

May 7, 2024

Corporate Relationship Department, BSE Limited Phiroze Jeejeebhoy Towers Dalal Street, Mumbai 400 001	Listing Department, National Stock Exchange of India Limited Exchange Plaza, C-1 Block G Bandra Kurla Complex, Bandra (E), Mumbai 400 051
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Dear Sir / Madam,

Ref.: Scrip Code: 540526, Symbol: IRBINVIT

Sub.: Valuation Report & Toll Revenue and O&M Cost Projection Report for the financial year ended March 31, 2024.

We are enclosing herewith the Valuation Report dated _April 30, 2024, as issued by Valuer, namely Mr. S Sundararaman (IBBI Registration Number - IBBI/RV/06/2018/10238) for the financial year ended March 31, 2024.

We are also enclosing herewith the Toll Revenue and O & M Cost Projection Report issued by M/s. GMD Consultants, Technical Consultant, for each Project SPV.

The Net Asset Value pursuant to Regulation 10 of SEBI (Infrastructure Investment Trusts) Regulations, 2014 based on the Valuation Report issued by the Valuer is as follows:

Statement of Net Assets at Fair Value as at March 31, 2024

Particulars	Amount in Lakhs
A. Assets	14,36,635.09
B. Liabilities	8,65,893.16
C. Net Assets	5,70,741.93
Outstanding units	5,805.00
NAV at Fair Value (Per Unit)	98.32

Further, the Trust has engaged DHC International Private Limited (formerly known as Baker Tilly DHC Business Private Limited) to serve as an independent advisor to provide a review opinion on the Valuation report of the Assets of the Trust prepared by Mr. S Sundararaman. We are enclosing herewith the review opinion by DHC International Private Limited.

You are requested to take note of the same.

Thanking you,

Yours faithfully,

**For IRB Infrastructure Private Limited
(Investment Manager to IRB InvIT Fund)**

**Swapna Vengurlekar
Company Secretary and Compliance Officer**

Encl.: As above

**Prepared for:
IRB InvIT Fund (“the Trust”)**

**IRB Infrastructure Private Limited
 (“the Investment Manager”)**

Valuation as per SEBI (Infrastructure Investment Trusts) Regulations, 2014 as amended

Fair Enterprise Valuation

Valuation Date: 31st March 2024

**Mr. S Sundararaman,
Registered Valuer,
IBBI Registration No - IBBI/RV/06/2018/10238**

S. SUNDARARAMAN

Registered Valuer

Registration No - IBBI/RV/06/2018/10238

RV/SSR/R/2024/31

Date: 30th April 2024

The Board of Directors

IRB Infrastructure Private Limited

3rd Floor, IRB Complex,
Chandivali Farm, Chandivali Village,
Andheri (E), Mumbai - 400 072,
Maharashtra, India.

The Board of Directors

IRB InvIT Fund

(IDBI Trusteeship Services Limited acting on behalf of the Trust)

IRB Complex,
Chandivali Farm, Chandivali Village,
Andheri (E), Mumbai - 400 072,
Maharashtra, India.

Sub: Financial Valuation as per SEBI (Infrastructure Investment Trusts) Regulations, 2014, as amended
("the SEBI InvIT Regulations")

Dear Sir(s)/Madam(s),

I, Mr. S. Sundararaman ("**Registered Valuer**" or "**RV**" or "**I**" or "**My**" or "**Me**") bearing IBBI registration number IBBI/RV/06/2018/10238, have been appointed vide letter dated 13th October, 2023 as an independent valuer, as defined under Regulation 2(zzf) of the SEBI (Infrastructure Investment Trusts) Regulations, 2014, by **IRB Infrastructure Private Limited** ("**the Investment Manager**" or "**IRBIM**"), acting as the investment manager for **IRB InvIT Fund** ("**the Trust**" or "**InvIT**"), and IDBI Trusteeship Services Limited ("**the Trustee**") acting as the trustee for the Trust, for the purpose of the financial valuation of the special purpose vehicles (defined hereinafter below) as per the requirements of the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014, as amended ("**SEBI InvIT Regulations**").

The Trust operates and maintains following special purpose vehicles (together referred to as "**SPVs**"):

Sr. No.	Name of the SPV	Abbreviation	Asset Type
1	MVR Infrastructure & Tollways Limited	MVR	Toll
2	IRB Pathankot Amritsar Toll Road Limited	IRBPA	Toll
3	IRB Talegaon Amravati Tollway Limited	IRBTA	Toll
4	IRB Tumkur Chitradurga Tollway Limited	IRBTC	Toll
5	IRB Jaipur Deoli Tollway Limited	IRBJD	Toll
6	VK1 Expressway Limited	VEL	HAM

The SPVs were acquired by the Trust and are to be valued as per Regulation 21(4) contained in the Chapter V of the SEBI InvIT Regulations.

I have relied on explanations and information provided by the Investment Manager. Although, I have reviewed such data for consistency, those are not independently investigated or otherwise verified. My team and I have no present or planned future interest in the Trust, the SPVs or the Investment Manager except to the extent of this appointment as an independent valuer and the fee for this Valuation Report ("**Report**") which is not contingent upon the values reported herein. The valuation analysis should not be construed as investment advice, specifically, I do not express any opinion on the suitability or otherwise of entering into any financial or other transaction with the Trust.

I am enclosing the Report providing opinion on the fair enterprise value of the SPVs on a going concern basis as at 31st March 2024 ("**Valuation Date**"). Enterprise Value ("**EV**") is described as the total value of the equity in a business plus the value of its debt and debt related liabilities, minus any cash or cash equivalents to meet those liabilities. The attached Report details the valuation methodologies used, calculations performed and the conclusion reached with respect to this valuation.

S. SUNDARARAMAN

Registered Valuer

Registration No - IBBI/RV/06/2018/10238

The analysis must be considered as a whole. Selecting portions of any analysis or the factors that are considered in this Report, without considering all factors and analysis together could create a misleading view of the process underlying the valuation conclusions. The preparation of a valuation is a complex process and is not necessarily susceptible to partial analysis or summary description. Any attempt to do so could lead to undue emphasis on any particular factor or analysis.

The information provided to me by the Investment Manager in relation to the SPVs included but not limited to historical financial statements, forecasts/projections, other statements and assumptions about future matters like forward-looking financial information prepared by the Investment Manager. The forecasts and projections as supplied to me are based upon assumptions about events and circumstances which are yet to occur.

By nature, valuation is based on estimates and it includes the risks and uncertainties relating to the events occurring in the future. Accordingly, the actual figures in future may differ from these estimates and may have a significant impact on the valuation of the SPVs.

I have not tested individual assumptions or attempted to substantiate the veracity or integrity of such assumptions in relation to the forward-looking financial information, however, I have made sufficient enquiry to satisfy myself that such information has been prepared on a reasonable basis.

Notwithstanding anything above, I cannot provide any assurance that the forward looking financial information will be representative of the results which will actually be achieved during the cash flow forecast period.

The valuation provided by RV and the valuation conclusion are included herein and the Report complies with the SEBI InvIT Regulations and guidelines, circular or notification issued by the Securities and Exchange Board of India ("SEBI") thereunder.

Please note that all comments in the Report must be read in conjunction with the caveats to the Report, which are contained in Section 10 of this Report. This letter, the Report and the summary of valuation included herein can be provided to 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.

RV draws your attention to the limitation of liability clauses in Section 10 of this Report.

This letter should be read in conjunction with the attached Report.

Yours faithfully,

SWAMINATHA Digitally signed by
N SWAMINATHAN
SUNDARARAMAN
SUNDARARA Date: 2024.04.30
MAN 14:45:17 +05'30'

S. Sundararaman

Registered Valuer

IBBI Registration No.: IBBI/RV/06/2018/10238

Asset Class: Securities or Financial Assets

Place: Chennai

UDIN: 24028423BKGAAAL2075

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Definition, abbreviation & glossary of terms

Abbreviations	Meaning
BOT	Build, Operate and Transfer
Capex	Capital Expenditure
CCIL	Clearing Corporation of India Limited
COD	Commercial Operation Date
DCF	Discounted Cash Flow
HAM	Hybrid Annuity Model
DBFOT	Design, Build, Finance, Operate and Transfer
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortization
ETC	Electronic Toll Collection
EV	Enterprise Value
FCFF	Free Cash Flow to the Firm
FDI	Foreign Direct Investment
FY / Financial Year	Financial Year Ended 31 st March
GQ	Golden Quadrilateral
Ind AS	Indian Accounting Standards
INR	Indian Rupee
IRB	IRB Infrastructure Developers Limited
IRBIM	IRB Infrastructure Private Limited
IRBJD	IRB Jaipur Deoli Tollway Limited
IRBPA	IRB Pathankot Amritsar Toll Road Limited
IRBTA	IRB Talegaon Amravati Tollway Limited
IRBTC	IRB Tumkur Chitradurga Tollway Limited
IVS	ICAI Valuation Standards 2018
Kms	Kilometres
MORTH	Ministry of Road Transport and Highways
Mn	Million
MVR	MVR Infrastructure & Tollways Limited
NAV	Net Asset Value Method
NCA	Net Current Assets Excluding Cash and Bank Balances
NHAI	National Highways Authority of India
NHDP	National Highways Development Project
NS-EW	North- South and East-West Corridors
O&M	Operation & Maintenance
PPP	Public Private Partnership
RFID	Radio Frequency Identification
RV	Registered Valuer
SEBI	Securities and Exchange Board of India
SEBI InvIT Regulations	SEBI (Infrastructure Investment Trusts) Regulations, 2014, as amended
the SPV	Special Purpose Vehicle
the Trust or InvIT	IRB InvIT Fund
VEL	VK1 Expressway Limited

1. Executive Summary

1.1. Background

The Infrastructure Investment Trust

- 1.1.1. IRB InvIT Fund (“the **Trust**” or “**InvIT**”) is constituted by “The Indenture of Trust” dated 16th October 2015, registered under the Registration Act, 1908 and is registered as an Indian infrastructure investment trust with the Securities and Exchange Board of India (“**SEBI**”) pursuant to the SEBI (Infrastructure Investment Trusts) Regulations, 2014, as amended (“the **SEBI InvIT Regulations**”).
- 1.1.2. The InvIT has been mainly formed to invest in infrastructure assets primarily being in the road sector in India. All of the Fund’s road projects are implemented and held through special purpose vehicles. The InvIT is currently involved in owning, operating and maintaining a portfolio of five toll road assets and one HAM in the Indian states of Maharashtra, Punjab, Karnataka, Tamil Nadu, Rajasthan and Gujarat pursuant to the concessions granted by the National Highways Authority of India (“**NHAI**”). The units issued by the Trust are listed on the National Stock Exchange of India Limited and Bombay Stock Exchange Limited since 18th May 2017.
- 1.1.3. Unitholding of the Trust as on 31st March 2024 is as under:

Sr. No.	Particulars	No. of Units	%
1	Sponsor & Sponsor Group	10,75,15,000	18.5
2	Mutual Funds	3,21,07,089	5.5
3	Financial Institutions or Banks	22,00,000	0.4
4	Insurance Companies	1,24,50,000	2.1
5	Provident or pension funds	7,12,964	0.1
6	Foreign Portfolio Investors	14,81,24,571	25.5
7	Non-institutional investors	27,73,90,376	47.8
	Total	58,05,00,000	100.0

Source: Investment Manager

The Sponsor

- 1.1.4. IRB Infrastructure Developers Limited (“**IRB**” or “the **Sponsor**”) is a listed infrastructure development company, undertaking development of various infrastructure projects via the Public Private Partnership (“**PPP**”) model in the toll road sector. It is one of the largest private roads and highways infrastructure developers in India. The equity shares of IRB are listed on the National Stock Exchange of India Limited and Bombay Stock Exchange Limited since 25th February 2008.
- 1.1.5. Shareholding of the Sponsor as on 31st March 2024 is as under:

Sr. No.	Particulars	No. of Shares	%
1	Promoter & Promoter Group	2,07,70,55,980	34.3
2	Mutual Funds	22,48,35,420	3.7
3	Financial Institutions or Banks	1,07,703	0.0
4	Insurance Companies	24,51,71,652	4.0
5	NBFC Registered with RBI	6,09,751	0.0
6	Foreign Portfolio Investors	2,85,13,84,877	47.2
7	Central Government/ State Government(s)/ President of India	3,25,460	0.0
8	Non-institutional investors	63,95,09,157	10.5
	Total	6,03,90,00,000	100.0

Source: Investment Manager

Investment Manager

- 1.1.6. IRB Infrastructure Private Limited (“the **Investment Manager**” or “**IRBIM**”) is a wholly-owned subsidiary of the Sponsor. The Investment Manager has approximately 19 years of experience in operating road Build Operate Transfer (“**BOT**”) projects and is also experienced in developing, operating and maintaining toll plazas in the infrastructure sector.

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1.1.7. Shareholding of the Investment Manager as on 31st March 2024 is as under:

Sr. No.	Particulars	%
1	IRB Infrastructure Developers Limited	100.0%

Source: Investment Manager

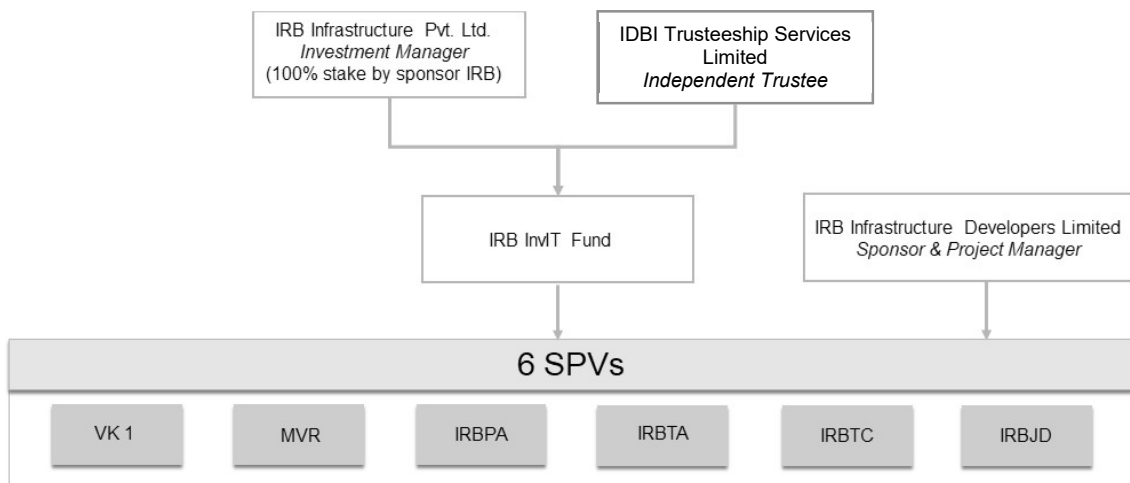
1.1.8. **Financial Assets to be Valued**

Enterprise Value ("EV") is described as the total value of the equity in a business plus the value of its debt and debt related liabilities, minus any cash or cash equivalents to meet those liabilities. The financial assets under consideration are valued at Enterprise Value.

Sr. No.	Name of the SPV
1	MVR Infrastructure & Tollways Limited ("MVR")
2	IRB Pathankot Amritsar Toll Road Limited ("IRBPA")
3	IRB Talegaon Amravati Tollway Limited ("IRBTA")
4	IRB Tumkur Chitradurga Tollway Limited ("IRBTC")
5	IRB Jaipur Deoli Tollway Limited ("IRBJD")
6	VK1 Expressway Limited ("VEL")

(together referred to as "the SPVs")

Structure of the Trust as at 31st March 2024:



1.2. **Purpose and Scope of Valuation**

Purpose of Valuation

1.2.1. As per Regulation 21(4) of Chapter V of the SEBI InvIT Regulations,

"A full valuation shall be conducted by the valuer not less than once in every financial year: Provided that such full valuation shall be conducted at the end of the financial year ending March 31st within two months from the date of end of such year."

In this regard, the Investment Manager intends to undertake the fair enterprise valuation of the SPVs as on 31st March 2024.

1.2.2. In this regard, the Investment Manager have appointed Mr. S. Sundararaman ("**Registered Valuer**" or "**RV**" or "**I**" or "**My**" or "**Me**") bearing IBBI registration number IBBI/RV/06/2018/10238 to undertake the fair valuation at the enterprise level of the SPVs as per the SEBI InvIT Regulations as at 31st March 2024. Enterprise Value ("**EV**") is described as the total value of the equity in a business plus the value of its debt and debt related liabilities, minus any cash or cash equivalents to meet those liabilities.

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- 1.2.3. Registered Valuer declares that:
- i. The RV is competent to undertake financial valuation in terms of SEBI InvIT Regulations;
 - ii. The RV is independent and has prepared the Report on a fair and unbiased basis;
 - iii. RV has valued the SPVs based on the valuation standards as specified / applicable as per the SEBI InvIT Regulations.
- 1.2.4. This Report covers all the disclosures required as per the SEBI InvIT Regulations and the valuation of the SPVs is impartial, true and fair and in compliance with the SEBI InvIT Regulations.

Scope of Valuation

1.2.5. **Nature of the Asset to be Valued**

The RV has been mandated by the Investment Manager to arrive at the Enterprise Value (“EV”) of the SPVs. Enterprise Value is described as the total value of the equity in a business plus the value of its debt and debt related liabilities, minus any cash or cash equivalents to meet those liabilities.

1.2.6. **Valuation Base**

Valuation Base means the indication of the type of value being used in an engagement. In the present case, RV has determined the fair value of the SPVs at the enterprise level. Fair Value Bases defined as under:

Fair Value

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 valuation date. Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction in the principal (or most advantageous) market at the measurement date under current market conditions (i.e. an exit price) regardless of whether that price is directly observable or estimated using another valuation technique. Fair value or Market value is usually synonymous to each other except in certain circumstances where characteristics of an asset translate into a special asset value for the party(ies) involved.

1.2.7. **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 due to changes in the condition of the asset to be valued. Accordingly, valuation of an asset as at a particular date can be different from other date(s).

The Valuation Date considered for the fair enterprise valuation of the SPVs is 31st March 2024 (“**Valuation Date**”). The attached Report is drawn up by reference to accounting and financial information as on 31st March 2024. The RV is not aware of any other events having occurred since 31st March 2024 till date of this Report which he deems to be significant for his valuation analysis.

1.2.8. **Premise of Value**

Premise of Value refers to the conditions and circumstances how an asset is deployed. In the present case, RV has determined the fair enterprise value of the SPVs on a Going Concern Value defined as under:

Going Concern Value

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 work force, an operational plant, necessary licenses, systems, and procedures in place etc.

- 1.2.9. For the amount pertaining to the operating working capital, the Investment Manager has acknowledged to consider the provisional financial statements as on 31st March 2024 to carry out the valuation of the SPVs.

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1.3. Summary of Valuation

I have assessed the fair enterprise value of each of the SPVs on a stand-alone basis by using the discounted cash flow method under the income approach. Following table summarizes my explanation on the usage or non usage of different valuation methods:

Valuation Approach	Valuation Methodology	Used	Explanation
Cost Approach	Net Asset Value	No	NAV does not capture the future earning potential of the business. Hence, NAV method has been considered for background reference only.
Income Approach	Discounted Cash Flow	Yes	The revenue of the projects are defined for a certain period of years as provided by M/s GMD Consultants in its Toll Revenue and O&M Cost Projection Report. As all the SPVs under considerations have executed projects under the BOT model, the ownership of the underlying assets shall be transferred after the expiry of the concession period. In case of all the SPVs, the total concession period is between 14 years to ~32 years. Hence, the growth potential of the SPVs and the true worth of its business would be reflected in its future earnings potential and therefore, DCF Method under the income approach has been considered as an appropriate method for the present valuation exercise.
Market Approach	Market Price	No	The equity shares of the SPVs are not listed on any recognized stock exchange in India. Hence, I was unable to apply the market price method.
	Comparable Companies	No	In the absence of any exactly comparable listed companies with characteristics and parameters similar to that of the SPVs, I am unable to consider this method for the current valuation.
	Comparable Transactions	No	In the absence of adequate details about the Comparable Transactions, I was unable to apply the CTM method.

Under the Discounted Cash Flow (DCF) Method, the Free Cash Flow to Firm (FCFF) has been used for the purpose of valuation of each of the SPVs. In order to arrive at the fair EV of the individual SPVs under the DCF Method, I have relied on provisional financial statements as at 31st March 2024 prepared in accordance with the Indian Accounting Standards (Ind AS) and the financial projections of the respective SPVs prepared by the Investment Manager as at the Valuation Date based on their best judgement.

The discount rate considered for the respective SPVs for the purpose of this valuation exercise is based on the Weighted Average Cost of Capital for each of the SPVs. As all the SPVs under considerations have executed projects under the BOT model, the ownership of the underlying assets shall be transferred after the expiry of the concession period. At the end of the agreed concession period, the ownership of the road, the obligation to maintain the road and the right to collect tolls from the vehicles using the road revert to the government entity that granted the concession by the SPVs. Accordingly, terminal period value i.e. value on account of cash flows to be generated even after the expiry of concession period has not been considered.

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Based on the methodology and assumptions discussed further, RV has arrived at the Fair Enterprise Value of the SPVs as on the Valuation Date

Sr. No.	SPVs	Projection Period (Balance Concession Period)	WACC	Fair EV (INR Mn)
1	MVR	~ 2 Years 9 Months	9.90%	2,950
2	IRBPA	~ 13 Years 9 Months	11.31%	15,895
3	IRBTA	~ 13 Years 2 Months	10.90%	7,905
4	IRBTC	~ 18 Years 9 Months	10.77%	20,781
5	IRBJD	~ 16 Years 7 Months	10.79%	19,492
6	VEL	~ 13 Years 0 Months	7.82%	12,667
Total				79,690

(Refer Appendix 1 & 2 for the detailed workings)

Further to above considering that present valuation exercise is based on the future financial performance and based on opinions on the future credit risk, cost of debt assumptions, etc., which represent reasonable expectations at a particular point of time, but such information, estimates or opinions are not offered as predictions or as assurances that a particular level of income or profit will be achieved, a particular event will occur or that a particular level of income or profit will be achieved, a particular event will occur or that a particular price will be offered or accepted. Actual results achieved during the period covered by the prospective financial analysis will vary from these estimates and variations may be material.

Accordingly, a quantitative sensitivity analysis is considered on the following unobservable inputs:

1. Weighted Average Cost of Capital (WACC) by increasing / decreasing it by 1.0%
2. Revenue by increasing / decreasing it by 10%
3. Expenses by increasing / decreasing it by 20%

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Sensitivity Analysis of Enterprise Value

1. Fair Enterprise Valuation Range based on WACC parameter (1.0%)

INR Mn

Sr. No.	SPVs	WACC +1.0%	EV	Base WACC	EV	WACC -1.0%	EV
1	MVR	10.90%	2,912	9.90%	2,950	8.90%	2,989
2	IRBPA	12.31%	14,967	11.31%	15,895	10.31%	16,910
3	IRBTA	11.90%	7,460	10.90%	7,905	9.90%	8,391
4	IRBTC	11.77%	18,667	10.77%	20,781	9.77%	23,198
5	IRBJD	11.79%	18,141	10.79%	19,492	9.79%	20,997
6	VEPL	8.82%	12,142	7.82%	12,667	6.82%	13,236
Total			74,289		79,690		85,721

2. Fair Enterprise Valuation Range based on Revenue parameter (10%)

INR Mn

Sr. No.	SPVs	EV at Revenue -10%	EV at Base Revenue	EV at Revenue +10.0%
1	MVR	2,644	2,950	3,256
2	IRBPA	14,263	15,895	17,618
3	IRBTA	6,953	7,905	8,858
4	IRBTC	15,320	20,781	26,242
5	IRBJD	17,177	19,492	21,795
6	VEL	11,465	12,667	13,861
Total		67,822	79,690	91,630

3. Fair Enterprise Valuation Range based on Expense parameter (20%)

INR Mn

Sr. No.	SPVs	EV at Expenses +20%	EV at Base Expenses	EV at Expenses -20%
1	MVR	2,885	2,950	3,014
2	IRBPA	15,327	15,895	16,462
3	IRBTA	7,456	7,905	8,354
4	IRBTC	20,340	20,781	21,221
5	IRBJD	18,993	19,492	20,437
6	VEL	12,471	12,667	12,863
Total		77,473	79,690	82,352

The above represents reasonable range of fair enterprise valuation of the SPVs.

2. Procedures adopted for current valuation exercise

- 2.1. I have performed the valuation analysis, to the extent applicable, in accordance with ICAI Valuation Standards 2018 ("IVS") issued by the Institute of Chartered Accountants of India read with SEBI InvIT Regulations.
- 2.2. In connection with this analysis, I have adopted the following procedures to carry out the valuation analysis:
- 2.2.1. Requested and received financial and qualitative information relating to the SPVs;
 - 2.2.2. Obtained and analyzed data available in public domain, as considered relevant by me;
 - 2.2.3. Discussions with the Investment Manager on:
 - Understanding of the business of the SPVs – business and fundamental factors that affect its earning-generating capacity including strengths, weaknesses, opportunities and threats analysis and historical and expected financial performance;
 - 2.2.4. Undertook industry analysis:
 - Research publicly available market data including economic factors and industry trends that may impact the valuation;
 - Analysis of key trends and valuation multiples of comparable companies/comparable transactions, if any, using proprietary databases subscribed by me;
 - 2.2.5. Analysis of other publicly available information;
 - 2.2.6. Selection of valuation approach and valuation methodology/(ies), in accordance with IVS, as considered appropriate and relevant by me;
 - 2.2.7. Determination of fair EV of the SPVs.

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3. Overview of the InvIT and the SPVs

The Trust

- 3.1. The Trust is registered with SEBI pursuant to the SEBI InvIT Regulations. The Trust was established on 16th October 2015 by IRB Infrastructure Developers Limited as the Sponsor.
- 3.2. It is mainly established to invest in infrastructure assets primarily being in the road sector in India. The units of the Trust are listed on the National Stock Exchange Limited and BSE Limited since 18th May 2017.
- 3.3. The InvIT comprises of six operational road projects having length of 3,665 lane Kms with two of the road projects forming part of Golden quadrilateral and one being part of East-West corridor. It has presence across six states in India.

Following is the historical valuation summary of the SPVs of the Trust:

Valuation (INR Mn)	IRBTA	IRBJD	IRBTC	MVR	IRBPA	VEL
Stake held by Trust	100%	100%	100%	100%	100%	100%
Acquisition Value	6,576	14,847	13,290	3,400	14,857	13,254
30-Sep-17	7,415	21,047	14,485	4,121	18,253	NA
31-Mar-18	7,749	19,509	13,690	4,132	16,452	NA
30-Sep-18	8,155	16,271	13,267	4,285	14,350	NA
31-Mar-19	8,664	16,244	14,410	4,334	14,845	NA
30-Sep-19	9,486	15,826	14,912	4,702	14,837	NA
31-Mar-20	8,637	14,187	13,114	4,246	13,723	NA
30-Sep-20	10,385	16,553	15,346	4,681	16,095	NA
31-Mar-21	11,399	18,467	16,462	4,524	17,275	NA
30-Sep-21	11,088	17,989	20,965	4,083	16,340	NA
31-Mar-22	10,279	18,483	21,024	4,151	17,142	NA
30-Sep-22	9961	18,563	21,561	3,847	16,185	NA
31-Mar-23	9,374	18,931	23,636	3,509	16,866	13,750
30-Sep-23	8,407	19,391	21,760	3,266	16,110	13,000

Note: I have conducted valuation from the period 30-Sep-20 onwards.

Following is a map of India showing the area covered by the SPVs of the Trust:



Source: Investment Manager

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Background of the SPVs

3.4. MVR Infrastructure & Tollways Limited (“MVR”)

3.4.1. Summary of details of MVR are as follows:

Parameters	Details
Total Length	275 Lane Kms
Nos. of Lanes	4
NH / SH	NH 7
States Covered	Tamilnadu
Area (Start and End)	Salem – Namakkal
Project Cost	INR 3,076 Mn
PPP Model	BOT
Concession Granted by	NHAI
Appointed Date	14 th August 2006
Tolling Start Date	14 th August 2009
Original Concession Period (CP)	20 years from Appointed Date
Extension (if any)	152 days
Likely End of CP (including extension)	12 th January 2027
Trust's stake	100%

Source: Investment Manager

3.4.2. NH 7 is one of India’s busiest traffic routes, connecting the north and south of India via commercial hubs like Varanasi, Rewa, Jabalpur, Nagpur, Adilabad, Nirmal, Armoor in (Nizamabad), Kamareddy, Hyderabad, Kurnool, Anantapur, Chikkaballapur, Bangalore, Krishnagiri, Salem, Madurai, Tirunelveli and Kanyakumari.

3.4.3. The map below illustrates the location of the Project and the corridor it covers:



Source: Investment Manager

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- 3.4.4. MVR project covers the Omalur and Namakkal section of NH 7 from 180.0 km to 248.6 km. The project has been implemented on a BOT basis by the NHA and is a combination of construction and maintenance packages as given under:
- Maintenance package - From 180 km to 207.5 km
 - Construction & Maintenance Package - From 207.5 km to 248.625 km
- 3.4.5. The project covers the stretch from Omalur to Namakkal and passes through two districts namely Salem and Namakkal. This project has been awarded for a concession period of 20 years starting from 14th August 2006. The project has been commissioned and is currently in the operation / maintenance phase. The project includes 1 Toll Fee Plaza, 8 Vehicular Underpasses, 36 Culverts, 11 pedestrian underpasses, 5 Flyovers & Railways Overbridges, 14 Minor bridges, and 16 Major Intersections. It has 68.625 Km Four-Lane Service Carriageway.
- 3.4.6. Projections provided by the Investment Manager considers an extension of 152 days from original concession end date, due to following:
- 15 days of extension due to floods in Chennai.
 - 24 days of extension due to demonetization.
 - 90 days of extension based on the Government of India notification on Force Majeure Clause (Notification No. F. 18/4/2020-PPD dated 13th May 2020) which got triggered due to suspension in toll operations owing to COVID-19 pandemic.
 - 23 days of extension based on the Government of India notification on Force Majeure Clause (Notification No. COVID-19/RoadMap/JS(H)/2020 dated 26th August, 2021) which got triggered due to suspension in toll operations owing to second wave of COVID-19 pandemic.
- 3.4.7. My team had conducted physical site visit of the road stretch of MVR on 3rd May 2023. Refer below for the pictures of the road stretch:



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3.5. IRB Pathankot Amritsar Toll Road Limited (“IRBPA”)

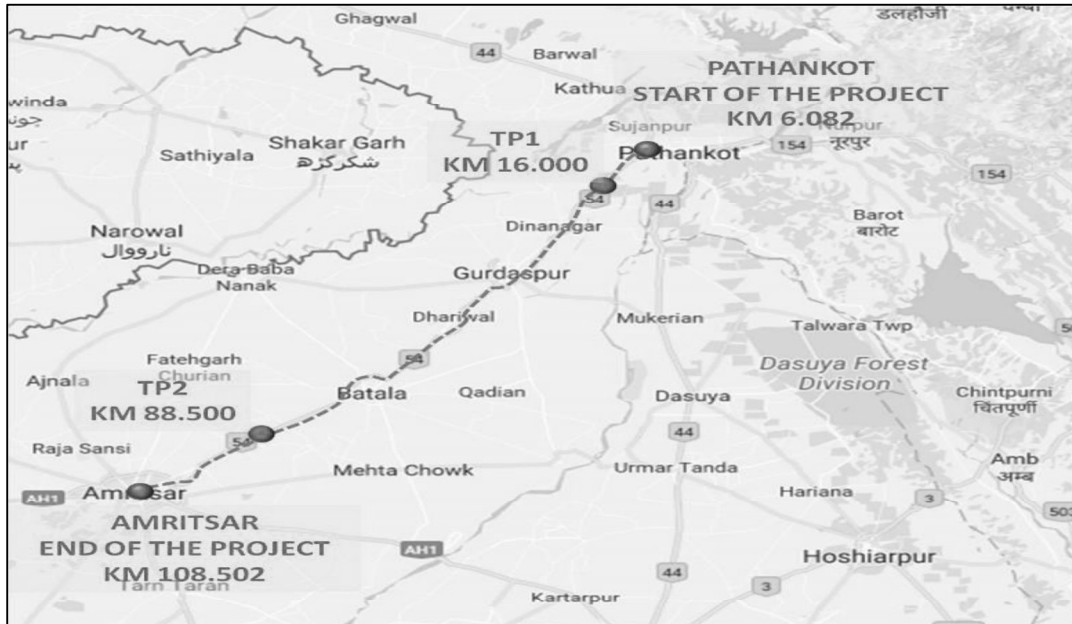
3.5.1. Summary of details of IRBPA are as follows:

Parameters	Details
Total Length	410 Lane Kms
Nos. of Lanes	4
NH / SH	NH 15
States Covered	Punjab
Area (Start and End)	Pathankot – Amritsar
Project Cost	INR 14,453 Mn
PPP Model	DBFOT
Concession Granted by	NHAI
Appointed Date	31 st December 2010
Tolling Start Date	27 th November 2014
Original Concession Period (CP)	20 years from Appointed Date
Extension (if any)	2,559 days
Likely End of CP (including extension)	2 nd January 2038
Trust's stake	100%

Source: Investment Manager

3.5.2. NH 15 is a two to four lane National Highway in India. The NH 15 is one of the major highways of northwestern India, starting at Pathankot in the state of Punjab and traversing through the states of Punjab, Rajasthan and ending at Samakhiali of Gujarat. Important cities and towns, en-route, are Amritsar, Bhatinda, Ganganagar, Bikaner, Jaisalmer and Barmer. In the state of Punjab, NH 15 passes through the districts of Gurudaspur, Amritsar, Firozpur, Faridkot, Moga, Mukatsar and Bhatinda. The Pathankot – Amritsar NH 15 Project is part of the high-density traffic corridor, catering to various types of traffic, including urban, suburban and regional traffic.

3.5.3. The map below illustrates the location of the Project and the corridor it covers:



Source: Investment Manager

3.5.4. IRBPA project covers the Pathankot and Amritsar section of NH 15 from 6.082 km to 108.502 km. The project has been awarded to IRBPA for a concession period of 20 years starting from 31st December 2010 on the basis of grant given by NHAI of INR 1,269.0 Mn.

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- 3.5.5. The project is in the state of Punjab, and passes through the districts of Gurudaspur, Amritsar, Firozpur, Faridkot, Moga, Mukatsar & Bhatinda. The project stretch provides connectivity for traffic from the states of Punjab and Rajasthan to Jammu and Kashmir. The project has been commissioned and is currently in the operation/ maintenance phase.
- 3.5.6. The project includes 2 Toll Fee Plaza, 30 Bus Bays, 317 Culverts, 5 Truck Lay Bys, 14 Vehicular Underpasses, 5 Flyovers, 5 Railways Over bridges, 6 Minor bridges, 4 Major Bridges and 168 Major Intersections. It has 102.420 Km Four-Lane Service Carriageway and 44.180Km.
- 3.5.7. Projections provided by the Investment Manager considers an extension of 2,559 days from original concession end date, due to following:
- 24 days of extension due to demonetization.
 - 1,460 days of extension owing to the target traffic clause as per Concession Agreement and the same has been approved by NHAI vide letter dated 5th March, 2021. (Kindly refer point no 3.5.8)
 - 90 days of extension based on the Government of India notification on Force Majeure Clause (Notification No. F. 18/4/2020-PPD dated 13th May 2020) which got triggered due to suspension in toll operations owing to COVID-19 pandemic.
 - 467 days of extension due to suspension in toll operations owing to Farmer's Protest. (Kindly refer point no 3.5.9)
 - 518 days of extension due to delay in completion of construction of the project on account of the reasons not attributable to IRBPA. (Kindly refer point no 3.5.11)
- 3.5.8. Modification in the Concession Period due to target traffic clause as per Concession Agreement

As per the Clause 29 of the concession agreement between NHAI and IRBPA provided to us by the Investment Manager, if the actual traffic falls short or exceeds target traffic on a defined date, the concession period shall be revised subject to calculation specified therein. The target date and target traffic as provided in the concession agreement along with the projected traffic as on the target date are given below:

Particulars	Unit	Details
Target date as per CA	Date	01-Jan-19
Target traffic as per CA	PCUs	34,498
Actual Average Traffic	PCUs	25,087
Comparison of average traffic at test date with target	%	-27%
Original concession period	years	20.0
Increase in concession period (Max. upto 20%)	%	20%
Change in concession period	days	1,460
Revised concession period	years	24.0
Appointed date	Date	31-Dec-10
Additional days due to Toll Suspension	Days	24
Additional days due to pandemic (First wave)	Days	90
Additional days due to farmers protest	Days	441
Original concession end date	Date	30-Dec-30
Revised concession end date	Date	06-July-36

As informed to us by the Investment Manager, the actual traffic volume has fallen short of the target traffic as on the target date. This warranted for an extension of the concession period by 4 years (1,460 days).

- 3.5.9. Extension due to Farmer's Protest Force Majeure
During the period October 2020 to December 2021 the user Toll collection of IRBPA were forcefully suspended on account of the farmer's civil commotion (agitation) against the farmer reform bill passed by Parliament of India.

The Concessionaire had notified the occurrence of Force Majeure event under Indirect Political Event as per provisions of the Concession Agreement wherein the concessionaire is eligible for extension of time and reimbursement 50% of operation and maintenance expenses and interest expenses.

Further, as per the NHAI Policy Circular No. NHAI/PD/PIU-ASR/11012/2022/1891 dated 27th August 2022 NHAI HQ had conveyed the approval of the Competent Authority for release of Rs. 36.03 Cr. to the Concessionaire towards Force Majeure costs due to Farmer's Agitation as per Cl. 34.7.2 of CA and extension

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of Concession period equal to the period affected by Force Majeure (i.e from 06.10.2020 to 15.12.2021 i.e. 436 days). The approval was accordingly conveyed to the Independent Engineer vide this office letter no. NHA/ PD/PIU-ASR/11012/2022/1851 dated 11th August 2022.

- 3.5.10. We understand from the Investment Manager that the farmers' agitation in Punjab and Haryana which had led to toll suspension of the tolls of IRBPA since October 2020 came to an end after the government decided to repeal the three contentious farm laws in the month of November 2021 and resulted into normalcy in road operations. IRBPA has resumed Toll collection from the month of December 2021.
- 3.5.11. Further toll collection was suspended from 16th December 2022 to 15th January 2023 due to farmers agitation in state of Punjab. In line with earlier claims, the concessionaire has filed claims for extension period for 31 days for complete toll suspension period
- 3.5.12. As per the Arbitration award, IRBPA is eligible for extension in Concession period by 472 days for farmer's protest. I have relied on the information provided by the Investment Manager in this regard.
- 3.5.13. Extension due to delay in completion of construction
IRBPA had initiated arbitration proceedings against National Highways Authority of India ("NHA") before the Hon'ble Arbitration Tribunal for extension of the Concession Period by 518 days for delay in completion of construction of the project on account of the reasons not attributable to IRBPA. Further, in July 2021 the Hon'ble Arbitration Tribunal has announced award in favour of IRBPA. I have been informed by the Investment Manager that the extension to concession period would entirely accrue to the benefit of IRBPA and the Trust.

I have been further informed that the petition filed by NHA challenging the said Arbitral Award has been dismissed by the Hon'ble Delhi High Court in March 2022 and the Arbitral Award has been upheld. Subsequently, the Delhi High Court by its order dated July 03, 2023 set aside the Award and IPATRL filed Special Leave Petition (SLP) in the Supreme Court challenging the Section 37 order of the Delhi High Court. The Supreme Court admitted the SLP and the matter is pending. I have considered extension, and 1% CSRP until NHA approval for same is accorded to the Concessionaire (IRBPA).

- 3.5.14. My team had conducted physical site visit of the road stretch of IRBPA on 15th April 2024. Refer below for the pictures of the road stretch:





3.6. IRB Talegaon Amravati Toll Road Limited (“IRBTA”)

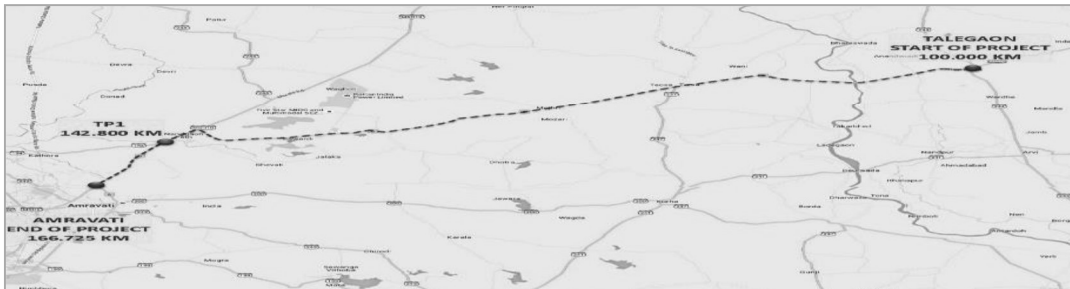
3.6.1. Summary of details of IRBTA are as follows:

Parameters	Details
Total Length	267 Lane Kms
Nos. of Lanes	4
NH / SH	NH 6
States Covered	Maharashtra
Area (Start and End)	Talegaon – Amravati
Project Cost	INR 8,926 Mn
PPP Model	DBFOT
Concession Granted by	NHAI
Appointed Date	3 rd September 2010
Tolling Start Date	24 th April 2013
Original Concession Period (CP)	22 years from Appointed Date
Extension (if any)	1,733 days
Likely End of CP (including extension)	2 nd June 2037
Trust's stake	100%

Source: Investment Manager

3.6.2. NH 6 connects Hazira and Kolkata via Surat, Dhule, Amravati, Nagpur, Raipur, and Sambalpur. It intersects with several other national highways, including NH 3 near Dhule, NH 5 near Jharkoparia, NH 7 near Nagpur and NH 8 near Surat. NH 6 passes through five states, namely Gujarat, Madhya Pradesh, Orissa, Chhattisgarh and West Bengal. The Talegaon–Amravati NH 6 Project caters to various types of traffic such as urban, suburban and regional traffic. IRBTA project covers the Talegaon and Amravati section of NH-6 from 100 km to 166.7 km.

3.6.3. The map below illustrates the location of the Project and the corridor it covers:



Source: Investment Manager

3.6.4. This project has been awarded to IRBTA for a concession period of 22 years starting from 3rd September 2010 on the basis of a grant of INR 2,160 Mn receivable from the NHAI during the construction period. The project includes 66 Entry/Exit Ramps, 38 Bus Bays, 20 pedestrian underpasses, 21 Minor bridges, 3 Major bridges and 36 Major Intersections. It has 114.45 Km Four-Lane Service Carriageway and 4.2 Km long Service road.

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- 3.6.5. The project includes 1 Toll Fee Plaza, 15 Bus Bays, 1 Rail over Bridge, 11 Vehicular Underpasses, 11 pedestrian underpasses, 2 Flyovers, 25 Minor bridges, 1 Major bridge and 36 Major Intersections. It has 66.7 Km Four-Lane Service Carriageway and 26.5 Km long Service Road.
- 3.6.6. The project is in the state of Maharashtra and passes through Amravati district. En-route, it passes few major/minor urban centres, viz. Nandgaon Peth, Mozri, Tivsa, and Ramdara etc. before reaching end of project stretch at Talegaon. The corridor of the project is also known as Amravati — Nagpur Highway. The project has been commissioned and is currently in the operation / maintenance phase.
- 3.6.7. Projections provided by the Investment Manager considers an extension of 1,733 days from original concession end date, due to following:
- 24 days of extension due to demonetization.
 - 1,606 days of extension owing to the target traffic clause as per Concession Agreement and the traffic survey conducted by SPV has been filed with NHAI vide letters dated 2nd April 2021, 14th October, 2020 and 25th September, 2020. NHAI approval for the same is pending as on Report date.
 - 90 days of extension based on the Government of India notification on Force Majeure Clause (Notification No. F. 18/4/2020-PPD dated 13 May 2020) which got triggered due to suspension in toll operations owing to COVID-19 pandemic.
 - 13 days of extension based on the Government of India notification on Force Majeure Clause (Notification No. COVID-19/RoadMap/JS(H)/2020 dated 26th August, 2021) which got triggered due to suspension in toll operations owing to second wave of COVID-19 pandemic.
- 3.6.8. Modification in the Concession Period due to target traffic clause as per Concession Agreement

As per the Clause 29 of the concession agreement between NHAI and IRBTA provided to us by the Investment Manager, if the actual traffic falls short or exceeds target traffic on a defined date, the concession period shall be revised subject to calculation specified therein. The target date and target traffic as provided in the concession agreement along with the projected traffic as on the target date are given below:

Particulars	Unit	Details
Target date as per CA	Date	01-Apr-20
Target traffic as per CA	PCUs	41,052
Actual Average Traffic	PCUs	20,306
Comparison of average traffic at test date with target	%	-51%
Original concession period	Years	22.0
Increase in concession period (Max. upto 20%)	%	20%
Change in concession period	Days	1,606
Revised concession period	Years	26.4
Appointed date	Date	03-Sep-10
Additional days due to Toll Suspension	Days	24
Additional days due to pandemic (First wave)	Days	90
Additional days due to pandemic (Second wave)	Days	13
Original concession end date	Date	02-Sep-32
Revised concession end date	Date	02-Jun-37

As informed to us by the Investment Manager, the actual traffic volume has fallen short of the target traffic as on the target date. This warranted for an extension of the concession period by 4.4 years (1,606 days).

- 3.6.9. My team had conducted virtual site visit of the road stretch of IRBTA to the extent appropriate.

3.7. IRB Tumkur Chitradurga Tollway Limited (“IRBTC”)

- 3.7.1. Summary of details of IRBTC are as follows:

Parameters	Details
Total Length	684 Lane Kms
Nos. of Lanes	6
NH / SH	NH 4
States Covered	Karnataka
Area (Start and End)	Tumkur – Chitradurga
Project Cost	INR 11,420 Mn
PPP Model	DBFOT

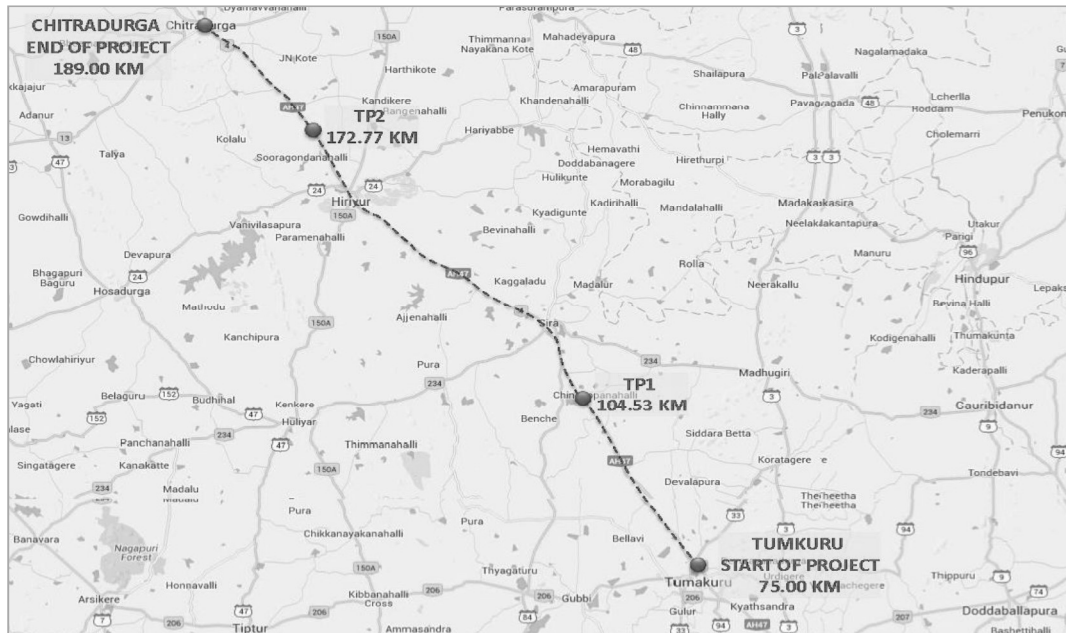
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Concession Granted by	NHAI
Appointed Date	4 th June 2011
Tolling Start Date	4 th June 2011
Original Concession Period (CP)	26 years from Appointed Date
Extension (if any)	2,034 days
Likely End of CP (including extension)	29 th December 2042
Trust's stake	100%

Source: Investment Manager

3.7.2. NH 4 is a four- to six-lane National highway in India. It connects Mumbai and Chennai via Pune, Kolhapur and Belgaum and intersects NH 9 at Pune, NH 4A at Belgaum, NH 63 and NH 218 at Dharwad, NH 13 at Chitradurga, NH 206 at Tumkur, NH 48 and NH 207 at Nelamangala. NH 4 passes through three states, namely, Maharashtra, Karnataka and Tamil Nadu. Between Thane and Chennai, it connects major urban centres and state capitals, such as Thane, Pune, Kolhapur, Belgaum, Dharwad, Hubli, Chitradurga, Tumkur, Bangalore and Chennai. The Tumkur-Chitradurga NH 4 Project caters to various types of traffic, including urban, suburban and regional traffic. IRBTC project covers the Tumkur and Chitradurga section of NH-4 from 75.0 km to 189.0 km.

3.7.3. The map below illustrates the location of the Project and the corridor it covers:



Source: Investment Manager

3.7.4. This project has been awarded for a concession period of 26 years starting from 4th June 2011 on the basis of a premium of INR 1,404.0 Mn payable to the NHAI in the first year of concession period increased annually at 5%. The actual premium payment for the project is agreed upon with the Authority basis Deferred Premium policy.

3.7.5. The project includes 2 Toll Fee Plazas, 66 Entry/ Exit Ramps, 7 Truck Lay Bys, 147 Culverts, 6 Flyovers, 38 Bus Bays, 20 pedestrian underpasses, 21 Minor bridges, 3 Major bridges and 36 Major Intersections. It has 114.45 Km Four-Lane Service Carriageway and 4.2 Km long Service road.

3.7.6. The project is in the state of Karnataka and passes through districts, viz. Tumkur and Chitradurga. En-route, it passes few major/minor urban centres, viz. Tumkur, Sira, Hiriya and Chitradurga. The project has been commissioned and is currently in the operation/ maintenance phase.

3.7.7. Projections provided by the Investment Manager considers an extension of 2,034 days from original concession end date, due to following:

- 24 days of extension due to demonetization.

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- 90 days of extension based on the Government of India notification on Force Majeure Clause (Notification No. F. 18/4/2020-PPD dated 13 May 2020) which got triggered due to suspension in toll operations owing to COVID-19 pandemic.
- 1,899 days of extension owing to the target traffic clause as per Concession Agreement though it has been intimated to NHAI vide letter dated 14th April, 2021, approval for the same is pending as on report date.
- 21 days of extension based on the Government of India notification on Force Majeure Clause (Notification No. COVID-19/RoadMap/JS(H)/2020 dated 26th August, 2021) which got triggered due to suspension in toll operations owing to second wave of COVID-19 pandemic.

3.7.8. Modification in the Concession Period due to target traffic clause as per Concession Agreement

As per the Clause 29 of the concession agreement between NHAI and IRBTC provided to us by the Investment Manager, if the actual traffic falls short or exceeds target traffic on a defined date, the concession period shall be revised subject to calculation specified therein.

The target date and target traffic as provided in the concession agreement along with the projected traffic as on the target date are given below:

Particulars	Unit	Details
Target date as per CA	Date	01-Apr-20
Target traffic as per CA	PCUs	54,558
Actual Average Traffic	PCUs	40,951
Comparison of average traffic at test date with target	%	-25%
Original concession period	Years	26
Increase in concession period	%	20%
Change in concession period	Days	1,899
Revised concession period	Years	31.2
Appointed date	Date	04-Jun-11
Additional days due to Toll Suspension	Days	24
Additional days due to pandemic (First wave)	Days	90
Additional days due to pandemic (Second wave)	Days	21
Original concession end date	Date	03-Jun-37
Revised concession end date	Date	29-Dec-42

As informed to us by the Investment Manager, the actual traffic volume has fallen short of the target traffic as on the target date. This warranted for an extension of the concession period by 5.2 years (1,899 days).

- 3.7.9. My team had conducted physical site visit of the road stretch of IRBTC on 24th April 2023. Refer below for the pictures of the road stretch:



3.8. IRB Jaipur Deoli Tollway Limited (“IRBJD”)

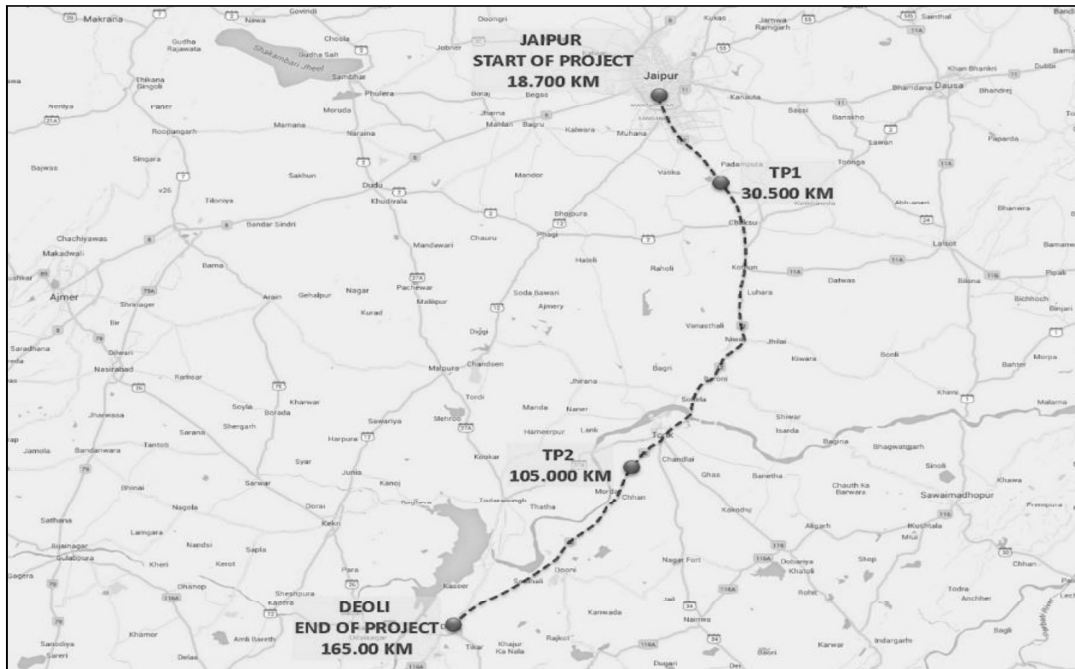
3.8.1. Summary of details of IRBJD are as follows:

Parameters	Details
Total Length	595 Lane Kms
Nos. of Lanes	4
NH / SH	NH 12
States Covered	Rajasthan
Area (Start and End)	Jaipur – Deoli
Project Cost	INR 17,747 Mn
PPP Model	DBFOT
Concession Granted by	NHA
Appointed Date	14 th June 2010
Tolling Start Date	27 th September 2013
Original Concession Period (CP)	25 years from Appointed Date
Extension (if any)	1,957 days
Likely End of CP (including extension)	21 st October 2040
Trust's stake	100%

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Source: Investment Manager

- 3.8.2. NH 12 connects Jaipur and Jabalpur via Tonk, Kota, and Bhopal. It intersects with several other national highways like NH 3 at Biora, NH 7 at Jabalpur, NH 8 at Jaipur, NH 11 at Jaipur, and NH 69 at Bhopal. NH 12 passes through two states via Rajasthan and Madhya Pradesh. IRBJD project covers the Jaipur and Deoli section of NH-12 from km 18.7 to km 165.0. The project is in the state of Rajasthan and passes through districts, viz. Jaipur and Tonk. En-route, it passes few major/minor urban centres, viz. Shivdasapura, Chaksu, Tonk, and Deoli.
- 3.8.3. The map below illustrates the location of the Project and the corridor it covers:



Source: Investment Manager

- 3.8.4. The project includes 2 toll fee plaza, 3 pedestrian underpasses, 11 vehicular underpasses, 5 cattle underpasses, 124 Culverts, 32 Bus Bays, 4 Flyovers, 23 Minor bridges, 1 Major bridges and 25 Major Intersections. It has 148.77Km Four-Lane Service Carriageway and 36.76 Km long Service road.
- 3.8.5. This project has been awarded to IRBJD for a concession period of 25 years starting from 14th June 2010 on the basis of a grant given by NHAI of INR 3,060.0 Mn during the concession period. The project has been commissioned and is currently in the operation / maintenance phase.
- 3.8.6. Projections provided by the Investment Manager considers an extension of 1,957 days from original concession end date, due to following:
- 24 days of extension due to demonetization.
 - 1,826 days of extension owing to the target traffic clause as per Concession Agreement and the same has been approved by NHAI vide letter dated 18th March, 2020.
 - 90 days of extension based on the Government of India notification on Force Majeure Clause (Notification No. F. 18/4/2020-PPD dated 13th May 2020) which got triggered due to suspension in toll operations owing to COVID-19 pandemic.
 - 17 days of extension based on the Government of India notification on Force Majeure Clause (Notification No. COVID-19/RoadMap/JS(H)/2020 dated 26th August, 2021) which got triggered due to suspension in toll operations owing to second wave of COVID-19 pandemic.
- 3.8.7. We understand from the Investment Manager that the ongoing sand mining ban in Rajasthan imposed since the year 2017 has been relaxed by the Supreme Court of India vide order dated 11th November 2021. The

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Investment Manager is of the opinion that the abovementioned order shall positively affect the project route traffic.

3.8.8. Modification in the Concession Period due to target traffic clause as per Concession Agreement

As per the Clause 29 of the concession agreement between NHA and IRBJD provided to us by the Investment Manager, if the actual traffic falls short or exceeds target traffic on a defined date, the concession period shall be revised subject to calculation specified therein. The target date and target traffic as provided in the concession agreement along with the projected traffic as on the target date are given below:

Particulars	Unit	Details
Target date as per CA	Date	01-Oct-18
Target traffic as per CA	PCUs	30,344
Actual Average Traffic	PCUs	16,611
Comparison of average traffic at test date with target	%	-45%
Original concession period	Years	25
Increase in concession period (Max. upto 20%)	%	20%
Change in concession period	Days	1,826
Revised concession period	Years	30
Appointed date	Date	14-Jun-10
Additional days due to Toll Suspension	Days	24
Additional days due to pandemic (First wave)	Days	90
Additional days due to pandemic (Second wave)	Days	17
Original concession end date	Date	13-Jun-35
Revised concession end date	Date	21-Oct-40

As informed to us by the Investment Manager, the actual traffic volume has fallen short of the target traffic as on the target date. This warranted for an extension of the concession period by 5 years (1,826 days).

3.8.9. My team had conducted physical site visit of the road stretch of IRBJD on 22nd April 2024. Refer below for the pictures of the road stretch:



3.9. VK1 Expressway Limited (“VEL” or the “Project” or the “SPV”)

3.9.1 Summary of details of VEL is as follows:

Parameters	Details
Total Length	208.4 lane Kms
Nos. of Lanes	8
NH / SH	NH-8

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State Covered	Gujarat
Area (Start and End)	Padra to Vadodara
Bid Project Cost	INR 20,430 Mn
PPP Model	Hybrid Annuity Mode
Project Type	Annuity
Concession Granted by	NHAI
Actual COD	2 nd April 2022
Nos. of Annuities	30 Annuities over period of 15 years
Concession Period (CP)	730 days + 15 Years

Source: Investment Manager

- 3.9.2 I understand from the Investment Manager that VEL has achieved COD on 2nd April 2022 and the first annuity post COD is due on 29th September 2022, i.e. 180 days after COD. Accordingly the Investment Manager has confirmed to me that VEL is an eligible infrastructure project as per the extant provisions of SEBI InvIT Regulations.
- 3.9.3 The Project alignment runs almost parallel to existing NH 8 on east side and crosses it at one location i.e., Ahmedabad – Vadodara section of NH-8 (at Km 94+900 of NH8) at Km 374+355 near Vadodara. The corridor forms a part of road kilometre 355.00 to kilometre 378.74 of Padra-Vadodara section of Vadodara - Mumbai Expressway.

Sr. No.	Salient Features	Count/ units
1	Total Length of the Project Highway	208.4 Lane Kms
2	Toll Plaza	2 Nos.
3	Bus Bays / Bus Shelters	Nil
4	Truck Lay Bays	Nil
5	Rest Area	Nil
6	Major/ Minor Junction	Nil
7	Rail Over Bridge	2 Nos.
8	Vehicular Underpass	5 Nos.
9	Light Vehicular Underpass	2 Nos.
10	Pedestrian Underpass (PUP/CUP)	11 Nos.
11	Flyover	8 Nos.
12	Major Bridges	3 Nos.
13	Minor Bridges for Main Carriageway	8 Nos.
14	Box/ Slab Culverts	47 Nos.
15	Pipe Culverts	18 Nos.

- 3.9.4 The shareholding of VEL as on the Valuation Date is as follows:

Sr. No.	Particulars	No. of Shares	%
1	IRB InvIT Fund	12,24,99,994	99.99%
2	Others*	6	0.01%
	Total	12,25,00,000	100.00%

*Held by Nominees of IRB Infrastructure Developers Limited

I have been represented by the Investment Manager that there is no change in shareholding pattern from the Valuation Date till the date of this Report.

- 3.9.5 The map below illustrates the location of the Project and the corridor it covers:



Source: Investment Manager

3.9.6 My team had conducted physical site visit of the road stretch of VEL on 6th April 2024. Refer below for pictures of the road stretch of the Project:





4. Overview of the Industry

4.1 Introduction

- 4.1.1 The road infrastructure is an important determinant of economic growth in India and it plays a significant role in the economy's overall development process.
- 4.1.2 Creation and operation of quality road infrastructure continue to be major requirements for enabling overall growth and development of India in a sustained manner.
- 4.1.3 Bridging of existing infrastructure gaps and creating additional facilities to cater to the increasing population are equally important. Apart from providing connectivity in terms of enabling movement of passengers and freight, roads act as force multipliers in the economy.
- 4.1.4 Further, roads play a significant role in times of natural calamities, wars and other such events in terms of timely evacuation of the impacted population, carriage of relief material and other associated movements. Government takes cognisance of this requirement and road infrastructure remains to be a focus area.

4.2 Road Network in India

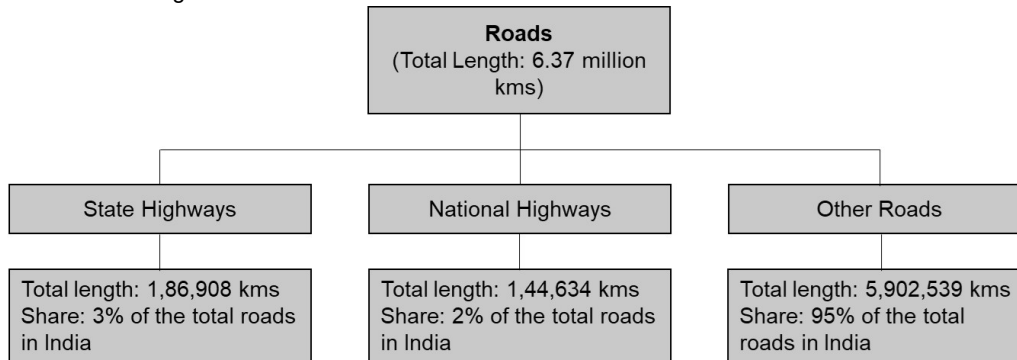
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- 4.2.1 India has the second largest road network in the world, spanning over 6.37 million kms. Over 64.5% of all goods in the country are transported through roads, while 90% of the total passenger traffic uses road network to commute.

Source: IBEF Roads Report, February 2023.

4.3 Government Agencies for Road Development

- 4.3.1 The Ministry of Road Transport & Highway (“**MoRTH**”) is responsible for development of Road Transport and Highways in general and construction & maintenance of National Highways.
- 4.3.2 The National Highways Authority of India (“**NHAI**”) is an autonomous agency of the Government of India, set up in 1988 and is responsible for implementation of National Highways Development Project (“**NHDP**”).
- 4.3.3 The NHDP in the context of NHs is nearing completion in seven phases. Later, the other highway development programmes like Special Accelerated Road Development Programme for Development of Road Network in North Eastern States (SARDP- NE) and National Highways Interconnectivity Improvement Project (NHIP) were also taken up by MoRTH. Further, Bharatmala Pariyojana is ongoing. For majority of the projects under NHDP and Bharatmala Pariyojana, NHAI is the implementation agency. Other NH related programmes/works are being implemented through agencies like National Highways Infrastructure Development Corporation Limited (NHIDCL), State Public Works Departments (PWDs), State Road Development Corporations and the Border Road Organizations.

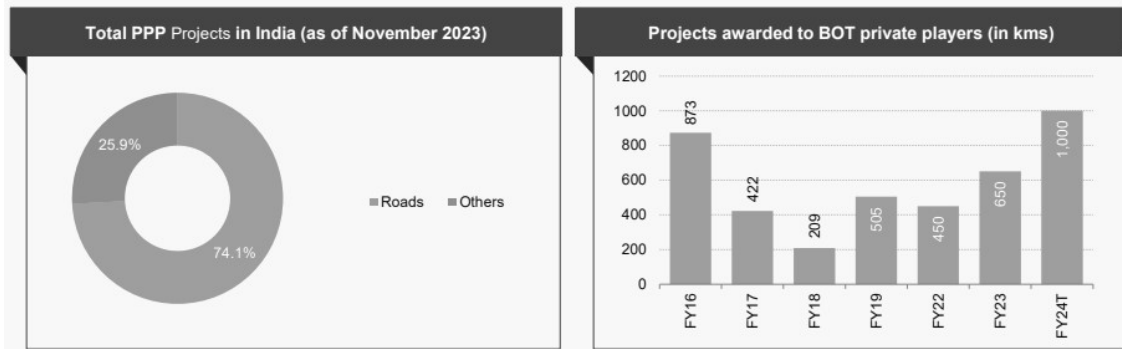


- 4.3.4 In August 2023, the National Highways Authority of India (NHAI) made a big step towards improving the highway user experience, with the introduction of 'Rajmargyatra,' a citizen-centric unified mobile application. This user-friendly app provides travelers with in-depth knowledge of Indian National Highways as well as an effective procedure for filing complaints.
- 4.3.5 In June 2023, National Highways Authority of India (NHAI) introduced a 'Knowledge Sharing' platform for sharing of knowledge and innovative best practices. This effort, which is hosted on the NHAI website, will assist the authority in working with specialists and citizens who want to exchange knowledge and views about subjects including road design, construction, road safety, environmental sustainability, and related sectors. The platform will promote the exchange of best practices from all around the world and work to strengthen the nation's national highway system.
- 4.3.6 NHAI is planning to raise Rs. 40,000 crore (US\$ 5.72billion) to monetise its highway assets through Infrastructure Investment Trust (InvIT).
- 4.3.7 In December 2022, NHAI raised Rs. 10,200 crore (US\$ 1.23 billion) from foreign and Indian institutional investors to meet ever-growing budgetary support. Indian Government and Asian Development Bank signed US\$ 500 million loan agreement to build the longest bridge across river Ganga, in Bihar. The bridge is expected to be ready by December 2021.
- 4.3.8 NHAI is planning to award 1,000-1,500 km of projects under the BOT model in 2023-24. As of November 2023, there were 352 PPP projects worth US\$ 76.95 billion in India.
- 4.3.9 A total of 261 road projects under different Schemes of MoRTH with a total sanctioned cost of Rs. 1,02,594 crore (US\$ 12.33 billion) are under implementation through the National Highways Authority of India (NHAI), National Highways & Infrastructure Development Corporation Ltd. (NHIDCL), and State Public Works

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Departments (PWDs) in the North-Eastern States. The Ministry of Development of the North-Eastern Region, under the erstwhile North-East Road Sector Development Scheme (NERSDS) and the present North-East Special Infrastructure Development Scheme (NESIDS), has sanctioned a total of 77 road projects amounting to Rs. 3,372.58 crore (US\$ 405.5 million).

- 4.3.10 As of November 2023, there were 352 PPP projects worth US\$ 76.95 billion in India.
- 4.3.11 In August 2020, the Government of India revised the Model Concession Agreement for BOT projects to plug delays by imposing a deadline on the NHAI and incentivising timely work by concessionaires. According to revised norms, the NHAI will have to hand over 90% of the project land (vacant and ready to build) to private developers, thus creating a more market-friendly sector and attracting more private players.
- 4.3.12 Roads in the jurisdiction of state governments are under different categories like State Highways (“SHs”) and Major District Roads. They are being developed/ upgraded through State PWDs and State Road Development Corporations. Pradhan Mantri Gramm Sadak Yojana is being implemented for rural roads through the Ministry of Rural Affairs with active participation by state governments. Further, roads within urban areas mostly with PWDs and Urban Local Bodies.
- 4.3.13 State Governments have a significant role to play in developing the SHs, Major District Roads, Other District Roads to ensure the last mile connectivity. States have varying levels of maturity in terms of road infrastructure development due to issues such as inadequate identification and prioritization of projects, funding shortfall, limited institutional capacity to implement projects, etc.



Trend of Road and Highways Construction

- 4.3.14 The length of National Highways awarded has almost doubled in the years FY15 to FY18 compared to FY11 to FY14. NHAI plans to construct 25,000 kilometres of national highways in 2022-23 at a pace of 50 km per day.
- 4.3.15 The current Rate of construction is almost three times that in 2007-08.
- 4.3.16 The launch of Bharatmala Pariyojana in 2017 provided a big fillip to construction activity, with the pace of construction doubling from 12 Km per day in 2014-15 to 30 Km per day in 2022-23, and peaking at 37Km per day in 2020-21.
- 4.3.17 The government aims to take this up to 100 km per day in the next few years.
- 4.3.18 National Highway (NH) network increased by 60% from 91,287 km in 2014 to 1,46,145 km in year 2023
- 4.3.19 Length of 4 lanes and above NH increased by 2.5 times – 18,387 km (2014) to 46,179 km (Nov'23). Length of less than 2 lane NH decreased from 30% (2014) to 10% (Nov'23).
- 4.3.20 Average pace of NH construction increased by 143% to 28.3 km/day from 2014 and expenditure is expected to increase by 9.4 times to Rs 3.17 lakh Crore from 2014.
- 4.3.21 Out of 108 (3700 km) port connectivity road projects, 8 (294 km) are completed, 28 (1808 km) are awarded and DPR under-progress for 72 (1595 km) projects

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- 4.3.22 Under the Union Budget 2023-24, the Government of India has allocated Rs. 270,000 crore (US\$ 33 billion) to the Ministry of Road Transport and Highways.
- 4.3.23 With the Government permitting 100% Foreign Direct Investment (FDI) in the road sector, several foreign companies have formed partnerships with Indian players to capitalise on the sector's growth. Cumulative FDI inflows in construction development stood at US\$ 26.42 billion between April 2000-September 2023.
- 4.3.24 The GST on construction equipment has been reduced to 18% from 28%, which is expected to give a boost to infrastructure development in the country.
- 4.3.25 With the launch of Bharatmala project, 10,000 km of highway construction left under NHDP was merged with Phase I of the Bharatmala project.
- 4.3.26 The Indian construction equipment industry, which aspires to become the world's second-largest by 2030, is believed to have grown by 25% year-on-year in FY23, surpassing 100,000-unit sales for the second year in a row.
- 4.3.27 In FY23, a total of 107,779 units of construction equipment were sold, registering an increase of 26%.
- 4.3.28 The NHDP is a program to upgrade, rehabilitate and widen major highways in India to a higher standard. The project was started in 1998 to be implemented in 7 phases.
- 4.3.29 With the launch of Bharatmala project, 10,000 km of highway construction left under NHDP was merged with Phase I of the Bharatmala project.
- 4.3.30 The Indian government launched Gati Shakti-National Master Plan, which has consolidated a list of 81 high impact projects, out of which road infrastructure projects were the top priority. The major highway projects include the Delhi-Mumbai expressway (1,350 kilometres), Amritsar-Jamnagar expressway (1,257 kilometres) and Saharanpur-Dehradun expressway (210 kilometres).
- 4.3.31 The main aim of this program is a faster approval process which can be done through the Gati shakti portal and digitized the approval process completely.
- 4.3.32 In December 2021, the government set a highway monetization target of Rs. 2 trillion (US\$ 26.20 billion) for the next 3 years.
- 4.3.33 The Ministry of Road Transport and Highways awarded road projects with a total length of 12,731 kms in FY22 as against 10,964 km in FY 21.
- 4.3.34 In FY 22, 10,457 kms of highways have been constructed against 13,298 kms of highway constructed in FY 21 across India.
- 4.3.35 The Government of India has allocated Rs. 111 lakh crore (US\$ 13.14 billion) under the National Infrastructure Pipeline for FY 2019-25. The Roads sector is expected to account for 18% capital expenditure over FY 2019-25.
- 4.3.36 NHAI is planning to raise Rs. 40,000 crore (US\$ 5.72 billion) to monetise its highway assets through Infrastructure Investment Trust (InvIT). The InvIT of NHAI, National Highways Infra Trust, has raised more than Rs 10,200 crore from foreign and Indian institutional investors till December 2022.

Implementation of important projects and expressways:

4.3.37 Char Dham Vikas Mahamarg Pariyojna:

This project envisages development of easy access to the four dhams in India – Gangotri, Yamunotri, Kedarnath and Badrinath. Development of this route of 889 km route is expected at an estimated cost of INR 12,000 Crores.

4.3.38 Bharatmala Pariyojana:

Bharatmala Pariyojana is a new umbrella program for the highways sector that focuses on optimizing efficiency of freight and passenger movement across the country by bridging critical infrastructure gaps through effective interventions like development of Economic Corridors, Inter Corridors and Feeder Routes, National Corridor Efficiency Improvement, Border and International connectivity roads, Coastal and Port connectivity roads and Green-field expressway.

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The Bharatmala Pariyojana envisages development of about 24,800 km length of Economic Corridors, which along with Golden Quadrilateral (GQ) and North-South and East-West (NS-EW) Corridors are expected to carry majority of the Freight Traffic on roads.

A total length of 34,800 km in road projects have been proposed to be constructed with an estimated outlay of Rs 5.35 trillion under Bharatmala Pariyojana Phase-I over a five year period (2017-18 to 2021-22).

4.3.39 Eastern peripheral and western peripheral expressway

These two projects will connect NH-1 and NH-2 from western and eastern side of Delhi.

4.3.40 NH-544G Bengaluru–Vijayawada Economic Corridor

In February 2023, Mr. Nitin Gadkari has approved the development of 32 km long 6-lane Access Controlled Greenfield Highway on NH-544G Bengaluru–Vijayawada Economic Corridor in Hybrid Annuity Mode in Andhra Pradesh worth US\$ 157 million (Rs. 1,292.65 crores).

4.3.41 Setu Bharatam:

This project aims to replace crossings on NHs with Road Over Bridges and Road Under Bridges. It is projected to construct 174 such structures.

4.3.42 To further augment road infrastructure, more economic corridors are also being planned by Government of India as revealed in Budget 2021-22.

- a. In July 2023, Prime Minister Mr. Narendra Modi dedicated a six-lane greenfield motorway part of the Amritsar-Jamnagar Economic Corridor and the first phase of the Inter-State Transmission Line for Green Energy Corridor.
- b. 3,500 km of National Highway works in the state of Tamil Nadu at an investment of INR 1.03 lakh Crores. These include Madurai-Kollam corridor, Chittoor-Thatchur corridor. Construction will start next year.
- c. 1,100 km of National Highway works in the State of Kerala at an investment of INR 65,000 Crores including 600 km section of Mumbai Kanyakumari corridor in Kerala.
- d. 675 km of highway works in the state of West Bengal at a cost of INR 25,000 Crores including upgradation of existing road-Kolkata –Siliguri.
- e. National Highway works of around INR 19,000 Crores are currently in progress in the State of Assam. Further works of more than INR 34,000 Crores covering more than 1300 kms of National Highways will be undertaken in the State in the coming three years.
- f. In the Union Budget of 2022-23, the increase in Budget was a whopping 68% compared to the last year and the government plans to complete 25,000 kilometres of National Highways.

4.4 Opportunities in road development & maintenance in India

- a. India has joined the league of 15 of global alliance which will work towards the ethical use of smart city technologies.
- b. A total of 202 national highway projects worth Rs. 79,789 crore (US\$ 9.59 billion) are at the implementation stage in the country and are 6,270 km in length.
- c. The Government aims to construct 65,000 kms of national highways at a cost of Rs. 5.35 lakh crore (US\$ 741.51 billion).
- d. The government also aims to construct 23 new national highways by 2025.
- e. Road building in India is second least expensive in Asia.
- f. In Andhra Pradesh, 70 projects underway, totaling 2,014 kms and costing Rs. 33,540 crore (US\$ 4.09 billion) are currently in progress.
- g. In February 2022, NHAI rolled out a plan to construct 5,795 kilometres of highways that will connect 117 districts. The plan was worth Rs. 1 trillion (US\$ 13.09 billion).

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- h. In March 2023, NHA has invited bid to help in developing Wayside Amenities at more than 600 locations on National Highways and Expressways by FY25.

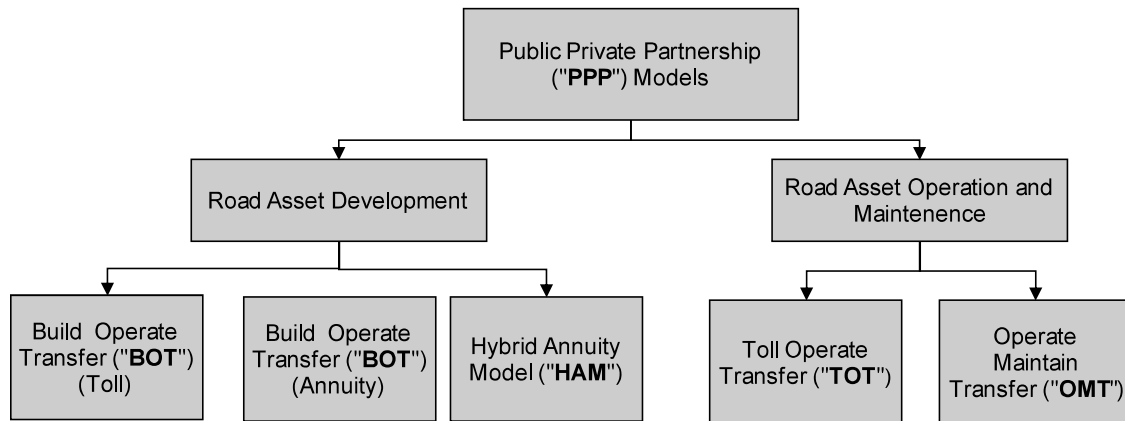
4.5 Public Private Partnership ("PPP") Models of road development and maintenance in India

4.5.1 India has a well-developed framework for Public-Private-Partnerships (PPP) in the highway sector. PPP has been a major contributor to the success story of the roads and highway sector in India. With the emergence of private players over the last decade, the road construction market has become fragmented and competitive. Players bidding for projects also vary in terms of size. PPP modes have been used in India for both development and operation & maintenance of road assets.

NHA is planning to award 500 km of the 6,500 km target for FY23 through BOT mode. It may give minimum toll revenue guarantee to make it easier for contractors to bid for BOT projects

4.5.2 As of November 2023, there were 352 PPP projects worth US\$ 76.95 billion in India.

4.5.3 In August 2020, the Government of India revised the Model Concession Agreement for BOT projects to plug delays by imposing a deadline on the NHA and incentivising timely work by concessionaires. According to revised norms, the NHA will have to hand over 90% of the project land (vacant and ready to build) to private developers, thus creating a more market-friendly sector and attracting more private players.



4.5.4 Road Asset Development Models

- **BOT Toll**
 - In a BOT toll project, the concessionaire is responsible for designing, building, financing, operating, maintaining, tolling and transferring the project to the relevant authority at the end of the concession period. The concession period is project specific but is usually for 30 years. In BOT Toll model, the concessionaire earns revenue primarily in the form of toll revenue which in turn depends on the traffic on the road stretch. Toll rates are regulated by the government through rules.
- **BOT Annuity**
 - Similar to a BOT Toll projects, in BOT Annuity project, the concessionaire is responsible for designing, building, financing, operating, maintaining, tolling and transferring the project to the relevant authority at the end of the concession period. However, in these projects, the responsibility of tolling on road stretch lies with the government. The concessionaire earns revenue in the form of pre-determined semi-annual annuity payments.
- **HAM**
 - Similar to a BOT projects, in HAM project, the concessionaire is responsible for designing, building, financing, operating, maintaining, tolling and transferring the project to the relevant authority at the end of the concession period. However, in these projects, the responsibility of tolling on road stretch lies

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with the government. The construction period for HAM projects is project specific and a fixed operation period of 15 years.

4.6 Government Investment in the Sector

4.6.1 Under the Union Budget 2023-24, the Government of India allocated Rs. 2.7 lakh crore (US\$ 33 billion) to the Ministry of Road Transport and Highways.

4.6.2 The Government aims to increase the toll revenue to INR 1.3 Trillion by 2030. In 2014, the waiting time at the toll plazas was 734 seconds, whereas in the 2023 this has reduced to 47 seconds. We are hopeful that we will bring it down to 30 second soon.

4.6.3 NHA is planning to raise Rs. 40,000 crore (US\$ 5.72 billion) to monetize its highway assets through Infrastructure Investment Trust (InvIT).

4.7 Growth Drivers

4.7.1 Robust Demand :

Growing domestic trade flows have led to rise in commercial vehicles and freight movement; supported by rise in production of commercial vehicles to 752,022 in FY20 which commands stronger road network in India. Higher individual discretionary spending has led to increased spending on two and four wheelers. Domestic sales of passenger vehicles, three-wheelers and two-wheelers, reached 254,287, 24,091, and 1,128,293 units, respectively, in January 2022. Road's traffic share of the total traffic in India has grown from 13.8% to 65% in freight traffic and from 32% to 90% in passenger traffic over 1951–2019.

4.7.2 Increasing Investment :

Huge investment have been made in the sector with total investment increasing more than three times from Rs. 51,914 crore (US\$ 7.43 billion) in 2014-15 to Rs. 158,839 crore (US\$ 22.73 billion) in 2018- 19. Between FY16 and FY21, budget outlay for road transport and highways increased at a robust CAGR of 13.10%. Under the Union Budget 2022-23, the Government of India has allocated Rs. 199,107.71 crore (US\$ 26.04 billion) to the Ministry of Road Transport and Highways.

4.7.3 Policy Support :

100% FDI is allowed under automatic route subject to applicable laws and regulations, standardized process for bidding and tolling. Under Union Budget 2020-21, the Government of India has allocated Rs. 19,500 crore (US\$ 2.79 billion) for Pradhan Mantri Gram Sadak Yojana (PMGSY) which is a scheme for development of rural roads in India. Government of India has set up India Infrastructure Finance Company (IIFCL) to provide long-term funding for infrastructure projects.

4.8 Challenges & Issues in the Sector

4.8.1 Land Acquisition Delays & Cost :

- Land acquisition cost has increased more than 30% since 2017, primarily due to enhanced compensation payment requirements as per 'The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013'.
- Delay in pre-construction activities (such as land acquisition, relocation) affects project timelines. Land acquisition for road projects involves various stages. Each stage involves a number of stakeholders and regulatory bodies. Thus processes consume considerable time.

4.8.2 Regulatory Approvals & Disputes :

- Road development process requires a number of approvals such as environmental clearance, forest clearance, railways clearance, etc. Each of these activities takes considerable time and non-adherence to timelines result in cost overruns due to delays.
- Claims arising out of disputes between the concessionaire/ contractor and the government authorities are also a significant cost which can lead to large liabilities.

4.8.3 Operational Issues :

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- Uncertainty of toll revenue collection and variation of collected toll revenue compared to projected levels as Actual traffic is much less than the anticipated traffic.
- Often unforeseen weather conditions require unplanned O&M, over and above the routine and periodic maintenance activities. This results in enhanced O&M expenses. The increase in O&M costs is also affecting the project returns.

4.8.4 Financing road construction projects :

- In the case of toll motorways, the challenge of financing construction projects is different but still remains. Traditionally, the construction of toll motorways is a profitable investment but in the times of recession, funding may be rare or non-existent.
- Powerful national economies may be able to efficiently tackle the problem but weaker economies can hardly find the financing sources for road construction projects.

4.10.5. Climate Change

- The road sector is vulnerable to climate change impacts. Climate change and extreme weather events pose a significant challenge to the safety, reliability, effectiveness and sustainability of road transportation systems. Tsunami waves, wildfires, floods and hurricanes constitute a big risk for passengers, vehicles and goods, as well as for the integrity of the transport infrastructure.
- Since reliable road transport is an essential driver of economic growth and social wellbeing worldwide, national road authorities and motorway operators must adapt the infrastructure to climate change and increase the resilience of road transport to extreme weather

4.10.6. Economy and cost effectiveness :

- Among all transport modes, road transport occupies a significant place in short- and medium distance travel operations. However, the unit cost of transportation (per ton × km), compared with other modes of transport, remains high and is getting higher and cost-ineffective as the travel distance increases.
- Road transport cost comprises direct costs (fuel, capital depreciation, maintenance, motorway tolls, ferry fares and wages) and external costs (noise, congestion, infrastructure damages, health and environmental issues).

4.11. Recent Initiatives by Government

4.11.1. Bhoomi Rashi – Land Acquisition Portal

The ministry has corroborated with the National Informatics Centre, to create Bhoomirashi, a web portal which digitises the cumbersome land acquisition process, and also helps in processing notifications relating to land acquisition online. Processing time, which was earlier two to three months has come down to one to two weeks now.

4.11.2. FASTag – Electronic Toll Collection

National Electronic Toll Collection (NETC) system, has been implemented on pan India basis in order to remove bottlenecks and ensure seamless movement of traffic and collection of user fee as per the notified rates, using passive Radio Frequency Identification (RFID) technology. In Q2 2022, NETC processed about 829 million transactions worth INR 129 billion. The transactions volume increased by 89% while value increased by 72% as compared to Q2 2021. As of March 2022, the total number of banks live with NETC FASTag were 36 while about 52.9 million NETC FASTags have been issued since the inception of the NETC program.

4.11.3. Revival of languishing projects

Projects which were languishing for a number of years have been attempted to be revived, with the help of a number of policy measures taken by the government. Some of the policy measures like Premium deferment in stressed projects, extension of concession period for languishing projects to the extent of delay not attributable to concessionaires, One Time Capital Support for physical completion of languishing projects that have achieved at least 50 per cent physical progress, through one time fund infusion by NHAI, subject to adequate due diligence on a case to case basis.

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4.11.4. Road Safety

The government has launched several initiatives to improve road safety in the country, including the implementation of the Motor Vehicles (Amendment) Act, 2019, which provides for higher penalties for traffic violations, the installation of speed cameras and red light cameras, and the promotion of road safety awareness through campaigns and training programs.

4.11.5. Gati Shakti-National Master Plan

India's Gati Shakti program has consolidated a list of 81 high impact projects, out of which road infrastructure projects were the top priority. The major highway projects include the Delhi-Mumbai expressway (1,350 kilometres), Amritsar-Jamnagar expressway (1,257 kilometres) and Saharanpur-Dehradun expressway (210 kilometres). The main aim of this program is a faster approval process which can be done through the Gati shakti portal and digitized the approval process completely

4.11.6. Rural development

Under the Union Budget 2021-22, the Government of India allocated Rs. 19,000 (US\$ 2.37 billion) for Pradhan Mantri Gram Sadak Yojana (PMGSY), a 36% rise over the earlier estimate of 2021-22. Under the Union Budget 2020-21, the Government of India has allocated Rs. 19,500 crore (US\$ 2.79 billion) for Pradhan Mantri Gram Sadak Yojana (PMGSY).

4.11.7. Improve safety standards

In October 2021, the government announced rules to improve road safety, such as fixed driving hours for commercial truck drivers and a mandate to install sleep detection sensors in commercial vehicles. In October 2020, a memorandum of understanding (MoU) has been signed with the National Highways Authority of India (NHAI) by Guru Nanak Dev University (GNDU) to conduct advanced research on various aspects, including highway architecture, protection and revitalisation. The GNDU will undertake studies on ~137 km length of the National Highways passing through Pathankot, Gurdaspur and Amritsar districts.

4.11.8. Portfolios in roads & highways sector

In October 2020, the National Investment and Infrastructure Fund (NIIF) is making progress towards integrating its road and highway portfolio. The NIIF has acquired Essel Devanahalli Tollway and Essel Dichpally Tollway through the NIIF master fund. These road infra-projects will be supported by Athaang Infrastructure, NIIF's proprietary road network, assisted by a team of established professionals with diverse domain expertise in the transport field.

4.11.9. International Tie-ups

In December 2020, the Ministry of Road Transport and Highways signed a MoU with the Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology of the Republic of Austria on technology cooperation in the road infrastructure sector.

4.11.10. Encourage private funding to reduce finance constraints

- Cumulative FDI inflows in construction development stood at US\$ 26.21 billion between April 2000 - March 2022, Maif 2 Investments India Pvt Ltd. became the first-largest foreign investment in Indian roads sector under toll-operate-transfer (TOT) mode worth Rs.9,681.5 crore (US\$ 1.50 billion).
- In October 2020, the Asian Development Bank (ADB) and the Government of India signed a US\$ 177 million loan to upgrade 450 kms of state highways and major district roads in Maharashtra.
- In January 2021, the Government of India and New Development Bank (NDB) signed two loan agreements for US\$ 646 million for upgrading the state highway and district road networks in Andhra Pradesh.
- In August 2020, the Government of India revised the Model Concession Agreement for BOT projects to plug delays by imposing a deadline on the NHAI and incentivising timely work by concessionaires.
- According to revised norms, the NHAI will have to hand over 90% of the project land (vacant and ready to build) to private developers, thus creating a more market-friendly sector and attracting more private players.

19.1 Outlook

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- 1.9.1. Highway construction in India increased at 17.00% CAGR between FY16-FY21. Despite pandemic and lockdown, India has constructed 10,457 km of highways in FY22. Under the Union Budget 2023-24, the Government of India has allocated Rs. 2.7 lakh crore (US\$ 33 billion) to the Ministry of Road Transport and Highways. In FY23 (until December), the Ministry of Road Transport and Highways constructed national highways extending 6,318 kms.
- 1.9.2. Development and maintenance of road infrastructure is a key Government priority, the sector has received strong budgetary support over the years. During the past years, the standardized processes for Public Private Partnership & public funded projects and a clear policy framework relating to bidding and tolling have also been developed.
- 1.9.3. The major initiatives undertaken by the Government such as National Infrastructure Pipeline (NIP) and the PM Gati Shakti National Master Plan will raise productivity, and accelerate economic growth and sustainable development.
- 1.9.4. The highways sector in India has been at the forefront of performance and innovation. The government is committed towards expanding the National Highway network to 2 lakh kilometres by 2025 emphasizing the construction of the World Class Road infrastructure in time bound & target oriented way. India has a well-developed framework for Public-Private-Partnerships (PPP) in the highway sector.
- 1.9.5. The Asian Development Bank ranked India at the first spot in PPP operational maturity and also designated India as a developed market for PPPs. The Hybrid Annuity Model (HAM) has balanced risk appropriated between private and public partners and boosted PPP activity in the sector.

Sources: IBEF Roads Report, Nember 2022; KPMG Report - Roads and Highway Sector; ICRA reports, website of Ministry of Road Transport and Highways, Government of India.

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5. Valuation Methodology and Approach

- 5.1. The present valuation exercise is being undertaken in order to derive the fair EV of the SPVs.
- 5.2. The valuation exercise involves selecting a method suitable for the purpose of valuation, by exercise of judgment by the valuers, based on the facts and circumstances as applicable to the business of the company to be valued.
- 5.3. There are three generally accepted approaches to valuation:
 - (a) "Cost" approach
 - (b) "Market" approach
 - (c) "Income" approach

Cost Approach

- 5.4. The cost approach values the underlying assets of the business to determine the business value. This valuation method carries more weight with respect to holding companies than operating companies. Also, cost value approaches are more relevant to the extent that a significant portion of the assets are of a nature that could be liquidated readily if so desired.

Net Asset Value ("NAV") Method

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- 5.5. The NAV Method under Cost Approach considers the assets and liabilities, including intangible assets and contingent liabilities. The Net Assets, after reducing the dues to the preference shareholders, if any, represent the value of a company.

The NAV Method is appropriate in a case where the main strength of the business is its asset backing rather than its capacity or potential to earn profits. This valuation approach is also used in cases where the firm is to be liquidated, i.e. it does not meet the "going concern" criteria.

As an indicator of the total value of the entity, the NAV method has the disadvantage of only considering the status of the business at one point in time.

Additionally, NAV does not properly take into account the earning capacity of the business or any intangible assets that have no historical cost. In many aspects, NAV represents the minimum benchmark value of an operating business.

Market Approach

- 5.6. Under the Market approach, the valuation is based on the market value of the company in case of listed companies, and comparable companies' trading or transaction multiples for unlisted companies. The Market approach generally reflects the investors' perception about the true worth of the company.

Comparable Companies Multiples ("CCM") Method

- 5.7. The value is determined on the basis of multiples derived from valuations of comparable companies, as manifest in the stock market valuations of listed companies. This valuation is based on the principle that market valuations, taking place between informed buyers and informed sellers, incorporate all factors relevant to valuation. Relevant multiples need to be chosen carefully and adjusted for differences between the circumstances.

Comparable Transactions Multiples ("CTM") Method

- 5.8. Under the CTM Method, the value is determined on the basis of multiples derived from valuations of similar transactions in the industry. Relevant multiples need to be chosen carefully and adjusted for differences between the circumstances. Few of such multiples are EV/Earnings before Interest, Taxes, Depreciation & Amortization ("EBITDA") multiple and EV/Revenue multiple.

Market Price Method

- 5.9. Under this method, the market price of an equity share of the company as quoted on a recognized stock exchange is normally considered as the fair value of the equity shares of that company where such quotations are arising from the shares being regularly and freely traded. The market value generally reflects the investors' perception about the true worth of the company.

Income Approach

- 5.10. The income approach is widely used for valuation under "Going Concern" basis. It focuses on the income generated by the company in the past as well as its future earning capability. The Discounted Cash Flow Method under the income approach seeks to arrive at a valuation based on the strength of future cash flows.

Discounted Cash Flow ("DCF") Method

- 5.11. Under DCF Method value of a company can be assessed using the Free Cash Flow to Firm Method ("FCFF") or Free Cash Flow to Equity Method ("FCFE"). Under the DCF method, the business is valued by discounting its free cash flows for the explicit forecast period and the perpetuity value thereafter. The free cash flows represent the cash available for distribution to both, the owners and creditors of the business. The free cash flows in the explicit period and those in perpetuity are discounted by the Weighted Average Cost of Capital ("WACC"). The WACC, based on an optimal vis-à-vis actual capital structure, is an appropriate rate of discount to calculate the present value of future cash flows as it considers equity-debt risk by incorporating debt-equity ratio of the firm.

The perpetuity (terminal) value is calculated based on the business' potential for further growth beyond the explicit forecast period. The "constant growth model" is applied, which implies an expected constant level of growth for perpetuity in the cash flows over the last year of the forecast period.

The discounting factor (rate of discounting the future cash flows) reflects not only the time value of money, but also the risk associated with the business' future operations. The EV (aggregate of the present value of

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explicit period and terminal period cash flows) so derived, is further reduced by the value of debt, if any, (net of cash and cash equivalents) to arrive at value to the owners of the business.

Conclusion on Valuation Approach

- 5.12. It is pertinent to note that the valuation of any company or its assets is inherently imprecise and is subject to certain uncertainties and contingencies, all of which are difficult to predict and are beyond my control. In performing my analysis, I have made numerous assumptions with respect to industry performance and general business and economic conditions, many of which are beyond the control of the SPVs. In addition, this valuation will fluctuate with changes in prevailing market conditions, and prospects, financial and otherwise, of the SPVs, and other factors which generally influence the valuation of companies and their assets.
- 5.13. The goal in selection of valuation approaches and methods for any financial instrument is to find out the most appropriate method under particular circumstances on the basis of available information. No one method is suitable in every possible situation. Before selecting the appropriate valuation approach and method, I have considered various factors, inter-alia, the basis and premise of current valuation exercise, purpose of valuation exercise, respective strengths and weaknesses of the possible valuation approach and methods, availability of adequate inputs or information and its reliability and valuation approach and methods considered by the market participants.

Cost Approach

The existing book value of EV of the SPVs comprising of the value of its Net fixed assets, Net intangible assets and working capital based on the unaudited financial statements as at 31st March 2024, 30th September 2023 and based on the audited financial statements as at 31st March 2023 prepared as per Indian Accounting Standards (Ind AS) are as under:

Book EV (INR Mn)	31-Mar-23	30-Sep-23	31-Mar-24
MVR	1,475	1,266	1,134
IRBPA	12,313	12,102	11,696
IRBTA	5,611	5,488	5,364
IRBTC	10,622	9,879	9,729
IRBJD	12,935	12,626	12,315
VEL	12,058	11,969	12,488
Total	55,015	53,330	52,725

In the present case, The SPVs operate and maintain the project facilities in accordance with the terms and conditions under the relevant concession agreement. During the concession period, the SPVs operate and maintain the road asset and earn revenues through charges, fees or tolls generated from the asset. The amount of charges, fees or tolls that they may collect are notified by the relevant government agency, which are usually revised annually as specified in the relevant concessions and toll notifications. In such scenario, the true worth of the business is reflected in its future earning capacity rather than the cost of the project. Accordingly, I have not considered the cost approach for the current valuation exercise.

Market Approach

The present valuation exercise is to undertake fair EV of the SPVs engaged in the road infrastructure projects for a predetermined tenure. Further, the tariff revenue and expenses are very specific to the SPVs depending on the nature of their geographical location, stage of project, terms of profitability. In the absence of any exactly comparable listed companies with characteristics and parameters similar to that of the SPVs, I have not considered CCM method in the present case. In the absence of adequate details about the Comparable Transactions, I was unable to apply the CTM method. Currently, the equity shares of the SPVs are not listed on any recognized stock exchange of India. Hence, I was unable to apply market price method.

Income Approach

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Each of the SPVs operates under a BOT or DBFOT concession agreement with the NHAI. Government authorities in India typically award highway infrastructure development projects under BOT concessions, which are characterized by three distinct phases:

1. Build: upon successfully securing a project concession through a competitive bid, a concessionaire secures financing for, and completes construction, of a road;
2. Operate: during the agreed concession period, the concessionaire operates, manages and maintains the road at its own expense and earns revenues by collecting tolls from vehicles using the road; and
3. Transfer: at the end of the agreed concession period, the ownership of the road, the obligation to maintain the road and the right to collect tolls from the vehicles using the road revert to the government entity that granted the concession.

A DBFOT project involves, in addition to the activities required under a BOT project, the provision of engineering design and financing for such project.

Currently, each of the SPVs are completed and are revenue generating SPVs. The revenue of the SPVs is based on tenure, traffic volumes, operations and other factors that are unique to each of the SPVs. The growth potential of the SPVs and the true worth of its business would be reflected in future earnings of each of the SPVs. I have been provided with the projected financial information for each of the SPVs under consideration, by the Investment Manager. Accordingly, DCF Method under the income approach has been considered as an appropriate method for the present valuation exercise.

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6. Valuation of the SPVs

- 6.1. In the present exercise, my objective is to determine the Fair Enterprise Value of the SPVs as per the DCF Method. EV is described as the total value of the equity in a business plus the value of its debt and debt related liabilities, minus any cash or cash equivalents to meet those liabilities. Accordingly, in the present case, I have considered it appropriate to consider cash flows at FCFF (Free Cash Flow to Firm) level i.e., cash flows that are available to all the providers of capital (equity shareholders, preference shareholders and lenders). Therefore, cash flows required to service lenders and preference shareholders such as interest, dividend, repayment of principal amount and even additional fund raising are not considered in the calculation of FCFF.
- 6.2. While carrying out this engagement, I have relied extensively on the information made available to me by the Investment Manager. I have considered projected financial statement of the SPVs as provided by the Investment Manager. I have not tested individual assumptions or attempted to substantiate the veracity or integrity of such assumptions in relation to the forward-looking financial information, however, I have made sufficient enquiries to satisfy myself that such information has been prepared on a reasonable basis. Notwithstanding anything above, I cannot provide any assurance that the forward looking financial information will be representative of the results which will actually be achieved during the cash flow forecast period.
- 6.3. Following are the major steps I have considered in order to arrive the EV of the SPVs as per the DCF Method:
- Determination of Free Cash Flows to Firm which included:
 - a. Obtaining the financial projections to determine the cash flows expected to be generated by the SPVs from the Investment Manager;
 - b. Analyzed the projections and its underlying assumptions to assess the reasonableness of the cash flows;
 - Determination of the discount rate for the explicit forecast period; and
- Applying the discount rate to arrive at the present value of the explicit period cash flows and for arriving at the terminal value.
- 6.4. The key assumptions of the projections provided to us by the Investment Manager are:

Key Assumptions:

- 6.4.1. **Toll Revenue:** As per the concession agreements for the respective SPVs, each SPV is allowed to levy, demand, collect and appropriate the fees (called as toll fees) from vehicles and persons liable to payment of fees for using their respective road asset or any part thereof and refuse entry of any vehicle to the road asset if the due fee is not paid. Toll revenues depend on toll receipts, which in turn depend on traffic volumes and toll fees on the toll roads.

Concession Period

The Concession Period refers to the period where the Concessionaire is granted with the exclusive rights, license and authority to demand, collect and appropriate fee, operate, manage and maintain the project highway subject to the terms and conditions mention in their respective concession agreement. The cash flow projection are prepared by the Investment Manager for the balance concession period remaining from the Valuation Date as summarized below:

SPV	Concession Period End Date		Extension Period	
	Original	Revised	For Traffic Variance	For Other Reasons
MVR	13 th August 2026	12 th January 2027	-	152
IRBPA	30 th December 2030	2 nd January 2038	1,460	1,099
IRBTA	2 nd September 2032	2 nd June 2037	*1,606	127
IRBTC	3 rd June 2037	29 th December 2042	*1,899	136
IRBJD	13 th June 2035	21 st October 2040	1,826	131
VEL	29 TH March 2037	29 th March 2037	-	-

**subject to NHAI approval*

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I understand, as per the extant provisions of the Concession Agreements for the respective SPVs in relation to the traffic variation, the concession period could be modified to take into the account shortfall or excess in actual average traffic vis-à-vis the target traffic ranging beyond 2.5% and such concession extension or truncation shall be subject to a cap of 20% extension for shortfall and 10% for truncation for excess.

Accordingly, in the Investment Manager has considered an extension period based on its calculation which is subject to the approval from the NHAI Authorities in case of IRBTA & IRBTC. I have relied on the information provided by the Investment Manager.

SPVs	NHAI Approval Order	Description
IRBPA	Received	Incremental concession period of 4 years (1,460 days) arising out of variation in traffic has been considered for valuation and NHAI approval for the same is received vide letter dated 5 th March 2021
IRBPA	Received	Incremental concession period of 436 days arising out of Force Majeure event due to user toll collection suspension on account of the farmer's civil commotion (agitation), vide NHAI letter dated 27 th August 2022
IRBPA	Not received	Incremental concession period of 518 days arising out of Arbitral Award d for delay in completion of construction of the project on account of the reasons not attributable to IRBPA, vide arbitral award dated July 2021. Moreover, the petition challenging the Award filed by NHAI in the Hon'ble Delhi High Court was dismissed by the Court on 8 th March 2022. Subsequently, the Delhi High Court by its order dated July 03, 2023 set aside the Award and IPATRL filed Special Leave Petition (SLP) in the Supreme Court challenging the Section 37 order of the Delhi High Court. The Supreme Court admitted the SLP and the matter is pending.
IRBTA	Not received (Filed traffic survey with NHAI vide letters dated 2nd April 2021, 14th October, 2020 and 25th September 2020)	Incremental concession period of 4.4 years (1,606 days) arising out of variation in traffic has been considered for valuation. SPV has already filed a traffic survey calculation with NHAI vide letters dated 2 nd April 2021, 14 th October, 2020 and 25 th September 2020 for extension. The same has been recommended by the independent engineer appointed by IRBTA vide letter dated 28 th July 2021. However, NHAI approval for the same is pending as on report date
IRBTC	Not received (Filed with NHAI vide letter dated 14th April, 2021)	Incremental concession period of 5.2 years (1,899 days) arising out of variation in traffic as per Concession Agreement, though it has been intimated to NHAI vide letter dated 14th April 2021, approval for the same is pending as on report date
IRBJD	Received	Incremental concession period of 5 years (1,826 days) arising out of variation in traffic has been considered for valuation as per the NHAI approval dated 18 th March 2020.

Extension for Other Reasons: NHAI vide its various orders has extended the concession period of the BOT Toll Projects for reasons including natural calamities, lockdowns on account of COVID-19, etc.

I have considered the projection period for the current valuation exercise based on the balance concession period as represented by the Investment Manager.

Traffic Volumes

Traffic volumes are directly or indirectly affected by a number of factors, many of which are outside of the control of the SPVs, including: toll fees; fuel prices in India; the frequency of traveller use; the quality, convenience and travel efficiency of alternative routes outside the SPV's network of toll roads; the convenience and extent of a toll road's connections with other parts of the local, state and national highway networks; the availability and cost of alternative means of transportation, including rail networks and air transport; the level of commercial, industrial and residential development in areas served by the SPVs' projects; adverse weather conditions; and seasonal holidays.

Toll Rates

During the concession period, the SPVs operate and maintain the road asset and earn revenues through charges, fees or tolls generated from the asset. The amount of charges, fees or tolls that they may collect are notified by the relevant government agency, which are usually revised annually as specified in the relevant concessions and toll notifications. The revision typically either (i) is linked to the extent of variation in the Wholesale Price Index for all commodities as published by the Ministry of Industry (the "WPI") or (ii) comprises

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a fixed component, which is three percent and a component linked to variation in the WPI, which is capped at 40% of the variation in the WPI.

The toll rates for the projected period have been derived in the manner stipulated in the individual concession agreements of the SPVs. The variable determinant supporting escalation in toll tariff is WPI which is considered as 5.0% p.a. through the projected period based on the discussion with the Investment Manager.

In the present case, the Investment Manager has appointed M/s GMD Consultants, an independent third-party research agency to forecast the traffic volumes and toll revenues for the SPVs' projects and to prepare traffic reports for the SPVs under consideration. As confirmed by the Investment Manager, the traffic volumes and toll revenues for each SPV has been estimated by the traffic consultant after considering overall structure and condition of the projects including analysis of demand and supply and strategic geographical locations of the individual road projects. This was one of the most important input in projecting the toll revenues.

- 6.4.2. **Operating & Maintenance Expenses (Routine maintenance):** A SPV is generally responsible for carrying out operation and maintenance activities at its toll road during its concession period. Within the scope of such operation and maintenance obligations, the SPV may be required to undertake routine and periodic maintenance of project roads, maintain and comply with safety standards to ensure smooth and safe traffic movement, deploy adequate human resources for incident management, maintain proper medical and sanitary arrangements for personnel deployed at the site, prevent any unauthorized entry to and exit from the project as may be required. The Project Manager, together with the SPVs, manages the critical day-to-day operation and maintenance of the SPVs. In the present case, the Investment Manager has relied on the technical study report provided by the external professional agency (M/s GMD Consultants) for estimating the O&M (routine) expenses for the projected period. Further, I have been informed that the SPVs have entered into long term agreement with the Sponsor to provide O&M support with respect to Routine and Periodic maintenance and the cost considered in the projections are in-line with the terms of these contracts.

- 6.4.3. **Major Maintenance Expenses (Periodic maintenance):**

Estimating the Major Maintenance Expenses

Period maintenance expenses will be incurred on periodic basis say every 2-5 years. These are the costs incurred to bring the road assets back to its earlier condition or keep the road assets in its present condition. Similar to O&M routine maintenance expenses, Investment Manager has relied on the technical study report provided by the external professional agency (M/s GMD Consultants) for estimating major maintenance expenses for the projected period.

Provisions for Major Maintenance Expenses and Cash Flow Adjustments

As per the financial requirements, provision is required for appropriate major maintenance expense over a period until the actual expenditure is incurred. These are non-cash expenses. Hence, for my DCF analysis, such provisions are added back in their respective years and the actual expenditure expected to be incurred during the particular interval of 2-5 years is deducted in those respective years in order to arrive at net cash flows.

The Investment Manager has provided me the estimated Major Maintenance Expenses.

- 6.4.4. **Depreciation and Amortization:** The toll collection rights (intangible assets) of the SPVs are being amortized using revenue-based amortization method. Under this method, the carrying value of the toll collection rights is amortised in the proportion of the actual toll revenue for the year to the projected revenue for the balance toll period, to reflect the pattern in which the economic benefits of the assets will be consumed. Further, for other fixed assets, depreciation is calculated on written down value method (WDV) using the useful lives prescribed by the Companies Act, 2013.

- 6.4.5. **NHAI Premium:** NHAI premium is the payment made by the concessionaire to NHAI for bagging the right to finance, develop, maintain and collect tolls from the road project during the concession period. Based on the future traffic estimates, the developers have to bid the premium amount that they pay to NHAI upfront. Further, developers can defer premium payment only if they do not collect enough toll revenue in a year to pay for it after servicing debt and other maintenance costs. They have to pay interest on the premium deferred. For the DCF, the NHAI premium provision (which is expensed out in the Profit & Loss) is added back since it is non-cash expenditure and the actual premium & interest on the same paid in each of the projected years is deducted to arrive at the net cash flows. Based on the representation of the Investment Manager, in case of

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IRBTC, interest on deferred NHA1 premium is assumed at 8.75% per annum throughout the balance project life (based on the bank rate applicable as of 31st March 2024 + 2 years).

- 6.4.6. **Revenue Share:** The revenues collected from the toll would be shared annually and paid to the NHA1 in the form of a concession fee. The percentage of revenue that the Road Project has to share with the NHA1 is defined in the Concession Agreement. This is applicable in case of MVR only. The SPVs records revenue on the net of share of revenue basis only. Further, the projections provided by the Investment Manager are on the basis of share of revenue that belongs to the individual SPV only. Accordingly, no additional adjustment in relation to share of revenue that belongs to NHA1 is required in order to derive the enterprise values of the SPVs.
- 6.4.7. **Capital Expenditure (“Capex”):** As represented by the Investment Manager, regarding the maintenance Capex, the same has already been considered in the Operations & Maintenance expenditure and Major maintenance expenditure for the projected period and regarding the expansion Capex, the SPVs are not expected to incur any capex in the projected period.
- 6.4.8. **Working Capital:** The entire collection of tolls is in cash and routine expenses are in cash or a credit period is available. In these cases the effective working capital deployed is relatively small or negative in certain instances. Further, I understand the working capital is expected to be stable and is not expected to vary drastically over a period of time. Hence, changes in working capital have been considered as an adjustment for its release or payment in the projected cash flows towards the end of the concession period.
- 6.4.9. **Taxes:** As per the discussions with the Investment Manager, taxes payable by the SPVs for the projected period shall be MAT rates or normal tax rates, whichever is applicable. While projecting the tax numbers, 80-IA benefits under the Income Tax Act, 1961 has been considered to arrive at tax payable by the SPVs.

6.5. Impact of Ongoing Material Litigation on Valuation

As on 31th March 2024, there are ongoing tax litigations as shown in Appendix 4 which are having no deposits paid under dispute/ protest for the SPVs, as informed by the Investment Manager. As represented by the Investment Manager, the Sponsor would indemnify the Trust and its SPVs against any financial losses suffered or incurred in connection with any pending or threatened claims against the Trust made prior to the transfer of the assets to the Trust, hence no impact has been factored on the valuation of the SPVs.

6.6. Modification in Concession Period

As per the Concession Agreement clause between NHA1 and SPVs as provided to us by the management of the Sponsors, “In the event Actual Average Traffic shall have fallen short of the target traffic, then for every 1% shortfall as compared to the target traffic, the Concession period shall, subject to payment of Concession Fee in accordance with this Agreement, be increased by 1.5% thereof; provided such increase in Concession period shall not in any case exceed 20% of the Concession period.

6.7. Calculation of Weighted Average Cost of Capital for the SPVs

6.7.1. Cost of Equity:

Cost of Equity (CoE) is a discounting factor to calculate the returns expected by the equity holders depending on the perceived level of risk associated with the business and the industry in which the business operates.

For this purpose, I have used the Capital Asset Pricing Model (CAPM), which is a commonly used model to determine the appropriate cost of equity for the SPVs.

$$K(e) = R_f + [ERP * Beta] + CSR_P$$

Wherein:

K(e) = cost of equity

R_f = risk free rate

ERP = Equity Risk Premium

Beta = a measure of the sensitivity of assets to returns of the overall market

CSR_P = Company Specific Risk Premium (In general, an additional company-specific risk premium will be added to the cost of equity calculated pursuant to CAPM).

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For valuation exercise, I have arrived at adjusted cost of equity of the SPVs based on the above calculation (Refer Appendix 2).

6.7.2. Risk Free Rate:

I have applied a risk free rate of return of 6.97% on the basis of the zero coupon yield curve as on 31st March 2024 for government securities having a maturity period of 10 years, as quoted on the website of Clearing Corporation of India Limited ("CCIL").

6.7.3. Equity Risk Premium ("ERP"):

Equity Risk Premium is a measure of premium that investors require for investing in equity markets rather than bond or debt markets. The equity risk premium is estimated based on consideration of historical realised returns on equity investments over a risk-free rate as represented by 10 year government bonds. Based on the aforementioned, a 7% equity risk premium for India is considered appropriate.

6.7.4. Beta:

Beta is a measure of the sensitivity of a company's stock price to the movements of the overall market index. In the present case, I find it appropriate to consider the beta of companies in similar business/ industry to that of the SPVs for an appropriate period.

Based on my analysis of the listed InvITs and other companies in road infrastructure sectors, I find it appropriate to consider the beta of Ashoka Buildcon Limited and IRB Infrastructure Developers Limited for an appropriate period for the current valuation exercise.

I have further unlevered the beta of such companies based on market debt-equity of the respective company using the following formula:

$$\text{Unlevered Beta} = \text{Levered Beta} / [1 + (\text{Debt} / \text{Equity}) * (1-T)]$$

Further I have re-levered it based on debt-equity at 50:50 based on the average debt:equity ratio of a Road BOT project over its life of concession using the following formula:

$$\text{Re-levered Beta} = \text{Unlevered Beta} * [1 + (\text{Debt} / \text{Equity}) * (1-T)]$$

Accordingly, as per above, I have arrived at re-levered betas of the SPVs. (Refer Appendix 2)

6.7.5. Company Specific Risk Premium ("CSRP"):

Discount Rate is the return expected by a market participant from a particular investment and shall reflect not only the time value of money but also the risk inherent in the asset being valued as well as the risk inherent in achieving the future cash flows. In the present case, considering the length of the explicit period, the basis of deriving the underlying cash flows and basis my discussion with Investment Manager, I found it appropriate to consider the following CSRPs:

SPVs	CSRP
MVR	0%
IRBPA	3%
IRBTA	2%
IRBTC	2%
IRBJD	2%
VEL	0%

6.7.6. Cost of Debt:

The calculation of Cost of Debt post-tax can be defined as follows:

$$K(d) = K(d) \text{ pre-tax} * (1 - T)$$

Wherein:

K(d) = Cost of debt

T = tax rate as applicable

For valuation exercise, pre-tax cost of debt has been considered as 8.96% for toll projects and 8.20% for HAM Projects, as represented by the Investment Manager.

6.7.7. Debt : Equity Ratio:

In present valuation exercise, I have considered debt: equity ratio of 50:50 based on average debt:equity ratio of a Road BOT project over its life of concession. Accordingly, I have considered the same weightage to arrive at the WACC of the SPVs.

6.7.8. Weighted Average Cost of Capital (WACC):

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The discount rate, or the WACC, is the weighted average of the expected return on equity and the cost of debt. The weight of each factor is determined based on the company's optimal capital structure.

Formula for calculation of WACC:

$$WACC = [K(d) * Debt / (Debt + Equity)] + [K(e) * (1 - Debt / (Debt + Equity))]$$

Accordingly, as per above, I have arrived the WACC for the explicit period of the SPVs. (Refer Appendix 2).

- 6.8. At the end of the agreed concession period, the ownership of the road, the obligation to maintain the road and the right to collect tolls from the vehicles using the road revert to the government entity that granted the concession by the SPVs. Hence, SPVs are not expected to generate cash flow after the expiry of their respective concession agreements. Accordingly, I found it appropriate not to consider terminal period value, which represents the present value at the end of explicit forecast period of all subsequent cash flows to the end of the life of the asset or into perpetuity if the asset has an indefinite life, in this valuation exercise.

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7. Valuation Conclusion

- 7.1. The current valuation has been carried out based on the discussed valuation methodology explained herein earlier. Further, various qualitative factors, the business dynamics and growth potential of the business, having regard to information base, management perceptions, key underlying assumptions and limitations were given due consideration.
- 7.2. I have been represented by the Investment Manager that there is no potential devolvement on account of the contingent liability as of valuation date; hence no impact has been factored in to arrive at EV of the SPVs.
- 7.3. Based on the above analysis, the EV as on the Valuation Date of the SPVs is as mentioned below: (Refer Appendix 1)

SPVs	Explicit Projection period		Enterprise Value (INR Mn)
	End Date	Balance Period	
MVR	12 th Jan 2027	~ 2 Years 3 Months	2,950
IRBPA	02 nd January 2038	~ 13 Years 9 Months	15,895
IRBTA	2 nd June 2037	~ 13 Years 2 Months	7,905
IRBTC	29 th December 2042	~ 18 Years 9 Months	20,781
IRBJD	21 st October 2040	~ 16 Years 7 Months	19,492
VEL	29 th March 2037	~ 13 Years 0 Months	12,667
Total of SPVs			79,690

- 7.4. EV is described as the total value of the equity in a business plus the value of its debt and debt related liabilities, minus any cash or cash equivalents to meet those liabilities.
- 7.5. The fair EV of the SPVs is estimated using DCF method. The valuation requires Investment Manager to make certain assumptions about the model inputs including forecast cash flows, discount rate, and credit risk.
- 7.6. Valuation is based on estimates of future financial performance or opinions, which represent reasonable expectations at a particular point of time, but such information, estimates or opinions are not offered as predictions or as assurances that a particular level of income or profit will be achieved, a particular event will occur or that a particular price will be offered or accepted. Actual results achieved during the period covered by the prospective financial analysis will vary from these estimates and the variations may be material.
- 7.7. Accordingly, I have conducted sensitivity analysis on certain model inputs, the results of which are as indicated below:
1. Weighted Average Cost of Capital (WACC) by increasing / decreasing it by 1.0%
 2. Revenue by increasing / decreasing it by 10%
 3. Expenses by increasing / decreasing it by 20%

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1. Fair Enterprise Valuation Range based on WACC parameter (1.0%)

INR Mn							
Sr. No.	SPVs	WACC +1.0%	EV	Base WACC	EV	WACC -1.0%	EV
1	MVR	10.90%	2,912	9.90%	2,950	8.90%	2,989
2	IRBPA	12.31%	14,967	11.31%	15,895	10.31%	16,910
3	IRBTA	11.90%	7,460	10.90%	7,905	9.90%	8,391
4	IRBTC	11.77%	18,667	10.77%	20,781	9.77%	23,198
5	IRBJD	11.79%	18,141	10.79%	19,492	9.79%	20,997
6	VEPL	8.82%	12,142	7.82%	12,667	6.82%	13,236
Total			74,289		79,690		85,721

2. Fair Enterprise Valuation Range based on Revenue parameter (10%)

INR Mn				
Sr. No.	SPVs	EV at Revenue -10%	EV at Base Revenue	EV at Revenue +10.0%
1	MVR	2,644	2,950	3,256
2	IRBPA	14,263	15,895	17,618
3	IRBTA	6,953	7,905	8,858
4	IRBTC	15,320	20,781	26,242
5	IRBJD	17,177	19,492	21,795
6	VEL	11,465	12,667	13,861
Total		67,822	79,690	91,630

3. Fair Enterprise Valuation Range based on Expense parameter (20%)

INR Mn				
Sr. No.	SPVs	EV at Expenses +20%	EV at Base Expenses	EV at Expenses -20%
1	MVR	2,885	2,950	3,014
2	IRBPA	15,327	15,895	16,462
3	IRBTA	7,456	7,905	8,354
4	IRBTC	20,340	20,781	21,221
5	IRBJD	18,993	19,492	20,437
6	VEL	12,471	12,667	12,863
Total		77,473	79,690	82,352

The above represents reasonable range of fair enterprise valuation of the SPVs.

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8. Additional Procedures to be complied with in accordance with InvIT regulations

8.1. Scope of Work

The Schedule V of the SEBI InvIT Regulations prescribes the minimum set of mandatory disclosures to be made in the valuation report. In this reference, the minimum disclosures in valuation report may include following information as well, so as to provide the investors with the adequate information about the valuation and other aspects of the underlying assets of the InvIT.

The additional set of disclosures, as prescribed under Schedule V of InvIT Regulations, to be made in the valuation report of the SPVs are as follows:

- List of one-time sanctions/approvals which are obtained or pending;
- List of up to date/overdue periodic clearances;
- Statement of assets included;
- Estimates of already carried as well as proposed major repairs and improvements along with estimated time of completion;
- Revenue pendencies including local authority taxes associated with InvIT asset and compounding charges, if any;
- On-going material litigations including tax disputes in relation to the assets, if any;
- Vulnerability to natural or induced hazards that may not have been covered in town planning/ building control.

8.2. Limitations

This Report is based on the information provided by the representatives of the Investment Manager. The exercise has been restricted and kept limited to and based entirely on the documents, records, files, registers and information provided to me. I have not verified the information independently with any other external source.

I have assumed the genuineness of all signatures, the authenticity of all documents submitted to me as original, and the conformity of the copies or extracts submitted to me with that of the original documents.

I have assumed that the documents submitted to me by the representatives of Investment Manager in connection with any particular issue are the only documents related to such issue.

I have reviewed the documents and records from the limited perspective of examining issues noted in the scope of work and I do not express any opinion as to the legal or technical implications of the same.

8.3. Analysis of Additional Set of Disclosures for the SPVs

A. List of one-time sanctions/approvals which are obtained or pending:

The list of such sanctions/ approvals obtained by the SPVs till 3^{1st} March 2024 is provided in Appendix 3

B. List of up to date/ overdue periodic clearances:

The Investment Manager has confirmed that the SPVs are not required to take any periodic clearances and hence there are no up to date/ overdue periodic clearances as on 31st March 2024.

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C. **Statement of assets included:**

The details of assets of the SPVs as at 31st March 2024 are as mentioned below:

					INR Mn
Sr. No.	SPVs	Net Fixed Assets	Net Intangible Assets	Other Non - Current Assets	Current Assets
1	MVR	10	1,278	-	55
2	IRBPA	0	11,866	-	4,562
3	IRBTA	1	5,465	-	41
4	IRBTC	0	10,594	0	46
5	IRBJD	0	12,994	-	24
6	VEL			12,739	1,652

D. **Estimates of already carried as well as proposed major repairs and improvements along with estimated time of completion:**

I have been informed that maintenance is regularly carried out by SPVs in order to maintain the working condition of the assets.

							INR Mn
SPVs	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24
MVR	-	-	54	-	-	-	102.20
IRBPA	-	-	265	313	218	-	-
IRBTA	-	-	28	4	228	236	-
IRBTC	-	-	185	-	-	-	-
IRBJD	-	-	318	324	-	-	-

Source: Investment Manager

Forecasted major repairs

							INR Mn
SPVs	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31
MVR	174	-	-	-	-	-	-
IRBPA	326	296	81	-	151	475	-
IRBTA	-	-	-	336	416	50	-
IRBTC	435	-	-	-	-	553	-
IRBJD	-	-	776	843	1,104	228	-

SPVs	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38
MVR	-	-	-	-	-	-	-
IRBPA	-	-	-	-	-	-	-
IRBTA	-	-	493	575	-	-	-
IRBTC	-	-	-	890	-	-	-
IRBJD	-	131	1,183	754	-	-	-

SPVs	FY 39	FY 40	FY 41	FY 42
MVR	-	-	-	-
IRBPA	-	-	-	-
IRBTA	-	-	-	-
IRBTC	-	-	-	-
IRBJD	-	-	-	-

Source: Investment Manager

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E. Revenue pendencies including local authority taxes associated with InvIT asset and compounding charges, if any:

Investment Manager has informed me that there are no material dues including local authority taxes (such as Municipal Tax, Property Tax, etc.) pending to be payable to the government authorities with respect to the SPVs (InvIT assets).

F. On-going material litigations including tax disputes in relation to the assets, if any:

As informed by the Investment Manager, no key changes have occurred from the previous valuation report in the list of all material litigations, (including tax litigations, if any) against the SPVs. As informed by the Investment Manager, the status of ongoing litigations are updated in Appendix 4. Investment Manager has informed us that it expects majority of the cases to be settled in favour of SPVs. Further, Investment Manager has informed us that majority of the cases are having low to medium risk and accordingly no material outflow is expected against the litigations. As represented by the Investment Manager, the Sponsor would indemnify the Trust and its SPVs against any financial losses suffered or incurred in connection with any pending or threatened claims against the Trust made prior to the transfer of the assets to the Trust.

I was not provided with the documents for certain cases as mentioned in the below table:

Sr. No.	SPVs	No. of Cases	Remarks
1	MVR	4	Documents not provided
2	IRBPA	4	Documents not provided
3	IRBTC	1	Documents not provided
4	IRBJD	3	Documents not provided
5	VEL	1	Documents not provided

Hence, I have relied on the Investment Manager with respect to the current status of the abovementioned cases.

G. Vulnerability to natural or induced hazards that may not have been covered in town planning/ building control:

Investment Manager has confirmed to me that there are no such natural or induced hazards which have not been considered in town planning/ building control.

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9. Sources of Information

- 9.1. For the purpose of undertaking this valuation exercise, I have relied on the following sources of information provided by the Investment Manager:
- a. Unaudited provisional financial statements of the SPVs as on 31st March 2024;
 - b. Projected financial information for the remaining project life for each of the SPVs;
 - c. Toll Revenue And O&M Cost Projection Report prepared by M/s GMD Consultants for all the SPVs;
 - d. Details of brought forward losses and MAT credit (as per Income Tax Act) of the SPVs as at 31st March 2024;
 - e. Details of Written Down Value (WDV) (as per Income Tax Act) of assets as at 31st March 2024;
 - f. Concession Agreement of each of the SPVs with NHAI;
 - g. Operation & Maintenance Work Order for each of the SPVs with the Sponsor dated 27th May 2019;
 - h. List of licenses / approvals, details of tax litigations, civil proceeding and arbitrations of the SPVs;
 - i. Details of projected Repairs and Capital Expenditure (Capex);
 - j. As on 31st March 2024, IRB InvIT Fund holds equity stake in the SPVs as mentioned in the Section 3 of this Report. As represented to us by the Investment Manager, there are no changes in the shareholding pattern from 31st March 2024 to the date of issuance of this Report;
 - k. Management Representation Letter by the Investment Manager dated 30th April 2024;
 - l. Relevant data and information about the SPVs provided to us by the Investment Manager either in written or oral form or in the form of soft copy;
 - m. Information provided by leading database sources, market research reports and other published data.
- 9.2. The information provided to me by the Investment Manager in relation to the SPVs included but not limited to historical financial statements, forecasts/projections, other statements and assumptions about future matters like forward-looking financial information prepared by the Investment Manager. The forecasts and projections as supplied to me are based upon assumptions about events and circumstances which are yet to occur.
- 9.3. I have not tested individual assumptions or attempted to substantiate the veracity or integrity of such assumptions in relation to the forward-looking financial information, however, I have made sufficient enquiries to satisfy myself that such information has been prepared on a reasonable basis.
- 9.4. Notwithstanding anything above, I cannot provide any assurance that the forward looking financial information will be representative of the results which will actually be achieved during the cash flow forecast period.

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8. Exclusions and Limitations

- a. My Report is subject to the limitations detailed hereinafter. This Report is to be read in totality, and not in parts, in conjunction with the relevant documents referred to herein.
- b. Valuation analysis and results are specific to the purpose of valuation and is not intended to represent value at any time other than the valuation date of 31st March 2024 ("Valuation Date") mentioned in the Report and as per agreed terms of my engagement. It may not be valid for any other purpose or as at any other date. Also, it may not be valid if done on behalf of any other entity.
- c. This Report, its contents and the results are specific to (i) the purpose of valuation agreed as per the terms of my engagements; (ii) the Valuation Date and (iii) are based on the financial information of the SPVs till 31st March 2024 . The Investment Manager has represented that the business activities of the SPVs have been carried out in normal and ordinary course between 31st March 2024 and the Report Date and that no material changes have occurred in the operations and financial position between 31st March 2024 and the Report date.
- d. The scope of my assignment did not involve me performing audit tests for the purpose of expressing an opinion on the fairness or accuracy of any financial or analytical information that was provided and used by me during the course of my work. The assignment did not involve me to conduct the financial or technical feasibility study. I have not done any independent technical valuation or appraisal or due diligence of the assets or liabilities of the SPVs or any of other entity mentioned in this Report and have considered them at the value as disclosed by the SPVs in their regulatory filings or in submissions, oral or written, made to me.
- e. In addition, I do not take any responsibility for any changes in the information used by me to arrive at my conclusion as set out herein which may occur subsequent to the date of my Report or by virtue of fact that the details provided to me are incorrect or inaccurate.
- f. I have assumed and relied upon the truth, accuracy and completeness of the information, data and financial terms provided to me or used by me; I have assumed that the same are not misleading and do not assume or accept any liability or responsibility for any independent verification of such information or any independent technical valuation or appraisal of any of the assets, operations or liabilities of the SPVs or any other entity mentioned in the Report. Nothing has come to my knowledge to indicate that the material provided to me was misstated or incorrect or would not afford reasonable grounds upon which to base my Report.
- g. This Report is intended for the sole use in connection with the purpose as set out above. It can however be relied upon and disclosed in connection with any statutory and regulatory filing in connection with the provision of SEBI InvIT Regulations. However, I will not accept any responsibility to any other party to whom this Report may be shown or who may acquire a copy of the Report, without my written consent.
- h. It is clarified that this Report is not a fairness opinion under any of the stock exchange/ listing regulations. In case of any third party having access to this Report, please note this Report is not a substitute for the third party's own due diligence/ appraisal/ enquiries/ independent advice that the third party should undertake for his purpose.
- i. Further, this Report is necessarily based on financial, economic, monetary, market and other conditions as in effect on, and the information made available to me or used by me up to, the date hereof. Subsequent developments in the aforementioned conditions may affect this Report and the assumptions made in preparing this Report and I shall not be obliged to update, revise or reaffirm this Report if information provided to me changes.
- j. This Report is based on the information received from the sources as mentioned in Section 9 of this Report and discussions with the Investment Manager. I have assumed that no information has been withheld that could have influenced the purpose of my Report.
- k. Valuation is not a precise science and the conclusions arrived at in many cases may be subjective and dependent on the exercise of individual judgment. There is, therefore, no indisputable single value. I have arrived at an indicative EV based on my analysis. While I have provided an assessment of the value based on an analysis of information available to me and within the scope of my engagement, others may place a different value on this business.
- l. Any discrepancies in any table / appendix between the total and the sums of the amounts listed are due to rounding-off.
- m. Valuation is based on estimates of future financial performance or opinions, which represent reasonable expectations at a particular point of time, but such information, estimates or opinions are not offered as predictions or as assurances that a particular level of income or profit will be achieved, a particular event will

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- occur or that a particular price will be offered or accepted. Actual results achieved during the period covered by the prospective financial analysis will vary from these estimates and the variations may be material.
- n. I do not carry out any validation procedures or due diligence with respect to the information provided/extracted or carry out any verification of the assets or comment on the achievability and reasonableness of the assumptions underlying the financial forecasts, save for satisfying ourselves to the extent possible that they are consistent with other information provided to me in the course of this engagement.
 - o. My conclusion assumes that the assets and liabilities of the SPVs, reflected in their respective latest balance sheets remain intact as of the Report date.
 - p. Whilst all reasonable care has been taken to ensure that the factual statements in the Report are accurate, neither myself, nor any of my associates, officers or employees shall in any way be liable or responsible either directly or indirectly for the contents stated herein. Accordingly, I make no representation or warranty, express or implied, in respect of the completeness, authenticity or accuracy of such factual statements. I expressly disclaim any and all liabilities, which may arise based upon the information used in this Report. I am not liable to any third party in relation to the issue of this Report.
 - q. The scope of my work has been limited both in terms of the areas of the business & operations which I have reviewed and the extent to which I have reviewed them. There may be matters, other than those noted in this Report, which might be relevant in the context of the transaction and which a wider scope might uncover.
 - r. For the present valuation exercise, I have also relied on information available in public domain; however the accuracy and timelines of the same has not been independently verified by me.
 - s. In the particular circumstances of this case, my liability (in contract or under any statute or otherwise) for any economic loss or damage arising out of or in connection with this engagement, however the loss or damage caused, shall be limited to the amount of fees actually received by me from the Investment Manager, as laid out in the engagement letter for such valuation work.
 - t. In rendering this Report, I have not provided any legal, regulatory, tax, accounting or actuarial advice and accordingly I do not assume any responsibility or liability in respect thereof.
 - u. This Report does not address the relative merits of investing in InvIT as compared with any other alternative business transaction, or other alternatives, or whether or not such alternatives could be achieved or are available.
 - v. I am not an advisor with respect to legal, tax and regulatory matters for the proposed transaction. No investigation of the SPVs' claim to title of assets has been made for the purpose of this Report and the SPVs' claim to such rights have been assumed to be valid. No consideration has been given to liens or encumbrances against the assets, beyond the loans disclosed in the accounts. Therefore, no responsibility is assumed for matters of a legal nature.
 - w. I have no present or planned future interest in the Trustee, Investment Manager or the SPVs and the fee for this Report is not contingent upon the values reported herein. My valuation analysis should not be construed as investment advice; specifically, I do not express any opinion on the suitability or otherwise of entering into any financial or other transaction with the Investment Manager or SPVs.
 - x. I have submitted the draft valuation report to the Trust and Investment Manager for confirmation of accuracy of the factual data used in my analysis and to prevent any error or inaccuracy in this Report.

Limitation of Liabilities

- y. It is agreed that, having regard to the RV's interest in limiting the personal liability and exposure to litigation of its personnel, the Sponsor, the Investment Manager and the Trust will not bring any claim in respect of any damage against any of RV personally.
- z. In no circumstances RV shall be responsible for any consequential, special, direct, indirect, punitive or incidental loss, damages or expenses (including loss of profits, data, business, opportunity cost, goodwill or indemnification) in connection with the performance of the services whether such damages are based on breach of contract, tort, strict liability, breach of warranty, negligence, or otherwise, even if the Investment Manager had contemplated and communicated to RV the likelihood of such damages. Any decision to act upon the deliverables (including this Report) is to be made by the Investment Manager and no communication by RV should be treated as an invitation or inducement to engage the Investment Manager to act upon the deliverable(s).

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- aa. It is clarified that the Investment Manager will be solely responsible for any delays, additional costs, or other liabilities caused by or associated with any deficiencies in their responsibilities, misrepresentations, incorrect and incomplete information including information provided to determine the assumptions.
- bb. RV will not be liable if any loss arises due to the provision of false, misleading or incomplete information or documentation by the Investment Manager.
- cc. Further, this Report is necessarily based on financial, economic, monetary, market and other conditions as in effect on, and the information made available to me or used by me up to, the date hereof. Subsequent developments in the aforementioned conditions may affect this Report and the assumptions made in preparing this Report and I shall not be obliged to update, revise or reaffirm this Report if information provided to me changes.

Yours faithfully,

SWAMINATHA Digitally signed by
N SWAMINATHAN
SUNDARARAM SUNDARARAMAN
AN Date: 2024.04.30
14:46:07 +05'30'

S. Sundararaman

Registered Valuer

IBBI Registration No.: IBBI/RV/06/2018/10238

Asset Class: Securities or Financial Assets

Place: Chennai

UDIN: 24028423BKGAAL2075

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Appendix 1 – Valuation of SPVs as on 31st March 2024

Abbreviations	Meaning
EBITDA	Operating Earnings Before Interest, Taxes, Depreciation and Amortization
MME Provision	Provision for Major Maintenance Expenses recorded in SPVs' Books
MME	Actual Major Maintenance Expenses incurred during the year
Capex	Capital Expenditure
Wcap	Incremental Working Capital
FCFF	Free Cash Flow to the Firm
CAF	Cash Accrual Factor
DF	Discounting Factor
PVFCFF	Present value of Free Cash Flow to the Firm

Appendix 1.1 – Valuation of MVR as on 31st March 2024 under the DCF Method

													INR Mn
Year	Book Revenue	EBITDA	MMR Provision	MMR Expense	Capex	Change in Wcap	Tax	FCFF	CAF	WACC	DF	PVFCFF	
		A	B	C	D	E	F	G=A-B-C-D-E-F	H	I	J	K=G*J	
FY 25	1,421	1,352	62	174	-	-	149	1,030	0.50	9.90%	0.95	982	
FY 26	1,521	1,449	62	-	-	-	171	1,278	1.50	9.90%	0.87	1,109	
FY 27*	1,290	1,214	62	-	-	-	145	1,069	2.39	9.90%	0.80	853	
Enterprise Value												2,945	
PV of WC Realised												5	
Enterprise Value												2,950	

Appendix 1.2 – Valuation of IRBPA as on 31st March 2024 under the DCF Method

													INR Mn
Year	Book Revenue	EBITDA	MMR Expense	Capex	Change in Wcap	Tax	FCFF	CAF	WACC	DF	PVFCFF		
		A	B	C	D	E	F=A-B-C-D-E	G	H	I	J=F*I		
FY25	1,756	1,494	326	-	(285)	160	1,292	0.50	11.31%	0.95	1,224		
FY26	1,944	1,668	296	-	-	183	1,190	1.50	11.31%	0.85	1,013		
FY27	2,158	1,869	81	-	-	208	1,580	2.50	11.31%	0.77	1,209		
FY28	2,387	2,081	-	-	-	236	1,845	3.50	11.31%	0.69	1,268		
FY29	2,613	2,292	151	-	-	263	1,878	4.50	11.31%	0.62	1,160		
FY30	2,873	2,536	475	-	-	295	1,767	5.50	11.31%	0.55	980		
FY31	3,166	2,872	-	-	-	341	2,532	6.50	11.31%	0.50	1,262		
FY32	3,499	3,197	-	-	-	383	2,814	7.50	11.31%	0.45	1,260		
FY33	3,796	3,486	-	-	-	421	3,066	8.50	11.31%	0.40	1,233		
FY34	4,144	3,826	-	-	-	465	3,361	9.50	11.31%	0.36	1,215		
FY35	4,524	4,198	-	-	-	513	3,685	10.50	11.31%	0.32	1,196		
FY36	4,961	4,617	-	-	-	948	3,669	11.50	11.31%	0.29	1,070		
FY37	5,393	5,051	-	-	-	1,157	3,894	12.50	11.31%	0.26	1,020		
FY38*	4,459	4,186	-	-	-	967	3,220	13.38	11.31%	0.24	768		
Enterprise Value												15,879	
PV of WC Realised												15	
Enterprise Value												15,895	

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Appendix 1.3 – Valuation of VEL as on 31st March 2024 under the DCF Method

										INR Mn
Year	Book Revenue	Cash EBITDA	Capex	Change in Wcap	Tax	FCFF	CAF	WACC	DF	PVFCFF
	A	B	C	D	E=A-B-C-D	F	G	H	I=E*H	
FY25	988	934	-	-	-	934	0.04	7.82%	1.00	931
FY25	982	926	-	-	-	926	0.54	7.82%	0.96	889
FY25	976	920	-	-	-	920	1.04	7.82%	0.92	851
FY 26	969	900	-	-	-	900	1.54	7.82%	0.89	802
FY 26	963	894	-	-	-	894	2.04	7.82%	0.86	767
FY 27	957	860	-	-	-	860	2.54	7.82%	0.83	710
FY 27	950	853	-	-	-	853	3.04	7.82%	0.80	679
FY 28	943	869	-	-	-	869	3.54	7.82%	0.77	665
FY 28	937	862	-	-	5	857	4.04	7.82%	0.74	632
FY 29	929	864	-	-	161	704	4.54	7.82%	0.71	500
FY 29	922	857	-	-	159	698	5.04	7.82%	0.68	478
FY 30	913	846	-	-	170	676	5.54	7.82%	0.66	445
FY 30	906	838	-	-	168	670	6.04	7.82%	0.63	425
FY 31	897	828	-	-	176	652	6.54	7.82%	0.61	398
FY 31	888	819	-	-	174	645	7.04	7.82%	0.59	380
FY 32	880	795	-	-	176	619	7.54	7.82%	0.57	351
FY 32	871	786	-	-	174	612	8.04	7.82%	0.55	334
FY 33	862	746	-	-	170	576	8.55	7.82%	0.53	303
FY 33	851	735	-	-	167	568	9.04	7.82%	0.51	288
FY 34	841	751	-	-	175	575	9.55	7.82%	0.49	280
FY 34	831	740	-	-	173	567	10.04	7.82%	0.47	266
FY 35	812	733	-	-	174	559	10.55	7.82%	0.45	253
FY 35	783	705	-	-	167	537	11.04	7.82%	0.44	234
FY 36	781	700	-	-	169	532	11.55	7.82%	0.42	223
FY 36	789	708	-	-	171	538	12.04	7.82%	0.40	217
FY 37	762	714	-	-	174	540	12.55	7.82%	0.39	210
FY 37	730	682	-	-	166	516	13.04	7.82%	0.37	193
Enterprise Value										12,705
PV of WC Realised										-38
Enterprise Value										12,667

Appendix 1.4 – Valuation of IRBTA as on 31st March 2024 under the DCF Method

											INR Mn
Year	Book Revenue	EBITDA	MMR Expense	Capex	Change in Wcap	Tax	FCFF	CAF	WACC	DF	PVFCFF
		A	B	C	D	E	F=A-B-C-D-E	G	H	I	J=I*F
FY25	947	788	-	-	-	79	709	0.50	10.90%	0.95	673
FY26	1,049	882	-	-	-	91	790	1.50	10.90%	0.86	677
FY27	1,161	986	-	-	-	105	881	2.50	10.90%	0.77	680
FY28	1,287	1,103	336	-	-	120	647	3.50	10.90%	0.70	450
FY29	1,419	1,225	416	-	-	137	672	4.50	10.90%	0.63	422
FY30	1,567	1,364	50	-	-	168	1,145	5.50	10.90%	0.57	648
FY31	1,731	1,464	-	-	-	151	1,313	6.50	10.90%	0.51	671
FY32	1,900	1,619	-	-	-	171	1,448	7.50	10.90%	0.46	667
FY33	2,096	1,801	-	-	-	195	1,606	8.50	10.90%	0.42	667
FY34	2,295	1,986	493	-	-	220	1,274	9.50	10.90%	0.37	477
FY35	2,531	2,207	575	-	-	249	1,382	10.50	10.90%	0.34	467
FY36	2,787	2,445	-	-	-	318	2,127	11.50	10.90%	0.30	647
FY37	3,046	2,687	-	-	-	350	2,337	12.50	10.90%	0.27	641
FY38**	575	510	-	-	-	67	443	13.09	10.90%	0.26	115
Enterprise Value											7,902
PV of WC Realised											3
Enterprise Value											7,905

Appendix 1.5 – Valuation of IRBTC as on 31st March 2024 under the DCF Method

											INR Mn		
Year	Book Revenue	EBITDA	MMR Expense	Premium Payment to NHAI	Revenue Share to NHAI	Capex	Change in Wcap	Tax	FCFF	CAF	WACC	DF	PVFCFF
		A	B	C	D	E	F	G	H=A-B-C-D-E-F-G	I	J	K	L=H*K
FY 25	4,026	3,916	435	2,647	-	-	-	419	415	0.50	10.77%	0.95	395
FY 26	4,431	4,319	-	3,100	-	-	-	464	754	1.50	10.77%	0.86	647
FY 27	4,889	4,769	-	3,551	-	-	-	515	704	2.50	10.77%	0.77	545
FY 28	5,426	5,298	-	4,079	-	-	-	574	644	3.50	10.77%	0.70	450
FY 29	5,975	5,839	-	4,621	-	-	-	635	583	4.50	10.77%	0.63	368
FY 30	6,587	6,445	553	4,676	-	-	-	703	512	5.50	10.77%	0.57	292
FY 31	7,229	7,049	-	5,896	-	-	-	758	395	6.50	10.77%	0.51	203
FY 32	7,972	7,782	-	6,770	-	-	-	841	171	7.50	10.77%	0.46	80
FY 33	8,782	8,582	-	4,399	-	-	-	931	3,252	8.50	10.77%	0.42	1,363
FY 34	9,637	9,427	-	4,107	-	-	-	1,026	4,294	9.50	10.77%	0.38	1,624
FY 35	10,580	10,359	890	4,312	-	-	-	1,131	4,026	10.50	10.77%	0.34	1,375
FY 36	11,602	11,372	-	4,528	-	-	-	1,277	5,568	11.50	10.77%	0.31	1,716
FY 37	12,671	12,421	-	4,754	-	-	-	1,394	6,272	12.50	10.77%	0.28	1,745
FY 38	13,871	13,608	-	787	4,205	-	-	794	7,822	13.50	10.77%	0.25	1,965
FY39	15,216	14,940	-	-	5,242	-	-	2,354	7,345	14.50	10.77%	0.23	1,666
FY40	16,681	16,391	-	-	5,504	-	-	2,653	8,234	15.50	10.77%	0.20	1,686
FY41	18,172	17,868	-	-	5,779	-	-	2,956	9,133	16.50	10.77%	0.18	1,688
FY42	19,810	19,491	-	-	6,068	-	-	3,291	10,132	17.50	10.77%	0.17	1,690
FY43	16,153	15,903	-	-	4,779	-	-	2,735	8,389	18.37	10.77%	0.15	1,280
NPV of Explicit Period													20,777
PV of WC Realised													3
Enterprise Value													20,781

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Appendix 1.6– Valuation of IRBJD as on 31st March 2024 under the DCF Method

Year	Book Revenue	EBITDA	MMR Expense	Capex	Change in Wcap	Tax	FCFF	CAF	WACC	DF	INR Mn									
											A	B	C	D	E	F=A-B-C-D-E	G	H	I	J=F*I
FY 25	1,963	1,781	-	-	-	181	1,600	0.50	10.79%	0.95	1,520									
FY 26	2,163	1,967	-	-	-	208	1,759	1.50	10.79%	0.86	1,509									
FY 27	2,390	2,184	776	-	-	238	1,169	2.50	10.79%	0.77	905									
FY 28	2,637	2,421	843	-	-	272	1,306	3.50	10.79%	0.70	913									
FY 29	2,887	2,660	1,104	-	-	306	1,251	4.50	10.79%	0.63	789									
FY 30	3,175	2,936	228	-	-	373	2,335	5.50	10.79%	0.57	1,329									
FY 31	3,456	3,096	-	-	-	360	2,736	6.50	10.79%	0.51	1,406									
FY 32	3,798	3,413	-	-	-	405	3,008	7.50	10.79%	0.46	1,395									
FY 33	4,121	3,716	131	-	-	447	3,138	8.50	10.79%	0.42	1,314									
FY 34	4,511	4,086	1,183	-	-	500	2,403	9.50	10.79%	0.38	908									
FY 35	4,919	4,473	754	-	-	554	3,164	10.50	10.79%	0.34	1,079									
FY 36	5,359	4,889	-	-	-	686	4,204	11.50	10.79%	0.31	1,294									
FY 37	5,792	5,299	-	-	-	744	4,555	12.50	10.79%	0.28	1,266									
FY 38	6,278	5,760	-	-	-	1,331	4,430	13.50	10.79%	0.25	1,111									
FY 39	6,817	6,274	-	-	-	1,460	4,814	14.50	10.79%	0.23	1,090									
FY 40	7,414	6,841	-	-	-	1,603	5,239	15.50	10.79%	0.20	1,071									
FY 41*	4,461	4,125	-	-	-	972	3,154	16.28	10.79%	0.19	595									
Enterprise Value											19,492									
PV of WC Realised											0									
Enterprise Value											19,492									

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Appendix 2 – Weighted Average Cost of Capital of the SPVs as on 31st March 2024

Particulars	MVR	IRBPA	IRBTA	IRBTC	IRBJD	VEL	Remarks
Risk Free Rate (Rf)	6.97%	6.97%	6.97%	6.97%	6.97%	6.97%	Risk Free Rate has been considered based on zero coupon yield curve as at 31 st March 2024 of Government Securities having maturity period of 10 years, as quoted on the website of Clearing Corporation of India Ltd (CCIL)
Equity Risk Premium (ERP)	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	Based on historical realized returns on equity investments over a risk free rate represented by 10 years government bonds, a 7% equity risk premium is considered appropriate for India
Beta (relevered)	0.78	0.77	0.78	0.77	0.77	0.48	Beta has been considered based on the beta of companies operating in the similar kind of business in India
Base Cost of Equity	12.40%	12.36%	12.40%	12.34%	12.35%	10.32%	Base Ke = Rf + ERP * β
Company Specific Risk Premium (CSRP)	0.00%	3.00%	2.00%	2.00%	2.00%	0.00%	Based on SPV specific risk(s)
Adjusted Cost of Equity (Ke)	12.40%	15.36%	14.40%	14.34%	14.35%	10.32%	Adjusted Ke = Rf + ERP * β + CSRP
Pre-tax Cost of Debt (Kd)	8.96%	8.96%	8.96%	8.96%	8.96%	8.20%	As represented by the Investment Manager
Tax rate of SPV	17.47%	18.95%	17.47%	19.50%	19.28%	17.77%	Tax Rate Applicable to SPV is considered
Post-tax Cost of Debt	7.39%	7.26%	7.39%	7.21%	7.23%	6.75%	Post-tax Kd = Pre-tax Kd * (1-Tax rate)
Debt / (Debt + Equity)	50%	50%	50%	50%	50%	70%	Debt : Equity ratio computed as [D/(D+E)] is considered as per Industry Standards
WACC	9.90%	11.31%	10.90%	10.77%	10.79%	7.82%	WACC = [Ke * (1 - D/(D+E))] + [Kd * (1-t) * D/(D+E)]

Strictly Private and Confidential**Appendix 3.1 – MVR: Summary of approval and licences**

Sr. No.	Description of the permits	Issuing Authority	Validity/ Current status
1	Licence No. CLRA/ALCCHENNAI/2020/L-116/ under the Contract Labour (Regulation and Abolition) Act, 1971, dated 03.08.2021	Regional Labour Commissioner (Central), Chennai	Valid up to 03.08.2024
2	Certificate for registration of DG Sets (40KVA and 125KVA no. 03/2012-13)	Government of Tamil Nadu, Electrical Inspector, Salem	Valid up to 02.05.2024

Source: Investment Manager

Appendix 3.2 – IRBPA: Summary of approval and licences

Sr. No.	Description of the permits	Issuing Authority	Validity/ Current status
1	Labour License for Contract Labours 46 (L-112)/2013/ALK dated 25.07.2023	Office of the Assist. Labour Commissioner, Jalandhar	Valid up to 01.09.2024
2	Inspection Certificate, WIM at Ladpalwan Toll Plaza (9 Nos.) and Receipt No. 230309036, LMUR No.-30202305575, VC S no. 9120230309136	Controller Legal Metrology, Punjab, Pathankot	Valid up to 19.06.2024
3	Inspection Certificate, WIM at Ladpalwan Toll Plaza (1 Nos.) and Receipt No. 230309122, LMUR No.30202305575, VC S no. 9120230309217	Controller Legal Metrology, Punjab, Pathankot	Valid up to 05.07.2024
4	Inspection Certificate, Static Weigh Bridge at Ladpalwan Toll Plaza PTK & ASR Side LMUR No. 37202071327, VC S. no. 9120220377647 and Fee Receipt No. 220377624	Controller Legal Metrology, Punjab, Pathankot	Valid up to 27.11.2024
5	Inspection Certificate, WIM at Waryam Nangal Toll (9 Nos.) LMUR No. 28202382606, VC S no.9120230283200 Fee Receipt 230282695	Controller Legal Metrology, Punjab, Amritsar	Valid up to 07.08.2024
6	Inspection Certificate, WIM at Waryam Nangal Toll (1 Nos.) LMUR No. 25202358066, VC S no.91202302563126 Fee Receipt 230251547	Controller Legal Metrology, Punjab, Amritsar	Valid up to 21.03.2025
7	Inspection Certificate, Static Weigh Bridge at Waryam Nangal Toll Plaza PTK & ASR Side LMUR No. 26202062518, VC S. no. 91202202622728 and Fee Receipt No. 220262999	Controller Legal Metrology, Punjab, Amritsar	Valid up to 10.10.2024

Source: Investment Manager

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Appendix 3.3 – IRBTA: Summary of approval and licences

Sr. No.	Description of the permits	Issuing Authority	Validity/ Current status
1	Principle employer registration - No. (Labour License No.ALCN/46(L)/158/2010-CL, dated 26.11.2010)	Office the Regional Labour, Nagpur	Valid upto 20.12.2024
2	License for Building & Other Construction activities No. (ALCN/42 (R)/150/2010/BOCW, dated 21.12.2010)	Office the Regional Labour, Nagpur	Valid upto 02.09.2032

Source: *Investment Manager*

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Appendix 3.4 – IRBTC: Summary of approval and licences

Sr. No.	Description of the permits	Issuing Authority	Validity/ Current status
1	Labour License for Contract Labours Licence no. 46(97)2011.B3 /2011 dated 28.02.2024	Office of the Assist. Labour Commissioner, Bangalore	Valid up to 30.03.2025
2	Labour License for Contract Labours Licence no. 33/2011-AH dated 26.02.2024	Office of the Assist. Labour Commissioner, Hubli	Valid up to 05.04.2025
3	Inspection Certificate, Iron hexagon weight at GuilaluToll Plaza and Receipt No. 2201110944, LCR No.-AC11046 SI no. 91202201110329	Controller Legal Metrology, Karnataka	Valid up to 05.08.2024
4	Inspection Certificate, WIM Lane 2 and 9 at Guilalu Toll Plaza and Receipt No. 2401112786, LCR No.-AC024202315918 SI no. 91202401112002	Controller Legal Metrology, Karnataka	Valid up to 19.03.2025
5	Inspection Certificate, WIM at Lane 1 and 7at Guilalu Toll Plaza and Receipt No. 2401112678, LCR No.-AC024202315918 SI no. 91202401111901	Controller Legal Metrology, Karnataka	Valid up to 26.02.2025
6	Inspection Certificate, WIM at Lane 3 and 8 at Guilalu Toll Plaza and Receipt No. 2301111772, LCR No.-AC024202315918 SI no. 91202301111050	Controller Legal Metrology, Karnataka	Valid up to 19.04.2024
7	Inspection Certificate, WIM at Lane 4 and 10 at Guilalu Toll Plaza and Receipt No. 2301111792, LCR No.-AC024202315918 SI no. 91202301111068	Controller Legal Metrology, Karnataka	Valid up to 02.05.2024
8	Inspection Certificate, WIM at Lane 5 and 6 at GuilaluToll Plaza and Receipt No. 2301112133, LCRNo.AC11046 SI no. 91202301111388	Controller Legal Metrology, Karnataka	Valid up to 15.09.2024
9	Inspection Certificate, WIM at Lane 11 and 12 at Guilalu Toll Plaza and Receipt No. 2301112063, LCR No.-AC11046 SI no. 91202301111325	Controller Legal Metrology, Karnataka	Valid up to 10.08.2024
10	Inspection Certificate, Static weigh bridge towards Chitradurga at Guilalu Toll Plaza and Receipt No. 2301111763, LCR No.-AC11046 SI no. 91202301111042	Controller Legal Metrology, Karnataka	Valid up to 17.04.2024
11	Inspection Certificate, Static weigh bridge towards Tumkur at Guilalu Toll Plaza and Receipt No. 2301112371, LCR No.-AC11046 SI no. 91202301111608	Controller Legal Metrology, Karnataka	Valid up to 03.12.2024

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12	Inspection Certificate, WIM at Lane 2 and 9 at Karjevvanahally Toll Plaza and Receipt No. 2403515264, LCR No.-AC51251 SI no. 91202403519109	Controller Legal Metrology, Karnataka	Valid up to 27.02.2025
13	Inspection Certificate, WIM at Lane 8 and 3 at Karjevvanahally Toll Plaza and Receipt No. 2403515368, LCR No.-AC51251 SI no. 91202403519370	Controller Legal Metrology, Karnataka	Valid up to 22.03.2025
14	Inspection Certificate, WIM at Lane 1 and 7 at Karjevvanahally Toll Plaza and Receipt No. 2303513538, LCR No.-AC 51251 SI no. 91202403519360	Controller Legal Metrology, Karnataka	Valid up to 23.04.2024
15	Inspection Certificate, WIM at Lane 4 and 10 at Karjevvanahally Toll Plaza and Receipt No. 2303513567, LCR No.-AC51251 SI no. 91202403516118	Controller Legal Metrology, Karnataka	Valid up to 01.05.2024
16	Inspection Certificate, WIM at Lane 5,6,11 and 12 at Karjevvanahally Toll Plaza and Receipt No. 2303514084, LCR No.-AC51251 SI no. 91202403517044	Controller Legal Metrology, Karnataka	Valid up to 07.08.2024
17	Inspection Certificate, Static weighbridge towards Bangalore at Karjevvanahally Toll Plaza and Receipt No. 2403515369, LCR No.-AC51251 SI no. 91202403519371	Controller Legal Metrology, Karnataka	Valid up to 22.03.2025
18	Inspection Certificate, Static weighbridge towards Chitradurga at Karjevvanahally Toll Plaza and Receipt No. 2303514740, LCR No.-AC51251 SI no. 91202403518174	Controller Legal Metrology, Karnataka	Valid up to 14.12.2024

Appendix 3.5 – IRBJD: Summary of approval and licences

Sr. No.	Description of the permits	Issuing Authority	Validity/ Current status
1	Labour License under Contract Labour (Regulation and Abolition) Act, 1970 and Contract Labour (Regulation and Abolition) Contract Rules, 1971		
i	Labour License No.JP-46(153)/2013-RLC,dated 03.10.2013	Regional Labour Commissioner (Central), Jaipur	Valid up to 02.10.2024
2	Provisional permission for energization of Installation (DG) set/Captive power) under Rule 63 & 47 A of Indian Electricity Rules, 1956		
i	Barkheda-Chandlai Toll Plaza	Sr.Electrical Inspector, Jaipur	Valid up to 31.03.2024 (Renewal under Process)

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ii	Sonwa Toll Plaza	Sr.Electrical Inspector, Jaipur	Valid up to 31.03.2024 (Renewal under Process)
3	WIM System		
i	Inspection certificate for Barkheda -Chandlai Toll Plaza	Weigh and Measure Department, Jaipur	Stamping Certificate renewed upto 11.12.2024.
ii	Inspection certificate for Sonwa Toll Plaza	Weigh and Measure Department, Tonk	Stamping Certificate renewed upto 05.12.2024
4	Static Weigh Bridge		
i	Inspection Certificate for Static Weight Bridge at Barkheda-Chandlai Toll Plaza	Weigh and Measure Department, Jaipur	1. Stamping of WBE 44 - Renewed upto 07.01.2025 2. Stamping Certificate for WBE 47 (Tonk Side) Renewed upto 07.01.2025
ii	Inspection Certificate for Static Weight Bridge at Sonwa Toll Plaza	Weigh and Measure Department, Tonk	Stamping of WBE 45 (Jaipur Side) & WBE 46 (Tonk Side): Valid up to 29.11.2024

Source: Investment Manager

Appendix 3.6: VEL: Summary of approval and licences

Sr. No.	Description of the permits	Issuing Authority	Validity/ Current status
1	Clearing of Pollution Control Board	Gujarat Pollution control board	06.12.2017 to 30.09.2024
2	Labour License	Ministry of Labour & Employment	19.12.2024
3	Permission of Village Panchayat and Pollution control board for installation of crushers	Gujarat Pollution control board, Vadodara	18.04.2019 to 25.03.2026

Source: Investment Manager

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Appendix 4: Summary of Ongoing Litigations (1/4)

Sr. No	SPVs	Matter	Pending Before	Particulars	Amount Involved (INR Million)
1	MVR	Civil Litigation	Madras High Court	<p>Background of the case: Certain colleges in Salem (the "Petitioners") have filed 25 writ petitions before the High Court of Madras, against MVR and others (collectively the "Respondents") alleging the legality of act of collecting entry fee at increased rates from college buses. The Petitioners have sought the directions against Respondents to collect entry fee at toll plaza for educational institution vehicles at par with that of school buses. An order was passed by the High Court of Madras, which took into consideration various petitions filed against MVR regarding the above mentioned issue and held that the discounted rates were only applicable to school buses carrying school students and not to college buses. However, the High Court of Madras passed an order granting an interim stay and ordered MVR to collect entry fee from the college buses of the Petitioners at par with the rates applicable to school buses. The matter is currently pending. Current Status: The writ petitions filed by 7 educations are disposed by the high court till date. the rest of the petitions are pending.</p>	Not quantified
2	MVR	Arbitration with NHAI	Arbitration Tribunal	<p>Background of the case: MVR initiated arbitration proceedings against NHAI before the Arbitration Tribunal Consisting of Dr. Arijit Pasayat (Presiding Arbitrator) Mr. S. S. Agarwal and Mr. Navin Kumar for its claim to the tune of Rs. 51.4 Mn (towards positive Change of scope for construction of additional arm of flyover) and Rs. 2.6 Mn (negative Change of Scope on account of deletion of 19 hume pipe culverts). The conciliation meeting between NHAI and MVR meeting was concluded. As NHAI did not respond on the matter, MVR invoked Arbitration proceedings against NHAI. MVR had submitted its statement of claims against NHAI. As per direction of the Court, NHAI deposited Rs 5.39 Crore in the registry of the Delhi High Court on August 22, 2023. The matter is pending.</p> <p>In th meantime NHAI challenged the Award under Section 34 which was dismissed by the Hon'ble Delhi High Court. Subsequently, NHAI appealed against the Section 34 judgment under Section 37 in the Delhi High Court which was also dismissed but with a liberty granted to NHAI to file a review petition against the Section 34 judgment. The matter is pending.</p> <p>Current Status: The Hon'ble Arbitral Tribunal has pronounced the Award in favour of MVR on 17/02/2022 and NHAI was directed to pay Rs 4,89,71,505/- . In terms of the Award, MVR requested NHAI for payment of the awarded amount along with interest @ 8% pa from the date of Award i.e. from 17.02.2022. Subsequently, MVR has filed execution application in the Hon'ble Delhi High Court and directed NHAI to deposit the amount in the registry. As per direction of the Court, MVR withdrew Rs 5.39 Crore from the Court's registry upon submission of the indemnity bond. The matter is pending.</p>	48.9 + interest @ 8% pa wef 17.02.2022
3	MVR	Arbitration with NHAI	Arbitration Tribunal	<p>Background of the case: NHAI had initiated arbitration proceedings against MVR before the Arbitration Tribunal Consisting of Dr. Arijit Pasayat (Presiding Arbitrator) Mr. S. S. Agarwal and Mr. Navin Kumar for its claim to the tune of Rs. 126.1 Mn (towards non construction of second carriageway of a Flyover at km 188.850) and Rs. 77.70 Mn (towards provision of safety barriers in missing location on the Project Highway). The proceedings are in progress.</p> <p>Current Status: The matter is pending.</p>	203.8
4	MVR	Direct Tax Matters	CIT (A)	<p>Background of the case: MVR has received order u/s 143(3) of Income Tax Act, 1961 ("ITA 1981") dated 18 Feb 2014 for A Y 2011-12. The matter pertains to addition on account of recomputation of Long Term Capital Gains u/s 50C and Disallowance of depreciation. Assessing Officer has also levied Interest u/s 234B and 234D of ITA 1981. However, MVR does not accept the views, findings and contentions of the Assessing Officer and has filed an appeal against the order on 14 Mar 2014. MVR also contends that it was entitled for deduction u/s 80-IA but no such deduction was allowed by the Assessing Officer.</p> <p>Current Status: Appeal to the Commissioner of Income-tax (Appeals) has been filed against the order and the same is under process.</p>	9.5

Source: Investment Manager

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Appendix 4: Summary of Ongoing Litigations (2/4)

Sr. No	SPVs	Matter	Pending Before	Particulars	Amount Involved (INR Million)
5	IRBPA	Civil Litigation	NA	<p>Background of the case: IRBPA has initiated arbitration proceedings against NHAI before Arbitration Tribunal consisting of Mr. Ajit Prakash Shah (Presiding Arbitrator), Mr. S S. Agarwal & Mr. Navin Kumar. The claim is for sum of Rs. 2522.5 Mn and extension in concession period by 518 days. IRBPA had submitted its claim on account of losses and requested NHAI for appointment of other Arbitrator. NHAI had refused the request for appointment of arbitrator. As per the provisions of Concession Agreement, IRBPA requested Indian road congress to appoint arbitrator on behalf of NHAI. Subsequently, on NHAI had appointed Mr Navin Kumar as the Arbitrator.</p> <p>Current Status: The Hon'ble Arbitral Tribunal pronounced unanimous Award on July 13, 2021 in favour of IPATRL and granted, i) extension in Concession Period by 518 days; ii) compensation of Rs. 252.251 Cr along with 9% interest w.e.f. November 27, 2014 till the date of realisation; and iii) cost of arbitration of Rs. 1.58 Crores. Further, the Hon'ble Tribunal passed an order on July 27, 2021 incorporating the factual corrections in the Award in response to IPATRL's application under Section 33 of the Arbitration and Conciliation Act 1996. IPATRL submitted a demand to NHAI requesting for implementation of the terms of the said Award. However, NHAI challenged Award in the Delhi High Court and filed a petition under section 34 under Arbitration and Conciliation Act 1996 on November 26, 2021 which was dismissed by the Court on March 8, 2022. IPATRL has served a legal notice for execution of the Award on March 30, 2022. IPATRL had filed application for execution of Section 34 order dated March 8, 2022 in the Delhi High Court. The Court vide its order dated May 20, 2022 had directed NHAI to release 75% of the arbitral amount awarded in terms of the decision of the Cabinet Committee and the SOP within 2 weeks. Pursuant to the Order dated May 20, 2022, IPATRL complied with the SOP of NHAI and submitted a BG of Rs. 317.3 crores on May 24, 2022 towards release of 75% of Payout Amount. Subsequently, NHAI released net amount of Rs. 310.91 crores after statutory deductions.</p> <p>In the meantime, on May 10, 2022, NHAI filed appeal under Section 37 challenging the Delhi High Court (Section 34) order dated March 8, 2022. Subsequently, the Delhi High Court by its order dated July 03, 2023 set aside the Award and Section 34 order. IPATRL had to redeposit the Arbitral amount of Rs. 317.3 crores with NHAI and the BG submitted has been withdrawn. IPATRL filed Special Leave Petition (SLP) in the Supreme Court challenging the Section 37 order of the Delhi High Court. The Supreme Court admitted the SLP and the matter is pending.</p>	2522.5 + interest @ 9% wef 27.11.2014
6	IRBPA	Regulatory Action (ESIC)	NA	<p>Background of the case: Employees' State Insurance Corporation, sub-regional office Marol ("ESIC") issued a notice to IRBPA demanding payment of Rs. 0.08 Mn towards pending employers contributions and employees' contributions required to be paid by IRBPA, in its capacity as the principal employer, under Section 40 read with Section 39 of the Employees' State Insurance Act, 1948. Further, ESIC has also directed IRBPA to show cause as to why the assessment of an amount of Rs. 5.83 Mn towards contributions payable in respect of the employees should not be recovered from IRBPA. IRBPA has replied to the aforementioned notice.</p> <p>Current Status: No further communication has been received in this regard.</p>	5.83
7	IRBPA	Criminal Litigation	HIGH COURT OF PUNJAB AND HARYANA	<p>Background of the case: The Concessionaire had constructed the toll plaza building on the land acquired and handed to the concessionaire by NHAI. Irrigation Distributary was shifted along the boundary of Ladpalwan Toll building. SDO, Irrigation department requested the concessionaire that water is not flowing smoothly in the shifted irrigation distributary and needs to be constructed as per approved drawings. NHAI submitted necessary documents to the irrigation department. Irrigation department did not approve the drawings and been continuously writing to concessionaire and NHAI for disturbed flow of water through Irrigation distributary. Irrigation Department imposed case on employees of Concessionaire with the help of adjacent farmers in the court of Divisional Officer, Gurdaspur for non-smooth flow of water in Irrigation Distributary, who imposed Rs. 20,000/- as penalty on the concessionaire. Hence, writ petition is filed praying to quash the order passed by Divisional Officer, Gurdaspur by which the personal liability of the petitioners has been fixed under Northern India Canal and Drainage Act 1873, etc.</p> <p>Current Status: The matter is pending.</p>	Rs. 20,000/-+

Source: Investment Manager

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Appendix 4: Summary of Ongoing Litigations (3/4)

Sr. No	SPVs	Matter	Pending Before	Particulars	Amount Involved (INR Million)
8	IRBPA	Arbitration with NHAI	Arbitration Tribunal	<p>Background of the case: In the month of September 2020, Government of India passed three new Farm bills in the Parliament. This drew flak among some group of farmers in the state of Haryana who forcefully stopped the operation of the toll plazas in Haryana. IRBPA had notified this event as the Force Majeure under Indirect Political Event and submitted its claim for the period i.e. 01.10.2020 to 15.12.2021 (Farmer's strike/ protest I) amounting to Rs. 121 crores and consequent extension to Concession Period by 441 days in terms of Clause 34.7.2 (b) and 34.6.2 (b) of the Concession Agreement respectively. Since there was no response received from NHAI, IRBPA crystallised this matter as the dispute and subsequently invoked arbitration as per Clause 44.3 of the Concession Agreement. Thereafter, during 17.11.2023 to 25.11.2022 and 15.12.2022 to 15.01.2023 (Farmer's strike/ protest II), the toll collection was affected due to Farmer's agitation against the State Govt. IRBPA filed claim for extension of Concession Period by 32.28 days and compensation of Force Majeure cost of Rs 7.19 Crore.</p> <p>Current Status: NHAI released partial amount of Rs. 36.03 Crore on 25.08.2022 and approved extension of Concession Period by 436 days. However, IRBPA has requested NHAI to resume conciliation through CCIE for resolution of the dispute with respect to the balance dues and extension in Concession Period. Till then Arbitration is kept in abeyance and both the above referred claims of IRBPA were taken up with CCIE for conciliation but the conciliation failed. Subsequently, IRBPA reinvoked the arbitration on 16.02.2023. IRBPA filed a consolidated claim towards Farmer's protest I & II amounting to Rs. 111.62 Cr (Rs 92.44 Cr + interest of Rs 19.18 Cr upto 31.03.2023) & execution of Supplementary Agreement for extension of Concession Period by 473.28 days (i.e. 441 days [approved is 436 days] +32.28 days). The Arbitral Award was pronounced on 17.02.2024, the Tribunal awarded Rs. 28.54 Crore as the compensation (as on 17.02.2024) along with interest @ 10.5% per annum till realisation of payment and allowed extension to Concession Period by 472 days.</p>	1116.2 + interest & extension of 473.28 days
9	IRBTC	Civil Litigation	Delhi High Court	<p>Background of the case: Due to a dispute on the deferred premium calculation of the previous years between the IRBTC and the NHAI, the concessionaire has filed an appeal with the Honorable High Court of Delhi for resolution against the NHAI's demand of advance premium of Rs. 169.8 Mn in aggregate and interest on it. As per the interim order of the Division Bench of Honorable High Court, withdrawals from Escrow Account are not permitted till final order in the matter. Current Status: The Section 37 matters were disposed off on 26.04.2022 with directions that interim relief in terms of order dated 19.12.2019 will continue to operate and also directed Arbitral Tribunal to conduct a hearing on 10.0.5.2022. Subsequently, the Arbitral Tribunal was constituted and the Learned Tribunal by its order dated 14.07.2022 directed NHAI to withdraw Rs. 97.8 Crore as an interim measure and then by interim order dated 09.08.2022 further directed NHAI to withdraw Rs 453.9 Crore and Concessionaire to withdraw Rs 193 Crore. The embargo on the operation of Escrow was also lifted. Arbitration proceedings are in progress.</p> <p>NHAI filed Section 37 against interim AT order dated 09.08.2022. The matter is pending</p>	949.8 + interest

Source: Investment Manager

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Appendix 4: Summary of Ongoing Litigations (4/4)

Sr. No	SPVs	Matter	Pending Before	Particulars	Amount Involved (INR Million)
10	IRBJD	Criminal Litigation	NA	Background of the case: Pradeep Sogani, Shankar Lal Sharma and certain others (collectively the "Complainants") have lodged 10 first information reports against Virendra Mahiskar, Managing Director, IRB Infrastructure Developers Limited, Vivek Chouhan (the project manager and the authorised signatory of the Sponsor) and certain others (collectively the "Accused") with the Chaksu Police Station. The aforesaid first information reports were lodged on the alleged ground that there was delay in the release of payments on the part of the Accused towards the purchase of various materials from the Complainants. Current Status: No offence have been found to be committed by the Accused. Hence, they are acquitted from all the cases. This matter is closed.	Not quantified
11	IRBJD	Civil Litigation (Writ Petition)	Rajasthan High Court	Background of the case: Jagannath University (the "Petitioner") had filed a writ petition before the Rajasthan High Court against the project manager of IRBJD and certain others (the "Respondent") seeking that the Respondents be directed to issue monthly pass to the buses/ vehicles of the Petitioner for the toll fee of Rs. 215 per month as per the notification dated 8 April 2013 and any other appropriate relief in favour of the Petitioner which the court deems fit. The said relief has been sought on the alleged grounds that the Respondents had previously issued a monthly pass of a higher denomination without taking into consideration the non-commercial nature of the vehicles of the Petitioner, which was in violation of Clause 3 of the notification dated 8 April 2013. Further, the Petitioner has also filed a stay application before the Rajasthan High Court seeking that during the pendency of the writ petition, the Respondents be directed to permit the vehicles of the Petitioner on the toll fee of Rs. 215 per month. The project manager of IRBJD has filed its reply denying the averments made by the Petitioner. Current Status: The matter is currently pending.	Not quantified
12	IRBJD	Direct Tax Matters	CIT (A)	Background of the case: IRBJD has received order u/s 143(3) r.w.s 147 of Income Tax Act, 1961 ("ITA 1961") dated 30 Dec 2019 for A Y 2012-13. The matter pertains to addition on account of interest under section 56 of ITA 1961 under Income from other sources. Assessing Officer has also levied Interest u/s 244A and 234D of ITA 1961 and has initiated penalty proceedings u/s.271(1)(c) of ITA 1961. However, IRBJD does not accept the views, findings and contentions of the Assessing Officer and has filed an appeal against the order on 27 Jan 2020. Commissioner of Income-tax (Appeals) was passed in favor of the Company. Department has filed an Appeal with ITAT. The ITAT passed an order in favor of the Company. Department has filed an appeal with Hon'ble High Court. Current Status: The matter is currently pending.	27.2
13	VK1	Arbitration Tribunal	Arbitration Tribunal	Background of the case: The Concessionaire submitted its claim under Article 29.2 of the Concession Agreement on the basis of claim submitted by the Project manager for compensation of additional cost/losses on account of the delay in completion of construction due to reasons attributable to the NHAI, damages under Article 4.2 and compensation under Article 35.1 on account of Change in Law along with interest as per Article 41.4. Since there was no response from NHAI, the Concessionaire crystallised dispute under Article 38. Further, the conciliation failed and the arbitration was invoked as per Article 38.3 of the Concession Agreement. Current Status: The Claimant filed Statement of Claim for a consolidated amount of Rs. 448.33 Crore. The arbitration proceedings are in progress and the matter is pending.	4,483.3

Source: Investment Manager

<<End of Report>>



Val-Blr/DHCI-R242501

30th April 2024

The Board of Directors, IRB InvIT Fund (IDBI Trusteeship Services Limited acting on behalf of the Trust) IRB Complex, Chandivali Farm, Chandivali Village, Andheri (East), Mumbai – 400 072	The Board of Directors, The Investment Manager, IRB Infrastructure Private Limited 3 rd Floor, IRB Complex, Chandivali Farm, Chandivali Village, Andheri (East), Mumbai – 400 072
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Sub: Review opinion on the valuation report for Internal Assessment

Dear Sirs / Madams,

We, **DHC International Private Limited (“DHC” or “we”)** have been appointed by **IRB Infrastructure Private Limited (“the Investment Manager” or “IRBIM”)**, acting as the **Investment Manager for IRB InvIT Fund (“the Trust” or “InvIT”)**, and **IDBI Trusteeship Services Limited (“the Trustee”)** acting as the **trustee for the Trust**, for the purpose as detailed out in this letter (“**Engagement**”).

Background

IRB Infrastructure Developers Limited (the “**Sponsor**”) has set up IRB InvIT Fund as an irrevocable trust under the Indian Trusts Act, 1882, and registered the Trust with the Securities and Exchange Board of India (“**SEBI**”) as an infrastructure investment trust under the Securities and Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014, as amended (“**SEBI InvIT Regulations**”). The investment manager of the Trust is IRB Infrastructure Private Limited (the “**Investment Manager**” or “**IRBIM**”), which is a wholly-owned subsidiary of the Sponsor.

IRB InvIT Fund has acquired the following road projects from the Sponsor (together referred to as “**SPVs**”):

Sr. No.	Name of the SPVs
1	MVR Infrastructure & Tollways Limited (“MVR”)
2	IRB Pathankot Amritsar Toll Road Limited (“IRBPA”)
3	IRB Talegaon Amravati Tollway Limited (“IRBTA”)
4	IRB Tumkur Chitradurga Tollway Limited (“IRBTC”)
5	IRB Jaipur Deoli Tollway Limited (“IRBJD”)
6	VK1 Expressway Limited (“VEL”)



Scope and Purpose of the Review Opinion

As per the requirements of the SEBI InvIT Regulations, a half yearly valuation of the assets of the InvIT shall be conducted by the valuer for the half-year ending 31st March 2024 for a publicly offered InvIT. In this regard, the Trust and the Investment Manager have appointed Mr. S. Sundararaman, bearing IBBI registration number IBBI/RV/06/2018/10238 (the “**Valuer**”) to perform Fair Enterprise Valuation (the “**Valuation**”) of the SPVs as on 31st March 2024 as per the SEBI InvIT Regulations. The Valuer had provided his Fair Enterprise Valuation of the SPVs as at 31st March 2024 vide his valuation report dated 30th April 2024 (the “**Valuation Report**”) to the Investment Manager and the Trust.

In this regard, the Investment Manager and the Trust, for their internal evaluation, has requested DHC:

1. To undertake an independent valuation of the SPVs;
2. To review the Valuation Report prepared by the Valuer; and
3. Provide a Review Opinion on:
 - a. Whether the Valuation of SPVs, as conducted by the Valuer is reasonable; and
 - b. Whether the Valuation Report of the Valuer is in compliance with requirements of the SEBI InvIT Regulations.

This Review Opinion Report (“**Review Opinion**”) is only for the internal evaluation of the Board of Directors of the Investment Manager and the Trust. This Review Opinion is not prepared for any statutory compliance or requirements of the SEBI InvIT Regulations or any other laws nor can be used for the purpose other than those mentioned in this Review Opinion.

This Review Opinion is subject to the scope, assumptions, exclusions, limitations and disclaimers detailed hereinafter. As such, the report is to be read in totality, and not in parts, in conjunction with the relevant documents referred to therein. This Review Opinion is our deliverable in respect of our Engagement.

Sources of Information

For the purpose of undertaking this exercise, we have relied on the following sources of information provided by the management and representatives of the Investment Manager and the Trust (“**Management**”):

1. Valuation Report dated 30th April 2024 prepared and submitted by the Valuer to the Management;
2. Unaudited provisional financial statements of the SPVs as on 31st March 2024;
3. Projected financial information for the remaining project life for each of the SPVs;
4. Toll Revenue And O&M Cost Projection Report prepared by M/s GMD Consultants for all the SPVs;
5. Details of brought forward losses and MAT credit (as per Income Tax Act) of the SPVs as at 31st March 2024;
6. Details of Written Down Value (WDV) (as per Income Tax Act) of assets as at 31st March 2024;
7. Concession Agreement of each of the SPVs with NHAI;
8. Operation & Maintenance Work Order for each of the SPVs with the Sponsor dated 27th May 2019;
9. List of licenses / approvals, details of tax litigations, civil proceeding and arbitrations of the SPVs;
10. Details of projected Repairs and Capital Expenditure (Capex);



11. As represented to us by the Investment Manager, there are no changes in the shareholding pattern of the SPVs from 31st March 2024 to the date of issuance of this Review Opinion;
12. Management Representation Letter by the Investment Manager dated 30th April 2024;
13. Relevant data and information about the SPVs provided to us by the Investment Manager either in written or oral form or in the form of soft copy;
14. Information provided by leading database sources, market research reports and other published data.
15. The information provided to DHC included forecasts/projections, other statements and assumptions about future matters like forward-looking financial information prepared by the Management. The forecasts and projections as supplied to us are based upon assumptions about events and circumstances which have not occurred. We have not tested individual assumptions or attempted to substantiate the veracity or integrity of such assumptions in relation to the forward-looking financial information, however, we have made sufficient enquiries to satisfy ourselves that such information has been prepared on a reasonable basis. Notwithstanding anything above, DHC cannot provide any assurance that the forward looking financial information will be representative of the results which will actually be achieved during the forecast period.
16. We have prepared this Review Opinion from information supplied by and from discussions with the Management. We have not verified the accuracy, reliability and competence of the information supplied; the procedures that we used to perform the work did not constitute an audit or review made under any generally accepted accounting standard.

Procedures Adopted

In connection with this Review Opinion, we have obtained the Valuation Report and held conversations with the Management about the methodologies and assumptions underlying the valuation analysis. In connection with this exercise, we have adopted the following procedures for providing our Review Opinion:

1. Requested and received financial and qualitative information relating to the SPVs;
2. Obtained the Valuation Report from the Management;
3. Obtained and analyzed data available in public domain, as considered relevant by us;
4. Discussions with the Management on:
Understanding of the businesses of SPVs – business and fundamental factors that affect its income-generating capacity including strengths, weaknesses, opportunities and threats analysis and historical and expected financial performance;
5. Undertook industry analysis:
Research of publicly available market data including economic factors and industry trends that may impact the Valuation; and analysis of key trends and valuation multiples of comparable companies/comparable transactions, if any, using proprietary databases subscribed by us;
6. Selection of internationally accepted valuation approach and valuation methodology/(ies), in accordance with the requirements, as considered appropriate and relevant by us and arriving at a range of Fair Enterprise Values of the SPVs.

We do not carry out any validation procedures or due diligence with respect to the information provided/ extracted or carry out any verification of the assets or comment on the achievability and reasonableness of



the assumptions underlying the financial forecasts, except for satisfying ourselves to the extent possible that they are consistent with other information provided to us in the course of this Engagement.

Assumptions, Qualifications and Exclusions & Limitations

a. Assumptions and Reliance:

In performing its analyses and rendering this Review Opinion, DHC, with the Trust's consent:

- Relied upon the accuracy, completeness, and fair presentation of all information, data, advice, opinions and representations obtained from public sources, or provided to it from private sources, including the Management, and did not independently verify such information;
- Assumed that any estimates, evaluations, forecasts and projections furnished to DHC were reasonably prepared and based upon the best currently available information and good faith judgment of the Management, and DHC expresses no opinion with respect to such projections or the underlying assumptions;
- Assumed that the information provided, and representations made by the Management regarding the SPVs and the Trust are substantially accurate;
- Assumed that there has been no material change in the information provided regarding the SPVs since 31st March 2024 till date of this Review Opinion, and that there is no information or facts that would make the information reviewed by DHC incomplete or misleading.

To the extent that any of the foregoing assumptions or any of the facts on which this Review Opinion is based prove to be untrue in any material respect, this Review Opinion cannot and should not be relied upon. Furthermore, in DHC's analysis and in connection with the preparation of the Review Opinion, DHC has made numerous assumptions with respect to industry performance, general business, market & economic conditions and other matters, many of which are beyond the control of any party.

b. Qualifications:

The analysis is qualified by the following:

- DHC has prepared the Review Opinion effective as of the date hereof. This Review Opinion is necessarily based upon on financial, economic, monetary, market and other conditions as in effect on, and the information made available to DHC or used by DHC up to the date hereof. Subsequent developments in the aforementioned conditions may affect this Review Opinion and the assumptions & analysis made for providing this Review Opinion, and DHC shall not be obliged to update, revise or reaffirm this Review Opinion if information provided to DHC changes.
- DHC did not evaluate the SPVs' and/or Trust's solvency or conduct an independent appraisal of any specific assets or liabilities (contingent or otherwise).
- This Review Opinion should not be construed as a credit rating, solvency opinion, a fairness opinion, an analysis of the Trust's / SPVs' credit worthiness, tax advice, regulatory advice or an accounting advice. DHC has not made, and assumes no responsibility to make, any representation, or render any opinion, as to any legal, tax or accounting matter. Accordingly DHC does not assume any responsibility or liability in respect thereof.
- The work performed by DHC was performed in accordance with instructions provided by the Management and was performed exclusively for the Management's use only.



- This Review Opinion is not statutorily mandated under the Companies Act, 2013 (“Companies Act”), the Companies (Registered Valuers and Valuation Rules, 2018) (“Rules”) as per any other rules, regulations, standards, bye-laws, ordinance, notifications issued pursuant to such Act or Rules or under the SEBI InvIT Regulations or any other regulations under SEBI Act, 1992 (“SEBI Act”). Accordingly, our Review Opinion Report does not constitute nor can be construed as a valuation carried out by a registered valuer in accordance with such Companies Act or Rules or SEBI Act or as per any rules, regulations, standards, bye-laws, ordinance, notifications issued pursuant to such Companies Act or Rules or SEBI Act and any such use of this Review Opinion is not permitted.

c. Exclusions & Limitations:

- This Review Opinion is furnished to the Management in connection with its consideration of the Valuation report prepared by the Valuer. It is not intended to, and does not, confer any rights or remedies upon any other person, and is not intended to be used, and may not be used, by any other person or for any other purpose, without DHC’s consent.
- Providing review opinion on a valuation report is not a precise science and the conclusions arrived at in many cases will, of necessity, be subjective and dependent on the exercise of individual judgement. In the ultimate analysis, our opinion will have to be tempered by the exercise of judicious discretion and judgment taking into accounts all the relevant factors. There is, therefore, no indisputable single value.
- With respect to explanations and information sought from the Management, we have been given to understand by the Management that they have not omitted any relevant and material factors about the SPVs and that they have checked the relevance or materiality of any specific information to the present exercise with us in case of any doubt. Our conclusion is based on the information given on behalf of the SPVs. The Management has indicated to us that they have understood that any omissions, inaccuracies or misstatements may materially affect our Review Opinion.
- DHC assumes that the SPVs comply fully with the relevant laws and regulations applicable in all its areas of operations, and that the SPVs will be managed in a competent and responsible manner. Our Review Opinion assumes that the assets and liabilities of the SPVs, reflected in their respective latest balance sheets remain intact as of the date hereof.
- This Review Opinion is not a substitute for the third party's own due diligence/ appraisal/ enquiries/ independent advice that the third party should undertake for his purpose.
- This Review Opinion:
 - (i) does not address the merits of the underlying business decision to enter into any transaction with the Trust;
 - (ii) is not a recommendation as to how the Unit holders of the Trust should vote or act with respect to any matters relating to the Trust;
 - (iii) should not be construed as creating any fiduciary duty on the part of DHC to any party;
 - (iv) does not indicate the Value at which the Units may be transacted either in the market or otherwise at any point in time in the present or in the future; instead, it merely states whether the Valuation concluded by the Valuer is within the range of our financial analysis.
- The fee for this Review Opinion is not contingent upon the nature of opinion provided herein.
- This Review Opinion should not be construed as investment advice; specifically, DHC does not express any opinion on the suitability or otherwise of entering into any financial or other transaction with the Investment Manager, the Trust or the SPVs.



- This Review Opinion is solely that of DHC, and DHC's liability in connection with this Review Opinion shall be limited in accordance with the terms set forth in the engagement letter between DHC and the Trust dated 13th October 2023 (the "Engagement Letter").
- The use and disclosure of this Review Opinion is strictly limited, as laid out in the Engagement Letter.

Conclusion

Based on our independent calculation and on consideration of all the relevant factors and circumstances including aforementioned assumptions and limitations:

- We believe that the fair enterprise values of the SPVs as recommended by the Valuer in his Valuation Report is reasonable in our opinion; and
- We are of the opinion that the Valuation report prepared by the Valuer is in compliance with the requirements of SEBI InvIT regulations.

Yours sincerely,

**For and on behalf of
DHC International Pvt. Ltd.**

A handwritten signature in black ink, appearing to read "D. G. Desai".

OMALAUUR TO NAMAKKAL (KM 180.00 TO KM 248.625)
SECTION OF NH-7 IN THE STATE OF TAMIL NADU.

APRIL 2024



**TOLL REVENUE AND O&M COST
PROJECTION REPORT
(FINAL)**



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**OMALAUUR TO NAMAKKAL (KM 180.00 TO KM 248.625)
SECTION OF NH-7 IN THE STATE OF
TAMIL NADU.**

**TOLL REVENUE AND O&M COST
PROJECTION REPORT
(FINAL)**



APRIL 2024

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ABBREVIATIONS

AADT	- Annual Average Daily Traffic	NHAI	- National Highways Authority of India
BOT	- Build Operate Transfer	NHDP	- National Highways Development Project
CAGR	- Compound Annual Growth Rate	NSDP	- Net State Domestic Product
CTV	- Classified traffic volume	O&M	- Operation & Maintenance
DBFOT	- Design, Build, Finance, Operate & Transfer	PCDP	- Per Capita Domestic Product
EME	- Earth Moving Equipment	PCI	- Per Capita Income
GDP	- Gross Domestic Product	PCU	- Passenger Car Unit
GSDP	- Gross State Domestic Product	PSC	- Pre-stressed Concrete
HCM	- Heavy Construction Machinery	RCC	- Reinforced cement concrete
HCV	- Heavy Commercial Vehicle	RHS	- Right Hand Side
HTMS	- Highway Traffic Management System	SH	- State Highway
IRC	- Indian Road Congress	TP	- Toll Plaza
IRR	- Internal Rate of Return	WPI	- Wholesale Price Index
LCV	- Light Commercial Vehicle	SIR	- Special Investment Region
LHS	- Left Hand Side	c.	- Circa
LGV	- Light Goods Vehicle	ROB	- Railway Over Bridge
MAV	- Multi Axle Vehicle	MDR	- Major District Road
MORTH	- Ministry of Road Transport and Highways	ODR	- Other District Road
NH	- National Highway	CA	- Concession Agreement
PCC	- Plain Cement Concrete	RMT	- Running Meter
CR	- Coarse Rubble		

CHAPTER 1

INTRODUCTION

1.1 Background

The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under NHDP Phase V. Under Phase V NHAI has planned to convert 6,500 km of existing 4-lane National Highways into 6-lane National Highway. Sections envisaged under 6-laning comprise the Golden Quadrilateral section (5,700 km) and some other sections which are 800 km in length.

The project under consideration, Omalur - Namakkal section of NH-7 from Km 180.000 to km 248.625 is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. Project has concession period of 20 years. Project achieved COD on 6th August-2009. The Project has been commissioned and is currently in the operation / maintenance phase. Project under consideration is a combination of construction and maintenance packages as given under

Maintenance package – From Km 180.000 to Km 207.500

Construction & Maintenance Package – From Km 207.500 to Km 248.625

1.2 Objective of the Study

M/s IRB INVIT FUND has engaged GMD Consultants to assess the future traffic and toll potential of the project along with related operation & maintenance expenditure involved.

This report named as “*Toll Revenue and O&M Cost Projection Report*” mainly focuses on traffic and O&M aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows.

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting
- d) Operation and Maintenance Cost Projections

The Concessionaire has provided basic historical traffic data and other project details on the basis of which the above analysis has been carried out, after applying our judgement on the traffic estimates.

“Toll Revenue and O&M Cost Projection Report” was submitted in March 2017. In this report traffic data of year 2015-16 was used as base traffic. The report was updated with traffic data for the year 2016-17 and the report was submitted in October 2017. The report was further updated with traffic data of 2017-18 and same was submitted in April 2018. The report was further updated with traffic Data of the period from April 2018 to September 2018 and was submitted in October 2018. The report was further updated with yearly traffic data for 2019-20 in May 2020. With traffic data from April 2020 to March 2021 report was updated, report was further updated with yearly traffic data from April 2021 to March 2022, April 2022 to March 2023 and now concessionaire has provided traffic data from April 2023 to March 2024, report is updated taking this latest traffic data into consideration.

CHAPTER 2

TRAFFIC SURVEYS AND ANALYSIS

2.1 Traffic Surveys

In the course of our work, we have collected the required information for the project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected for the project.

- Classified traffic volume counts at toll plaza location on Omalur - Namakkal section of NH-7 for base year 2015-16, 2016-17, 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-23 and annual traffic data from April 2023 to March 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

Project can be divided into the following homogenous sections from traffic point of view.

These sections can be.

- Omalur to Salem
- Salem to Rasipuram
- Rasipuram to Namakkal

Table 2-1 below lists provides details of locations from where traffic details have been collected.

Table 2-1 : Traffic Data Details

SR. NO	LOCATION	CTV	Single Journey Traffic	Multiple Journey	Monthly Pass	Local Traffic
1	Km 191.800 Toll Plaza	AADT for Year 2015-2016	For Year 2015-2016	For Year 2015-2016	For Year 2015-2016	For Year 2015-2016
		AADT for year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017
		AADT for year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018
		AADT for Year 2018-19	For Year 2018-19	For Year 2018-19	For Year 2018-19	For Year 2018-19
		AADT for Year 2019-20	For Year 2019-20	For Year 2019-20	For Year 2019-20	For Year 2019-20
		AADT for Year 2020-21	For Year 2020-21	For Year 2020-21	For Year 2020-21	For Year 2020-21
		AADT for Year 2021-22	For Year 2021-22	For Year 2021-22	For Year 2021-22	For Year 2021-22
		AADT for Year 2022-23	For Year 2022-23	For Year 2022-23	For Year 2022-23	For Year 2022-23
		AADT for Year 2023-24	For Year 2023-24	For Year 2023-24	For Year 2023-24	For Year 2023-24

The locations of each of the traffic surveys are illustrated in Figure 2-1.

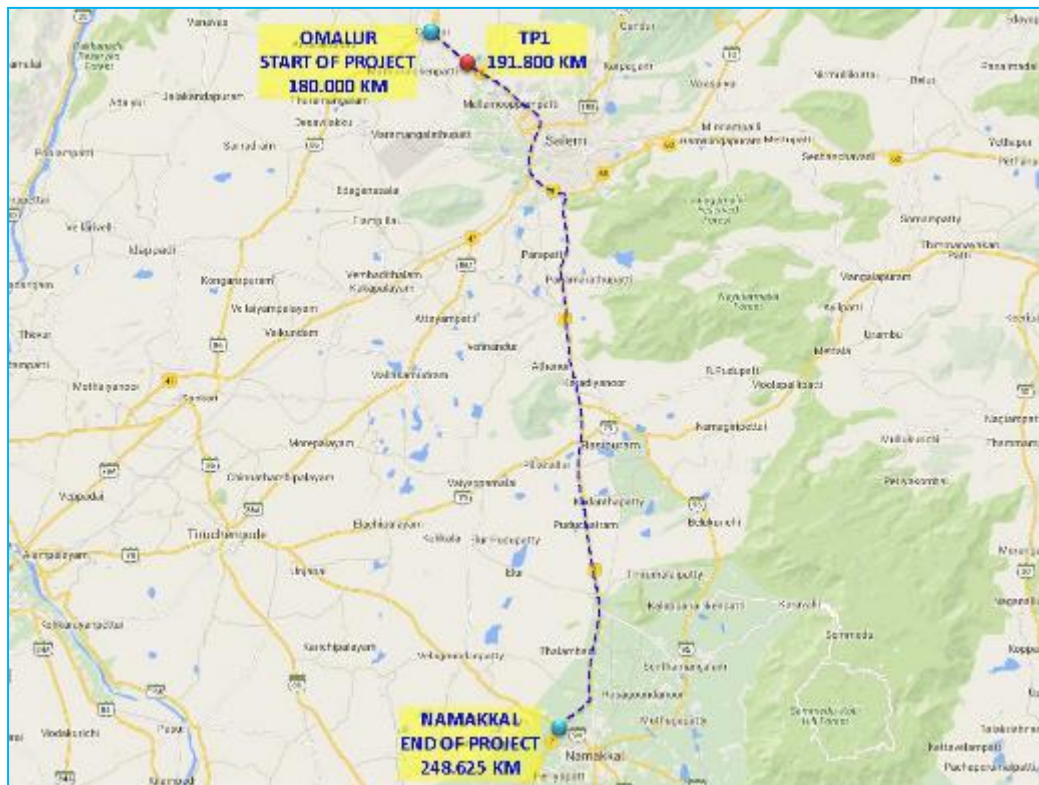


Figure 2-1: Toll Plaza Locations

2.2 Classified Traffic Volume Count

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI. These locations are indicated in Figure 2-1 and listed in Table 2-1.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in **Table 2-2**.

Table 2-2 : Vehicle Classification System

Vehicle Type	
	Auto Rickshaw
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

Source - IRC: 64 – 1990

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / Van
- LCV
- Truck / Bus
- Multi Axle

2.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of the report.

2.3.1 Traffic Data

Project concessionaire has provided Traffic data for base year 2015-16, 2016-17, 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-23 and from April 2023 to March 2024 as under for toll plaza –

Table 2-3 : Traffic Data at Toll Plaza at Km 191.800

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) – FY 2018-19	Annual Average Daily Traffic (Nos.) – FY 2019-20	Annual Average Daily Traffic (Nos.) – FY 2020-21	Annual Average Daily Traffic (Nos.) – FY 2021-22	Annual Average Daily Traffic (Nos.) – FY 2022-23	Annual Average Daily Traffic (Nos.) – FY 2023-24
1	Car	12645	13352	12618	14831	18389	19694
2	LCV	4672	4632	4290	2748	2856	2671
3	Truck/Bus	3199	3446	2666	3075	3796	4319
4	Multi Axle	2952	2873	3017	3350	3765	4057
	Total	23468	24304	22591	24004	28806	30741

2.4 Data Analysis

2.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in Table 2-4

Table 2-4 : PCU Factors Adopted for Study

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under

Table 2-5 : Traffic in PCU at Project Stretch

Year	Toll Plaza Location	Traffic No.	PCU	PCU Index
FY 2015-16	191.800	19447	36164	1.86
FY 2016-17	191.800	20589	38355	1.86
FY 2017-18	191.800	21977	39232	1.78
FY 2018-19	191.800	23468	42534	1.81
FY 2019-20	191.800	24304	43569	1.79
FY 2020-21	191.800	22591	40626	1.80
FY 2021-22	191.800	24004	43254	1.80

Year	Toll Plaza Location	Traffic No.	PCU	PCU Index
FY 2022-23	191.800	28806	51004	1.77
FY 2023-24	191.800	30741	54914	1.79

It can be observed from above that project traffic has PCU index near 2 which is a fair indicator of good mix being split between commercial and urban traffic.

2.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.

For the purpose of analysis, the recent traffic numbers of for period from April 2023 to September 2023 have been considered as the base numbers.

It is observed that car traffic forms 64% of total traffic at toll plaza location Km 191.800 LCV and bus / truck share 9% and 14% respectively. Multi axle consists of 13% of total traffic. Overall, about 36% of traffic is commercial in nature. A higher percentage of urban traffic is due to the project corridor passing through the city of Salem which is a fast-upcoming urban C category town.

Another important bifurcation of traffic is components of traffic with respect to various type of toll ticketing like

1. Single Journey
2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of the above categories on base year 2015-16, 2016-17, 2017-18, 2018-19, 2019-20, 2020-21,2021-22,2022-23 and from April 2023 to March 2024.

Table 2-6 : Journey Type Bifurcation of Traffic at KM 191.800

Sr. No	Type	Traffic Volume (Nos.) For FY 2018-19	Traffic Volume (Nos.) For FY 2019-20	Traffic Volume (Nos.) For FY 2020-21	Traffic Volume (Nos.) For FY 2021-22	Traffic Volume (Nos.) For FY 2022-23	Traffic Volume (Nos.) For FY 2023-24
1	Single Journey	16311	16931	16626	16244	19856	20766
2	Return Journey	5210	5280	4492	7196	8280	9200
3	Monthly Pass	1947	2093	1473	564	670	775

The single journey component in total traffic numbers is as high as 68% while the return journey component is 30%. The monthly pass share is as low as 2%. As the project corridor serves as primary link for traffic between Madurai and Bangalore the component of single journey ticket is much higher. Moreover, the toll structure of the project is based on old toll policy and there are special rates for local single journey traffic. This makes the option of a monthly pass less attractive.

2.5 Secondary Data Collection

There are several other factors which have substantial impact on traffic pattern and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or industrial projects
- Special industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from the various sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
 - a) GDP
 - b) NSDP
 - c) Population Growth
 - d) Per Capita Income growth

- e) Industrial Growth
 - f) Special Industry Potential
 - g) Regional and National development vision / plan
 - h) Any other relevant data
3. Competing road network.

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor.

CHAPTER 3

GROWTH OF TRAFFIC ON PROJECT HIGHWAY

3.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the forecasts of factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Omalur - Namakkal section of NH-7 has been carried out taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

3.2 Trend Analysis

One of the methods of estimation of future rate of traffic growth is to assume the same rate of growth as experienced in the past. However, it may be noted that major influencing factors which reflect Economic conditions such as GDP, agricultural output, industrial output, national policies etc. are susceptible to change over a longer period of time and necessary adjustments need to be made to past trends to account for these changes.

Thus, we have considered the Elasticity model of growth projection which is one of the most widely acceptable methods for traffic forecast and is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method past trends of any vehicular data are paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicular traffic varies for different types of vehicles. It is a proven fact that growth patterns for passenger and goods vehicles are different. Traffic growth on any highway typically depends on a number of economic parameters. The most important and direct parameters are given as under

- Per Capita Income

- Net State Domestic Product (NSDP)
- Population

It is observed that the ownership of a car is more closely related to affordability hence per capita is the index which closely fits with growth of car traffic among other criteria. In similar fashion, the following pairs of vehicle type and independent variable can be established for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Trucks / Heavy / Goods Vehicle – NSDP
- Time series data of vehicle (both passenger and goods) Registered in the state of Tamil Nadu is used as the base data for analysis of growth.

3.3 Estimation of Traffic Demand Elasticity

The elasticity of traffic demand is defined as the rate at which traffic intensity varies due to change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish the relationship between the growth in number of given categories of vehicle with one of the economic variables considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-2015 the model for estimating elasticity index for the project corridor is of the following form and is as given below:

$$\text{Log}(P) = k \times \text{Log}(EI) + A$$

Where,

P = Number of Vehicles (Mode wise)

EI = Economic Indicator

A = Regression constant

k = Elasticity coefficient (Regression coefficient)

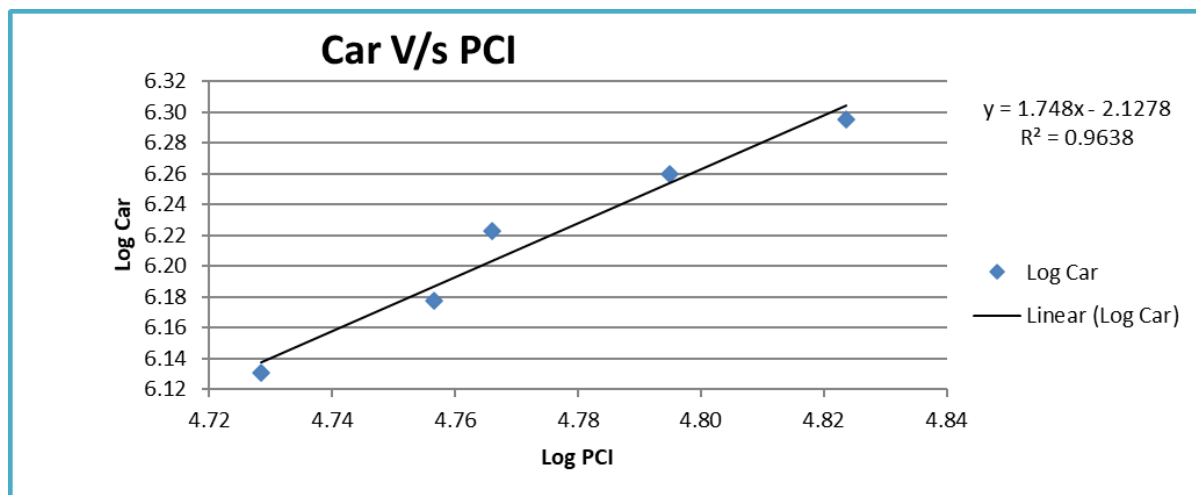
The elasticity for cars and buses (passenger vehicles) is calculated based on Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

The following tables and graphs depict regression and elasticity of growth model.

Table 3-1 : Per Capita Income Vs Car

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2011	53507	1350722	4.73	6.13		
2012	57093	1504735	4.76	6.18	7%	
2013	58360	1668913	4.77	6.22	2%	
2014	62361	1818284	4.79	6.26	7%	
2015	66635	1972354	4.82	6.29	7%	5.7%

Regression analysis of same is given in figure below.

**Figure 3-1: Regression and Elasticity PCI vs. Car–Extrapolation****Table 3-2 : Population Vs Bus**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2011	72147030	134887	7.86	5.13		
2012	73447335	144251	7.87	5.16	2%	
2013	74744601	156470	7.87	5.19	2%	
2014	76038376	165176	7.88	5.22	2%	
2015	77328222	171581	7.89	5.23	2%	1.75%

Regression analysis of same is given in figure below.

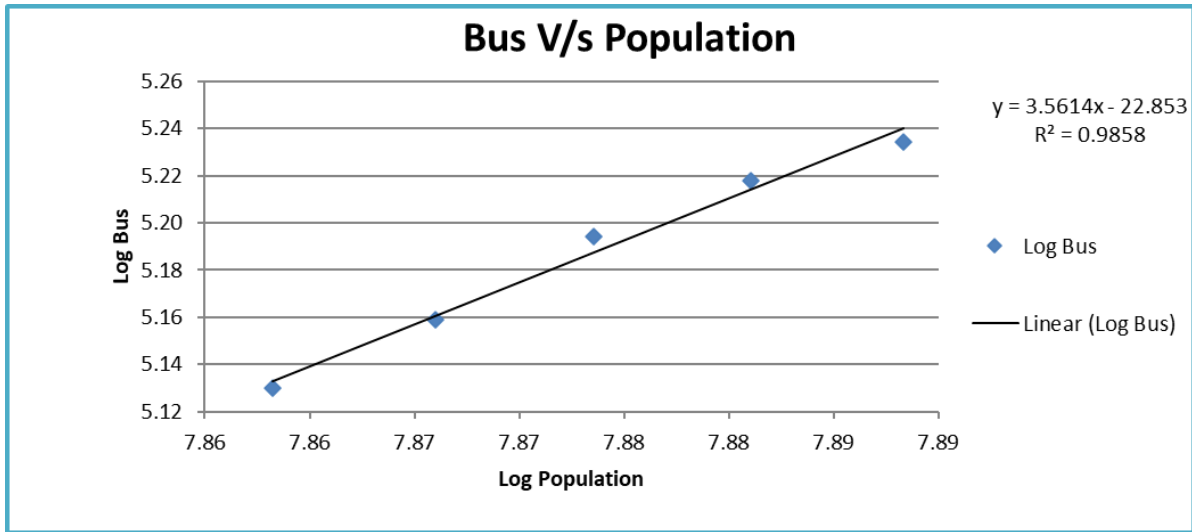


Figure 3-2: Regression and Elasticity Population vs. Bus – Extrapolation

The elasticity of goods traffic has been worked out by regression analysis with NSDP. The following table represents the data and details.

Table 3-3 : Goods Traffic Vs NSDP

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (Year)
2011	35996050	744663	7.56	5.87		
2012	38650813	821108	7.59	5.91	7%	
2013	39747091	896985	7.60	5.95	3%	
2014	42718219	924082	7.63	5.97	7%	
2015	45898663	946232	7.66	5.98	7%	6.28%

The following figure depicts regression analysis and extrapolation.

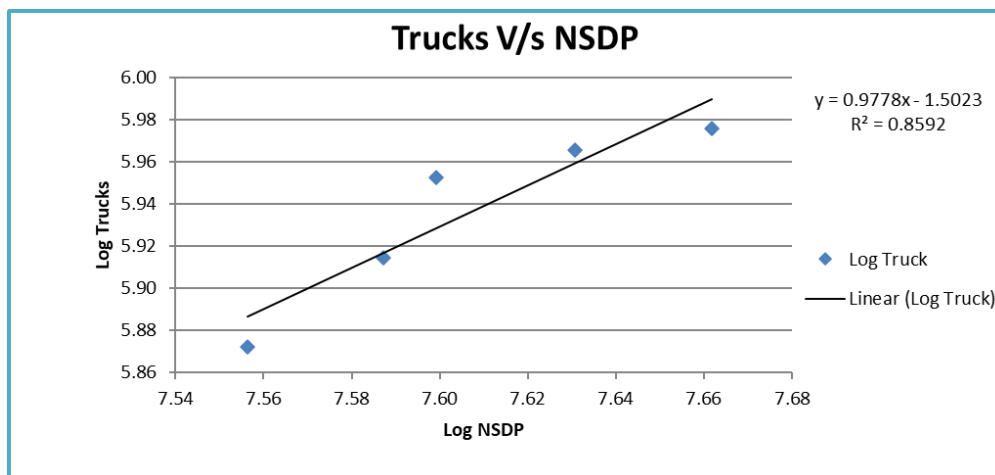


Figure 3-3: Regression and Elasticity NSDP vs. Goods Traffic – extrapolation.

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R^2 is a statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R^2 more representative is the regression model of data.

The results of these analyses for the good fit as reflected by R^2 values are presented in the Table below.

Table 3-4 : Summary Regression Analysis

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Tamil Nadu	Car/Jeep	PCI	$y = 1.748x - 2.1278$	$R^2 = 0.9638$	1.7480	5.66%	9.89%	Good Regression
	Bus	Population	$y = 3.5614x - 22.8532$	$R^2 = 0.9858$	3.5614	1.75%	6.23%	Good Regression
	Truck	NSDP	$y = 0.9778x - 1.5023$	$R^2 = 0.8592$	0.9778	6.28%	6.14%	Good Regression

While the economic model for predicting growth is a good tool, other local, regional, national factors such as proposed developments etc. should also be considered before finalizing growth factors. These factors are discussed in subsequent sections.

3.4 Analysis of Historic Traffic Data

Historic traffic data forms useful information for any highway project. It provides useful information for establishing past trends of growth. Project stretch of Omalur to Namakkal has been commissioned and it has been under tolled operation since 2009.

Table 3-5 : Historical Traffic at Project Stretch

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) FY 2018-19	Annual Average Daily Traffic (Nos.) FY 2019-20	Annual Average Daily Traffic (Nos.) FY 2020-21	Annual Average Daily Traffic (Nos.) FY 2021-22	Annual Average Daily Traffic (Nos.) FY 2022-23	Annual Average Daily Traffic (Nos.) FY 2023-24
1	Car	12645	13352	12618	14831	18389	19694
2	LCV	4672	4632	4290	2748	2856	2671
3	Truck/Bus	3199	3446	2666	3075	3796	4319
4	Multi Axle	2952	2873	3017	3350	3765	4057
	Total	23468	24304	22591	24004	28806	30741

3.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economic, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.

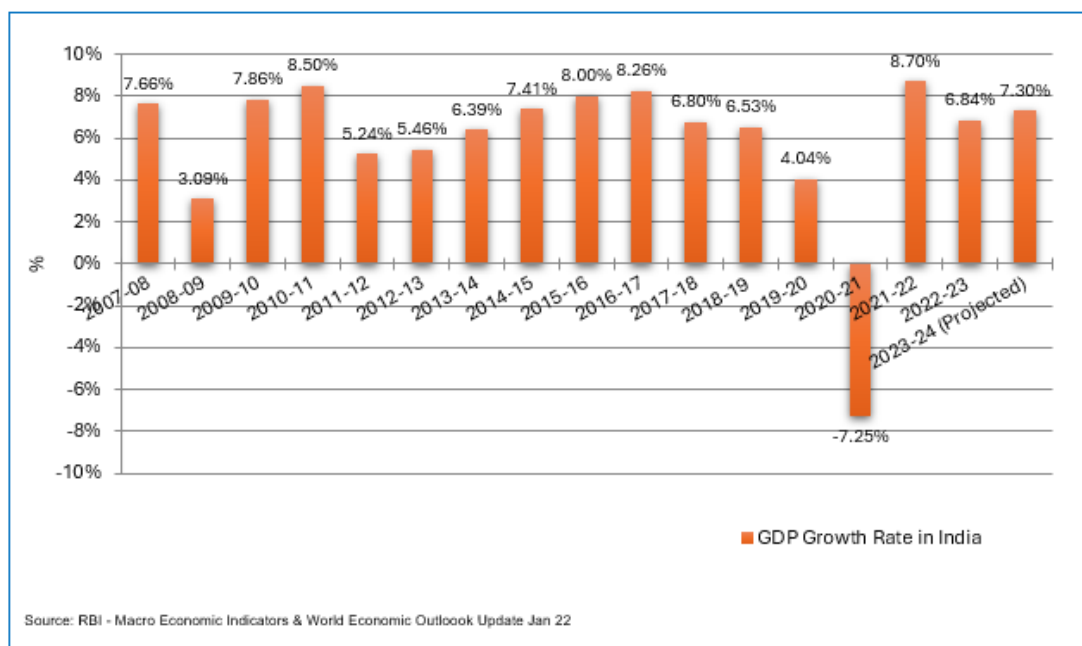


Figure 3-4 : Growth of GDP in India

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of

6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22.

3.6 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as below. The rate of growth is moderate in light of overall regional trends. Growth of multi-Axle is kept slightly higher as trend of technological advances in logistic industry favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, the rate of growth diminishes. Same growth rate is not sustainable for long. It is established practice to step down future growth rates at suitable intervals of years.

Temporary disruptions caused by implementation of Goods and Service Tax (GST) and demonetization have dissipated, and growth of economy has significantly improved since then. Hence the corridor can have the expected growth.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic**, **Pessimistic** and **Most Likely** with a positive and negative variation 0.25% from Most Likely case.

Table 3-6 : Recommended Growth Rates Optimistic

Year/ Vehicle Type	2021-2023	2023-2026	2026-2031	2031-2036	2036-2041	2041-2046
Car	7.46%	4.58%	4.24%	3.87%	3.36%	2.81%
Minibus /LCV	5.93%	3.09%	2.88%	2.72%	2.65%	2.53%
Truck / Bus	7.48%	3.86%	3.52%	3.19%	2.86%	2.53%
Multi Axle	7.48%	3.86%	3.52%	3.19%	2.86%	2.53%

Table 3-7 : Recommended Growth Rates Pessimistic

Year/ Vehicle Type	2021-2023	2023-2026	2026-2031	2031-2036	2036-2041	2041- 2046
Car	6.96%	4.08%	3.74%	3.37%	2.86%	2.31%
Minibus /LCV	5.43%	2.59%	2.38%	2.22%	2.15%	2.03%
Truck / Bus	6.98%	3.36%	3.02%	2.69%	2.36%	2.03%
Multi Axle	6.98%	3.36%	3.02%	2.69%	2.36%	2.03%

Table 3-8 : Recommended Growth Rates Most Likely

Year/ Vehicle Type	2021-2023	2023-2026	2026-2031	2031-2036	2036-2041	2041- 2046
Car	7.21%	4.33%	3.99%	3.62%	3.11%	2.56%
Minibus /LCV	5.68%	2.84%	2.63%	2.47%	2.40%	2.28%
Truck / Bus	7.23%	3.61%	3.27%	2.94%	2.61%	2.28%
Multi Axle	7.23%	3.61%	3.27%	2.94%	2.61%	2.28%

CHAPTER 4

TRAFFIC FORECAST

4.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

Table 4-1 : Total Tollable Traffic @ Toll Plaza 1- Chainage 191.800 KM
(Optimistic Growth Scenario)

Year	Car	LCV	Truck/ Bus	Multi axle	Total No.	Total PCU (Including Non-Paid Traffic)
2024-25	20792	2779	4530	4254	32355	57694
2025-26	21672	2859	4689	4404	33624	59846
2026-27	22590	2941	4854	4559	34944	62079

Table 4-2 : Total Tollable Traffic @ Toll Plaza 1- Chainage 191.800 KM
(Pessimistic Growth Scenario)

Year	Car	LCV	Truck/ Bus	Multi axle	Total No.	Total PCU (Including Non- Paid Traffic)
2024-25	20695	2766	4507	4234	32202	57418
2025-26	21469	2832	4642	4362	33305	59272
2026-27	22272	2899	4782	4494	34447	61190

Table 4-3 : Total Tollable Traffic @ Toll Plaza 1- Chainage 191.800 KM**(Most Likely Growth Scenario)**

Year	Car	LCV	Truck/ Bus	Multi axle	Total No.	Total PCU (Including Non- Paid Traffic)
2024-25	20743	2773	4519	4244	32279	57558
2025-26	21570	2846	4666	4383	33465	59561
2026-27	22430	2922	4819	4527	34698	61642

4.2 Extension of Concession Period

15 days of extension in concession period has been approved by NHAI due to floods in Chennai in December 2015. Due to the suspension in toll in the year FY17 because of demonetization for a period of 24 days, the Concessionaire would be entitled to an extension of an additional 24 days. Traffic was severely impacted on the project highway during the initial lockdown period. NHAI has declared a policy of providing extension of concession to make up for revenue loss during lockdown. It is expected that an extension would be provided to project concession period on this account as well.

CHAPTER 5

FORECAST OF TOLL REVENUE

5.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

5.2 Discount Categories

Fee schedule of agreement of Omalur – Namakkal section of NH-7 is based on old toll policy. As per the Toll Notification (Schedule R) the following discounts have been considered:

1. Monthly Pass: For frequent user's monthly pass would be issued at fee 30 times the single journey fee. There are other local monthly passes for cars /Jeep/ Van category I and II and school bus @ Rs.150, Rs.300 and Rs.1000 respectively.
2. Multiple Journeys (for Return Trip): Will be charged at 1.5-time single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travelers or whose frequency does not yield any discount from the above categories.
4. There are several categories of local discounts.
 - a) Local Bus / truck and LCV (within 20 km) will be charged @ Rs. 25 and 15 respectively. The rate will be constant throughout the concession period.

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule R) as given under

$$\text{Base Fee} \times \frac{\text{WPI-B}}{\text{WPI-A}} \times \text{length of the said section.}$$

Where

- WPI-A = is the Wholesale Price Index of June, 1997 (131.4).
- WPI-B = is the Average Wholesale Price Index for the year ending March, 31st preceding the fee revision date.

5.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

Table 5-1 : Base Toll Rates June 1997

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Jeep	0.40
Light Commercial Vehicle, (LCV)	0.70
Bus or Truck (2 Axle)	1.40
MAV (> 2 axle)	2.25

Factor of inflation / growth has been incorporated as per Schedule R. WPI are available up to 2021-22. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. Following graph provides projection of rate of inflation (WPI) in India. Data has been taken from Office of Economic Advisor web site (www.eaindustry.nic.in). WPI for years 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.

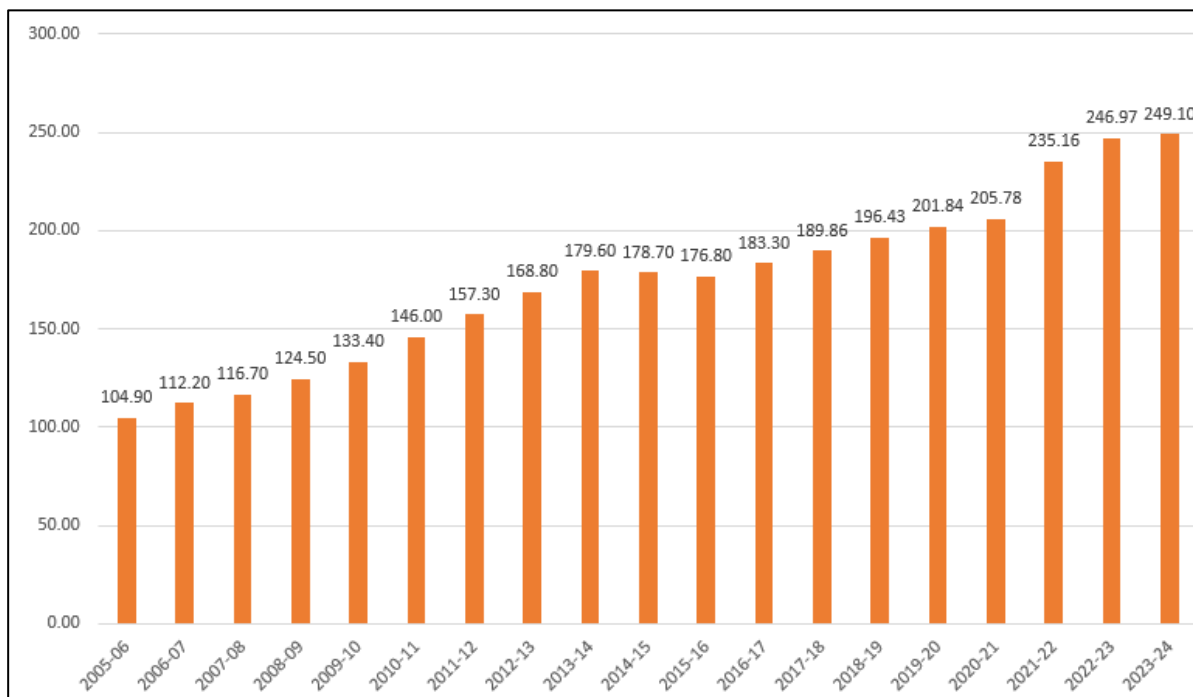


Figure 5-1 : Historical Rate of WPI Inflation in India

Except for the negative growth of WPI in the year 2015-16 average inflation in WPI from the year 2005-2024 is 4.98%. For future years initially it takes 5% and suitably stepped down for future years.

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs. five) for the concession period and are given below.

Thus, worked out rates for various categories of vehicle and discounts are given as under

Table 5-2 : Toll Rates for Single Journey @191.800

Year	Car/Jeep/Van	LCV	Truck/Bus	Multi Axle (> 2 axle)	Car - LCO	LCV - LTO	Truck/Bus - LTO
2024-25	95	170	340	545	15	15	25
2025-26	100	180	355	575	15	15	25
2026-27	105	185	375	600	15	15	25

Table 5-3 : Toll Rates for Multiple Journeys @ 191.800

Year	Car	Minibus /LCV	Truck/ Bus	Multi Axle
2024-25	145	255	510	820
2025-26	155	265	535	860
2026-27	160	280	560	900

Table 5-4 : Toll Rates for Monthly Pass @191.800

Year	Car/ Jeep/ Van	LCV	Truck/ Bus	Multi Axle (> 2 axle)	Car - LT1	Car - LT2	School Bus
2024-25	2910	5090	10180	16360	150	300	1000
2025-26	3055	5345	10690	17180	150	300	1000
2026-27	3205	5610	11225	18040	150	300	1000

5.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated under in all three scenarios. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

5.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under most likely scenario at each of the toll plaza up to 2026-27 (End of Concession Period) starting from the year 2024-25 are shown in tables below.

Table 5-5 : Toll Revenue Optimistic Scenario*(Rs. Crores)*

Year	Toll Plaza 191.800	Total
2024-25	184.22	184.22
2025-26	198.14	198.14
2026-27	214.66	214.66

Table 5-6 : Toll Revenue Pessimistic Scenario**(Rs. Crores)**

Year	Toll Plaza 191.800	Total
2024-25	183.39	183.39
2025-26	196.31	196.31
2026-27	211.66	211.66

Table 5-7 : Toll Revenue Most Likely Scenario**(Rs. Crores)**

Year	Toll Plaza 191.800	Total
2024-25	183.78	183.78
2025-26	197.20	197.20
2026-27	213.13	213.13

CHAPTER 6

OPERATION & MAINTENANCE

6.1 Operation & Maintenance

The following are project parameters which would contribute towards the cost of operation and maintenance.

The future cost of operation and maintenance is estimated on engineering judgment and experience basis. Keeping all above factors in view, following can be basis of working out cost of operation and maintenance for project corridor from Omallur to Salem on NH-44 in state of Tamil Nadu.

- b) **Annual Regular Maintenance** – Covering pothole repair, shoulder and slope repair, drain cleaning, median maintenance, Crash barrier, toll plaza maintenance, Toll collection, other services like medical help and rescue operations etc.
- c) **Periodic Maintenance** – This will be done on a periodic basis, say every 5 years. It will consist of overlaying of wearing course and painting and marking. Some pavement strengthening is also anticipated in a few sections. This operation and its cost are spread over three years.

Concessionaire has recently updated the program of maintenance of project road. Same has been reviewed and year-wise cost of O&M from year 2023-24 is given in table below.

Table 6-1 : O&M COST

Year	Annual maintenance (Rs. Cr)	Thermoplastic painting (Rs. Cr)	Renewal Coat with BC (Rs. Cr.)	Special Repair of pavement	Structure maintenance. (Rs. Cr)	Electric System	Total Expenditure (Rs. Crores)	Remarks
						Annual		
2024-25	5.13	1.51	6.08	5.71	0.14	0.23	25.20	Renewal of Wearing course + Pavement repair
2025-26	5.13				0.14	0.23	7.75	Regular O & M
2026-27	5.13				0.14	0.23	8.13	Regular O & M

CHAPTER 7

CONCLUSION & RECOMMENDATIONS

7.1 Conclusion & Recommendations

Project stretch of Omalur to Namakkal section of NH-7 in state of Tamil Nadu from km 180.000 to km 248.625 is presently a four-lane road. The road is in sound condition and serves healthy traffic volumes. The project corridor is a part of critical North – South connectivity via national highway NH-7. Bangalore has already emerged as the IT capital of country and the project stretch falls in its catchment. There are many upcoming projects in the area which are proposed to boost economic growth of the area and add value to the development of the region. All the developments considered in the Report have the potential to have a positive impact on the traffic flow on the project. The following can be considered as major outcome of study.

- a) There is a healthy volume of tollable traffic running on the project.
- b) Project corridor has the potential to witness good traffic growth annually in the post COVID-19 scenario due to various developments in area and overall development of economy.
- c) Project corridor does not have risk of traffic leakage due to lack of competing roads of comparable quality.

The project infrastructure is in good condition and its maintenance cost is also reasonable.

Based on the above it can be considered a stable healthy project from the traffic and revenue point of view.

CHAPTER 8

PROJECT ILLUSTRATIONS

8.1 General

Project current condition has been depicted in the following photographs.



Figure 8-1 : General Project Condition



Figure 8-2 : Toll Plaza



Figure 8-3 General Project Condition



Figure 8-4 General Project Condition



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PATHANKOT TO AMRITSAR SECTION OF NH-15
(KM 6.082 TO 108.502)
IN THE STATE OF PUNJAB



APRIL 2024



**TOLL REVENUE AND O&M COST
PROJECTION REPORT
(FINAL)**



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APRIL 2024

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ABBREVIATIONS

AADT	- Annual Average Daily Traffic	NHAI	- National Highways Authority of India
BOT	- Build Operate Transfer	NHDP	- National Highways Development Project
CAGR	- Compound Annual Growth Rate	NSDP	- Net State Domestic Product
CTV	- Classified traffic volume	O&M	- Operation & Maintenance
DBFOT	- Design, Build, Finance, Operate & Transfer	PCDP	- Per Capita Domestic Product
EME	- Earth Moving Equipment	PCI	- Per Capita Income
GDP	- Gross Domestic Product	PCU	- Passenger Car Unit
GSDP	- Gross State Domestic Product	PSC	- Pre-stressed Concrete
HCM	- Heavy Construction Machinery	RCC	- Reinforced cement concrete
HCV	- Heavy Commercial Vehicle	RHS	- Right Hand Side
HTMS	- Highway Traffic Management System	SH	- State Highway
IRC	- Indian Road Congress	TP	- Toll Plaza
IRR	- Internal Rate of Return	WPI	- Wholesale Price Index
LCV	- Light Commercial Vehicle	NH	- National Highway
LHS	- Left Hand Side		
LGV	- Light Goods Vehicle		
MAV	- Multi Axle Vehicle		
MORTH	- Ministry of Road Transport and Highways		

CHAPTER 1

INTRODUCTION

1.1 Background

The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under NHDP Phase III.

The project under consideration, **Pathankot- Amritsar** section of NH 15 from km 6.082 to km 108.502 is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. M/s IPATRL (Concessionaire) has been awarded the Project for concession period of 20 years starting from December 31, 2010. The Project has been commissioned and is currently in the operation / maintenance phase.

The Pathankot - Amritsar NH 15 Project comprises the section of NH 15 from km 6.082 to km 108.502. IPATRL was entrusted to expand a 102.42 Km section of NH 15 between Pathankot and Amritsar in Punjab from two lanes to four lanes on a DBFOT basis. The project received a completion certificate on November 27, 2014, and IPATRL commenced tolling for a project length of 102.42 Km on that date. Subsequently, the project received a final completion certificate on August 17, 2017.

1.2 Objective of the Study

M/s IRB INVIT FUND has engaged *GMD Consultants* to assess the future traffic and toll potential of the project along with related operation & maintenance expenditure involved.

This report named as “**Toll Revenue and O&M Cost Projection Report**” mainly focuses on traffic and O&M aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows.

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting
- d) Operation and Maintenance Cost Projections

The Concessionaire has provided basic traffic data and other project details on the basis of which the above analysis has been carried out.

“Toll Revenue and O&M Cost Projection Report” was submitted in August 2017. In this report traffic data of year 2016-17 was used as base traffic. The report was updated with traffic data of 2017-18 and same was submitted in April 2018. The report was further updated with traffic Data of the period from April 2018 to September 2019 and was submitted in October 2018. A revised report was submitted with updated traffic for the years 2018-19 in April 2019. The report was further updated with yearly traffic data for 2019-20 in May 2020. Toll collection is affected on project stretch due to ongoing Farmer’s agitation in state. Toll collection is suspended at both toll plazas from early October 2020. Traffic data from April 2020 to October 2020, April 2022 to March 2023 was available, this report was updated taking this latest traffic data into consideration. Hence the data from April-2023 to March -2024 can be considered as base traffic for future projections. Projections have been updated on the basis of this new data.

CHAPTER 2

TRAFFIC SURVEYS AND ANALYSIS

2.1 Traffic Survey

In the course of our work, we have collected the required information for project corridor to understand the general traffic and travel characteristics of the corridor.

Toll operation on the project was suspended due to farmer's agitation. Toll operation is resumed from December 2021 and only nine-month data is available for that period which is also affected due to Covid-19 Third wave. Classified traffic volume counts at the toll plaza locations on Pathankot-Amritsar section for base year 2022-23 and now annual traffic data from April 2023 to March 2024.

The following traffic data has been collected for the project.

- Classified traffic volume counts at the two toll plaza locations on Pathankot Amritsar section of NH-15 for base year 2016-17, 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-23 and annual traffic data from April 2023 to March 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

The project can be divided into two homogenous sections from a traffic point of view.

These sections can be.

1. Pathankot to Gurdaspur
2. Gurdaspur to Amritsar

Traffic of both sections is represented by toll plaza in each section. The table below provides details of locations from where traffic details have been collected.

Table 2-1 : Traffic Data Details

SR. NO	LOCATION	CTV	Single Journey Traffic	Return Pass Traffic	Monthly Pass Traffic	Local Traffic
1	Km 16.00 Toll Plaza	AADT for Year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017
		AADT for Year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018
		AADT for Year 2018-2019	For Year 2018-2019	For Year 2018-2019	For Year 2018-2019	For Year 2018-2019
		AADT for Year 2019-2020	For Year 2019-2020	For Year 2019-2020	For Year 2019-2020	For Year 2019-2020
		AADT for Year 2020-2021 (up to Oct-20)	For Year 2020-2021 (up to Oct-20)	For Year 2020-2021 (up to Oct-20)	For Year 2020-2021 (up to Oct-20)	For Year 2020-2021 (up to Oct-20)

SR. NO	LOCATION	CTV	Single Journey Traffic	Return Pass Traffic	Monthly Pass Traffic	Local Traffic
		AADT for Year 2022-2023	For Year 2022-2023	For Year 2022-2023	For Year 2022-2023	For Year 2022-2023
		AADT for Year 2023-2024	For Year 2023-2024	For Year 2023-2024	For Year 2023-2024	For Year 2023-2024
2	Km 88.50 Toll Plaza	AADT for Year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017
		AADT for Year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018
		AADT for Year 2018-2019	For Year 2018-2019	For Year 2018-2019	For Year 2018-2019	For Year 2018-2019
		AADT for Year 2019-2020	For Year 2019-2020	For Year 2019-2020	For Year 2019-2020	For Year 2019-2020
		AADT for Year 2020-2021 (up to Oct-20) *	For Year 2020-2021 (up to Oct-20)	For Year 2020-2021 (up to Oct-20)	For Year 2020-2021 (up to Oct-20)	For Year 2020-2021 (up to Oct-20)
		AADT for Year 2022-2023	For Year 2022-2023	For Year 2022-2023	For Year 2022-2023	For Year 2022-2023
		AADT for Year 2023-2024	For Year 2023-2024	For Year 2023-2024	For Year 2023-2024	For Year 2023-2024

SR. NO	LOCATION	CTV	Single Journey Traffic	Return Pass Traffic	Monthly Pass Traffic	Local Traffic
		2023-2024				

The locations of each of the traffic surveys are illustrated in Figure below.

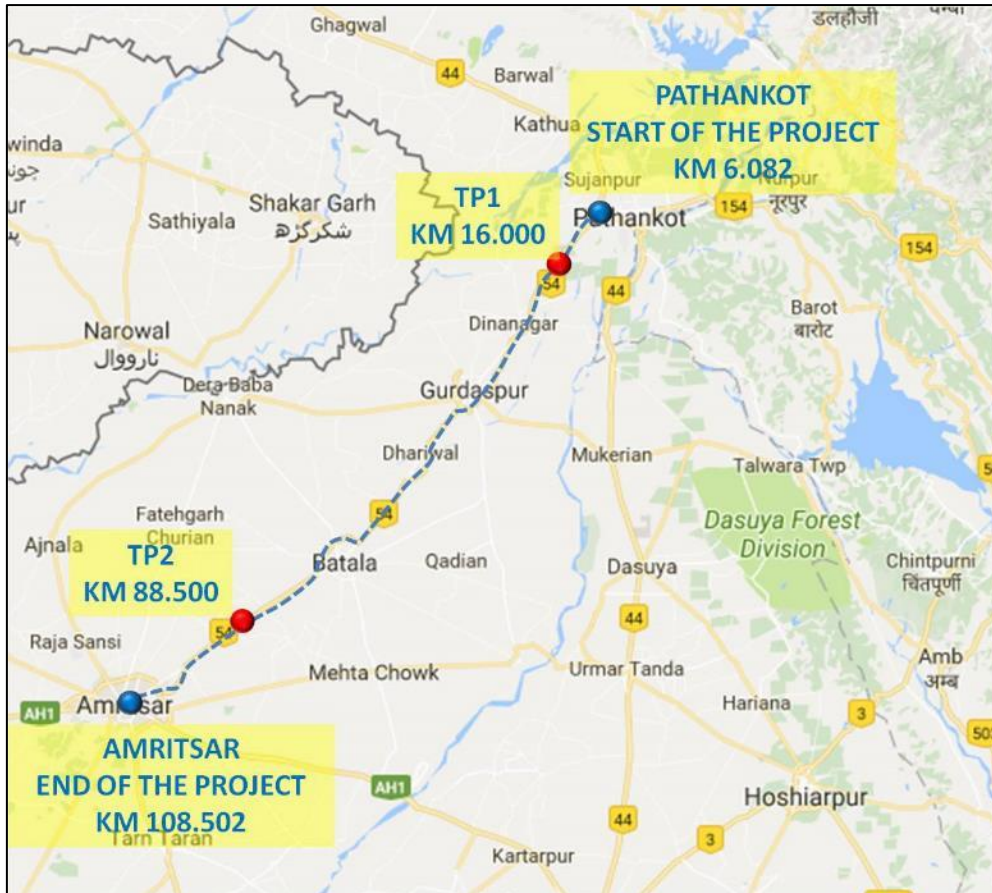


Figure 2-1: Toll Plaza Locations

2.2 Classified Traffic Volume Count

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI. These locations are indicated in the figure and table given above.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of

vehicles. The groupings of vehicles are further segregated to capture the toll able vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given below.

Table 2-2 : Vehicle Classification System

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

Source - IRC: 64 – 1990

However, since the project highway is currently under toll operation, the data collected corresponds to the category of toll able vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Minibus /LCV
- Truck / Bus
- Multi Axle
- Oversize Vehicle

2.3 Traffic Characteristic

Toll revenue of the project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have significant potential to affect toll revenue. Components of local traffic, component of passenger and commercial traffic, portion of return journey traffic, portion of monthly pass traffic are some such characteristics of traffic. These will be discussed in subsequent sections of this report.

2.3.1 Traffic Data

Project concessionaire has provided Traffic data for base years 2016-17, 2017-18, 2018-19, 2019-20, April 2020 to October-2020, April 2022 to March 2023 and April 2023 to March 2024 as under for toll plazas after resumption of traffic on project stretch.

Table 2-3 : Traffic Data at Toll Plaza @ Km 16.00

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) 2016-17	Annual Average Daily Traffic (Nos.) 2017-18	Annual Average Daily Traffic (Nos.) 2018-19	Annual Average Daily Traffic (Nos.) 2019-20	Annual Average Daily Traffic (Nos.) 2020-21 (up to Oct-20) *	Annual Average Daily Traffic (Nos.) 2022-23	Annual Average Daily Traffic (Nos.) 2023-24
1	Car	8094	8916	9220	9402	5404	5888	5808
2	Minibus / LCV	999	992	881	804	660	383	2
3	Truck / Bus	1470	1343	1109	1063	738	1087	965
4	Multi Axle	2940	2979	2450	2113	2013	2134	2441
5	Oversized Vehicles	604	22	17	32	16	10	6
	Total	14107	14252	13677	13414	8831	9502	9222

Similar traffic data for toll plaza at km 88.50 is given as under

Table 2-4 : Traffic Data at Toll Plaza @ Km 88.50

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) 2016-17	Annual Average Daily Traffic (Nos.) 2017-18	Annual Average Daily Traffic (Nos.) 2018-19	Annual Average Daily Traffic (Nos.) 2019-20	Annual Average Daily Traffic (Nos.) 2020-21 (up to Oct-20)	Annual Average Daily Traffic (Nos.) 2022-23	Annual Average Daily Traffic (Nos.) 2023-24
1	Car	10428	11238	11271	11633	6284	8064	7714
2	Minibus/ LCV	578	598	574	587	496	248	189
3	Truck/Bus	840	849	841	845	395	892	954
4	Multi Axle	688	939	1177	1239	1181	1498	1458
5	Oversized Vehicles	479	26	8	15	62	8	4
	Total	13013	13649	13870	14319	8418	10710	10318

2.4 Data Analysis

2.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of futuristic traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in table given below.

Table 2-5 : PCU Factors Adopted for Study

Vehicle Type	PCUs
Car	1.0
Minibus	1.5

Vehicle Type	PCUs
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under

Table 2-6 : Traffic in PCU at both sections

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
FY2016-17	16.00	14107	29951	2.12
	88.50	13013	19067	1.47
FY2017-18	16.00	14249	27926	1.96
	88.50	13642	18999	1.39
FY 2018-19	16.00	13677	24969	1.83
	88.50	13870	19986	1.44
FY 2019-20	16.00	13414	23449	1.75
	88.50	14319	20691	1.45

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
FY 2020-21 (up to Oct-20)	16.00	17739	8831	2.01
	88.50	13808	8418	1.64
FY 2022-23	16.00	9502	19371	2.04
	88.50	10710	17888	1.67
FY 2023-24	16.00	9222	18578	2.01
	88.50	10318	17438	1.69

It can be observed from above that project traffic has a PCU index ranging between 1.4 to 2.0 which indicates a good mix of passenger and commercial traffic on the project corridor.

2.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.

It is observed that car traffic forms 63% of total traffic at toll plaza location Km 16.00 while multi axle vehicles are 12% of total traffic. 22% of traffic is Truck /Bus while LCV traffic forms the balance 3%. Overall, about 37% of traffic is commercial in nature.

At toll plaza location Km 88.50 car traffic forms 75% of total traffic at toll plaza while multi axle and truck / bus are 9% and 7%. LCV volume is 2% of the total traffic. Overall, about 25% of traffic is commercial in nature which is lower as compared to toll plaza location Km 16.00.

Another important bifurcation of traffic is components of traffic with respect to various type of toll ticketing like

1. Single Journey
2. Return Journey
3. Overweight Vehicles (Concessionaire provided special tariff for this category)

4. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category in various years.

Table 2-7 : Journey Type Bifurcation of Traffic at KM 16.00

Sr. No	Type	Traffic Volume (Nos.) 2016-17	Traffic Volume (Nos.) 2017-18	Traffic Volume (Nos.) 2018-19	Traffic Volume (Nos.) 2019-20	Traffic Volume (Nos.) 2020-21 (up to Oct-21)	Traffic Volume (Nos.) 2022-23	Traffic Volume (Nos.) 2023-24
1	Single Journey	4255	4785	4574	4407	3786	4674	4313
2	Return Journey	5364	4648	4322	4236	1924	4676	4770
3	Monthly Pass	4488	4820	4781	4771	3121	152	139

A significant part of the traffic at KM 16.00 is monthly and return journey which is 1% and 52% respectively. Single journey component is 47%. This indicated the presence of dedicated urban traffic in the corridor.

Similarly, traffic numbers for type of journey at KM 88.50 is return and monthly journey 56% and 1% respectively. Single journey component is 43%.

Table 2-8 : Journey Type Bifurcation of Traffic at KM 88.50

Sr. No	Type	Traffic Volume (Nos.) 2016-17	Traffic Volume (Nos.) 2017-18	Traffic Volume (Nos.) 2018-19	Traffic Volume (Nos.) 2019-20	Traffic Volume (Nos.) 2020-21 (up to Oct-20)	Traffic Volume (Nos.) 2022-23	Traffic Volume (Nos.) 2023-24
1	Single Journey	2656	2858	3177	3616	3406	5021	4458
2	Return Journey	5352	5434	5620	5736	2332	5542	5740
3	Monthly Pass	5005	5360	5073	4967	2680	149	120

Now traffic data for the period April 2023 to March 2024 is for journey type bifurcation.

2.5 Secondary data collection

There are several other factors which have substantial impact on traffic pattern and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from the various sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
 - a) GDP
 - b) NSDP
 - c) Population Growth
 - d) Per Capita Income growth
 - e) Industrial Growth
 - f) Special Industry Potential
 - g) Regional and National development vision / plan
 - h) Any other relevant data

CHAPTER 3

GROWTH OF TRAFFIC ON PROJECT HIGHWAY

3.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the forecasts of factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Pathankot- Amritsar section of NH-15 has been done taking the above factors in to consideration. Established best practices and standard guidelines such as “**IRC: 108-2015-Guidelines for Traffic Forecast on Highways**” have been used for traffic growth forecast.

3.2 Trend Analysis

One of the methods of estimation of future rate of traffic growth is to assume the same rate of growth as experienced in the past. However, it may be noted that major influencing factors which reflect Economic conditions such as GDP, agricultural output, industrial output, national policies etc. are susceptible to change over a longer period of time and necessary adjustments need to be made to past trends to account for these changes.

Thus, we have considered the Elasticity model of growth projection which is one of the most widely acceptable methods for traffic forecast and is recommended in **IRC: 108-2015-Guidelines for Traffic Forecast on Highways**. Since the entire project alignment falls in Punjab State and has very little contribution from other states in terms of traffic, all developmental parameters pertaining to traffic growth are considered for Punjab State only.

In this method, past trends of any vehicular data are paired with an economic

indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that growth patterns for passenger and goods vehicles are different. Traffic growth on any highway typically depends on a number of economic parameters. The most important and direct parameters are given as under:

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It is observed that the ownership of a car is more closely related to affordability hence per capita is the index which closely fits with growth of car traffic among other criteria. In similar fashion, the following pairs of vehicle type and independent variable can be established for elasticity modeling of growth.

- Car / Jeep – Par Capita Income
- Bus / Minibus – Population
- Trucks / Heavy / Goods Vehicle – NSDP

Time series data of vehicles (both passenger and goods) Registered in the state of Punjab is used as the base data for analysis of growth.

3.3 Estimation of Traffic Demand Elasticity

The elasticity of traffic demand is defined as the rate at which traffic intensity varies due to change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish the relationship between the growth in number of given categories of vehicle with one of the economic variables considered, such as NSDP, per capita income and population growth.

As per IRC: 108-2015 the model for estimating elasticity index for the project corridor is of the following form and is as given below:

$$\text{Log } (P) = k \times \text{Log } (EI) + A$$

Where,

P = Number of Vehicles (Mode wise)

EI = Economic Indicator

A = Regression constant

k = Elasticity coefficient (Regression coefficient)

The elasticity for cars and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

The following tables and graphs depict regression and elasticity of growth model.

Table 3-1: Per Capita Income Vs Car

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2004-05	33103	337345	4.52	5.53		
2005-06	34096	376954	4.53	5.58	3%	
2006-07	37087	414612	4.57	5.62	9%	
2007-08	39567	456521	4.60	5.66	7%	
2008-09	41003	496658	4.61	5.70	4%	
2009-10	42831	538862	4.63	5.73	4%	
2010-11	44783	609469	4.65	5.78	5%	
2011-12	46422	680076	4.67	5.83	4%	
2012-13	48496	774611	4.69	5.89	4%	
2013-14	49411	869565	4.69	5.94	2%	
2014-15	51517	960734	4.71	5.98	4%	4.5%

Regression analysis of same is given in figure below.

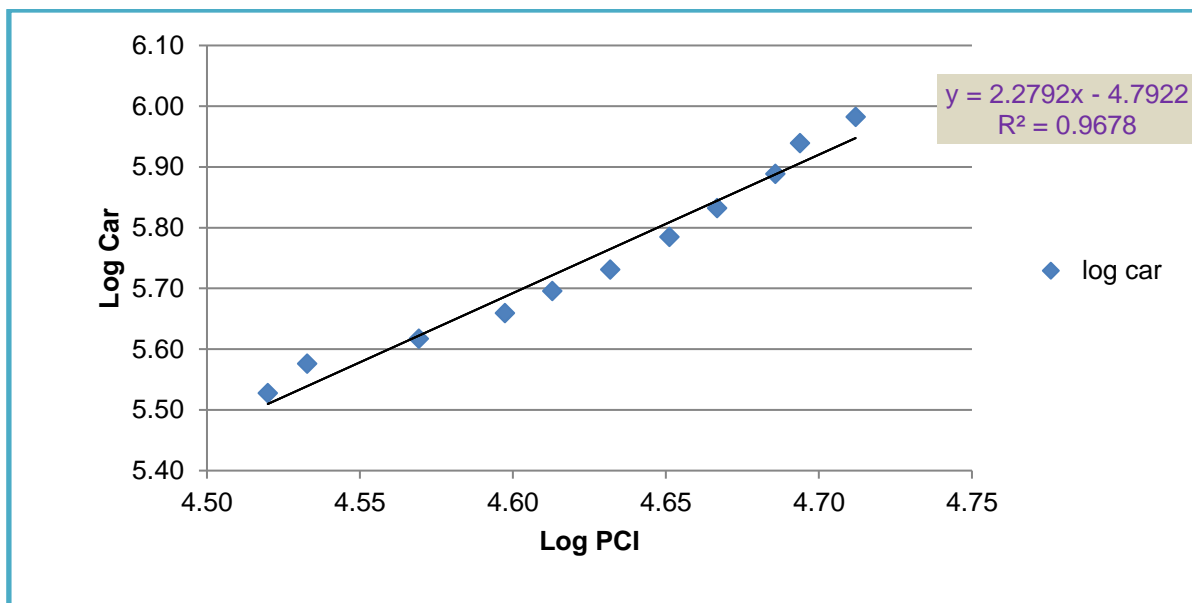


Figure 3-1: Regression and Elasticity PCI vs. Car-Extrapolation

Table 3-2 : Population Vs Bus

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2004-05	26012183	19855	7.42	4.30		
2005-06	26492788	21136	7.42	4.33	2%	
2006-07	26982983	22373	7.43	4.35	2%	
2007-08	27482038	24457	7.44	4.39	2%	
2008-09	27989725	25682	7.45	4.41	2%	
2009-10	28506747	27146	7.45	4.43	2%	
2010-11	29034180	28653	7.46	4.46	2%	
2011-12	29571111	30160	7.47	4.48	2%	
2012-13	29795907	33475	7.47	4.52	1%	
2013-14	35222450	35864	7.55	4.55	18%	
2014-15	35579780	40545	7.55	4.61	1%	3.29%

Regression analysis of same is given in figure below.

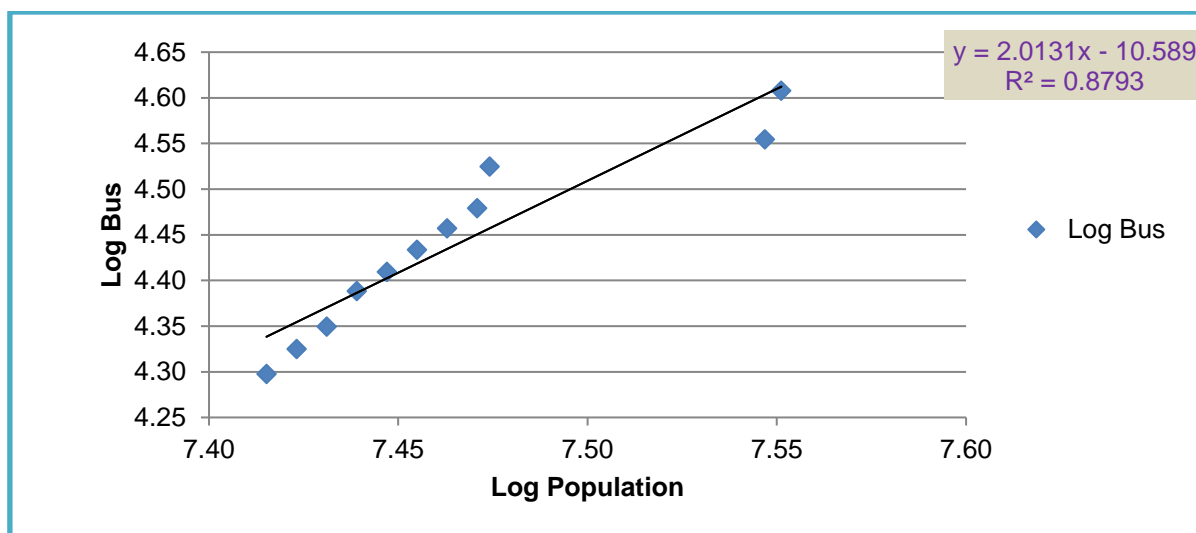


Figure 3-2: Regression and Elasticity Population vs. Bus – Extrapolation

The elasticity of goods traffic has been worked out by regression analysis with NSDP. The following table represents the data and details.

Table 3-3 : Goods Traffic Vs NSDP

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2004-05	8610813	119183	6.94	5.08		
2005-06	9032981	128201	6.96	5.11	5%	
2006-07	10007179	140380	7.00	5.15	11%	
2007-08	10873818	150720	7.04	5.18	9%	
2008-09	11476627	160113	7.06	5.20	6%	
2009-10	12209725	170519	7.09	5.23	6%	
2010-11	13002377	186725	7.11	5.27	6%	
2011-12	13727501	202930	7.14	5.31	6%	
2012-13	14449823	216238	7.16	5.33	5%	
2013-14	17403765	233211	7.24	5.37	20%	
2014-15	18329810	251035	7.26	5.40	5%	7.96%

The following figure depicts regression analysis and extrapolation.

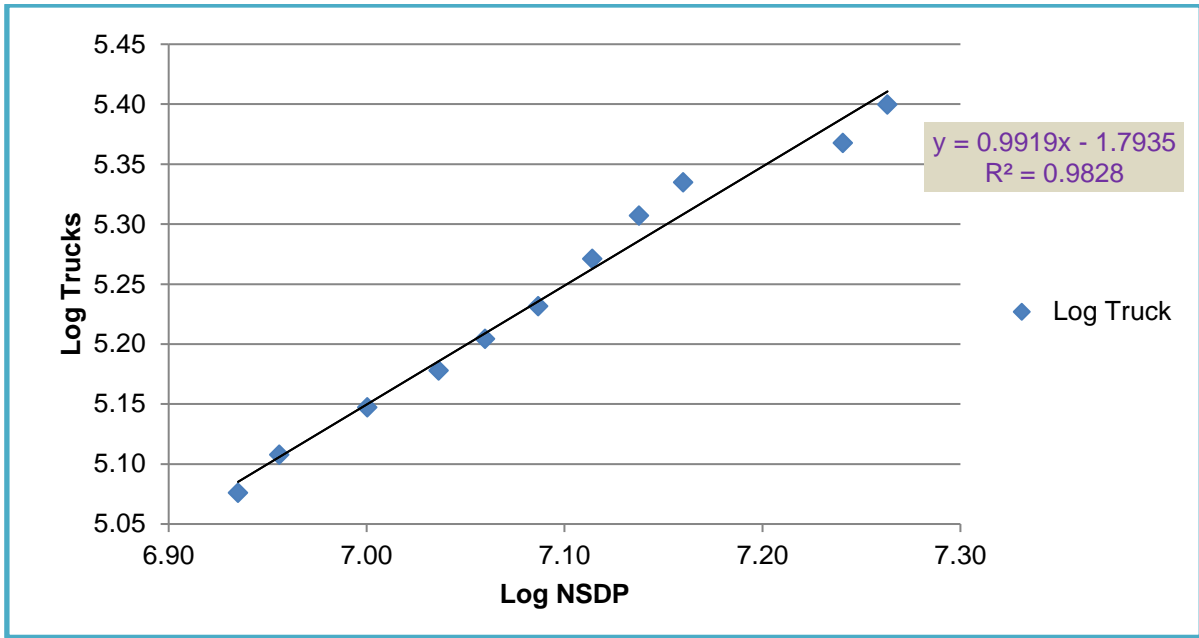


Figure 3-3: Regression and Elasticity NSDP vs. Goods Traffic – extrapolation.

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth.

The results of these analyses for the good fit as reflected by R^2 values are presented in the Table below.

Table 3-4 : Summary Regression Analysis

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Punjab	Car/Jeep	PCI	$y = 2.2792x - 4.7922$	$R^2 = 0.9678$	2.2792	4.54%	10.34%	Good Regression
	Bus	Population	$y = 2.0131x - 10.5894$	$R^2 = 0.8793$	2.0131	3.29%	6.63%	Good Regression
	Truck	NSDP	$y = 0.9919x - 1.7935$	$R^2 = 0.9828$	0.9919	7.96%	7.90%	Good Regression

The economic model for predicting growth is a good tool, however other local, regional, and national factors should also be considered before finalizing growth factors. Considering factors such as Existing developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

3.4 Analysis of Historic Traffic Data

Historic traffic data forms useful information for any highway project. It provides useful information for establishing past trends of growth. Project stretch of Pathankot to Amritsar has recently been commissioned and tolling commenced in 2014. Only a few years of traffic data are available, which is not sufficient to establish any credible trend. Moreover, due to the ban on mining in the area commercial traffic is temporarily affected. Lockdown for Corona Virus pandemic (COVID-19) disrupted project traffic in March 2020. Traffic for the period from April 2020 to September 2020 is impacted due to COVID-19 lockdown and from October-20 onwards toll collection was suspended on project which is recently resumed in December 2021. Hence the same cannot be considered for historical growth.

Hence traffic growth on the project corridor has been taken from the economic model.

3.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economic, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.

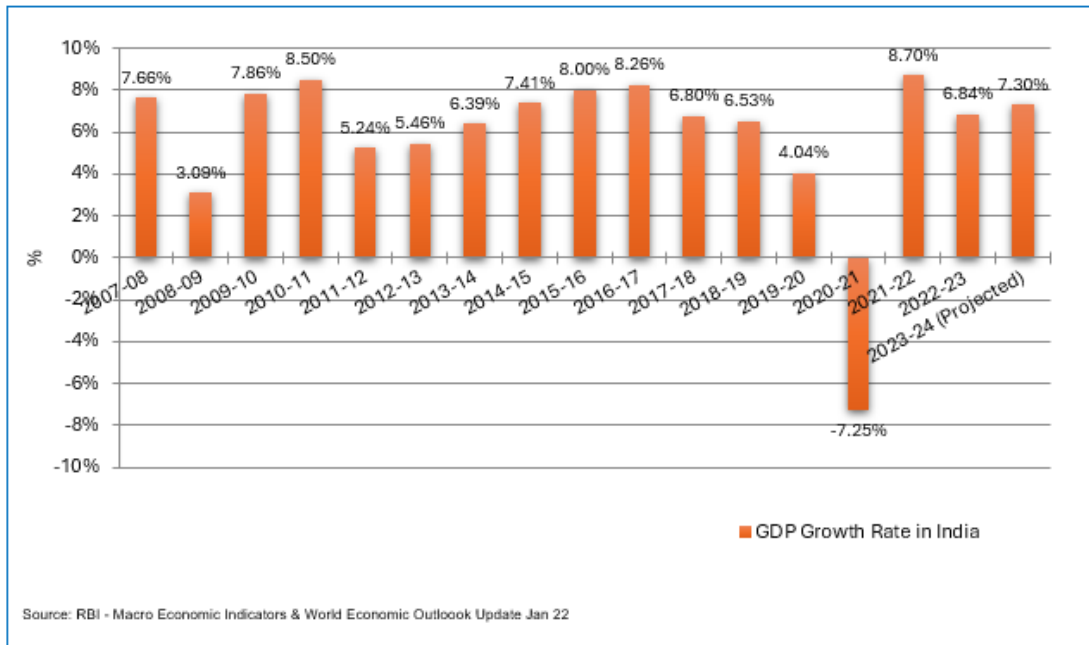


Figure 3-4 : Growth of GDP in India

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honorable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into an opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on **Make -In- India** it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. The World Economic Outlook update also has predicted a growth rate of about 7.5 % in the next year 2022-23.

3.6 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as below. Growth rates are recommended for three scenarios for sensitivity analysis namely Optimistic, Pessimistic and Most Likely with a positive and negative variation 0.5% and -1.0% from Most Likely case respectively. While working out future growth projections both historical and economic model growths are considered.

The rate of growth is moderate in light of overall regional trends. Growth of multi-Axle is kept slightly higher as the trend of technological advances in the logistics industry favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, the rate of growth diminishes. Same growth rate is not sustainable for long. It is an established practice to step down future growth rates at intervals of 5 years.

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Table 3-5 : Recommended Growth Rates Optimistic

Year/ Vehicle Type	2020-22	2022-27	2027-32	2032-37	2037-42
Car/Jeep/Van	8.84%	7.84%	6.84%	5.84%	5.34%
LCV	7.40%	6.40%	5.40%	4.40%	4.15%
Truck/Bus	6.13%	5.13%	4.13%	3.13%	2.88%
Multi Axle (> 2 axle)	8.40%	7.40%	6.40%	5.40%	5.15%

Table 3-6 : Recommended Growth Rates Pessimistic

Year/ Vehicle Type	2020-22	2022-27	2027-32	2032-37	2037-42
Car/Jeep/Van	7.34%	6.34%	5.34%	4.34%	3.84%
LCV	5.90%	4.90%	3.90%	2.90%	2.65%
Truck/Bus	4.63%	3.63%	2.63%	1.63%	1.38%
Multi Axle (> 2 axle)	6.90%	5.90%	4.90%	3.90%	3.65%

Table 3-7 : Recommended Growth Rates Most Likely

Year/ Vehicle Type	2020-22	2022-27	2027-32	2032-37	2037-42
Car/Jeep/Van	8.34%	7.34%	6.34%	5.34%	4.84%
LCV	6.90%	5.90%	4.90%	3.90%	3.65%
Truck/Bus	5.63%	4.63%	3.63%	2.63%	2.38%
Multi Axle (> 2 axle)	7.90%	6.90%	5.90%	4.90%	4.65%

Traffic on the project corridor in the year 2023-24 was temporarily affected due to farmer agitation in the state of Punjab for part of the year. Traffic has been stabilized on the project corridor from the month of March 2024 onwards. Hence an additional growth has been applied in the year 2024-25 to compensate for temporary deficit of traffic in the year 2023-24.

CHAPTER 4

TRAFFIC FORECAST

4.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 4-1 : Total Tollable Traffic @ Toll Plaza 1- Chainage 16.000 KM
(Optimistic Growth Scenario)**

Year	Car	Minibus/ LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2024-25	6669	347	1251	2273	7	10547	21203
2025-26	7191	370	1315	2442	7	11325	22712
2026-27	7754	393	1382	2623	7	12159	24325
2027-28	8284	414	1440	2791	7	12936	25816
2028-29	8851	437	1501	2969	7	13765	27402
2029-30	9457	460	1562	3159	7	14645	29080
2030-31	10104	485	1626	3361	7	15583	30866
2031-32	10795	512	1693	3576	7	16583	32766
2032-33	11424	535	1747	3769	7	17482	34460
2033-34	12091	558	1802	3972	7	18430	36240
2034-35	12797	583	1859	4187	7	19433	38122
2035-36	13544	608	1917	4413	7	20489	40097
2036-37	14334	635	1978	4651	7	21605	42182
2037-38	15100	662	2036	4890	7	22695	44238

Table 4-2 : Total Tollable Traffic @ Toll Plaza 2- Chainage 88.50 KM
(Optimistic Growth Scenario)

Year	Car	Minibus/ LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2024-25	8858	214	1071	1668	12	11823	19952
2025-26	9553	228	1127	1792	13	12713	21399
2026-27	10302	243	1185	1925	14	13669	22947
2027-28	11007	257	1233	2049	15	14561	24380
2028-29	11759	271	1285	2179	16	15510	25898
2029-30	12563	286	1338	2318	17	16522	27514
2030-31	13422	302	1393	2467	18	17602	29237
2031-32	14340	319	1450	2625	19	18753	31067
2032-33	15177	333	1495	2767	20	19792	32703
2033-34	16062	348	1542	2916	21	20889	34427
2034-35	16999	364	1589	3074	22	22048	36244
2035-36	17991	380	1637	3240	23	23271	38156
2036-37	19041	397	1689	3415	24	24566	40179
2037-38	20058	414	1737	3591	25	25825	42162

Similarly, traffic projections for Pessimistic scenario are given below.

Table 4-3 : Total Tollable Traffic @ Toll Plaza 1- Chainage 16.000 KM
(Pessimistic Growth Scenario)

Year	Car	Minibus/ LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2024-25	6583	341	1234	2242	7	10407	20917
2025-26	7000	358	1278	2374	7	11017	22086
2026-27	7444	375	1323	2513	7	11662	23316
2027-28	7842	390	1358	2637	7	12234	24399
2028-29	8261	405	1393	2766	7	12832	25526
2029-30	8702	422	1430	2902	7	13463	26716
2030-31	9167	439	1468	3044	7	14125	27959
2031-32	9656	456	1506	3193	7	14818	29258
2032-33	10075	469	1529	3317	7	15397	30324
2033-34	10512	482	1554	3446	7	16001	31436
2034-35	10968	497	1579	3580	7	16631	32592
2035-36	11444	512	1604	3719	7	17286	33791
2036-37	11940	527	1629	3863	7	17966	35033
2037-38	12399	542	1651	4004	7	18603	36215

Table 4-4 : Total Tollable Traffic @ Toll Plaza 2- Chainage 88.50 KM
(Pessimistic Growth Scenario)

Year	Car	Minibus/ LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2024-25	8742	211	1055	1646	12	11666	19685
2025-26	9296	221	1093	1743	13	12366	20809
2026-27	9885	231	1133	1846	14	13109	22001
2027-28	10413	239	1162	1937	15	13766	23042
2028-29	10969	247	1191	2031	16	14454	24124
2029-30	11555	257	1221	2131	17	15181	25270
2030-31	12172	267	1252	2235	18	15944	26467
2031-32	12822	277	1285	2345	19	16748	27731
2032-33	13378	285	1306	2436	20	17425	28776
2033-34	13959	293	1327	2530	21	18130	29859
2034-35	14565	301	1348	2628	22	18864	30986
2035-36	15198	309	1370	2731	23	19631	32165
2036-37	15858	317	1392	2837	24	20428	33384
2037-38	16467	325	1410	2940	25	21167	34527

Similarly, traffic projections for Most Likely are given below.

Table 4-5 : Total Tollable Traffic @ Toll Plaza 1- Chainage 16.000 KM
(Most Likely Growth Scenario)

Year	Car	Minibus/ LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2024-25	6641	345	1246	2262	7	10501	21107
2025-26	7128	366	1304	2418	7	11223	22502
2026-27	7650	387	1365	2584	7	11993	23985
2027-28	8135	406	1416	2736	7	12700	25336
2028-29	8650	427	1468	2897	7	13449	26763
2029-30	9199	448	1522	3068	7	14244	28275
2030-31	9782	470	1577	3249	7	15085	29870
2031-32	10402	493	1635	3440	7	15977	31558
2032-33	10958	512	1677	3609	7	16763	33029
2033-34	11542	533	1719	3786	7	17587	34567
2034-35	12157	554	1764	3971	7	18453	36181
2035-36	12806	575	1809	4166	7	19363	37874
2036-37	13490	598	1854	4370	7	20319	39646
2037-38	14143	619	1897	4573	7	21239	41373

Table 4-6 : Total Tollable Traffic @ Toll Plaza 2- Chainage 88.500 KM
(Most Likely Growth Scenario)

Year	Car	Minibus/ LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2024-25	8819	213	1065	1661	12	11770	19862
2025-26	9466	225	1113	1775	13	12592	21189
2026-27	10161	238	1164	1897	14	13474	22610
2027-28	10805	249	1206	2009	15	14284	23905
2028-29	11489	261	1249	2128	16	15143	25276
2029-30	12217	273	1295	2253	17	16055	26727
2030-31	12992	286	1342	2386	18	17024	28265
2031-32	13816	299	1390	2527	19	18051	29892
2032-33	14553	310	1426	2651	20	18960	31316
2033-34	15330	322	1464	2781	21	19918	32814
2034-35	16147	334	1503	2917	22	20923	34383
2035-36	17008	347	1543	3060	23	21981	36031
2036-37	17916	360	1583	3209	24	23092	37754
2037-38	18783	373	1621	3358	25	24160	39429

4.2 Modification in Concession Period

As per Article 29 of the concession agreement, if actual traffic on the project falls short or exceeds Target Traffic on project highway on defined date, concession period shall be modified subject to calculation stipulated therein. For Pathankot-Amritsar project, the Target Date and Target Traffic are defined as below.

Target Date - 1st January 2019

Target Traffic - 34498 in PCU.

It was observed that as per traffic projections, traffic volume falls short of target traffic in all scenarios. This warrants for extension of the concession period. Extension of the concession period is worked out as per the provisions of concession agreement. The following table provides details of modification in concession agreement.

Scenario	Average Traffic in PCUs of Month Dec-2019 Jan-2019	Expected reduction/shortening in Concession Period
Actual	23110	4 years

Further, due to the suspension of toll in the year FY17 for a period of 24 days, the Concessionaire would be entitled to an extension of an additional 24 days.

Traffic was severely impacted on the project highway during the initial lockdown period. NHAI has declared a policy of providing extension of concession to make up for revenue loss during lockdown. It is expected extension would be provided to project concession period on this account as well.

Concessionaire had initiated arbitration proceedings against National Highways Authority of India (“NHAI”) before the Hon’ble Arbitration Tribunal for extension of the Concession Period by 518 days and compensation for delay in completion of construction of the project on account of the reasons not attributable to Concessionaire.

A petition filed by NHAI challenging the Arbitral Award has been dismissed by the Honorable Delhi High Court & the Arbitral Award has been upheld. As a result, the extension of the Concession period by 518 days would accrue to concession period. The matter is currently pending before the Hon'ble Supreme Court.

Thus, a total of about 6 years would be added to the original concession period. Projection of revenue and traffic has been done accordingly.

Due to farmers’ protest in the state of Punjab and Haryana, toll operations were suspended from October 2020 to December 2021. As per the provisions of the Concession agreement, the Concessionaire is eligible for extension of concession period by 441 days.

Due to farmers’ protest in the state of Punjab, toll operations were temporarily suspended from December 16, 2022, to January 15, 2023. As per the provisions of the Concession agreement, the Concessionaire is eligible for extension of concession period by 31 days.

CHAPTER 5

FORECAST OF TOLL REVENUE

5.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

5.2 Discount Categories

As per the Toll Notification (Schedule R) the following discounts have been considered:

1. Monthly Pass: For frequent user's monthly pass is issued for 50 trips per month. The applicable discounted rate is 2/3 times the normal rate. Concessionaire has also issued an additional monthly pass for 60 trips at 2/3 times the normal rate.
2. Daily Pass (for Return Trip): A 75% discount will be offered on the return trip.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travelers or whose frequency does not yield any discount from the above categories.
4. Local Car / Jeep / Van to be charged at Rs 150 per month (2007)

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule R) as given under

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI are available up to 2021-22. A moderate growth in Wholesale Price Index (WPI) has

been assumed after that. Following graph provides projection of rate of inflation (WPI) in India. Data has been taken from Office of Economic Advisor web site (www.eaindustry.nic.in). WPI for years 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.

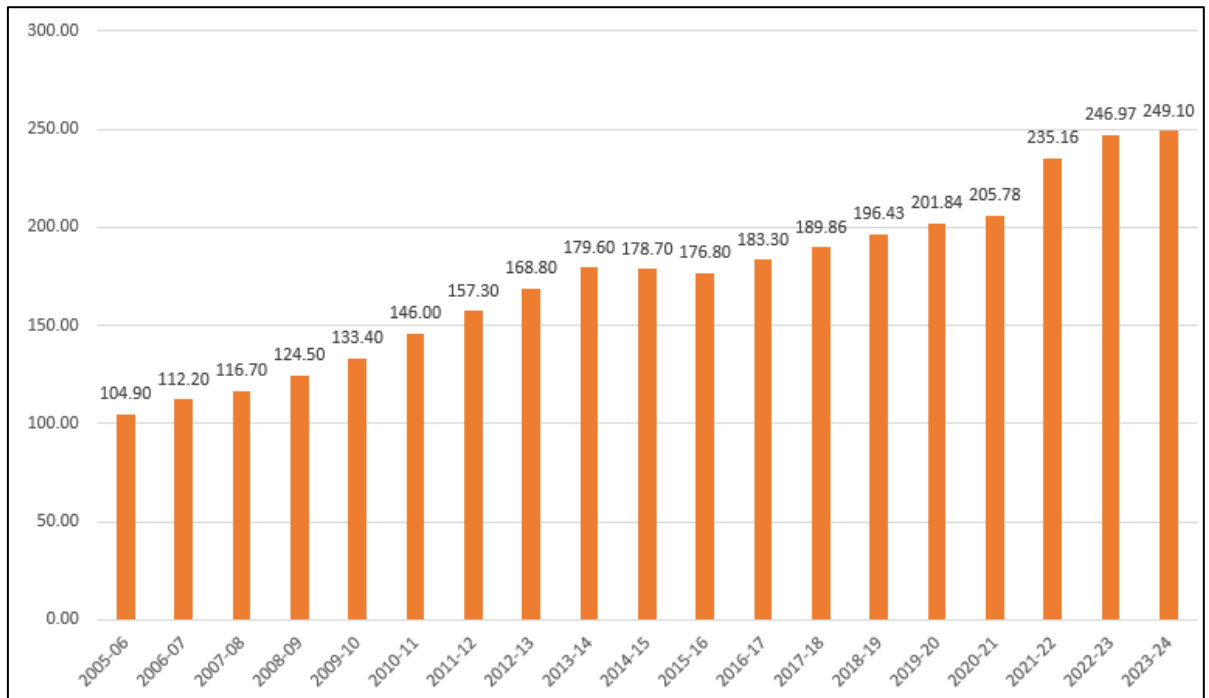


Figure 5-1 : Historical Rate of WPI Inflation in India

Except for the negative growth of WPI in the year 2015-16 average inflation in WPI from the year 2005-2024 is 4.98%. A WPI growth of 5% has been considered for future rate estimates.

5.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules, 2008.

Table 5-1 : Base Toll Rates 2007 - 08

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (2 Axle)	2.2
Three Axle commercial vehicles	2.4
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4-6 axles)	3.45
Oversized Vehicle (seven or more axles)	4.2

There are a number of bypasses and structures in each package. Equivalent length for structures is added to tollable length at each toll plaza. Bypasses cost more than Rs. 50 Cr. are to be charged as per fee notification which provides incremental rate over basic rate for Rs. 15 Cr cost of bypass. The following table provides details of Bypasses having cost more than Rs. 50 Cr.

Additional rates for bypass having cost more than Rs. 50 Cr has been added as per schedule -R in toll rates for both toll plazas. Lengths of bypasses are deducted to arrive at effective length of road for each toll plaza for normal toll rates. Effective length excluding length of bypasses thus works out to Km 31.310 and Km 36.97 for Toll Plaza at Km 16.00 and Km 88.50 respectively.

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs. five) for the concession period and are given below. Since applicable length of highway length is equal for both plazas, applicable toll rates are also same

Thus, worked out rates for various categories of vehicle and discounts are given as under.

Table 5-2 : Toll Rates for Single Journey @Km 16.00

Year	Car	Minibus	LCV	Truck	Bus	Multi axle	Oversized Vehicles
2024-25	135	205	205	420	420	635	825
2025-26	140	215	215	440	440	670	865
2026-27	150	230	230	465	465	700	910
2027-28	155	240	240	485	485	740	955
2028-29	165	250	250	510	510	775	1005
2029-30	170	265	265	535	535	815	1055
2030-31	180	280	280	565	565	855	1110
2031-32	190	290	290	595	595	900	1170
2032-33	200	305	305	625	625	950	1230
2033-34	210	325	325	660	660	1000	1295
2034-35	220	340	340	690	690	1050	1360
2035-36	235	360	360	730	730	1105	1430
2036-37	245	375	375	765	765	1165	1510
2037-38	260	395	395	805	805	1225	1590

Table 5-3 : Toll Rates for Return Journey@ Km 16.000

Year	Car	Minibus	LCV	Truck	Bus	Multi axle	Oversized Vehicles
2024-25	200	310	310	630	630	955	1235
2025-26	210	325	325	660	660	1005	1300
2026-27	220	340	340	695	695	1055	1365
2027-28	235	360	360	730	730	1105	1435
2028-29	245	375	375	765	765	1165	1510
2029-30	255	395	395	805	805	1225	1585
2030-31	270	415	415	845	845	1285	1665
2031-32	285	440	440	890	890	1350	1750
2032-33	300	460	460	935	935	1420	1845
2033-34	315	485	485	985	985	1495	1940
2034-35	330	510	510	1040	1040	1575	2040
2035-36	350	535	535	1090	1090	1660	2150
2036-37	365	565	565	1150	1150	1745	2260
2037-38	385	595	595	1210	1210	1840	2380

Table 5-4 : Toll Rates for Local Monthly Ticket @ Km 16.000

Year	Car
2024-25	340
2025-26	355
2026-27	375
2027-28	390
2028-29	410

Year	Car
2029-30	435
2030-31	455
2031-32	480
2032-33	505
2033-34	530
2034-35	560
2035-36	590
2036-37	620
2037-38	650

Table 5-5 : Toll Rates for Monthly Pass Local (50 Trips) @Km 16.000

Year	Car/Jeep/Van	LCV	Truck	Bus	3 - Axle	Multi Axle
2024-25	4465	6870	13980	13980	21210	27490
2025-26	4690	7220	14685	14685	22280	28875
2026-27	4925	7585	15425	15425	23405	30335
2027-28	5175	7970	16210	16210	24595	31875
2028-29	5440	8375	17040	17040	25850	33500
2029-30	5720	8805	17910	17910	27175	35215
2030-31	6015	9255	18830	18830	28570	37030
2031-32	6325	9735	19805	19805	30045	38940
2032-33	6650	10240	20830	20830	31605	40960
2033-34	7000	10775	21920	21920	33255	43095
2034-35	7365	11340	23065	23065	34995	45355
2035-36	7750	11935	24275	24275	36835	47735
2036-37	8160	12565	25560	25560	38780	50260
2037-38	8595	13230	26915	26915	40835	52925

Table 5-6 : Toll Rates for Single Journey @ Km 88.500

Year	Car	Minibus	LCV	Truck	Bus	Multi axle	Oversized Vehicles
2024-25	115	180	180	365	365	560	715
2025-26	120	190	190	385	385	590	750
2026-27	125	195	195	405	405	620	790
2027-28	135	210	210	425	425	650	830
2028-29	140	220	220	445	445	680	870
2029-30	150	230	230	470	470	715	915
2030-31	155	240	240	495	495	755	965
2031-32	165	255	255	520	520	795	1015
2032-33	170	265	265	545	545	835	1065
2033-34	180	280	280	575	575	875	1120
2034-35	190	295	295	605	605	925	1180
2035-36	200	310	310	635	635	970	1245

Year	Car	Minibus	LCV	Truck	Bus	Multi axle	Oversized Vehicles
2036-37	210	325	325	670	670	1025	1310
2037-38	220	345	345	705	705	1075	1380

Table 5-7 : Toll Rates for Return Journey @ Km 88.500

Year	Car	Minibus	LCV	Truck	Bus	Multi axle	Oversized Vehicles
2024-25	175	270	270	550	550	840	1075
2025-26	180	280	280	575	575	880	1130
2026-27	190	295	295	605	605	925	1185
2027-28	200	310	310	635	635	975	1245
2028-29	210	325	325	670	670	1025	1310
2029-30	220	345	345	705	705	1075	1375
2030-31	235	360	360	740	740	1130	1445
2031-32	245	380	380	780	780	1190	1520
2032-33	255	400	400	820	820	1250	1600
2033-34	270	420	420	860	860	1315	1685
2034-35	285	445	445	905	905	1385	1770
2035-36	300	465	465	955	955	1460	1865
2036-37	315	490	490	1005	1005	1535	1965
2037-38	335	515	515	1060	1060	1615	2065

Table 5-8 : Toll Rates for Local Monthly Ticket @ Km 88.500

Year	Car
2024-25	340
2025-26	355
2026-27	375
2027-28	390
2028-29	410
2029-30	435
2030-31	455
2031-32	480
2032-33	505
2033-34	530
2034-35	560
2035-36	590
2036-37	620
2037-38	650

Table 5-9 : Toll Rates for Monthly Pass Local (50 Trips) @ Km 88.50

Year	Car/Jeep/Van	LCV	Truck	Bus	3 - Axle	Multi Axle
2024-25	3840	5965	12210	12210	18655	23865
2025-26	4030	6265	12825	12825	19595	25065
2026-27	4235	6585	13475	13475	20585	26335
2027-28	4450	6920	14155	14155	21635	27670
2028-29	4675	7270	14880	14880	22735	29080
2029-30	4915	7645	15640	15640	23900	30570
2030-31	5170	8035	16445	16445	25130	32145
2031-32	5435	8450	17295	17295	26430	33805
2032-33	5720	8890	18195	18195	27800	35555
2033-34	6015	9355	19140	19140	29250	37410
2034-35	6330	9840	20145	20145	30780	39370
2035-36	6665	10360	21200	21200	32395	41440
2036-37	7015	10905	22320	22320	34110	43625
2037-38	7390	11485	23505	23505	35915	45940

5.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated under in all three scenarios. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section. Toll operation was suspended at both toll plazas from October 2020 to December, 2021 due to ongoing Farmer's agitation in the state. The current report is updated with traffic data made available by Concessionaire from April 2023 to March 2024.

5.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under most likely scenario at each of the toll plaza up to 2037-38 starting from the year 2023-24 are shown in tables below.

Table 5-10 : Toll Revenue Pessimistic Scenario (Crores)

Year	Toll at Plaza 16.00	Toll at Plaza 88.50	Total
2024-25	97.19	78.38	175.57
2025-26	107.74	86.61	194.35

Year	Toll at Plaza 16.00	Toll at Plaza 88.50	Total
2026-27	119.65	96.16	215.81
2027-28	132.12	106.59	238.71
2028-29	144.80	116.54	261.34
2029-30	158.57	128.71	287.28
2030-31	174.77	141.87	316.64
2031-32	193.01	156.93	349.94
2032-33	210.08	169.53	379.61
2033-34	229.15	185.26	414.41
2034-35	249.44	202.95	452.39
2035-36	274.04	222.01	496.05
2036-37	297.37	241.93	539.30
2037-38	324.07	263.50	587.58

Table 5-11 : Toll Revenue Optimistic Scenario
(Rs. Crores)

Year	Toll at Plaza 16.00	Toll at Plaza 88.50	Total
2024-25	98.46	79.42	177.88
2025-26	110.73	89.04	199.77
2026-27	124.81	100.31	225.12
2027-28	139.77	112.77	252.54
2028-29	155.36	125.08	280.44
2029-30	172.56	140.14	312.70
2030-31	192.86	156.70	349.56

Year	Toll at Plaza 16.00	Toll at Plaza 88.50	Total
2031-32	216.02	175.79	391.80
2032-33	238.59	192.62	431.21
2033-34	264.08	213.56	477.64
2034-35	291.67	237.37	529.04
2035-36	325.14	263.35	588.49
2036-37	357.90	291.12	649.02
2037-38	395.73	321.74	717.47

*Table 5-12 : Toll Revenue Most Likely Scenario
(Rs. Crores)*

Year	Toll at Plaza 16.00	Toll at Plaza 88.50	Total
2024-25	98.01	79.03	177.04
2025-26	109.71	88.14	197.85
2026-27	123.05	98.79	221.84
2027-28	137.16	110.51	247.67
2028-29	151.81	122.02	273.83
2029-30	167.85	136.10	303.95
2030-31	186.79	151.44	338.24
2031-32	208.27	169.09	377.36
2032-33	228.91	184.40	413.32
2033-34	252.16	203.48	455.64
2034-35	277.10	225.03	502.13
2035-36	307.31	248.47	555.78
2036-37	336.62	273.38	610.00

Year	Toll at Plaza 16.00	Toll at Plaza 88.50	Total
2037-38	370.42	300.65	671.08

CHAPTER 6

OPERATION & MAINTENANCE COST

6.1 General

The following are project parameters which would contribute towards the cost of operation and maintenance.

The future cost of operation and maintenance is estimated on a guess basis. Keeping all above factors in view, following can be basis of working out cost of operation and maintenance for project corridor from Pathankot to Amritsar on NH-15 in state of Punjab.

- i) **Annual Regular Maintenance** – Covering pothole repair, shoulder and slope repair, drain cleaning, median maintenance, Crash barrier, toll plaza maintenance, Toll collection, other services like medical help and rescue operations etc.
- j) **Periodic Maintenance** – This will be done on a periodic basis, say every 5 years. It will consist of overlaying of wearing course and painting and marking. Some pavement strengthening is also anticipated in a few sections. This operation and its cost are spread over more than one years.

Concessionaire has recently updated the program of maintenance of project road. Same has been reviewed and year-wise cost of O&M from year 2023-24 is given in table below.

Table 6-1 : Year wise Details of Operation & Maintenance Cost

Year	Annual maintenance (Rs. Cr)	Thermoplastic painting (Rs. Cr)	Renewal Coat with BC (Rs. Cr.)	Special Repair of pavement	Structure maintenance (Rs. Cr)	Electric System	Total Expenditure (Rs. Crores)	Remarks
						Annual		
2024-25	19.12	1.18	16.64	7.21	0.06	0.94	60.50	Periodic Repair
2025-26	19.12	1.18	16.64	5.04	0.06	0.94	60.48	Periodic Repair
2026-27	19.12			5.76	0.06	0.94	38.24	Periodic Repair
2027-28	19.12				0.06	0.94	31.21	Regular O & M
2028-29	19.12			10.09	0.06	0.94	49.20	Periodic Repair
2029-30	19.12	2.03	28.52		0.06	0.94	86.65	Periodic Repair
2030-31	16.25				0.06	0.94	30.39	Regular O & M
2031-32	16.25				0.06	0.94	31.30	Regular O & M
2032-33	16.25				0.06	0.94	32.24	Regular O & M
2033-34	16.25				0.06	0.94	33.21	Regular O & M
2034-35	16.25				0.06	0.94	34.20	Regular O & M

CHAPTER 7

CONCLUSION & RECOMMENDATIONS

7.1 Conclusion & Recommendations

Project stretch of Pathankot to Amritsar section of NH-15 in state of Punjab from km 6.082 to km 108.502 is currently a four-lane road. The road is in sound condition and serves reasonably good levels of traffic volume. The project corridor falls in the influence zone of fast upcoming metro city Amritsar. There are many upcoming projects in the area which have the potential to boost economic growth of the area and add value to the development of the region. All these developments have potential to give a positive impact to traffic flow on the project. As estimated in this study report, project traffic is expected to grow at rate of 6-8% per annum in post COVID-19 scenario.

The following can be considered as major outcome of study.

- a) There is a good amount of toll able traffic running on the project.
- b) Project corridor has potential to witness good traffic growth annually in near future due to various development in area and overall growth of the economy once tolling is resumed on project stretch.
- c) Project corridor does not have risk of traffic leakage due to lack of competing roads of comparable quality.
- d) Project infrastructure is in good condition and its maintenance cost is also reasonable.

Based on the above it can be considered a stable healthy project from the traffic and revenue point of view.

CHAPTER 8

PROJECT ILLUSTRATIONS

8.1 General

Project current condition has been depicted in the following photographs.



Figure 8-1 : General Condition



Figure 8-2 : General Condition



Figure 8-3 : General Condition



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TALEGAON TO AMRAVATI SECTION OF NH-6 (KM 100.000 To KM 166.725) IN THE STATE OF MAHARASHTRA



TOLL REVENUE AND O&M COST PROJECTION REPORT (FINAL)



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APRIL 2024



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ABBREVIATIONS

AADT	- Annual Average Daily Traffic	NHAI	- National Highways Authority of India
BOT	- Build Operate Transfer	NHDP	- National Highways Development Project
CAGR	- Compound Annual Growth Rate	NSDP	- Net State Domestic Product
CTV	- Classified traffic volume	O&M	- Operation & Maintenance
DBFOT	- Design, Build, Finance, Operate & Transfer	PCDP	- Per Capita Domestic Product
EME	- Earth Moving Equipment	PCI	- Per Capita Income
GDP	- Gross Domestic Product	PCU	- Passenger Car Unit
GSDP	- Gross State Domestic Product	PSC	- Pre-stressed Concrete
HCM	- Heavy Construction Machinery	RCC	- Reinforced cement concrete
HCV	- Heavy Commercial Vehicle	RHS	- Right Hand Side
HTMS	- Highway Traffic Management System	SH	- State Highway
IRC	- Indian Road Congress	TP	- Toll Plaza
IRR	- Internal Rate of Return	WPI	- Wholesale Price Index
LCV	- Light Commercial Vehicle	SIR	- Special Investment Region
LHS	- Left Hand Side	c.	- Circa
LGV	- Light Goods Vehicle	ROB	- Railway Over Bridge
MAV	- Multi Axle Vehicle	MDR	- Major District Road
MORTH	- Ministry of Road Transport and Highways	ODR	- Other District Road
NH	- National Highway	CA	- Concession Agreement
PCC	- Plain Cement Concrete	RMT	- Running Meter
CR	- Coarse Rubble		

CHAPTER 1

INTRODUCTION

1.1 Background

The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under NHDP Phase V. Under Phase V NHAI has planned to convert 6,500 km of existing 4-lane National Highways into 6-lane National Highway. Sections envisaged under 6-laning comprise the Golden Quadrilateral section (5,700 km) and some other sections which are 800 km in length.

The project under consideration, Talegaon - Amravati section of NH-6 from Km 100.000 to km 166.725 is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. *M/s IRB Talegaon - Amravati Tollway Ltd.* (Concessionaire) has been awarded the Project for concession period of 22 years starting from 3rd September 2010 to 2nd September 2032. The Project has been commissioned and is currently in the operation / maintenance phase.

1.2 Objective of the Study

M/s IRB INVIT FUND has engaged GMD Consultants to assess the future traffic and toll potential of the project along with related operation & maintenance expenditure involved.

This report named as “*Toll Revenue and O&M Cost Projection Report*” mainly focuses on traffic and O&M aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows.

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting
- d) Operation and Maintenance Cost Projections

The Concessionaire has provided basic historical traffic data and other project details on the basis of which the above analysis has been carried out, after applying our judgment on the traffic estimates.

“Toll Revenue and O&M Cost Projection Report” was submitted in March 2017. In this report traffic data of year 2015-16 was used as base traffic. The report was updated with traffic data for the year 2016-17 and report was submitted in October 2017. The report was further updated with traffic data of 2017-18 and same was submitted in April 2018. The report was further updated with traffic Data of the period from April 2018 to September 2018 and was submitted in October 2018. A revised report was submitted with updated traffic for the years 2018-19 in April 2019. The report was further updated with yearly traffic data of 2019-20 in May 2020. With traffic data from April 2020 to March 2021 report was updated report was further updated with yearly traffic data from April 2021 to March 2022, April 2022 to March 2023 and now concessionaire has provided traffic data from April 2023 to March 2024 this report is updated with this annual traffic data into consideration.

CHAPTER 2

TRAFFIC SURVEYS AND ANALYSIS

2.1 Traffic Surveys

In the course of our work, we have collected the required information for project corridor to understand the general traffic and travel characteristics of the corridor.

The following traffic data has been collected for the project.

- Classified traffic volume counts at toll plaza locations on Amravati - Talegaon section of NH-6 for base year 2015-16, 2016-17, 2017-18, 2018-19, 2019-20, 2020-21, 2021-22 ,2022-23 and annual traffic data from April 2023 to March 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

Table 2-1 below lists provides details of locations from where traffic details have been collected.

Table 2-1 : Traffic Data Details

SR. NO	LOCATION	CTV	Single Journey Traffic	Return Journey Traffic	Monthly Pass Traffic	Local Traffic
1	Km 142.800 Toll Plaza	AADT for Year 2015-2016	For Year 2015-2016	For Year 2015-2016	For Year 2015-2016	For Year 2015-2016
		AADT for year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017
		AADT for year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018
		AADT for Year 2018-2019	For Year 2018-2019	For Year 2018-2019	For Year 2018-19	For Year 2018-19
		AADT for Year 2019-2020	For Year 2019-2020	For Year 2019-2020	For Year 2019-2020	For Year 2019-2020
		AADT for year 2020-2021	For Year 2020-2021	For Year 2020-2021	For Year 2020-2021	For Year 2020-2021
		AADT for year 2021-2022	For year 2021-2022	For year 2021-2022	For year 2021-2022	For year 2021-2022
		AADT for year 2022-2023	For year 2022-2023	For year 2022-2023	For year 2022-2023	For year 2022-2023
		AADT for year 2023-2024	For year 2023-2024	For year 2023-2024	For year 2023-2024	For year 2023-2024

The locations of each of the traffic surveys are illustrated in the following Figure.

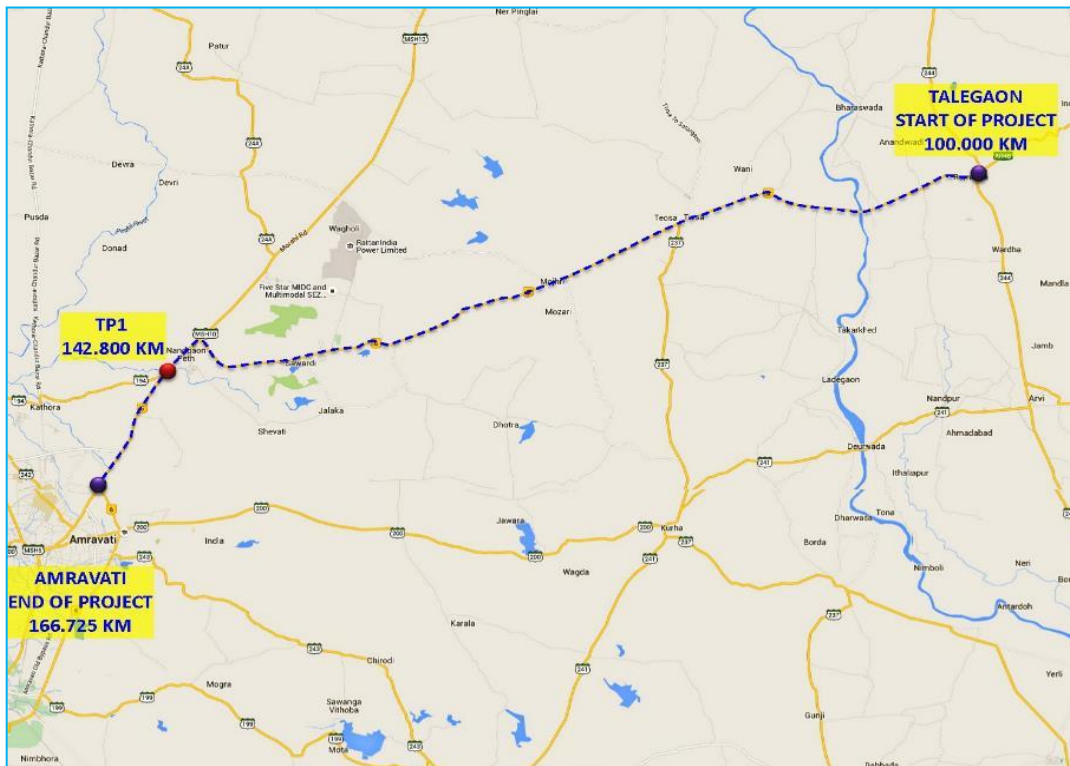


Figure 2-1: Toll Plaza Location

2.2 Classified Traffic Volume Count

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHA. These locations are indicated in **Figure 2-1** and listed in **Table 2-1**.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in **Table 2-2**.

Table 2-2 : Vehicle Classification System

Vehicle Type	
	Auto Rickshaw
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus

Vehicle Type	
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

Source - IRC: 64 – 1990

However, since the project highway is currently under toll operation, the data collected corresponds to category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Minibus /LCV
- Truck / Bus
- Multi Axle
- Oversize Vehicle

2.3 Traffic Characteristic

Toll revenue of the project highway does not solely depend on total traffic volume. There are certain characteristics of traffic which have significant potential to affect toll revenue. Components of local traffic, component of passenger and commercial traffic, portion of return journey traffic, portion of monthly pass traffic are some such characteristics of traffic. These will be discussed in subsequent sections of this report.

2.3.1 Traffic Data

The Concessionaire has provided Traffic data for base year 2015-16, 2016-17, 2017-18, 2018-19, 2019-20, 2020-21,2021-22, 2022-23 and from April 2023 to March 2024 as under for toll plaza -

Table 2-3 : Traffic Data at Toll Plaza at Km 142.800

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) - FY 2018-19	Annual Average Daily Traffic (Nos.) – FY 2019-20	Annual Average Daily Traffic (Nos.) – FY 2020-21	Annual Average Daily Traffic (Nos.) – FY 2021-22	Annual Average Daily Traffic (Nos.) – FY 2022-23	Annual Average Daily Traffic (Nos.) – FY 2023-24
1	Car	6738	7407	7090	5937	6173	6230
2	Minibus/ LCV	1511	1408	1217	620	547	454
3	Truck/Bus	1421	1623	1374	1340	1661	1558
4	Multi Axle	2285	2173	2297	2327	2239	1979
5	Oversized Vehicles	2	4	4	7	9	9
	Total	11957	12616	11981	10231	10629	10230

2.4 Data Analysis

2.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in

Table 2-4.

Table 2-4 : PCU Factors Adopted for Study

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5

Vehicle Type	PCUs
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under

Table 2-5 : Traffic in PCU at Project Stretch

Period	Toll Plaza Location	Traffic No	PCU	PCU Index
FY 2015-16	142.800 (Nandgaon Peth)	9340	18547	1.99
FY 2016-17	142.800 (Nandgaon Peth)	10452	20590	1.97
FY 2017-18	142.800 (Nandgaon Peth)	11312	22582	2.00
FY 2018-19	142.800 (Nandgaon Peth)	11957	23558	1.97
FY 2019-20	142.800 (Nandgaon Peth)	12616	24187	1.92
FY 2020-21	142.800 (Nandgaon Peth)	11981	23389	1.95
FY 2021-22	142.800 (Nandgaon Peth)	10231	21390	2.09
FY 2022-23	142.800 (Nandgaon Peth)	10629	22092	2.08
FY 2023-24	142.800 (Nandgaon Peth)	10230	20530	2.01

It can be observed from above that project traffic has PCU index close to 2.0 which indicates balance mix of commercial, goods traffic and passenger traffic. It can be appreciated that the character of traffic is consistent on stretch.

2.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.

For the purpose of analysis, the recent traffic numbers for the period April 2023 to March 2024 have been considered as the base numbers.

It is observed that car traffic forms 61% of total traffic at toll plaza location 142.800 where multi axle commercial vehicles comprise 19% of total traffic. Overall, about 39% of traffic is commercial in nature.

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like

1. Single Journey
2. Return Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of the above categories. on base year 2015-16, 2016-17, 2017-18, 2018-19, 2019-20, 2020-21, 2021-22 ,2022-23 and from April 2023 to March 2024 as under for toll plaza –

Table 2-6 : Journey Type Bifurcation of Traffic at KM 142.800

Sr. No	Type	Traffic Volume (Nos.) FY 2018-19	Traffic Volume (Nos.) FY 2019-20	Traffic Volume (Nos.) FY 2020-21	Traffic Volume (Nos.) for FY 2021-22	Traffic Volume (Nos.) for FY 2022-23	Traffic Volume (Nos.) for FY 2023-24
1	Single Journey	5285	5513	6647	5828	5594	5054
2	Return Journey	3514	3341	1906	4274	4906	5042
3	Monthly Pass	3158	3761	3428	129	129	134

A significant part of the traffic at KM 142.800 is single journey 50% followed by return journey 49% and monthly passes which share 1% of the total traffic volume.

2.5 Secondary Data Collection

There are several other factors which have substantial impact on traffic pattern and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from the various sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
 - a) GDP
 - b) NSDP
 - c) Population Growth
 - d) Per Capita Income growth
 - e) Industrial Growth
 - f) Special Industry Potential
 - g) Regional and National development vision / plan
 - h) Any other relevant data
3. Competing road network.

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor. The same was presented in previous report and there is no significant update on this

CHAPTER 3

GROWTH OF TRAFFIC ON PROJECT HIGHWAY

3.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Bharuch - Surat section of NH-8 has been done taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

3.2 Trend Analysis

One of the methods of estimation of future rate of traffic growth is to assume the same rate of growth as experienced in the past. However, it may be noted that major influencing factors which reflect Economic conditions such as GDP, agricultural output, industrial output, national policies etc. are susceptible to change over a longer period of time and necessary adjustments need to be made to past trends to account for these changes.

Thus, we have considered the Elasticity model of growth projection which is one of the most widely acceptable methods for traffic forecast and is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method past trends of any vehicular data are paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different type of vehicle. It is a proven fact that growth patterns for passenger and goods vehicles are different. Traffic growth on any highway typically depends on a number of economic parameters. The most important and direct parameters are given as under

- Per Capita Income

- Net State Domestic Product (NSDP)
- Population

It is observed that the ownership of a car is more closely related to affordability hence per capita is the index which closely fits with growth of car traffic among other criteria. In similar fashion, the following pairs of vehicle type and independent variable can be established for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Trucks / Heavy / Goods Vehicle – NSDP

Time series data of vehicles (both passenger and goods) Registered in state of Maharashtra is used as the base data for analysis of growth.

3.3 Estimation of Traffic Demand Elasticity

The elasticity of traffic demand is defined as the rate at which traffic intensity varies due to change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish the relationship between the growth in number of given categories of vehicle with one of the economic variables considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-2015 the model for estimating elasticity index for the project corridor is of the following form and is as given below:

$$\text{Log}(P) = k \times \text{Log}(EI) + A$$

Where,

P = Number of Vehicles (Mode wise)

EI = Economic Indicator

A = Regression constant

k = Elasticity coefficient (Regression coefficient)

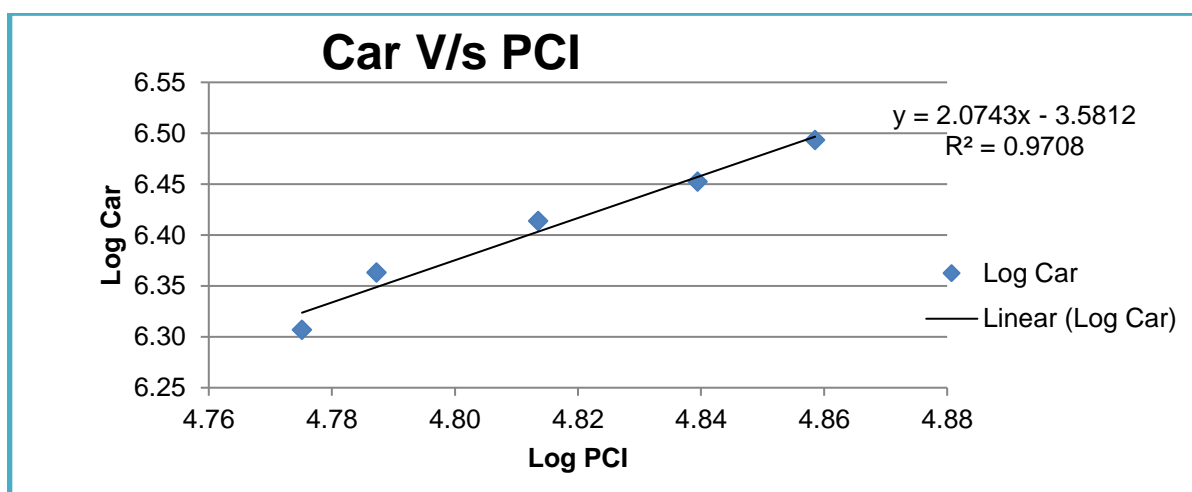
The elasticity for cars and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

The following tables and graphs depict regression and elasticity of growth model.

Table 3-1 : Per Capita Income Vs Car

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2011	59587	2027080	4.78	6.31		
2012	61276	2307841	4.79	6.36	3%	
2013	65095	2592565	4.81	6.41	6%	
2014	69097	2834847	4.84	6.45	6%	
2015	72200	3113773	4.86	6.49	4%	4.9%

Regression analysis of same is given in figure below.

**Figure 3-1: Regression and Elasticity PCI vs. Car–Extrapolation****Table 3-2 : Population Vs Bus**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2011	112374333	89861	8.05	4.95		
2012	113807248	100097	8.06	5.00	1%	
2013	115229410	110121	8.06	5.04	1%	
2014	116640546	120886	8.07	5.08	1%	
2015	118040394	120750	8.07	5.08	1%	1.24%

Regression analysis of same is given in figure below.

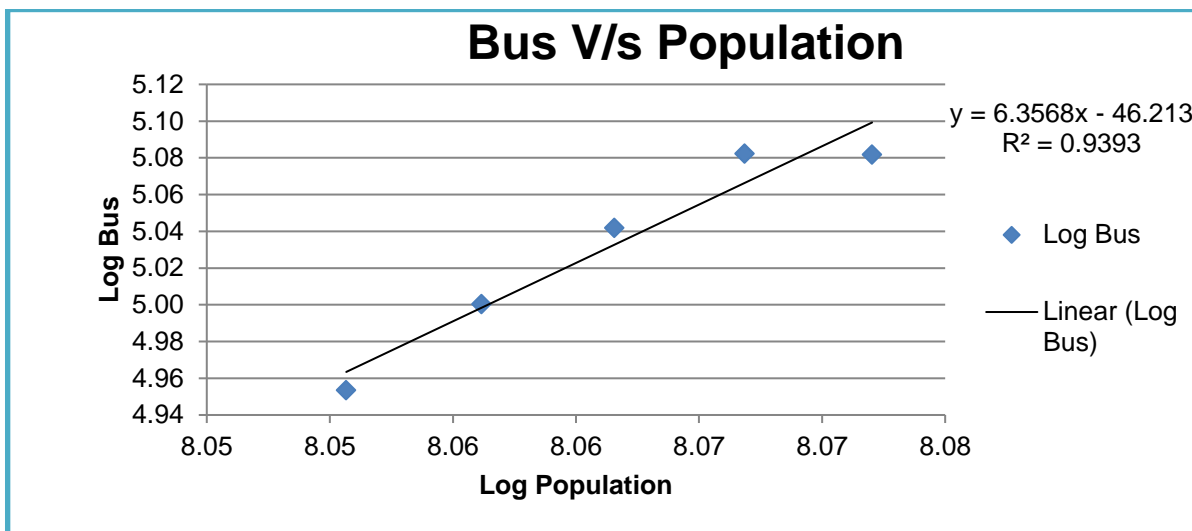


Figure 3-2: Regression and Elasticity Population vs. Bus – Extrapolation

The elasticity of goods traffic has been worked out by regression analysis with NSDP. The following table represents the data and details.

Table 3-3 : Goods Traffic Vs NSDP

Year	NSDP	Trucks	Log NDSP	Log Truck	NSDP Growth	Average Growth
2011	66762536	973788	7.82	5.99		
2012	69590440	1067825	7.84	6.03	4%	
2013	74913695	1142091	7.87	6.06	8%	
2014	80559286	1273256	7.91	6.10	8%	
2015	85245134	1360214	7.93	6.13	6%	6.31%

The following figure depicts regression analysis and extrapolation.

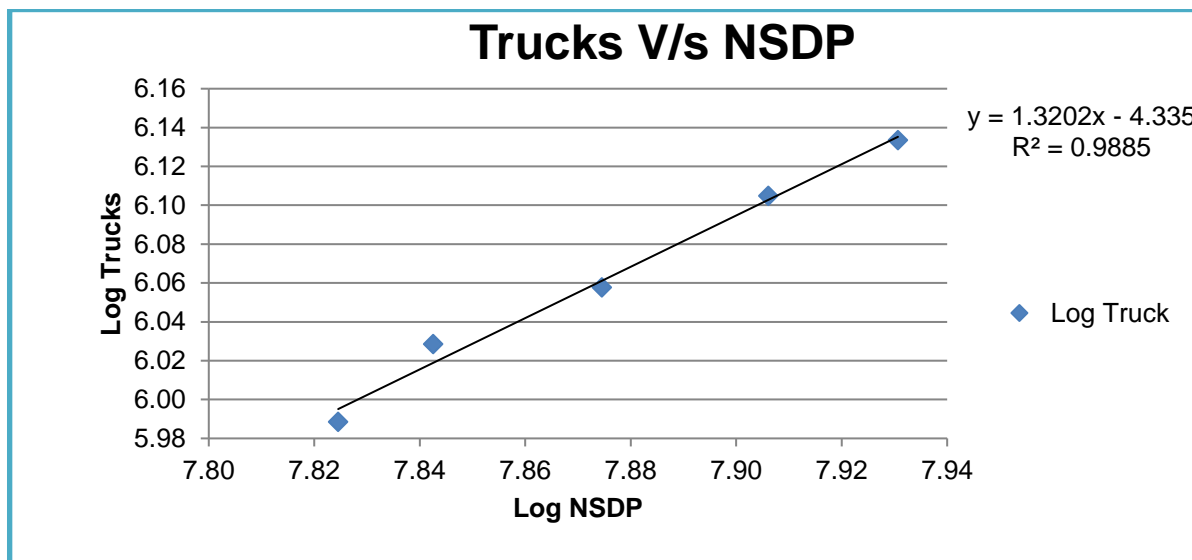


Figure 3-3: Regression and Elasticity NSDP vs. Goods Traffic – extrapolation.

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R^2 is a statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R^2 more representative is the regression model of data.

The results of these analyses for the good fit as reflected by R^2 values are presented in the Table below.

Table 3-4 : Summary Regression Analysis

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth	Growth Elastic Model
Maharashtra	Car/Jeep	PCI	$y = 2.0743x - 3.5812$	$R^2 = 0.9708$	2.0743	4.93%	11.08%
	Bus	Population	$y = 6.3568x - 46.2131$	$R^2 = 0.9393$	6.3568	1.24%	6.82%
	Truck	NSDP	$y = 1.3202x - 4.335$	$R^2 = 0.9885$	1.3202	6.31%	7.57%

While the economic model for predicting growth is a good tool, other local, regional, national factors such as proposed developments etc. should also be considered before finalizing growth factors. These factors are discussed in subsequent sections.

3.4 Analysis of Historic Traffic Data

Historic traffic data forms useful information for any highway project. It provides useful information for establishing past trends of growth. Project stretch of Talegaon to Amravati has recently been commissioned and tolling commenced in 2013. Stable traffic data from the year 2015-16 is only available for stretch which is not enough to establish any growth pattern for future. The following table presents details of historic traffic on project road.

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) FY 2018-19	Annual Average Daily Traffic (Nos.) FY 2019-20	Annual Average Daily Traffic (Nos.) FY 2020-21	Annual Average Daily Traffic (Nos.) FY 2021-22	Annual Average Daily Traffic (Nos.) FY 2022-23	Annual Average Daily Traffic (Nos.) FY 2023-24
1	Car	6738	7407	7090	5937	6173	6230
2	LCV/Minibus	1511	1408	1217	620	547	454
3	Bus/Truck	1421	1623	1374	1340	1661	1558
4	Mav	2285	2173	2297	2327	2239	1979
5	OSV	2	4	4	7	9	9
	Total	11957	12616	11981	10231	10629	10230

3.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economic, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.

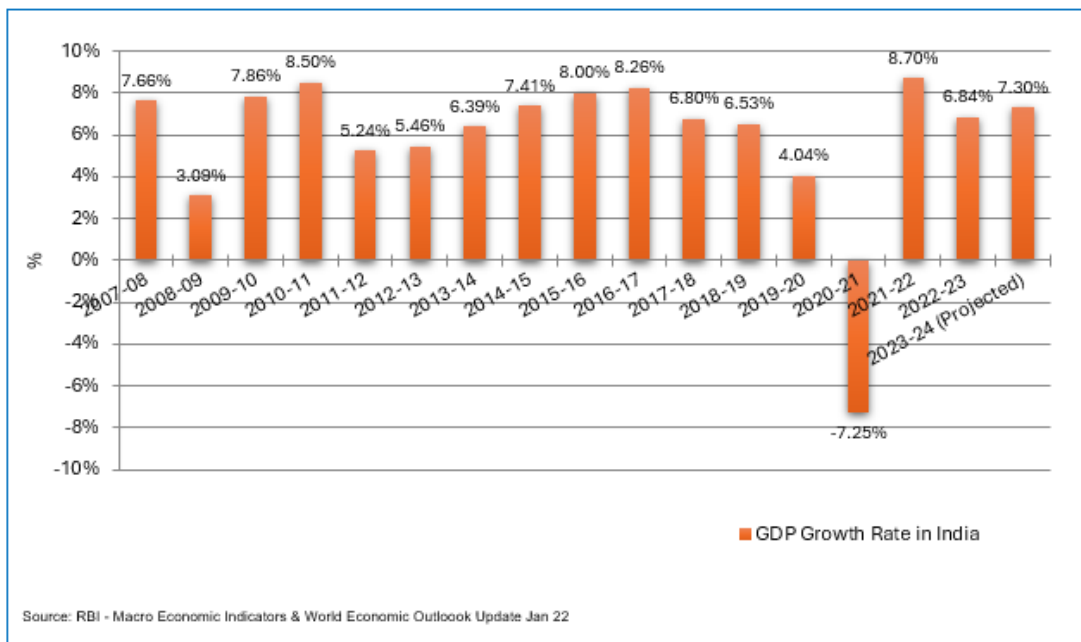


Figure 3-4 : Growth of GDP in India

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

3.6 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as below. The rate of growth is moderate in light of overall regional trends. Growth of multi-Axle is kept slightly higher as trend of technological advances in logistic industry favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, the rate of growth diminishes. Same growth rate is not sustainable for long. It is an established practice to step down future growth rates at suitable interval of years.

Temporary disruptions caused by implementation of Goods and Service Tax (GST) and demonetization have dissipated, and growth of economy has significantly improved since then. Hence corridor can expect to have expected growth.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic**, **Pessimistic** and **Most Likely** with a positive and negative variation 0.5% from Most Likely case.

Table 3-5 : Recommended Growth Rates Optimistic

Year/ Vehicle Type	2021-2023	2023-2026	2026-2031	2031-2036	2036-2041	2041-2046
Car	7.64%	6.53%	6.11%	5.64%	5.22%	4.51%
Minibus /LCV	6.00%	5.43%	5.06%	4.75%	4.46%	4.22%
Truck / Bus	6.42%	6.42%	5.84%	5.53%	4.96%	4.40%
Multi Axle	7.51%	6.78%	6.17%	5.84%	5.24%	4.65%
Oversized Vehicles	7.51%	6.42%	5.84%	5.53%	4.96%	4.40%

Table 3-6 : Recommended Growth Rates Pessimistic

Year/ Vehicle Type	2021-2023	2023-2026	2026-2031	2031-2036	2036-2041	2041-2046
Car	7.14%	6.03%	5.61%	5.14%	4.72%	4.01%
Minibus /LCV	5.50%	4.93%	4.56%	4.25%	3.96%	3.72%
Truck / Bus	5.92%	5.92%	5.34%	5.03%	4.46%	3.90%
Multi Axle	7.01%	6.28%	5.67%	5.34%	4.74%	4.15%
Oversized Vehicles	7.01%	5.92%	5.34%	5.03%	4.46%	3.90%

Table 3-7 : Recommended Growth Rates Most Likely

Year/ Vehicle Type	2021-2023	2023-2026	2026-2031	2031-2036	2036-2041	2041-2046
Car	7.39%	6.28%	5.86%	5.39%	4.97%	4.26%
Minibus /LCV	5.75%	5.18%	4.81%	4.50%	4.21%	3.97%
Truck / Bus	6.17%	6.17%	5.59%	5.28%	4.71%	4.15%

Year/ Vehicle Type	2021-2023	2023-2026	2026-2031	2031-2036	2036-2041	2041-2046
Multi Axle	7.26%	6.53%	5.92%	5.59%	4.99%	4.40%
Oversized Vehicles	7.26%	6.17%	5.59%	5.28%	4.71%	4.15%

Traffic was partially disturbed due to the ongoing construction works of Nagpur metro. Construction of Nagpur metro, especially Phase-I has been substantially completed and traffic has shown improvement recently. Hence a nominal additional growth of traffic has been considered in the year 2024-25 to account for this factor recently.

CHAPTER 4

TRAFFIC FORECAST

4.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

Table 4-1 : Total Tollable Traffic @ Toll Plaza 1- Chainage 142.800 KM
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU (Including Non-Paid Traffic)
2024-25	6793	491	1697	2155	9	11145	22359
2025-26	7208	515	1795	2280	9	11807	23666
2026-27	7648	541	1899	2413	9	12510	25056
2027-28	8115	568	2009	2554	9	13255	26528
2028-29	8611	596	2126	2702	9	14044	28083
2029-30	9137	626	2249	2860	9	14881	29734
2030-31	9652	656	2373	3018	9	15708	31377
2031-32	10196	687	2504	3184	9	16580	33107
2032-33	10770	719	2642	3360	9	17500	34935
2033-34	11377	753	2788	3546	9	18473	36868
2034-35	12018	789	2942	3741	9	19499	38903
2035-36	12645	824	3088	3927	9	20493	40857
2036-37	13305	860	3241	4121	9	21536	42903

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU (Including Non-Paid Traffic)
2037-38	13999	898	3402	4325	9	22633	45055

**Table 4-2 : Total Tollable Traffic @ Toll Plaza 1- Chainage 142.800 KM
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU (Including Non-Paid Traffic)
2024-25	6761	488	1690	2145	9	11093	22256
2025-26	7141	510	1780	2259	9	11699	23452
2026-27	7541	533	1874	2379	9	12336	24709
2027-28	7964	557	1974	2506	9	13010	26039
2028-29	8411	582	2079	2640	9	13721	27442
2029-30	8882	608	2190	2781	9	14470	28919
2030-31	9338	634	2300	2921	9	15202	30374
2031-32	9817	661	2415	3068	9	15970	31900
2032-33	10322	689	2536	3222	9	16778	33503
2033-34	10852	718	2663	3384	9	17626	35187
2034-35	11409	748	2797	3554	9	18517	36956
2035-36	11947	777	2922	3712	9	19367	38623
2036-37	12511	807	3052	3877	9	20256	40365
2037-38	13102	839	3188	4049	9	21187	42186

**Table 4-3 : Total Tollable Traffic @ Toll Plaza 1- Chainage 142.800 KM
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU (Including Non-Paid Traffic)
2024-25	6777	489	1694	2150	9	11119	22308
2025-26	7174	512	1788	2269	9	11752	23557
2026-27	7594	536	1888	2396	9	12423	24885
2027-28	8039	562	1993	2530	9	13133	26287
2028-29	8510	589	2104	2671	9	13883	27766
2029-30	9008	617	2221	2820	9	14675	29327
2030-31	9493	645	2338	2968	9	15453	30871
2031-32	10004	674	2461	3125	9	16273	32501
2032-33	10543	704	2590	3290	9	17136	34215
2033-34	11110	736	2726	3464	9	18045	36021
2034-35	11708	769	2870	3646	9	19002	37919
2035-36	12290	801	3005	3817	9	19922	39724
2036-37	12900	835	3147	3997	9	20888	41621
2037-38	13541	870	3295	4185	9	21900	43604

4.2 Modification in Concession Period

As per Article 29 of the concession agreement, if actual traffic on the project falls short or exceeds Target Traffic on project highway on defined date, concession period shall be modified subject to calculation stipulated therein. For Talegaon - Amravati project, the Target Date and Target Traffic are defined as under:

Target Date - 1st April 2020

Target Traffic - 41052 in PCU

It was observed that as per traffic projections, traffic volume falls short of target traffic in all scenarios. This warrants an extension of the envisaged concession period. Based

on the above traffic estimate probable extension of concession period is worked out as per article 29 of concession agreement which is summarized as under –

Scenario	Projected Traffic in PCUs (average of traffic on target date, one year before target date and one year after target date)	Expected extension in Concession Period
All	24187	4.4 years

Due to the suspension in toll in the year FY17 because of demonetization for a period of 24 days, the Concessionaire would be entitled to an extension of an additional 24 days. Traffic was severely impacted on the project highway during the initial lockdown period. NHAI has declared a policy of providing extension of concession to make up for revenue loss during lockdown. It is expected that an extension would be provided to the project concession period on this account also.

Hence, traffic and toll revenue projections have been worked out for additional 5 years beyond original concession period.

CHAPTER 5

FORECAST OF TOLL REVENUE

5.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

5.2 Discount Categories

As per the Toll Notification (Schedule R) the following discounts have been considered:

1. Monthly Pass: For frequent users, monthly pass is issued for 50 trips per month. The discount factor works out to 33.33% for 50 journeys.
2. Daily Pass (for Return Trip): A 75% discount will be offered on the return trip.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travelers or whose frequency does not yield any discount from the above categories.
4. Local Car / Jeep / Van to be charged at Rs 150 per month (2007)
5. Additionally, Concessionaire has introduced monthly rates for local commercial vehicles also.

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule R) as given under

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI are available up to 2021-22. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. Following graph provides projection of rate of inflation (WPI) in India. Data has been taken from Office of Economic Advisor web site (www.eaindustry.nic.in). WPI for years 2017-18 and 2018-2019 is worked back by applying a correlation factor

for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.

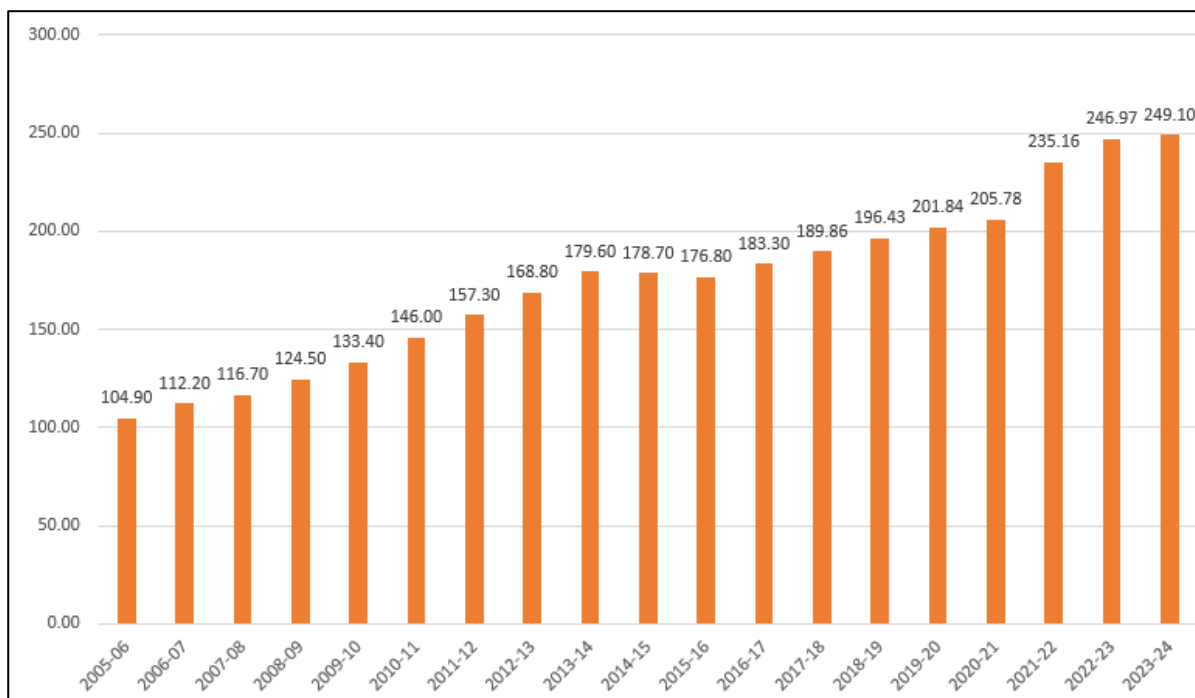


Figure 5-1 : Historical Rate of WPI Inflation in India

Except for the negative growth of WPI in the year 2015-16 average inflation in WPI from the year 2005-2024 is 4.98%. For future years initially it is considered @ 5% and suitably stepped down for future years.

5.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules, 2008.

Table 5-1 : Base Toll Rates 2007 - 08

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (2 Axle)	2.2

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Three Axle commercial vehicles	2.4
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4-6 axles)	3.45
Oversized Vehicle (seven or more axles)	4.2

Factor of inflation / growth has been incorporated as per Schedule R. WPI are available up to 2023-24.

Amravati bypass qualifies for adding to toll rate since its cost is more than 10 Cr. There is no structure in a project which qualifies for addition in toll rates.

Table 5-2 : Additional Rate for Amravati Bypass

Total Cost of Bypass	95.09 Cr	Length	17.43 km
Type of Vehicle	Base Rate for 15 Cr	Addition for every 5 Cr over 15 Cr	Rate 2007-08
Car/Jeep/Van	5.00	1.00	22
LCV	7.50	1.50	33
Bus	15.00	3.00	66
2-axle	15.00	3.00	66
3 - Axle	22.00	4.50	98.5
Multi Axle	30.00	6.00	132

The above table provides for rates applicable for accounting for bypass in toll rates. This has been incorporated in toll rates at Toll Plaza at Km 142.800 at Nandgaon Peth.

Other than this there is no structure or bypass which qualifies for additional toll rate at any toll plaza.

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs. five) for the concession period and are given below.

Thus, worked out rates for various categories of vehicle and discounts are given as under.

Table 5-3 : Toll Rates for Single Journey @ KM 142.800

Year	Car	LCV	Truck / Bus	Multi Axle	Oversized Vehicles
2024-25	120	190	395	605	765
2025-26	130	200	415	635	805
2026-27	135	210	435	670	845
2027-28	140	220	455	705	885
2028-29	150	230	480	735	930
2029-30	155	245	500	770	975
2030-31	165	255	525	810	1020
2031-32	170	265	550	845	1070
2032-33	180	280	575	890	1120
2033-34	185	295	605	930	1175
2034-35	195	310	635	975	1235
2035-36	205	325	665	1025	1295
2036-37	215	340	700	1075	1355
2037-38	225	355	730	1125	1420

Table 5-4 : Toll Rates for Return Journey @ KM 142.800

Year	Car	LCV	Truck / Bus	HCM /EME/ MAV	Oversized Vehicles
2024-25	185	285	590	910	1150
2025-26	190	300	620	955	1205
2026-27	200	315	650	1005	1265
2027-28	210	335	685	1055	1330
2028-29	220	350	715	1105	1395
2029-30	235	365	750	1155	1460
2030-31	245	385	790	1215	1530
2031-32	255	400	825	1270	1605
2032-33	270	420	865	1335	1680
2033-34	280	440	905	1395	1765
2034-35	295	460	950	1465	1850
2035-36	310	485	1000	1535	1940
2036-37	325	510	1045	1610	2035
2037-38	340	535	1100	1690	2135

Table 5-5 : Toll Rates for Monthly Pass @ KM 142.800

Year	Car - LP	LCV - LC	Truck/Bus - LC	Car	Minibus /LCV	Truck/Bus	Multi Axle	Oversized Vehicle
2024-25	340	2095	3930	4065	6375	13120	20200	25500
2025-26	355	2200	4125	4270	6695	13780	21220	26785
2026-27	375	2310	4330	4485	7035	14480	22290	28140
2027-28	390	2425	4545	4715	7390	15215	23425	29570
2028-29	410	2535	4750	4940	7745	15940	24540	30980

Year	Car - LP	LCV - LC	Truck/Bus - LC	Car	Minibus /LCV	Truck/Bus	Multi Axle	Oversized Vehicle
2029-30	430	2650	4965	5175	8115	16705	25720	32465
2030-31	450	2770	5190	5425	8505	17505	26950	34025
2031-32	475	2895	5425	5685	8915	18350	28250	35660
2032-33	495	3025	5670	5960	9345	19235	29610	37380
2033-34	520	3160	5925	6245	9800	20165	31045	39190
2034-35	545	3300	6190	6550	10275	21145	32550	41090
2035-36	570	3450	6470	6870	10775	22175	34135	43090
2036-37	600	3605	6760	7205	11300	23255	35800	45195
2037-38	630	3765	7065	7555	11850	24390	37555	47405

* LP- Local Passenger, LC – Local Commercial

5.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated under in all three scenarios. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

5.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under most likely scenario at each of the toll plaza up to 2037-38 (End of Concession Period+ 5 Years) starting from the year 2024-25 are shown in tables below.

Table 5-6 : Toll Revenue Optimistic Scenario
(Rs. Crores)

Year	Toll at Plaza 142.800	Total
2024-25	95.13	95.13
2025-26	105.84	105.84
2026-27	117.71	117.71
2027-28	131.15	131.15
2028-29	145.21	145.21
2029-30	161.12	161.12
2030-31	178.80	178.80
2031-32	197.11	197.11
2032-33	218.46	218.46
2033-34	240.41	240.41
2034-35	266.45	266.45
2035-36	294.79	294.79
2036-37	323.79	323.79
2037-38	355.88	355.88

Table 5-7 : Toll Revenue Pessimistic Scenario
(Rs. Crores)

Year	Toll at Plaza 142.800	Total
2024-25	94.71	94.71
2025-26	104.87	104.87
2026-27	116.11	116.11
2027-28	128.74	128.74
2028-29	141.87	141.87
2029-30	156.70	156.70
2030-31	173.14	173.14
2031-32	189.97	189.97
2032-33	209.57	209.57
2033-34	229.53	229.53
2034-35	253.15	253.15
2035-36	278.66	278.66
2036-37	304.58	304.58
2037-38	333.22	333.22

Table 5-8 : Toll Revenue Most Likely Scenario
(Rs. Crores)

Year	Toll at Plaza 142.800	Total
2024-25	94.94	94.94
2025-26	105.37	105.37
2026-27	116.95	116.95
2027-28	129.93	129.93

Year	Toll at Plaza 142.800	Total
2028-29	143.56	143.56
2029-30	158.97	158.97
2030-31	176.02	176.02
2031-32	193.58	193.58
2032-33	214.05	214.05
2033-34	235.01	235.01
2034-35	259.83	259.83
2035-36	286.76	286.76
2036-37	314.19	314.19
2037-38	344.57	344.57

CHAPTER 6

OPERATION & MAINTENANCE

6.1 Operation & Maintenance

The operation and maintenance cost of a project depends on a number of factors like quality of construction, response of maintenance team to early damage, local climate (rain etc.).

The future cost of operation and maintenance is estimated on a guess basis. Keeping all above factors in view, the following can be basis of working out cost of operation and maintenance for project corridor from Talegaon to Amravati on NH-6 in state of Maharashtra.

- a) **Annual Regular Maintenance** – Covering pothole repair, shoulder and slope repair, drain cleaning, median maintenance, Crash barrier, toll plaza maintenance, Toll collection, other services like medical help and rescue operations etc.
- b) **Periodic Maintenance** – This will be done on a periodic basis, say every 5 years. It will consist of overlaying of wearing course and painting and marking. Some pavement strengthening is also anticipated in a few sections. This operation and its cost are spread over three years.

Concessionaire has recently updated the program of maintenance of project road. Same has been reviewed and year-wise cost of O&M from year FY 2022-23 is given in table below.

Table 6-1 : O&M Cost

Year	Annual maintenance (Rs. Cr)	Thermoplastic painting (Rs. Cr)	Renewal Coat with BC (Rs. Cr.)	Special Repair of pavement	Structure maintenance. (Rs. Cr)	Electric System		Total Expenditure (Rs. Crores)	Remarks
						Annual	Periodic		
2024-25	12.45				0.02	0.59		17.49	Regular O & M
2025-26	12.45				0.02	0.59		18.37	Regular O & M
2026-27	12.45				0.02	0.59		19.29	Regular O & M
2027-28	12.45	1.47	16.36	4.58	0.02	0.59		55.01	Renewal of Wearing course + Pavement repair
2028-29	12.45	1.47	16.36	7.64	0.02	0.59		62.74	Renewal of Wearing course + Pavement repair
2029-30	12.45			2.29	0.02	0.59		26.25	Regular O & M
2030-31	12.45			2.29	0.02	0.59		27.56	Regular O & M
2031-32	12.45			2.29	0.02	0.59		28.94	Regular O & M
2032-33	12.45			2.29	0.02	0.59		30.38	Regular O & M

Year	Annual maintenance (Rs. Cr)	Thermoplastic painting (Rs. Cr)	Renewal Coat with BC (Rs. Cr.)	Special Repair of pavement	Structure maintenance. (Rs. Cr)	Electric System		Total Expenditure (Rs. Crores)	Remarks
						Annual	Periodic		
2033-34	12.45	1.47	16.36	9.16	0.02	0.59		83.25	Renewal of Wearing course + Pavement repair
2034-35	12.45	1.47	16.36	12.22	0.02	0.59		94.08	Renewal of Wearing course + Pavement repair
2035-36	12.45			2.29	0.02	0.59		35.17	Regular O & M
2036-37	12.45			2.29	0.02	0.59		36.93	Regular O & M

CHAPTER 7

CONCLUSION & RECOMMENDATIONS

7.1 Conclusion & Recommendations

Project stretch of Talegaon to Amravati section of NH-6 in state of Maharashtra from km 100.000 to km 166.725 is currently a four-lane road. The road is in sound condition and serves to stable traffic volumes. Project corridor is part of major east west connectivity National highway NH-6. There are many upcoming projects in the area which will boost economic growth of the area and add value to the development of the region. All these developments have potential to give a positive impact to traffic flow on the project. The following can be considered as major outcome of study.

- a) There is a good amount of tollable traffic running on the project.
- b) Project corridor has potential to witness traffic growth @ 6-8% annually post COVID-19 impact in the near future, further moderated by 1-2% in the longer term due to various development in area and overall development of economy.

The project infrastructure is in good condition and its maintenance cost is also reasonable.

Based on the above it can be considered a stable healthy project from the traffic and revenue point of view.

CHAPTER 8

PROJECT ILLUSTRATIONS

8.1 General

Project current condition has been depicted in the following photographs.



Figure 8-1 : General Condition



Figure 8-2 : Toll Plaza



Figure 8-3 : General Condition



Figure 8-4 : General Condition



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**TUMKUR TO CHITRADURGA
(KM 75.000 TO KM 189.000)
SECTION OF NH-4 IN THE STATE OF KARNATAKA**



**TOLL REVENUE AND O&M
COST PROJECTION REPORT
(FINAL)**



APRIL 2024



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(KM 75.000 TO KM 189.000)
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APRIL 2024

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ABBREVIATIONS

AADT	- Annual Average Daily Traffic	NHAI	- National Highways Authority of India
BOT	- Build Operate Transfer	NHDP	- National Highways Development Project
CAGR	- Compound Annual Growth Rate	NSDP	- Net State Domestic Product
CTV	- Classified traffic volume	O&M	- Operation & Maintenance
DBFOT	- Design, Build, Finance, Operate & Transfer	PCDP	- Per Capita Domestic Product
EME	- Earth Moving Equipment	PCI	- Per Capita Income
GDP	- Gross Domestic Product	PCU	- Passenger Car Unit
GSDP	- Gross State Domestic Product	PSC	- Pre-stressed Concrete
HCM	- Heavy Construction Machinery	RCC	- Reinforced cement concrete
HCV	- Heavy Commercial Vehicle	RHS	- Right Hand Side
HTMS	- Highway Traffic Management System	SH	- State Highway
IRC	- Indian Road Congress	TP	- Toll Plaza
IRR	- Internal Rate of Return	WPI	- Wholesale Price Index
LCV	- Light Commercial Vehicle	SIR	- Special Investment Region
LHS	- Left Hand Side	c.	- Circa
LGV	- Light Goods Vehicle	ROB	- Railway Over Bridge
MAV	- Multi Axle Vehicle	MDR	- Major District Road
MORTH	- Ministry of Road Transport and Highways	ODR	- Other District Road
NH	- National Highway	CA	- Concession Agreement
PCC	- Plain Cement Concrete	RMT	- Running Meter
CR	- Coarse Rubble		

CHAPTER 1

INTRODUCTION

1.1 Background

The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under NHDP Phase V. Under Phase V NHAI has planned to convert 6,500 km of existing 4-lane National Highways into 6-lane National Highway. Sections envisaged under 6-laning comprise the Golden Quadrilateral section (5,700 km) and some other sections which are 800 km in length.

The project under consideration, Tumkur - Chitradurga Section of NH-4 is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. M/s *IRB Tumkur Chitradurga Tollway Ltd.* (Concessionaire) has been awarded the Project for concession period of 26 years starting from June 4th, 2011, to June 3rd, 2037. The Project has been commissioned and is currently in the operation / maintenance phase.

1.2 Objective of the Study

M/s IRB INVIT FUND has engaged GMD Consultants to assess the future traffic and toll potential of the project along with related operation & maintenance expenditure involved.

This report named as “*Toll Revenue and O&M Cost Projection Report*” mainly focuses on traffic and O&M aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows.

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting
- d) Operation and Maintenance Cost Projections

The Concessionaire has provided basic historical traffic data and other project details on the basis of which the above analysis has been carried out, after applying our judgment to the traffic estimates.

“Toll Revenue and O&M Cost Projection Report” was submitted in March 2017. In this report traffic data of year 2015-16 was used as base traffic. The report was updated with traffic data for the year 2016-17 and the report was submitted in October 2017. The report was further updated with traffic data of 2017-18 and same was submitted in April 2018. The report was further updated with traffic Data of the period from April 2018 to September 2018 and was submitted in October 2018. A revised report was submitted with updated traffic for the years 2018-19 in April 2019. With traffic data from April 2020 to March 2021 report was updated report was further updated with yearly traffic data from April 2021 to March 2022, April 2022 to March 2023 and now concessionaire has provided traffic data from April 2023 to March 2024 report is updated taking this latest traffic data into consideration.

CHAPTER 2

TRAFFIC SURVEYS AND ANALYSIS

2.1 Traffic Surveys

In the course of our work, we have collected the required information for project corridor to understand the general traffic and travel characteristics of the corridor.

The following traffic data has been collected for the project.

- Classified traffic volume counts at the two toll plaza locations on Tumkur-Chitradurga section of NH-4 for base year 2015-16, 2016-17, 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-23 and annual traffic data from April 2023 to March 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

The project can be divided into two homogenous sections from a traffic point of view.

These sections can be.

1. Chitradurga to Sira
2. Sira to Tumkur

Traffic of both sections is represented by toll plaza in each section.

Table 2-1 below lists provides details of locations from where traffic details have been collected.

Table 2-1 : Traffic Survey Locations

Sr. No.	Location	CTV	Single Journey Traffic	Return Journey Traffic	Monthly Pass Traffic	Local Traffic
1	Km 172.770 Toll Plaza (Guilalu)	AADT for Year 2015-2016	For Year 2015-2016	For Year 2015-2016	For Year 2015-2016	For Year 2015-2016
		AADT for year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017
		AADT for year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018
		AADT for year 2018-19	For year 2018-19	For year 2018-19	For year 2018-19	For year 2018-19
		AADT for year 2019-20	For year 2019-20	For year 2019-20	For year 2019-20	For year 2019-20
		AADT for year 2020-21	For year 2020-21	For year 2020-21	For year 2020-21	For year 2020-21
		AADT for Year 2021-22	For Year 2021-22	For Year 2021-22	For Year 2021-22	For Year 2021-22
		AADT for Year 2022-23	For Year 2022-23	For Year 2022-23	For Year 2022-23	For Year 2022-23
		AADT for Year 2023-24	For Year 2023-24	For Year 2023-24	For Year 2023-24	For Year 2023-24
2	Km 104.530 Toll Plaza (Karjeevanhalli)	AADT for Year 2015-2016	For Year 2015-2016	For Year 2015-2016	For Year 2015-2016	For Year 2015-2016
		AADT for year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017
		AADT for year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018
		AADT for year 2018-19	For year 2018-19	For year 2018-19	For year 2018-19	For year 2018-19
		AADT for year 2019-20	For year 2019-20	For year 2019-20	For year 2019-20	For year 2019-20

	AADT for year 2020-21	For year 2020-21	For year 2020-21	For year 2020-21	For year 2020-21
	AADT for Year 2021-22	For Year 2021-22	For Year 2021-22	For Year 2021-22	For Year 2021-22
	AADT for Year 2022-23	For Year 2022-23	For Year 2022-23	For Year 2022-23	For Year 2022-23
	AADT for Year 2023-24	For Year 2023-24	For Year 2023-24	For Year 2023-24	For Year 2023-24

The locations of each of the traffic surveys are illustrated in Figure 2-1.

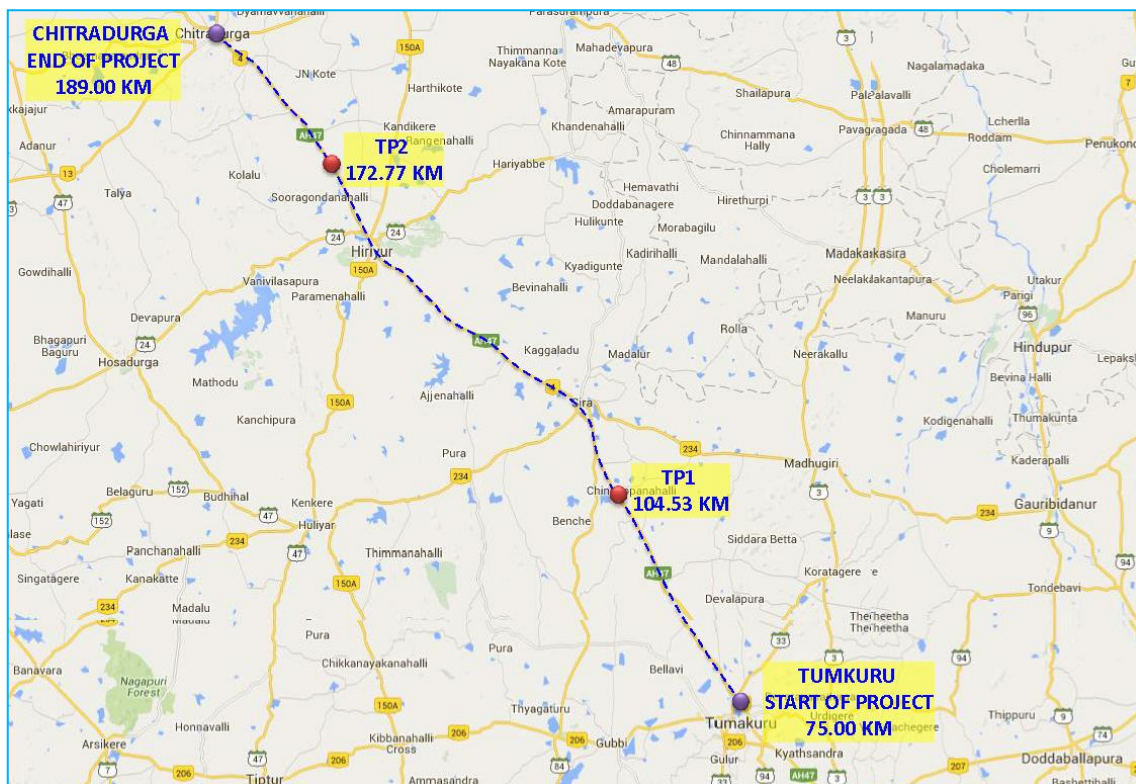


Figure 2-1: Traffic Survey Locations

2.2 Classified Traffic Volume Count

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI. These locations were indicated in **Figure 2-1** and listed in **Table 2-1**.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable

vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in **Table 2-2**.

Table 2-2 : Vehicle Classification System

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

Source - IRC: 64 – 1990

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per the Concession Agreement.

- Car / Jeep / Van
- LCV
- Truck / Bus
- HCM/ EME/ MAV

2.3 Traffic Characteristic

Toll revenue of the project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have significant potential to affect toll revenue. Components of local traffic, component of passenger and commercial traffic, portion of return journey traffic, portion of monthly pass traffic are some such characteristics of traffic. These will be discussed in subsequent sections of this report.

2.3.1 Traffic Data

The Concessionaire has provided Traffic data for base year 2015-16, 2016-17, 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-23 and from April 2023 to March 2024 as under for toll plazas –

Table 2-3 : Traffic Data at Toll Plaza at Km 172.770

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) FY 2018-19	Annual Average Daily Traffic (Nos.) FY 2019-20	Annual Average Daily Traffic (Nos.) FY 2020-21	Annual Average Daily Traffic (Nos.) FY 2021-22	Annual Average Daily Traffic (Nos.) FY 2022-23	Annual Average Daily Traffic (Nos.) FY 2023-24
1	Car	5244	5560	7633	11046	12943	13427
2	LCV	2918	2752	2652	2006	2079	2206
3	Truck/Bus	3157	3167	2631	3423	4395	5015
4	HCM /EME/ MAV	5748	5033	4968	5831	6359	6293
5	Oversized Vehicles	31	37	14	15	25	331
	Total	17099	16548	17898	22322	25801	27272

Similar traffic data for toll plaza at Km 104.530 is given as under

Table 2-4 : Traffic Data at Toll Plaza at Km 104.530

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) FY 2018-19	Annual Average Daily Traffic (Nos.) FY 2019-20	Annual Average Daily Traffic (Nos.) FY 2020-21	Annual Average Daily Traffic (Nos.) FY 2021-22	Annual Average Daily Traffic (Nos.) FY 2022-23	Annual Average Daily Traffic (Nos.) FY 2023-24
1	Car	6855	7664	10224	8597	10272	11069
2	LCV	3401	3237	3103	1803	1916	2030
3	Truck/Bus	3888	3896	3133	3005	3912	4429
4	HCM /EME/ MAV	6656	5833	5617	5305	5811	5774
5	Oversized Vehicles	35	45	18	15	31	227
	Total	20834	20675	22094	18725	21942	23528

2.4 Data Analysis

2.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in *Table 2-5*.

Table 2-5 : PCU Factors Adopted for Study

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under.

Table 2-6 : Traffic in PCU at both Toll Plazas

Toll Plaza Location	Period	Traffic No	PCU	PCU Index
172.770	FY 2015-16	14885	40661	2.73
	FY 2016-17	15460	41587	2.69
	FY 2017-18	16451	43474	2.64
	FY 2018-19	17099	45099	2.64
	FY 2019-20	16548	42002	2.54
	FY 2020-21	17898	41923	2.34

	FY 2021-22	22322	50632	2.27
	FY 2022-23	25801	57974	2.25
	FY 2023-24	27272	61590	2.26
104.530	FY 2015-16	17678	48037	2.72
	FY 2016-17	18782	49471	2.63
	FY 2017-18	19826	51585	2.60
	FY 2018-19	20834	53728	2.58
	FY 2019-20	20675	50659	2.45
	FY 2020-21	22094	49634	2.25
	FY 2021-22	18725	44256	2.36
	FY 2022-23	21942	51171	2.33
	FY 2023-24	23528	54404	2.31

It can be observed from the above that project traffic has a PCU index near 2.5 which indicates a good mix of commercial and passenger traffic.

2.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A Larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.

For the purpose of analysis, the recent traffic numbers for the period April 2023 to March 2024 have been considered as the base numbers.

It is observed that at Toll KM 172.770 Car traffic forms 49% of total traffic while HCM / EME / MAV comprises 23% of total traffic. Overall, about 51% of traffic is commercial in nature, and at Toll KM 104.530 Car traffic forms 47% of total traffic while HCM / EME / MAV comprises 24% of total traffic. Overall, about 52% of traffic is commercial in nature.

Another important bifurcation of traffic is components of traffic with respect to various types of toll ticketing.

1. Single Journey
2. Return Journey
3. Local Single Journey (Concessionaire provided special tariff for this category)
4. Monthly Pass Journey

The following table provides numbers of vehicles falling in each of the above categories.

Table 2-7 : Journey Type Bifurcation of Traffic at KM 172.770

Sr. No	Type	Traffic Volume (Nos.) for FY 2018-19	Traffic Volume (Nos.) for FY 2019-20	Traffic Volume (Nos.) for FY 2020-21	Traffic Volume (Nos.) for FY 2021-22	Traffic Volume (Nos.) for FY 2022-23	Traffic Volume (Nos.) for FY 2023-24
1	Single Journey	13370	12845	14512	15558	18017	18741
2	Return Journey	3332	3356	3074	6724	7740	8488
3	Local Single Journey	185	128	150	18	22	23
4	Monthly Pass	212	219	162	22	22	20

A significant part of the traffic at KM 172.770 is single journey (69%) followed by return journey (31%) with a very low component of local single journey and monthly pass traffic.

Similarly, traffic numbers for type of journey at KM 104.530 are given in following table.

Table 2-8 : Journey Type Bifurcation of Traffic at KM 104.530

Sr. No	Type	Traffic Volume (Nos.) for FY 2018-19	Traffic Volume (Nos.) for FY 2019-20	Traffic Volume (Nos.) for FY 2020-21	Traffic Volume (Nos.) for FY 2021-22	Traffic Volume (Nos.) for FY 2022-23	Traffic Volume (Nos.) for FY 2023-24
1	Single Journey	15053	14807	16990	13821	16220	17209
2	Return Journey	4820	4910	4456	4782	5632	6242
3	Local Single Journey	387	385	316	65	73	64
4	Monthly Pass	574	573	332	57	15	13

A significant part of the traffic at KM 104.530 is single journey (73%) followed by return journey (27%) with a very low component of local single journey and monthly pass traffic.

Here too it was observed that single journey is the most dominant component of traffic consistent across entire length of the project highway.

2.5 Secondary Data Collection

There are several other factors which have substantial impact on traffic pattern and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from the various sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
 - a) GDP
 - b) NSDP
 - c) Population Growth
 - d) Per Capita Income growth
 - e) Industrial Growth
 - f) Special Industry Potential
 - g) Regional and National development vision / plan
 - h) Any other relevant data

CHAPTER 3

GROWTH OF TRAFFIC ON PROJECT HIGHWAY

3.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the forecasts of factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor viz. Tumkur – Chitradurga section of NH-4 has been done after taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

3.2 Trend Analysis

One of the methods of estimation of future rate of traffic growth is to assume the same rate of growth as experienced in the past. However, it may be noted that major influencing factors which reflect Economic conditions such as GDP, agricultural output, industrial output, national policies etc. are susceptible to change over a longer period of time and necessary adjustments need to be made to past trends to account for these changes.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method past trends of any vehicular data are paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that growth patterns for passenger and goods vehicles are different. Traffic growth on any highway typically depends on a number of economic parameters. The most important and direct parameters are given as under

- Per Capita Income

- Net State Domestic Product (NSDP)
- Population

It is observed that the ownership of a car is more closely related to affordability hence per capita is the index which closely fits with growth of car traffic among other criteria. In similar fashion, the following pairs of vehicle type and independent variable can be established for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Trucks / Heavy / Goods Vehicle – NSDP

Time series data of vehicles (both passenger and goods) Registered in state of Karnataka is used as the base data for analysis of growth.

3.3 Estimation of Traffic Demand Elasticity

The elasticity of traffic demand is defined as the rate at which traffic intensity varies due to change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish the relationship between the growth in number of given categories of vehicle with one of the economic variables considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-2015 the model for estimating elasticity index for the project corridor is of the following form and is as given below:

$$\text{Log}(P) = k \times \text{Log}(EI) + A$$

Where,

$$P = \text{Number of Vehicles (Mode wise)}$$

$$EI = \text{Economic Indicator}$$

$$A = \text{Regression constant}$$

$$k = \text{Elasticity coefficient (Regression coefficient)}$$

The elasticity for cars and buses (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) respectively and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

The following tables and graphs depict regression and elasticity of growth model.

Table 3-1 : Per Capita Income Vs Car

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2011	40699	1131201	4.61	6.05		
2012	41492	1269430	4.62	6.10	2%	
2013	43266	1420767	4.64	6.15	4%	
2014	46012	1572521	4.66	6.20	6%	
2015	48907	1741831	4.69	6.24	6%	4.7%

Regression analysis PCI Vs Car data is presented in the figure below.

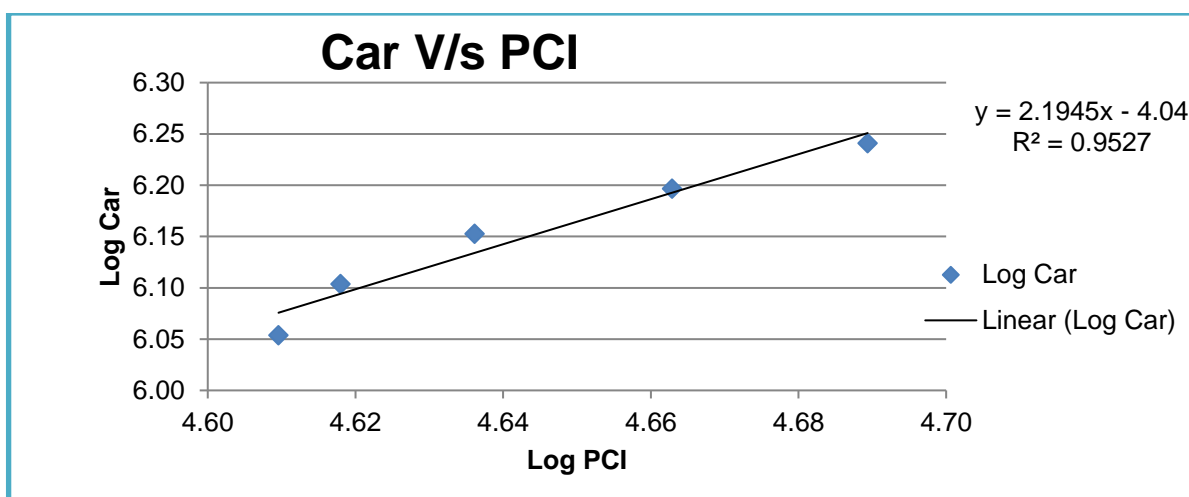


Figure 3-1: Regression and Elasticity PCI vs. Car–Extrapolation

Table 3-2 : Population Vs Bus

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2011	61095297	58012	7.79	4.76		
2012	62058777	62501	7.79	4.80	2%	
2013	63017877	69718	7.80	4.84	2%	
2014	63972322	75529	7.81	4.88	2%	
2015	64921845	80911	7.81	4.91	1%	1.53%

Regression analysis of population Vs. Bus Traffic is presented in figure below.

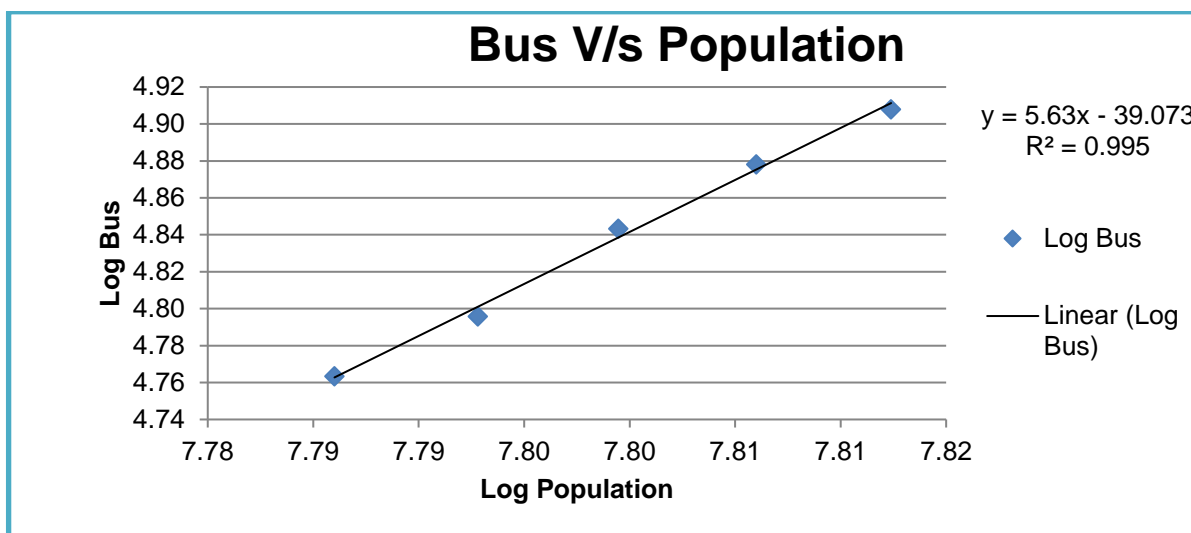


Figure 3-2: Regression and Elasticity Population vs. Bus – Extrapolation

Elasticity of goods traffic demand has been worked out by regression analysis with NSDP. The following table represents the data and details.

Table 3-3 : Goods Traffic Vs NSDP

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth
2011	24081677	415491	7.38	5.62		
2012	24804028	454582	7.39	5.66	3%	
2013	26125013	506340	7.42	5.70	5%	
2014	28056052	555255	7.45	5.74	7%	
2015	30107076	606352	7.48	5.78	7%	5.76%

The following figure depicts regression analysis and extrapolation of NSDP vs. goods traffic.

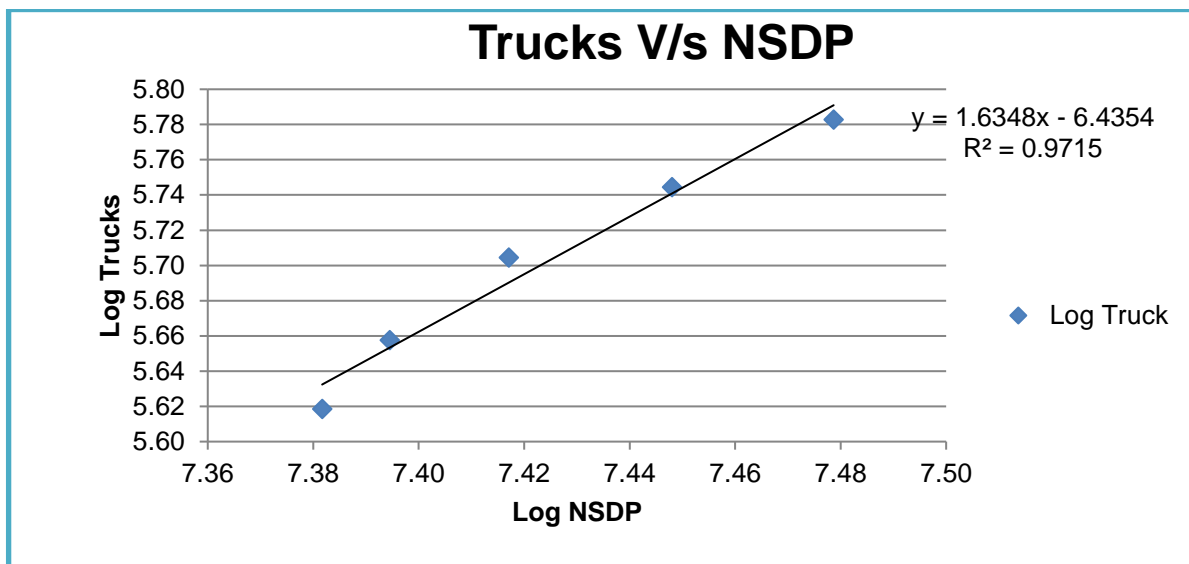


Figure 3-3: Regression and Elasticity NSDP vs. Goods Traffic – extrapolation.

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R^2 is statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R^2 more representative is the regression model of data.

The results of these analyses for the good fit as reflected by R^2 values are presented in the Table below.

Table 3-4 : Summary Regression Analysis

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient	Average Growth	Growth Elastic Model
Karnataka	Car/Jeep	PCI	$y = 2.1945x - 4.04$	$R^2 = 0.9527$	2.1945	4.72%	10.35%
	Bus	Population	$y = 5.63x - 39.0727$	$R^2 = 0.995$	5.6300	1.53%	8.62%
	Truck	NSDP	$y = 1.6348x - 6.4354$	$R^2 = 0.9715$	1.6348	5.76%	9.41%

While the economic model for predicting growth is a good tool, other local, regional, national factors such as proposed developments etc. should also be considered before finalizing growth factors. These factors are discussed in subsequent sections.

3.4 Analysis of Historic Traffic Data

Traffic growth on a particular section of the highway depends on a number of factors. Some of these are local and some have regional or national context. Regional or national economic development has a marked impact on traffic growth. Still, historical traffic volume data at the project highway provides a meaningful insight into traffic development on the corridor.

Recently there has been tremendous up-gradation in the logistics industry in terms of processes, technology and mode of transportation. Improvement in road networks has opened the way for larger freight vehicles to be used for transportation of goods. This has added substantial value to logistical operations all across the country. It has been observed that the volume of the typical 2 Axle truck has reduced and multi axle trucks or larger size have come in their place. This phenomenon is observed at project highway under study as well.

The following historical traffic data have been used for our analysis.

- a) Traffic Numbers provided in Contract document pertaining to year 2008.
- b) Traffic Numbers provided in Report of Lea Associates pertaining to year 2010.
- c) Traffic Numbers provided in by concessionaire pertaining to year 2016 to year upto March 2024

Traffic numbers pertaining to tollable category of contract have been compared.

The following tables provide historical traffic numbers at both toll plaza locations i.e., at Km 104.530 (Near Sira) and Km 172.770 (Near Chitradurga)

Table 3-5 : Historical Traffic Volume at Sira

Location	Year									
	2007-08	2009-10	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
At Sira										
Car	2571	3061	6203	6577	6855	7664	10224	8597	10272	11069
LCV	493	1462	2581	2999	3401	3237	3103	1803	1916	2030
Truck/Bus	9211	4386	3727	3743	3888	3896	3133	3005	3912	4429
HCM /EME/ MAV	524	5498	6140	6464	6656	5833	5617	5305	5811	5774
Oversized Vehicles	0	0	130	43	35	45	18	15	31	227
Total	12799	14407	18782	19826	20834	20675	22094	18725	21942	23528

Table 3-6 : Historical Traffic Volume at Chitradurga

Location	Year									
	2007-08	2009-10	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
At Chitradurga										
Car	1664	2356	4803	5261	5244	5560	7633	11046	12943	13427
LCV	385	1475	2237	2514	2918	2752	2652	2006	2079	2206
Truck/Bus	7907	9628	2976	3066	3157	3167	2631	3423	4395	5015
HCM /EME/ MAV	524	564	5365	5563	5748	5033	4968	5831	6359	6293
Oversized Vehicles	0	0	80	46	31	37	14	15	25	331
Total	10480	14023	15460	16451	17099	16548	17898	22322	25801	27272

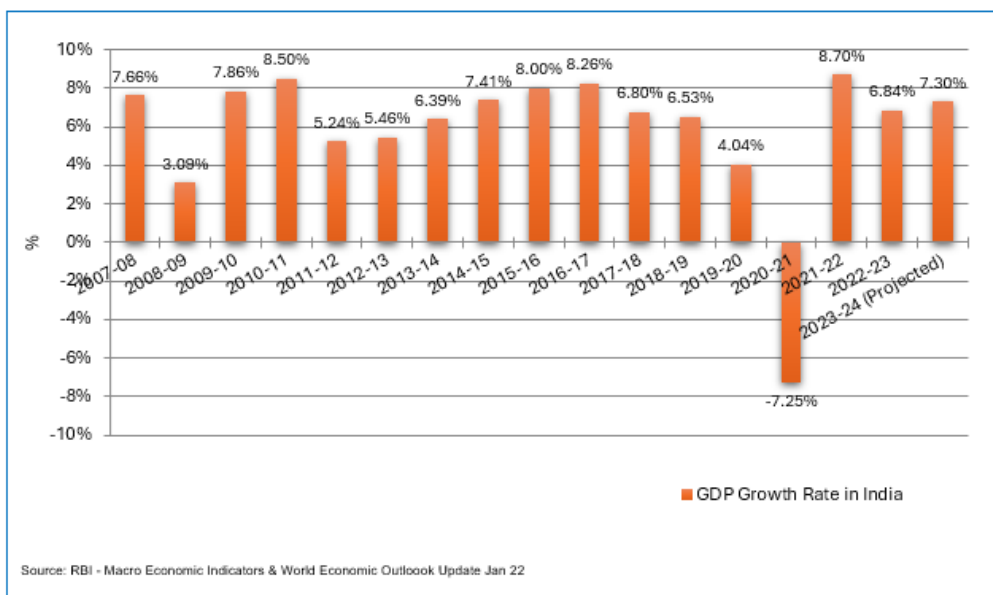
3.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economic, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

Economy

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.

**Figure 3-4 : Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22.

3.6 Recommended Growth Rates of Traffic

The rate of growth is moderate in light of overall regional trends. Growth of multi-Axle is kept slightly higher as trend of technological advances in logistic industry favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, the rate of growth diminishes. Same growth rate is not sustainable for long. It is an established practice to step down future growth rates at suitable intervals of the year.

Temporary disruptions caused by implementation of Goods and Service Tax (GST) and demonetization have dissipated, and growth of economy has significantly improved since then. Hence corridor can expect to have expected growth.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic**, **Pessimistic** and **Most Likely** with a positive and negative variation 0.5% from Most Likely case.

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as below.

Table 3-7 : Recommended Growth Rates in an Optimistic Scenario

Year/ Vehicle Type	2023-25	2025-30	2030-35	2035-40	2040-45
Car	7.09%	5.66%	5.21%	4.61%	3.94%
LCV	7.00%	6.05%	5.59%	5.16%	4.80%
Truck / Bus	5.68%	5.26%	4.85%	4.44%	4.04%

Year/ Vehicle Type	2023-25	2025-30	2030-35	2035-40	2040-45
HCM /EME/ MAV	7.14%	6.03%	5.55%	5.09%	4.63%
Oversized Vehicles	7.14%	6.61%	6.08%	5.57%	5.06%

Table 3-8 : Recommended Growth Rates in a Pessimistic Scenario

Year/ Vehicle Type	2023-25	2025-30	2030-35	2035-40	2040-45
Car	6.59%	5.16%	4.71%	4.11%	3.44%
LCV	6.50%	5.55%	5.09%	4.66%	4.30%
Truck / Bus	5.18%	4.76%	4.35%	3.94%	3.54%
HCM /EME/ MAV	6.64%	5.53%	5.05%	4.59%	4.13%
Oversized Vehicles	6.64%	6.11%	5.58%	5.07%	4.56%

Table 3-9 : Recommended Growth Rates in a Most Likely Scenario

Year/ Vehicle Type	2023-25	2025-30	2030-35	2035-40	2040-45
Car	6.84%	5.41%	4.96%	4.36%	3.69%
LCV	6.75%	5.80%	5.34%	4.91%	4.55%
Truck / Bus	5.43%	5.01%	4.60%	4.19%	3.79%
HCM /EME/ MAV	6.89%	5.78%	5.30%	4.84%	4.38%
Oversized Vehicles	6.89%	6.36%	5.83%	5.32%	4.81%

CHAPTER 4

TRAFFIC FORECAST

4.1 Traffic Projections

Growth rates recommended in the previous section of the Report are used to arrive at traffic projections for future years. Traffic projections at the respective toll plazas are presented in the tables below.

These projections have been done for following three growth scenarios:

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 4-1 : Total Tollable Traffic @ Toll Plaza 1- Chainage 172.770 KM
(Optimistic Growth Scenario)**

Year	Car	LCV	Truck / Bus	HCM /EME/ MAV	Oversized Vehicles	Total No.	Total PCU
2024-25	14379	2361	5301	6742	354	29137	65756
2025-26	15193	2503	5580	7148	375	30799	69541
2026-27	16053	2654	5873	7579	397	32556	73545
2027-28	16962	2814	6181	8036	421	34414	77783
2028-29	17922	2984	6506	8521	446	36379	82268
2029-30	18937	3165	6848	9035	473	38458	87015
2030-31	19923	3342	7179	9537	499	40480	91635
2031-32	20961	3528	7527	10067	527	42610	96507
2032-33	22052	3725	7892	10626	556	44851	101635
2033-34	23200	3933	8274	11216	587	47210	107035
2034-35	24408	4153	8675	11839	619	49694	112724
2035-36	25533	4367	9059	12441	650	52050	118170
2036-37	26710	4592	9461	13074	683	54520	123888
2037-38	27942	4829	9882	13739	718	57110	129888
2038-39	29231	5078	10321	14437	754	59821	136171
2039-40	30578	5340	10779	15171	792	62660	142759
2040-41	31628	5570	11160	15797	825	64980	148262
2041-42	32715	5810	11556	16449	859	67389	153984
2042-43	33839	6059	11966	17127	894	69885	159920

**Table 4-2 : Total Tollable Traffic @ Toll Plaza 2- Chainage 104.530 KM
(Optimistic Growth Scenario)**

Year	Car	LCV	Truck / Bus	HCM /EME/ MAV	Oversized Vehicles	Total No.	Total PCU
2024-25	11853	2172	4681	6186	243	25135	58085
2025-26	12525	2303	4926	6559	258	26571	61434
2026-27	13234	2442	5184	6955	273	28088	64975
2027-28	13982	2589	5456	7374	289	29690	68717
2028-29	14773	2745	5743	7818	306	31385	72678
2029-30	15608	2911	6045	8289	324	33177	76868
2030-31	16420	3073	6338	8749	342	34922	80953
2031-32	17275	3245	6645	9234	361	36760	85255
2032-33	18174	3426	6967	9747	381	38695	89790
2033-34	19120	3617	7304	10288	402	40731	94563
2034-35	20115	3819	7657	10859	424	42874	99588
2035-36	21042	4016	7997	11411	445	44911	104409
2036-37	22012	4223	8352	11991	468	47046	109468
2037-38	23026	4440	8723	12600	492	49281	114769
2038-39	24088	4668	9110	13241	517	51624	120331
2039-40	25199	4909	9515	13914	543	54080	126164
2040-41	26065	5120	9852	14488	565	56090	131040
2041-42	26961	5340	10200	15085	588	58174	136100
2042-43	27887	5570	10561	15707	612	60337	141361

Table 4-3 : Total Tollable Traffic @ Toll Plaza 1- Chainage 172.770 KM
(Pessimistic Growth Scenario)

Year	Car	LCV	Truck / Bus	HCM /EME/ MAV	Oversized Vehicles	Total No.	Total PCU
2024-25	14312	2350	5276	6710	353	29001	65449
2025-26	15051	2480	5527	7081	372	30511	68891
2026-27	15828	2617	5789	7473	392	32099	72513
2027-28	16645	2762	6064	7886	414	33771	76330
2028-29	17504	2915	6352	8322	437	35530	80348
2029-30	18407	3077	6654	8782	461	37381	84578
2030-31	19273	3233	6943	9226	484	39159	88647
2031-32	20180	3397	7245	9692	508	41022	92911
2032-33	21130	3570	7560	10181	534	42975	97383
2033-34	22125	3752	7888	10696	561	45022	102074
2034-35	23166	3942	8230	11236	589	47163	106982
2035-36	24118	4125	8554	11751	616	49164	111619
2036-37	25110	4317	8890	12290	644	51251	116459
2037-38	26143	4518	9240	12854	673	53428	121512
2038-39	27218	4729	9603	13443	704	55697	126782
2039-40	28337	4949	9981	14060	736	58063	132286
2040-41	29311	5161	10334	14640	766	60212	137382
2041-42	30318	5383	10699	15244	798	62442	142679
2042-43	31360	5614	11077	15873	831	64755	148180

Table 4-4 : Total Tollable Traffic @ Toll Plaza 2- Chainage 104.530 KM
(Pessimistic Growth Scenario)

Year	Car	LCV	Truck / Bus	HCM /EME/ MAV	Oversized Vehicles	Total No.	Total PCU
2024-25	11798	2162	4659	6157	242	25018	57814
2025-26	12406	2282	4880	6498	255	26321	60858
2026-27	13045	2408	5112	6857	269	27691	64060
2027-28	13718	2541	5355	7236	284	29134	67435
2028-29	14426	2682	5610	7636	300	30654	70991
2029-30	15170	2830	5876	8058	316	32250	74726
2030-31	15884	2974	6131	8466	332	33787	78329
2031-32	16631	3125	6397	8893	349	35395	82099
2032-33	17414	3284	6674	9342	367	37081	86053
2033-34	18233	3451	6964	9814	385	38847	90197
2034-35	19091	3627	7267	10310	404	40699	94546
2035-36	19875	3795	7554	10782	422	42428	98648
2036-37	20692	3972	7852	11276	441	44233	102933
2037-38	21543	4157	8161	11793	461	46115	107405
2038-39	22429	4350	8482	12334	482	48077	112072
2039-40	23351	4552	8816	12899	504	50122	116941
2040-41	24153	4748	9128	13431	525	51985	121461
2041-42	24982	4952	9451	13985	547	53917	126157
2042-43	25841	5165	9786	14562	569	55923	131036

Table 4-5 : Total Tollable Traffic @ Toll Plaza 1- Chainage 172.770 KM
(Most Likely Growth Scenario)

Year	Car	LCV	Truck / Bus	HCM /EME/ MAV	Oversized Vehicles	Total No.	Total PCU
2024-25	14345	2355	5288	6727	354	29069	65606
2025-26	15121	2492	5552	7116	374	30655	69220
2026-27	15940	2636	5830	7527	395	32328	73033
2027-28	16803	2789	6121	7962	418	34093	77060
2028-29	17712	2951	6427	8422	442	35954	81308
2029-30	18670	3122	6748	8909	467	37916	85789
2030-31	19596	3289	7058	9381	492	39816	90132
2031-32	20568	3464	7382	9879	518	41811	94697
2032-33	21587	3649	7721	10403	545	43905	99490
2033-34	22657	3844	8075	10955	574	46105	104529
2034-35	23780	4049	8446	11536	604	48415	109822
2035-36	24818	4248	8800	12094	633	50593	114862
2036-37	25900	4456	9169	12679	664	52868	120135
2037-38	27030	4675	9553	13292	696	55246	125648
2038-39	28209	4904	9953	13935	730	57731	131417
2039-40	29440	5145	10371	14609	765	60330	137454
2040-41	30452	5366	10738	15212	796	62564	142751
2041-42	31499	5596	11118	15839	829	64881	148253
2042-43	32581	5837	11512	16492	863	67285	153970

Table 4-6 : Total Tollable Traffic @ Toll Plaza 2- Chainage 104.530 KM
(Most Likely Growth Scenario)

Year	Car	LCV	Truck / Bus	HCM /EME/ MAV	Oversized Vehicles	Total No.	Total PCU
2024-25	11826	2167	4670	6172	242	25077	57950
2025-26	12465	2292	4904	6528	256	26445	61143
2026-27	13140	2424	5149	6905	271	27889	64515
2027-28	13851	2564	5407	7304	287	29413	68078
2028-29	14600	2712	5678	7726	303	31019	71833
2029-30	15390	2869	5962	8172	320	32713	75794
2030-31	16153	3022	6236	8605	337	34353	79633
2031-32	16953	3183	6523	9061	355	36075	83669
2032-33	17792	3353	6823	9541	374	37883	87908
2033-34	18674	3531	7136	10047	394	39782	92363
2034-35	19600	3719	7463	10580	415	41777	97045
2035-36	20455	3901	7776	11092	435	43659	101506
2036-37	21348	4092	8102	11628	456	45626	106170
2037-38	22279	4293	8441	12190	478	47681	111048
2038-39	23251	4504	8794	12780	501	49830	116154
2039-40	24265	4725	9162	13398	525	52075	121492
2040-41	25098	4928	9486	13950	547	54009	126185
2041-42	25961	5140	9822	14525	569	56017	131060
2042-43	26854	5361	10170	15124	592	58101	136128

4.2 Modification of Concession Period

As per Article 29 of the concession agreement, if actual traffic on the project falls short or exceeds Target Traffic on project highway on defined date, concession period shall be modified subject to calculation stipulated therein. For Tumkur-Chitradurga project, the Target Date and Target Traffic are defined as under:

Target Date - 1st April 2020

Target Traffic - 54558 in PCU

It was observed that as per traffic projections, traffic volume falls short of Target Traffic in all scenarios. This warrants for extension of the concession period as per provisions of concession agreement which is summarized as under -

Scenario	Projected Traffic in PCUs (average of traffic on target date, one year before target date and one year after target date)	Expected extension in Concession Period
All	46331	5.20

As per above, traffic and toll revenue have been considered assuming extension of 5.2 years in the concession period. The said extension is subject to approval from NHAI.

Due to the suspension of toll in the year FY-17 because of demonetization for a period of 24 days, the Concessionaire would be entitled to an extension of an additional 24 days.

Traffic was severely impacted on the project highway during the initial lockdown period. NHAI has declared a policy of providing extension of concession to make up for revenue loss during lockdown. It is expected that extension will be provided to the project concession period on this account also.

CHAPTER 5

FORECAST OF TOLL REVENUE

5.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

5.2 Discount Categories

As per the Toll Notification (Schedule R) the following discounts have been considered:

1. Monthly Pass: For frequent users a monthly pass is issued for 50 trips per month. The discount factor works out to 33.33% for 50 journeys.
2. Daily Pass (for Return Trip): A 25% discount will be offered for a return pass.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travelers.
4. Local Car / Jeep / Van to be charged at Rs 150 per month (2007)

The inflation and escalation of toll rate on the basis of WPI has been built up as per toll notification (Schedule R) as given under

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Concessionaire has further declared special discount rates which are applicable on project corridor.

These categories and rate on base year (2015-16) are given as under

Table 5-1 : Special Local Monthly Rate

Category	Monthly Rate
Car (Local 2)	370.00
Car (Local 3)	615.00
LCV (Local 1)	615.00
LCV (Local 2)	1,850.00
Truck/Bus (Local 1)	3085.00
Truck/Bus (Local 2)	5185.00

Normal escalation in the basis of WPI would be applicable to these rates as well.

In addition to above Concessionaire has also declared special rates for single local journey as under

Table 5-2 : Special Local Single Journey Rate

Category	Rate
Car	30.00
LCV	40.00
Truck/Bus	70.00
HCM /EME/ MAV	95.00

Factor of inflation / growth has been incorporated as per Schedule R. WPI are available up to 2021-22. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. Following graph provides projection of rate of inflation (WPI) in India. Data has been taken from Office of Economic Advisor web site (www.eaindustry.nic.in). WPI for years 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.

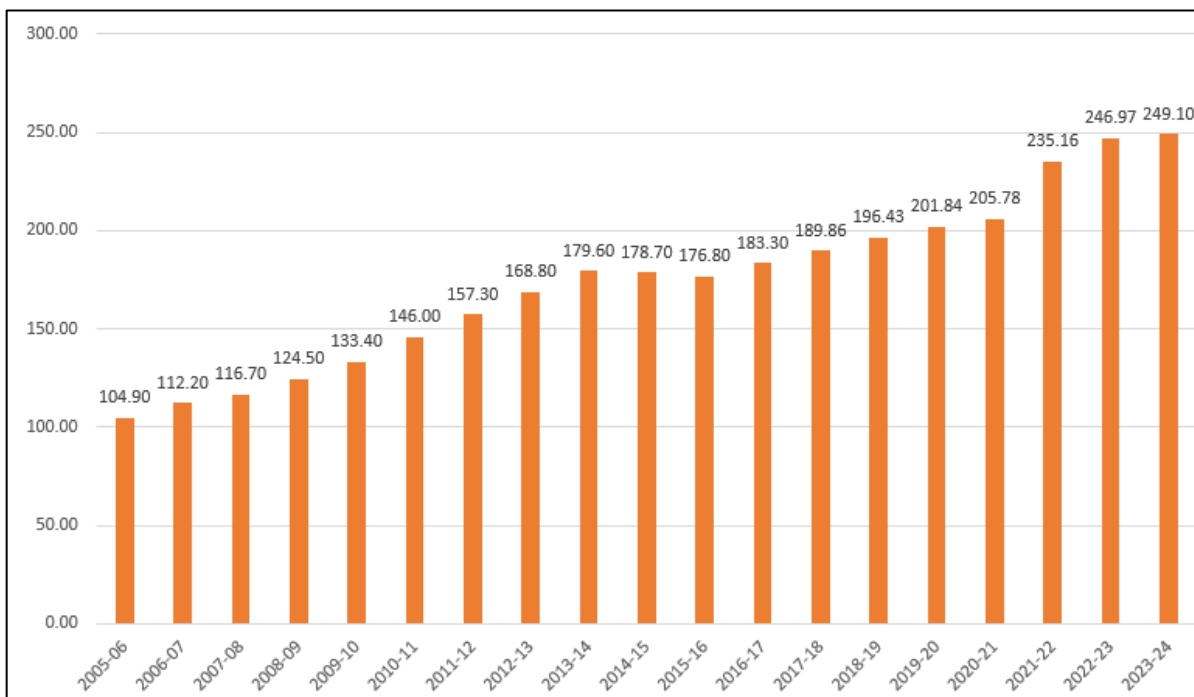


Figure 5-1 : Historical Rate of WPI Inflation in India

Except for the negative growth of WPI in the year 2015-16 average inflation in WPI from the year 2005-2024 is 4.98%. For future years initially it takes 5% and suitably stepped down for future years.

5.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules, 2008.

Table 5-3 : Base Toll Rates 2007 - 08

Type of Vehicle	Base Rate of Fee / Km (In Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (2 Axle)	2.2
Three Axle commercial vehicles	2.4
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4-6 axles)	3.45

Type of Vehicle	Base Rate of Fee / Km (In Rs.)
Oversized Vehicle (seven or more axles)	4.2

Factor of inflation / growth has been incorporated as per Schedule R. WPI are available up to 108-19. A moderate growth in Wholesale Price Index (WPI) has been assumed after that as discussed above.

Table 5-4 : Tollable Length PKG-I

Toll Plaza Chainage	Length (Km)	Tollable Highway + Structure length (Km)
172.770	57.00	57.00
104.530	57.00	70.680

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs. five) for the concession period and are given below. Since applicable length of highway length is equal for both plazas, applicable toll rates are also same

Thus, worked out rates for various categories of vehicle and discounts are given as under

Table 5-5 : Toll Rates for Single Journey @ 172.770 & @104.530

Year	Car	LCV	Truck / Bus	HCM /EME/ MAV	Oversized Vehicles
2024-25	85	135	285	445	540
2025-26	90	140	295	465	565
2026-27	90	150	310	490	595
2027-28	95	155	330	515	625
2028-29	100	165	345	540	655
2029-30	105	170	360	565	690
2030-31	110	180	380	590	720
2031-32	115	190	395	620	755

Year	Car	LCV	Truck / Bus	HCM /EME/ MAV	Oversized Vehicles
2032-33	125	200	415	650	790
2033-34	130	210	435	680	830
2034-35	135	220	455	715	870
2035-36	140	230	480	750	915
2036-37	150	240	500	785	955
2037-38	155	250	525	825	1005
2038-39	165	265	550	865	1055
2039-40	170	275	580	910	1105
2040-41	180	290	610	955	1160
2041-42	190	305	640	1000	1215
2042-43	200	320	670	1050	1280

Table 5-6 : Toll Rates for Return Journey @ 172.770 & @104.530

Year	Car	LCV	Truck / Bus	HCM /EME/ MAV	Oversized Vehicles
2024-25	125	205	425	665	810
2025-26	130	215	445	700	850
2026-27	140	225	470	735	895
2027-28	145	235	490	770	940
2028-29	150	245	515	810	985
2029-30	160	260	540	845	1030
2030-31	165	270	565	890	1080
2031-32	175	285	595	930	1135
2032-33	185	295	620	975	1190
2033-34	195	310	650	1025	1245
2034-35	200	325	685	1070	1305

Year	Car	LCV	Truck / Bus	HCM /EME/ MAV	Oversized Vehicles
2035-36	210	340	715	1125	1370
2036-37	220	360	750	1180	1435
2037-38	235	375	790	1235	1505
2038-39	245	395	830	1300	1580
2039-40	255	415	870	1360	1660
2040-41	270	435	910	1430	1740
2041-42	285	455	955	1500	1825
2042-43	295	480	1005	1575	1915

Table 5-7 : Toll Rates for Local Single Journey @ 172.770 & @104.530

Year	Car	LCV	Truck / Bus	HCM /EME/ MAV
2024-25	70	80	140	285
2025-26	75	85	145	300
2026-27	80	90	150	315
2027-28	85	95	160	330
2028-29	90	100	165	345
2029-30	95	105	170	360
2030-31	100	110	180	375
2031-32	105	115	190	390
2032-33	110	120	200	410
2033-34	115	125	210	430
2034-35	120	130	220	450
2035-36	125	135	230	470

Year	Car	LCV	Truck / Bus	HCM /EME/ MAV
2036-37	130	140	240	490
2037-38	135	145	250	510
2038-39	140	150	260	535
2039-40	145	155	270	560
2040-41	150	160	280	585
2041-42	155	165	295	610
2042-43	160	170	310	635

Table 5-8 : Toll Rates for Monthly Pass@ 172.770 & @104.530

Year	Car (Regular)	Car (Local 1)	Car (Local 2)	Car (Local 3)	LCV (Regular)	LCV (Local 1)	LCV (Local 2)	Truck/Bus (Regular)	Truck/Bus ((Local 1)	Truck/Bus (Local 2)	HCM /EME/ MAV	Oversized Vehicles	Truck / Bus (60 Trips)	Truck / Bus (80Trips)
2024-25	2785	340	675	1075	4500	4010	3060	9430	5110	8390	14790	18005	11270	15090
2025-26	2925	355	705	1125	4730	4210	3215	9905	5365	8810	15535	18915	11840	15850
2026-27	3075	375	740	1185	4965	4420	3375	10410	5635	9250	16320	19870	12440	16650
2027-28	3230	390	780	1245	5220	4645	3545	10935	5915	9715	17150	20880	13075	17500
2028-29	3385	410	815	1300	5470	4850	3705	11460	6180	10150	17970	21875	13700	18335
2029-30	3550	430	850	1355	5730	5070	3870	12005	6460	10610	18830	22925	14360	19210
2030-31	3720	450	890	1420	6005	5300	4045	12585	6750	11085	19735	24025	15050	20135
2031-32	3895	475	930	1480	6295	5535	4225	13190	7055	11585	20685	25180	15775	21105
2032-33	4085	495	970	1550	6600	5785	4415	13825	7370	12105	21680	26395	16540	22120
2033-34	4285	520	1015	1620	6920	6045	4615	14495	7705	12650	22730	27670	17345	23190
2034-35	4490	545	1060	1690	7255	6320	4820	15200	8050	13220	23835	29015	18185	24315
2035-36	4710	570	1105	1770	7605	6605	5040	15935	8410	13815	24995	30425	19075	25500
2036-37	4940	600	1155	1845	7980	6900	5265	16715	8790	14435	26210	31910	20010	26745
2037-38	5180	630	1210	1930	8370	7210	5500	17535	9185	15085	27495	33470	20990	28055
2038-39	5435	660	1265	2015	8780	7535	5750	18395	9600	15765	28845	35115	22020	29430
2039-40	5700	695	1320	2110	9210	7875	6010	19300	10030	16475	30265	36845	23110	30880
2040-41	5985	725	1380	2205	9665	8230	6280	20250	10480	17215	31760	38660	24250	32400
2041-42	6280	765	1440	2300	10145	8600	6560	21255	10955	17990	33330	40575	25455	34005
2042-43	6590	800	1505	2405	10645	8985	6855	22310	11445	18800	34985	42590	26720	35695

5.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated under in all three scenarios. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

5.5 Toll Revenue at all toll plazas under Scenarios

Starting from the year 2024-25 are shown in the tables below.

Table 5-9 : Toll Revenue Optimistic Scenario
(Rs. Crores)

Year	Toll Plaza at 177.2	Toll Plaza at 104.53	Total
2024-25	212.40	192.05	404.44
2025-26	234.92	212.31	447.23
2026-27	260.37	235.43	495.80
2027-28	290.21	262.59	552.80
2028-29	321.12	290.51	611.63
2029-30	355.76	321.68	677.44
2030-31	392.19	354.71	746.90
2031-32	434.62	393.07	827.69
2032-33	481.03	434.97	915.99
2033-34	530.40	479.55	1009.95
2034-35	585.01	529.02	1114.03
2035-36	644.48	583.07	1227.54
2036-37	707.35	639.70	1347.05
2037-38	778.03	703.57	1481.60
2038-39	857.59	775.51	1633.10
2039-40	944.47	854.47	1798.94
2040-41	1028.84	930.87	1959.71
2041-42	1121.63	1014.68	2136.31
2042-43	1222.92	1106.16	2329.07

Table 5-10 : Toll Revenue Pessimistic Scenario
(Rs. Crores)

Year	Toll Plaza at 177.2	Toll Plaza at 104.53	Total
2024-25	211.41	191.15	402.56
2025-26	232.74	210.31	443.05
2026-27	256.74	232.15	488.89
2027-28	284.83	257.74	542.57
2028-29	313.69	283.86	597.54
2029-30	345.90	312.85	658.75
2030-31	379.53	343.33	722.86
2031-32	418.57	378.68	797.25

Year	Toll Plaza at 177.2	Toll Plaza at 104.53	Total
2032-33	461.09	417.07	878.16
2033-34	506.03	457.67	963.71
2034-35	555.46	502.51	1057.98
2035-36	609.03	551.19	1160.22
2036-37	665.28	601.85	1267.13
2037-38	728.23	658.84	1387.07
2038-39	798.88	722.72	1521.60
2039-40	875.64	792.50	1668.14
2040-41	953.85	863.35	1817.19
2041-42	1039.92	941.09	1981.01
2042-43	1133.79	1025.90	2159.68

**Table 5-11 : Toll Revenue Most Likely Scenario
(Rs. Crores)**

Year	Toll Plaza at 177.2	Toll Plaza at 104.53	Total
2024-25	211.92	191.59	403.51
2025-26	233.85	211.30	445.14
2026-27	258.55	233.77	492.32
2027-28	287.52	260.14	547.66
2028-29	317.43	287.13	604.55
2029-30	350.85	317.18	668.02
2030-31	385.88	348.91	734.79
2031-32	426.60	385.74	812.34
2032-33	471.03	425.85	896.88
2033-34	518.17	468.42	986.58
2034-35	570.17	515.52	1085.69
2035-36	626.65	566.81	1193.47
2036-37	686.16	620.38	1306.54
2037-38	752.90	680.70	1433.60
2038-39	827.91	748.50	1576.42
2039-40	909.65	822.77	1732.42
2040-41	990.86	896.35	1887.21
2041-42	1080.21	977.06	2057.27
2042-43	1177.71	1065.14	2242.85

CHAPTER 6

OPERATION & MAINTENANCE

6.1 Operation & Maintenance

The following are project parameters which would contribute towards the cost of operation and maintenance.

The future cost of operation and maintenance is estimated on engineering judgment and experience basis. Keeping all above factors in view, the following can be basis of working out cost of operation and maintenance for project corridor from Tumkur to Chitradurga on NH-4 in state of Karnataka.

- a) **Annual Regular Maintenance** – Covering pothole repair, shoulder and slope repair, drain cleaning, median maintenance, Crash barrier, toll plaza maintenance, Toll collection, other services like medical help and rescue operations etc.
- b) **Periodic Maintenance** – This will be done on a periodic basis, say every 5 years. It will consist of overlaying of wearing course and painting and marking. Some pavement strengthening is also anticipated in a few sections. This operation and its cost are spread over three years. But since the project is commissioned and running traffic for last many years, periodic maintenance shall be as per condition of pavement and other infrastructure. Input from concessionaires have been taken in this regard.

Concessionaire has recently updated the program of maintenance of project road. Same has been reviewed and year-wise cost of O&M from year 2022-23 is given in table below.

Table 6-1 : O&M COST

Year	Annual Maintenance (Rs. Cr)	Thermoplastic Painting (Rs. Cr)	Renewal Coat with BC (Rs. Cr.)	Special Repair of pavement	Structure maintenance. (Rs. Cr)	Electric System		Total Expenditure (Rs. Crores)	Remarks
						Annual	Periodic		
2024-25	8.56	0.98	13.74	19.91	0.01	0.04		57.94	Renewal of Wearing course + Pavement repair
2025-26	8.56				0.01	0.04		12.10	Regular O & M
2026-27	8.56				0.01	0.04		12.70	Regular O & M
2027-28	8.56				0.01	0.04		13.34	Regular O & M
2028-29	8.56				0.01	0.04		14.01	Regular O & M
2029-30	8.56	0.98	13.74	19.91	0.01	0.04		73.94	Renewal of Wearing course + Pavement repair
2030-31	8.56			1.81	0.01	0.04		18.69	Regular O & M
2031-32	8.56			1.81	0.01	0.04		19.63	Regular O & M
2032-33	8.56			1.81	0.01	0.04		20.61	Regular O & M
2033-34	8.56			1.81	0.01	0.04		21.64	Regular O & M
2034-35	8.56	1.72	13.74	28.96	0.01	0.04		115.74	Renewal of Wearing course + Pavement repair
2035-36	8.56			1.81	0.01	0.04		23.86	Regular O & M
2036-37	8.56			2.17	0.01	0.04		25.92	Regular O & M

Year	Annual Maintenance	Thermoplastic Painting	Renewal Coat with	Special Repair of	Structure maintenance.	Electric System		Total Expenditure	Remarks
2037-38	2.57				0.01	0.04		6.60	Regular O & M

CHAPTER 7

CONCLUSION & RECOMMENDATIONS

7.1 Conclusion & Recommendations

Project stretch of Tumkur to Chitradurga section of NH-4 in state of Karnataka from km 75.000 to km 189.000 is currently Six lane road. The road is in sound condition and serves to good traffic volume. As Indian economy is poised to grow at 7%+ post COVID-19, project corridor is expected to pick up same trend in terms of traffic flow. All these developments have potential to give a positive impact to traffic flow on the project. Following can considered as major outcome of study:

- a) There is a good amount of tollable traffic running on the project.
- b) Project corridor has potential to witness good traffic growth annually in near future in post COVID-19 scenario due to various development in area and overall development of economy.
- c) Project corridor has committed traffic as long route traffic and does not have risk of traffic leakage due lack of competing road of comparable quality.

The project infrastructure is in good condition and its maintenance cost is also reasonable.

Based on the above it can be considered a stable healthy project from the traffic and revenue point of view.

CHAPTER 8

PROJECT ILLUSTRATIONS

8.1 General

Project current condition has been depicted in the following photographs.



Figure 8-1 : General Condition of project road.



Figure 8-2 : General Condition of project road.



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JAIPUR TO DEOLI SECTION OF NH-12

(KM 18.700 To 165.00)

IN THE STATE OF RAJASTHAN



APRIL 2024



TOLL REVENUE AND O&M COST PROJECTION REPORT (FINAL)



GMD Consultants

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**JAIPUR TO DEOLI SECTION OF NH-12
(KM 18.700 To 165.00)
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**TOLL REVENUE AND O&M COST
PROJECTION REPORT
(FINAL)**

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ABBREVIATIONS

AADT	- Annual Average Daily Traffic	NHAI	- National Highways Authority of India
BOT	- Build Operate Transfer	NHDP	- National Highways Development Project
CAGR	- Compound Annual Growth Rate	NSDP	- Net State Domestic Product
CTV	- Classified traffic volume	O&M	- Operation & Maintenance
DBFOT	- Design, Build, Finance, Operate & Transfer	PCDP	- Per Capita Domestic Product
EME	- Earth Moving Equipment	PCI	- Per Capita Income
GDP	- Gross Domestic Product	PCU	- Passenger Car Unit
GSDP	- Gross State Domestic Product	PSC	- Pre-stressed Concrete
HCM	- Heavy Construction Machinery	RCC	- Reinforced cement concrete
HCV	- Heavy Commercial Vehicle	RHS	- Right Hand Side
HTMS	- Highway Traffic Management System	SH	- State Highway
IRC	- Indian Road Congress	TP	- Toll Plaza
IRR	- Internal Rate of Return	WPI	- Wholesale Price Index
LCV	- Light Commercial Vehicle	SIR	- Special Investment Region
LHS	- Left Hand Side	c.	- Circa
LGV	- Light Goods Vehicle	ROB	- Railway Over Bridge
MAV	- Multi Axle Vehicle	MDR	- Major District Road
MORTH	- Ministry of Road Transport and Highways	ODR	- Other District Road
NH	- National Highway	CA	- Concession Agreement
PCC	- Plain Cement Concrete	RMT	- Running Meter
CR	- Coarse Rubble		

CHAPTER 1

INTRODUCTION

1.1 Background

The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under NHDP Phase V. Under Phase V NHAI has planned to convert 6,500 km of existing 4-lane National Highways into 6-lane National Highway. Sections envisaged under 6-laning comprise the Golden Quadrilateral section (5,700 km) and some other sections which are 800 km in length.

The project under consideration, Jaipur - Deoli section of NH-12 from Km 18.700 to km 165.000 is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. *M/s IRB Jaipur Deoli Tollway Ltd.* (Concessionaire) has been awarded the Project for concession period of 25 years starting from 14th June 2010 to 13th June 2035. The Project has been commissioned and is currently in the operation / maintenance phase.

1.2 Objective of the Study

M/s IRB INVIT FUND has engaged *GMD Consultants* to assess the future traffic and toll potential of the project along with related operation & maintenance expenditure involved.

This report named as “*Toll Revenue and O&M Cost Projection Report*” mainly focuses on traffic and O&M aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows:

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting
- d) Operation and Maintenance Cost Projections

The Concessionaire has provided basic historical traffic data and other project details on the basis of which the above analysis has been carried out, after applying our judgment to the traffic estimates.

“Toll Revenue and O&M Cost Projection Report” was submitted in March 2017. In this report traffic data of year 2015-16 was used as base traffic. The report was updated based on traffic data of year 2017-18 and submitted in April 2018. The report was further updated with traffic Data of the period from April 2018 to September 2018 and was submitted in October 2018. A revised report was submitted with updated traffic for the years 2018-19 in April 2019. The report was further updated with yearly traffic data for 2019-20 in May 2020. With traffic data from April 2020 to March 2021 report was updated, report was further updated with yearly traffic data from April 2021 to March 2022, April 2022 to March 2023 and now concessionaire has provided traffic data from April 2023 to March 2024, report is updated with this annual traffic data.

CHAPTER 2

TRAFFIC SURVEYS AND ANALYSIS

2.1 Traffic Surveys

In the course of our work, we have collected the required information for project corridor to understand the general traffic and travel characteristics of the corridor.

The following traffic data has been collected for project:

- Classified traffic volume counts at the two toll plaza locations on Jaipur-Deoli section of NH-12 for base year 2015-16, 2016-17, 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-23 and annual traffic data from April 2023 to March 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

The project can be divided into two homogenous sections from a traffic point of view.

These sections can be:

1. Jaipur to Tonk
2. Tonk to Deoli

Traffic of both sections is represented by toll plaza in each section. Table below lists provides details of locations from where traffic details have been collected:

Table 2-1 : Traffic Data Details

SR. NO	LOCATION	CTV	Single Journey Traffic	Return Pass Traffic	Monthly Pass Traffic	Local Traffic
1	Km 30.500 Toll Plaza	AADT for Year 2015-2016	For Year 2015-2016	For Year 2015-2016	For Year 2015-2016	For Year 2015-2016
		AADT for year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017
		AADT for year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018
		AADT for year 2018-2019	For year 2018-2019	For year 2018-2019	For year 2018-2019	For year 2018-2019
		AADT for year 2019-2020	For year 2019-2020	For year 2019-2020	For year 2019-2020	For year 2019-2020
		AADT for year 2020-2021	For year 2020-2021	For year 2020-2021	For year 2020-2021	For year 2020-2021
		AADT for year 2021-2022	For year 2021-2022	For year 2021-2022	For year 2021-2022	For year 2021-2022
		AADT for year 2022-2023	For year 2022-2023	For year 2022-2023	For year 2022-2023	For year 2022-2023
		AADT for year 2023-2024	For year 2023-2024	For year 2023-2024	For year 2023-2024	For year 2023-2024
2	Km 105.000 Toll Plaza	AADT for Year 2015-2016	For Year 2015-2016	For Year 2015-2016	For Year 2015-2016	For Year 2015-2016
		AADT for year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017	For Year 2016-2017
		AADT for year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018	For Year 2017-2018
		AADT for year 2018-2019	For year 2018-2019	For year 2018-2019	For year 2018-2019	For year 2018-2019
		AADT for year 2019-2020	For year 2019-2020	For year 2019-2020	For year 2019-2020	For year 2019-2020

SR. NO	LOCATION	CTV	Single Journey Traffic	Return Pass Traffic	Monthly Pass Traffic	Local Traffic
		AADT for year 2020-2021	For year 2020-2021	For year 2020-2021	For year 2020-2021	For year 2020-2021
		AADT for year 2021-2022	For year 2021-2022	For year 2021-2022	For year 2021-2022	For year 2021-2022
		AADT for year 2022-2023	For year 2022-2023	For year 2022-2023	For year 2022-2023	For year 2022-2023
		AADT for year 2023-2024	For year 2023-2024	For year 2023-2024	For year 2023-2024	For year 2023-2024

The locations of each of the traffic surveys are illustrated in Figure 2-1.

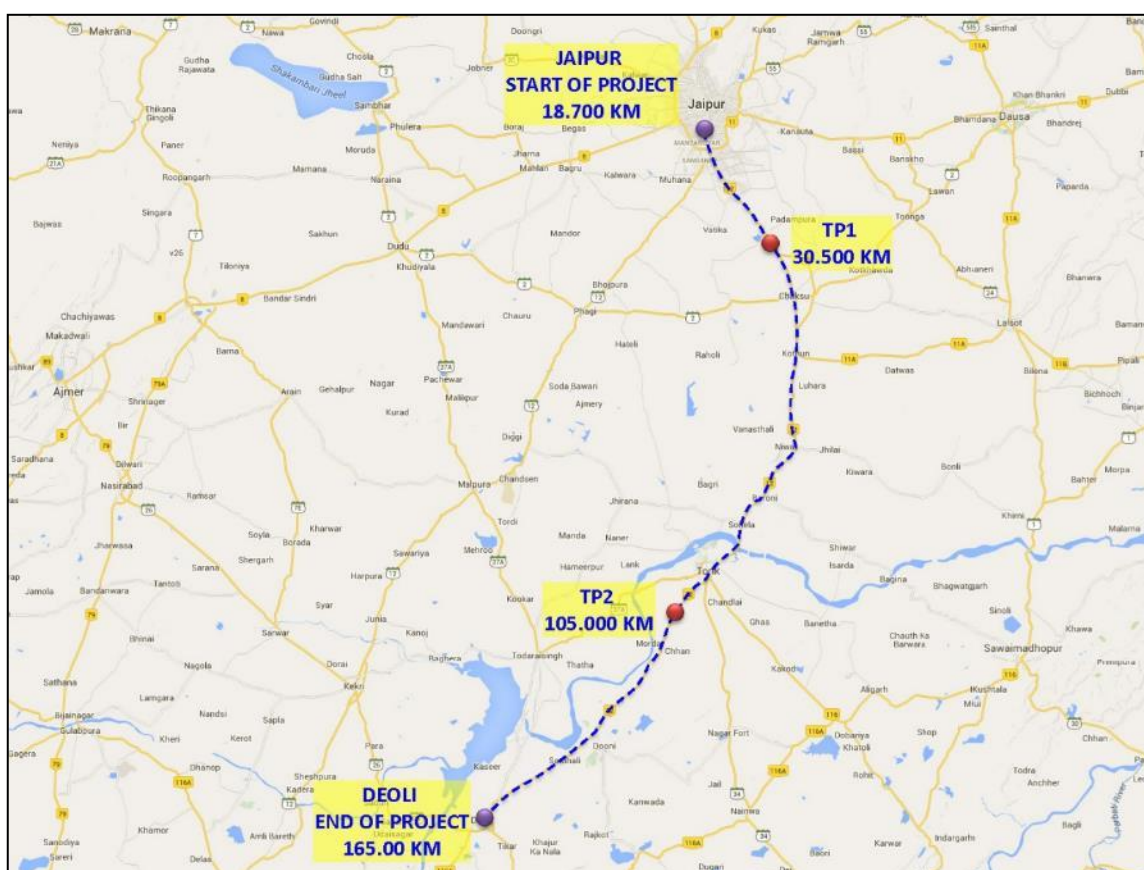


Figure 2-1: Toll Plaza Locations

2.2 Classified Traffic Volume Count

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume

Count survey has been provided by concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI. These locations are indicated in **Figure 2-1** and listed in **Table 2-1**.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in the table below.

Table 2-2 : Vehicle Classification System

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old /new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

Source - IRC: 64 – 1990

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. Following are the type of vehicles as per concession agreement:

- Car / Jeep / van
- Minibus /LCV
- Truck / Bus
- Multi Axle
- Oversize Vehicle

2.3 Traffic Characteristic

Toll revenue of the project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have significant potential to affect toll revenue. Components of local traffic, component of passenger and commercial traffic, portion of return journey traffic, portion of monthly pass traffic are some such characteristics of traffic. These will be discussed in subsequent sections of this report.

2.3.1 Traffic Data

Project concessionaire has provided Traffic data for base year 2015-16, 2016-17 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-23 and from April 2023 to March 2024 as under for both toll plazas –

Table 2-3 : Traffic Data at Toll Plaza @ Km 30.500

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) FY 2018-19	Annual Average Daily Traffic (Nos.) FY 2019-20	Annual Average Daily Traffic (Nos.) FY 2020-21	Annual Average Daily Traffic (Nos.) FY 2021-22	Annual Average Daily Traffic (Nos.) FY 2022-23	Annual Average Daily Traffic (Nos.) FY 2023-24
1	Car	8428	8860	9044	7684	8808	8880
2	Minibus / LCV	1506	1370	1056	377	553	665
3	Truck / Bus	1109	1278	996	1178	1314	1266
4	Multi Axle	1453	1402	1390	1616	2207	2362
5	Oversized Vehicles	60	50	28	5	7	4
	Total	12556	12960	12515	10860	12889	13176

Similar traffic data for toll plaza at km 105.000 is given as under

Table 2-4 : Traffic Data at Toll Plaza @ Km 105.000

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) FY 2018-19	Annual Average Daily Traffic (Nos.) FY 2019-20	Annual Average Daily Traffic (Nos.) – FY 2020-21	Annual Average Daily Traffic (Nos.) FY 2021-22	Annual Average Daily Traffic (Nos.) FY 2022-23	Annual Average Daily Traffic (Nos.) FY 2023-24
1	Car	3276	3446	3736	3612	3918	4557
2	Minibus/ LCV	780	661	573	235	363	497
3	Truck/Bus	691	778	767	913	914	1243
4	Multi Axle	1315	1248	1556	2031	2203	2529
5	Oversized Vehicles	25	19	18	6	9	7
	Total	6087	6151	6650	6798	7407	8832

2.4 Data Analysis

2.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in **Table 2-5**.

Table 2-5 : PCU Factors Adopted for Study

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5

Vehicle Type	PCUs
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under.

Table 2-6 : Traffic in PCU at both sections

Toll Plaza Location	Period	PCU	PCU Index
30.500	FY 2015-16	26809	2.17
	FY 2016-17	28629	2.07
	FY 2017-18	26323	1.98
	FY 2018-19	20823	1.66
	FY 2019-20	21283	1.64
	FY 2020-21	19998	1.60
	FY 2021-22	19077	1.76
	FY 2022-23	23541	1.83
	FY 2023-24	24321	1.85
105.000	FY 2015-16	15963	2.29
	FY 2016-17	13747	2.25
	FY 2017-18	14917	2.30
	FY 2018-19	12549	2.06
	FY 2019-20	12472	2.03
	FY 2020-21	13979	2.10
	FY 2021-22	15871	2.33
	FY 2022-23	17158	2.32
	FY 2023-24	20443	2.31

It can be observed from above that project traffic has a PCU index ranging from 1.5 to 2.4.

which indicates a good mix of commercial and passenger traffic.

2.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.

For the purpose of analysis, the recent yearly traffic numbers for the year 2023-24 have been considered as the base numbers.

It is observed that car traffic forms 67% of total traffic at toll plaza location 30.5 while multi axle vehicles are 18% of total traffic. 10% of traffic is Truck /Bus while LCV traffic forms the balance 5%. Overall, about 33% of traffic is commercial in nature.

At toll plaza location 105.0 car traffic forms 51% of total traffic at toll plaza while multi axle and LCV are 29% and 6%. Truck/ Bus volume is 14% of the total traffic. Overall, about 49% of traffic is commercial in nature which is higher as compared to toll plaza location 30.5.

Another important bifurcation of traffic is components of traffic with respect to various type of toll ticketing like

1. Single Journey
2. Return Journey
3. Overweight Vehicles (Concessionaire provided special tariff for this category)
4. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of the above categories on base year 2015-16, 2016-17, 2017-18, 2018-19, 2019-20 2020-21, 2021-22 ,2022-23 and April 2023 to March 2024.

Table 2-7 : Journey Type Bifurcation of Traffic at KM 30.500

Sr. No	Type	Traffic Volume (Nos.) FY 2018-19	Traffic Volume (Nos.) FY 2019-20	Traffic Volume (Nos.) FY 2020-21	Traffic Volume (Nos.) for FY 2021-22	Traffic Volume (Nos.) for FY 2022-23	Traffic Volume (Nos.) for FY 2023-24
1	Single Journey	4395	5113	6409	4900	5273	5325
2	Return Journey	5372	5188	3676	5858	7502	7736

Sr. No	Type	Traffic Volume (Nos.) FY 2018-19	Traffic Volume (Nos.) FY 2019-20	Traffic Volume (Nos.) FY 2020-21	Traffic Volume (Nos.) for FY 2021-22	Traffic Volume (Nos.) for FY 2022-23	Traffic Volume (Nos.) for FY 2023-24
3	Overweight vehicles	314	2	0	0	0	0
4	Monthly Pass	2475	2657	2430	102	114	115

A significant part of the traffic at KM 30.500 is return journey (59%) followed by single journey (40%) and monthly passes which share 1% of the total traffic volume. Overweight vehicle shares have reduced to almost nil.

Similarly, traffic numbers for the type of journey at KM 105.000 are given in the following table.

Table 2-8 : Journey Type Bifurcation of Traffic at KM 105.000

Sr. No	Type	Traffic Volume (Nos.) FY 2018-19	Traffic Volume (Nos.) FY 2019-20	Traffic Volume (Nos.) FY 2020-21	Traffic Volume (Nos.) for FY 2021-22	Traffic Volume (Nos.) for FY 2022-23	Traffic Volume (Nos.) for FY 2023-24
1	Single Journey	2999	3379	4475	3950	4082	5791
2	Return Journey	2036	1978	1634	2816	3300	3018
3	Overweight vehicles	252	6	0	0	0	0
4	Monthly Pass	800	788	541	32	25	23

Here single journey (66%) forms highest portion of traffic followed by return journey (34%) and monthly pass journey (0%). It can be observed as 105.000 is predominantly a rural part, monthly passes and return journey components have reduced as compared to location 30.500. Components of overweight vehicles remain the same though.

2.5 Secondary Data Collection

There are several other factors which have substantial impact on traffic pattern and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from the various sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
 - a) GDP
 - b) NSDP
 - c) Population Growth
 - d) Per Capita Income growth
 - e) Industrial Growth
 - f) Special Industry Potential
 - g) Regional and National development vision / plan
 - h) Any other relevant data

CHAPTER 3

GROWTH OF TRAFFIC ON PROJECT HIGHWAY

3.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the forecasts of factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Jaipur – Deoli section of NH-12 has been done taking above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

3.2 Trend Analysis

One of the methods of estimation of future rate of traffic growth is to assume the same rate of growth as experienced in the past. However, it may be noted that major influencing factors which reflect Economic conditions such as GDP, agricultural output, industrial output, national policies etc. are susceptible to change over a longer period of time and necessary adjustments need to be made to past trends to account for these changes.

Thus, we have considered the Elasticity model of growth projection which is one of the most widely acceptable methods for traffic forecast and is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method past trends of any vehicular data are paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that growth patterns for passenger and goods vehicles are different. Traffic growth on any highway typically depends on a number of economic parameters. The most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It is observed that the ownership of a car is more closely related to affordability hence per capita is the index which closely fits with growth of car traffic among other criteria. In similar fashion, the following pairs of vehicle type and independent variable can be established for elasticity modeling of growth.

- Car / Jeep – Par Capita Income
- Bus / Minibus – Population
- Trucks / Heavy / Goods Vehicle – NSDP

Time series data of vehicle (both passenger and goods) Registered in state of Rajasthan is used as the base data for analysis of growth.

3.3 Estimation of Traffic Demand Elasticity

The elasticity of traffic demand is defined as the rate at which traffic intensity varies due to change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish the relationship between the growth in number of given categories of vehicle with one of the economic variables considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-2015 the model for estimating elasticity index for the project corridor is of the following form and is as given below:

$$\text{Log}(P) = k \times \text{Log}(EI) + A$$

Where,

P = Number of Vehicles (Mode wise)

EI = Economic Indicator

A = Regression constant

k = Elasticity coefficient (Regression coefficient)

The elasticity for cars and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

The following tables and graphs depict regression and elasticity of growth model.

Table 3-1 : Per Capita Income Vs Car

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2004	18565	397290	4.27	5.60		
2005	19445	417701	4.29	5.62	5%	
2006	21342	467675	4.33	5.67	10%	
2007	21922	524723	4.34	5.72	3%	
2008	23356	585161	4.37	5.77	7%	
2009	24304	659616	4.39	5.82	4%	
2010	27502	748295	4.44	5.87	13%	
2011	29612	845909	4.47	5.93	8%	
2012	30839	947598	4.49	5.98	4%	
2013	31386	1053406	4.50	6.02	2%	
2014	33186	1171267	4.52	6.07	6%	6.0%

Regression analysis of same is given in figure below.

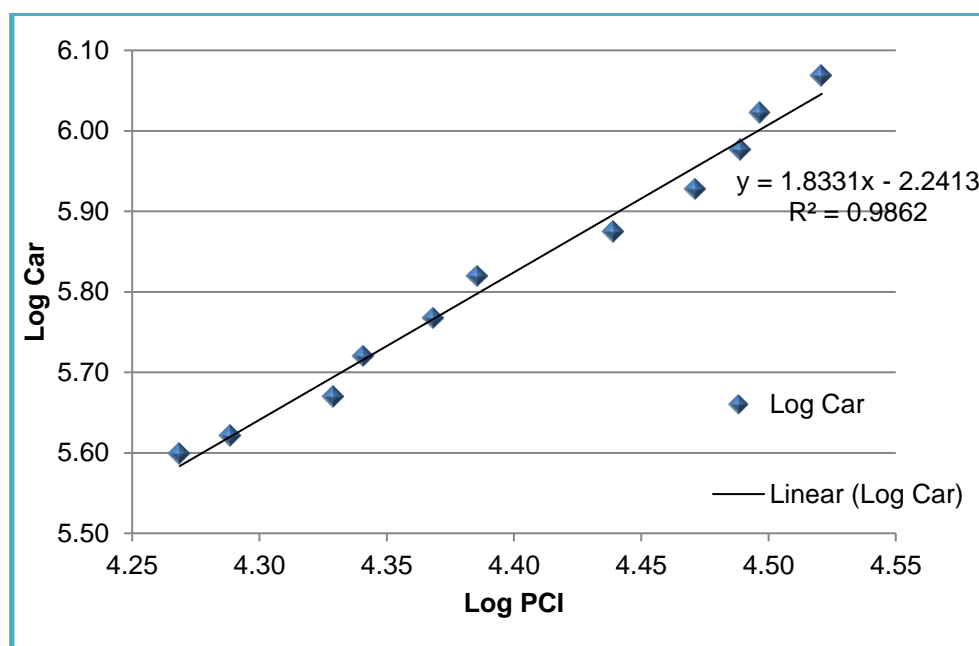
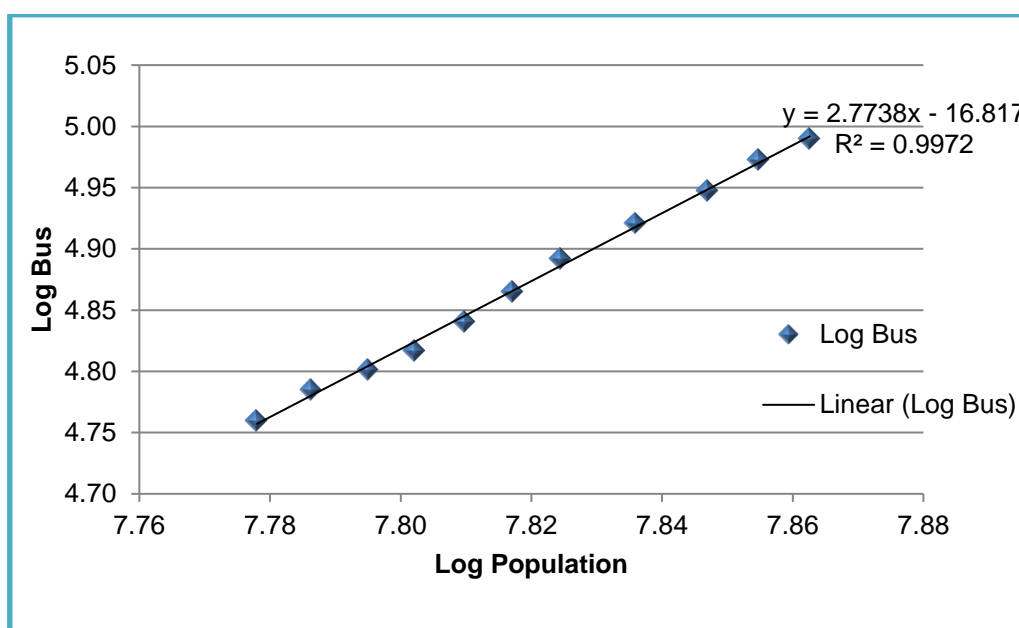
**Figure 3-1: Regression and Elasticity PCI vs. Car-Extrapolation**

Table 3-2 : Population Vs Bus

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2004	59984000	57542	7.78	4.76		
2005	61136000	60979	7.79	4.79	2%	
2006	62377000	63320	7.80	4.80	2%	
2007	63407000	65605	7.80	4.82	2%	
2008	64533000	69298	7.81	4.84	2%	
2009	65650000	73257	7.82	4.86	2%	
2010	66750000	77980	7.82	4.89	2%	
2011	68548437	83345	7.84	4.92	3%	
2012	70314000	88616	7.85	4.95	3%	
2013	71584000	93892	7.85	4.97	2%	
2014	72877000	97650	7.86	4.99	2%	1.97%

Regression analysis of same is given in figure below.

**Figure 3-2: Regression and Elasticity Population vs. Bus – Extrapolation**

The elasticity of goods traffic has been worked out by regression analysis with NSDP. The following table represents the data and details.

Table 3-3 : Goods Traffic Vs NSDP

Year	NSDP	Trucks	Log NDSP	Log Truck	NSDP Growth	Average Growth (5 Year)
2004	112636000	186431	8.05	5.27		
2005	120202000	206381	8.08	5.31	7%	
2006	134350000	232007	8.13	5.37	12%	
2007	140471000	252109	8.15	5.40	5%	
2008	152284000	266048	8.18	5.42	8%	
2009	161159000	289925	8.21	5.46	6%	
2010	185366000	323273	8.27	5.51	15%	
2011	202749000	362028	8.31	5.56	9%	
2012	214391000	401983	8.33	5.60	6%	
2013	224632000	434379	8.35	5.64	5%	
2014	237530000	472365	8.38	5.67	6%	7.43%

The following figure depicts regression analysis and extrapolation.

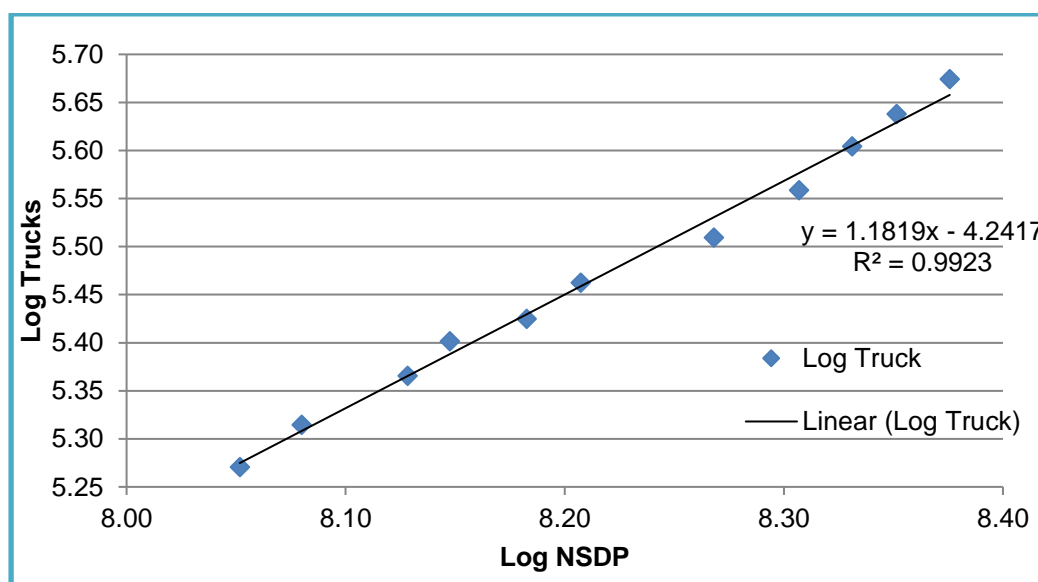


Figure 3-3: Regression and Elasticity NSDP vs. Goods Traffic – extrapolation.

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R^2 is a statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R^2 more representative is the regression model of data.

The results of these analyses for the good fit as reflected by R^2 values are presented in the Table below.

Table 3-4 : Summary Regression Analysis

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth	Growth Elastic Model
Rajasthan	Car/Jeep	PCI	$y = 1.8331x - 2.2413$	$R^2 = 0.9862$	1.8331	6.03%	11.05%
	Bus	Population	$y = 2.7738x - 16.8173$	$R^2 = 0.9972$	2.7738	1.97%	5.46%
	Truck	NSDP	$y = 1.1819x - 4.2417$	$R^2 = 0.9923$	1.1819	7.43%	8.78%

Economic model for predicting growth is good tool, however other local, regional, national factors should also be considered before finalizing growth factors. Considering factors such as proposed developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

3.4 Analysis of Historic Traffic Data

Historic traffic data forms useful information for any highway project. It provides useful information for establishing past trends of growth. Project stretch of Jaipur to Deoli has recently been commissioned and tolling only commenced in 2013-14. Only 3-4 years of traffic data is available with project concessionaire. The following factors also have added to inconsistency in traffic volume on project during previous years.

- a) Demonetization in November 2016
- b) Ban on mining in Rajasthan
- c) Covid-19 Impact from Feb-20 onwards by successive waves

It is assumed that as the project is now completed after adding the balance length, the impact of demonetization is diminishing, and mining ban has also been lifted in area. This had impacted the traffic growth adversely.

3.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economic, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.

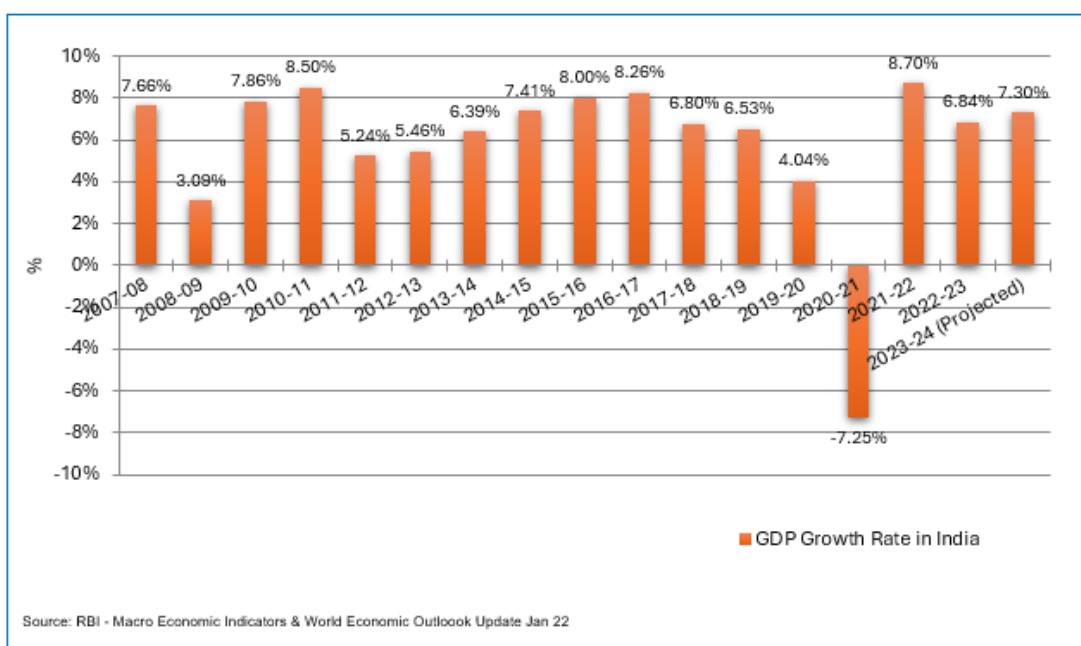


Figure 3-4 : Growth of GDP in India

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22.

3.6 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as below. The rate of growth is moderate in light of overall regional trends. Growth of multi-Axle is kept slightly higher as trend of technological advances in logistic industry favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, the rate of growth diminishes. Same growth rate is not sustainable for long.

Temporary disruptions caused by implementation of Goods and Service Tax (GST) and demonetization have dissipated, and growth of economy has significantly improved since then. The curb on mining activity in the area due to the ban on quarrying had affected traffic on this project.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic**, **Pessimistic** and **Most Likely** with a positive and negative variation 0.5% from Most Likely case.

Table 3-5 : Recommended Growth Rates Optimistic

Up to Year/ Vehicle Type	2021- 2023	2023- 2026	2026- 2031	2031- 2036	2036- 2041	2041- 2046
Car	9.51%	8.69%	7.54%	6.46%	5.45%	4.50%
Minibus /LCV	6.25%	5.67%	5.23%	4.52%	3.59%	2.70%
Truck / Bus	6.81%	6.81%	5.97%	5.19%	4.47%	3.81%
Multi Axle	6.81%	5.76%	5.06%	4.41%	3.81%	3.26%
Oversized Vehicles	6.81%	5.76%	5.06%	4.41%	3.81%	3.26%

Table 3-6 : Recommended Growth Rates Pessimistic

Year/ Vehicle Type	2021-2023	2023- 2026	2026- 2031	2031- 2036	2036- 2041	2041- 2046
Car	8.51%	7.69%	6.54%	5.46%	4.45%	3.50%
Minibus /LCV	5.25%	4.67%	4.23%	3.52%	2.59%	1.70%

Year/ Vehicle Type	2021-2023	2023- 2026	2026- 2031	2031- 2036	2036- 2041	2041- 2046
Truck / Bus	5.81%	5.81%	4.97%	4.19%	3.47%	2.81%
Multi Axle	5.81%	4.76%	4.06%	3.41%	2.81%	2.26%
Oversized Vehicles	5.81%	4.76%	4.06%	3.41%	2.81%	2.26%

Table 3-7 : Recommended Growth Rates Most Likely

Year/ Vehicle Type	2021-2023	2023-2026	2026-2031	2031-2036	2036-2041	2041-2046
Car	9.01%	8.19%	7.04%	5.96%	4.95%	4.00%
Minibus /LCV	5.75%	5.17%	4.73%	4.02%	3.09%	2.20%
Truck / Bus	6.31%	6.31%	5.47%	4.69%	3.97%	3.31%
Multi Axle	6.31%	5.26%	4.56%	3.91%	3.31%	2.76%
Oversized Vehicles	6.31%	5.26%	4.56%	3.91%	3.31%	2.76%

CHAPTER 4

TRAFFIC FORECAST

4.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 4-1 : Total Tollable Traffic @ Toll Plaza 1- Chainage 30.500 KM
(Optimistic Growth Scenario)**

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2024-25	9814	713	1366	2546	4	14443	26457
2025-26	10554	750	1447	2674	4	15429	28071
2026-27	11349	789	1533	2809	4	16484	29790
2027-28	12205	830	1624	2951	4	17614	31620
2028-29	13125	873	1721	3101	4	18824	33570
2029-30	14114	918	1823	3257	4	20116	35635
2030-31	15026	959	1917	3400	4	21306	37534
2031-32	15997	1002	2016	3550	4	22569	39541
2032-33	17029	1047	2120	3706	4	23906	41655
2033-34	18128	1094	2230	3870	4	25326	43892
2034-35	19299	1143	2346	4041	4	26833	46254
2035-36	20350	1184	2450	4194	4	28182	48367
2036-37	21457	1227	2560	4354	4	29602	50589
2037-38	22626	1270	2674	4520	4	31094	52911
2038-39	23859	1315	2793	4692	4	32663	55343
2039-40	25158	1362	2917	4870	4	34311	57885
2040-41	26291	1399	3028	5029	4	35751	60122

Table 4-2 : Total Tollable Traffic @ Toll Plaza 2- Chainage 105.000 KM
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2024-25	5036	533	1340	2726	7	9642	22154
2025-26	5416	560	1420	2864	7	10267	23436
2026-27	5825	589	1505	3009	7	10935	24796
2027-28	6264	619	1595	3161	7	11646	26234
2028-29	6737	650	1690	3320	7	12404	27754
2029-30	7244	685	1791	3488	7	13215	29372
2030-31	7712	715	1884	3641	7	13959	30853
2031-32	8210	746	1981	3801	7	14745	32408
2032-33	8740	780	2084	3969	7	15580	34054
2033-34	9304	816	2192	4144	7	16463	35784
2034-35	9906	853	2305	4327	7	17398	37604
2035-36	10445	883	2408	4492	7	18235	39239
2036-37	11014	914	2515	4663	7	19113	40945
2037-38	11614	946	2628	4840	7	20035	42729
2038-39	12246	980	2746	5024	7	21003	44594
2039-40	12913	1016	2869	5215	7	22020	46543
2040-41	13495	1043	2979	5385	7	22909	48261

Table 4-3 : Total Tollable Traffic @ Toll Plaza 1- Chainage 30.500 KM
(Pessimistic Growth Scenario)

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2024-25	9724	707	1353	2523	4	14311	26215
2025-26	10360	736	1420	2625	4	15145	27555
2026-27	11038	766	1490	2731	4	16029	28965
2027-28	11759	798	1564	2842	4	16967	30455
2028-29	12528	831	1641	2957	4	17961	32022
2029-30	13346	865	1722	3077	4	19014	33674
2030-31	14074	895	1794	3181	4	19948	35131
2031-32	14843	926	1870	3290	4	20933	36665
2032-33	15653	958	1949	3402	4	21966	38264
2033-34	16507	991	2031	3517	4	23050	39931
2034-35	17407	1025	2116	3637	4	24189	41677
2035-36	18181	1051	2190	3739	4	25165	43171
2036-37	18989	1078	2266	3843	4	26180	44716
2037-38	19832	1106	2345	3951	4	27238	46324
2038-39	20714	1134	2426	4062	4	28340	47990
2039-40	21634	1163	2509	4176	4	29486	49716
2040-41	22392	1183	2579	4270	4	30428	51137

Table 4-4 : Total Tollable Traffic@ Toll Plaza 2- Chainage 105.000 KM
(Pessimistic Growth Scenario)

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2024-25	4990	527	1328	2701	7	9553	21951
2025-26	5316	549	1394	2810	7	10076	22998
2026-27	5664	572	1463	2924	7	10630	24101
2027-28	6034	596	1535	3043	7	11215	25258

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2028-29	6428	621	1612	3167	7	11835	26479
2029-30	6848	647	1692	3295	7	12489	27754
2030-31	7222	670	1763	3407	7	13069	28879
2031-32	7616	693	1838	3522	7	13676	30050
2032-33	8031	717	1915	3642	7	14312	31272
2033-34	8470	742	1995	3766	7	14980	32547
2034-35	8932	768	2079	3894	7	15680	33876
2035-36	9330	787	2150	4003	7	16277	35006
2036-37	9745	808	2225	4115	7	16900	36181
2037-38	10178	829	2302	4230	7	17546	37394
2038-39	10630	851	2382	4349	7	18219	38655
2039-40	11103	873	2466	4471	7	18920	39962
2040-41	11492	888	2535	4571	7	19493	41030

**Table 4-5 : Total Tollable Traffic @ Toll Plaza 1- Chainage 30.500 KM
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2024-25	9769	711	1360	2535	4	14379	26341
2025-26	10457	744	1434	2650	4	15289	27818
2026-27	11193	778	1513	2771	4	16259	29387
2027-28	11981	815	1596	2897	4	17293	31046
2028-29	12824	854	1682	3029	4	18393	32800
2029-30	13726	895	1774	3166	4	19565	34656
2030-31	14544	931	1857	3290	4	20626	36335
2031-32	15411	968	1943	3418	4	21744	38091
2032-33	16329	1007	2034	3552	4	22926	39944

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2033-34	17302	1048	2130	3691	4	24175	41892
2034-35	18332	1090	2229	3836	4	25491	43934
2035-36	19239	1123	2318	3962	4	26646	45725
2036-37	20191	1158	2410	4093	4	27856	47595
2037-38	21189	1194	2506	4228	4	29121	49542
2038-39	22238	1231	2605	4367	4	30445	51569
2039-40	23338	1269	2708	4512	4	31831	53688
2040-41	24272	1297	2798	4636	4	33007	55492

**Table 4-6 : Total Tollable Traffic @ Toll Plaza 2- Chainage 105.000 KM
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2024-25	5013	531	1334	2714	7	9599	22056
2025-26	5366	556	1407	2838	7	10174	23224
2026-27	5744	582	1484	2968	7	10785	24457
2027-28	6148	609	1565	3104	7	11433	25756
2028-29	6581	638	1650	3246	7	12122	27127
2029-30	7044	668	1740	3394	7	12853	28571
2030-31	7464	694	1821	3526	7	13512	29867
2031-32	7909	721	1906	3664	7	14207	31228
2032-33	8380	750	1995	3807	7	14939	32653
2033-34	8879	780	2089	3956	7	15711	34150
2034-35	9408	811	2186	4111	7	16523	35714
2035-36	9873	836	2273	4248	7	17237	37094
2036-37	10361	862	2363	4388	7	17981	38521
2037-38	10873	888	2457	4533	7	18758	40006

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2038-39	11410	915	2554	4683	7	19569	41550
2039-40	11973	943	2655	4838	7	20416	43155
2040-41	12452	964	2743	4972	7	21138	44533

4.2 Modification in Concession Period

As per Article 29 of the concession agreement, if actual traffic on the project falls short or exceeds Target Traffic on project highway on defined date, concession period shall be modified subject to calculation stipulated therein. For Jaipur - Deoli project, the Target Date and Target Traffic are defined as under:

Target Date - 1st October 2018

Target Traffic - 30344 in PCU

It was observed that as per traffic projections, traffic volume fell short of target traffic and concession period is expected to extend by about 5 years.

Due to the suspension in toll in the year FY17 because of demonetization for a period of 24 days, the Concessionaire would be entitled to an extension of an additional 24 days.

Traffic was severely impacted on the project highway during the initial lockdown period. NHAI has declared a policy of providing extension of concession to make up for revenue loss during lockdown. It is expected that extensions will be provided to project concession period on this account as well.

Accordingly, traffic and revenue projections have been worked out up to year 2040-41.

CHAPTER 5

FORECAST OF TOLL REVENUE

5.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

5.2 Discount Categories

As per the Toll Notification (Schedule R) the following discounts have been considered:

1. Monthly Pass: For frequent users a monthly pass is issued for 50 trips per month. The discount factor works out to 33.33% for 50 journeys. Similarly, there is a pass for 100 trips per month as well, with a discount factor of 33.33% for 100 journeys.
2. Daily Pass (for Return Trip): A 75% discount will be offered on the return trip.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travelers or whose frequency does not yield any discount from the above categories.
4. Local Car / Jeep / Van to be charged at Rs 150 per month (2007)

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule R) as given under

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI are available up to 2021-22. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. Following graph provides projection of rate of inflation (WPI) in India. Data has been taken from Office of Economic Advisor web site

(www.eaindustry.nic.in). WPI for years 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.

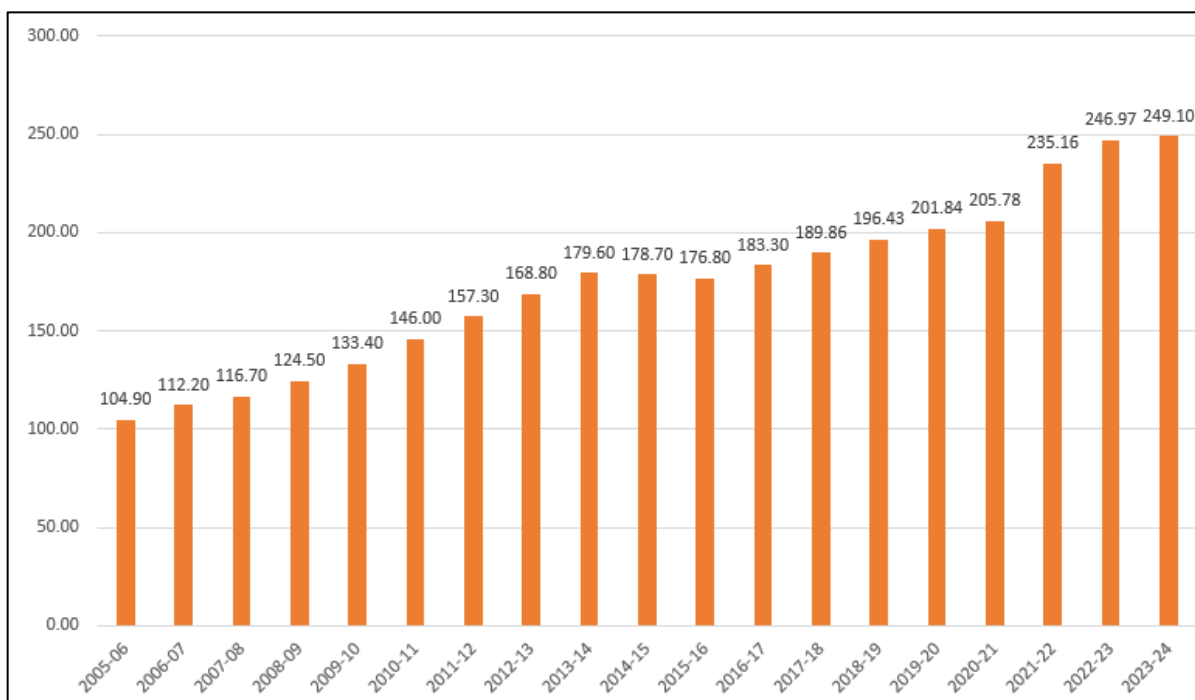


Figure 5-1 : Historical Rate of WPI Inflation in India

Except for the negative growth of WPI in the year 2015-16 average inflation in WPI from the year 2005-2024 is 4.98%. For Future year initially it is takes 5% and suitably stepped down for future year.

It has been observed that the project corridor witness's high percentage of overweight vehicles. In response to same, Concessionaire has further declared special rates for overweight vehicles which are applicable on project corridor.

These overweight categories and rate on base year (2015-16) are given as under

Table 5-1 : Overweight Traffic Rate

Category	Rate (Rs)
LCV (Single Journey of Ten Times)	1300
LCV (Single Journey of Two Times)	260

Category	Rate (Rs)
Truck/ Bus (Single Journey of Ten Times)	2700
Truck/ Bus (Single Journey of Two Times)	540
Multi Axle Vehicle (Single Journey of Ten Times)	4150
Multi Axle Vehicle (Single Journey of Two Times)	830

Normal escalation in the basis of WPI would be applicable to these rates as well.

In addition to above concessive has also declared special rates for overweight return journey as under

Table 5-2 : Special Overweight Return Pass

Category	Rate (Rs.)
Minibus /LCV	170
Truck/Bus	210
Multi Axle	205

These rates would be escalated at normal inflation rate.

5.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules, 2008.

Table 5-3 : Base Toll Rates 2007 - 08

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Bus or Truck (2 Axle)	2.2
Three Axle commercial vehicles	2.4
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4-6 axles)	3.45
Oversized Vehicle (seven or more axles)	4.2

There are a number of bypasses and structures in each package. Equivalent length for structures is added to tollable length at each toll plaza. Bypasses cost more than Rs. 10 Cr. are to be charged 1.5 times the normal fee. This has been incorporated in rates. The following table provides details of tollable lengths at each toll plaza.

Table 5-4 : Tollable Length Jaipur – Deoli section of NH -12

Toll Plaza Chainage	Length (km)	Bypass Cost (Cr)	Equivalent Structure length (km)	Tollable highway + structure length (km)
30.500	59.164	64.5 (Chaksu Bypass)	-	59.194
105.000	66.500	-	-	66.50

Additional rate for bypass having cost more than 10 Cr has been added as per schedule -R in toll rates for toll plaza at 30.50 km.

Other than this there is no structure or bypass which qualifies for additional toll rate at any toll plaza.

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs. five) for the concession period and are given below. Since applicable length of highway length is equal for both plazas, applicable toll rates are also same

Thus, worked out rates for various categories of vehicle and discounts are given as under;

Table 5-5 : Toll Rates for Single Journey @ Km 30.500

Year	Car	LCV	Truck / Bus	Multi Axle	Oversized Vehicles
2024-25	120	190	395	610	765
2025-26	125	200	415	645	805
2026-27	135	210	435	675	845
2027-28	140	220	460	710	885
2028-29	145	230	480	745	930
2029-30	155	245	505	780	975
2030-31	160	255	530	815	1020
2031-32	170	265	555	855	1070
2032-33	175	280	580	900	1120
2033-34	185	295	610	940	1175
2034-35	195	310	640	985	1230
2035-36	205	325	670	1035	1290
2036-37	215	340	700	1085	1355
2037-38	225	355	735	1140	1420
2038-39	235	375	770	1195	1490
2039-40	245	390	810	1255	1565
2040-41	260	410	850	1315	1640

Table 5-6 : Toll Rates for Return Journey @ Km 30.500

Year	Car	LCV	Truck / Bus	HCM /EME/ MAV	Oversized Vehicles
2024-25	180	285	595	920	1145
2025-26	190	300	625	965	1205
2026-27	200	315	655	1015	1265
2027-28	210	330	690	1065	1330
2028-29	220	350	720	1115	1395
2029-30	230	365	755	1170	1460
2030-31	240	385	790	1225	1530
2031-32	255	400	830	1285	1605
2032-33	265	420	870	1345	1680
2033-34	280	440	910	1410	1765
2034-35	290	460	955	1480	1850
2035-36	305	485	1005	1550	1940
2036-37	320	510	1050	1630	2035
2037-38	335	535	1105	1710	2130
2038-39	355	560	1160	1790	2235
2039-40	370	585	1215	1880	2345
2040-41	390	615	1275	1975	2465

Table 5-7 : Toll Rates for Overweight Ticket @ Km 30.500

Year	LCV (Single Journey of Ten Times)	LCV (Single Journey of Two Times)	Truck/ Bus (Single Journey of Ten Times)	Truck/ Bus (Single Journey of Two Times)	Multi Axle Vehicle (Single Journey of Ten Times)	Multi Axle Vehicle (Single Journey of Two Times)
2024-25	1900	380	3950	790	6100	1220
2025-26	2000	400	4150	830	6450	1290
2026-27	2100	420	4350	870	6750	1350
2027-28	2200	440	4600	920	7100	1420
2028-29	2300	460	4800	960	7450	1490
2029-30	2450	490	5050	1010	7800	1560
2030-31	2550	510	5300	1060	8150	1630
2031-32	2650	530	5550	1110	8550	1710
2032-33	2800	560	5800	1160	9000	1800
2033-34	2950	590	6100	1220	9400	1880
2034-35	3100	620	6400	1280	9850	1970
2035-36	3250	650	6700	1340	10350	2070
2036-37	3400	680	7000	1400	10850	2170
2037-38	3550	710	7350	1470	11400	2280
2038-39	3750	750	7700	1540	11950	2390
2039-40	3900	780	8100	1620	12550	2510
2040-41	4100	820	8500	1700	13150	2630

Table 5-8 : Toll Rates for Overweight Return Ticket (RPPU) @Km 30.500

Year	Minibus /LCV	Truck/ Bus	Multi Axle
2024-25	305	420	460
2025-26	320	440	485
2026-27	335	460	510
2027-28	350	485	535
2028-29	365	505	560
2029-30	380	530	585
2030-31	395	555	610
2031-32	415	580	635
2032-33	435	605	665
2033-34	455	630	695
2034-35	475	660	725
2035-36	495	690	760
2036-37	515	720	795
2037-38	540	750	830
2038-39	565	785	865
2039-40	590	820	905
2040-41	615	855	945

Table 5-9 : Toll Rates for Monthly Pass Local @ Km 30.500

Year	Car (Non-Commercial Vehicles)	Car SPL (10 to 20 Km)	LCV / Minibus SPL	LCV / Minibus (10 to 20 Km)
2024-25	340	1815	3060	4015
2025-26	355	1905	3215	4215

Year	Car (Non-Commercial Vehicles)	Car SPL (10 to 20 Km)	LCV / Minibus SPL	LCV / Minibus (10 to 20 Km)
2026-27	375	2000	3375	4425
2027-28	390	2100	3545	4645
2028-29	410	2195	3705	4855
2029-30	430	2295	3870	5075
2030-31	450	2400	4045	5305
2031-32	475	2510	4225	5545
2032-33	495	2625	4415	5795
2033-34	520	2745	4615	6055
2034-35	545	2870	4825	6325
2035-36	570	3000	5040	6610
2036-37	600	3135	5265	6905
2037-38	630	3275	5500	7215
2038-39	660	3420	5750	7540
2039-40	695	3575	6010	7880
2040-41	725	3735	6280	8235

Table 5-10 : Toll Rates for Monthly Pass @ Km 30.500

Year	Car	Minibus /LCV	Truck/ Bus	Multi Axle	Oversized Vehicle	Truck/Bus - 100 Trips
2024-25	4025	6370	13190	20415	25490	26380
2025-26	4230	6695	13855	21445	26770	27710
2026-27	4440	7030	14555	22530	28125	29110
2027-28	4665	7390	15295	23675	29555	30590
2028-29	4890	7740	16025	24805	30965	32050

Year	Car	Minibus /LCV	Truck/ Bus	Multi Axle	Oversized Vehicle	Truck/Bus - 100 Trips
2029-30	5125	8110	16790	25990	32450	33585
2030-31	5370	8500	17600	27240	34005	35195
2031-32	5630	8910	18445	28550	35645	36890
2032-33	5900	9340	19335	29930	37365	38670
2033-34	6185	9795	20270	31375	39170	40540
2034-35	6485	10270	21255	32900	41070	42510
2035-36	6800	10770	22290	34500	43070	44575
2036-37	7135	11295	23375	36180	45170	46750
2037-38	7485	11845	24520	37955	47385	49040
2038-39	7850	12425	25725	39815	49710	51445
2039-40	8235	13040	26990	41775	52155	53980
2040-41	8645	13680	28320	43835	54730	56645

Table 5-11 : Toll Rates for Single Journey @ Km 105.000

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles
2024-25	105	165	350	545	665
2025-26	110	175	365	575	700
2026-27	115	185	385	605	735
2027-28	120	195	405	635	770
2028-29	125	200	425	665	810
2029-30	130	210	445	695	845
2030-31	135	220	465	730	890
2031-32	145	235	485	765	930
2032-33	150	245	510	800	975

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles
2033-34	160	255	535	840	1025
2034-35	165	270	560	880	1070
2035-36	175	280	590	925	1125
2036-37	180	295	620	970	1180
2037-38	190	310	650	1015	1235
2038-39	200	325	680	1065	1300
2039-40	210	340	715	1120	1360
2040-41	220	355	750	1175	1430

Table 5-12 : Toll Rates for Return Journey @ Km 105.000

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles
2024-25	155	250	525	820	1000
2025-26	160	260	550	860	1050
2026-27	170	275	575	905	1100
2027-28	180	290	605	950	1155
2028-29	190	305	635	995	1215
2029-30	195	320	665	1045	1270
2030-31	205	335	700	1095	1330
2031-32	215	350	730	1145	1395
2032-33	225	365	765	1200	1465
2033-34	235	385	805	1260	1535
2034-35	250	400	840	1320	1610
2035-36	260	420	885	1385	1685
2036-37	275	440	925	1455	1770

Year	Car	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles
2037-38	285	465	970	1525	1855
2038-39	300	485	1020	1600	1945
2039-40	315	510	1070	1675	2040
2040-41	330	535	1125	1760	2145

Table 5-13 : Toll Rates for Overweight Tickets @ Km 105.000

Year	LCV (Single Journey of Ten Times)	LCV (Single Journey of Two Times)	Truck/ Bus (Single Journey of Ten Times)	Truck/ Bus (Single Journey of Two Times)	Multi Axle Vehicle (Single Journey of Ten Times)	Multi Axle Vehicle (Single Journey of Two Times)
2024-25	1650	330	3500	700	5450	1090
2025-26	1750	350	3650	730	5750	1150
2026-27	1850	370	3850	770	6050	1210
2027-28	1950	390	4050	810	6350	1270
2028-29	2000	400	4250	850	6650	1330
2029-30	2100	420	4450	890	6950	1390
2030-31	2200	440	4650	930	7300	1460
2031-32	2350	470	4850	970	7650	1530
2032-33	2450	490	5100	1020	8000	1600
2033-34	2550	510	5350	1070	8400	1680
2034-35	2700	540	5600	1120	8800	1760
2035-36	2800	560	5900	1180	9250	1850
2036-37	2950	590	6200	1240	9700	1940
2037-38	3100	620	6500	1300	10150	2030
2038-39	3250	650	6800	1360	10650	2130
2039-40	3400	680	7150	1430	11200	2240
2040-41	3550	710	7500	1500	11750	2350

Table 5-14 : Toll Rates for Overweight Return Pass (RPPU) @ Km 105.00

Year	Minibus /LCV	Truck/ Bus	Multi Axle
2024-25	265	380	395
2025-26	280	400	415
2026-27	295	420	435
2027-28	310	440	455
2028-29	325	460	475
2029-30	340	480	495
2030-31	355	500	515
2031-32	370	525	540
2032-33	385	550	565
2033-34	400	575	590
2034-35	420	600	615
2035-36	440	625	645
2036-37	460	655	675
2037-38	480	685	705
2038-39	500	715	735
2039-40	525	745	770
2040-41	550	780	805

Table 5-15 : Toll Rates for Local Monthly Pass @ Km 105.000

Year	Car (Non-Commercial Vehicles)	Car SPL (10 to 20 Km)	LCV / Minibus SPL	LCV / Minibus (10 to 20 Km)
2024-25	340	1805	2965	7990
2025-26	355	1895	3115	8390

Year	Car (Non-Commercial Vehicles)	Car SPL (10 to 20 Km)	LCV / Minibus SPL	LCV / Minibus (10 to 20 Km)
2026-27	375	1990	3270	8810
2027-28	390	2090	3435	9250
2028-29	410	2185	3590	9665
2029-30	430	2285	3750	10100
2030-31	450	2390	3920	10555
2031-32	475	2500	4095	11030
2032-33	495	2615	4280	11525
2033-34	520	2735	4475	12045
2034-35	545	2860	4675	12585
2035-36	570	2990	4885	13150
2036-37	600	3125	5105	13740
2037-38	630	3265	5335	14360
2038-39	660	3410	5575	15005
2039-40	695	3565	5825	15680
2040-41	725	3725	6085	16385

Table 5-16 : Toll Rates for Monthly Pass @ Km 105.000

Year	Car	Minibus /LCV	Truck/ Bus	Multi Axle	Oversized Vehicle	Truck/Bus - 100 Trips
2024-25	3430	5545	11615	18220	22180	23235
2025-26	3605	5825	12200	19135	23295	24405
2026-27	3790	6120	12820	20105	24475	25640
2027-28	3980	6430	13470	21125	25715	26940
2028-29	4170	6735	14115	22135	26945	28230
2029-30	4370	7060	14790	23195	28235	29580

Year	Car	Minibus /LCV	Truck/ Bus	Multi Axle	Oversized Vehicle	Truck/Bus - 100 Trips
2030-31	4580	7400	15500	24305	29590	31000
2031-32	4800	7755	16245	25475	31015	32490
2032-33	5030	8130	17030	26705	32510	34060
2033-34	5275	8520	17855	28000	34085	35710
2034-35	5530	8935	18720	29355	35740	37440
2035-36	5800	9370	19630	30785	37475	39260
2036-37	6085	9825	20590	32285	39305	41180
2037-38	6380	10305	21595	33865	41230	43195
2038-39	6695	10815	22655	35530	43255	45310
2039-40	7025	11345	23770	37280	45380	47545
2040-41	7370	11905	24945	39120	47620	49890

5.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated under in all three scenarios. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

5.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under most likely scenario at each of the toll plaza starting from the year 2024-25 are shown in tables below.

Table 5-17 : Toll Revenue Optimistic Scenario

(Rs. Crores)

Year	Toll at Plaza 30.500	Toll at Plaza 105.000	Total
2024-25	108.08	90.00	198.07
2025-26	120.48	99.88	220.36
2026-27	134.69	111.10	245.79
2027-28	150.20	123.63	273.82
2028-29	166.13	136.50	302.62
2029-30	185.29	150.62	335.91

Year	Toll at Plaza 30.500	Toll at Plaza 105.000	Total
2030-31	203.51	165.70	369.21
2031-32	226.35	183.23	409.58
2032-33	247.97	200.51	448.48
2033-34	274.39	221.37	495.76
2034-35	302.53	243.31	545.84
2035-36	332.96	267.46	600.41
2036-37	364.05	291.26	655.31
2037-38	399.05	318.08	717.13
2038-39	438.04	348.29	786.33
2039-40	480.61	382.62	863.23
2040-41	523.73	414.81	938.54

Table 5-18 : Toll Revenue Pessimistic Scenario
(Rs. Crores)

Year	Toll at Plaza 30.500	Toll at Plaza 105.000	Total
2024-25	107.12	89.17	196.29
2025-26	118.23	98.05	216.27
2026-27	130.95	108.02	238.97
2027-28	144.68	119.07	263.75
2028-29	158.50	130.24	288.74
2029-30	175.14	142.32	317.46
2030-31	190.52	155.11	345.63
2031-32	209.92	169.88	379.81
2032-33	227.87	184.18	412.05
2033-34	249.72	201.35	451.07
2034-35	272.71	219.16	491.88

Year	Toll at Plaza 30.500	Toll at Plaza 105.000	Total
2035-36	297.27	238.60	535.87
2036-37	321.86	257.32	579.18
2037-38	349.49	278.32	627.81
2038-39	379.98	301.77	681.74
2039-40	412.98	328.40	741.38
2040-41	445.65	352.55	798.20

Table 5-19 : Toll Revenue Most Likely Scenario

(Rs. Crores)

Year	Toll at Plaza 30.500	Toll at Plaza 105.000	Total
2024-25	107.61	89.61	197.22
2025-26	119.38	98.98	218.36
2026-27	132.87	109.55	242.42
2027-28	147.48	121.37	268.85
2028-29	162.37	133.35	295.72
2029-30	180.27	146.43	326.70
2030-31	197.04	160.36	357.40
2031-32	218.13	176.49	394.61
2032-33	237.93	192.18	430.11
2033-34	261.99	211.13	473.13
2034-35	287.53	230.88	518.41
2035-36	314.95	252.61	567.55
2036-37	342.68	273.74	616.42
2037-38	373.79	297.56	671.35

Year	Toll at Plaza 30.500	Toll at Plaza 105.000	Total
2038-39	408.35	324.22	732.57
2039-40	445.96	354.45	800.40
2040-41	483.53	382.47	866.00

CHAPTER 6

OPERATION AND MAINTENANCE

6.1 Operation & Maintenance

The following are project parameters which would contribute towards the cost of operation and maintenance.

The future cost of operation and maintenance is estimated on a guess basis. Keeping all above factors in view, the following can be basis of working out cost of operation and maintenance for project corridor from Jaipur to Deoli on NH-12 in state of Rajasthan.

- i) **Annual Regular Maintenance** – Covering pothole repair, shoulder and slope repair, drain cleaning, median maintenance, Crash barrier, toll plaza maintenance, Toll collection, other services like medical help and rescue operations etc.
- j) **Periodic Maintenance** – This will be done on a periodic basis, say every 5 years. It will consist of overlaying of wearing course and painting and marking. Some pavement strengthening is also anticipated in a few sections. This operation and its cost are spread over three years.

Concessionaire has recently updated the program of maintenance of project road. Same has been reviewed and year-wise cost of O&M from year 2023-2024 is given in table below.

Table 6-1 : O&M Cost

Year	Annual maintenance (Rs. Cr)	Thermoplastic painting (Rs. Cr)	Renewal Coat with BC (Rs. Cr.)	Special Repair of pavement	Structure maintenance. (Rs. Cr)	Electric System		Total Expenditure (Rs. Crores)	Remarks
						Annual	Periodic		
2024-25	12.70			0.80	0.07	0.04		19.14	Regular O & M
2025-26	12.95			0.80	0.07	0.04		20.47	Regular O & M
2026-27	13.21	1.72	23.37	27.28	0.07	0.04		101.89	Renewal of Wearing course + Pavement repair
2027-28	13.47	1.47	20.03	32.10	0.07	0.04		109.42	Renewal of Wearing course + Pavement repair
2028-29	13.74	1.72	23.37	43.33	0.07	0.04		140.70	Renewal of Wearing course + Pavement repair
2029-30	14.43			12.84	0.07	0.04		49.16	Regular O & M
2030-31	15.15			4.81	0.07	0.04		37.85	Regular O & M
2031-32	15.91			4.81	0.07	0.04		41.24	Regular O & M
2032-33	16.23	0.49		10.43	0.07	0.04		56.66	Renewal of Wearing course + Pavement repair
2033-34	16.55	1.47	20.03	40.12	0.07	0.04		170.87	Renewal of Wearing course + Pavement repair
2034-35	16.88	1.72	23.37	12.84	0.07	0.04		125.86	Renewal of Wearing course
2035-36	16.88			3.21	0.07	0.04		48.61	Regular O & M

Year	Annual maintenance	Thermoplastic painting	Renewal Coat with	Special Repair of	Structure maintenance.	Electric System		Total Expenditure	Remarks
2036-37	16.88			3.21	0.07	0.04		51.04	Regular O & M
2037-38	16.88			3.21	0.07	0.04		53.59	Regular O & M
2038-39	16.88			3.21	0.07	0.04		56.27	Regular O & M
2039-40	16.88	1.72		1.60	0.07	0.04		59.41	Regular O & M
2040-41	5.06			0.32	0.07	0.04		16.86	Regular O & M

CHAPTER 7

CONCLUSION & RECOMMENDATIONS

7.1 Conclusion & Recommendations

Project stretch of Jaipur to Deoli section of NH-12 in state of Rajasthan from km 18.700 to km 165.000 is currently a four-lane road. The road is in sound condition and serves reasonably good levels of traffic volume. The project corridor falls in the influence zone of fast upcoming metro city Jaipur. There are many upcoming projects in the area which have the potential to boost economic growth of the area and add value to the development of the region. All these developments have potential to give a positive impact to traffic flow on the project. As estimated in this study report, project traffic revenue is expected to grow at a rate of 6-8% per annum.

The following can be considered as major outcome of study.

- a) There is a good amount of tollable traffic running on the project.
- b) Project corridor has potential to witness traffic growth @ 6-8% annually in near future due to various development in area and overall growth of the economy.
- c) Project corridor does not have risk of traffic leakage due to lack of competing roads of comparable quality.

The project infrastructure is in good condition and its maintenance cost is also reasonable.

Based on the above it can be considered a stable healthy project from the traffic and revenue point of view.

CHAPTER 8

PROJECT ILLUSTRATIONS

8.1 Project Illustrations

Current condition OF Project has been depicted in the following photographs.



Figure 8-1 : Chaksu Junction



Figure 8-2 : General Condition



Figure 8-3 : General Condition



Figure 8-4 : Toll at Barkheda



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