



November 3, 2023

Corporate Relationship Department, <b>BSE Limited</b> Phiroze Jeejeebhoy Towers Dalal Street, Mumbai 400 001	Listing Department, <b>National Stock Exchange of India Limited</b> 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 for half year ended September 30, 2023**

We are enclosing herewith the Valuation Report dated October 26, 2023, as issued by Valuer, namely Mr. S Sundararaman (IBBI Registration Number - IBBI/RV/06/2018/10238) for the half year ended September 30, 2023.

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 September 30, 2023**

Particulars	Amount in Lakhs
A. Assets	15,06,752.07
B. Liabilities	9,22,594.92
C. Net Assets	5,84,157.15
Outstanding units	5,805.00
<b>NAV at Fair Value (Per Unit)</b>	<b>100.63</b>

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: 30<sup>th</sup> September 2023**

**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/2024/23

Date: 26<sup>th</sup> October 2023

**The Board of Directors**  
**IRB Infrastructure Private Limited**  
3<sup>rd</sup> 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 13<sup>th</sup> 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 30<sup>th</sup> September 2023 ("**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,



S. Sundararaman  
Registered Valuer

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

Asset Class: Securities or Financial Assets

Place: Chennai

UDIN: 23028423BGYWU3661

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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 <sup>st</sup> 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 Private Limited



IBBI/RV08/2018/10238

IRB InvIT Fund  
Fair Enterprise Valuation  
September 2023

## 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 16<sup>th</sup> 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 18<sup>th</sup> May 2017.

1.1.3. Unitholding of the Trust as on 30<sup>th</sup> September 2023 is as under:

Sr. No.	Particulars	No. of Units	%
1	Sponsor & Sponsor Group	10,72,40,000	18.5
2	Mutual Funds	3,80,90,000	6.6
3	Financial Institutions or Banks	22,00,000	0.4
4	Insurance Companies	1,24,50,000	2.1
5	Provident or pension funds	5,36,408	0.1
6	Foreign Portfolio Investors	14,27,16,546	24.6
7	Non-institutional investors	27,72,67,046	47.8
	<b>Total</b>	<b>58,05,00,000</b>	<b>100.0</b>

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 25<sup>th</sup> February 2008.

1.1.5. Shareholding of the Sponsor as on 30<sup>th</sup> September 2023 is as under:

Sr. No.	Particulars	No. of Shares	%
1	Promoter & Promoter Group	2,07,70,55,980	34.4
2	Mutual Funds	23,60,75,734	3.9
3	Financial Institutions or Banks	5,170	0.0
4	Insurance Companies	20,95,52,913	3.5
5	NBFC Registered with RBI	12,16,746	0.0
6	Foreign Portfolio Investors	2,85,55,28,096	47.3
7	Non-institutional investors	65,95,65,361	10.9
	<b>Total</b>	<b>6,03,90,00,000</b>	<b>100.0</b>

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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IRB InvIT Fund  
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1.1.7. Shareholding of the Investment Manager as on 30<sup>th</sup> September 2023 is as under:

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

Source: Investment Manager

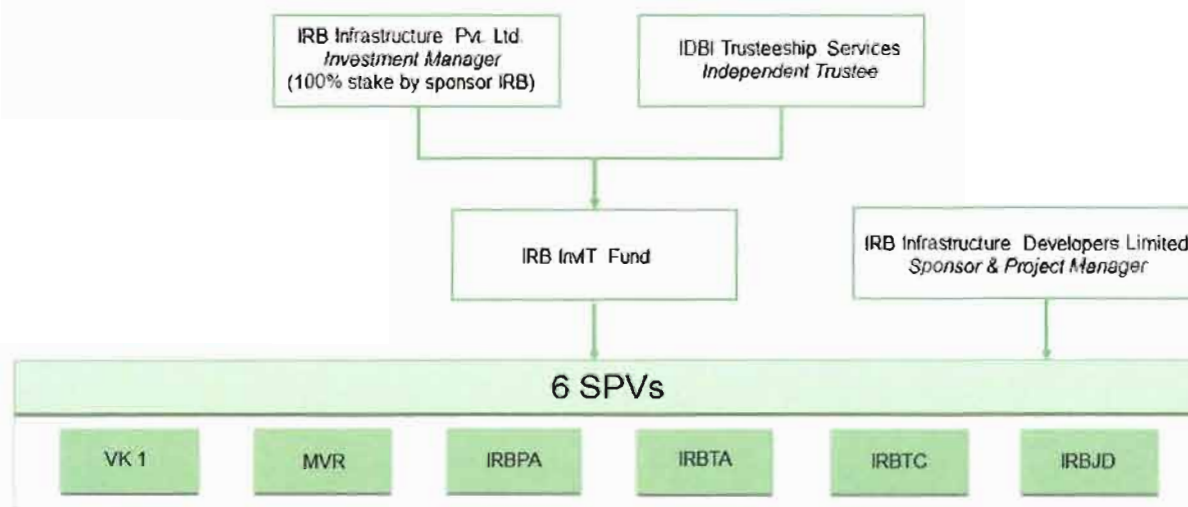
1.1.8. **Financial Assets to be Valued**

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 30<sup>th</sup> September 2023:**



**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 31<sup>st</sup> 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 30<sup>th</sup> September 2023.

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 30<sup>th</sup> September 2023. 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:
- The RV is competent to undertake financial valuation in terms of SEBI InvIT Regulations;
  - The RV is independent and has prepared the Report on a fair and unbiased basis;
  - 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 30<sup>th</sup> September 2023 ("Valuation Date"). The attached Report is drawn up by reference to accounting and financial information as on 30<sup>th</sup> September 2023. The RV is not aware of any other events having occurred since 30<sup>th</sup> September 2023 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 30<sup>th</sup> September 2023 to carry out the valuation of the SPVs.



S. SUNDARAMAN  
Registered Valuer  
Registration No - RBBI/RV/03/2018/18238

IRB InvIT Fund  
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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 30<sup>th</sup> September 2023 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	~ 3 Years 3 Months	9.88%	3,266
2	IRBPA	~ 14 Years 3 Months	11.31%	16,110
3	IRBTA	~ 13 Years 8 Months	10.85%	8,407
4	IRBTC	~ 19 Years 3 Months	10.74%	21,760
5	IRBJD	~ 17 Years 1 Months	10.78%	19,391
6	VEL	~ 13 Years 6 Months	7.73%	13,000
<b>Total</b>				<b>81,935</b>

(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	10.88%	3,215	9.88%	3,266	8.88%	3,318
2	IRBPA	12.31%	15,151	11.31%	16,110	10.31%	17,163
3	IRBTA	11.85%	7,920	10.85%	8,407	9.85%	8,941
4	IRBTC	11.74%	19,446	10.74%	21,760	9.74%	24,408
5	IRBJD	11.78%	18,016	10.78%	19,391	9.78%	20,928
6	VEPL	8.73%	12,440	7.73%	13,000	6.73%	13,608
<b>Total</b>			<b>76,188</b>		<b>81,935</b>		<b>88,367</b>

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	2,911	3,266	3,620
2	IRBPA	14,374	16,110	17,840
3	IRBTA	7,407	8,407	9,408
4	IRBTC	16,263	21,760	27,006
5	IRBJD	17,114	19,391	21,669
6	VEL	11,769	13,000	14,223
<b>Total</b>		<b>69,837</b>	<b>81,935</b>	<b>93,766</b>

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	3,229	3,266	3,302
2	IRBPA	15,737	16,110	16,484
3	IRBTA	8,139	8,407	8,676
4	IRBTC	21,520	21,760	21,999
5	IRBJD	18,993	19,391	19,790
6	VEL	12,804	13,000	13,197
<b>Total</b>		<b>80,422</b>	<b>81,935</b>	<b>83,448</b>

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 16<sup>th</sup> 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 18<sup>th</sup> May 2017.
- 3.3. The InvIT comprises of six operational road projects having length of 3,665 lane Kms with four 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	9,961	18,563	21,561	3,847	16,185	NA
31-Mar-23	9,374	18,931	23,636	3,509	16,866	13,750

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:



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	NHA
Appointed Date	14 <sup>th</sup> August 2006
Tolling Start Date	14 <sup>th</sup> August 2009
Original Concession Period (CP)	20 years from Appointed Date
Extension (if any)	152 days
Likely End of CP (including extension)	12 <sup>th</sup> 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 NHAI 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 14<sup>th</sup> 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 13<sup>th</sup> 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 26<sup>th</sup> 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 3<sup>rd</sup> May 2023. Refer below for the pictures of the road stretch:





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

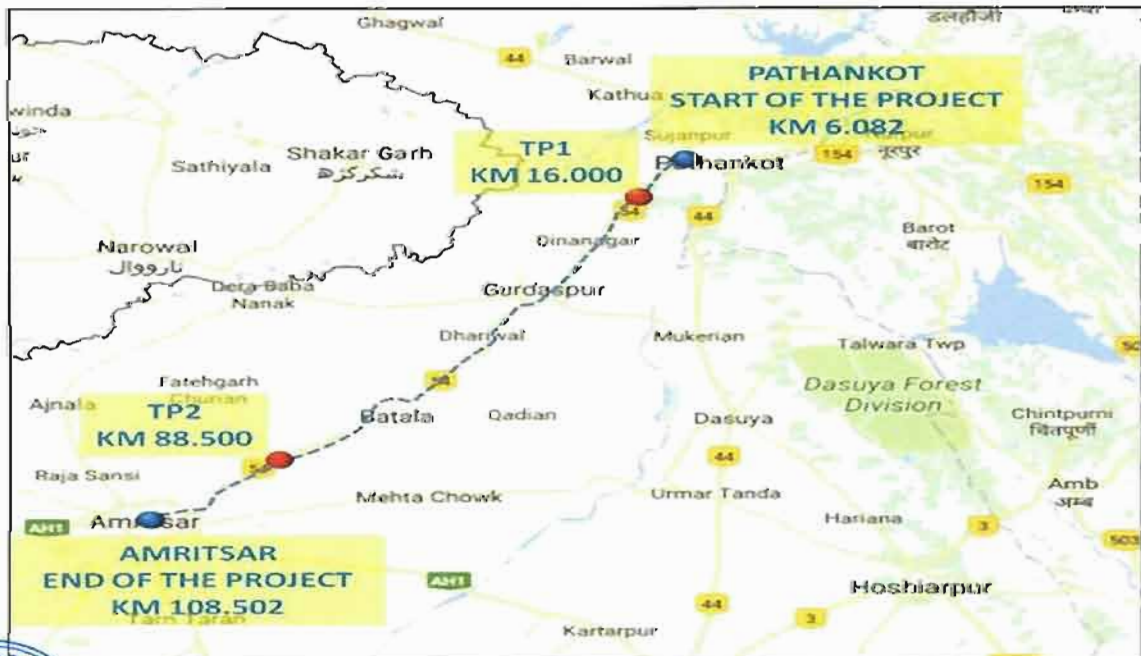
3.5.1. Summary of details of IRBPA are as follows:

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 <sup>st</sup> December 2010
Tolling Start Date	27 <sup>th</sup> November 2014
Original Concession Period (CP)	20 years from Appointed Date
Extension (if any)	2,559 days
Likely End of CP (including extension)	2 <sup>nd</sup> 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 31<sup>st</sup> 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 5<sup>th</sup> 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 13<sup>th</sup> 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 27<sup>th</sup> 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



BEIRV/06/2018/10238

IRB Invt Fund  
Fair Enterprise Valuation  
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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/PIU-ASR/11012/2022/1851 dated 11<sup>th</sup> 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. This extension is subject to receiving approval from NHA authorities. I have relied on the information provided by the Investment Manager in this regard.

3.5.12. 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. I have considered extension, and 1% CSR until NHA approval for same is accorded to the Concessionaire (IRBPA)

3.5.13. My team had conducted physical site visit of the road stretch of IRBPA on 24<sup>th</sup> April 2022. 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 <sup>rd</sup> September 2010
Tolling Start Date	24 <sup>th</sup> April 2013
Original Concession Period (CP)	22 years from Appointed Date
Extension (if any)	1,733 days
Likely End of CP (including extension)	2 <sup>nd</sup> 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 3<sup>rd</sup> 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.

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.



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- 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 2<sup>nd</sup> April 2021, 14<sup>th</sup> October, 2020 and 25<sup>th</sup> 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 28<sup>th</sup> 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
Concession Granted by	NHAI
Appointed Date	4 <sup>th</sup> June 2011
Tolling Start Date	4 <sup>th</sup> June 2011
Original Concession Period (CP)	26 years from Appointed Date
Extension (if any)	2,034 days
Likely End of CP (including extension)	29 <sup>th</sup> 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



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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 4<sup>th</sup> June 2011 on the basis of a premium of INR 1,404.0 Mn payable to the NHA 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.
  - 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 NHA vide letter dated 14<sup>th</sup> 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 26<sup>th</sup> 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

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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 24<sup>th</sup> 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	NHAI
Appointed Date	14 <sup>th</sup> June 2010
Tolling Start Date	27 <sup>th</sup> September 2013
Original Concession Period (CP)	25 years from Appointed Date
Extension (if any)	1,957 days
Likely End of CP (including extension)	21 <sup>st</sup> October 2040
Trust's stake	100%

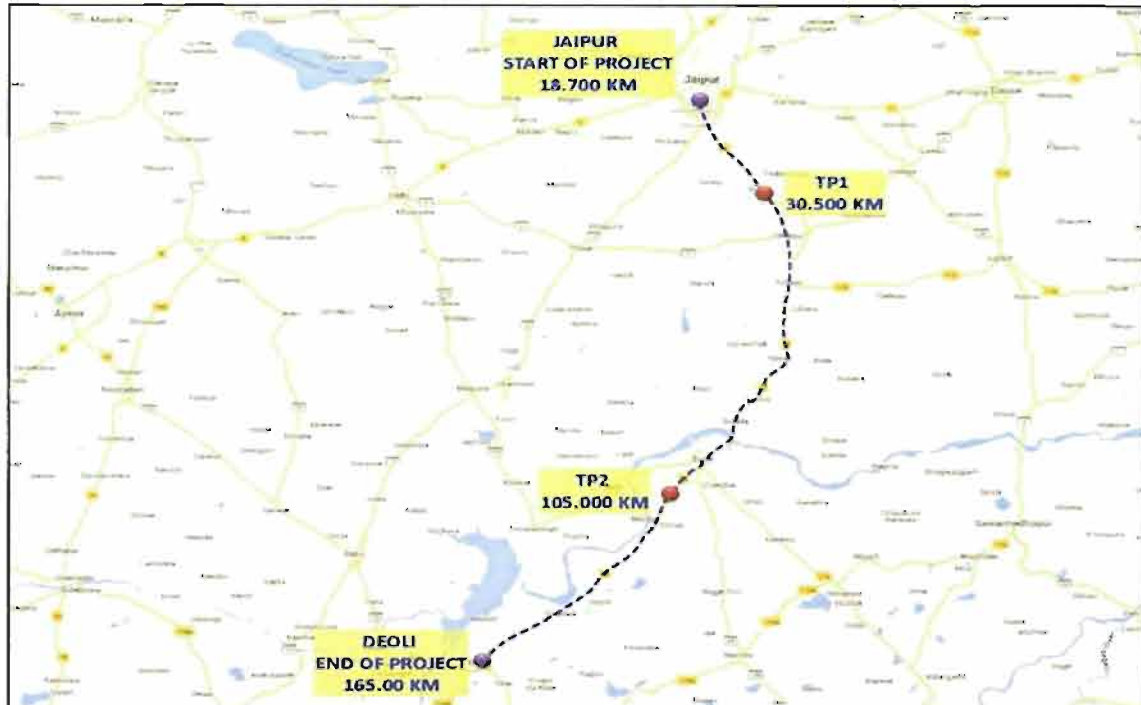
Source: Investment Manager

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. Shivasapura, 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 14<sup>th</sup> 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 18<sup>th</sup> 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 13<sup>th</sup> 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 26<sup>th</sup> 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 11<sup>th</sup> November 2021. The 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 NHAI 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:

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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 28<sup>th</sup> April 2023. 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
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 <sup>nd</sup> April 2022
Nos. of Annuities	30 Annuities over period of 15 years
Concession Period (CP)	730 days + 15 Years

Source: Investment Manager



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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.

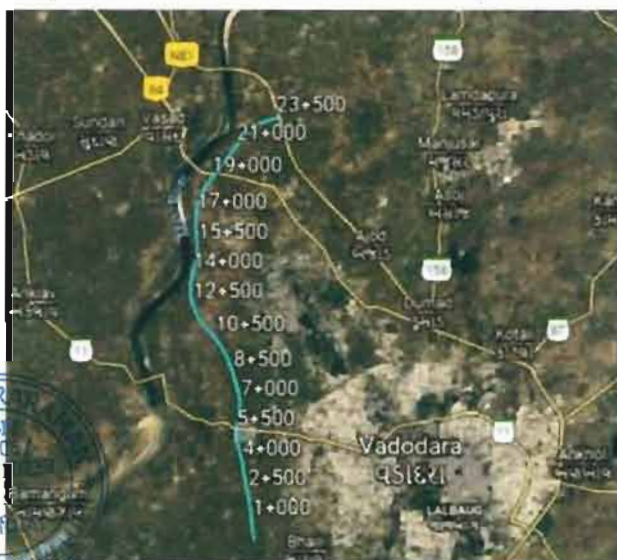
3.9.4 The shareholding of VEL as on the Valuation Date is as follows:

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

\*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.

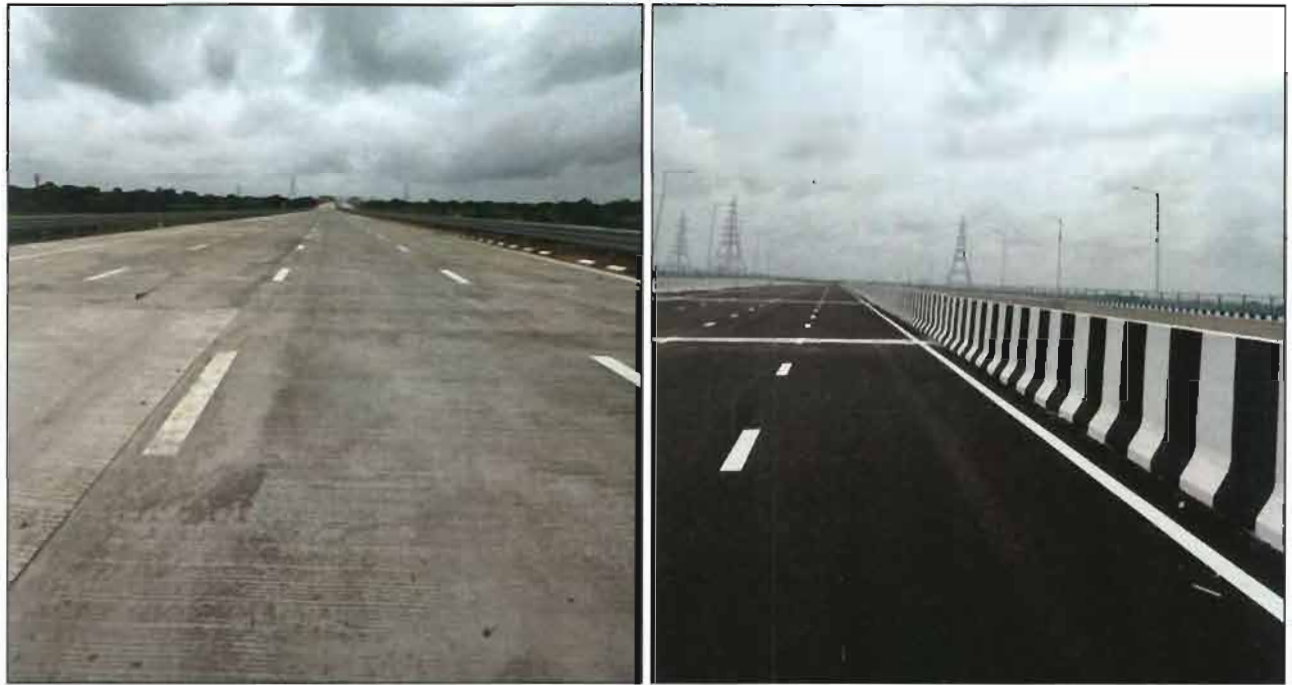
3.9.5 The map below illustrates the location of the Project and the corridor it covers:



Source: Investment Manager

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3.9.6 My team had conducted physical site visit of the road stretch of VEL on 2<sup>nd</sup> August 2022. Refer below for pictures of the road stretch of the Project:



**S. SUNDARARAMAN**  
Registered Valuer  
Registration No - IBBI/RV/06/2018/10238

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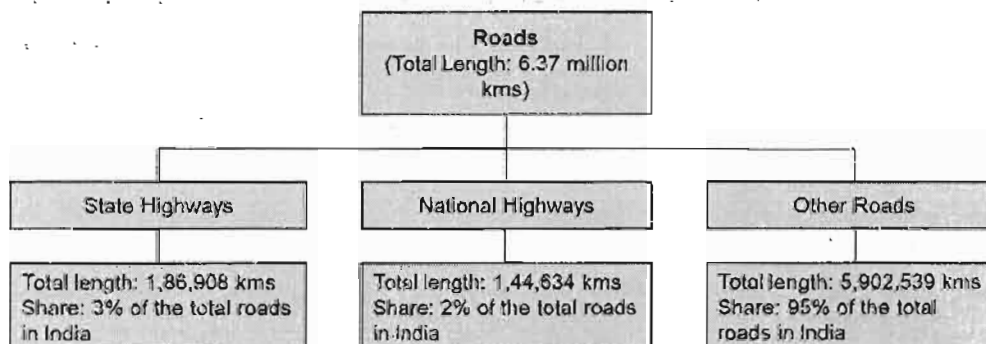
## 4. Overview of the Industry

### 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

- 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.

- 4.2.2 Out of this around 1.41 lakh km are National Highways ("NHs"). Significantly, NHs constitute around 2 per cent of the total road network in the country but carry about 40% of the road traffic. The density of India's highway network: at 1.89 km of roads per square kilometer of land – is similar to that of the France (1.98) and much greater than China's (0.49) or USA's (0.68).

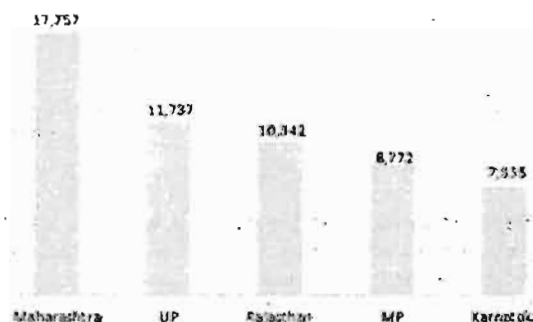
### 4.3 Government Agencies for Road Development

- 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 (NHIIIP) 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

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- 4.3.4 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 Gram 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.
- 4.3.5 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.

Top 5 states by length of NHs in India (In Km)



Source: MoRTH, Government of India.

## 4.4 Trend of Road and Highways Construction

- 4.4.1 The length of National Highways awarded has almost doubled in the years FY15 to FY18 compared to FY11 to FY14.
- 4.4.2 Length of NHs constructed has increased by 70% during the same period. This pace is expected to gain further ground, with the ambitious targets set by the ministry and the implementation of the Bharatmala Pariyojana as MORTH is planning to construct around 83,667 km of national highways at a cost of Rs 10.63 trillion (US\$ 130 billion) after factoring in cost escalations up to December 2021 and is 99% higher than the initial estimates owing to substantial rise in land acquisition cost, and steep increase in input costs.
- 4.4.3 India has become the fastest highway developer in the world with 28.64 kms of highways built each day in 2021-22 and plans to construct 18,000 kilometres of national highways in 2022-23 at a pace of 50 km per day.
- 4.4.4 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.
- 4.4.5 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.
- 4.4.6 The NHDP is a project 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.
- 4.4.7 With the launch of Bharatmala project, 10,000 km of highway construction left under NHDP was merged with Phase I of the Bharatmala project.
- 4.4.8 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).
- 4.4.9 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.

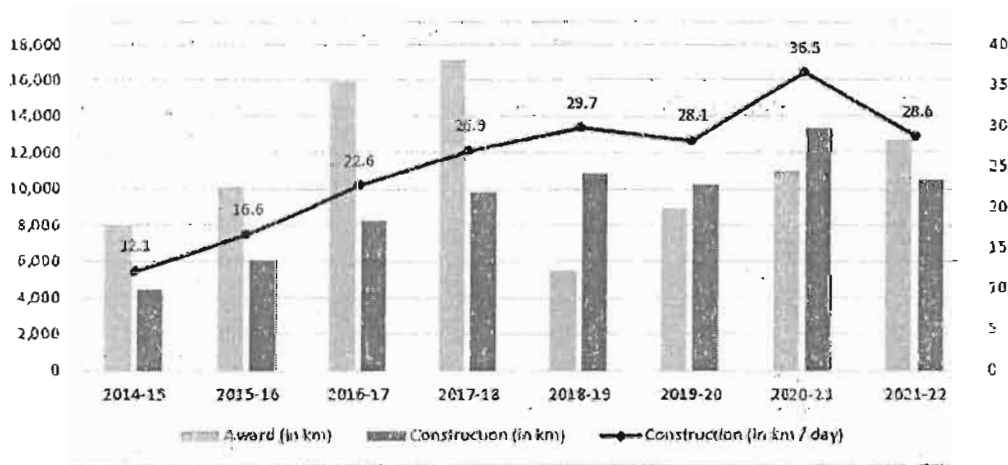


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- 4.4.10 In December 2021, the government set a highway monetization target of Rs. 2 trillion (US\$ 26.20 billion) for the next 3 years.
- 4.4.11 The Ministry of Road Transport and Highways awarded road projects with a total length of 12,731 kms in FY22 as against 10,964 km in FY 21.
- 4.4.12 In FY 22, 10,457 kms of highways have been constructed against 13,298 kms of highway constructed in FY 21 across India.
- 4.4.13 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.
- 4.4.14 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.
- 4.4.15 The development of market for roads and highways is projected to exhibit a CAGR of 36.16% during 2016-2025, on account of growing government initiatives to improve transportation infrastructure in the country.

**Details of national highways awarded (by NHAI) and constructed in India (KMs):**



**4.5 Implementation of important projects and expressways:**

**4.5.1 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.

The Bharatmala Pariyojana envisages development of about 25,000 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 (US\$ 74.15 billion) under Bharatmala Pariyojana Phase-I over a five year period (2017-18 to 2021-22). In Bharatmala Pariyojana, 60% projects on Hybrid Annully Mode, 10% projects on BOT (Toll) Mode and 30% projects on EPC mode have been envisaged respectively.

Components under Bharatmala Pariyojana Phase-I are as given below:



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Component	Length (Km)	Cost (INR Crore)
Economic corridors development	9,000	1,20,000
Inter-corridor & feeder roads	6,000	80,000
National Corridors Efficiency	5,000	1,00,000
Border & International connectivity	2,000	25,000
Coastal & port connectivity roads	2,000	20,000
Expressways	800	40,000
Sub Total	24,800	3,85,000
Other works - under NHDP	10,000	1,50,000
Total	34,800	5,35,000

Source: Ministry of Road Transport and Highways, Government of India

The completion cost of Phase-I is now estimated 10.63 trillion (US\$ 130 billion) after factoring in cost escalations up to December 2021 and is 99% higher than the initial estimates owing to substantial rise in land acquisition cost, and steep increase in input costs. It is expected to be completed in FY2028, a delay of six years from the initial envisaged completion date of FY2022. During the last seven years, around 60% (20,632 km vs 34,800 km) of highway length has been awarded as of December 2021, and ~23% of the total length completed till March 2022.

#### 4.5.2 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.

#### 4.5.3 Eastern peripheral and western peripheral expressway

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

#### 4.5.4 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.

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

- 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.
- 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.
- 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.
- 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.
- 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.

#### 4.6 Opportunities in road development & maintenance in India

- India has joined the league of 15 of global alliance which will work towards the ethical use of smart city technologies
- The Government aims to construct 65,000 kms of national highways at a cost of Rs. 5.35 lakh crore (US\$ 741.51 billion).
- The government also aims to construct 23 new national highways by 2025.



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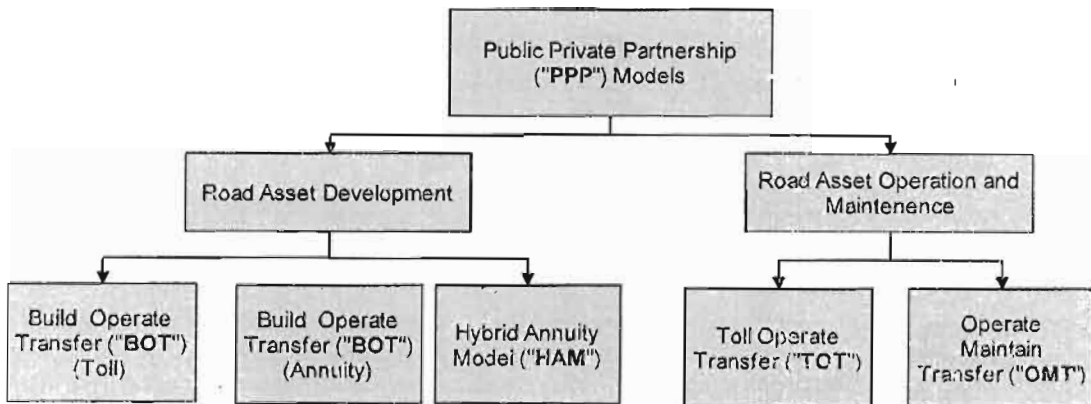
- d. Road building in India is second least expensive in Asia.
- e. Andhra Pradesh will spend US\$ 296.05 million to build 8,970 kms of roads.
- f. In February 2022, NHAI rolled out a plan to construct 5,795 kilometres of highways that will connect 117 districts. The plan was worth Rs. 1 trillion (US\$ 13.09 billion).

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

4.7.1 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.

NHAI 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.

4.7.2 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.



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



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### 4.8 Government Investment in the Sector

- 4.8.1 Under Union Budget 2022-23, the Government of India has allocated Rs. 199,107 crore (US\$ 26.04 billion) to the Ministry of Road Transport and Highways.
- 4.8.2 During 2019-23, NHAI is expected to generate Rs. 1 trillion (US\$ 14.30 billion) annually from toll and other sources.
- 4.8.3 NHAI is planning to raise Rs. 40,000 crore (US\$ 5.72 billion) to monetize its highway assets through Infrastructure Investment Trust (InvIT). Five operational roads with an estimated enterprise value of INR 5,000 crores are being transferred to the NHAI InvIT.

### 4.9 Growth Drivers

#### 4.9.1 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.

#### 4.9.2 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.

#### 4.9.3 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.

### 4.10 Challenges & Issues in the Sector

#### 4.10.1 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.

#### 4.10.2 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.

#### 4.10.3 Operational Issues :

- 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.



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- 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.

### 4.10.4 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 88% 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. 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).

### 4.11.5. 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.

### 4.11.6. 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 Athang Infrastructure, NIIF's proprietary road network, assisted by a team of established professionals with diverse domain expertise in the transport field.

### 4.11.7. International Tie-ups

In December 2020, the Ministry of Road Transport and Highways signed an 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.

### 4.11.8. 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 Modal 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.

Sources: IBEF Roads Report, February 2023; KPMG Report - Roads and Highway Sector, 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

- 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 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 30<sup>th</sup> September 2023 and based on the audited financial statements as at 31<sup>st</sup> March 2023 prepared as per Indian Accounting Standards (Ind AS) are as under:

Book EV (INR Mn)	31-Mar-23	30-Sep-23
MVR	1,475	1,266
IRBPA	12,313	12,102
IRBTA	5,611	5,488
IRBTC	10,622	9,879
IRBJD	12,935	12,626
VEL	12,058	11,968
<b>Total</b>	<b>55,015</b>	<b>53,330</b>



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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 Independent Comparable Transactions, I was unable to apply the CTM method as a measure of valuation. 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

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 <sup>th</sup> August 2026	12 <sup>th</sup> January 2027	-	152
IRBPA	30 <sup>th</sup> December 2030	2 <sup>nd</sup> January 2038	1,460	1,099
IRBTA	2 <sup>nd</sup> September 2032	2 <sup>nd</sup> June 2037	*1,606	127
IRBTC	3 <sup>rd</sup> June 2037	25 <sup>th</sup> December 2042	*1,899	136
IRBJD	13 <sup>th</sup> June 2035	21 <sup>st</sup> October 2040	1,828	131
VEL	29 <sup>th</sup> March 2037	29 <sup>th</sup> 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 <sup>th</sup> 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 <sup>th</sup> August 2022
IRBPA	Not received	Incremental concession period of 518 days arising out of Arbitral Award 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 <sup>th</sup> March 2022
IRBTA	Not received (Filed traffic survey with NHAI vide letters dated 2 <sup>nd</sup> April 2021, 14 <sup>th</sup> October, 2020 and 25 <sup>th</sup> 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 <sup>nd</sup> April 2021, 14 <sup>th</sup> October, 2020 and 25 <sup>th</sup> September 2020 for extension. The same has been recommended by the independent engineer appointed by IRBTA vide letter dated 28 <sup>th</sup> July 2021. However, NHAI approval for the same is pending as on report date
IRBTC	Not received (Filed with NHAI vide letter dated 14 <sup>th</sup> 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 14 <sup>th</sup> 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 <sup>th</sup> 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 SPV's 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 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.



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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 IRBTC, interest on deferred NHAI premium is assumed at 6.75% per annum throughout the balance project life (based on the bank rate applicable as of 30<sup>th</sup> September 2023).



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- 6.4.6. **Revenue Share:** The revenues collected from the toll would be shared annually and paid to the NHAI in the form of a concession fee. The percentage of revenue that the Road Project has to share with the NHAI 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 NHAI 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 30<sup>th</sup> September 2023, 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 NHAI 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<sub>f</sub> = risk free rate  
ERP = Equity Risk Premium  
Beta = a measure of the sensitivity of assets to returns of the overall market  
CSR<sub>P</sub> = Company Specific Risk Premium (In general, an additional company-specific risk premium will be added to the cost of equity calculated pursuant to CAPM).
- For valuation exercise, I have arrived at adjusted cost of equity of the SPVs based on the above calculation (Refer Appendix 2).



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**6.7.2. Risk Free Rate:**

I have applied a risk free rate of return of 7.16% on the basis of the zero coupon yield curve as on 30<sup>th</sup> September 2023 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 8.5%, 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):**

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.



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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 <sup>th</sup> Jan 2027	~ 3 Years 3 Months	3,266
IRBPA	02 <sup>nd</sup> January 2038	~ 14 Years 3 Months	16,110
IRBTA	2 <sup>nd</sup> June 2037	~ 13 Years 8 Months	8,407
IRBTC	29 <sup>th</sup> December 2042	~ 19 Years 3 Months	21,760
IRBJD	21 <sup>st</sup> October 2040	~ 17 Years 1 Months	19,391
VEL	29 <sup>th</sup> March 2037	~ 13 Years 6 Months	13,000
Total of SPVs			81,935

- 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	10.88%	3,215	9.88%	3,266	8.88%	3,318
2	IRBPA	12.31%	15,151	11.31%	16,110	10.31%	17,163
3	IRBTA	11.85%	7,920	10.85%	8,407	9.85%	8,941
4	IRBTC	11.74%	19,446	10.74%	21,760	9.74%	24,408
5	IRBJD	11.78%	18,016	10.78%	19,391	9.78%	20,928
6	VEPL	6.73%	12,440	7.73%	13,000	6.73%	13,608
<b>Total</b>			<b>76,188</b>		<b>81,935</b>		<b>88,367</b>

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	2,911	3,266	3,620
2	IRBPA	14,374	16,110	17,840
3	IRBTA	7,407	8,407	9,408
4	IRBTC	16,263	21,760	27,006
5	IRBJD	17,114	19,391	21,669
6	VEL	11,769	13,000	14,223
<b>Total</b>		<b>69,837</b>	<b>81,935</b>	<b>93,766</b>

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	3,229	3,265	3,302
2	IRBPA	15,737	16,110	16,484
3	IRBTA	8,139	8,407	8,676
4	IRBTC	21,520	21,760	21,999
5	IRBJD	18,993	19,391	19,790
6	VEL	12,804	13,000	13,197
<b>Total</b>		<b>80,422</b>	<b>81,935</b>	<b>83,448</b>

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

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### 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 pendences 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 30<sup>th</sup> September 2023 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 30<sup>th</sup> September 2023.





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C. Statement of assets included:

The details of assets of the SPVs as at 30<sup>th</sup> September 2023 are as mentioned below:

Sr. No.	SPVs	INR Mn			
		Net Fixed Assets	Net intangible Assets	Other Non - Current Assets	Current Assets
1	MVR	10	1,469	-	55
2	IRBPA	0	12,044	-	1,516
3	IRBTA	1	65,929	-	32
4	IRBTC	0	10,670	0	56
5	IRBJD	0	13,126	-	21
6	VEL			11,760	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.

SPVs	Historical major repairs					
	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23
MVR	-	-	54	-	-	-
IRBPA	-	-	265	313	218	-
IRBTA	-	-	28	4	228	236
IRBTC	-	-	185	-	-	-
IRBJD	-	-	318	324	-	-

Source: Investment Manager

**Forecasted major repairs**

SPVs	INR Mn						
	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30
MVR	174	174	-	-	-	-	-
IRBPA	-	326	296	81	-	151	475
IRBTA	-	-	-	-	336	416	50
IRBTC	-	435	-	-	-	-	553
IRBJD	-	-	-	776	843	1,104	228

SPVs	INR Mn						
	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37
MVR	-	-	-	-	-	-	-
IRBPA	-	-	-	-	-	-	-
IRBTA	-	-	-	493	575	-	-
IRBTC	-	-	-	-	890	-	-
IRBJD	-	-	131	1,183	754	-	-

SPVs	INR Mn				
	FY 38	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:
- Unaudited provisional financial statements of the SPVs as on 30<sup>th</sup> September 2023;
  - Projected financial information for the remaining project life for each of the SPVs;
  - Toll Revenue And O&M Cost Projection Report prepared by M/s GMD Consultants for all the SPVs;
  - Details of brought forward losses and MAT credit (as per Income Tax Act) of the SPVs as at 31<sup>st</sup> March 2023;
  - Details of Written Down Value (WDV) (as per Income Tax Act) of assets as at 31<sup>st</sup> March 2023;
  - Concession Agreement of each of the SPVs with NHAI;
  - Operallon & Maintenance Work Order for each of the SPVs with the Sponsor dated 27<sup>th</sup> May 2019;
  - List of licenses / approvals, details of tax litigations, civil proceeding and arbitrations of the SPVs;
  - Details of projected Repairs and Capital Expenditure (Capex);
  - As on 31<sup>st</sup> December 2022, 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 31<sup>st</sup> December 2022 to the date of issuance of this Report;
  - Management Representation Letter by the Investment Manager dated 26<sup>th</sup> October 2023;
  - 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;
  - 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 30<sup>th</sup> September 2023 ("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 30<sup>th</sup> September 2023. The Investment Manager has represented that the business activities of the SPVs have been carried out in normal and ordinary course between 30<sup>th</sup> September 2023 and the Report Date and that no material changes have occurred in the operations and financial position between 30<sup>th</sup> September 2023 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





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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



**S. Sundararaman**

Registered Valuer

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

Asset Class: Securities or Financial Assets

Place: Chennai

UDIN: 23028423BGYWIU3661

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Appendix 1 – Valuation of SPVs as on 30<sup>th</sup> September 2023

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 30<sup>th</sup> September 2023 under the DCF Method

Year	Book Revenue	EBITDA	MMR Provision	MMR Expense	Capex	Change in Wcap	Tax	FCFF	CAF	WACC	DF	PVFCFF	INR Mn
													K=G*J
		A	B	C	D	E	F	G=A-B-C-D-E-F	H	I	J	K=G*J	
6m FY 24	668	629	109	174	-	-	71	384	0.25	9.88%	0.98	375	
FY 25	1,428	1,380	109	174	-	-	154	1,052	1.00	9.88%	0.91	957	
FY 26	1,574	1,502	109	-	-	-	181	1,321	2.00	9.88%	0.83	1,094	
FY 27*	1,336	1,260	109	-	-	7	151	1,102	2.89	9.88%	0.76	839	
Enterprise Value												3,266	

Appendix 1.2 – Valuation of IRBPA as on 30<sup>th</sup> September 2023 under the DCF Method

Year	Book Revenue	EBITDA	MMR Expense	Capex	Change in Wcap	Tax	FCFF	CAF	WACC	DF	PVFCFF	INR Mn
												J=I*J
		A	B	C	D	E	F=A-B-C-D-E	G	H	I	J=I*J	
6m FY 24	855	737	-	-	(442)	71	1,108	0.25	11.31%	0.97	1,078	
FY 25	1,767	1,505	326	-	-	163	1,016	1.00	11.31%	0.90	912	
FY 26	1,966	1,691	296	-	-	187	1,208	2.00	11.31%	0.81	975	
FY 27	2,178	1,889	81	-	-	213	1,595	3.00	11.31%	0.73	1,157	
FY 28	2,404	2,099	-	-	-	240	1,858	4.00	11.31%	0.65	1,210	
FY 29	2,645	2,324	151	-	-	269	1,903	5.00	11.31%	0.59	1,114	
FY 30	2,901	2,564	475	-	-	300	1,789	6.00	11.31%	0.53	941	
FY 31	3,208	2,914	-	-	-	348	2,565	7.00	11.31%	0.47	1,212	
FY 32	3,539	3,237	-	-	-	391	2,846	8.00	11.31%	0.42	1,208	
FY 33	3,850	3,540	-	-	-	430	3,110	9.00	11.31%	0.38	1,186	
FY 34	4,207	3,889	-	-	-	476	3,413	10.00	11.31%	0.34	1,169	
FY 35	4,588	4,262	-	-	-	525	3,737	11.00	11.31%	0.31	1,150	
FY 36	5,035	4,692	-	-	-	609	3,883	12.00	11.31%	0.28	1,073	
FY 37	5,479	5,137	-	-	-	1,178	3,959	13.00	11.31%	0.25	983	
FY 38*	4,538	4,266	-	-	(11)	987	3,290	13.88	11.31%	0.23	744	
Enterprise Value												15,110



Appendix 1.3 – Valuation of VEL as on 30th September 2023 under the DCF Method

Year	Book Revenue	Cash EBITDA	Capex	Change in Wcap	Tax	FCFF	CAF	WACC	DF	INR Mn
										PVFCFF
										I=E*H
A	B	C	D	E=A-B-C-D	F	G	H			
FY 24	993	939	-	-	-	939	0.04	7.73%	1.00	936
FY 24	988	934	-	-	-	934	0.54	7.73%	0.96	897
FY 25	982	926	-	-	-	926	1.04	7.73%	0.93	857
FY 25	976	920	-	-	-	920	1.54	7.73%	0.89	820
FY 26	969	900	-	-	-	900	2.04	7.73%	0.86	773
FY 28	963	894	-	-	-	894	2.54	7.73%	0.83	740
FY 27	957	860	-	-	-	860	3.04	7.73%	0.80	686
FY 27	950	853	-	-	24	830	3.54	7.73%	0.77	638
FY 28	943	869	-	-	143	726	4.04	7.73%	0.74	537
FY 28	937	862	-	-	141	721	4.54	7.73%	0.71	514
FY 29	929	864	-	-	161	704	5.04	7.73%	0.69	483
FY 29	922	857	-	-	159	698	5.54	7.73%	0.66	462
FY 30	913	848	-	-	170	676	6.04	7.73%	0.64	431
FY 30	906	838	-	-	168	670	6.54	7.73%	0.61	412
FY 31	897	828	-	-	176	652	7.04	7.73%	0.59	386
FY 31	888	819	-	-	174	645	7.54	7.73%	0.57	368
FY 32	880	795	-	-	176	619	8.04	7.73%	0.55	340
FY 32	871	786	-	-	174	612	8.54	7.73%	0.53	324
FY 33	862	746	-	-	170	576	9.05	7.73%	0.51	294
FY 33	851	735	-	-	167	568	9.54	7.73%	0.49	279
FY 34	841	751	-	-	175	575	10.05	7.73%	0.47	272
FY 34	831	740	-	-	173	567	10.54	7.73%	0.46	259
FY 35	812	733	-	-	174	559	11.05	7.73%	0.44	246
FY 35	783	705	-	-	167	537	11.54	7.73%	0.42	227
FY 36	781	700	-	-	169	532	12.05	7.73%	0.41	217
FY 36	789	708	-	-	171	538	12.55	7.73%	0.39	211
FY 37	762	714	-	-	174	540	13.05	7.73%	0.38	204
FY 37	730	682	-	3	166	513	13.55	7.73%	0.36	187
<b>Enterprise Value</b>										<b>13,000</b>





Appendix 1.4 – Valuation of IRBTA as on 30<sup>th</sup> September 2023 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
6m FY 24	498	421	-	-	-	39	382	0.25	10.85%	0.97	372
FY 25	999	840	-	-	-	89	751	1.00	10.85%	0.90	678
FY 26	1,104	937	-	-	-	102	835	2.00	10.85%	0.81	680
FY 27	1,228	1,052	-	-	-	118	935	3.00	10.85%	0.73	686
FY 28	1,366	1,181	338	-	-	135	710	4.00	10.85%	0.66	470
FY 29	1,501	1,307	416	-	-	153	738	5.00	10.85%	0.60	441
FY 30	1,660	1,456	50	-	-	186	1,220	6.00	10.85%	0.54	658
FY 31	1,824	1,556	-	-	-	169	1,387	7.00	10.85%	0.49	675
FY 32	2,019	1,738	-	-	-	194	1,544	8.00	10.85%	0.44	678
FY 33	2,220	1,926	-	-	-	219	1,706	9.00	10.85%	0.40	675
FY 34	2,447	2,138	493	-	-	248	1,397	10.00	10.85%	0.36	499
FY 35	2,680	2,365	575	-	-	279	1,510	11.00	10.85%	0.32	486
FY 36	2,957	2,615	-	-	-	351	2,264	12.00	10.85%	0.29	658
FY 37	3,230	2,871	-	-	-	386	2,486	13.00	10.85%	0.26	652
FY 38*	612	547	-	-	14	127	406	13.59	10.85%	0.25	100
Enterprise Value											8407

Appendix 1.5 – Valuation of IRBTC as on 30<sup>th</sup> September 2023 under the DCF Method

INR Mn													
Year	Book Revenue	EBITDA	MMR Expense	Premium Payment to NHAJ	Revenue Share to NHAJ	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
6m FY 24	1,904	1,854	-	918	-	-	-	196	740	0.25	10.74%	0.97	721
FY 25	4,120	4,010	435	3,417	-	-	-	438	(260)	1.00	10.74%	0.90	(253)
FY 26	4,554	4,452	-	3,751	-	-	-	489	212	2.00	10.74%	0.82	172
FY 27	5,034	4,914	-	4,358	-	-	-	542	14	3.00	10.74%	0.74	11
FY 28	5,607	5,479	-	5,931	-	-	-	607	(1,059)	4.00	10.74%	0.66	(704)
FY 29	6,181	6,045	-	5,237	-	-	-	672	136	5.00	10.74%	0.60	82
FY 30	6,804	6,661	553	3,461	-	-	-	743	1,904	6.00	10.74%	0.54	1,032
FY 31	7,487	7,307	-	3,551	-	-	-	803	2,953	7.00	10.74%	0.49	1,448
FY 32	8,245	8,055	-	3,724	-	-	-	889	3,442	8.00	10.74%	0.44	1,522
FY 33	9,032	8,832	-	3,911	-	-	-	978	3,942	9.00	10.74%	0.40	1,574
FY 34	9,898	9,688	-	4,107	-	-	-	1,077	4,504	10.00	10.74%	0.36	1,624
FY 35	10,941	10,720	890	4,312	-	-	-	1,196	4,323	11.00	10.74%	0.33	1,407
FY 36	11,968	11,738	-	4,528	-	-	-	1,344	5,868	12.00	10.74%	0.29	1,725
FY 37	13,115	12,865	-	4,754	-	-	-	1,473	6,638	13.00	10.74%	0.27	1,762
FY 38	14,338	14,075	-	832	4,160	-	-	2,199	6,884	14.00	10.74%	0.24	1,650
FY 39	15,707	15,431	-	-	5,242	-	-	2,477	7,712	15.00	10.74%	0.22	1,669
FY 40	17,216	16,926	-	-	5,504	-	-	2,787	8,635	16.00	10.74%	0.20	1,688
FY 41	18,739	18,435	-	-	5,779	-	-	3,098	9,557	17.00	10.74%	0.18	1,687
FY 42	20,456	20,137	-	-	6,068	-	-	3,454	10,615	18.00	10.74%	0.16	1,692
FY 43*	16,712	16,462	-	-	4,779	-	211	2,876	8,596	18.87	10.74%	0.15	1,253
Enterprise Value													21,760



Appendix 1.6– Valuation of IRBJD as on 30<sup>th</sup> September 2023 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
6m FY 24	905	820	-	-	-	79	742	0.25	10.78%	0.97	723
FY 25	1,968	1,786	-	-	-	183	1,603	1.00	10.78%	0.90	1,447
FY 26	2,170	1,974	-	-	-	209	1,764	2.00	10.78%	0.81	1,438
FY 27	2,390	2,184	778	-	-	239	1,169	3.00	10.78%	0.74	860
FY 28	2,646	2,429	843	-	-	274	1,312	4.00	10.78%	0.66	871
FY 29	2,902	2,675	1,104	-	-	309	1,262	5.00	10.78%	0.60	756
FY 30	3,191	2,953	228	-	-	377	2,348	6.00	10.78%	0.54	1,271
FY 31	3,486	3,126	-	-	-	366	2,761	7.00	10.78%	0.49	1,349
FY 32	3,821	3,436	-	-	-	409	3,027	8.00	10.78%	0.44	1,335
FY 33	4,161	3,756	131	-	-	455	3,171	9.00	10.78%	0.40	1,262
FY 34	4,543	4,118	1,183	-	-	506	2,429	10.00	10.78%	0.36	873
FY 35	4,961	4,515	754	-	-	562	3,199	11.00	10.78%	0.32	1,038
FY 36	5,402	4,932	-	-	-	694	4,239	12.00	10.78%	0.29	1,241
FY 37	5,841	5,347	-	-	-	753	4,595	13.00	10.78%	0.26	1,215
FY 38	6,331	5,814	-	-	-	1,344	4,469	14.00	10.78%	0.24	1,067
FY 39	6,893	6,350	-	-	-	1,479	4,871	15.00	10.78%	0.22	1,049
FY 40	7,489	6,917	-	-	-	1,621	5,295	16.00	10.78%	0.19	1,030
FY 41*	4,503	4,167	-	-	24	982	3,161	16.78	10.78%	0.18	568
<b>Enterprise Value</b>											<b>19,391</b>



Appendix 2 – Weighted Average Cost of Capital of the SPVs as on 30<sup>th</sup> September 2023

Particulars	MVR	IRBPA	IRBTA	IRBTC	IRBJD	VEL	Remarks
Risk Free Rate (Rf)	7.16%	7.16%	7.16%	7.16%	7.16%	7.16%	Risk Free Rate has been considered based on zero coupon yield curve as at 30 <sup>th</sup> September 2023 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)	0.75	0.74	0.75	0.74	0.74	0.47	Beta has been considered based on the beta of companies operating in the similar kind of business in India
Base Cost of Equity	12.41%	12.37%	12.39%	12.34%	12.36%	10.45%	Base $K_e = R_f + ERP * \beta$
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)	12.41%	15.37%	14.39%	14.34%	14.36%	10.45%	Adjusted $K_e = R_f + ERP * \beta + CSRP$
Pre-tax Cost of Debt (Kd)	8.90%	8.90%	8.90%	8.90%	8.90%	8.10%	As represented by the Investment Manager
Tax rate of SPV	17.47%	18.61%	17.99%	19.78%	19.18%	18.88%	Tax Rate Applicable to SPV is considered
Post-tax Cost of Debt	7.35%	7.25%	7.30%	7.14%	7.20%	6.57%	Post-tax $K_d = \text{Pre-tax } K_d * (1 - \text{Tax rate})$
Debt / (Debt + Equity)	50%	50%	50%	50%	50%	70%	Debt Equity ratio computed as $[D/(D+E)]$ is considered as per Industry Standards
WACC	9.88%	11.31%	10.85%	10.74%	10.78%	7.73%	$WACC = [K_e * (1 - D/(D+E))] + [K_d * (1-t) * D/(D+E)]$



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**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 19.08.2024
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 21.11.2023
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 16.03.2024
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 13.10.2023

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/48(L,Y158/2010-CL, dated 26.11.2010)	Office the Regional Labour, Nagpur	Valid upto 20.12.2023
2	License for Building & Other Construction activities No. (ALCN/42 (RY150/2010/BOCW, dated 21.12.2010)	Office the Regional Labour, Nagpur	Valid upto 02.09.2032
3	Inspection Certificate for Static Weigh Bridge at Nandagaon Toll Plaza (Amravati Side)	Inspector, Legal Metrology, Amravati	Valid upto 26/01/2024
4	Inspection Certificate for Static Weigh Bridge at Nandagaon Toll Plaza (Nagpur Side)	Inspector, Legal Metrology, Amravati	Valid upto 26/01/2024

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	Certificate of Principle employer registration	Asst. Labour Commissioner (Central), Bangalore	One time permission
2	Labour License for Local Labours	Asst. Labour Commissioner (Central), Hubli	Valid up to 05.04.2024
3	Labour License for Local Labours	Asst. Labour Commissioner (Central), Bangalore	Valid up to 30.03.2024
4	License for Generator more than 5 KVA ( 40kva 62.5 kva and 125 kva)	a) Electrical Inspector, Tumkur (Karjeevanahalli toll) b) Electrical Inspector, Davanagere (Guilalu Toll) c) Electrical Inspector, Chitradurga (Project office, Hiriyur)	a) Valid up to 31.03.2024 b) Electrical Inspector, Davanagere (Guilalu Toll) 40 KVA DG Dismantling Guilalu toll (IDLE) Renewal not necessary. c) Valid up to 31.03.2024 a) SS WIM Valid up to 13.09.2023 (4 Nos. indicators restamping work done 188, 192, 193 & 194) b) MS WIM Valid up to 23.02.2024 ( 02 No.Indicator Indicator Sl.no 0064,0065 new restamping work done ) c) SSWIM Valid up to 04.12.2023 (3 Nos. Indicator restamping work done 187, 189 & 196) d) SSWIM Valid up to 05.08.2023 (4 Nos Indicator restamping work done 190, 197, 191, 195) e) MSWIM Valid up to 20.03.2024 (2 Nos. Indicator New restamping work done 0067,066) a) SSWIM Valid up to 01.08.2023 ( 9 Nos indicators 199,201,202,203,204,205,207,209,208) b) SSWIM Valid up to 22.11.2023 (2 Nos indicators 198 & 200) c) SSWIM Valid up to 22.11.2023 (1 No indicator 206) d) MSWIM Valid up to 23.03.2024 (2 No indicator 8187,8354 new restamping work done ) e) MSWIM Valid Up to 19.02.2024 (2 No indicator 0072,0073 new restamping work done )
5	Inspection Certificate for WIM installed at Guilalu Toll	Assistant Controller, Legal Metrology Department, Davanagere	Valid up to 04.12.2023 Valid up to 11.04.2024 Valid up to 15.03.2024 Valid up to 14.12.2023
6	Inspection Certificate for WIM installed at Karjeevanahalli Toll No. 9120160352273 and 9120160352274 dated 16.03.2016	Assistant Controller, Legal Metrology Department, Tumkur	
7	a) 01 No of 100 MT Static Weigh Bridge at Guilalu Toll Plaza towards Tumkur side b) 01 No of 100 MT Static Weigh Bridge at Guilalu Toll Plaza towards Chitradurga side	Assistant Controller of Legal Metrology, Chitradurga	
8	a) 01 No of 100 MT Static Weigh Bridge at Karjeevanahalli Toll Plaza towards Tumkur side b) 01 No of 100 MT Static Weigh Bridge at Karjeevanahalli Toll Plaza towards Chitradurga side	Assistant Controller of Legal Metrology, Tumkur	



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Appendix 3.5 – IREJD: 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
ii	Sonwa Toll Plaza	Sr.Electrical Inspector, Jaipur	Valid up to 31.03.2024
3	WIM System		
i	Inspection certificate for Barkheda -Chandlai Toll Plaza	Weigh and Measure Department, Jaipur	Stamping Certificate renewed upto 13.12.2023.
ii	Inspection certificate for Sonwa Toll Plaza	Weigh and Measure Department, Tonk	Stamping Certificate renewed upto 29.11.2023
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 11.01.2024 2. Stamping Certificate for WBE 47 (Tonk Side) Renewed upto 11.01.2024
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 24.11.2023

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	19.12.2023
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



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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><b>Background of the case:</b> 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.</p> <p><b>Current Status:</b> The writ petitions filed by 7 educators are disposed by the high court till date, the rest of the petitions are pending.</p>	Not quantified
2	MVR	Arbitration with NHA1	Arbitration Tribunal	<p><b>Background of the case:</b> MVR initiated arbitration proceedings against NHA1 before the Arbitration Tribunal Consisting of Dr. Ajit 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 hurra pipe culverts) The conciliation meeting between NHA1 and MVR meeting was concluded. As NHA1 did not respond on the matter, MVR invoked Arbitration proceedings against NHA1. MVR had submitted its statement of claims against NHA1. As per direction of the Court, NHA1 deposited Rs 5.39 Crore in the registry of the Delhi High Court on August 22, 2023. The matter is pending</p> <p>In the meantime NHA1 challenged the Award under Section 34 which was dismissed by the Hon'ble Delhi High Court. Subsequently, NHA1 appealed against the Section 34 judgment under Section 37 in the Delhi High Court which was also dismissed but with a liberty granted to NHA1 to file a review petition against the Section 34 judgment. The matter is pending.</p> <p><b>Current Status:</b> The Hon'ble Arbitral Tribunal has pronounced the Award in favour of MVR on 17/02/2022 and NHA1 was directed to pay Rs 4,89,71,505/-, in terms of the Award. MVR requested NHA1 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 the matter is pending.</p>	48.9 + interest @ 8% pa w e f 17.02.2022
3	MVR	Arbitration with NHA1	Arbitration Tribunal	<p><b>Background of the case:</b> NHA1 had initiated arbitration proceedings against MVR before the Arbitration Tribunal Consisting of Dr. Ajit Pasayat (Presiding Arbitrator) Mr. S. S. Agarwal and Mr. Navin Kumar for its claim to the tune of Rs. 128.1 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><b>Current Status:</b> The matter is pending.</p>	203.8
4	MVR	Direct Tax Matters	CIT (A)	<p><b>Background of the case:</b> MVR has received order u/s 143(3) of Income Tax Act, 1961 ("ITA 1961") 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 1961. However, MVR does not accept the view s, 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><b>Current Status:</b> 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





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

Sr. No	SPVs	Matter	Pending Before	Amount Involved (INR Million)
5	IRBPA	Civil Litigation	NA	2522.5 + interest @ 9% w e f 27.11.2014
6	IRBPA	Regulatory Action (ESIC)	NA	5.8
7	IRBPA	Criminal Litigation	HIGH COURT OF PUNJAB AND HARYANA	Rs. 20,000/-*
8	IRBPA	Arbitration with NHAJ	Arbitration Tribunal	1116.2 + interest & extension of 473.28 days

**Background of the case:** IRBPA has initiated arbitration proceedings against NHAJ before Arbitration Tribunal consisting of Mr. Ajit Prakash Shah (Presiding Arbitrator), Mr. S. S. Agarwal & Mr. Navin Kumar. The claims for sum of Rs. 2522.5 Mn and extension in concession period by 618 days. IRBPA had submitted its claim on account of losses and requested NHAJ for appointment of other Arbitrator. NHAJ had refused the request for appointment of arbitrator. As per the provisions of Concession Agreement, IRBPA requested Indian road congress to appoint an arbitrator on behalf of NHAJ. Subsequently, on NHAJ had appointed Mr. Navin Kumar as the Arbitrator.

**Current Status:** The Honble 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 Honble 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 NHAJ requesting for implementation of the terms of the said Award. However, NHAJ 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 NHAJ 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 NHAJ and submitted a BG of Rs. 317.3 crores on May 24, 2022 towards release of 75% of Payout Amount. Subsequently, NHAJ released net amount of Rs. 310.91 crores after statutory deductions.

In the meantime, on May 10, 2022, NHAJ 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 re-deposit the Arbitral amount of Rs. 317.3 crores with NHAJ 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.

**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 38 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. 3.83 Mn towards contributions payable in respect of the employees should not be recovered from IRBPA. IRBPA has replied to the aforementioned notice.

**Current Status:** No further communication has been received in this regard.

**Background of the case:** The Concessionaire had constructed the toll plaza building on the land acquired and handed to the concessionaire by NHAJ. Irrigation Distributary was shifted along the boundary of Ladpatwan 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. NHAJ submitted necessary documents to the irrigation department. Irrigation department did not approve the drawings and been continuously writing to concessionaire and NHAJ 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-ensured 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.

**Current Status:** The matter is pending.

**Background of the case:** In the month of September 2020, Government of India passed three new Farm bills in the Parliament. This drew ire 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 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 NHAJ, 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), 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.

**Current Status:** NHAJ 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 NHAJ to resume conciliation through OCE 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 OCE for conciliation but the conciliation failed. Subsequently, IRBPA renewed 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 matter is pending.



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)
9	IRBTC	Civil Litigation	Delhi High Court	<p><b>Background of the case:</b> Due to a dispute on the deferred premium calculation of the previous years between the IRBTC and the NHA, the concessionaire has filed an appeal with the Honorable High Court of Delhi for resolution against the NHA'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.</p> <p><b>Current Status:</b> 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 NHA to withdraw Rs. 97.8 Crore as an interim measure and then by interim order dated 09.08.2022 further directed NHA 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>NHA filed Section 37 against interim A.T order dated 09.08.2022. The matter is pending.</p>	949.8 + interest
10	IRBJD	Criminal Litigation	NA	<p><b>Background of the case:</b> Pradeep Sogani, Shankar Lal Sharma and certain others (collectively the "Complainants") have lodged 10 first information reports against Virendra Mahiswar, 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 Chakras 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.</p> <p><b>Current Status:</b> No offence has been found to be committed by the Accused. Hence, they are acquitted from all the cases. This matter is closed.</p>	Not quantified
11	IRBJD	Civil Litigation (Writ Petition)	Rajasthan High Court	<p><b>Background of the case:</b> 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.</p> <p><b>Current Status:</b> The matter is currently pending.</p>	Not quantified
12	IRBJD	Direct Tax Matters	CIT (A)	<p><b>Background of the case:</b> IRBJD has received order u/s 143(3) r.w s 147 of Income Tax Act, 1961 ("ITA 1961") dated 30 Dec 2019 for AY 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 Honble High Court.</p> <p><b>Current Status:</b> The matter is currently pending.</p>	27.2

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)
13	VK1	Arbitration Tribunal	Arbitration Tribunal	<p>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 costs/losses on account of the delay in completion of construction due to reasons attributable to the NHA, 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 NHA, 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.</p> <p>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.</p>	4,483.3

Source: Investment Manager



<<End of Report>>



Val-Blr/DHCI-R232405

26<sup>th</sup> October 2023

<p><b>The Board of Directors, IRB InvIT Fund</b> (IDBI Trusteeship Services Limited acting on behalf of the Trust) IRB Complex, Chandivali Farm, Chandivali Village, Andheri (East), Mumbai – 400 072</p>	<p><b>The Board of Directors, The Investment Manager, IRB Infrastructure Private Limited</b> 3<sup>rd</sup> Floor, IRB Complex, Chandivali Farm, Chandivali Village, Andheri (East), Mumbai – 400 072</p>
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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 30<sup>th</sup> September 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 30<sup>th</sup> September 2023 as per the SEBI InvIT Regulations. The Valuer had provided his Fair Enterprise Valuation of the SPVs as at 30<sup>th</sup> September 2023 vide his valuation report dated 26<sup>th</sup> October 2023 (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 26<sup>th</sup> October 2023 prepared and submitted by the Valuer to the Management;
2. Unaudited provisional financial statements of the SPVs as on 30<sup>th</sup> September 2023;
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 31<sup>st</sup> March 2023;
6. Details of Written Down Value (WDV) (as per Income Tax Act) of assets as at 31<sup>st</sup> March 2023;
7. Concession Agreement of each of the SPVs with NHAI;
8. Operation & Maintenance Work Order for each of the SPVs with the Sponsor dated 27<sup>th</sup> 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 30<sup>th</sup> September 2023 to the date of issuance of this Review Opinion;
12. Management Representation Letter by the Investment Manager dated 26<sup>th</sup> October 2023;
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 30<sup>th</sup> September 2023 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 13<sup>th</sup> 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.

# JAIPUR TO DEOLI SECTION OF NH-12

(KM 18.700 To 165.00 )

IN THE STATE OF RAJASTHAN



**OCTOBER  
2023**



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



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**JAIPUR TO DEOLI SECTION OF NH-12  
(KM 18.700 To 165.00 )  
IN THE STATE OF RAJASTHAN**

**OCTOBER 2023**



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

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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highways Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- 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 14<sup>th</sup> June 2010 to 13<sup>th</sup> 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 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 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 September 2023, report is updated with this six-monthly 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 Six-Monthly traffic data from April 2023 to September 2023.
- 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
		Six Monthly Data from April 23 to September 23	For April 23 to Sept 23	For April 23 to Sept 23	For April 23 to Sept 23	For April 23 to Sept 23
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

SR. NO	LOCATION	CTV	Single Journey Traffic	Return Pass Traffic	Monthly Pass Traffic	Local Traffic
		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
		Six Monthly Data from April 23 to September 23	For April 23 to Sept 23	For April 23 to Sept 23	For April 23 to Sept 23	For April 23 to Sept 23

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

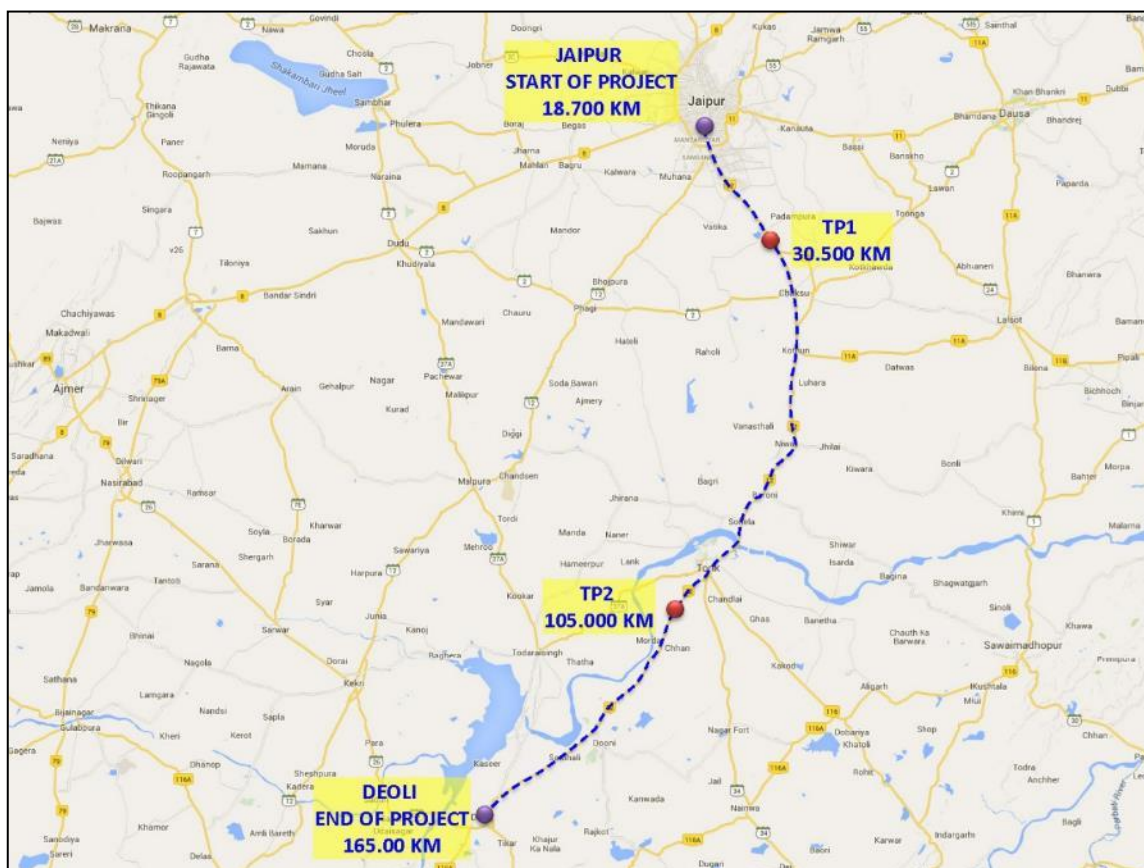


Figure 2-1: Toll Plaza Locations

## 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 project highway is currently under toll operation, the data collected is corresponding to 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 September 2023 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	Average Daily Traffic April 2023 to Sept 2023
1	Car	8428	8860	9044	7684	8808	9120
2	Minibus / LCV	1506	1370	1056	377	553	638
3	Truck / Bus	1109	1278	996	1178	1314	1297
4	Multi Axle	1453	1402	1390	1616	2207	2483
5	Oversized Vehicles	60	50	28	5	7	4
	<b>Total</b>	<b>12556</b>	<b>12960</b>	<b>12515</b>	<b>10860</b>	<b>12889</b>	<b>13541</b>

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	Average Daily Traffic April 2023 to Sept 2023
1	CAR	3276	3446	3736	3612	3918	4563
2	Minibus/ LCV	780	661	573	235	363	476
3	Truck/Bus	691	778	767	913	914	1176
4	Multi Axle	1315	1248	1556	2031	2203	2313
5	Oversized Vehicles	25	19	18	6	9	6
	<b>Total</b>	<b>6087</b>	<b>6151</b>	<b>6650</b>	<b>6798</b>	<b>7407</b>	<b>8534</b>

The above data was arrived at by applying standard trip frequencies to monthly passes and return journey tickets issued. Since the current data is for six months from April-2023 to September 2023 only, monsoon also has affected the project traffic in the current period, hence a suitable correction factor is applied for annual representation of this traffic.

## 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



Vehicle Type	PCUs
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**

Toll Plaza Location	Period	PCU	PCU Index
<b>30.500</b>	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	25156	1.86
<b>105.000</b>	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	19241	2.25

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 2022-23 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 53% of total traffic at toll plaza while multi axle and LCV are 27% and 6%. Truck/ Bus volume is 14% of the total traffic. Overall, about 47% 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 September 2023.

**Table 2-7 : Journey Type Bifurcation of Traffic at KM 30.500**

Sr. No	Type	Traffic Volume (Nos.) FY	Traffic Volume (Nos.) FY	Traffic Volume	Traffic Volume (Nos.)	Traffic Volume (Nos.)	Traffic Volume (Nos.)

		2018-19	2019-20	(Nos.) FY 2020-21	for FY 2021-22	for FY 2022-23	for April 23 to Sept 23
1	Single Journey	4395	5113	6409	4900	5273	5351
2	Return Journey	5372	5188	3676	5858	7502	8068
3	Overweight vehicles	314	2	0	0	0	0
4	Monthly Pass	2475	2657	2430	102	114	122

A significant part of the traffic at KM 30.500 is return journey (58%) followed by single journey (41%) 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 April 23 to Sept 23
1	Single Journey	2999	3379	4475	3950	4082	5391
2	Return Journey	2036	1978	1634	2816	3300	3120
3	Overweight vehicles	252	6	0	0	0	0
4	Monthly Pass	800	788	541	32	25	23

Here single journey (39%) forms highest portion of traffic followed by return journey (60%) and monthly pass journey (1%). 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 pattern 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 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 – 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)

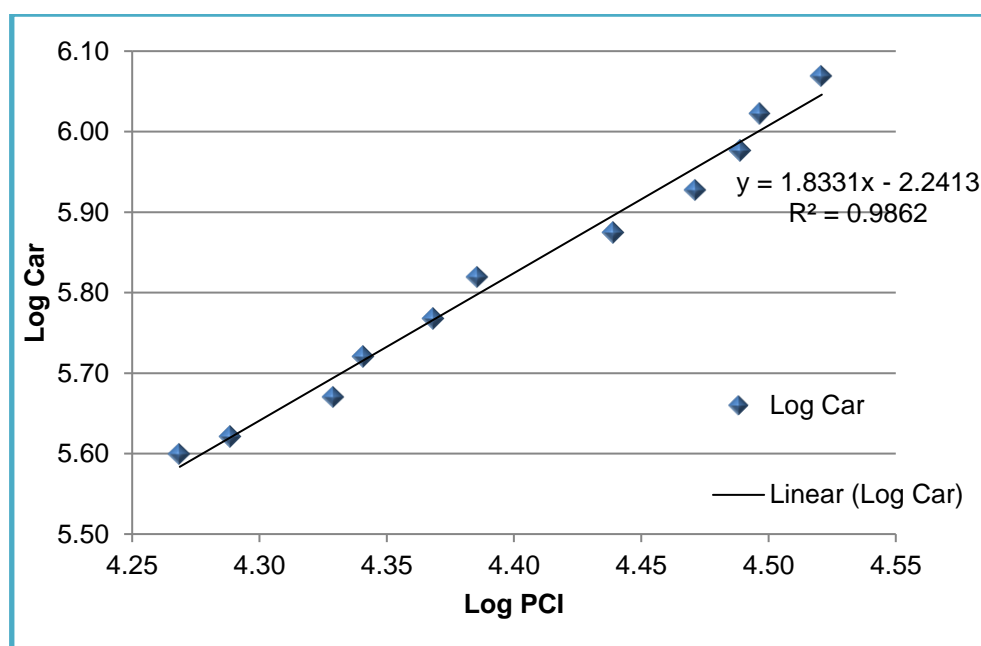
The elasticity for car and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

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.

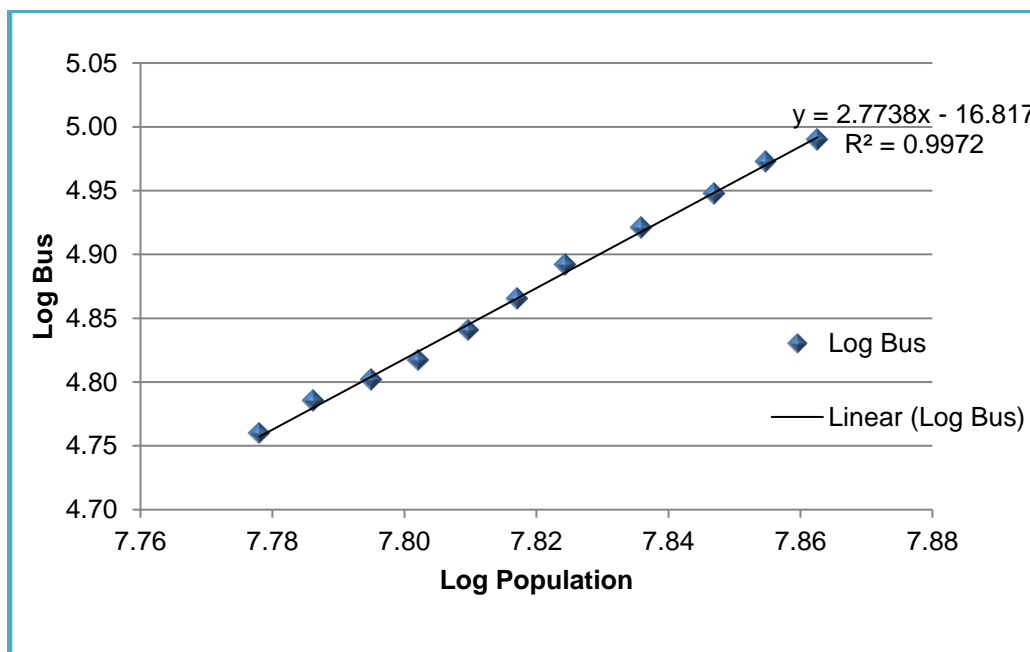


Figure 3-2: Regression and Elasticity Population vs. Bus – Extrapolation

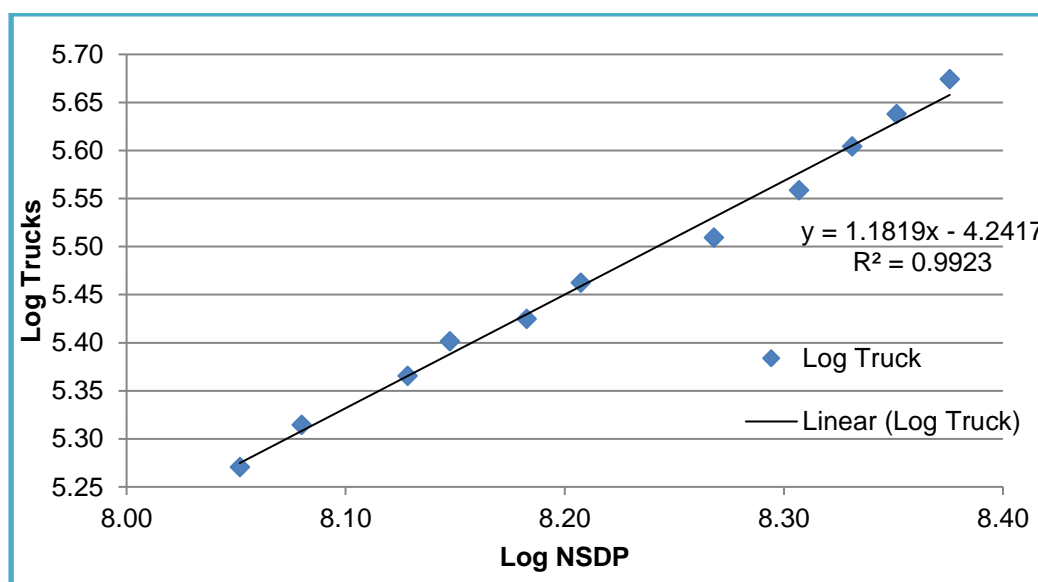


The elasticity of goods traffic has been worked out by regression analysis with NSDP. The following table represents the data and details.

**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.

- Demonetization in November 2016
- Ban on mining in Rajasthan
- 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.

Traffic on the project stretch was affected due to COVID-19 lockdown announced by Central government in March 2020. Traffic is affected by subsequent second and third waves as well in the year 2021-22. Traffic for period from April 2021 to March 2022 was also impacted due to COVID-19 lockdown hence same is not considered for historical growth.

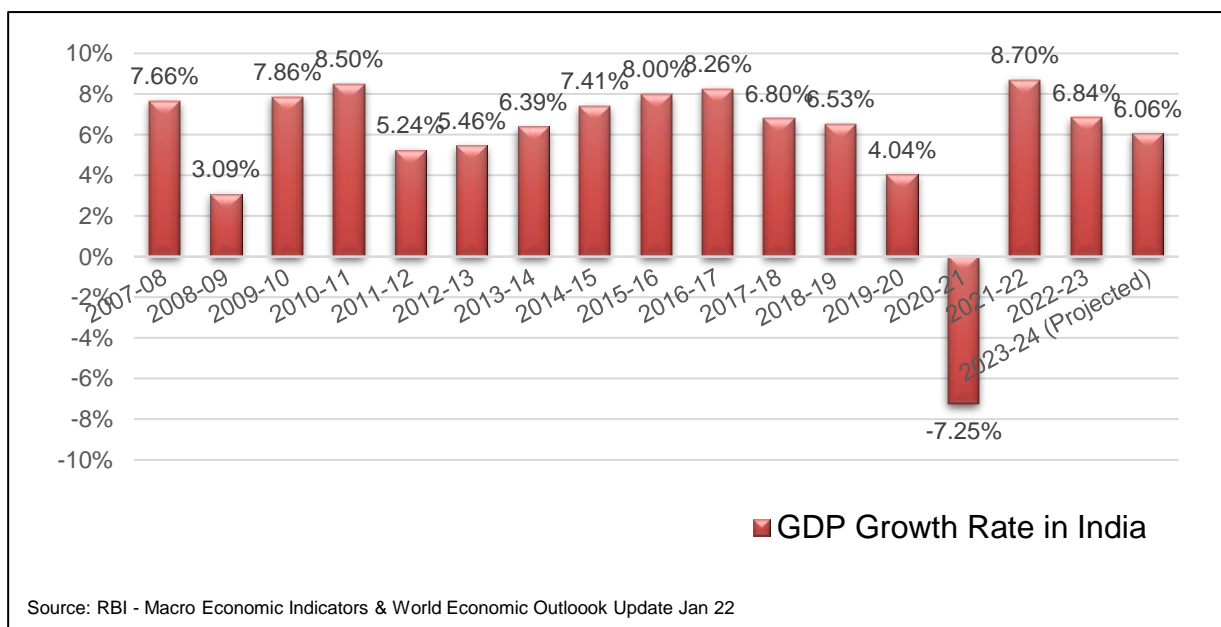
### 3.5 Other Factors Influencing Growth

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 decision 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 under. Rate of growth is moderated in light of overall regional trend. 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, 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. Curb on mining activity in area due to 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**

<b>Year/ Vehicle Type</b>	<b>2021- 2023</b>	<b>2023- 2026</b>	<b>2026- 2031</b>	<b>2031- 2036</b>	<b>2036- 2041</b>	<b>2041- 2046</b>
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%
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**

<b>Year/ Vehicle Type</b>	<b>2021- 2023</b>	<b>2023- 2026</b>	<b>2026- 2031</b>	<b>2031- 2036</b>	<b>2036- 2041</b>	<b>2041- 2046</b>
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)**

<b>Year</b>	<b>CAR</b>	<b>Minibus /LCV</b>	<b>Truck/ Bus</b>	<b>Multi axle</b>	<b>Oversized Vehicles</b>	<b>Total No.</b>	<b>Total PCU</b>
<b>2023-24</b>	9120	638	1297	2483	4	<b>13541</b>	<b>25156</b>
<b>2024-25</b>	9988	679	1385	2652	4	<b>14708</b>	<b>27114</b>
<b>2025-26</b>	10741	715	1468	2786	4	<b>15714</b>	<b>28773</b>
<b>2026-27</b>	11551	752	1555	2927	4	<b>16789</b>	<b>30534</b>
<b>2027-28</b>	12421	791	1648	3075	4	<b>17939</b>	<b>32407</b>
<b>2028-29</b>	13357	832	1746	3231	4	<b>19170</b>	<b>34401</b>
<b>2029-30</b>	14364	875	1850	3394	4	<b>20487</b>	<b>36518</b>
<b>2030-31</b>	15291	914	1946	3543	4	<b>21698</b>	<b>38462</b>
<b>2031-32</b>	16279	955	2047	3700	4	<b>22985</b>	<b>40521</b>
<b>2032-33</b>	17330	998	2153	3863	4	<b>24348</b>	<b>42688</b>
<b>2033-34</b>	18449	1043	2265	4034	4	<b>25795</b>	<b>44980</b>
<b>2034-35</b>	19641	1090	2382	4211	4	<b>27328</b>	<b>47390</b>
<b>2035-36</b>	20711	1129	2488	4371	4	<b>28703</b>	<b>49556</b>
<b>2036-37</b>	21838	1170	2599	4537	4	<b>30148</b>	<b>51825</b>
<b>2037-38</b>	23027	1211	2715	4710	4	<b>31667</b>	<b>54202</b>
<b>2038-39</b>	24281	1254	2836	4889	4	<b>33264</b>	<b>56689</b>
<b>2039-40</b>	25604	1299	2963	5075	4	<b>34945</b>	<b>59297</b>
<b>2040-41</b>	26758	1334	3076	5240	4	<b>36412</b>	<b>61585</b>

**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
2023-24	4563	476	1176	2313	6	8534	19241
2024-25	4998	505	1256	2471	6	9236	20670
2025-26	5375	532	1331	2595	6	9839	21871
2026-27	5780	560	1410	2726	6	10482	23144
2027-28	6216	589	1495	2864	6	11170	24500
2028-29	6685	620	1584	3009	6	11904	25935
2029-30	7189	652	1678	3161	6	12686	27453
2030-31	7653	681	1765	3300	6	13405	28847
2031-32	8147	712	1857	3446	6	14168	30320
2032-33	8673	744	1953	3597	6	14973	31862
2033-34	9234	777	2055	3755	6	15827	33489
2034-35	9830	812	2161	3920	6	16729	35198
2035-36	10366	841	2257	4070	6	17540	36741
2036-37	10931	870	2358	4226	6	18391	38354
2037-38	11527	901	2463	4387	6	19284	40036
2038-39	12154	933	2574	4554	6	20221	41796
2039-40	12816	966	2688	4728	6	21204	43632
2040-41	13393	992	2791	4881	6	22063	45246



**Table 4-3 : Total Tollable Traffic @ Toll Plaza 1- Chainage 30.500 KM**  
(Pessimistic Growth Scenario)

<b>Year</b>	<b>CAR</b>	<b>Minibus /LCV</b>	<b>Truck/ Bus</b>	<b>Multi axle</b>	<b>Oversized Vehicles</b>	<b>Total No.</b>	<b>Total PCU</b>
<b>2023-24</b>	9120	638	1297	2483	4	<b>13541</b>	<b>25156</b>
<b>2024-25</b>	9897	672	1372	2627	4	<b>14572</b>	<b>26861</b>
<b>2025-26</b>	10544	700	1440	2734	4	<b>15422</b>	<b>28235</b>
<b>2026-27</b>	11233	729	1511	2845	4	<b>16322</b>	<b>29680</b>
<b>2027-28</b>	11968	760	1586	2961	4	<b>17279</b>	<b>31209</b>
<b>2028-29</b>	12750	791	1664	3080	4	<b>18289</b>	<b>32807</b>
<b>2029-30</b>	13584	824	1747	3205	4	<b>19364</b>	<b>34502</b>
<b>2030-31</b>	14325	853	1821	3313	4	<b>20316</b>	<b>35994</b>
<b>2031-32</b>	15107	882	1898	3426	4	<b>21317</b>	<b>37559</b>
<b>2032-33</b>	15931	913	1978	3542	4	<b>22368</b>	<b>39192</b>
<b>2033-34</b>	16801	944	2061	3663	4	<b>23473</b>	<b>40902</b>
<b>2034-35</b>	17718	977	2147	3788	4	<b>24634</b>	<b>42689</b>
<b>2035-36</b>	18505	1002	2222	3894	4	<b>25627</b>	<b>44215</b>
<b>2036-37</b>	19328	1028	2299	4003	4	<b>26662</b>	<b>45799</b>
<b>2037-38</b>	20187	1055	2379	4116	4	<b>27741</b>	<b>47447</b>
<b>2038-39</b>	21084	1082	2462	4232	4	<b>28864</b>	<b>49155</b>
<b>2039-40</b>	22021	1109	2547	4351	4	<b>30032</b>	<b>50923</b>
<b>2040-41</b>	22792	1128	2618	4450	4	<b>30992</b>	<b>52381</b>

**Table 4-4 : Total Tollable Traffic@ Toll Plaza 2- Chainage 105.000 KM**  
**(Pessimistic Growth Scenario)**

<b>Year</b>	<b>CAR</b>	<b>Minibus /LCV</b>	<b>Truck/ Bus</b>	<b>Multi axle</b>	<b>Oversized Vehicles</b>	<b>Total No.</b>	<b>Total PCU</b>
<b>2023-24</b>	4563	476	1176	2313	6	<b>8534</b>	<b>19241</b>
<b>2024-25</b>	4952	501	1245	2447	6	<b>9151</b>	<b>20477</b>
<b>2025-26</b>	5276	522	1308	2546	6	<b>9658</b>	<b>21467</b>
<b>2026-27</b>	5621	544	1373	2649	6	<b>10193</b>	<b>22504</b>
<b>2027-28</b>	5989	567	1442	2756	6	<b>10760</b>	<b>23595</b>
<b>2028-29</b>	6381	591	1514	2868	6	<b>11360</b>	<b>24743</b>
<b>2029-30</b>	6798	616	1589	2985	6	<b>11994</b>	<b>25949</b>
<b>2030-31</b>	7169	637	1655	3087	6	<b>12554</b>	<b>27008</b>
<b>2031-32</b>	7561	660	1725	3193	6	<b>13145</b>	<b>28122</b>
<b>2032-33</b>	7974	683	1797	3301	6	<b>13761</b>	<b>29271</b>
<b>2033-34</b>	8409	707	1872	3413	6	<b>14407</b>	<b>30471</b>
<b>2034-35</b>	8868	732	1951	3530	6	<b>15087</b>	<b>31731</b>
<b>2035-36</b>	9262	751	2018	3629	6	<b>15666</b>	<b>32800</b>
<b>2036-37</b>	9673	771	2088	3731	6	<b>16269</b>	<b>33910</b>
<b>2037-38</b>	10103	791	2160	3836	6	<b>16896</b>	<b>35059</b>
<b>2038-39</b>	10552	811	2235	3943	6	<b>17547</b>	<b>36244</b>
<b>2039-40</b>	11021	832	2313	4054	6	<b>18226</b>	<b>37478</b>
<b>2040-41</b>	11407	847	2378	4145	6	<b>18783</b>	<b>38491</b>

**Table 4-5 : Total Tollable Traffic @ Toll Plaza 1- Chainage 30.500 KM**  
(Most Likely Growth Scenario)

<b>Year</b>	<b>CAR</b>	<b>Minibus /LCV</b>	<b>Truck/ Bus</b>	<b>Multi axle</b>	<b>Oversized Vehicles</b>	<b>Total No.</b>	<b>Total PCU</b>
<b>2023-24</b>	9120	638	1297	2483	4	<b>13541</b>	<b>25156</b>
<b>2024-25</b>	9943	675	1378	2640	4	<b>14640</b>	<b>26988</b>
<b>2025-26</b>	10642	706	1453	2761	4	<b>15566</b>	<b>28503</b>
<b>2026-27</b>	11391	739	1533	2888	4	<b>16555</b>	<b>30113</b>
<b>2027-28</b>	12192	774	1617	3020	4	<b>17607</b>	<b>31812</b>
<b>2028-29</b>	13050	810	1705	3157	4	<b>18726</b>	<b>33605</b>
<b>2029-30</b>	13968	848	1799	3301	4	<b>19920</b>	<b>35510</b>
<b>2030-31</b>	14800	882	1883	3430	4	<b>20999</b>	<b>37225</b>
<b>2031-32</b>	15681	918	1971	3564	4	<b>22138</b>	<b>39027</b>
<b>2032-33</b>	16615	955	2063	3702	4	<b>23339</b>	<b>40914</b>
<b>2033-34</b>	17605	993	2160	3846	4	<b>24608</b>	<b>42900</b>
<b>2034-35</b>	18653	1033	2261	3996	4	<b>25947</b>	<b>44986</b>
<b>2035-36</b>	19576	1064	2352	4128	4	<b>27124</b>	<b>46822</b>
<b>2036-37</b>	20543	1098	2446	4264	4	<b>28355</b>	<b>48734</b>
<b>2037-38</b>	21559	1132	2543	4405	4	<b>29643</b>	<b>50727</b>
<b>2038-39</b>	22626	1167	2644	4551	4	<b>30992</b>	<b>52806</b>
<b>2039-40</b>	23744	1203	2748	4701	4	<b>32400</b>	<b>54965</b>
<b>2040-41</b>	24695	1229	2839	4831	4	<b>33598</b>	<b>56813</b>

**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
<b>2023-24</b>	4563	476	1176	2313	6	<b>8534</b>	<b>19241</b>
<b>2024-25</b>	4975	503	1250	2459	6	<b>9193</b>	<b>20572</b>
<b>2025-26</b>	5326	527	1319	2571	6	<b>9749</b>	<b>21670</b>
<b>2026-27</b>	5701	552	1391	2689	6	<b>10339</b>	<b>22830</b>
<b>2027-28</b>	6102	577	1467	2812	6	<b>10964</b>	<b>24050</b>
<b>2028-29</b>	6531	604	1547	2941	6	<b>11629</b>	<b>25340</b>
<b>2029-30</b>	6991	632	1632	3075	6	<b>12336</b>	<b>26700</b>
<b>2030-31</b>	7408	657	1708	3195	6	<b>12974</b>	<b>27922</b>
<b>2031-32</b>	7850	684	1788	3319	6	<b>13647</b>	<b>29203</b>
<b>2032-33</b>	8317	711	1872	3449	6	<b>14355</b>	<b>30547</b>
<b>2033-34</b>	8812	739	1959	3584	6	<b>15100</b>	<b>31953</b>
<b>2034-35</b>	9337	768	2052	3724	6	<b>15887</b>	<b>33430</b>
<b>2035-36</b>	9799	792	2133	3847	6	<b>16577</b>	<b>34725</b>
<b>2036-37</b>	10284	816	2218	3974	6	<b>17298</b>	<b>36072</b>
<b>2037-38</b>	10792	841	2306	4105	6	<b>18050</b>	<b>37471</b>
<b>2038-39</b>	11326	866	2398	4240	6	<b>18836</b>	<b>38926</b>
<b>2039-40</b>	11887	893	2494	4380	6	<b>19660</b>	<b>40446</b>
<b>2040-41</b>	12362	913	2576	4500	6	<b>20357</b>	<b>41737</b>

#### 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 - 1<sup>st</sup> 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 extension of additional 24 days

Traffic was severely impacted on project highway during 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 would 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 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)

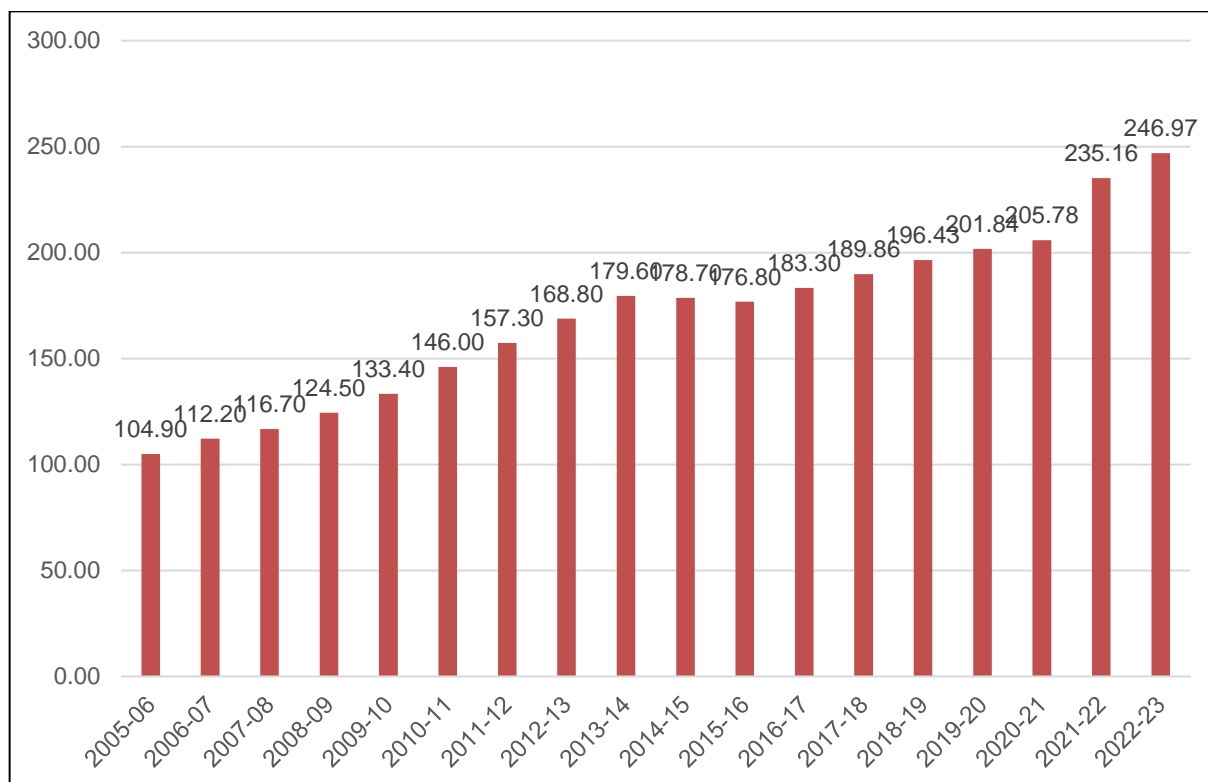
Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule R) as given under

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](http://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 year 2015-16 average inflation in WPI from year 2005-2023 is 5.23%. 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 having 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**

<b>Year</b>	<b>CAR</b>	<b>LCV</b>	<b>Truck / Bus</b>	<b>Multi Axle</b>	<b>Oversized Vehicles</b>
<b>2023-24</b>	120	185	385	595	745
<b>2024-25</b>	125	195	405	625	785
<b>2025-26</b>	130	205	425	660	825
<b>2026-27</b>	135	215	450	695	865
<b>2027-28</b>	145	225	470	730	910
<b>2028-29</b>	150	240	495	765	955
<b>2029-30</b>	160	250	515	800	1000
<b>2030-31</b>	165	260	540	840	1050
<b>2031-32</b>	175	275	570	880	1100
<b>2032-33</b>	180	290	595	925	1150
<b>2033-34</b>	190	300	625	970	1210
<b>2034-35</b>	200	315	655	1015	1270
<b>2035-36</b>	210	330	690	1065	1330
<b>2036-37</b>	220	350	720	1115	1395
<b>2037-38</b>	230	365	760	1175	1465
<b>2038-39</b>	245	385	795	1230	1535
<b>2039-40</b>	255	405	835	1290	1610
<b>2040-41</b>	265	425	875	1355	1695

**Table 5-6 : Toll Rates for Return Journey @ Km 30.500**

<b>Year</b>	<b>CAR</b>	<b>LCV</b>	<b>Truck / Bus</b>	<b>HCM /EME/ MAV</b>	<b>Oversized Vehicles</b>
<b>2023-24</b>	175	280	580	895	1120
<b>2024-25</b>	185	295	610	940	1175
<b>2025-26</b>	195	310	640	990	1235
<b>2026-27</b>	205	325	670	1040	1300
<b>2027-28</b>	215	340	705	1095	1365
<b>2028-29</b>	225	360	740	1145	1430
<b>2029-30</b>	235	375	775	1200	1500
<b>2030-31</b>	250	395	815	1260	1570
<b>2031-32</b>	260	410	855	1320	1650
<b>2032-33</b>	275	430	895	1385	1730
<b>2033-34</b>	285	455	940	1450	1815
<b>2034-35</b>	300	475	985	1525	1900
<b>2035-36</b>	315	500	1030	1600	1995
<b>2036-37</b>	330	525	1085	1675	2095
<b>2037-38</b>	345	550	1135	1760	2195
<b>2038-39</b>	365	575	1195	1845	2305
<b>2039-40</b>	380	605	1250	1935	2420
<b>2040-41</b>	400	635	1315	2035	2540

**Table 5-7 : Toll Rates for Overweight Ticket @ Km 30.500**

<b>Year</b>	<b>LCV (Single Journey of Ten Times)</b>	<b>LCV (Single Journey of Two Times)</b>	<b>Truck/ Bus (Single Journey of Ten Times)</b>	<b>Truck/ Bus (Single Journey of Two Times)</b>	<b>Multi Axle Vehicle (Single Journey of Ten Times)</b>	<b>Multi Axle Vehicle (Single Journey of Two Times)</b>
<b>2023-24</b>	1850	370	3850	770	5950	1190
<b>2024-25</b>	1950	390	4050	810	6250	1250
<b>2025-26</b>	2050	410	4250	850	6600	1320
<b>2026-27</b>	2150	430	4500	900	6950	1390
<b>2027-28</b>	2250	450	4700	940	7300	1460
<b>2028-29</b>	2400	480	4950	990	7650	1530
<b>2029-30</b>	2500	500	5150	1030	8000	1600
<b>2030-31</b>	2600	520	5400	1080	8400	1680
<b>2031-32</b>	2750	550	5700	1140	8800	1760
<b>2032-33</b>	2900	580	5950	1190	9250	1850
<b>2033-34</b>	3000	600	6250	1250	9700	1940
<b>2034-35</b>	3150	630	6550	1310	10150	2030
<b>2035-36</b>	3300	660	6900	1380	10650	2130
<b>2036-37</b>	3500	700	7200	1440	11150	2230
<b>2037-38</b>	3650	730	7600	1520	11750	2350
<b>2038-39</b>	3850	770	7950	1590	12300	2460
<b>2039-40</b>	4050	810	8350	1670	12900	2580
<b>2040-41</b>	4250	850	8750	1750	13550	2710

**Table 5-8 : Toll Rates for Overweight Return Ticket (RPPU) @Km 30.500**

<b>Year</b>	<b>Minibus /LCV</b>	<b>Truck/ Bus</b>	<b>Multi Axle</b>
<b>2023-24</b>	300	415	455
<b>2024-25</b>	315	435	480
<b>2025-26</b>	330	455	505
<b>2026-27</b>	345	480	530
<b>2027-28</b>	360	505	555
<b>2028-29</b>	375	530	580
<b>2029-30</b>	390	555	605
<b>2030-31</b>	410	580	630
<b>2031-32</b>	430	605	660
<b>2032-33</b>	450	630	690
<b>2033-34</b>	470	660	720
<b>2034-35</b>	490	690	750
<b>2035-36</b>	510	720	785
<b>2036-37</b>	535	750	820
<b>2037-38</b>	560	785	855
<b>2038-39</b>	585	820	895
<b>2039-40</b>	610	855	935
<b>2040-41</b>	635	895	975

**Table 5-9 : Toll Rates for Monthly Pass Local @ Km 30.500**

<b>Year</b>	<b>CAR (Non-Commercial Vehicles)</b>	<b>CAR SPL (10 to 20 Km)</b>	<b>LCV / Minibus SPL</b>	<b>LCV / Minibus (10 to 20 Km)</b>
<b>2023-24</b>	330	1800	3035	3980
<b>2024-25</b>	345	1890	3185	4180
<b>2025-26</b>	365	1985	3345	4390
<b>2026-27</b>	385	2085	3510	4610
<b>2027-28</b>	405	2190	3685	4840
<b>2028-29</b>	420	2290	3850	5060
<b>2029-30</b>	440	2395	4025	5290
<b>2030-31</b>	465	2505	4205	5530
<b>2031-32</b>	485	2620	4395	5780
<b>2032-33</b>	510	2740	4595	6040
<b>2033-34</b>	535	2865	4800	6310
<b>2034-35</b>	560	2995	5015	6595
<b>2035-36</b>	590	3130	5240	6890
<b>2036-37</b>	620	3270	5475	7200
<b>2037-38</b>	650	3415	5720	7525
<b>2038-39</b>	680	3570	5975	7865
<b>2039-40</b>	715	3730	6245	8220
<b>2040-41</b>	750	3900	6525	8590

**Table 5-10 : Toll Rates for Monthly Pass @ Km 30.500**

<b>Year</b>	<b>Car</b>	<b>Minibus /LCV</b>	<b>Truck/ Bus</b>	<b>Multi Axle</b>	<b>Oversized Vehicle</b>	<b>Truck/Bus - 100 Trips</b>
<b>2023-24</b>	3925	6215	12860	19905	24855	25725
<b>2024-25</b>	4125	6530	13515	20915	26115	27025
<b>2025-26</b>	4335	6860	14200	21980	27440	28400
<b>2026-27</b>	4555	7210	14925	23105	28845	29850
<b>2027-28</b>	4790	7580	15690	24290	30320	31385
<b>2028-29</b>	5020	7945	16450	25460	31785	32895
<b>2029-30</b>	5260	8330	17240	26690	33320	34485
<b>2030-31</b>	5515	8735	18075	27980	34930	36155
<b>2031-32</b>	5785	9155	18955	29340	36625	37910
<b>2032-33</b>	6065	9600	19875	30765	38410	39755
<b>2033-34</b>	6360	10070	20845	32265	40285	41690
<b>2034-35</b>	6675	10565	21865	33845	42255	43730
<b>2035-36</b>	7000	11080	22940	35505	44325	45875
<b>2036-37</b>	7345	11625	24065	37250	46505	48130
<b>2037-38</b>	7705	12200	25250	39085	48800	50505
<b>2038-39</b>	8085	12805	26500	41020	51210	53000
<b>2039-40</b>	8490	13435	27815	43050	53750	55630
<b>2040-41</b>	8910	14105	29195	45190	56420	58395

**Table 5-11 : Toll Rates for Single Journey @ Km 105.000**

<b>Year</b>	<b>CAR</b>	<b>Minibus /LCV</b>	<b>Truck/ Bus</b>	<b>Multi axle</b>	<b>Oversized Vehicles</b>
<b>2023-24</b>	100	160	340	535	650
<b>2024-25</b>	105	170	355	560	680
<b>2025-26</b>	110	180	375	590	715
<b>2026-27</b>	115	190	395	620	755
<b>2027-28</b>	120	200	415	650	790
<b>2028-29</b>	130	205	435	680	830
<b>2029-30</b>	135	215	455	715	870
<b>2030-31</b>	140	230	480	750	910
<b>2031-32</b>	150	240	500	785	955
<b>2032-33</b>	155	250	525	825	1005
<b>2033-34</b>	165	265	550	865	1050
<b>2034-35</b>	170	275	580	905	1105
<b>2035-36</b>	180	290	605	950	1155
<b>2036-37</b>	190	305	635	995	1215
<b>2037-38</b>	195	320	665	1045	1275
<b>2038-39</b>	205	335	700	1100	1335
<b>2039-40</b>	215	350	735	1155	1405
<b>2040-41</b>	230	370	770	1210	1475



**Table 5-12 : Toll Rates for Return Journey @ Km 105.000**

<b>Year</b>	<b>CAR</b>	<b>Minibus /LCV</b>	<b>Truck/ Bus</b>	<b>Multi axle</b>	<b>Oversized Vehicles</b>
<b>2023-24</b>	150	245	510	800	975
<b>2024-25</b>	160	255	535	840	1025
<b>2025-26</b>	165	270	565	885	1075
<b>2026-27</b>	175	280	590	930	1130
<b>2027-28</b>	185	295	620	975	1185
<b>2028-29</b>	195	310	650	1020	1245
<b>2029-30</b>	200	325	685	1070	1305
<b>2030-31</b>	210	340	715	1125	1370
<b>2031-32</b>	220	360	750	1180	1435
<b>2032-33</b>	235	375	790	1235	1505
<b>2033-34</b>	245	395	825	1295	1575
<b>2034-35</b>	255	415	865	1360	1655
<b>2035-36</b>	270	435	910	1425	1735
<b>2036-37</b>	280	455	955	1495	1820
<b>2037-38</b>	295	480	1000	1570	1910
<b>2038-39</b>	310	500	1050	1645	2005
<b>2039-40</b>	325	525	1100	1730	2105
<b>2040-41</b>	340	550	1155	1815	2210

**Table 5-13 : Toll Rates for Overweight Tickets @ Km 105.000**

<b>Year</b>	<b>LCV (Single Journey of Ten Times)</b>	<b>LCV (Single Journey of Two Times)</b>	<b>Truck/ Bus (Single Journey of Ten Times)</b>	<b>Truck/ Bus (Single Journey of Two Times)</b>	<b>Multi Axle Vehicle (Single Journey of Ten Times)</b>	<b>Multi Axle Vehicle (Single Journey of Two Times)</b>
<b>2023-24</b>	1600	320	3400	680	5350	1070
<b>2024-25</b>	1700	340	3550	710	5600	1120
<b>2025-26</b>	1800	360	3750	750	5900	1180
<b>2026-27</b>	1900	380	3950	790	6200	1240
<b>2027-28</b>	2000	400	4150	830	6500	1300
<b>2028-29</b>	2050	410	4350	870	6800	1360
<b>2029-30</b>	2150	430	4550	910	7150	1430
<b>2030-31</b>	2300	460	4800	960	7500	1500
<b>2031-32</b>	2400	480	5000	1000	7850	1570
<b>2032-33</b>	2500	500	5250	1050	8250	1650
<b>2033-34</b>	2650	530	5500	1100	8650	1730
<b>2034-35</b>	2750	550	5800	1160	9050	1810
<b>2035-36</b>	2900	580	6050	1210	9500	1900
<b>2036-37</b>	3050	610	6350	1270	9950	1990
<b>2037-38</b>	3200	640	6650	1330	10450	2090
<b>2038-39</b>	3350	670	7000	1400	11000	2200
<b>2039-40</b>	3500	700	7350	1470	11550	2310
<b>2040-41</b>	3700	740	7700	1540	12100	2420

**Table 5-14 : Toll Rates for Overweight Return Pass (RPPU) @ Km 105.00**

<b>Year</b>	<b>Minibus /LCV</b>	<b>Truck/ Bus</b>	<b>Multi Axle</b>
<b>2023-24</b>	265	375	390
<b>2024-25</b>	280	395	410
<b>2025-26</b>	295	415	430
<b>2026-27</b>	310	435	450
<b>2027-28</b>	325	455	475
<b>2028-29</b>	340	475	495
<b>2029-30</b>	355	495	515
<b>2030-31</b>	370	515	540
<b>2031-32</b>	385	540	565
<b>2032-33</b>	400	565	590
<b>2033-34</b>	420	590	615
<b>2034-35</b>	440	615	645
<b>2035-36</b>	460	645	675
<b>2036-37</b>	480	675	705
<b>2037-38</b>	500	705	735
<b>2038-39</b>	525	735	770
<b>2039-40</b>	550	770	805
<b>2040-41</b>	575	805	840

**Table 5-15 : Toll Rates for Local Monthly Pass @ Km 105.000**

<b>Year</b>	<b>CAR (Non-Commercial Vehicles)</b>	<b>CAR SPL (10 to 20 Km)</b>	<b>LCV / Minibus SPL</b>	<b>LCV / Minibus (10 to 20 Km)</b>
<b>2023-24</b>	330	1790	2940	7920
<b>2024-25</b>	345	1880	3085	8315
<b>2025-26</b>	365	1975	3240	8730
<b>2026-27</b>	385	2075	3400	9165
<b>2027-28</b>	405	2180	3570	9625
<b>2028-29</b>	420	2280	3730	10060
<b>2029-30</b>	440	2385	3900	10515
<b>2030-31</b>	465	2490	4075	10990
<b>2031-32</b>	485	2600	4260	11485
<b>2032-33</b>	510	2715	4450	12000
<b>2033-34</b>	535	2835	4650	12540
<b>2034-35</b>	560	2965	4860	13105
<b>2035-36</b>	590	3100	5080	13695
<b>2036-37</b>	620	3240	5310	14310
<b>2037-38</b>	650	3385	5550	14955
<b>2038-39</b>	680	3535	5800	15630
<b>2039-40</b>	715	3695	6060	16335
<b>2040-41</b>	750	3860	6335	17070

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
2023-24	3345	5405	11330	17765	21625	22655
2024-25	3515	5680	11900	18665	22720	23805
2025-26	3695	5970	12510	19615	23880	25015
2026-27	3885	6275	13145	20615	25100	26295
2027-28	4085	6595	13820	21675	26385	27640
2028-29	4280	6915	14485	22720	27655	28975
2029-30	4485	7250	15185	23815	28990	30375
2030-31	4705	7600	15920	24970	30395	31845
2031-32	4930	7970	16695	26180	31870	33390
2032-33	5170	8355	17505	27455	33420	35015
2033-34	5425	8765	18360	28795	35050	36720
2034-35	5690	9190	19260	30200	36765	38515
2035-36	5970	9640	20205	31680	38570	40405
2036-37	6265	10115	21195	33240	40465	42390
2037-38	6570	10615	22240	34880	42460	44485
2038-39	6895	11140	23340	36605	44560	46680
2039-40	7240	11690	24500	38415	46770	48995
2040-41	7600	12275	25715	40325	49095	51430

#### 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 2023-24 are shown in tables below.

**Table 5-17 : Toll Revenue Optimistic Scenario****(Rs. Crores)**

<b>Year</b>	<b>Toll at Plaza 30.500</b>	<b>Toll at Plaza 105.000</b>	<b>Total</b>
<b>2023-24</b>	100.46	75.98	<b>176.44</b>
<b>2024-25</b>	113.33	85.30	<b>198.62</b>
<b>2025-26</b>	126.31	94.78	<b>221.09</b>
<b>2026-27</b>	140.54	105.35	<b>245.88</b>
<b>2027-28</b>	157.57	117.16	<b>274.73</b>
<b>2028-29</b>	174.30	129.90	<b>304.20</b>
<b>2029-30</b>	193.93	143.79	<b>337.73</b>
<b>2030-31</b>	214.27	158.24	<b>372.52</b>
<b>2031-32</b>	237.23	174.94	<b>412.17</b>
<b>2032-33</b>	260.80	192.29	<b>453.09</b>
<b>2033-34</b>	287.58	212.00	<b>499.58</b>
<b>2034-35</b>	318.04	232.67	<b>550.71</b>
<b>2035-36</b>	349.81	255.72	<b>605.53</b>
<b>2036-37</b>	382.08	278.91	<b>661.00</b>
<b>2037-38</b>	418.97	304.45	<b>723.42</b>
<b>2038-39</b>	461.33	333.85	<b>795.18</b>
<b>2039-40</b>	505.72	366.51	<b>872.23</b>
<b>2040-41</b>	549.32	398.23	<b>947.55</b>

**Table 5-18 : Toll Revenue Pessimistic Scenario****(Rs. Crores)**

<b>Year</b>	<b>Toll at Plaza 30.500</b>	<b>Toll at Plaza 105.000</b>	<b>Total</b>
<b>2023-24</b>	100.46	75.98	<b>176.44</b>
<b>2024-25</b>	112.27	84.50	<b>196.77</b>
<b>2025-26</b>	123.93	93.04	<b>216.97</b>
<b>2026-27</b>	136.60	102.43	<b>239.03</b>
<b>2027-28</b>	151.71	112.85	<b>264.56</b>
<b>2028-29</b>	166.22	123.95	<b>290.17</b>
<b>2029-30</b>	183.26	135.88	<b>319.14</b>
<b>2030-31</b>	200.49	148.15	<b>348.64</b>
<b>2031-32</b>	219.90	162.20	<b>382.10</b>
<b>2032-33</b>	239.46	176.60	<b>416.05</b>
<b>2033-34</b>	261.48	192.81	<b>454.30</b>
<b>2034-35</b>	286.47	209.62	<b>496.09</b>
<b>2035-36</b>	312.02	228.17	<b>540.19</b>
<b>2036-37</b>	337.60	246.46	<b>584.06</b>
<b>2037-38</b>	366.66	266.47	<b>633.13</b>
<b>2038-39</b>	399.91	289.41	<b>689.32</b>
<b>2039-40</b>	434.13	314.77	<b>748.90</b>
<b>2040-41</b>	467.05	338.70	<b>805.75</b>

**Table 5-19 : Toll Revenue Most Likely Scenario****(Rs. Crores)**

<b>Year</b>	<b>Toll at Plaza 30.500</b>	<b>Toll at Plaza 105.000</b>	<b>Total</b>
<b>2023-24</b>	100.46	75.98	<b>176.44</b>
<b>2024-25</b>	112.83	84.88	<b>197.70</b>
<b>2025-26</b>	125.14	93.90	<b>219.04</b>
<b>2026-27</b>	138.60	103.87	<b>242.47</b>
<b>2027-28</b>	154.64	114.99	<b>269.63</b>
<b>2028-29</b>	170.25	126.87	<b>297.12</b>
<b>2029-30</b>	188.62	139.76	<b>328.38</b>
<b>2030-31</b>	207.41	153.15	<b>360.56</b>
<b>2031-32</b>	228.55	168.43	<b>396.98</b>
<b>2032-33</b>	250.08	184.30	<b>434.38</b>
<b>2033-34</b>	274.45	202.22	<b>476.67</b>
<b>2034-35</b>	302.01	220.86	<b>522.87</b>
<b>2035-36</b>	330.62	241.56	<b>572.18</b>
<b>2036-37</b>	359.42	262.12	<b>621.54</b>
<b>2037-38</b>	392.25	284.85	<b>677.10</b>
<b>2038-39</b>	429.90	310.85	<b>740.75</b>
<b>2039-40</b>	468.95	339.65	<b>808.60</b>
<b>2040-41</b>	506.96	367.27	<b>874.23</b>



## CHAPTER 6

### OPERATION AND MAINTENANCE

#### 6.1 Operation & Maintenance

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

The future cost of operation and maintenance is estimate on 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 is 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		
2023-24	12.45				0.07	0.04		16.82	Regular O & M
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

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
2035-36	16.88			3.21	0.07	0.04		48.61	Regular O & M
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 area and add value to development of 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 rate of 6-8% per annum.

The following can consider as major outcome of study.

- a) There is a good amount of tollable traffic running on 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 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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**PATHANKOT TO AMRITSAR SECTION OF NH-15**  
**(KM 6.082 TO 108.502)**  
**IN THE STATE OF PUNJAB**



**OCTOBER  
2023**



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



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**(KM 6.082 TO 108.502) IN THE STATE OF PUNJAB**

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



**OCTOBER 2023**

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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highways Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>NH</b>	- National Highway
<b>LHS</b>	- Left Hand Side		
<b>LGV</b>	- Light Goods Vehicle		
<b>MAV</b>	- Multi Axle Vehicle		
<b>MORTH</b>	- 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 has 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 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 period from April 2018 to September 2019 and was submitted in October 2018. A revised report was submitted with updated traffic of year 2018-19 in April 2019. Report was further updated with yearly traffic data of 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 plaza 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 September -2023 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 on 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 Six-monthly traffic data from April 2023 to September 2023.

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 Six-Monthly traffic data from April 2023 to September 2023.
- 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
		Six Monthly Data from April 23 to September 23	For April 23 to Sept 23	For April 23 to Sept 23	For April 23 to Sept 23	For April 23 to Sept 23
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
		Six Monthly Data from April 23 to	For April 23 to Sept 23	For April 23 to Sept 23	For April 23 to Sept 23	For April 23 to Sept 23

SR. NO	LOCATION	CTV	Single Journey Traffic	Return Pass Traffic	Monthly Pass Traffic	Local Traffic
		September 23				

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 September 2023 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	Average Daily Traffic April 2023 to Sept 2023
1	Car	8094	8916	9220	9402	5404	5888	6264
2	Minibus / LCV	999	992	881	804	660	383	339
3	Truck / Bus	1470	1343	1109	1063	738	1087	1137
4	Multi Axle	2940	2979	2450	2113	2013	2134	2133
5	Oversized Vehicles	604	22	17	32	16	10	6
	<b>Total</b>	<b>14107</b>	<b>14252</b>	<b>13677</b>	<b>13414</b>	<b>8831</b>	<b>9502</b>	<b>9878</b>

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	Average Daily Traffic April 2023 to Sept 2023
1	CAR	10428	11238	11271	11633	6284	8064	5183
2	Minibus/ LCV	578	598	574	587	496	248	201
3	Truck/Bus	840	849	841	845	395	892	967
4	Multi Axle	688	939	1177	1239	1181	1498	1497
5	Oversized Vehicles	479	26	8	15	62	8	4
	<b>Total</b>	<b>13013</b>	<b>13649</b>	<b>13870</b>	<b>14319</b>	<b>8418</b>	<b>10710</b>	<b>10851</b>

The above data was arrived at by applying standard trip frequencies to monthly passes and return journey tickets issued. Since the current data is for six months from April-2023 to September 2023 only, monsoon also has affected the project traffic in the current period, hence a suitable correction factor is applied for annual representation of this traffic.

## 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
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

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
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
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	9878	19807	2.01
	88.50	10851	18139	1.67

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 62% of total traffic at toll plaza location Km 16.00 while multi axle vehicles are 22% of total traffic. 12% of traffic is Truck /Bus while LCV traffic forms the balance 4%. Overall, about 38% of traffic is commercial in nature.

At toll plaza location Km 88.50 car traffic forms 63% of total traffic at toll plaza while multi axle and truck / bus are 12% and 7%. LCV volume is 3% of the total traffic. Overall, about 37% 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.) for April 23 to Sept 23
1	Single Journey	4255	4785	4574	4407	3786	4674	4644
2	Return Journey	5364	4648	4322	4236	1924	4676	5084
3	Monthly Pass	4488	4820	4781	4771	3121	152	150

A significant part of the traffic at KM 16.00 is monthly and return journey which is 2% and 51% 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.) for April 23 to Sept 23
1	Single Journey	2656	2858	3177	3616	3406	5021	4674
2	Return Journey	5352	5434	5620	5736	2332	5542	6042
3	Monthly Pass	5005	5360	5073	4967	2680	149	135

Now traffic data for the period April 2023 to September 2023 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 pattern 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 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 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 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, 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 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).

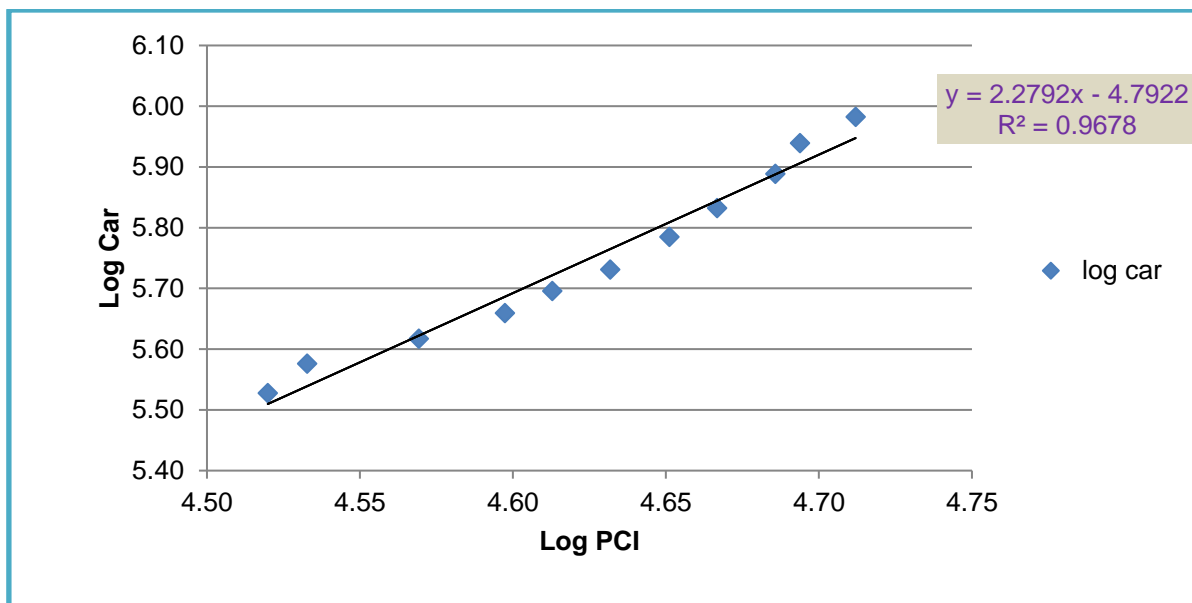
The following tables and graphs depict regression and elasticity of growth model.

**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.



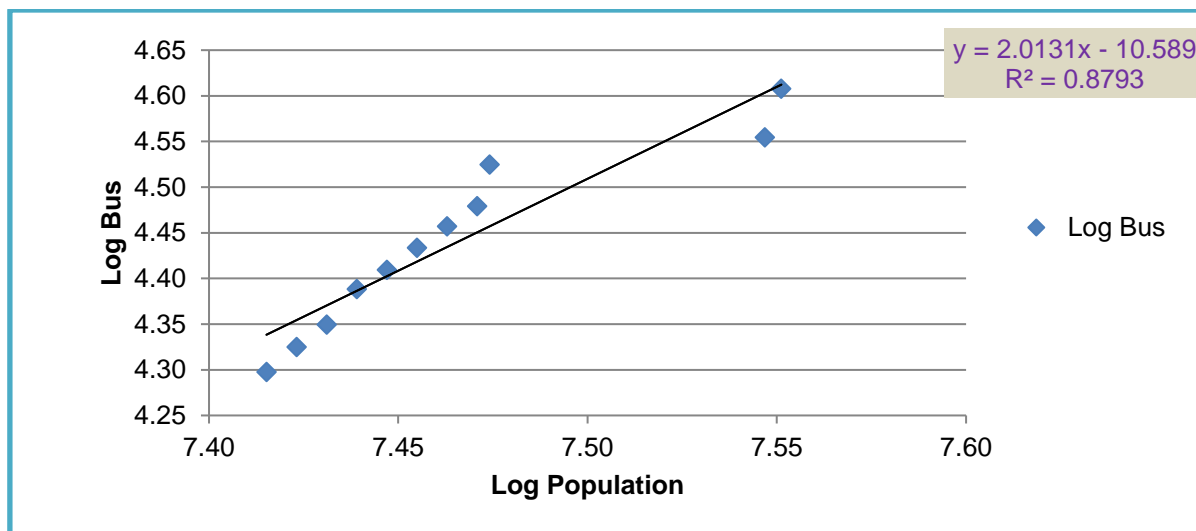


**Figure 3-1: Regression and Elasticity PCI vs. Car-Extrapolation**

**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.



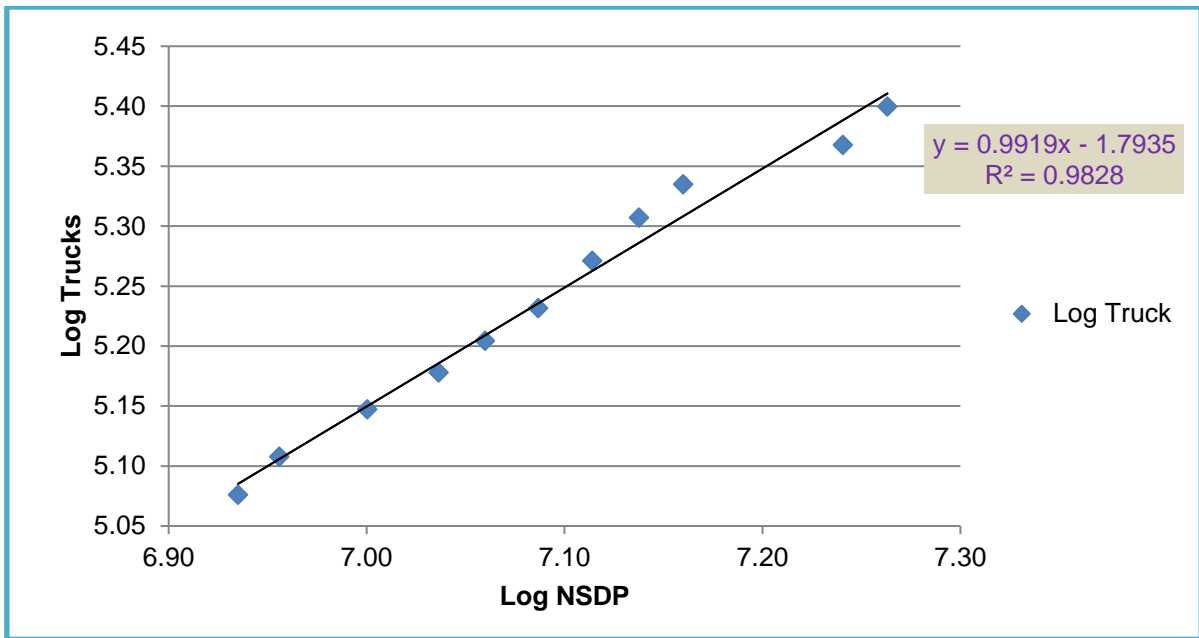
**Figure 3-2: Regression and Elasticity Population vs. Bus – Extrapolation**

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, 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 is available which is not sufficient to establish any credible trend. Moreover, due to ban on mining in area commercial traffic is temporarily affected. Lockdown for Corona Virus pandemic (COVID-19) disrupted project traffic in March 2020. Traffic for 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 project corridor has been taken from economic model.

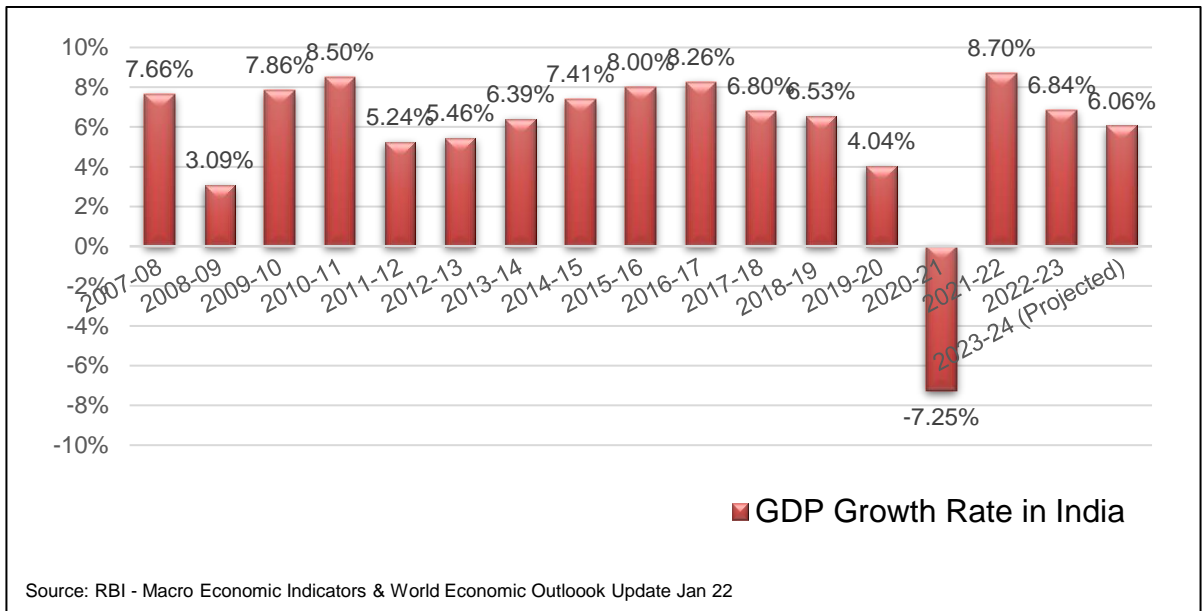
### **3.5 Other Factors Influencing Growth**

There are many factors which have 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 slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. Government took major policy decision 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 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. World Economic Outlook update also has predicted a growth rate of about 7.5 % in 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 under. 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 moderated 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, rate of growth diminishes. Same growth rate is not sustainable for long. It is an established practice to step down future growth rates at interval of 5 years.

The rate of growth is moderated 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, 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.

**Table 3-5 : Recommended Growth Rates Optimistic**

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

**Table 3-6 : Recommended Growth Rates Pessimistic**

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

**Table 3-7 : Recommended Growth Rates Most Likely**

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

## 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
2023-24	6264	339	1137	2133	6	9878	19807
2024-25	6756	361	1195	2290	6	10608	21215
2025-26	7285	384	1256	2460	6	11391	22726
2026-27	7855	408	1321	2642	6	12232	24346
2027-28	8391	430	1375	2811	6	13013	25838
2028-29	8964	454	1432	2990	6	13846	27423
2029-30	9577	478	1490	3181	6	14732	29106
2030-31	10231	504	1551	3385	6	15677	30900
2031-32	10930	531	1615	3602	6	16684	32808
2032-33	11568	555	1665	3797	6	17591	34509
2033-34	12243	579	1716	4002	6	18546	36296
2034-35	12958	605	1769	4218	6	19556	38181
2035-36	13714	631	1824	4446	6	20621	40167
2036-37	14515	659	1881	4686	6	21747	42261
2037-38	15290	686	1935	4927	6	22844	44323



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

Year	CAR	Minibus	Truck/Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2023-24	8183	201	967	1497	4	10851	18139
2024-25	8824	213	1017	1608	12	11674	19485
2025-26	9515	226	1069	1727	13	12550	20891
2026-27	10261	240	1123	1855	14	13493	22401
2027-28	10962	252	1170	1974	15	14373	23801
2028-29	11711	265	1219	2101	16	15312	25292
2029-30	12512	279	1269	2236	17	16313	26876
2030-31	13368	294	1321	2380	18	17381	28563
2031-32	14282	309	1375	2532	19	18517	30350
2032-33	15115	322	1417	2669	20	19543	31950
2033-34	15996	336	1461	2813	21	20627	33636
2034-35	16929	350	1508	2965	22	21774	35420
2035-36	17917	365	1555	3125	23	22985	37296
2036-37	18962	380	1604	3293	24	24263	39271
2037-38	19975	395	1651	3463	25	25509	41217

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
2023-24	6264	339	1137	2133	6	9878	19807
2024-25	6662	356	1178	2259	6	10461	20923
2025-26	7084	374	1220	2391	6	11075	22092
2026-27	7532	392	1264	2531	6	11725	23329
2027-28	7933	408	1298	2655	6	12300	24414
2028-29	8357	424	1333	2785	6	12905	25552
2029-30	8803	440	1368	2922	6	13539	26743
2030-31	9273	458	1403	3065	6	14205	27989
2031-32	9768	476	1440	3215	6	14905	29297
2032-33	10192	490	1463	3341	6	15492	30378
2033-34	10634	504	1486	3471	6	16101	31495
2034-35	11096	519	1509	3606	6	16736	32656
2035-36	11578	535	1533	3746	6	17398	33864
2036-37	12081	551	1557	3891	6	18086	35115
2037-38	12546	566	1578	4033	6	18729	36305

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

Year	CAR	Minibus	Truck/Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2023-24	8183	201	967	1497	4	10851	18139
2024-25	8701	210	1003	1586	12	11512	19216
2025-26	9253	220	1039	1679	13	12204	20314
2026-27	9839	230	1076	1777	14	12936	21472
2027-28	10364	239	1104	1864	15	13586	22490
2028-29	10917	248	1133	1956	16	14270	23562
2029-30	11499	257	1163	2051	17	14987	24680
2030-31	12114	267	1193	2152	18	15744	25859
2031-32	12761	277	1224	2257	19	16538	27091
2032-33	13316	285	1243	2345	20	17209	28115
2033-34	13894	293	1262	2437	21	17907	29181
2034-35	14497	301	1282	2532	22	18634	30288
2035-36	15126	310	1302	2630	23	19391	31436
2036-37	15783	319	1323	2732	24	20181	32633
2037-38	16390	327	1341	2831	25	20914	33756

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
2023-24	6264	339	1137	2133	6	9878	19807
2024-25	6724	359	1189	2281	6	10559	21121
2025-26	7217	381	1243	2438	6	11285	22516
2026-27	7746	403	1301	2607	6	12063	24012
2027-28	8237	423	1348	2761	6	12775	25367
2028-29	8759	443	1397	2923	6	13528	26795
2029-30	9314	465	1448	3095	6	14328	28310
2030-31	9905	487	1500	3277	6	15175	29909
2031-32	10534	511	1554	3470	6	16075	31605
2032-33	11096	531	1595	3640	6	16868	33085
2033-34	11689	551	1637	3819	6	17702	34639
2034-35	12312	573	1679	4006	6	18576	36263
2035-36	12968	595	1722	4202	6	19493	37963
2036-37	13660	619	1768	4408	6	20461	39756
2037-38	14321	641	1810	4614	6	21392	41503

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

Year	CAR	Minibus	Truck/Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU
2023-24	8183	201	967	1497	4	<b>10851</b>	<b>18139</b>
2024-25	8783	213	1011	1601	12	<b>11620</b>	<b>19394</b>
2025-26	9427	225	1058	1712	13	<b>12435</b>	<b>20701</b>
2026-27	10118	237	1107	1831	14	<b>13307</b>	<b>22097</b>
2027-28	10759	249	1148	1939	15	<b>14110</b>	<b>23370</b>
2028-29	11441	261	1189	2053	16	<b>14960</b>	<b>24710</b>
2029-30	12166	273	1231	2174	17	<b>15861</b>	<b>26128</b>
2030-31	12937	286	1275	2302	18	<b>16818</b>	<b>27631</b>
2031-32	13757	300	1322	2437	19	<b>17835</b>	<b>29225</b>
2032-33	14491	312	1358	2556	20	<b>18737</b>	<b>30625</b>
2033-34	15264	324	1394	2681	21	<b>19684</b>	<b>32091</b>
2034-35	16078	336	1431	2812	22	<b>20679</b>	<b>33628</b>
2035-36	16936	348	1468	2950	23	<b>21725</b>	<b>35241</b>
2036-37	17840	362	1506	3094	24	<b>22826</b>	<b>36932</b>
2037-38	18704	375	1542	3238	25	<b>23884</b>	<b>38576</b>

#### 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 under.

Target Date - 1<sup>st</sup> 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 concession period. Extension of concession period is worked out as per provisions of concession agreement. 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 in toll in the year FY17 for a period of 24 days, the Concessionaire would be entitled to extension of additional 24 days.

Traffic was severely impacted on project highway during 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. 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 provisions of Concession agreement, the Concessionaire is eligible for extension of concession period by 436 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 provisions of 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. Applicable discounted rate is 2/3 times the normal rate. Concessionaire has also issued 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)

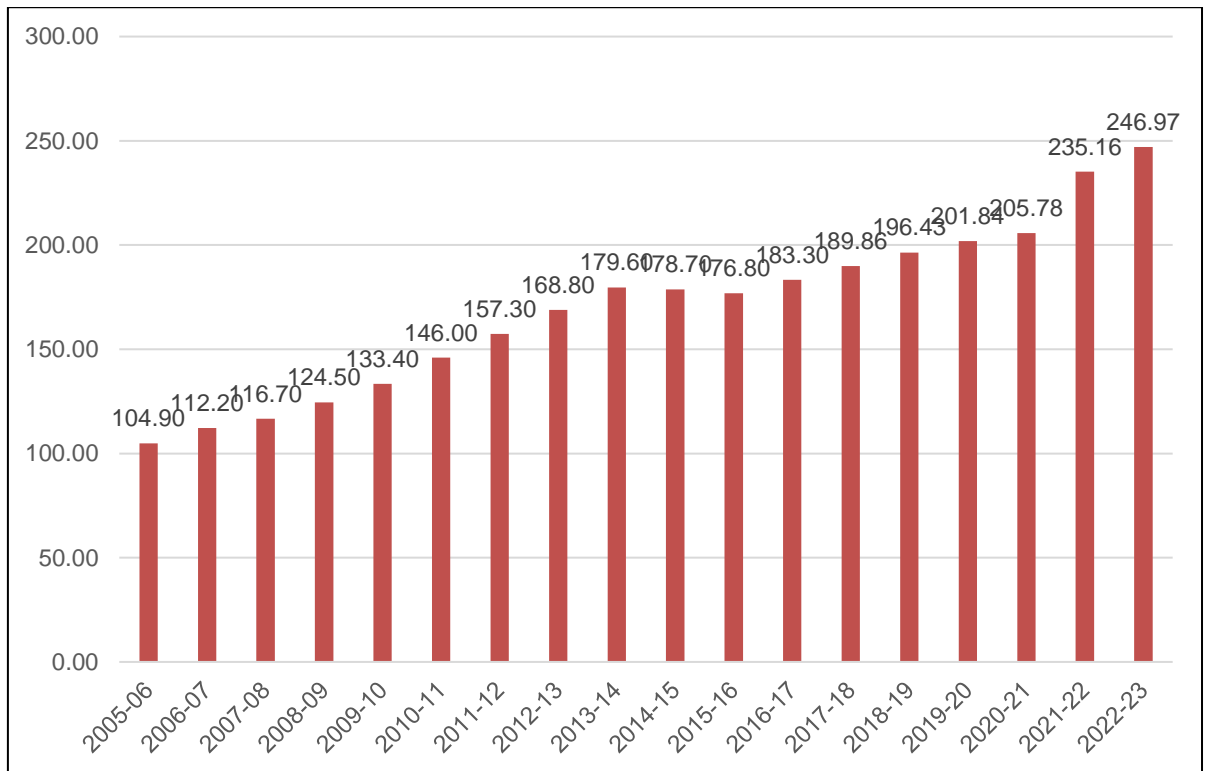
Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule R) as given under

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](http://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 year 2015-16 average inflation in WPI from year 2005-2021 is 5.24%. 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 number of bypasses and structures in each package. Equivalent length for structures is added to tollable length at each toll plaza. Bypasses having cost more than Rs. 50 Cr. are to be charged as per fee notification which provide incremental rate over basic rate for Rs. 15 Cr cost of bypass. 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
2023-24	130	200	200	410	410	620	805
2024-25	135	210	210	430	430	650	845
2025-26	145	220	220	450	450	685	890
2026-27	150	235	235	475	475	720	935
2027-28	160	245	245	500	500	755	980
2028-29	170	260	260	525	525	795	1030
2029-30	175	270	270	550	550	835	1085
2030-31	185	285	285	580	580	880	1140
2031-32	195	300	300	610	610	925	1200
2032-33	205	315	315	645	645	975	1265
2033-34	215	330	330	675	675	1025	1330
2034-35	225	350	350	710	710	1080	1400
2035-36	240	370	370	750	750	1140	1475
2036-37	250	390	390	790	790	1200	1555
2037-38	265	410	410	830	830	1260	1635

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

Year	CAR	Minibus	LCV	Truck	Bus	Multi axle	Oversized Vehicles
2023-24	195	300	300	615	615	930	1205
2024-25	205	315	315	645	645	980	1265
2025-26	215	335	335	675	675	1030	1330
2026-27	225	350	350	710	710	1080	1400
2027-28	240	370	370	750	750	1135	1470
2028-29	250	385	385	785	785	1195	1545
2029-30	265	405	405	830	830	1255	1625
2030-31	280	430	430	870	870	1320	1710
2031-32	290	450	450	915	915	1390	1800
2032-33	310	475	475	965	965	1460	1895
2033-34	325	500	500	1015	1015	1540	1995
2034-35	340	525	525	1070	1070	1620	2100
2035-36	360	555	555	1125	1125	1705	2210
2036-37	380	580	580	1185	1185	1795	2330
2037-38	400	615	615	1250	1250	1895	2455



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

Year	CAR
2023-24	330
2024-25	345
2025-26	365
2026-27	385
2027-28	405
2028-29	425
2029-30	445
2030-31	470
2031-32	495
2032-33	520
2033-34	545
2034-35	575
2035-36	605
2036-37	635
2037-38	670

**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
2023-24	4355	6700	13630	13630	20685	26805
2024-25	4575	7040	14325	14325	21730	28165
2025-26	4805	7400	15050	15050	22835	29595
2026-27	5050	7775	15820	15820	24005	31110
2027-28	5310	8175	16630	16630	25235	32705
2028-29	5585	8595	17490	17490	26530	34385
2029-30	5870	9040	18390	18390	27905	36165
2030-31	6175	9510	19345	19345	29350	38040
2031-32	6500	10005	20355	20355	30880	40025
2032-33	6840	10530	21420	21420	32495	42115
2033-34	7200	11085	22545	22545	34205	44330
2034-35	7580	11665	23735	23735	36010	46670
2035-36	7980	12285	24995	24995	37920	49145
2036-37	8405	12940	26320	26320	39935	51760
2037-38	8855	13630	27730	27730	42070	54525

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

Year	CAR	Minibus	LCV	Truck	Bus	Multi axle	Oversized Vehicles
2023-24	110	175	175	355	355	545	700
2024-25	120	185	185	375	375	575	735
2025-26	125	195	195	395	395	605	770
2026-27	130	205	205	415	415	635	810
2027-28	135	215	215	435	435	665	850
2028-29	145	225	225	460	460	700	895
2029-30	150	235	235	480	480	735	940
2030-31	160	250	250	505	505	775	990
2031-32	170	260	260	535	535	815	1040
2032-33	175	275	275	560	560	855	1095
2033-34	185	290	290	590	590	905	1155
2034-35	195	305	305	620	620	950	1215
2035-36	205	320	320	655	655	1000	1280
2036-37	215	335	335	690	690	1055	1350
2037-38	230	355	355	725	725	1110	1420

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

Year	CAR	Minibus	LCV	Truck	Bus	Multi axle	Oversized Vehicles
2023-24	170	260	260	535	535	820	1045
2024-25	175	275	275	565	565	860	1100
2025-26	185	290	290	590	590	905	1155
2026-27	195	305	305	620	620	950	1215
2027-28	205	320	320	655	655	1000	1275
2028-29	215	335	335	685	685	1050	1345
2029-30	225	355	355	725	725	1105	1415
2030-31	240	370	370	760	760	1160	1485
2031-32	250	390	390	800	800	1220	1565
2032-33	265	410	410	840	840	1285	1645
2033-34	280	435	435	885	885	1355	1730
2034-35	295	455	455	935	935	1425	1825
2035-36	310	480	480	980	980	1500	1920
2036-37	325	505	505	1035	1035	1580	2020
2037-38	345	530	530	1090	1090	1665	2130

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

Year	CAR
2023-24	330
2024-25	345

Year	CAR
2025-26	365
2026-27	385
2027-28	405
2028-29	425
2029-30	445
2030-31	470
2031-32	495
2032-33	520
2033-34	545
2034-35	575
2035-36	605
2036-37	635
2037-38	670

**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
2023-24	3745	5815	11905	11905	18190	23270
2024-25	3930	6110	12510	12510	19115	24450
2025-26	4130	6425	13145	13145	20085	25690
2026-27	4345	6750	13815	13815	21110	27005
2027-28	4565	7095	14525	14525	22195	28390
2028-29	4800	7460	15275	15275	23335	29850
2029-30	5050	7850	16060	16060	24545	31390
2030-31	5310	8255	16895	16895	25815	33020
2031-32	5590	8685	17775	17775	27160	34740
2032-33	5880	9140	18705	18705	28585	36560
2033-34	6190	9620	19690	19690	30085	38480
2034-35	6515	10130	20730	20730	31675	40510
2035-36	6860	10665	21825	21825	33350	42660
2036-37	7225	11230	22990	22990	35125	44930
2037-38	7615	11830	24215	24215	37005	47330

#### 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. Current report is updated with traffic data made available by Concessionaire from April 2023 to September 2023.

## 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)**

<b>Year</b>	<b>Toll at Plaza 16.00</b>	<b>Toll at Plaza 88.50</b>	<b>Total</b>
<b>2023-24</b>	89.18	70.23	<b>159.41</b>
<b>2024-25</b>	98.51	78.22	<b>176.73</b>
<b>2025-26</b>	109.65	86.91	<b>196.56</b>
<b>2026-27</b>	121.49	96.27	<b>217.76</b>
<b>2027-28</b>	134.45	105.98	<b>240.43</b>
<b>2028-29</b>	147.64	116.84	<b>264.48</b>
<b>2029-30</b>	162.00	128.11	<b>290.11</b>
<b>2030-31</b>	178.75	142.01	<b>320.76</b>
<b>2031-32</b>	196.99	156.89	<b>353.88</b>
<b>2032-33</b>	214.97	170.07	<b>385.04</b>
<b>2033-34</b>	234.19	186.55	<b>420.73</b>
<b>2034-35</b>	255.17	203.64	<b>458.81</b>
<b>2035-36</b>	280.54	222.96	<b>503.50</b>
<b>2036-37</b>	305.07	242.85	<b>547.93</b>
<b>2037-38</b>	332.17	265.83	<b>598.00</b>

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

<b>Year</b>	<b>Toll at Plaza 16.00</b>	<b>Toll at Plaza 88.50</b>	<b>Total</b>
<b>2023-24</b>	89.18	70.23	<b>159.41</b>
<b>2024-25</b>	99.85	79.33	<b>179.18</b>
<b>2025-26</b>	112.82	89.35	<b>202.17</b>
<b>2026-27</b>	126.78	100.42	<b>227.20</b>
<b>2027-28</b>	142.28	112.13	<b>254.41</b>
<b>2028-29</b>	158.42	125.43	<b>283.84</b>
<b>2029-30</b>	176.24	139.51	<b>315.76</b>
<b>2030-31</b>	197.32	156.84	<b>354.16</b>
<b>2031-32</b>	220.59	175.79	<b>396.38</b>
<b>2032-33</b>	244.20	193.36	<b>437.56</b>
<b>2033-34</b>	269.84	215.16	<b>485.00</b>
<b>2034-35</b>	298.29	238.29	<b>536.58</b>
<b>2035-36</b>	332.67	264.69	<b>597.36</b>
<b>2036-37</b>	367.03	292.37	<b>659.39</b>
<b>2037-38</b>	405.36	324.74	<b>730.09</b>

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

<b>Year</b>	<b>Toll at Plaza 16.00</b>	<b>Toll at Plaza 88.50</b>	<b>Total</b>
<b>2023-24</b>	89.18	70.23	<b>159.41</b>
<b>2024-25</b>	99.44	78.97	<b>178.40</b>
<b>2025-26</b>	111.77	88.59	<b>200.36</b>
<b>2026-27</b>	125.01	99.09	<b>224.10</b>
<b>2027-28</b>	139.68	110.15	<b>249.83</b>
<b>2028-29</b>	154.75	122.58	<b>277.33</b>
<b>2029-30</b>	171.37	135.73	<b>307.10</b>
<b>2030-31</b>	190.89	151.88	<b>342.78</b>
<b>2031-32</b>	212.30	169.41	<b>381.71</b>
<b>2032-33</b>	233.94	185.48	<b>419.42</b>
<b>2033-34</b>	257.31	205.40	<b>462.72</b>
<b>2034-35</b>	283.08	226.36	<b>509.43</b>
<b>2035-36</b>	314.19	250.20	<b>564.39</b>
<b>2036-37</b>	345.04	275.08	<b>620.12</b>
<b>2037-38</b>	379.33	304.09	<b>683.42</b>

## CHAPTER 6

### OPERATION & MAINTENANCE COST

#### 6.1 General

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

The future cost of operation and maintenance is estimated on 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 few sections. This operation and its cost is 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		
2023-24	19.12				0.06	0.94	25.68	Regular O & M
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 area and add value to development of region. All these developments have potential to give a positive impact to traffic flow on 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 traffic growth @ 6-8% 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 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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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highways Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- 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 3<sup>rd</sup> September 2010 to 2<sup>nd</sup> 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 of year 2016-17 and report was submitted in October 2017. 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 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 September 2023 this report is updated with this six-monthly 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 on 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 Six-monthly traffic data from April 2023 to September 2023.
- 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**

<b>SR. NO</b>	<b>LOCATION</b>	<b>CTV</b>	<b>Single Journey Traffic</b>	<b>Return Journey Traffic</b>	<b>Monthly Pass Traffic</b>	<b>Local Traffic</b>
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
		Six Monthly Data from April 23 to September 23	For April 23 to Sept 23	For April 23 to Sept 23	For April 23 to Sept 23	For April 23 to Sept 23

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

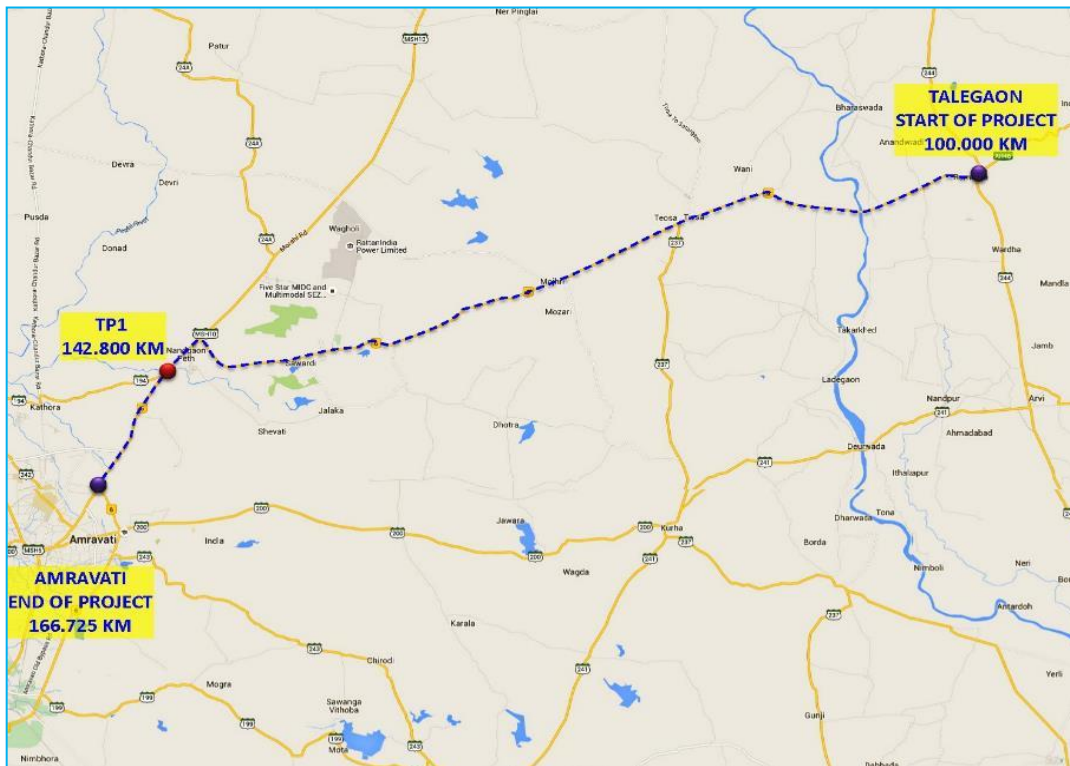


Figure 2-1: Toll Plaza Location

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 project highway is currently under toll operation, the data collected is corresponding to category of tollable vehicles. The 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 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 September 2023 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	Average Daily Traffic April 2023 to Sept 2023
1	Car	6738	7407	7090	5937	6173	6650
2	Minibus/ LCV	1511	1408	1217	620	547	513
3	Truck/Bus	1421	1623	1374	1340	1661	1666
4	Multi Axle	2285	2173	2297	2327	2239	2038
5	Oversized Vehicles	2	4	4	7	9	8
	<b>Total</b>	<b>11957</b>	<b>12616</b>	<b>11981</b>	<b>10231</b>	<b>10629</b>	<b>10875</b>

The above data was arrived at by applying standard trip frequencies to monthly passes and return journey tickets issued. Due to construction of Nagpur Metro traffic is negatively impacted as there is restriction on entry of traffic in Nagpur which has direct lining with project traffic. It is expected that Nagpur Metro would be completed soon, and the traffic will increase on project stretch Since the current data is for six months from April-2023 to September 2023 only, monsoon also has affected the project traffic in the current period, hence a suitable correction factor is applied for annual representation of this traffic.

## 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**

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

Period	Toll Plaza Location	Traffic No	PCU	PCU Index
FY 2022-23	142.800 (Nandgaon Peth)	10629	22092	2.08
FY 2023-24	142.800 (Nandgaon Peth)	10875	21624	1.99

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 September 2023 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 category. on base year 2015-16, 2016-17, 2017-18, 2018-19, 2019-20, 2020-21, 2021-22 ,2022-23 and from April 2023 to September 2023 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 April 23 to Sept 23
1	Single Journey	5285	5513	6647	5828	5594	5447
2	Return Journey	3514	3341	1906	4274	4906	5284
3	Monthly Pass	3158	3761	3428	129	129	144

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 – Par 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 car 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).

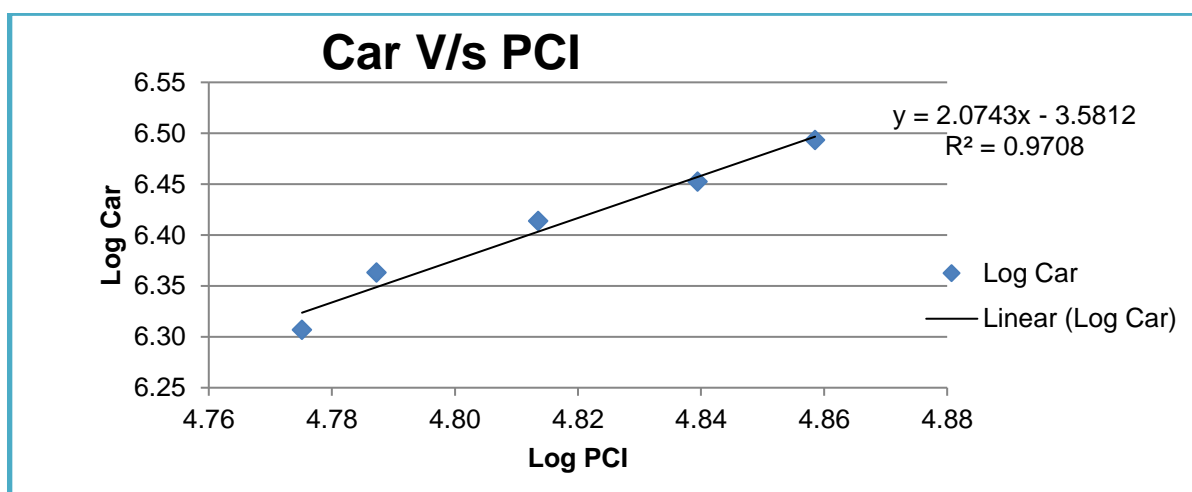
The following tables and graphs depict regression and elasticity of growth model.



**Table 3-1 : Per Capita Income Vs Car**

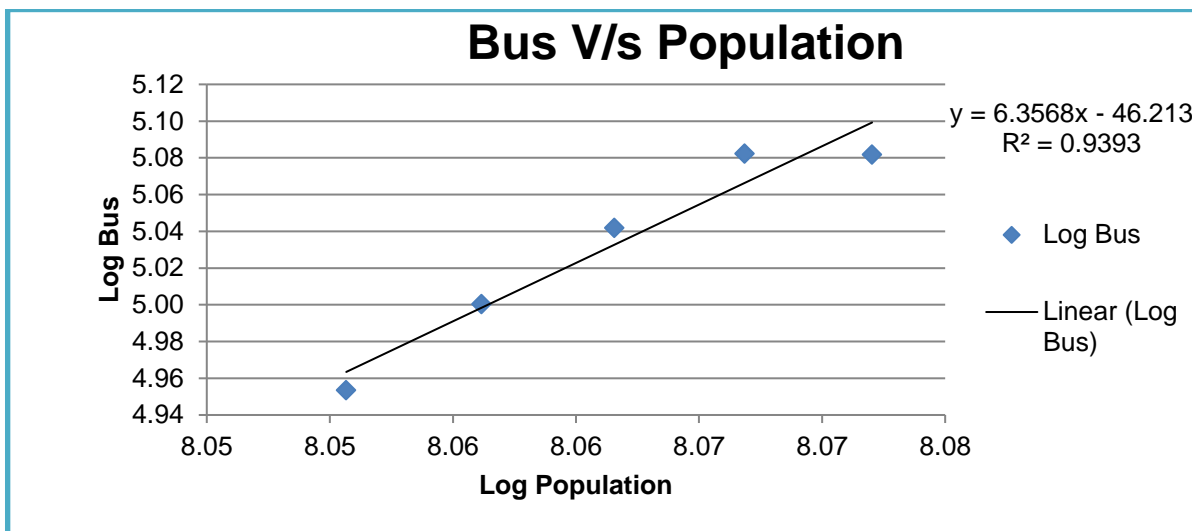
Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2011	59587	2027080	4.78	6.31		
2012	61276	2307841	4.79	6.36	3%	
2013	65095	2592565	4.81	6.41	6%	
2014	69097	2834847	4.84	6.45	6%	
2015	72200	3113773	4.86	6.49	4%	4.9%

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.



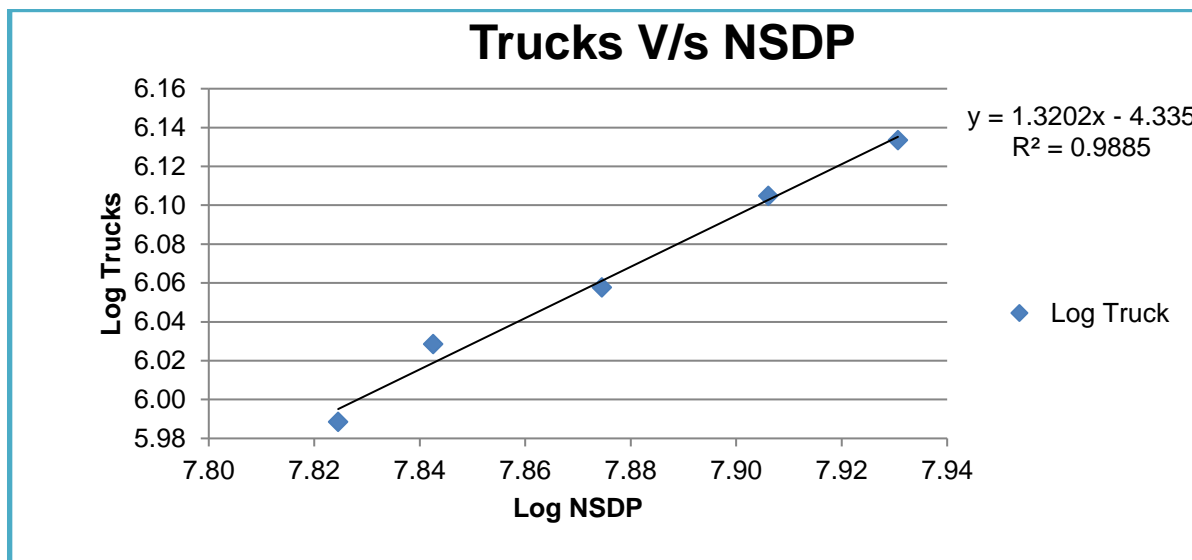
**Figure 3-2: Regression and Elasticity Population vs. Bus – Extrapolation**

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 NSDP	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	Average Daily Traffic April 2023 to Sept 2023
1	Car	6738	7407	7090	5937	6173	6650
2	LCV/Minibus	1511	1408	1217	620	547	513
3	Bus/Truck	1421	1623	1374	1340	1661	1666
4	Mav	2285	2173	2297	2327	2239	2038
5	OSV	2	4	4	7	9	8
	<b>Total</b>	<b>11957</b>	<b>12616</b>	<b>11981</b>	<b>10231</b>	<b>10629</b>	<b>10875</b>

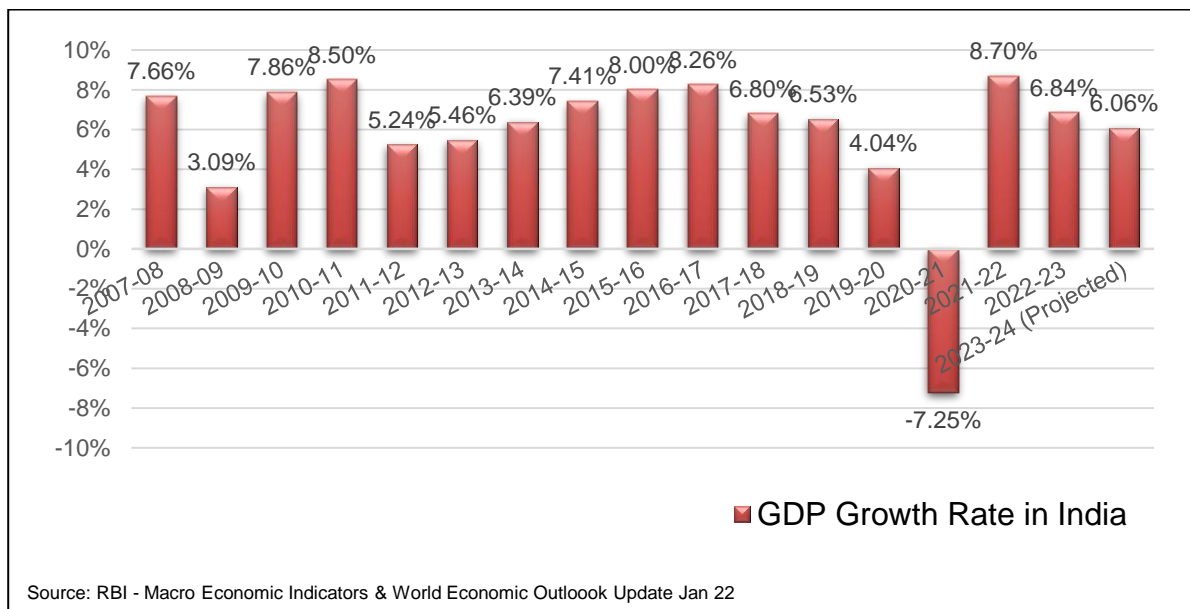
### 3.5 Other Factors Influencing Growth

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 under. The rate of growth is moderated 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, rate of growth diminishes. Same growth rate is not sustainable for long. It is established practice to stepdown 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%

<b>Year/ Vehicle Type</b>	<b>2021-2023</b>	<b>2023-2026</b>	<b>2026-2031</b>	<b>2031-2036</b>	<b>2036-2041</b>	<b>2041-2046</b>
Truck / Bus	6.17%	6.17%	5.59%	5.28%	4.71%	4.15%
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%

## 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)
2023-24	6650	513	1666	2038	8	10875	21624
2024-25	7084	541	1773	2169	8	11575	23011
2025-26	7517	568	1876	2295	8	12264	24361
2026-27	7976	597	1985	2429	8	12995	25793
2027-28	8463	627	2100	2570	8	13768	27305
2028-29	8979	658	2222	2720	8	14587	28908
2029-30	9528	691	2351	2879	8	15457	30609
2030-31	10065	724	2480	3038	8	16315	32298
2031-32	10632	758	2617	3206	8	17221	34083
2032-33	11231	794	2762	3383	8	18178	35968
2033-34	11863	832	2915	3570	8	19188	37957
2034-35	12531	872	3076	3768	8	20255	40059



Year	CAR	Minibus /LCV	Truck/ Bus	Multi axle	Oversized Vehicles	Total No.	Total PCU (Including Non-Paid Traffic)
2035-36	13185	910	3229	3955	8	21287	42071
2036-37	13873	950	3389	4152	8	22372	44185
2037-38	14597	992	3557	4358	8	23512	46403

**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)
2023-24	6650	513	1666	2038	8	10875	21624
2024-25	7051	539	1765	2158	8	11521	22902
2025-26	7446	564	1859	2273	8	12150	24134
2026-27	7863	589	1957	2394	8	12811	25427
2027-28	8304	616	2061	2521	8	13510	26792
2028-29	8769	644	2171	2655	8	14247	28232
2029-30	9261	673	2287	2796	8	15025	29750
2030-31	9737	702	2402	2936	8	15785	31244
2031-32	10236	731	2522	3083	8	16580	32808
2032-33	10762	762	2649	3238	8	17419	34459
2033-34	11314	794	2782	3400	8	18298	36187
2034-35	11896	828	2921	3571	8	19224	38007
2035-36	12457	861	3051	3730	8	20107	39723
2036-37	13044	895	3187	3896	8	21030	41516
2037-38	13659	930	3329	4070	8	21996	43392

**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)
2023-24	6650	513	1666	2038	8	10875	21624
2024-25	7068	541	1769	2164	8	11550	22961
2025-26	7481	566	1867	2285	8	12207	24250
2026-27	7919	593	1971	2412	8	12903	25612
2027-28	8382	621	2081	2546	8	13638	27050
2028-29	8873	650	2197	2688	8	14416	28571
2029-30	9392	681	2319	2838	8	15238	30178
2030-31	9898	712	2441	2987	8	16046	31767
2031-32	10431	744	2570	3145	8	16898	33446
2032-33	10993	777	2705	3311	8	17794	35209
2033-34	11585	812	2848	3485	8	18738	37066
2034-35	12209	848	2998	3669	8	19732	39022
2035-36	12816	884	3139	3842	8	20689	40884
2036-37	13453	921	3286	4023	8	21691	42832
2037-38	14121	959	3441	4212	8	22741	44873

#### 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 - 1<sup>st</sup> 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 –

<b>Scenario</b>	<b>Projected Traffic in PCUs (average of traffic on target date, one year before target date and one year after target date)</b>	<b>Expected extension in Concession Period</b>
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.

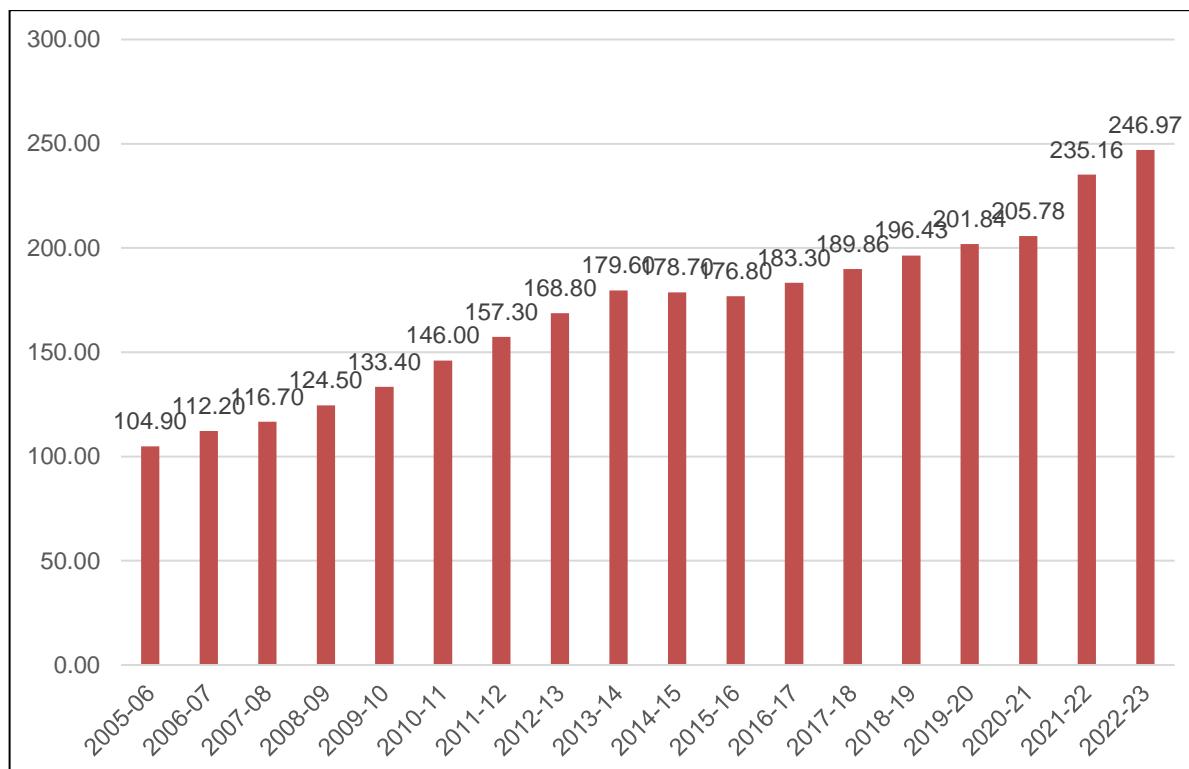
Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule R) as given under

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](http://www.eaindustry.nic.in)). WPI for year 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 year 2015-16 average inflation in WPI from year 2005-2023 is 5.23%. 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 2018-19.

Amravati bypass qualifies for adding to toll rate since its cost is more than 10 Cr. There is not structure in 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	<b>22</b>
LCV	7.50	1.50	<b>33</b>
Bus	15.00	3.00	<b>66</b>
2-axle	15.00	3.00	<b>66</b>
3 - Axle	22.00	4.50	<b>98.5</b>
Multi Axle	30.00	6.00	<b>132</b>

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**

<b>Year</b>	<b>CAR</b>	<b>LCV</b>	<b>Truck / Bus</b>	<b>Multi Axle</b>	<b>Oversized Vehicles</b>
<b>2023-24</b>	120	185	385	590	745
<b>2024-25</b>	125	195	405	620	785
<b>2025-26</b>	130	205	425	650	825
<b>2026-27</b>	140	215	445	685	865
<b>2027-28</b>	145	230	470	720	910
<b>2028-29</b>	150	240	490	755	955
<b>2029-30</b>	160	250	515	790	1000
<b>2030-31</b>	165	260	540	830	1050
<b>2031-32</b>	175	275	565	870	1100
<b>2032-33</b>	185	290	595	915	1155
<b>2033-34</b>	195	300	620	960	1210
<b>2034-35</b>	200	315	655	1005	1270
<b>2035-36</b>	210	335	685	1055	1330
<b>2036-37</b>	220	350	720	1105	1395
<b>2037-38</b>	235	365	755	1160	1465

**Table 5-4 : Toll Rates for Return Journey @ KM 142.800**

<b>Year</b>	<b>CAR</b>	<b>LCV</b>	<b>Truck / Bus</b>	<b>HCM /EME/ MAV</b>	<b>Oversized Vehicles</b>
<b>2023-24</b>	180	280	575	885	1120
<b>2024-25</b>	185	295	605	930	1175
<b>2025-26</b>	195	310	635	980	1235
<b>2026-27</b>	205	325	670	1030	1300
<b>2027-28</b>	220	340	700	1080	1365
<b>2028-29</b>	230	360	735	1135	1430
<b>2029-30</b>	240	375	770	1190	1500
<b>2030-31</b>	250	395	810	1245	1575
<b>2031-32</b>	265	410	850	1305	1650
<b>2032-33</b>	275	430	890	1370	1730
<b>2033-34</b>	290	455	935	1435	1815
<b>2034-35</b>	305	475	980	1505	1900
<b>2035-36</b>	320	500	1025	1580	1995
<b>2036-37</b>	335	525	1075	1660	2095
<b>2037-38</b>	350	550	1130	1740	2195



**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
<b>2023-24</b>	330	2075	3895	3965	6215	12795	19700	24865
<b>2024-25</b>	345	2180	4090	4165	6530	13445	20695	26125
<b>2025-26</b>	365	2290	4295	4375	6865	14125	21750	27455
<b>2026-27</b>	385	2405	4510	4600	7215	14850	22860	28860
<b>2027-28</b>	405	2525	4735	4835	7585	15610	24030	30335
<b>2028-29</b>	420	2640	4950	5070	7950	16360	25190	31800
<b>2029-30</b>	440	2760	5175	5315	8335	17150	26405	33335
<b>2030-31</b>	465	2885	5410	5570	8735	17985	27685	34950
<b>2031-32</b>	485	3015	5655	5840	9160	18855	29030	36645
<b>2032-33</b>	510	3150	5910	6125	9605	19775	30440	38430
<b>2033-34</b>	535	3290	6175	6425	10075	20740	31925	40305
<b>2034-35</b>	560	3440	6455	6740	10570	21750	33485	42275
<b>2035-36</b>	590	3595	6745	7070	11085	22820	35130	44345
<b>2036-37</b>	620	3755	7050	7415	11630	23940	36855	46530
<b>2037-38</b>	650	3925	7365	7780	12205	25120	38675	48820

\* 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 2023-24 are shown in tables below.

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

<b>Year</b>	<b>Toll at Plaza 142.800</b>	<b>Total</b>
<b>2023-24</b>	90.40	<b>90.40</b>
<b>2024-25</b>	100.41	<b>100.41</b>
<b>2025-26</b>	111.47	<b>111.47</b>
<b>2026-27</b>	124.55	<b>124.55</b>
<b>2027-28</b>	139.12	<b>139.12</b>
<b>2028-29</b>	153.59	<b>153.59</b>
<b>2029-30</b>	170.62	<b>170.62</b>
<b>2030-31</b>	188.37	<b>188.37</b>
<b>2031-32</b>	209.59	<b>209.59</b>
<b>2032-33</b>	231.59	<b>231.59</b>
<b>2033-34</b>	256.51	<b>256.51</b>
<b>2034-35</b>	283.23	<b>283.23</b>
<b>2035-36</b>	312.89	<b>312.89</b>
<b>2036-37</b>	343.47	<b>343.47</b>
<b>2037-38</b>	379.18	<b>379.18</b>

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

<b>Year</b>	<b>Toll at Plaza 142.800</b>	<b>Total</b>
<b>2023-24</b>	90.40	<b>90.40</b>
<b>2024-25</b>	99.92	<b>99.92</b>
<b>2025-26</b>	110.45	<b>110.45</b>
<b>2026-27</b>	122.80	<b>122.80</b>
<b>2027-28</b>	136.55	<b>136.55</b>
<b>2028-29</b>	150.08	<b>150.08</b>
<b>2029-30</b>	165.96	<b>165.96</b>
<b>2030-31</b>	182.36	<b>182.36</b>
<b>2031-32</b>	201.89	<b>201.89</b>
<b>2032-33</b>	222.04	<b>222.04</b>
<b>2033-34</b>	244.73	<b>244.73</b>
<b>2034-35</b>	268.93	<b>268.93</b>
<b>2035-36</b>	295.65	<b>295.65</b>
<b>2036-37</b>	323.01	<b>323.01</b>
<b>2037-38</b>	354.84	<b>354.84</b>

**Table 5-8 : Toll Revenue Most Likely Scenario**  
(Rs. Crores)

<b>Year</b>	<b>Toll at Plaza 142.800</b>	<b>Total</b>
<b>2023-24</b>	90.40	<b>90.40</b>
<b>2024-25</b>	100.16	<b>100.16</b>
<b>2025-26</b>	110.94	<b>110.94</b>
<b>2026-27</b>	123.67	<b>123.67</b>
<b>2027-28</b>	137.84	<b>137.84</b>
<b>2028-29</b>	151.88	<b>151.88</b>
<b>2029-30</b>	168.27	<b>168.27</b>
<b>2030-31</b>	185.33	<b>185.33</b>
<b>2031-32</b>	205.71	<b>205.71</b>
<b>2032-33</b>	226.76	<b>226.76</b>
<b>2033-34</b>	250.51	<b>250.51</b>
<b>2034-35</b>	275.92	<b>275.92</b>
<b>2035-36</b>	304.09	<b>304.09</b>
<b>2036-37</b>	333.02	<b>333.02</b>
<b>2037-38</b>	366.70	<b>366.70</b>

## 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		
2023-24	12.45				0.02	0.59		16.66	Regular O & M
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.
- 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 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)



**OCTOBER 2023**



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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  
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(FINAL)**



**OCTOBER 2023**

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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highways Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- 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 4<sup>th</sup>, 2011 to June 3<sup>rd</sup>, 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 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. 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 September 2023 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 Six-monthly traffic data from April 2023 to September 2023.
- 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.

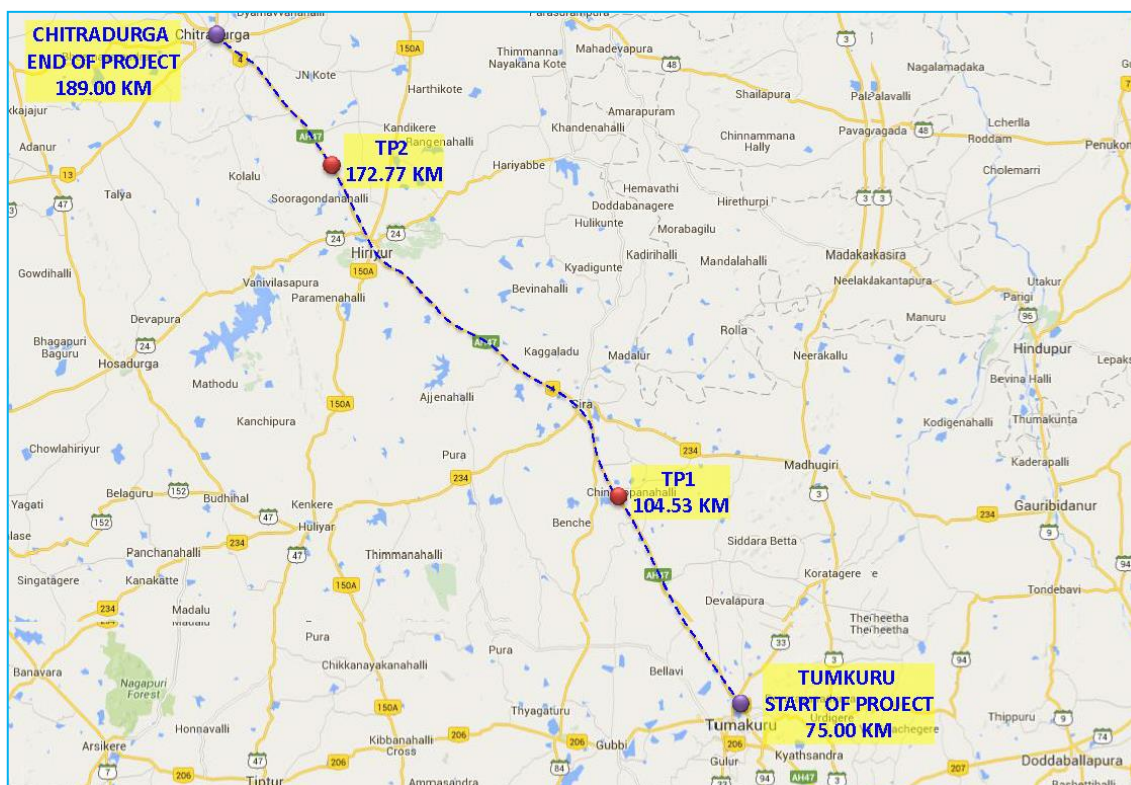
Table 2-1 below lists provides details of locations from where traffic details have been collected.

**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
		Six Monthly Data from April 23 to September 23	For April 23 to Sept 23	For April 23 to Sept 23	For April 23 to Sept 23	For April 23 to Sept 23
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
		Six Monthly Data from April 23 to September 23	For April 23 to Sept 23	For April 23 to Sept 23	For April 23 to Sept 23	For April 23 to Sept 23

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 is corresponding to 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. Component 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 September 2023 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	Average Daily Traffic April 2023 to Sept 2023
1	CAR	5244	5560	7633	11046	12943	13640
2	LCV	2918	2752	2652	2006	2079	2167
3	Truck/Bus	3157	3167	2631	3423	4395	4942
4	HCM /EME/ MAV	5748	5033	4968	5831	6359	6421
5	Oversized Vehicles	31	37	14	15	25	349
	<b>Total</b>	<b>17099</b>	<b>16548</b>	<b>17898</b>	<b>22322</b>	<b>25801</b>	<b>27519</b>

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	Average Daily Traffic April 2023 to Sept 2023
1	CAR	6855	7664	10224	8597	10272	11114
2	LCV	3401	3237	3103	1803	1916	1994
3	Truck/Bus	3888	3896	3133	3005	3912	4369
4	HCM /EME/ MAV	6656	5833	5617	5305	5811	5905

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	Average Daily Traffic April 2023 to Sept 2023
5	Oversized Vehicles	35	45	18	15	31	232
	<b>Total</b>	<b>20834</b>	<b>20675</b>	<b>22094</b>	<b>18725</b>	<b>21942</b>	<b>23614</b>

The above data was arrived at by applying standard trip frequencies to monthly passes and return journey tickets issued. Since the current data is for six months from April-2023 to September 2023 only, monsoon also has affected the project traffic in the current period, hence a suitable correction factor is applied for annual representation of this traffic.

## 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 Toll Plazas**

Toll Plaza Location	Period	Traffic No	PCU	PCU Index
<b>172.770</b>	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	27519	62182	2.26
<b>104.530</b>	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	23614	54828	2.32

It can be observed from the above that project traffic has a PCU index near 2.5 which indicates 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 September 2023 have been considered as the base numbers.

It is observed that at Toll KM 172.770 Car traffic forms 50% of total traffic while HCM / EME / MAV comprises 23% of total traffic. Overall, about 50% of traffic is commercial in nature, and at Toll KM 104.530 Car traffic forms 47% of total traffic while HCM / EME / MAV comprises 25% of total traffic. Overall, about 53% 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 April 23 to Sept 23
1	Single Journey	13370	12845	14512	15558	18017	19122
2	Return Journey	3332	3356	3074	6724	7740	8352
3	Local Single Journey	185	128	150	18	22	25
4	Monthly Pass	212	219	162	22	22	20

A significant part of the traffic at KM 172.770 is single journey (70%) followed by return journey (30%) 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 April 23 to Sept 23
1	Single Journey	15053	14807	16990	13821	16220	17392
2	Return Journey	4820	4910	4456	4782	5632	6144
3	Local Single Journey	387	385	316	65	73	63
4	Monthly Pass	574	573	332	57	15	15

A significant part of the traffic at KM 104.530 is single journey (74%) followed by return journey (26%) 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 pattern 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 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 – Par 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 car and bus (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).

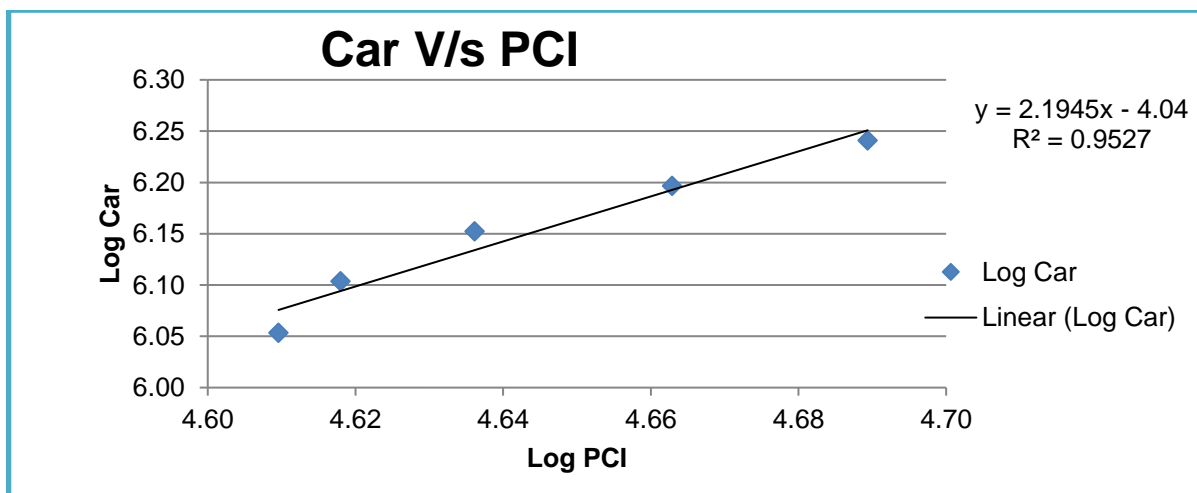


The following tables and graphs depict regression and elasticity of growth model.

**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.



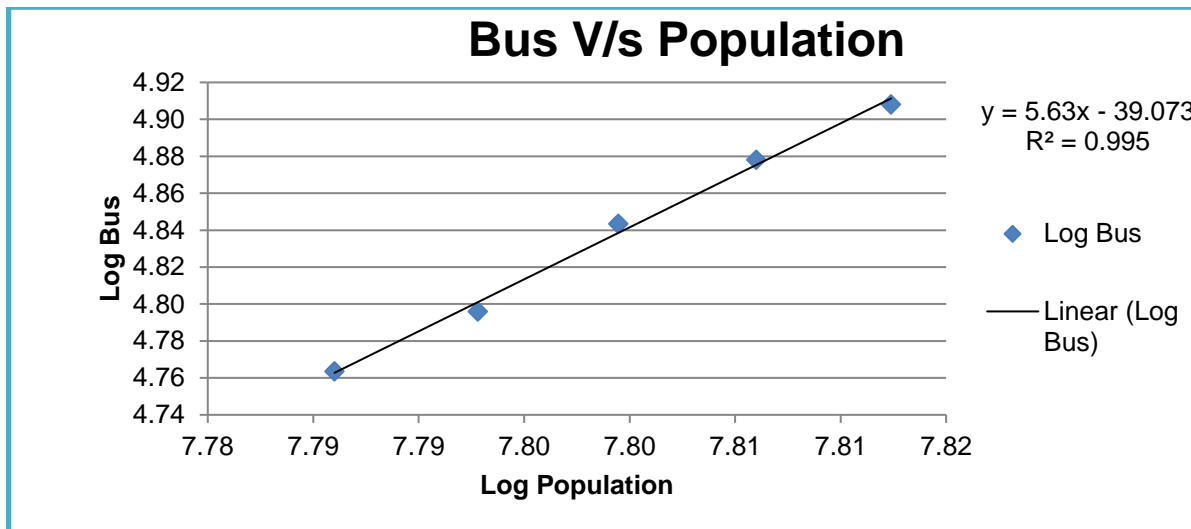
**Figure 3-1: Regression and Elasticity PCI vs. Car-Extrapolation**

**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%	

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2015	64921845	80911	7.81	4.91	1%	1.53%

Regression analysis of population Vs. Bus Traffic is presented in figure below.



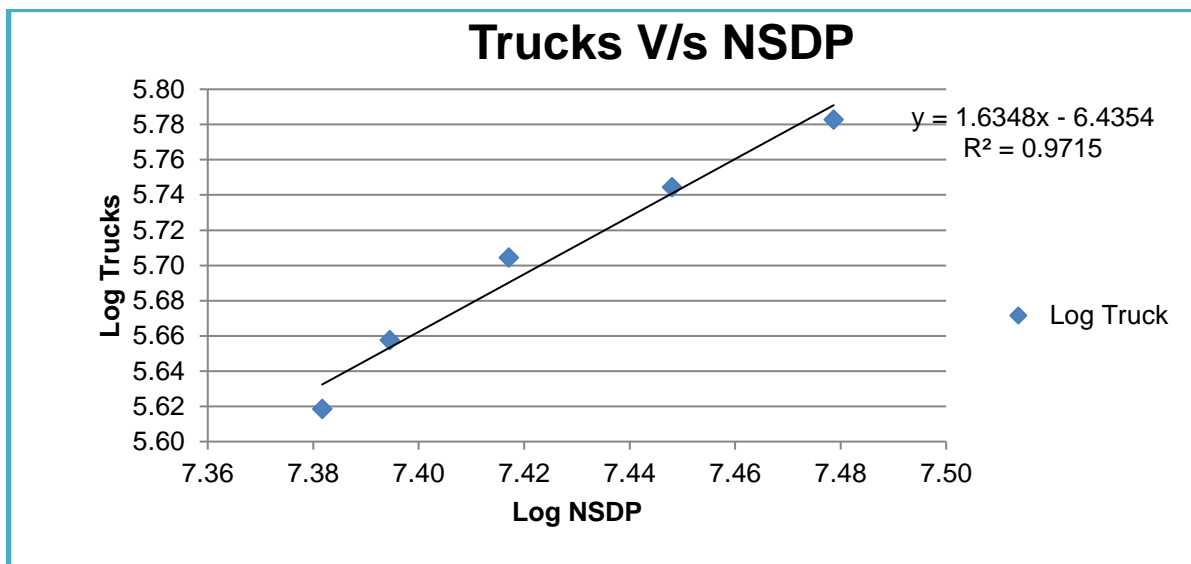
**Figure 3-2: Regression and Elasticity Population vs. Bus – Extrapolation**

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 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.

- Traffic Numbers provided in Contract document pertaining to year 2008.
- Traffic Numbers provided in Report of Lea Associates pertaining to year 2010.
- Traffic Numbers provided in by concessionaire pertaining to year 2016 to year upto March 2023

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	11114
LCV	493	1462	2581	2999	3401	3237	3103	1803	1916	1994
Truck/ Bus	9211	4386	3727	3743	3888	3896	3133	3005	3912	4369
HCM /EME/ MAV	524	5498	6140	6464	6656	5833	5617	5305	5811	5905
Oversized Vehicle	0	0	130	43	35	45	18	15	31	232

Location	Year									
<b>Total</b>	<b>12799</b>	<b>14407</b>	<b>18782</b>	<b>19826</b>	<b>20834</b>	<b>20675</b>	<b>22094</b>	<b>18725</b>	<b>21942</b>	<b>23614</b>

*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	13640
LCV	385	1475	2237	2514	2918	2752	2652	2006	2079	2167
Truck/Bus	7907	9628	2976	3066	3157	3167	2631	3423	4395	4942
HCM /EME/ MAV	524	564	5365	5563	5748	5033	4968	5831	6359	6421
Oversized Vehicles	0	0	80	46	31	37	14	15	25	349
<b>Total</b>	<b>10480</b>	<b>14023</b>	<b>15460</b>	<b>16451</b>	<b>17099</b>	<b>16548</b>	<b>17898</b>	<b>22322</b>	<b>25801</b>	<b>27519</b>

Traffic on the project stretch was affected due to COVID-19 lockdown announced by central government in March-2020. Traffic was further affected by subsequent second and third waves as well in the year 2021-22. Hence the same is not considered for historical growth.

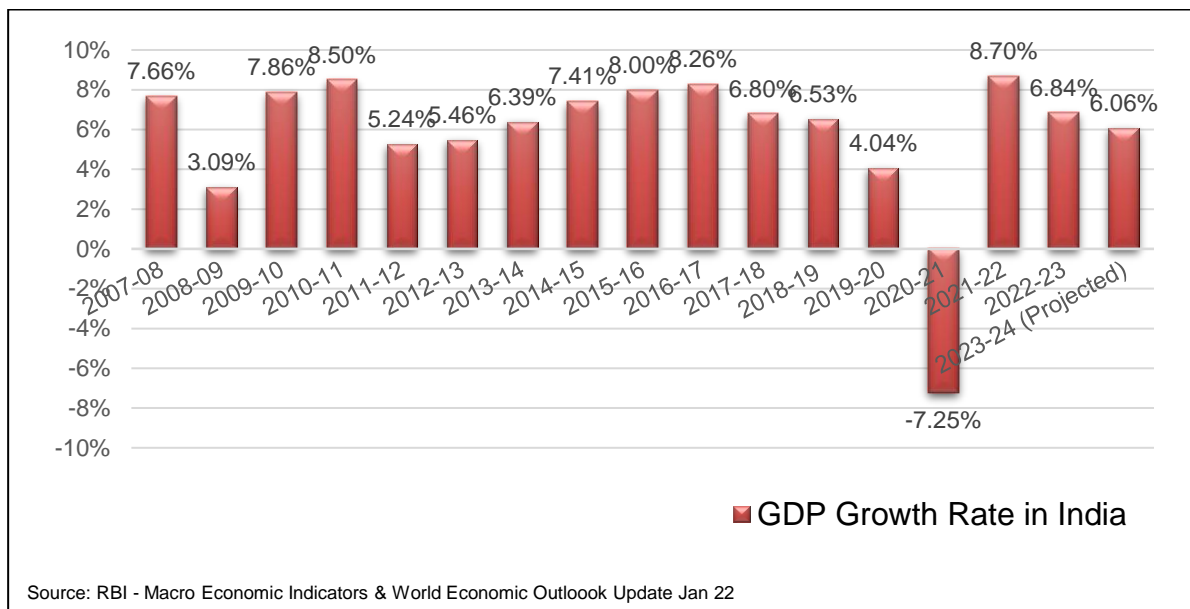
### 3.5 Other Factors Influencing Growth

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

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, 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 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.

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	2021-23	2023-26	2026-31	2031-36	2036-41	2041-46
CAR	7.09%	6.06%	5.66%	5.21%	4.61%	3.94%
LCV	7.00%	6.45%	6.05%	5.59%	5.16%	4.80%
Truck / Bus	5.68%	5.68%	5.26%	4.85%	4.44%	4.04%
HCM /EME/ MAV	7.14%	6.51%	6.03%	5.55%	5.09%	4.63%
Oversized Vehicles	7.14%	7.14%	6.61%	6.08%	5.57%	5.06%

**Table 3-8 : Recommended Growth Rates in a Pessimistic Scenario**

Year/ Vehicle Type	2021-23	2023-26	2026-31	2031-36	2036-41	2041-46
CAR	6.59%	5.56%	5.16%	4.71%	4.11%	3.44%
LCV	6.50%	5.95%	5.55%	5.09%	4.66%	4.30%
Truck / Bus	5.18%	5.18%	4.76%	4.35%	3.94%	3.54%
HCM /EME/ MAV	6.64%	6.01%	5.53%	5.05%	4.59%	4.13%
Oversized Vehicles	6.64%	6.64%	6.11%	5.58%	5.07%	4.56%

**Table 3-9 : Recommended Growth Rates in a Most Likely Scenario**

Year/ Vehicle Type	2021-23	2023-26	2026-31	2031-36	2036-41	2041-46
CAR	6.84%	5.81%	5.41%	4.96%	4.36%	3.69%
LCV	6.75%	6.20%	5.80%	5.34%	4.91%	4.55%

<b>Year/ Vehicle Type</b>	<b>2021-23</b>	<b>2023-26</b>	<b>2026-31</b>	<b>2031-36</b>	<b>2036-41</b>	<b>2041-46</b>
Truck / Bus	5.43%	5.43%	5.01%	4.60%	4.19%	3.79%
HCM /EME/ MAV	6.89%	6.26%	5.78%	5.30%	4.84%	4.38%
Oversized Vehicles	6.89%	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)**

<b>Year</b>	<b>CAR</b>	<b>LCV</b>	<b>Truck / Bus</b>	<b>HCM /EME/ MAV</b>	<b>Oversized Vehicles</b>	<b>Total No.</b>	<b>Total PCU</b>
<b>2023-24</b>	13640	2167	4942	6421	349	<b>27519</b>	<b>62182</b>
<b>2024-25</b>	14467	2306	5223	6839	374	<b>29209</b>	<b>66054</b>
<b>2025-26</b>	15286	2445	5497	7251	396	<b>30875</b>	<b>69856</b>
<b>2026-27</b>	16152	2592	5786	7688	420	<b>32638</b>	<b>73884</b>
<b>2027-28</b>	17066	2749	6090	8151	445	<b>34501</b>	<b>78142</b>
<b>2028-29</b>	18032	2915	6410	8643	472	<b>36472</b>	<b>82652</b>
<b>2029-30</b>	19053	3091	6746	9164	500	<b>38554</b>	<b>87416</b>
<b>2030-31</b>	20045	3264	7072	9673	528	<b>40582</b>	<b>92062</b>
<b>2031-32</b>	21088	3447	7415	10210	557	<b>42717</b>	<b>96955</b>
<b>2032-33</b>	22186	3639	7774	10777	588	<b>44964</b>	<b>102109</b>
<b>2033-34</b>	23341	3842	8151	11376	621	<b>47331</b>	<b>107544</b>
<b>2034-35</b>	24556	4057	8546	12007	655	<b>49821</b>	<b>113259</b>
<b>2035-36</b>	25689	4266	8926	12618	688	<b>52187</b>	<b>118743</b>
<b>2036-37</b>	26873	4486	9322	13260	723	<b>54664</b>	<b>124492</b>
<b>2037-38</b>	28112	4718	9736	13934	760	<b>57260</b>	<b>130520</b>
<b>2038-39</b>	29409	4961	10168	14642	799	<b>59979</b>	<b>136839</b>
<b>2039-40</b>	30765	5217	10620	15386	840	<b>62828</b>	<b>143468</b>
<b>2040-41</b>	31975	5468	11050	16098	879	<b>65470</b>	<b>149724</b>
<b>2041-42</b>	33234	5730	11497	16842	920	<b>68223</b>	<b>156249</b>
<b>2042-43</b>	34542	6005	11962	17621	962	<b>71092</b>	<b>163059</b>

**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
<b>2023-24</b>	11114	1994	4369	5905	232	<b>23614</b>	<b>54828</b>
<b>2024-25</b>	11789	2122	4617	6290	248	<b>25066</b>	<b>58244</b>
<b>2025-26</b>	12458	2250	4859	6669	263	<b>26499</b>	<b>61604</b>
<b>2026-27</b>	13164	2385	5114	7071	279	<b>28013</b>	<b>65159</b>
<b>2027-28</b>	13909	2529	5383	7497	296	<b>29614</b>	<b>68920</b>
<b>2028-29</b>	14697	2682	5665	7948	314	<b>31306</b>	<b>72894</b>
<b>2029-30</b>	15529	2844	5963	8427	333	<b>33096</b>	<b>77104</b>
<b>2030-31</b>	16338	3003	6252	8895	351	<b>34839</b>	<b>81206</b>
<b>2031-32</b>	17189	3171	6555	9389	370	<b>36674</b>	<b>85526</b>
<b>2032-33</b>	18084	3349	6872	9910	390	<b>38605</b>	<b>90074</b>
<b>2033-34</b>	19026	3537	7205	10460	412	<b>40640</b>	<b>94871</b>
<b>2034-35</b>	20016	3735	7554	11040	435	<b>42780</b>	<b>99918</b>
<b>2035-36</b>	20939	3928	7889	11602	457	<b>44815</b>	<b>104764</b>
<b>2036-37</b>	21905	4131	8239	12192	480	<b>46947</b>	<b>109843</b>
<b>2037-38</b>	22915	4344	8604	12812	504	<b>49179</b>	<b>115165</b>
<b>2038-39</b>	23972	4568	8986	13463	530	<b>51519</b>	<b>120751</b>
<b>2039-40</b>	25078	4803	9385	14147	557	<b>53970</b>	<b>126606</b>
<b>2040-41</b>	26065	5033	9764	14802	583	<b>56247</b>	<b>132139</b>
<b>2041-42</b>	27092	5274	10159	15486	610	<b>58621</b>	<b>137912</b>
<b>2042-43</b>	28159	5527	10570	16202	638	<b>61096</b>	<b>143940</b>

**Table 4-3 : Total Tollable Traffic @ Toll Plaza 1- Chainage 172.770 KM  
(Pessimistic Growth Scenario)**

<b>Year</b>	<b>CAR</b>	<b>LCV</b>	<b>Truck / Bus</b>	<b>HCM /EME/ MAV</b>	<b>Oversized Vehicles</b>	<b>Total No.</b>	<b>Total PCU</b>
<b>2023-24</b>	13640	2167	4942	6421	349	<b>27519</b>	<b>62182</b>
<b>2024-25</b>	14398	2296	5198	6807	372	<b>29071</b>	<b>65742</b>
<b>2025-26</b>	15141	2423	5445	7184	392	<b>30585</b>	<b>69203</b>
<b>2026-27</b>	15922	2558	5704	7581	414	<b>32179</b>	<b>72849</b>
<b>2027-28</b>	16744	2700	5975	8000	437	<b>33856</b>	<b>76686</b>
<b>2028-29</b>	17608	2850	6258	8442	461	<b>35619</b>	<b>80721</b>
<b>2029-30</b>	18516	3008	6556	8908	486	<b>37474</b>	<b>84969</b>
<b>2030-31</b>	19388	3161	6841	9358	510	<b>39258</b>	<b>89059</b>
<b>2031-32</b>	20301	3322	7137	9831	536	<b>41127</b>	<b>93347</b>
<b>2032-33</b>	21256	3491	7446	10327	563	<b>43083</b>	<b>97836</b>
<b>2033-34</b>	22257	3668	7769	10849	591	<b>45134</b>	<b>102546</b>
<b>2034-35</b>	23305	3855	8106	11397	621	<b>47284</b>	<b>107487</b>
<b>2035-36</b>	24263	4035	8425	11920	649	<b>49292</b>	<b>112151</b>
<b>2036-37</b>	25261	4223	8757	12467	679	<b>51387</b>	<b>117024</b>
<b>2037-38</b>	26300	4419	9102	13038	710	<b>53569</b>	<b>122101</b>
<b>2038-39</b>	27381	4625	9460	13636	742	<b>55844</b>	<b>127400</b>
<b>2039-40</b>	28506	4840	9832	14261	776	<b>58215</b>	<b>132929</b>
<b>2040-41</b>	29486	5048	10180	14849	808	<b>60371</b>	<b>138055</b>
<b>2041-42</b>	30499	5265	10540	15462	841	<b>62607</b>	<b>143380</b>
<b>2042-43</b>	31547	5491	10913	16100	876	<b>64927</b>	<b>148915</b>

**Table 4-4 : Total Tollable Traffic @ Toll Plaza 2- Chainage 104.530 KM  
(Pessimistic Growth Scenario)**

<b>Year</b>	<b>CAR</b>	<b>LCV</b>	<b>Truck / Bus</b>	<b>HCM /EME/ MAV</b>	<b>Oversized Vehicles</b>	<b>Total No.</b>	<b>Total PCU</b>
<b>2023-24</b>	11114	1994	4369	5905	232	<b>23614</b>	<b>54828</b>
<b>2024-25</b>	11733	2112	4596	6260	247	<b>24948</b>	<b>57971</b>
<b>2025-26</b>	12338	2229	4814	6606	261	<b>26248</b>	<b>61025</b>
<b>2026-27</b>	12974	2352	5043	6971	275	<b>27615</b>	<b>64238</b>
<b>2027-28</b>	13644	2482	5282	7357	290	<b>29055</b>	<b>67625</b>
<b>2028-29</b>	14348	2620	5533	7764	306	<b>30571</b>	<b>71192</b>
<b>2029-30</b>	15088	2765	5796	8193	323	<b>32165</b>	<b>74946</b>
<b>2030-31</b>	15798	2905	6048	8607	339	<b>33697</b>	<b>78557</b>
<b>2031-32</b>	16541	3053	6311	9042	356	<b>35303</b>	<b>82345</b>
<b>2032-33</b>	17319	3208	6585	9499	374	<b>36985</b>	<b>86315</b>
<b>2033-34</b>	18133	3371	6870	9979	393	<b>38746</b>	<b>90474</b>
<b>2034-35</b>	18987	3542	7168	10483	413	<b>40593</b>	<b>94836</b>
<b>2035-36</b>	19767	3707	7450	10964	432	<b>42320</b>	<b>98960</b>
<b>2036-37</b>	20579	3880	7743	11467	452	<b>44121</b>	<b>103264</b>
<b>2037-38</b>	21425	4060	8048	11993	473	<b>45999</b>	<b>107756</b>
<b>2038-39</b>	22306	4249	8365	12543	495	<b>47958</b>	<b>112446</b>
<b>2039-40</b>	23223	4447	8695	13118	518	<b>50001</b>	<b>117341</b>
<b>2040-41</b>	24021	4638	9003	13659	539	<b>51860</b>	<b>121878</b>
<b>2041-42</b>	24846	4837	9322	14223	561	<b>53789</b>	<b>126596</b>
<b>2042-43</b>	25700	5045	9652	14810	584	<b>55791</b>	<b>131497</b>

**Table 4-5 : Total Tollable Traffic @ Toll Plaza 1- Chainage 172.770 KM**  
**(Most Likely Growth Scenario)**

<b>Year</b>	<b>CAR</b>	<b>LCV</b>	<b>Truck / Bus</b>	<b>HCM /EME/ MAV</b>	<b>Oversized Vehicles</b>	<b>Total No.</b>	<b>Total PCU</b>
<b>2023-24</b>	13640	2167	4942	6421	349	<b>27519</b>	<b>62182</b>
<b>2024-25</b>	14433	2301	5211	6823	373	<b>29141</b>	<b>65900</b>
<b>2025-26</b>	15214	2434	5472	7217	394	<b>30731</b>	<b>69531</b>
<b>2026-27</b>	16037	2574	5746	7634	417	<b>32408</b>	<b>73366</b>
<b>2027-28</b>	16904	2723	6033	8075	441	<b>34176</b>	<b>77410</b>
<b>2028-29</b>	17818	2881	6335	8541	466	<b>36041</b>	<b>81676</b>
<b>2029-30</b>	18782	3047	6652	9034	493	<b>38008</b>	<b>86180</b>
<b>2030-31</b>	19713	3209	6957	9513	519	<b>39911</b>	<b>90542</b>
<b>2031-32</b>	20690	3381	7276	10017	546	<b>41910</b>	<b>95123</b>
<b>2032-33</b>	21715	3561	7610	10548	575	<b>44009</b>	<b>99940</b>
<b>2033-34</b>	22791	3752	7959	11108	605	<b>46215</b>	<b>105005</b>
<b>2034-35</b>	23921	3952	8325	11697	637	<b>48532</b>	<b>110327</b>
<b>2035-36</b>	24964	4146	8673	12263	668	<b>50714</b>	<b>115392</b>
<b>2036-37</b>	26053	4349	9037	12856	700	<b>52995</b>	<b>120690</b>
<b>2037-38</b>	27189	4563	9416	13478	734	<b>55380</b>	<b>126236</b>
<b>2038-39</b>	28375	4787	9811	14130	769	<b>57872</b>	<b>132034</b>
<b>2039-40</b>	29612	5022	10222	14813	806	<b>60475</b>	<b>138097</b>
<b>2040-41</b>	30704	5251	10610	15461	841	<b>62867</b>	<b>143770</b>
<b>2041-42</b>	31835	5490	11012	16137	878	<b>65352</b>	<b>149674</b>
<b>2042-43</b>	33009	5740	11430	16843	916	<b>67938</b>	<b>155825</b>

**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
2023-24	11114	1994	4369	5905	232	23614	54828
2024-25	11760	2117	4607	6274	248	25006	58106
2025-26	12396	2240	4838	6637	262	26373	61316
2026-27	13067	2369	5080	7021	277	27814	64702
2027-28	13774	2506	5334	7426	293	29333	68271
2028-29	14519	2651	5600	7855	310	30935	72038
2029-30	15304	2805	5880	8309	328	32626	76018
2030-31	16063	2955	6150	8749	345	34262	79869
2031-32	16859	3113	6432	9212	363	35979	83912
2032-33	17694	3279	6727	9700	382	37782	88163
2033-34	18571	3454	7036	10215	402	39678	92637
2034-35	19491	3638	7359	10757	423	41668	97335
2035-36	20341	3817	7667	11277	443	43545	101808
2036-37	21229	4004	7988	11822	464	45507	106486
2037-38	22154	4200	8323	12394	486	47557	111383
2038-39	23119	4406	8672	12993	509	49699	116503
2039-40	24127	4622	9035	13621	534	51939	121863
2040-41	25016	4832	9378	14217	557	54000	126881
2041-42	25938	5052	9733	14839	581	56143	132105
2042-43	26894	5282	10101	15488	606	58371	137543

#### 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 - 1<sup>st</sup> 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 -

<b>Scenario</b>	<b>Projected Traffic in PCUs (average of traffic on target date, one year before target date and one year after target date)</b>	<b>Expected extension in Concession Period</b>
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 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 extension would 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

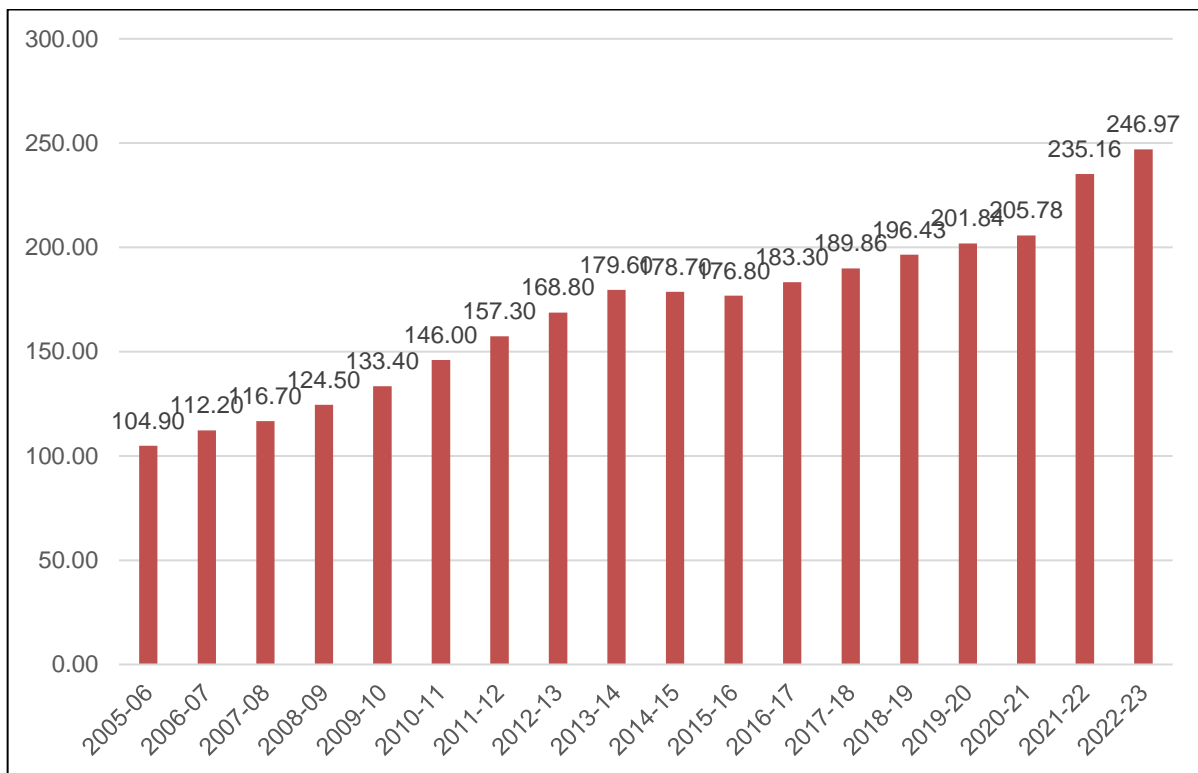
Normal escalation in the basis of WPI would be applicable to these rates as well.

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](http://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 year 2005-2023 is 5.23%. 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

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
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 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**

<b>Year</b>	<b>CAR</b>	<b>LCV</b>	<b>Truck / Bus</b>	<b>HCM /EME/ MAV</b>	<b>Oversized Vehicles</b>
<b>2023-24</b>	80	130	275	435	525
<b>2024-25</b>	85	140	290	455	555
<b>2025-26</b>	90	145	305	480	580
<b>2026-27</b>	95	155	320	500	610
<b>2027-28</b>	100	160	335	530	645
<b>2028-29</b>	105	170	355	555	675
<b>2029-30</b>	110	175	370	580	705
<b>2030-31</b>	115	185	390	610	740
<b>2031-32</b>	120	195	405	640	775
<b>2032-33</b>	125	205	425	670	815
<b>2033-34</b>	130	215	445	700	855
<b>2034-35</b>	140	225	470	735	895
<b>2035-36</b>	145	235	490	770	940
<b>2036-37</b>	155	245	515	810	985
<b>2037-38</b>	160	260	540	850	1035
<b>2038-39</b>	170	270	570	890	1085
<b>2039-40</b>	175	285	595	935	1140
<b>2040-41</b>	185	300	625	980	1195
<b>2041-42</b>	195	315	660	1030	1255
<b>2042-43</b>	205	330	690	1085	1320

**Table 5-6 : Toll Rates for Return Journey @ 172.770 & @104.530**

<b>Year</b>	<b>CAR</b>	<b>LCV</b>	<b>Truck / Bus</b>	<b>HCM /EME/ MAV</b>	<b>Oversized Vehicles</b>
<b>2023-24</b>	120	200	415	650	790
<b>2024-25</b>	130	210	435	680	830
<b>2025-26</b>	135	220	455	715	870
<b>2026-27</b>	140	230	480	755	915
<b>2027-28</b>	150	240	505	790	965
<b>2028-29</b>	155	255	530	830	1010
<b>2029-30</b>	165	265	555	870	1060
<b>2030-31</b>	170	280	580	910	1110
<b>2031-32</b>	180	290	610	955	1165
<b>2032-33</b>	190	305	640	1005	1220
<b>2033-34</b>	200	320	670	1050	1280
<b>2034-35</b>	210	335	705	1105	1345
<b>2035-36</b>	220	350	740	1155	1410
<b>2036-37</b>	230	370	775	1215	1480
<b>2037-38</b>	240	390	815	1275	1550
<b>2038-39</b>	250	405	855	1335	1630
<b>2039-40</b>	265	425	895	1405	1710
<b>2040-41</b>	280	450	940	1475	1795
<b>2041-42</b>	290	470	985	1545	1885
<b>2042-43</b>	305	495	1035	1625	1975

**Table 5-7 : Toll Rates for Local Single Journey@ 172.770 & @104.530**

<b>Year</b>	<b>CAR</b>	<b>LCV</b>	<b>Truck / Bus</b>	<b>HCM /EME/ MAV</b>
<b>2023-24</b>	70	80	140	285
<b>2024-25</b>	75	85	145	300
<b>2025-26</b>	80	90	150	315
<b>2026-27</b>	85	95	160	330
<b>2027-28</b>	90	100	170	345
<b>2028-29</b>	95	105	180	360
<b>2029-30</b>	100	110	190	375
<b>2030-31</b>	105	115	200	390
<b>2031-32</b>	110	120	210	410
<b>2032-33</b>	115	125	220	430
<b>2033-34</b>	120	130	230	450
<b>2034-35</b>	125	135	240	470
<b>2035-36</b>	130	140	250	490
<b>2036-37</b>	135	145	260	510
<b>2037-38</b>	140	150	270	535
<b>2038-39</b>	145	155	280	560
<b>2039-40</b>	150	160	295	585
<b>2040-41</b>	155	165	310	610
<b>2041-42</b>	160	170	325	635
<b>2042-43</b>	165	180	340	665

**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)
<b>2023-24</b>	2715	330	665	1065	4390	3975	3035	9195	5065	8320	14420	17555	10985	14715
<b>2024-25</b>	2855	345	700	1120	4610	4175	3185	9665	5320	8735	15155	18445	11545	15460
<b>2025-26</b>	3000	365	735	1175	4845	4385	3345	10155	5585	9175	15925	19385	12135	16245
<b>2026-27</b>	3155	385	770	1230	5095	4605	3515	10675	5865	9630	16735	20375	12760	17075
<b>2027-28</b>	3315	405	810	1295	5355	4835	3690	11220	6155	10115	17595	21420	13415	17950
<b>2028-29</b>	3475	420	845	1350	5615	5050	3855	11760	6435	10570	18445	22455	14065	18815
<b>2029-30</b>	3645	440	885	1415	5885	5280	4030	12330	6725	11045	19335	23535	14745	19725
<b>2030-31</b>	3820	465	925	1475	6170	5515	4210	12925	7025	11540	20270	24675	15460	20680
<b>2031-32</b>	4005	485	965	1545	6470	5765	4400	13555	7345	12060	21255	25875	16215	21685
<b>2032-33</b>	4200	510	1010	1610	6785	6025	4595	14215	7675	12605	22290	27135	17005	22740
<b>2033-34</b>	4405	535	1055	1685	7115	6295	4805	14905	8020	13170	23375	28455	17835	23850
<b>2034-35</b>	4620	560	1105	1760	7460	6580	5020	15635	8380	13765	24520	29850	18710	25015
<b>2035-36</b>	4845	590	1155	1840	7830	6875	5245	16400	8755	14380	25720	31310	19630	26245
<b>2036-37</b>	5085	620	1205	1925	8215	7185	5480	17210	9150	15030	26985	32850	20600	27535



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)
<b>2037-38</b>	5335	650	1260	2010	8620	7505	5730	18055	9560	15705	28315	34470	21620	28890
<b>2038-39</b>	5600	680	1315	2100	9045	7845	5985	18950	9990	16415	29715	36175	22690	30320
<b>2039-40</b>	5875	715	1375	2195	9490	8195	6255	19890	10440	17150	31190	37970	23815	31820
<b>2040-41</b>	6170	750	1435	2295	9965	8565	6535	20875	10910	17925	32740	39855	25000	33405
<b>2041-42</b>	6475	785	1500	2395	10460	8950	6830	21915	11405	18730	34370	41840	26250	35070
<b>2042-43</b>	6800	825	1570	2505	10985	9355	7140	23015	11915	19570	36090	43935	27565	36820

## 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 2023-24 are shown in the tables below.

**Table 5-9 : Toll Revenue Optimistic Scenario**  
(Rs. Crores)

Year	Toll at Plaza 177.2	Toll at Plaza 104.53	Total
2023-24	195.68	175.27	370.96
2024-25	218.39	195.54	413.93
2025-26	243.01	217.67	460.69
2026-27	269.34	241.17	510.51
2027-28	301.44	269.94	571.38
2028-29	333.80	298.99	632.79
2029-30	369.23	330.63	699.86
2030-31	408.16	365.65	773.81
2031-32	451.65	404.56	856.21
2032-33	497.14	445.25	942.39
2033-34	547.46	490.30	1037.76
2034-35	608.04	544.48	1152.53
2035-36	668.32	598.51	1266.83
2036-37	735.89	658.99	1394.88
2037-38	808.26	723.92	1532.19
2038-39	889.71	796.92	1686.63
2039-40	979.83	877.72	1857.55
2040-41	1071.65	959.92	2031.58

<b>Year</b>	<b>Toll at Plaza 177.2</b>	<b>Toll at Plaza 104.53</b>	<b>Total</b>
<b>2041-42</b>	1175.31	1053.16	<b>2228.47</b>
<b>2042-43</b>	1289.93	1155.89	<b>2445.82</b>

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

<b>Year</b>	<b>Toll at Plaza 177.2</b>	<b>Toll at Plaza 104.53</b>	<b>Total</b>
<b>2023-24</b>	195.68	175.27	<b>370.96</b>
<b>2024-25</b>	217.33	194.63	<b>411.96</b>
<b>2025-26</b>	240.72	215.66	<b>456.38</b>
<b>2026-27</b>	265.54	237.82	<b>503.36</b>
<b>2027-28</b>	295.82	264.92	<b>560.74</b>
<b>2028-29</b>	326.02	292.05	<b>618.07</b>
<b>2029-30</b>	358.95	321.44	<b>680.39</b>
<b>2030-31</b>	394.88	353.82	<b>748.70</b>
<b>2031-32</b>	434.92	389.60	<b>824.53</b>
<b>2032-33</b>	476.46	426.76	<b>903.22</b>
<b>2033-34</b>	522.15	467.68	<b>989.83</b>
<b>2034-35</b>	577.18	516.88	<b>1094.07</b>
<b>2035-36</b>	631.37	565.45	<b>1196.82</b>
<b>2036-37</b>	691.91	619.63	<b>1311.54</b>
<b>2037-38</b>	756.34	677.48	<b>1433.82</b>
<b>2038-39</b>	828.50	742.19	<b>1570.69</b>
<b>2039-40</b>	908.07	813.55	<b>1721.62</b>
<b>2040-41</b>	988.45	885.41	<b>1873.86</b>
<b>2041-42</b>	1078.82	966.76	<b>2045.59</b>

<b>Year</b>	<b>Toll at Plaza 177.2</b>	<b>Toll at Plaza 104.53</b>	<b>Total</b>
<b>2042-43</b>	1178.39	1056.04	<b>2234.43</b>

*Table 5-11 : Toll Revenue Most Likely Scenario  
(Rs. Crores)*

<b>Year</b>	<b>Toll at Plaza 177.2</b>	<b>Toll at Plaza 104.53</b>	<b>Total</b>
<b>2023-24</b>	195.68	175.27	<b>370.96</b>
<b>2024-25</b>	217.85	195.10	<b>412.95</b>
<b>2025-26</b>	241.85	216.66	<b>458.51</b>
<b>2026-27</b>	267.40	239.47	<b>506.87</b>
<b>2027-28</b>	298.55	267.37	<b>565.92</b>
<b>2028-29</b>	329.82	295.46	<b>625.28</b>
<b>2029-30</b>	363.96	325.96	<b>689.93</b>
<b>2030-31</b>	401.38	359.63	<b>761.01</b>
<b>2031-32</b>	443.11	396.97	<b>840.08</b>
<b>2032-33</b>	486.57	435.88	<b>922.45</b>
<b>2033-34</b>	534.53	478.87	<b>1013.40</b>
<b>2034-35</b>	592.30	530.52	<b>1122.82</b>
<b>2035-36</b>	649.49	581.73	<b>1231.23</b>
<b>2036-37</b>	713.45	638.97	<b>1352.43</b>
<b>2037-38</b>	781.79	700.26	<b>1482.05</b>
<b>2038-39</b>	858.49	768.96	<b>1627.44</b>
<b>2039-40</b>	943.18	844.99	<b>1788.16</b>
<b>2040-41</b>	1029.13	921.82	<b>1950.95</b>
<b>2041-42</b>	1126.00	1008.89	<b>2134.89</b>
<b>2042-43</b>	1232.93	1104.69	<b>2337.62</b>

## 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 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 few sections. This operation and its cost are spread over three years. But since project is commissioned and running traffic for last many years, periodic maintenance shall be as per condition of pavement and other infrastructure. Inputs of concessionaire 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		
<b>2023-24</b>	8.56				0.01	0.04		10.97	Regular O & M
<b>2024-25</b>	8.56	0.98	13.74	19.91	0.01	0.04		57.94	Renewal of Wearing course + Pavement repair
<b>2025-26</b>	8.56				0.01	0.04		12.10	Regular O & M
<b>2026-27</b>	8.56				0.01	0.04		12.70	Regular O & M
<b>2027-28</b>	8.56				0.01	0.04		13.34	Regular O & M
<b>2028-29</b>	8.56				0.01	0.04		14.01	Regular O & M
<b>2029-30</b>	8.56	0.98	13.74	19.91	0.01	0.04		73.94	Renewal of Wearing course + Pavement repair
<b>2030-31</b>	8.56			1.81	0.01	0.04		18.69	Regular O & M
<b>2031-32</b>	8.56			1.81	0.01	0.04		19.63	Regular O & M
<b>2032-33</b>	8.56			1.81	0.01	0.04		20.61	Regular O & M
<b>2033-34</b>	8.56			1.81	0.01	0.04		21.64	Regular O & M
<b>2034-35</b>	8.56	1.72	13.74	28.96	0.01	0.04		115.74	Renewal of Wearing course + Pavement repair
<b>2035-36</b>	8.56			1.81	0.01	0.04		23.86	Regular O & M

Year	Annual Maintenance	Thermoplastic Painting	Renewal Coat with	Special Repair of	Structure maintenance	Electric System		Total Expenditure	Remarks
<b>2036-37</b>	8.56			2.17	0.01	0.04		25.92	Regular O & M
<b>2037-38</b>	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 traffic growth @ 6-8% 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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**OMALAUUR TO NAMAKKAL (KM 180.00 TO KM 248.625)**  
**SECTION OF NH-7 IN THE STATE OF TAMIL NADU.**

**OCTOBER 2023**



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



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(FINAL)**



**OCTOBER 2023**

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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highways Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- 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 6<sup>th</sup> 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 of year 2016-17 and report was submitted in October 2017. 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 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 September 2023, 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 Six-monthly traffic data from April 2023 to September 2023.
- 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.



**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 project highway is currently under toll operation, the data collected is corresponding to category of tollable vehicles. The following are the type 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 September 2023 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	Average Daily Traffic April 2023 to Sept 2023
1	CAR	12645	13352	12618	14831	18389	20084
2	LCV	4672	4632	4290	2748	2856	2767
3	Truck/Bus	3199	3446	2666	3075	3796	4302
4	Multi Axle	2952	2873	3017	3350	3765	4066
	<b>Total</b>	<b>23468</b>	<b>24304</b>	<b>22591</b>	<b>24004</b>	<b>28806</b>	<b>31218</b>

The above data was arrived at by applying standard trip frequencies to monthly passes and return journey tickets issued. Since the current data is for six months from April-2023 to September 2023 only, monsoon also has affected the project traffic in the current period, hence a suitable correction factor is applied for annual representation of this traffic.

## 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**

Period	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
FY 2022-23	191.800	28806	51004	1.77
FY 2023-24	191.800	31218	55436	1.78

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 above category on base year 2015-16, 2016-17, 2017-18, 2018-19, 2019-20, 2020-21,2021-22,2022-23 and from April 2023 to September 2023.

**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 April 23 to Sept 23
1	Single Journey	16311	16931	16626	16244	19856	20974
2	Return Journey	5210	5280	4492	7196	8280	9466
3	Monthly Pass	1947	2093	1473	564	670	778

The single journey component in total traffic numbers is as high as 67% while the return journey component is 30%. The monthly pass share is as low as 3%. 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 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 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 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)

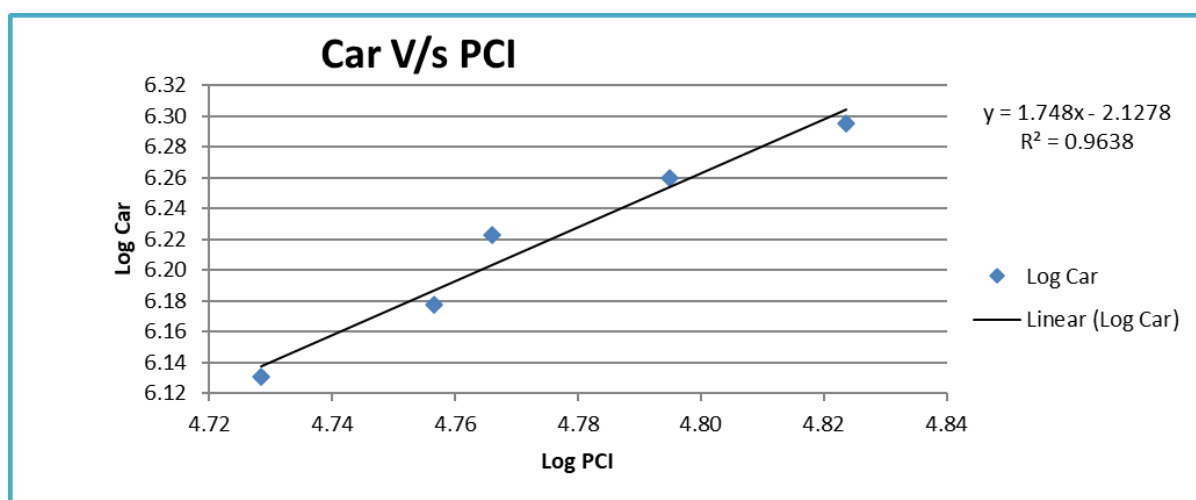
The elasticity for car and bus (passenger vehicles) is calculated based on Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

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

**Table 3-1 : Per Capita Income Vs Car**

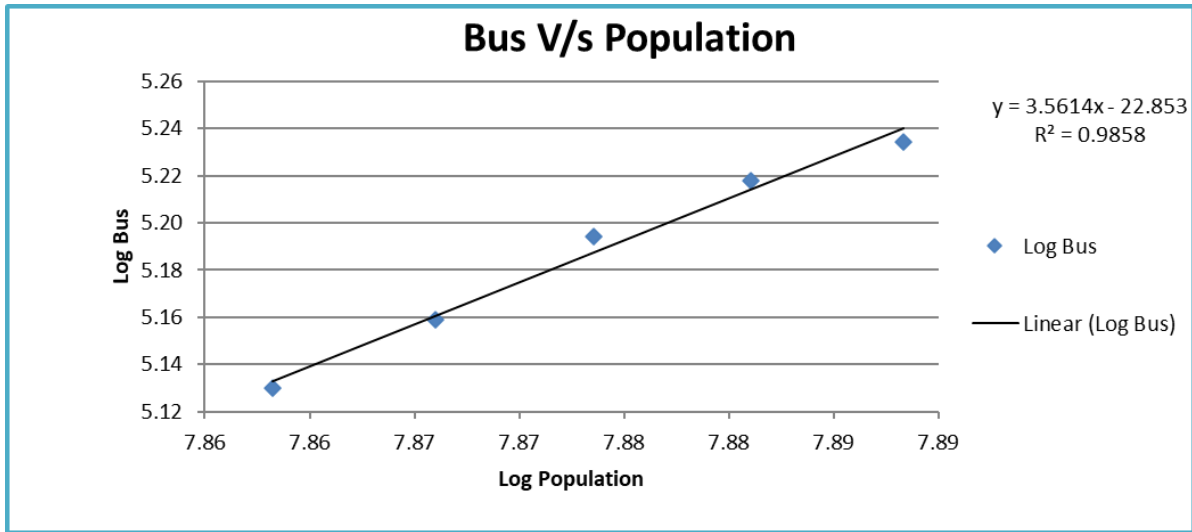
Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2011	53507	1350722	4.73	6.13		
2012	57093	1504735	4.76	6.18	7%	
2013	58360	1668913	4.77	6.22	2%	
2014	62361	1818284	4.79	6.26	7%	
2015	66635	1972354	4.82	6.29	7%	5.7%

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.



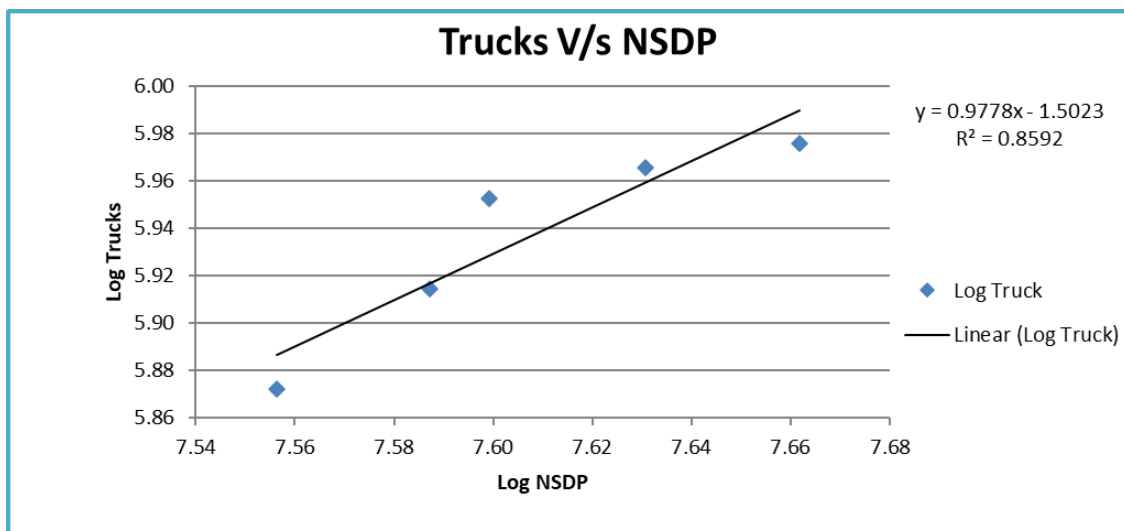
**Figure 3-2: Regression and Elasticity Population vs. Bus – Extrapolation**

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	Average Daily Traffic (Nos.) for April 2023 to Sept 2023
1	CAR	12645	13352	12618	14831	18389	20084
2	LCV	4672	4632	4290	2748	2856	2767
3	Truck/Bus	3199	3446	2666	3075	3796	4302
4	Multi Axle	2952	2873	3017	3350	3765	4066
	<b>Total</b>	<b>23468</b>	<b>24304</b>	<b>22591</b>	<b>24004</b>	<b>28806</b>	<b>31218</b>

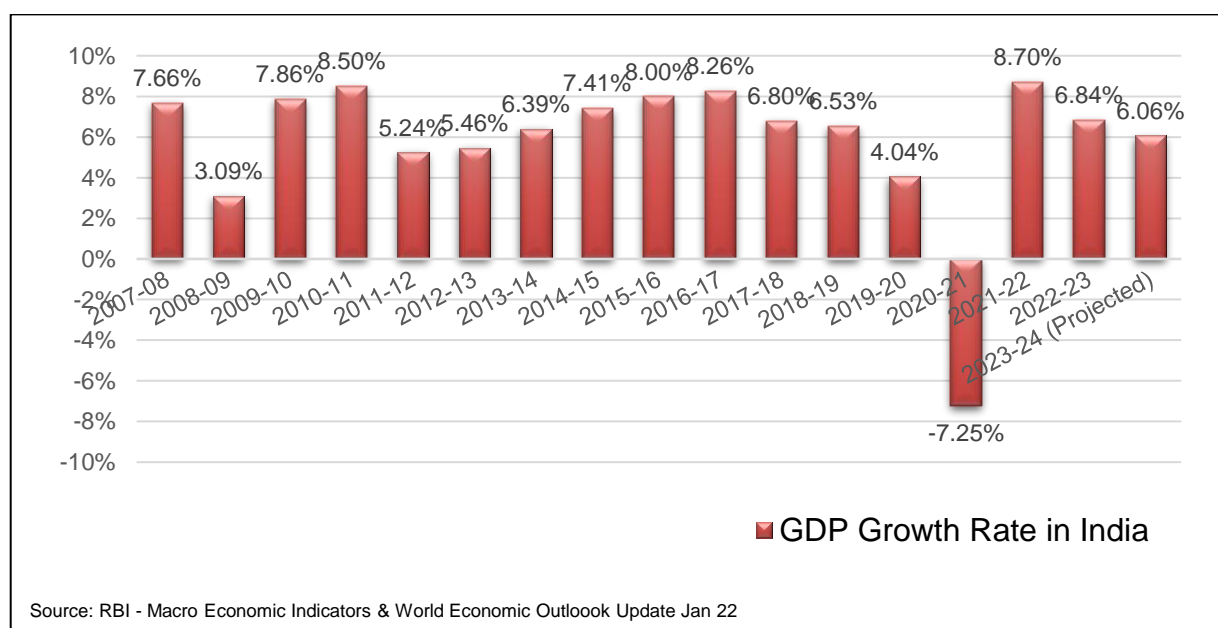
### 3.5 Other Factors Influencing Growth

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 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 decision 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 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**

<b>Year/ Vehicle Type</b>	<b>2021-2023</b>	<b>2023- 2026</b>	<b>2026- 2031</b>	<b>2031- 2036</b>	<b>2036- 2041</b>	<b>2041- 2046</b>
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**

<b>Year/ Vehicle Type</b>	<b>2021-2023</b>	<b>2023-2026</b>	<b>2026-2031</b>	<b>2031-2036</b>	<b>2036- 2041</b>	<b>2041- 2046</b>
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)
<b>2023-24</b>	20084	2767	4302	4066	<b>31218</b>	<b>55436</b>
<b>2024-25</b>	21003	2852	4468	4223	<b>32546</b>	<b>57689</b>
<b>2025-26</b>	21893	2935	4625	4371	<b>33824</b>	<b>59840</b>
<b>2026-27</b>	22821	3020	4788	4524	<b>35153</b>	<b>62073</b>

**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)
<b>2023-24</b>	20084	2767	4302	4066	<b>31218</b>	<b>55436</b>
<b>2024-25</b>	20902	2839	4446	4202	<b>32389</b>	<b>57408</b>
<b>2025-26</b>	21683	2906	4580	4329	<b>33498</b>	<b>59263</b>
<b>2026-27</b>	22493	2976	4719	4459	<b>34647</b>	<b>61180</b>

**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)
<b>2023-24</b>	20084	2767	4302	4066	<b>31218</b>	<b>55436</b>
<b>2024-25</b>	20953	2846	4458	4213	<b>32470</b>	<b>57555</b>
<b>2025-26</b>	21788	2921	4604	4351	<b>33664</b>	<b>59561</b>
<b>2026-27</b>	22657	2997	4754	4493	<b>34901</b>	<b>61633</b>

#### 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 car /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. Rate will be constant throughout 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, 31<sup>st</sup> preceding the fee revision date.

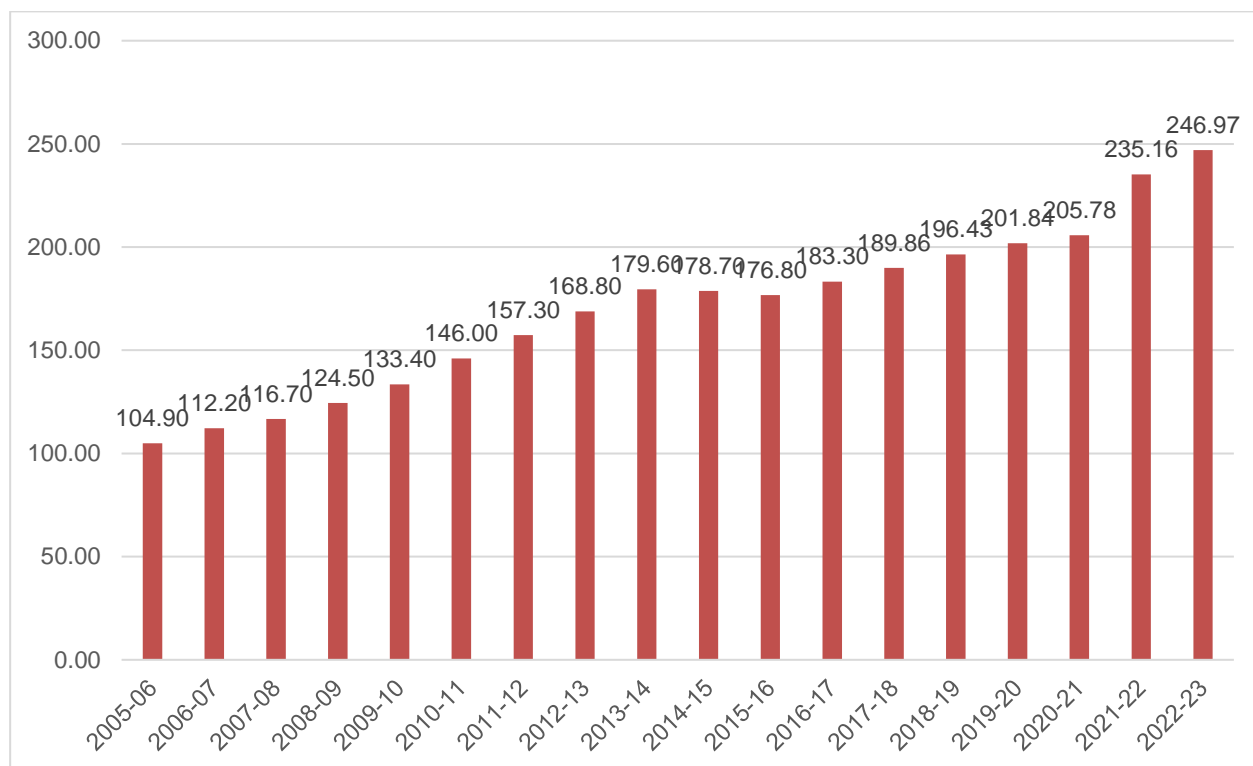
### 5.3 Estimation of Toll Rates

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](http://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 year 2005-2023 is 5.23%. 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
2023-24	95	165	335	540	15	15	25
2024-25	100	175	350	565	15	15	25
2025-26	105	185	370	595	15	15	25
2026-27	110	195	385	625	15	15	25



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

Year	Car	Minibus /LCV	Truck/ Bus	Multi Axle
2023-24	145	250	500	805
2024-25	150	265	525	845
2025-26	160	275	555	890
2026-27	165	290	580	935

**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
2023-24	2870	5020	10040	16135	150	300	1000
2024-25	3010	5270	10540	16940	150	300	1000
2025-26	3160	5535	11070	17785	150	300	1000
2026-27	3320	5810	11620	18675	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 2023-24 are shown in tables below.

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

<b>Year</b>	<b>Toll Plaza 191.800</b>	<b>Total</b>
<b>2023-24</b>	171.80	<b>171.80</b>
<b>2024-25</b>	187.80	<b>187.80</b>
<b>2025-26</b>	205.08	<b>205.08</b>
<b>2026-27</b>	222.46	<b>222.46</b>

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

<b>Year</b>	<b>Toll Plaza 191.800</b>	<b>Total</b>
<b>2023-24</b>	171.80	<b>171.80</b>
<b>2024-25</b>	186.91	<b>186.91</b>
<b>2025-26</b>	203.11	<b>203.11</b>
<b>2026-27</b>	219.28	<b>219.28</b>

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

<b>Year</b>	<b>Toll Plaza 191.800</b>	<b>Total</b>
<b>2023-24</b>	171.80	<b>171.80</b>
<b>2024-25</b>	187.38	<b>187.38</b>
<b>2025-26</b>	204.11	<b>204.11</b>
<b>2026-27</b>	220.90	<b>220.90</b>

## 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		
<b>2023-24</b>	5.13	1.51	6.08	6.23	0.14	0.23	24.66	Renewal of Wearing course + Pavement repair
<b>2024-25</b>	5.13	1.51	6.08	5.71	0.14	0.23	25.20	Renewal of Wearing course + Pavement repair
<b>2025-26</b>	5.13				0.14	0.23	7.75	Regular O & M
<b>2026-27</b>	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 IT capital of country and the project stretch falls in its catchment. There are many upcoming projects in area which are proposed to boost economic growth of area and add value to development of the region. All the developments considered in the Report have the potential to have a positive impact on the traffic flow on project. Following can be considered as major outcome of study.

- a) There is a healthy volume of tollable traffic running on project.
- b) Project corridor has the potential to witness traffic growth @ 6-8% annually in 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 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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