**(14,397.78)**	**(20,129.29)**	**(35,133.88)**	**(33,702.80)**	**(80,079.22)**

NATIONAL HIGHWAYS AUTHORITY OF INDIA
G-5 & 6, Sector-10, Dwarka, New Delhi - 110075

STATEMENT OF ASSETS & LIABILITIES AS AT 30TH SEPTEMBER 2024

(Rs. In lakhs)

Particulars	30/09/2024 Unaudited	31/03/2024 Unaudited
SOURCES OF FUNDS		
Shareholders' Fund		
a) Capital	8,15,42,994.62	7,08,17,757.84
b) Reserves & Surplus	-	
Grants		
a) Capital	16,44,738.38	15,90,738.34
Borrowings		
a) Secured Loans	1,96,70,925.54	1,98,93,104.95
b) Unsecured Loans	1,20,46,144.18	1,36,44,214.71
TOTAL	11,49,04,802.72	10,59,45,815.84
APPLICATION OF FUNDS		
Fixed Assets		
a) Gross Block	45,538.48	44,800.38
b) Less: Assets created out of Grant	758.11	758.11
c) Assets out of Own Fund (a-b)	44,780.37	44,042.27
d) Less: Depreciation	20,190.55	20,295.99
e) Net Block (c-d)	24,589.82	23,746.28
Assets held on behalf of GoI		
a) Completed	4,55,69,285.41	4,47,78,244.69
b) Ongoing and others	6,13,85,307.64	5,59,75,047.20
Total (a+b)	10,69,54,593.05	10,07,53,291.89
Total	10,69,79,182.87	10,07,77,038.17
Investment	8,52,131.45	8,32,990.45
Current Assets, Loans and Advance		
a) Inventories		
b) Deposits, Loans & Advances	55,80,592.35	56,49,123.25
c) Interest accrued but not due on deposits		
d) Interest accrued and due on CALA deposits		
e) Cash & Bank Balance	65,19,536.31	36,33,701.24
sub total	1,21,00,128.66	92,82,824.49
Less: Current Liabilities and Provisions		
a) Liabilities	50,12,519.38	49,32,731.12
b) Reserves & Provisions	14,120.88	14,306.15
sub total	50,26,640.26	49,47,037.27
Net Current Assets	70,73,488.40	43,35,787.22
Misc. Expenditure	-	
(to the extent not written off)		
Profit & Loss Account	-	
(Debit balance if any)		
TOTAL	11,49,04,802.72	10,59,45,815.84

NATIONAL HIGHWAYS AUTHORITY OF INDIA
G-5 & 6, Sector-10, Dwarka, New Delhi - 110075

STATEMENT OF CASH FLOWS FOR THE HALF YEAR ENDED 30th SEPTEMBER, 2024

Rs. in Lakhs

Particulars	30/09/2024 Unaudited	30/09/2023 Unaudited
Cash flow from operating activities:		
Net profit before tax	(31,799.38)	(30,712.46)
Adjustments for:		
Depreciation	5.58	2.84
Profit/Loss on sale of assets	(4.60)	(2.79)
Interest income	(72.61)	(13.45)
Operating profit before working capital changes	**(31,871.01)**	**(30,725.86)**
Adjustments for:		
(Increase)/Decrease in Deposits, Loans & Advances	68,530.90	(2,88,599.80)
Increase/(Decrease) in liabilities	79,788.26	(17,66,843.04)
Increase/(Decrease) in Provision for Gratuity and Leave Encashment	(185.27)	(144.32)
Cash flow before extraordinary item & prior period items	**1,16,262.88**	**(20,86,313.02)**
Loss due to conversion of receivable accrued interest into shares	-	(1,24,068.89)
Prior period items	(3,334.50)	(2,990.34)
Net cash generated from operating activities (A)	**1,12,928.38**	**(22,13,372.25)**
Cash flow from investing activities:		
Inter unit		
Purchase of fixed assets	(856.42)	(865.11)
Realisation from sale of assets	11.90	7.80
(Increase)/Decrease in Assets held on behalf of GoI	(41,34,669.15)	(50,50,496.54)
(Increase)/Decrease in investment	(19,141.00)	3,370.80
Interest Income	1,46,450.13	1,12,826.87
Capital Reserve (Receipts)	(53,533.13)	11,746.22
Net Loss from transfer of shares of various SPVs	-	(29,300.07)
Recovery of loss-Winding up of MTRCL	-	-
Net cash used in investing activities (B)	**(40,61,737.67)**	**(49,52,710.03)**
Cash flow from financing activities:		-
Cess funds received from Govt of India	68,80,000.00	95,25,000.00
Capital additional budgetary receipts	17,82,500.00	21,75,000.00
Proceeds from InvIT Projects	-	0.00
EAP Grant Received & utilised towards Revenue Expenditure	54,000.04	24,000.01
Adjusted Plough back of Toll Remittance,etc	20,62,736.78	14,55,855.10
Repayment of ADB Loan (including exchange fluctuation)	(6,293.71)	(5,621.68)
Proceeds from issue of 54EC Capital Gains Tax-Free Bonds	(2,15,885.70)	(1,85,617.09)
Proceeds / Repayment from issue of Taxable bonds	-	-
Proceeds / Repayment from NSSF Loan & SBI Term Loan	(15,98,070.53)	(77,244.33)
Redemption of Tax Free Secured Redeemable Non-Convertible Bonds (10Yr) 11-12		-
Redemption of Masala Bonds	-	-
Interest and other expenditure on Bond	(21,24,342.53)	(12,40,491.96)
Net cash generated from financing activities (C)	**68,34,644.35**	**1,16,70,880.05**
		-
Net increase/(decrease) in cash and cash equivalents (A+B+C)	**28,85,835.07**	**45,04,797.77**
Opening cash and cash equivalents	36,33,701.24	3,75,705.86
Closing cash and cash equivalents	**65,19,536.31**	**48,80,503.63**
Cash and cash equivalents include:		
Cash and cheques in hand / in transit	5.27	5.07
Balance with banks-Current Account	49,04,898.84	41,19,354.37
Balance with banks-Savings Bank Account	15,63,617.51	7,40,838.27
Balance with banks-Fixed Deposit Account	51,014.69	20,305.92
Balance as per books of account	**65,19,536.31**	**48,80,503.63**

NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED

BALANCE SHEET AS AT 31ST MARCH, 2022

(All amounts in ₹ lakh)

PARTICULARS	NOTE NO.	AS AT 31st March, 2022	AS AT 31st March, 2021
ASSETS			
1) Non - Current Assets:			
(a) Property, Plant and Equipment	3	7.25	-
(b) Intangible assets	4	0.79	-
(c) Financial Assets			
i) Other Financials Asset	5	550.00	-
(d) Deferred tax assets	6	5.67	-
(e) Other Non Current Tax Assets (Net)	7	66.56	-
2) Current Assets:			
(a) Financial Assets			
(i) Cash and Cash Equivalents	8	72.03	1,418.23
(ii) Other than Bank Balances	9	970.00	-
(iii) Other financial assets	10	59.52	-
(b) Other current assets	11	10.57	13.88
Total Assets		**1,742.39**	**1,432.11**
EQUITY AND LIABILITIES			
EQUITY			
(a) Equity Share Capital	12	1,100.00	1,100.00
(b) Other Equity	13	481.15	276.90
LIABILITIES			
1) Non-Current liabilities:			
(a) Financial liabilities			
(i) Provision	14	23.05	-
2) Current Liabilities			
(a) Financial liabilities			
(i) Trade Payables	15		
(a) Total Outstanding, dues of micro and small enterprises		0.23	-
(b) Total outstanding, dues of creditors other than micro and small enterprises		41.78	36.17
(ii) Other financial liabilities	16	63.77	12.98
(b) Other current liabilities	17	31.56	6.06
(c) Provisions	18	0.85	-
Total Equity and Liabilities		**1,742.39**	**1,432.11**

Significant Accounting Policies 1-2
The accompanying notes form an integral part of these financial statements 3-43

This is the Balance Sheet referred to in our report of even date.

For ASC & Associates
Chartered Accountants
Firm Registration no. 011863N

CA Chandmal Khandelwal
Partner
M.No. 037956

Date : 05-07-2022
Place : New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited

Sumeet Krishan Goyal
Director
DIN: 02721580
Place : New Delhi

Mahavir Parsad Sharma
Director
DIN: 03158413
Place : New Delhi

Mathew George
Chief Financial Officer
Place : New Delhi

Gunjan Singh
Company Secretary
Place : New Delhi

NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED

STATEMENT OF PROFIT AND LOSS FOR THE YEAR ENDED 31ST MARCH, 2022

(All amounts in ₹ lakh)

PARTICULARS	NOTE NO.	YEAR ENDED 31-03-2022	YEAR ENDED 31-03-2021
INCOME			
Revenue from Operations	19	1,637.04	-
Other Income	20	28.47	-
Total Income		1,665.51	-
EXPENSES			
Employee Benefits Expense	21	499.91	49.55
Depreciation & Amortization Expense	22	1.12	-
Other Expenses	23	295.93	173.55
Total Expenses		**796.96**	**223.10**
Profit/(Loss) before Exceptional Items and Tax		**868.55**	**(223.10)**
Exceptional Items (net)		-	
Profit / (Loss) before Tax		**868.55**	**(223.10)**
Tax Expenses			
Current Tax	24	169.97	-
Deferred Tax expense/(credit)		(5.67)	
Total Tax		164.30	-
Profit/ (loss) for the period		704.25	(223.10)
Other Comprehensive Income			
Items that will not be reclassified to Profit and Loss		-	-
Items that will be reclassified to Profit and Loss		-	-
		-	-
Total Comprehensive Income for the period		704.25	(223.10)
Earnings per Equity Share (Par Value Rs.10/-each) -			
Basic	25	6.40	(2.03)
Diluted	25	**6.40**	**(2.03)**

Significant Accounting Policies	1-2
The accompanying notes form an integral part of these financial statements.	3-43

This is the Profit and Loss Account referred to in our report of even date.

For ASC & Associates
Chartered Accountants
Firm Registration no. 011863N

CA Chandmal Khandelwal
Partner
M.No. 037956

Date : 05-07-2022
Place : New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited

Suresh Krishan Goyal
Director
DIN: 02721580
Place : New Delhi

Mahavir Parsad Sharma
Director
DIN: 03158413
Place : New Delhi

Mathew George
Chief Financial Officer
Place : New Delhi

Gunjan Singh
Company Secretary
Place : New Delhi

NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED

CASH FLOW STATEMENT FOR THE YEAR ENDED 31ST MARCH, 2022

(All amounts in ₹ lakh)

	PARTICULARS	YEAR ENDED 31-03-2022	YEAR ENDED 31-03-2021
A.	**OPERATING ACTIVITIES**		
	Net Profit/(Loss) Before Tax	868.55	(223.10)
	Adjustments to reconcile profit before tax to net cash flows:		
	Depreciation and Amortization	1.12	-
	Interest earned on Investments	(28.47)	-
	Operating Profit/(Loss) before Working Capital Changes	841.20	(223.10)
	Working Capital Adjustments:		
	Decrease / (Increase) in Trade and Other Receivables	-	-
	Decrease / (Increase) in Inventories	-	-
	Decrease / (Increase) in Financial Assets	(59.52)	-
	Decrease / (Increase) in Non Current/ Current Assets	3.31	(13.88)
	Increase / (Decrease) in Trade & Other Payables	5.85	55.21
	Decrease / (Increase) in Other Financial Liabilities	50.79	-
	Increase / (Decrease) in Provisions	23.90	-
	Decrease / (Increase) in Other Current Liabilities	25.50	-
		891.03	**(181.77)**
	Income Tax paid	(236.54)	-
	Net Cash Flows from/(used in) Operating Activities	**654.49**	**(181.77)**
B.	**INVESTING ACTIVITIES**		
	(Purchase)/ Sale of Property, Plant & Equipment	(9.16)	-
	Investment in FDRs	(1,498.34)	-
	Interest Received	6.81	-
	Net cash flows from/ (used in) Investing activities	**(1,500.69)**	-
C.	**FINANCING ACTIVITIES**		
	Proceeds from issue of shares (including Share Premium)*	-	1,100.00
	Proceeds from long term Borrowings	-	500.00
	Repayment of long term Borrowings	(500.00)	-
	Net cash flows from (used in) Financing activities	**(500.00)**	**1,600.00**
	Net Increase/Decrease in Cash and Cash equivalents (A+B+C)	(1,346.20)	1,418.23
	Cash and cash equivalents at the beginning of the year	1,418.23	-
	Cash and cash equivalents at the end of the year	**72.03**	**1,418.23**

The accompanying notes form an integral part of these financial statements.

This is the Cash Flow Statement referred to in our report of even date.

For ASC & Associates
Chartered Accountants
Firm Registration no. 011863N

CA Chandmal Khandelwal
Partner
M.No. 037956

Date : 05-07-2022
Place : New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited

Suresh Krishan Goyal
Director
DIN: 02721580
Place : New Delhi

Mahavir Parsad Sharma
Director
DIN: 03158413
Place : New Delhi

Mathew George
Chief Financial Officer
Place : New Delhi

Gunjan Singh
Company Secretary
Place : New Delhi

NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED

CIN - U65929DL2020GOI366835

BALANCE SHEET AS AT MARCH 31, 2023

(All amounts in ₹ lakh, unless otherwise stated)

Particulars	Note No	As at March 31, 2023	As at March 31, 2022
ASSETS			
1) Non - Current Assets:			
(a) Property, Plant and Equipment	3	9.34	7.25
(b) Intangible assets	4	0.48	0.79
(c) Financial Assets			
i) Other financials asset	5	-	550.00
(d) Deferred tax assets (net)	6	14.40	5.67
(e) Other non-current tax assets (net)	7	99.19	66.56
Total Non-current assets		123.43	630.26
2) Current Assets:			
(a) Financial Assets			
(i) Cash and cash equivalents	8	577.88	72.03
(ii) Bank balances other than cash and cash equivalents	9	1,118.86	970.00
(iii) Other financial assets	10	46.16	59.52
(b) Other current assets	11	21.24	10.57
Total Current assets		1,764.14	1,112.12
Total Assets		1,887.57	1,742.39
EQUITY AND LIABILITIES			
EQUITY			
(a) Equity Share Capital	12	1,100.00	1,100.00
(b) Other Equity	13	536.05	481.15
Total Equity		1,636.05	1,581.15
LIABILITIES			
1) Non-Current liabilities:			
(a) Financial liabilities			
(i) Provisions	14	57.30	23.05
Total non-current liabilities		57.30	23.05
2) Current Liabilities			
(a) Financial liabilities			
(i) Trade Payables	15		
(a) Total Outstanding, dues of micro and small enterprises		5.24	0.23
(b) Total outstanding, dues of creditors other than micro and small enterprises		58.84	41.78
(ii) Other financial liabilities	16	11.46	63.77
(b) Other current liabilities	17	117.00	31.56
(c) Provisions	18	1.68	0.85
Total current liabilities		194.22	138.19
Total Equity and Liabilities		1,887.57	1,742.39

Significant Accounting Policies 2

The accompanying notes form an integral part of these financial statements. 3-44

This is the Balance Sheet referred to in our report of even date.

For ASC & Associates
Chartered Accountants
Firm Registration no. 011863N

Suraj Prasad Sharma
Partner
M.No. 096806

Date : 11.08.2023
Place : New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited

Suresh Krishan Goyal
Director
DIN: 02721580
Place : New Delhi

Mahavir Parsad Sharma
Director
DIN: 03158413
Place : New Delhi

Mathew George
Chief Financial Officer
Place : New Delhi

Gunjan Singh
Company Secretary
Place : New Delhi

NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED

CIN - U65929DL2020GOI366835

STATEMENT OF PROFIT AND LOSS FOR THE YEAR ENDED MARCH 31, 2023

(All amounts in ₹ lakh, unless otherwise stated)

Particulars	Note No	For the Year Ended March 31,2023	For the Year Ended March 31,2022
INCOME			
Revenue from Operations	19	1,263.70	1,637.04
Other Income	20	236.27	28.47
Total Income		**1,499.97**	**1,665.51**
EXPENSES			
Employee Benefits Expense	21	818.01	499.91
Depreciation & Amortization Expense	22	4.15	1.12
Other Expenses	23	529.31	295.93
Total Expenses		**1,351.46**	**796.96**
Profit before Tax		**148.51**	**868.55**
Tax Expenses			
Current Tax			
-Current year	24	43.47	169.97
-Earlier years		58.43	-
Deferred Tax credit		(8.73)	(5.67)
Total Tax		**93.17**	**164.30**
Profit for the year		**55.34**	**704.25**
Other Comprehensive Income			
A (i) Items that will not be reclassified to Profit and Loss			
'- Remeasurement of the defined benefit plans		(0.43)	-
'- Income tax relating to item that will not be reclassified to profit or loss		-	-
B (i) Items that will be reclassified to Profit and Loss		-	-
(ii) Income tax relating to items that will not be reclassified to profit or loss		-	-
		(0.43)	-
Total Comprehensive Income for the year, Comprising Loss and Other comprehensive loss for the year		**54.90**	**704.25**
Earnings per equity share (Face value of Rs.10/-each)			
Basic	25	0.50	6.40
Diluted	25	**0.50**	**6.40**

Significant Accounting Policies 2

The accompanying notes form an integral part of these financial statements. 3-44

This is the Statement Profit and Loss referred to in our report of even date.

For ASC & Associates
Chartered Accountants
Firm Registration no. 011863N

Suraj Prasad Sharma
Partner
M.No. 096806

Date : 11.08.2023
Place : New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited

Suresh Krishan Goyal
Director
DIN: 02721580
Place : New Delhi

Mahavir Parsad Sharma
Director
DIN: 03158413
Place : New Delhi

Mathew George
Chief Financial Officer
Place : New Delhi

Gunjan Singh
Company Secretary
Place : New Delhi

NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED

CIN - U65929DL2020GOI366835

CASH FLOW STATEMENT FOR THE YEAR ENDED MARCH 31, 2023

(All amounts in ₹ lakh, unless otherwise stated)

	Particulars	For the Year Ended March 31,2023	For the Year Ended March 31,2022
A.	**OPERATING ACTIVITIES**		
	Net Profit Before Tax	148.51	868.55
	Adjustments to reconcile profit before tax to net cash flows:		
	Depreciation and Amortization Expenses	4.15	1.12
	Interest earned on Investments	(76.88)	(28.47)
	Operating Profit before Working Capital Changes	**75.78**	**841.20**
	Working Capital Adjustments:		
	Decrease / (Increase) in Financial Assets	35.50	(37.86)
	Decrease / (Increase) in Non Current/ Current Assets	(10.67)	3.31
	Increase / (Decrease) in Trade & Other Payables	22.07	5.85
	Decrease / (Increase) in Other Financial Liabilities	(52.31)	50.79
	Increase / (Decrease) in Provisions	34.65	23.90
	Decrease / (Increase) in Other Current Liabilities	85.44	25.50
		190.45	**912.69**
	Income Tax paid	(134.54)	(236.54)
	Net Cash Flows from/(used in) Operating Activities	**55.92**	**676.15**
B.	**INVESTING ACTIVITIES**		
	Purchase of Property, Plant & Equipment	(5.94)	(9.16)
	Investment in FDRs	(618.86)	(1,520.00)
	Proceeds from FDR	1,020.00	-
	Interest Received	54.74	6.81
	Net cash flows from/ (used in) Investing activities	**449.94**	**(1,522.35)**
C.	**FINANCING ACTIVITIES**		
	Repayment of long term Borrowings	-	(500.00)
	Net cash flows (used in) Financing activities	-	**(500.00)**
	Net Increase/Decrease in Cash and Cash equivalents (A+B+C)	505.85	(1,346.20)
	Cash and cash equivalents at the beginning of the year	72.03	1,418.23
	Cash and cash equivalents at the end of the year (refer note 8)	**577.88**	**72.03**

The above statement of cash flows has been prepared under 'Indirect Method' as set out IND AS 7, 'Statement of Cash Flows'.
The accompanying notes form an integral part of these financial statements.

This is the Cash Flow Statement referred to in our report of even date.

For ASC & Associates
Chartered Accountants
Firm Registration no. 011863N

Suraj Prasad Sharma
Partner
M.No. 096806

Date : 11.08.2023
Place : New Delhi

For and on behalf of the National Highways Infra Investment Managers Private Limited

Suresh Krishan Goyal
Director
DIN: 02721580
Place : New Delhi

Mahavir Parsad Sharma
Director
DIN: 03158413
Place : New Delhi

Mathew George
Chief Financial Officer
Place : New Delhi

Gurjar Singh
Company Secretary
Place : New Delhi

NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED
CIN - U65929DL2020GOI366835
BALANCE SHEET AS AT MARCH 31, 2024

(All amounts in ₹ lakh, unless otherwise stated)

Particulars	Note No.	As at March 31, 2024	As at March 31, 2023
ASSETS			
1) Non - Current Assets:			
(a) Property, Plant and Equipment	3	60.60	9.34
(b) Capital Work in Progress	4	305.17	-
(c) Intangible assets	5	0.18	0.48
(d) Right of Use Assets	6	780.45	-
(e) Financial Assets			
i) Other financials asset	7	87.86	-
(f) Deferred tax assets (net)	8	40.25	14.40
(g) Non-current tax assets (net)	9	130.77	99.19
Total Non-current assets		**1,405.28**	**123.43**
2) Current Assets:			
(a) Financial Assets			
(i) Cash and cash equivalents	10	184.67	577.88
(ii) Bank balances other than cash and cash equivalents	11	1,287.51	1,118.86
(iii) Other financial assets	12	88.05	46.16
(b) Other current assets	13	75.92	21.24
Total Current assets		**1,636.15**	**1,764.14**
Total Assets		**3,041.43**	**1,887.57**
EQUITY AND LIABILITIES			
EQUITY			
(a) Equity Share Capital	14	1,100.00	1,100.00
(b) Other Equity	15	630.40	536.05
Total Equity		**1,730.40**	**1,636.05**
LIABILITIES			
1) Non-Current liabilities:			
(a) Financial liabilities			
(i) Lease Liabilities	16	725.92	-
(b) Provisions	17	94.82	57.30
Total non-current liabilities		**820.74**	**57.30**
2) Current Liabilities			
(a) Financial liabilities			
(i) Lease Liabilities	18	94.62	-
(ii) Trade Payables	19		
(a) Total Outstanding, dues of micro and small enterprises		28.58	5.24
(b) Total outstanding, dues of creditors other than micro and small enterprises		156.75	58.84
(iii) Other financial liabilities	20	133.20	11.46
(b) Other current liabilities	21	74.79	117.00
(c) Provisions	22	2.35	1.68
Total current liabilities		**490.29**	**194.22**
Total Equity and Liabilities		**3,041.43**	**1,887.57**
Material Accounting Policies	1-2		
The accompanying notes form an integral part of these financial statements.	3-50		

This is the Balance Sheet referred to in our report of even date.

For ASC & Associates
Chartered Accountants
Firm Registration no. 018638N

Vishal Singh
Partner
M.No. 511451

Date :24th July,2024
Place : New Delhi

For and on behalf of the board of directors of
National Highways Infra Investment Managers Private Limited

Sargam Krishan Gupta New Delhi
Director
DIN: 02721580

Lt Parvad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Company Secretary

NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED

CIN - U65929DL2020GOI366835

STATEMENT OF PROFIT AND LOSS FOR THE YEAR ENDED MARCH 31, 2024

(All amounts in ₹ lakh, unless otherwise stated)

Particulars	Note No	For the Year Ended March 31,2024	For the Year Ended March 31,2023
INCOME			
Revenue from Operations	23	1,800.00	1,263.70
Other Income	24	155.97	236.27
Total Income		**1,955.97**	**1,499.97**
EXPENSES			
Employee Benefits Expense	25	1,123.84	828.72
Depreciation & Amortization Expense	26	107.36	4.15
Finance Cost	27	53.11	-
Other Expenses	28	544.94	518.61
Total Expenses		**1,829.24**	**1,351.47**
Profit before Tax		**126.73**	**148.50**
Tax Expenses			
Current Tax			
-Current year	29	57.14	43.47
-Earlier years		4.17	58.43
Deferred Tax credit		(26.63)	(8.73)
Total Tax		**34.68**	**93.17**
Profit for the year		**92.05**	**55.33**
Other Comprehensive Income			
A (i) Items that will not be reclassified to Profit and Loss			
- Remeasurement of the defined benefit plans		3.08	(0.43)
- Income tax relating to item that will not be reclassified to profit or loss		(0.78)	-
B (i) Items that will be reclassified to Profit and Loss			-
(ii) Income tax relating to items that will not be reclassified to profit or loss		-	-
		2.30	**(0.43)**
Total Comprehensive Income for the year, Comprising Loss and Other comprehensive loss for the year		**94.35**	**54.89**
Earnings per equity share (Face value of Rs.10/-each)			
Basic	30	0.84	0.50
Diluted	30	**0.84**	**0.50**
Material Accounting Policies	1-2		
The accompanying notes form an integral part of these financial statements.	3-50		

This is the Statement Profit and Loss referred to in our report of even date.

For ASC & Associates
Chartered Accountants
Firm Registration No.010611N

Vishal Singh
Partner
M.No. 511451

Date : 24th July.2024
Place : New Delhi

For and on behalf of the board of directors of National Highways Infra Investment Managers Private Limited

Suresh Krishan Goyal
Director
DIN: 02721580

Mahavir Parsad Sharma
Director
DIN: 03158413

Mathew George
Chief Financial Officer

Gunjan Singh
Company Secretary

NATIONAL HIGHWAYS INFRA INVESTMENT MANAGERS PRIVATE LIMITED

CIN - U65929DL2020GOI366835

STATEMENT OF CASH FLOWS FOR THE YEAR ENDED MARCH 31, 2024

(All amounts in ₹ lakh, unless otherwise stated)

	Particulars	For the Year Ended March 31,2024	For the Year Ended March 31,2023
A.	**OPERATING ACTIVITIES**		
	Net Profit Before Tax	126.73	148.50
	Adjustments to reconcile profit before tax to net cash flows:		
	Depreciation and Amortization Expenses	107.36	4.14
	Unwinding interest income on lease security deposit	(2.82)	-
	Unwinding Interest on Lease Liability	53.11	-
	Interest earned on FDR	(112.29)	(76.88)
	Profit on redemtion of mutual funds	(1.78)	
	Operating Profit before Working Capital Changes	**170.31**	**75.76**
	Working Capital Adjustments:		
	Decrease / (Increase) in Financial Assets	(124.50)	35.50
	Decrease / (Increase) in Non Current/ Current Assets	(835.13)	(10.67)
	Increase / (Decrease) in Trade & Other Payables	121.25	22.07
	Decrease / (Increase) in Other Financial Liabilities	972.46	(52.31)
	Increase / (Decrease) in Provisions	41.27	34.65
	Decrease / (Increase) in Other Current Liabilities	(42.22)	85.44
		303.44	**190.44**
	Income Tax paid	(92.89)	(134.54)
	Net Cash Flows from/(used in) Operating Activities	**210.55**	**55.90**
B.	**INVESTING ACTIVITIES**		
	Net (Purchase)/Sales of Property, Plant & Equipment	(463.48)	(5.94)
	Investment in FDRs	(432.93)	(618.86)
	Proceeds from FDR	264.29	1,020.00
	Interest Received	109.87	54.74
	Income on mutual fund	1.78	-
	Net cash flows from/ (used in) Investing activities	**(520.47)**	**449.94**
C.	**FINANCING ACTIVITIES**		
	Payment of Lease Rent	(83.29)	-
	Net cash flows (used in) Financing activities	**(83.29)**	**-**
	Net Increase/Decrease in Cash and Cash equivalents (A+B+C)	(393.21)	505.84
	Cash and cash equivalents at the beginning of the year	577.88	72.04
	Cash and cash equivalents at the end of the year	**184.67**	**577.88**

The above statement of cash flows has been prepared under 'Indirect Method' as set out IND AS 7, 'Statement of Cash Flows'.
The accompanying notes form an integral part of these financial statements.

This is the Cash Flow Statement referred to in our report of even date.

For ASC & Associates
Chartered Accountants
Firm Registration No.:011925N

Vishal Singh
Partner
M.No. 511451

Date : 24th July 2024
Place : New Delhi

For and on behalf of the board of directors of National Highways Infra Investment Managers Private Limited

Suresh Kishan Goyal
Director
DIN: 02721580

Mathew George
Chief Financial Officer

Mahavir Parsad Sharma
Director
DIN: 03158413

Gurjan Singh
Company Secretary