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FINAL REPORT

Technical Diligence Study: Construction of Second Vivekananda Bridge Tollway Project on BOT- TOLL basis- SVBTC

SAMARTH INFRAENGG Technocrats Private Limited

SAMARTH
committed competence

AUGUST 2025

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LIST OF ABBREVIATIONS AND SYMBOLS

AADT	-Average Annual Daily Traffic
AE	-Authority Engineer
AMC	-Annual Maintenance Contract
ATMS	-Advanced Traffic Management System
BC	-Bituminous Concrete
BOQ	-Bill of Quantities
BOT	-Build, Operate & Transfer
CA	-Concession Agreement
CBR	-California Bearing Ratio
CCB	-Concrete Crash Barrier
CCR	-Cement Concrete Railing
COD	-Commercial Operation Date
COS	-Change of scope
CPI	-Consumer Price Index
CUP	-Cattle Underpass
CVC	-Classified Volume Count
CVPD	-Commercial Vehicles per Day
DBM	-Dense Bituminous Concrete
DPR	-Detailed Project Report
ECB	-Emergency Call Box
EPC	-Engineering, Procurement and Construction
ESI	- Employees' State Insurance
FDD	-Filed Dry Density
FOB	-Foot Over Bridge
FRL	-Finished Road Level
FSI	-Free Swell Index
FWD	-Falling Weight Deflectometer
FY	-Financial Year
GOI	- Government of India
GR	-Growth Rates
GS	-Grade Separated
GSB	-Granular Sub Base
GST	-Goods and Services Tax
HCPT	-Half cell Potential Test
HPC	-Hume Pipe Culvert
HR	- Human Resources
HTMS	-Highway Traffic Management Systems
IE	-Independent Engineer

IRC	- Indian Roads Congress
IRC SP	- Indian Roads Congress Special Publications
IRI	-International Roughness Index
Km	-kilometer
LHS	-Left Hand Side
LL	-Liquid Limit
LS	-Lump sum
m	-Meter
MBIU	-Mobile Bridge Inspection Unit
MCB	-Metal Beam Crash Barrier
MCS	-Micro Surfacing
MCW	-Main Carriageway
MDD	-Maximum Dry Density
MHR	-Metallic Hand Rail
MJB	-Major Bridge
mm	-Millimeter
MM	-Major Maintenance
MNB	-Minor Bridge
MoRT&H	- Ministry of Road Transport & Highways
MPa	-Mega Pascal
MR	-Resilient Modulus
MSA	-Million Standard Axle
NDT	-Non-Destructive Testing
NHAI	- National Highways Authority of India
NSV	-Network survey Vehicle
O&M	- Operation and Maintenance
OL	-Overlay
PF	-Provident Fund
PGR	-Pedestrian Guard Rail
PI	-Plasticity Index
PL	-Plastic Limit
PM	-Periodic Maintenance
PUP	-Pedestrian Underpass
R&R	-Repair and Rehabilitation
RCC	-Reinforced Cement Concrete
RE Wall	-Reinforced Earth Wall
RHS	-Right Hand Side
RHT	-Rebound Hammer Test
RM	-Routine Maintenance
ROB	-Road Over Bridge
RPO	-Route Patrol Officer

RUB	-Road Under Bridge
SDBC	-Semi-Dense Bituminous Concrete
SPV	-Special Purpose Vehicle
SR	-Service Road
SWB	-Static Weigh Bridge
TCS	-Typical cross Section
TDRT	-Transient Dynamic Response test
TMS	-Toll Management System
UI	-Unevenness Index
UPVT	-Ultra Pulse Velocity test
VDF	-Vehicle Damage Factor
VG	-Viscosity Grade
VUP	-Vehicular Underpass
WBM	-Water Bound Macadam
WMM	-Wet Mix Macadam
WPI	-Wholesale Price Index

CHAPTER 1. INTRODUCTION

1.1 INTRODUCTION

Second Vivekananda Bridge Tollway Company Pvt. Ltd. (SVBTCL) is a Special Purpose Vehicle (SPV) established in 2001 to implement the Second Vivekananda Bridge (Nivedita Setu), having a multi-span extradosed bridge connecting Howrah and Kolkata across the Hooghly River in West Bengal. It was constructed between 2004 and 2007, replacing the older Vivekananda Bridge. The new bridge is a toll highway with six lanes, 880m long length forms part of a 6.041 km long tollway. It was India's first multi-span, single-plane cable-supported extradosed bridge Project. The project, awarded by the National Highways Authority of India (NHAI), was undertaken on a Build-Operate-Transfer (BOT) basis and aims to decongest traffic across the Hooghly River and improve connectivity between Kolkata and Howrah under a 30-year concession agreement.

SVBTC is a part of a consortium led by Pacific Alliance-Stradec Group Infrastructure Company (PASGIC), Mauritius, and Larsen & Toubro Ltd. (L&T). The project faced several challenges, including land acquisition, environmental clearances, and coordination with multiple agencies such as the Kolkata Port Trust and Indian Railways. Despite these hurdles, SVBTPL successfully achieved financial closure, and thus Appointed Date declared as April 30, 2003. Further, after completion of works, COD achieved on July 4, 2007.

The project is presently under maintenance by Concessionaire (Vendor) and M/s ACTIS intends to acquire the said project.

The client, M/s ACTIS has engaged M/s SAMARTH INFRAENGG Technocrats Pvt. Ltd. as their Technical DD Consultant (hereafter referred to as the “Consultant”) to undertake technical due diligence study for the said project.

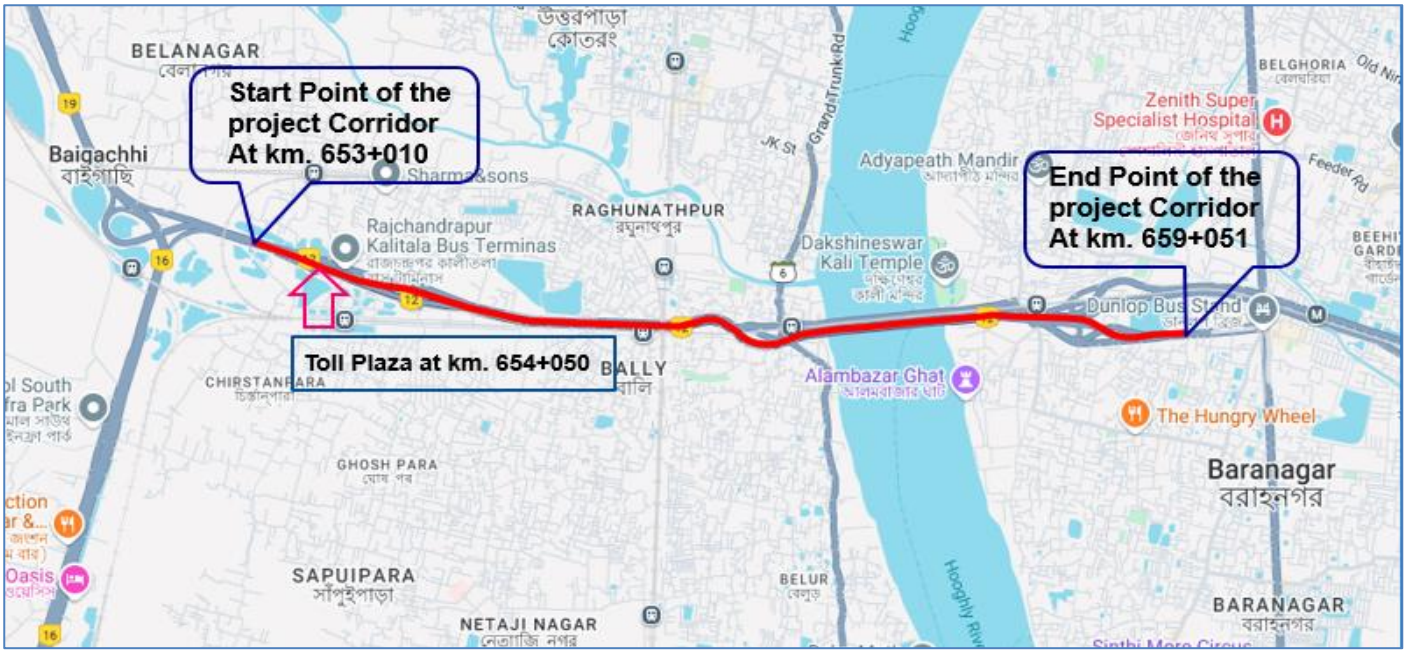
This report highlights the findings of technical diligence study along with estimation of initial Capex including improvements and immediate requirements for repair & rehabilitation of various elements of project highway and also to make an assessment of Major maintenance requirements and Operation & Maintenance costs for entire concession period.

1.2 PROJECT AT A GLANCE

The project road is a part of newly designated NH-19 (formerly known as NH-2), which runs between Kanpur, Allahabad, Varanasi, Sasaram, and Aurangabad, Dhanbad, and Asansol, Durgapur, and Bardhaman and Dankuni covering the total length of 1323 kms.

The Project Road is provided with high-speed connectivity between NH-2/ NH-6 (interchange at Jaypore Bill, West of Bally) and NH -34 towards North-East via Belghoria Expressway and Dumdum Airport. The project stretch has the new bridge (Nivedita setu, also known as 2nd Vivekananda Bridge) is 50m downstream of the existing Vivekananda Setu and is well situated to provide a fast-moving regional crossing across the river Hooghly in the Northern Kolkata Metropolitan Area (NKMA).

The Project Corridor traverses through municipal and railway land in addition to private and other government lands. The settlements observed are Rajchandrapur, Bally and Dakshineswar within Kolkata and Howrah districts.



Map Showing the Project Corridor

The start and end points of the project stretch areas follows.

Table 1: Project Corridor Chainage System

Referencing system	Project Corridor Start Point (km)	Project Corridor End Point (km)	Length (km)
Existing Chainage	653.010	659.051	6.041
Design Chainage	653.010	659.051	6.041

Photograph showing the start and end point of the project road are presented below

A view of the Start Point at km 653.010

A view of stretch at km 657.910

Table 2: Project Details

S.No	Description	Date
1	Date of Signing the Concession Agreement	02-09-2002
2	Appointment Date	30-04-2003
3	Schedule Project Construction Period (36 months from Appointed Date)	30-10-2005
4	Final COD	04-07-2007
5	End of Concession Period (30 years from Appointed Date)	30-04-2033

1.3 OBJECTIVE AND SCOPE OF SERVICES

The main objective of the study is to review the current status of project corridor including details pertaining to its construction and maintenance and to carryout requisite surveys and investigations and finalize the Major Maintenance and estimate the Strategy and estimate the Operation and Maintenance Costs. Finally required to provide Y-O-Y Costs till end of Concession Period:

Scope of work is mainly divided into following major activities

a) Review of Project documents

- ✓ Collection of relevant records and documents and review of same
- ✓ Review of correspondences with IE, if any, on technical issues
- ✓ Review of EPC, Operation, Maintenance and Systems Contracts
- ✓ Review of Asset Management Contracts to understand the maintenance of asset from the Concession agreement perspective

- ✓ Review the technical approvals / consents from IE or another agency required under the CA

b) Field Investigations

- ✓ Undertake detailed reconnaissance to appreciate the project corridor characteristics
- ✓ Undertake field investigations to collect first-hand information on present condition of project road and establish the requirements for rehabilitation and up gradation
- ✓ Carrying out inventory and condition surveys for Project Road;
- ✓ Carrying out Inventory and detailed condition surveys for bridges & cross drainage structures (along with Photographs thereof) including recommendation for either strengthening/rehabilitation or reconstruction; Identify requirements of NDT tests if any (to be executed if required and commissioned by client with separate mutually agreed payments).
- ✓ Video-graphic survey of the entire Project corridor/s.
- ✓ Carrying out Roughness Survey on each lane of Project Corridors using NSV.
- ✓ Availability of construction materials.
- ✓ Assess drainage adequacy: Review of available hydrological reports and assess the availability and condition of existing road side drainage along the corridors.
- ✓ The outputs of investigations are basically used to identify the strengthening requirements for project sections and also used to form the inputs for deterioration modelling.

c) Major Maintenance

- ✓ Review of current maintenance system.
- ✓ Preparation of the maintenance costs to be incurred over the period of the concession keeping in mind the maintenance requirements of the Concession Agreement.
- ✓ Detailed assessment of maintenance cycles for pavements using HDM4 analysis and estimation of maintenance cost for the concession period
- ✓ To understand the current maintenance strategy for each of the project and review the BOQ to be provided by the DPR consultant for adequacy in relation to Major Maintenance work of Highways, structures, Road Furniture and other site-specific requirements as per respective CA
- ✓ Minor maintenance will be included in routine maintenance and estimated year wise based on assumed percentages based on present condition.
- ✓ Identify any impacts on revenue due to Major Maintenance.
- ✓ Maintenance requirements for approaches/VOP/Underpass forming part of CA would also be assessed.

d) Cost of Operations

- ✓ Preparation of O&M cost for the concession period.
- ✓ Assess the adequacy of costs assumed in the vendor model are adequate to meet the major maintenance, stage construction and routine maintenance requirements.
- ✓ Independently develop a bottom-up forecast of Operating expenses for project, with detailed break up of each type of operating expense, along with underlying assumptions

e) BOQ and Cost Estimates

- ✓ Preparation of BOQ and Costs for Major Maintenance
- ✓ Preparation of BOQ and cost for Routine maintenance and Route Patrolling
- ✓ Preparation of BOQ and Cost for Operations
- ✓ Preparation of year-by-year O&M cost
- ✓ The costs would be provided till the end of the concession period including any expected extension of Concession periods as informed by the Client.
- ✓ Review and comment on the current organizational structure from an O&M perspective at each asset. Also suggest an indicative organization structure based on project / CA requirements
- ✓ The technical documents such as DPR, Pavement Design Reports, Material test reports, draft Concession Agreement, technical schedules and drawings pertaining to the Projects shall be made available by NHIIMPL

f) Additional Services

Services in addition to the scope of services, which may be required as per the actual site conditions and may include but not limited to Non-destructive Test on structure, additional points for FWD survey, additional days for axle load survey, any such additional services required by the company

1.4 DATA COLLECTION AND REVIEW

In brief, following were covered

- ✓Review of Concession Agreement & Schedules,
- ✓Review of O&M costs as presented in DPR reports
- ✓Review of MPR provided by Concessionaire

1.5 REVIEW OF CONCESSION AGREEMENT

National Highways Authority of India, NHAI ("Authority") and Second Vivekananda Bridge Tollway Company Pvt Ltd (SVBTPL) as "Concessionaire" entered into the Concession Agreement on 2nd September 2002. Few important Articles of Concession Agreement (CA) are described as below:

S No	Relevant Clause	Description
1	Article 3 Grant of Concession	"Concession Period" includes 36 months Construction Period from Appointed Date (Articles 15.3) 30 years commencing from Appointed Date.
2	Clause 4.3 of CA	The Conditions Precedent required to be satisfied by the Concessionaire within, unless specifically stated, a period of 180 days from the date of this Agreement else damages to be paid to the Authority by way of forfeiting the Performance Security.
3	Clause 4.4 of CA (Delay by Authority)	Authority shall pay to the Concessionaire, the full refund of performance Security and may terminate the agreement
4	Article 5.1 of CA	Performance Security: 10.00 Crores Concessionaire to provide no later than 120 days from the date of this Agreement in the form of Bank Guarantee from any Bank. This will be in full force and effect upto COD and shall be released upon contribution of 100% Equity by shareholders of Concessionaire and by expending on Project construction to an aggregate sum of not less than 20% of Total Project cost (TPC).
5	Article 6.1 of CA	The Concessionaire shall be entitled to demand and collect Fee during the Operation Period in accordance with the provisions of Schedule-G
6	Article 7.1 of CA	Sharing of Excess Revenues: In any accounting year, the excess of the projected fee in which COD occurs, 94% of such excess fee shall be deposited in sub-account as part of Escrow arrangement on monthly basis. For the case of shortfall, from this sub-account the Fee shall be adjusted as per clause 7.1.3.
7	Article 8.1 of CA	No parallel competing trans-river facility shall not be constructed of new or augmentation of existing facilities for a period of 22 years from COD. Upon reaching the saturation capacity, NHAI may commission new trans-river toll facility and the fee payable by the User shall not be less than 140% of the Fees payable for the project bridge.
8	Article 13.5	If NHAI does not provide encumbrance free land after post financial close, NHAI shall pay damages at a rate of Rs1000 per month per sq. meters. These charges shall be raised to Rs 2000 per month after COD if such area is essential for smooth traffic flow.
9	Article 13.7	If Concessionaire fail to achieve Project mile stones as set in Schedule-H, within a period of 90 days from schedule H set forth dates, damages shall be paid to NHAI at a rate of Rs.10,00,000 per day until such milestone is achieved.
10	Clause 15.2 of CA	On issuance of PCC or Completion Certificate, the date can be considered as COD. The Concessionaire shall be entitled to demand and collect Fee
11	Clause 15.4 of CA	if COD does not occur by the Schedule Completion Date, unless delay is on account of Authority or Force Majeure Damages for delay of COD, shall be 0.01% of the Total Project Cost per week or part thereof.

S No	Relevant Clause	Description
12	Clause 16.5 of CA	All items in the punch List shall be completed by the Concessionaire within 120 days of the date of issue of the Provisional Certificate. For the delays Authority shall be entitled to recover damages equal to Rs.2 lakhs per week.
13	Clause 17.1 of CA	Concessionaire shall be entitled for COS works for the cumulative cost not exceeding 5% of the Total Project Cost and do not adversely affect the COD.
14	Clause 18.2 of CA	Not later than 180 days prior to the scheduled completion, the Concessionaire shall provide Maintenance Manual. The Maintenance Manual shall be revised and updated once in every 3 (three) years.
15	Clause 18.12 of CA	If Concessionaire does not maintain/repair the project Bridge as per maintenance program, damages shall be levied after expiry of 30 days period for each day of until default is cured at higher of the following ***a) Rs10,000 and*** b) 0.1% of cost of such repair as estimated by IE.
16	Article 20.4 of CA Independent Engineer	Remuneration of IE, shall be paid in equal proportion by Concessionaire and by NHAI.
17	Article 22.2 of CA Financial Close:	Concessionaire to achieve Financial Close within 240days from the date of Agreement. Further period of 90days can be availed subject to advance weekly payment to NHAI for Rs 1,00,000/- towards damages for delay.
18	Article 23.1 of CA Grant	NHAI agreed to provide Rs 120 Crores as cash support to Concessionaire by way of an outright Grant. • ***Grant should not exceed 20% of TPC and*** In no case be greater than total Equity
19	Article 24.1 of CA	Revenue Shortfall Loan: If the Realisable Fees in any accounting year fall below the subsistence Revenue Level due to force majeure event, NHAI agrees to provide shortfall support by way of loan from time to time with interest thereon @ SBI PLR per annum. This amount shall be repaid along with interest thereon atleast two years before expiry of Concession Period.
20	Article 27.1	Insurance during Concession Period: • ***The Concessionaire shall effect and maintain at its own cost, during the Construction period and the operation period, such insurances required under the Financing Documents, Applicable Laws and in accordance with Good Industry Practice.***
21	Article 28.2	The fees and expenses of the Statutory Auditors shall be borne by the Concessionaire.
22	Article 32.2 & 32.4.2.2	Termination on account of Concessionaire default during O&M period: • ***Authority shall pay Termination Payment, an amount equal to 90% of the Debt Due less Insurance Claims***

S No	Relevant Clause	Description
		Termination on account of Authority default, during O&M period: Authority shall pay an amount equal to Debt Due and projected cashflows to the equity providers upto termination date
23	Article 36.1	Increase in Cost due to Change in Law • *for increase in Cost or reduction in net after-tax return due to change in Law, the aggregate financial effect of which exceeds Rs. 1.0 crore in any accounting year. Authority has to compensate the Concessionaire.*
24	Article 36.2	Reduction in Cost due to Change in Law • *reduction in Cost or increase in net after-tax return, the aggregate financial effect of which exceeds Rs. 1.0 crore in any accounting year. Concessionaire has to pay back to Authority.*
25	Article 39.2	Arbitration: Any dispute shall be resolved amicably by way of conciliation. If not resolved shall be decided by reference to Arbitration, in accordance with UNCITRAL rules of Arbitration (the "Rules"), and shall be subject to the provisions of the Arbitration and Conciliation Act
26	Article 43.1	Governing Law: Agreement shall be construed and interpreted in accordance with and governed by the laws of India, and the courts in New Delhi shall have exclusive jurisdiction over matters arising out of or relating to this Agreement

1.6 REVIEW OF CONCESSIONAIRE'S REPORT

From the Concessionaire's monthly report, April 2025 following inferences were drawn:

- *No-Entry imposed between 6AM-12Noon & 4PM-10PM have impacted traffic movement and revenue to the Company.*
- *Dunlop Flyover getting congested due to installation of height barriers by PWD at approach ramp. This must be made functional to its full capacity to ensure free flow.*
- *There is a new road opening between Belghoria Expressway to Muragacha on newly proposed Kalyani Expressway. Traffic is partially started to move through this even though certain elevated portion is under construction.*

The claim raised by Concessionaire:

Following claims are pending with NHAI (without interest) as on 30th April 2025.

Sr No.	Description	Amount
1	Revenue loss due to Demonetization [09.11.2016 to 02.12.2016] *	57,480,669
2	Revenue loss due to toll suspension during COVID-19 pandemic [25.03.2020 to 19.04.2020]	105,098,756
Total (1 + 2)		**162,579,425**
3	COS Claims:	
a)	Two Lanes ETC	9,401,366
b) (i)	16 Lanes HES	116,025,301
b) (ii)	Additional 4 Lanes HES	8,918,149
c)	Toilet Block	8,733,302
d)	Ambulance	3,182,209
e)	Patrolling Vehicle	1,183,791
Total (a + b + c + d + e)		**147,444,118**
4	Damages claimed by SVBTC from RVNL/NHAI	28,848,187
Total (1 + 2 + 3 + 4)		**338,871,730**

A claim of Rs. 1,121,892/- (2x) was initially submitted to NHAI for reimbursement from Eastern Railways for the temporary diversion of traffic through Second Vivekananda Bridge for retrofit work of CCR Bridge. NHAI vide its letter dated 13th March 2025 has recommended Rs. 582,782/- to Eastern Railways for reimbursement to Concessionaire. Further a revised claim of Rs. 535,470/- was resubmitted to Eastern Railways for reimbursement of toll charges (1x) only vide letter dated 25th April 2025 in reply and compliance of Eastern Railways letter dated 11th April 2025.

❖ *Pending Litigations of SVBTC*

(i) *Show-cause notice by on account of irregularities under Section 23 and 24 of Contract Labour (Regulation and Abolition) Act, 1970 Commission ("**CLRA**")*

A show cause notice dated February 24, 2010 , was issued by the Ministry of Labour, Government of India to SVBTC on account of alleged irregularities committed by it under Section 23 & 24 of CLRA.

SVBTC filed a writ petition before Calcutta High Court on May 4, 2010 praying for the quashing of the show cause notice issued on February 24, 2010 and for restraining Labour Enforcement Officer (Central) from proceeding any further on the basis of this show cause notice.

The Calcutta High Court *vide* its order dated May 17, 2010, stayed the show cause notice and further issued directions to the respondents to show cause as to whether the Central or the State Government will be the appropriate government in respect of SVBTC with reference to the CLRA.

Subsequently, a criminal case was instituted before the Chief Judicial Magistrate, Howrah by Labour Enforcement Officer (Central), Calcutta -IV for prosecution under section 23 and section

24 of the CLRA. SVBTC, in response, filed an application for injunction to stay the criminal prosecution in July 2010.

The Calcutta High Court heard the case on February 4, 2011, wherein it directed the Union of India to take appropriate directions and appear before the Court. The injunction application was again heard on April 8, 2011, wherein it was directed that the Union of India would have to file an affidavit-in-opposition within 2 weeks from the date of reopening of the High Court and that SVBTC would have to file an affidavit-in-reply within 1 week thereafter However, no affidavit-in-opposition has been filed by the Union of India, as of date.

Subsequently, SVBTC received two summons on September 14, 2019 from the Chief Judicial Magistrate, Howrah, whereby, SVBTC was directed to intimate the court about the updated position of the case pending before the Calcutta High Court.

The petition seeking information about the case before Calcutta High Court was filed by the advocates of SVBTC, while parallelly, the matter was heard on various dates at Howrah Court. The matter was listed for a hearing on May 13, 2022, whereby the Calcutta High Court listed the matter for a hearing on July 5, 2022, however no hearing took place.

The matter will be listed in the Monthly List of June'2025 in Calcutta High Court after the Cout opens on 9th June, 2025.

(ii) *Appeal against order of Income Tax Appellate Tribunal*

SVBTC has sought to claim a depreciation on its intangible assets for an amount of INR 419,922,054 for the assessment year 2012-2013. However, the claim of SVBTC was rejected by the assessing officer *vide* its order dated March 18, 2015.

Aggrieved by the order of the assessing officer, SVBTC filed an appeal before the Commissioner of Income Tax (Appeal) Kolkata who upheld the order of the assessing officer *vide* its order dated November 4, 2016.

SVBTC preferred an appeal before Income Tax Appellate Tribunal which passed order in favour of SVBTC on July 11, 2018.

The Income Tax Department then filed the instant appeal against the Income Tax Appellate Tribunal order *vide* their petition dated July 12, 2019 which is pending before the Hon'ble Calcutta High Court. Hearing is not completed. The last hearing was held on January 7, 2022.

The matter was heard before the Calcutta High Court on November 17, 2021, December 13, 2021, January 7, 2022 and was last listed for a hearing on November 13, 2022. The matter is yet to be listed in Calcutta High Court.

Damages and Claims of NHAI against SVBTC

The Concession Agreement requires SVBTC to maintain the Project in accordance with the Concession Agreement. NHAI, *vide* its letter dated April 25, 2022 has levied damages against SVBTC on various counts of non-maintenance of the Project and delay, negligence and failure to timely repair the maintenance issues.

As per NHAI's aforementioned letter, SVBTC is liable for recovery of damages if SVBTC fails to maintain or repair the defects and deficiencies notified by NHAI. NHAI has claimed damages against SVBTC for a total amount of INR 52,554,256.

The claimed amount is divided across various counts:

#	Works performed by SVBTC	Costs (in INR)
1.	Delay in replacement of damaged post tensioned tendon T1-L of viaduct span KD12-KD13	4,200,000
2.	Replacement of tendon T1-L of viaduct span KE3-KE4	Not applicable.
3.	Delay in replacement of damaged post tensioned tendons D2-R of span P2-P3 and D1-R of span P9-P10 of main bridge	7,620,000
4.	Delay in repair of neoprene boots	2,710,000
5.	Non-functioning of traffic count cum classifier	26,700,000
6.	Delay in rectification of damaged wearing course on Main Bridge and viaducts	5,190,000
7.	Delay in repairing off-down take pipes under viaducts	4,070,000
8.	Delay in repair/rectification of potholes and damaged wearing surface	1,020,000
9.	Non-functioning of dedicated ETC lanes in Rajchandrapur Toll Plaza	224,256
10	Delay in repair/rectification of pavement defects	820,000

As per SVBTC's letter dated 27 December 2022 to the Manager and Regional Officer of NHAI, SVBTC informed NHAI that claims by and against SVBTC will have to be settled at the project implementation unit level. Accordingly, the Chief Executive Officer of SVBTC and his team met the new Regional Officer, NHAI on December 27, 2022 and briefed about the claims. The Regional Officer agreed to examine the claims by and against SVBTC and get back to SVBTC for a joint meeting.

It is pertinent to note that SVBTC has not accepted any claim, fines, penalties, damages levied against it by NHAI on account of the above items and is disputing the claim amount raised by NHAI for such alleged non- compliance. To this effect SVBTC has obtained a legal opinion from Khaitan and Co., a law firm located in Kolkata, dated April 19, 2019 which opines that the claims raised by NHAI against SVBTC are not payable as NHAI has not incurred any actual loss and hence cannot claim any damages from SVBTC. SVBTC is expected to meet with NHAI to resolve the pending change of scope claims of SVBTC, with a proposal to settle the pending claims of NHAI against SVBTC. However, SVBTC has not received any communication from NHAI in the last 2 years on this matter.

In a meeting held between the representatives of SVBTC and NHAI on January 9, 2024, SVBTC and NHAI, based on the ongoing good faith negotiations between them, agreed to settle NHAI's outstanding claims of INR 52,554,256. In this regard, SVBTC issued a letter on January 10, 2024, through which SVBTC agreed to settle the outstanding claims of NHAI against SVBTC (as articulated above) by setting off the said claims against the pending claims of SVBTC against NHAI (specifically the claims pertaining to demonetisation and on account of the change of scope works undertaken by SVBTC). SVBTC submitted all relevant documents sought by NHAI and the discussions for settlement of such claims are presently pending between the Parties. The damage claim of NHAI was settled by SVBTC on January 19, 2024.

1.7 O&M REQUIREMENTS

1. The Sch-B, Clause 2.3. 3 indicates BBD test to be carried out at repeated intervals (every year). Wherever, the Ch. Deflection is more than 0.8mm, an overlay shall be designed for an additional traffic of 100 msa.
2. The Sch-B, Clause 2.3.4 indicates Rigid pavement to be designed for 30 years
3. Sch-D, Clause 3.5.4, the Traffic Aid Post (TAP) equipped with a Crane, Diesel Jeep or Station Wagon, Ambulance, motorcycle and other equipment as per requirement.
4. The Sch-L, Clause 4.1, Roughness measurement shall be done once a year, immediately after the monsoon. But there is no mention of the threshold limit of roughness value.

1.8 REVIEW OF O&M MANUAL

The pavement crust thick as given in the manual under “details of Carriageway” is as follows

S. No	Description	Details of Pavement (in MM)
1	Main Carriageway (Flexible)	50 BC + 130 DBM + 250 WMM + 230 GSB
2	Toll Plaza (Rigid)	300 PQC +150 DLC +150 GSB
3	Toll Free Road	50 BC + 110 DBM + 250 WMM + 230 GSB
4	Service Road (4m)	50 BC + 110 DBM + 250 WMM + 230 GSB
5	Ramp-A,B	40 BC + 75 DBM + 250 WMM + 230 GSB
6	Ramp-C,D	50 BC + 130 DBM + 250 WMM + 230 GSB
7	Ramp-G,H, PWD-Up Road & PWD-Down Road	40 BC + 60 DBM + 250 WMM + 230 GSB

CHAPTER 2. SURVEYS AND INVESTIGATIONS

2.1 INTRODUCTION

The main objective of undertaking Surveys and Investigations is to appreciate the existing engineering features along the project corridor and to understand the present condition of the various elements of the project road and to prepare required inputs for various rehabilitation and maintenance strategies.

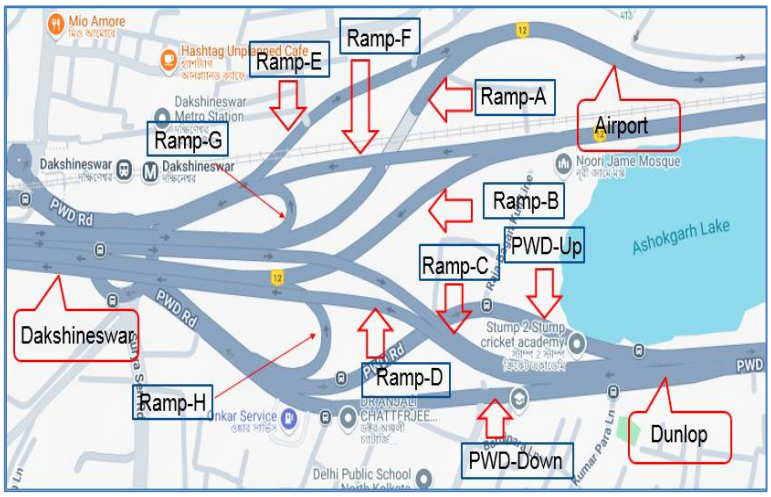
Following Survey and Investigations have been undertaken as a part of study with an objective to understand the present condition of the road and there by access the quality of construction and as well to prepare requisite rehabilitation/corrective designs where necessary.

- Road Inventory Surveys
- Pavement Condition using NSV
- Roughness Surveys using NSV
- Structure Inventory and Condition Surveys

2.2 ROAD INVENTORY

The project corridor predominantly comprises a flexible pavement structure with a 6-lane divided carriageway throughout its length, except at the Toll Plaza location, where rigid pavement is provided. The main carriageway generally has a width of 10.0 meters, supplemented by a 2-meter paved shoulder on either side. The central median is 2.6 meters wide, including a 0.3-meter shyness zone.

The main carriageway is integrated with Ramps A, B, C, and D. Additionally, the corridor includes Ramp E (connected to Ramp A), Ramp F (connected to Ramp B), Ramp G (connecting to Ramp F), and Ramp H (connecting to Ramp B) by facilitating connectivity to the Airport and Dakshineswar. Furthermore, the PWD, Up and Down roads link the Belgoria Expressway to Dakshineswar, serving as entry and exit routes.



The project alignment predominantly traverses plain terrain, with elevated embankments near bridge approaches. It passes through a combination of municipal, railway, private, and other government-owned lands. Key habitations along the corridor include the built-up sections of Rajchandrapur, Bally, and Dakshineswar.

Typical View of Project Road is shown below:

A view of the Project Road at km 653.400

A view of the Project Road at km 654.900 RHS

A view of the Project Road at km 655.560

A view of the Project Road at km 656.000

A view of the Project Road at km 656.100

A view of the Project Road at km 657.000

Approaches to the structures are provided with partial/Full RCC wall. High embankments are provided with grouting on soil embankment along with chutes. The sample photos are presented below.

Partial RCC wall Km 655+160 LHS

High Embk. with chutes km 653+600 RHS

RCC-cover drains are provided at Ramps and certain length of Main Carriageway. Trapezoidal Lined Drains are provided in separator portion between MCW and Service Road. The sample photos are as presented below.

Drain at Km 653+500 RHS

Drain at Km 655+300 LHS

Highway lighting in the form of Single/double arms are provided near structure approaches and ramps. Whereas, High-masts are provided at Toll Plazas and at Ramp intersection locations. Representative photographs of the High Mast installations and highway lighting are presented below.

High Mast Lighting at km 654.100 on MCW

High Mast Lighting at km 658.000 Ramp-B

Single Arm lighting at km 657.100 on MCW

Single arm Lighting 654.700 RHS-SR road

The ramps connected to main carriageway for entry/exist purpose are as presented below:

View of Ramp-E

View of PWD-Down road

Service/slip roads are constructed with varying carriageway widths from 3.5m to 7m. These are constructed with flexible pavement. Photos depicting the service/slip road pavement surface type, condition and the other associated features like drain. Few photos taken at service/slip road locations are presented below:

Service road at km 653.500 RHS

At km 655.160 Lower lever sevice road

At km 655.290 Toll Free Road

At km 653.200 Toll Free Road

The Project Road has a Toll Plaza at Km 654.050 (Rajchandrapur Toll Plaza). It has Rigid pavement including its tapering portions. The condition of the toll plaza appears to be fair. It has 9+1 lanes on each side. High mast lights and double arm lighting are provided to this Plaza.

The details of Toll Plaza are as follows.

S.No	Type	Units	TP1	Remarks
1	Chainage	*Km*	654.050	**Rajchandrapur Toll plaza**
2	Pavement Type		Rigid	
3	Pavement Type Central Portion		Rigid	
4	No of lanes	*Nos*	20	10+10
5	Canopy		yes	
6	Toll office		yes	
7	Toll booths		yes	

S.No	Type	Units	TP1	Remarks
8	Fast tag lanes	*Nos*	yes	
9	Total Toll Plaza length	*Rmt*	160.000	
10	Toll plaza width	*m*	56	
11	Static Weigh bridges	*Nos*	2	
12	WIMS	*Nos*	20	
13	Highmast Post	*Nos*	6	
14	Ambulances	*Nos*	1	
15	Cranes	*Nos*	1	
16	Highway Petroling Vehicles	*Nos*	2	
17	Toeing Vehicle	*Nos*	0	
18	Elevated walk Way	*Nos*	-	
19	Tunnel	*Nos*	1	
20	Toilets	*Nos*	2	
21	Administrative Building	*Nos*	1	
22	Maintenance Building	*Nos*	1	
23	Medical Aid post	*Nos*	1	
24	Control Room	*Nos*	1	
25	Traffic Aid Post	*Nos*	1	
26	Water tankers	*Nos*	1	

A view of the Existing Toll Plaza near km 654.050 (Rajchandrapur Toll Plaza)

Static Weigh Bridge @ km 654.00

Toll Admin Building @ km 654.050

The collected Road Inventory Data is presented in **Appendix 1** of this Report

2.3 PAVEMENT CONDITION SURVEYS

The Pavement Condition Data collected through Network Survey Vehicle (NSV) surveys for the main carriageway and ramp roads is presented in **Appendix 2** of this report. The data has been captured at 10-meter intervals for each lane in both directions.

Pavement Condition data has been collected for both Main carriageway and Ramps.

The photographs showing the pavement condition of the Project Road is presented below.

Delamination @ 656.000 LHS

Fair @ Km 654.900 RHS

Rutting @ 655.400 LHS

2.4 ROUGHNESS SURVEYS

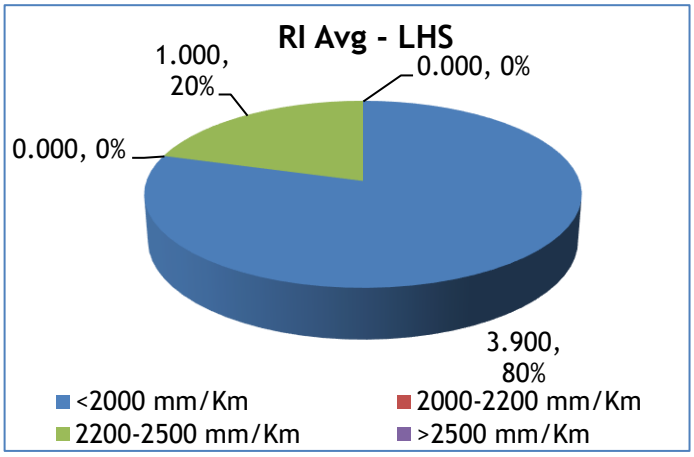
The Roughness data has been collected using **Network Survey Vehicle** and analyzed in terms of International Roughness Index (IRI), separately for each lane, for both direction of travel. Pavement Roughness data collection and computation of IRI for each km length in each direction is presented in **Appendix 3** of this Report.

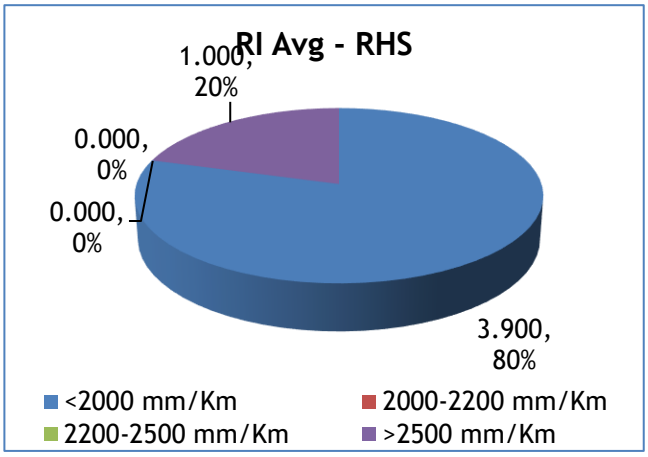
Roughness data has been collected for both Main carriageway and Ramps.

As Schedule-L, has not mentioned about the intervention level of roughness value. Presently, 2500mm/Km is considered as roughness threshold limit.

Average Roughness Index (RI) values along the corridor were grouped in to four categories, Pie chart showing the range of RI values in each carriageway of the project road have been presented below:

❖ **Main Carriageway**





From the above graph, about 80% of the project stretch is fair to good riding quality. It is also to note that high roughness values(>2500mm/km) are recorded on main bridge and viaduct portion are likely due to the influence of segmental joints and these high values can be ignored.

Further, roughness values have also been recorded and analyzed on the ramp sections.

CHAPTER 3. VALIDATION OF EXECUTED WORKS

3.1 ROAD WORKS

The project road has been closely inspected to verify the executed works on ground. As a part of the validation, the available as-built drawings and the inventory data received from the Concessionaire were also referred. Each structure has been inspected to note down its structural configuration and condition. The following table highlights the scope comparison of the executed works on ground.

Table 3: Scope Comparison of Executed works

S. No.	Particulars	Length/ Nos	Total for O&M Estimation	As per Site	As per Vendor
1	Start Chainage (Km)	Km	653.010	653.010	653.010
2	End Chainage (Km)	Km		659.051	659.051
3	Length of the Project Corridor	Kms		6.041	6.041
4	Service Road / Slip Road (Including Taper Length)	Kms	5.160	5.160	
5	Ramps	Km	7.440	7.440	
6	High Embankments	Kms		1.070	
7	Partial RCC Wall with Concrete Lining	Kms		0.130	
8	Concrete Lining	Kms		0.480	
9	RCC Cover Drain	Kms	0.930	0.930	0.423
10	RCC Open Lined Drain	Kms	15.224	5.420	15.224
11	Chutes	Nos	53	53	
12	Toll Plaza	Nos	1	1	1
13	No.of Lanes (Both side)10lane+10lanes	Nos	20	20	20
14	ECB - Emergency Call Box	Nr	12	12	11
15	Route Patrolling Vehicle	Nos	2	2	2
16	Ambulance	Nos	1	1	1
17	Cranes	Nos	1	1	1
18	High Mast Post	Nos	20	20	20
19	Single Arm Lighting poles	Nos	279	273	279
20	Double Arm Lighting poles	Nos	101	101	100
21	Solar Blinkers	Nos	11	11	11
22	Median Opening	Nos	4	4	
23	Median Plantation Functional	Kms	2.69	2.69	
24	Road Markings	Kms		9.8	
25	Delineators	Nos	75	9	75
26	Kilometer Stones	Nos	12	6	12
27	Hectometer Stones	Nos	57	20	57

S. No.	Particulars	Length/ Nos	Total for O&M Estimation	As per Site	As per Vendor
28	Single Face W-Beam Safety Barriers	Kms	12.059	11.265	12.059
29	Rigid Concrete Barriers	Kms	12.828	12.820	12.828
30	Pedestrian Guard Rails	Kms		0.840	
31	Road Signs	Nos	323	320	323
32	Cantilever Sign Boards	Nos	1	1	
33	Varying Message Signs(VMS)	No.	4	4	
34	PTZ camera's	No.	9	9	
35	3-Lane Gantry Sign Boards	No.	3	3	
36	Fencing	Kms	8.812	5.260	8.812
37	Compound Wall	Kms	4.249	1.460	4.249
38	Paver block	Kms		0.070	
39	Speed detectors	N0.	4	4	4

Within the project stretch, Service Roads/Slip Roads have been observed with a total cumulative length of 5.160 km. These roads feature flexible pavements and vary in width, with observed widths of 3.5 m, 4.5 m, 5.5 m, and 7.0 m. The summary of service roads and slip roads are presented in the table below and the location details are presented in the **Appendix-4** of this report.

Table 4: Details of Service Roads/Slip Roads along Project Road

Summary	As Per Site
Service Road -RHS	1.690
Lower-level Road-LHS	0.470
Toll Free Road-LHS	3.000
Total	**5.160**

RCC Lined Covered drains and RCC opened line drain are provided along the project road at service road locations The summary of **RCC Covered Drains** is presented in the table below and the location details are presented in the **Appendix-4** of this report.

Table 5: RCC Covered Drains

Summary	RCC Drain As per Site (Km)
RCC Open lined drain	5.420
RCC Covered drain	0.930

Partial RCC walls/ Full height RCC wall are found in approaches of some of the structure locations, at High embankment along the Project Corridor. The summary of the slope protection are presented below and the location details are given in the **Appendix-4** of this report.

Table 6: Summary of Slope Protection along Project Road

Partial RE Wall +Concrete lining	Embankment	Full Height RCC	Concrete Lining
0.070 km	1.070 km	0.130 km	0.480 km

In general, the median width along the project corridor is 2.0 meters. There are 4 normal median openings are identified and all these are temporarily closed. The summary of Median Openings is presented in the table below and the location details are presented in the **Appendix-4** of this report.

Table 7: Details of Median Openings

Median Openings As per Site					
S. No	**Existing Chainage (km)**	**Width (m)**	**Length (m)**	**Reserve lane**	**Remarks**
1	653.74	2	20	No	Temporary closed
2	654.29	2	30	No	Temporary closed
3	655.59	2	20	No	Temporary closed
4	655.74	2	20	No	Temporary closed

Safety Barriers in form of W-beams, PGRs and Concrete barriers are provided at approaches to Minor/Major Bridges, Underpasses (VUP, PUP and LVUP etc) and at Ramp locations. The table below shows the summary of Safety Barriers provided along the project corridor. The location details are presented in the **Appendix-4** of this report:

Table 8: Summary of Safety Barriers

S. No.	Description	Length (Kms)
1	W-Beam Safety Barriers	12.820
2	Concrete Crash Barriers	11.265
3	Pedestrian Guard Railings	0.840

A total of 20 High Mast poles are installed near ramp locations and the Toll Plaza. Additionally, highway lighting is provided along a cumulative length of 13.200 km, covering the entire project corridor, including service roads, ramps, and toll-free road sections.

Table 9: Highway Lighting Details

High mast Poles (No's)	Single Arm Poles (No's)	Double Arm Poles (No's)
20	273	101

Road furniture in the form of Sign boards, gantries, boundary fencing etc have been provided along the project road. The list of all road items has been furnished in **Appendix-4** of this report.

The tables below depict the summary of few Road Furniture items and the location wise details are provided.

Table 10: Details of Road Signs along Project Road

Summary	As per Site (Nos)
Circular	103
Triangular	46
Rectangular	120
Chevron	51
Cantilever Gantry	1
Over Head Gantry	3

The details of ATMS items are presented below.

Table 11: Details of ATMS Project Road

ATMS Details	Nos	Remarks
VMS	4	Working
ECB	12	Working
Solar blinkers	11	Working
Speedometer	4	Working
PTZ	9	Working
ATCC camera	1	Working

ROW fencing and boundary wall is provided on either side of the main carriageway and ramps. The summary of the total length is as follows:

Table 12: Details of Fencing

Summary	Kms	Remarks
Fencing	5.260	Fair
boundary wall	1.460	Fair

3.2 STRUCTURES

List of Structures found during the inventory surveys along the corridor are as follows:

Table 13: Summary of Structures as per Site

S. No	Type of Str	No. of Str			Total No. of Str's	Total No. of Locations
		LHS	RHS	BHS		
1	ROB	2	1	-	3	1
2	RUB	2	1	-	3	2
3	Main Bridge	-	-	1	1	1
4	Viaduct	4	4	-	8	6
5	Underpass	7	4	-	11	4
6	PUP	3	3	-	6	2
7	Box Culvert	-	1	2	3	3
Total Nos		18	14	3	35	19

Table 14: Age of Structures

S. No	Type of Str	LHS		RHS		BHS		Total Nos		Total No. of Str's
		Old	New	Old	New	Old	New	Old	New	
1	ROB	-	2	1	-	-	-	1	2	3
2	RUB	-	2	-	1	-	-	-	3	3
3	Main Bridge	-	-	-	-	-	1	-	1	1
4	Viaduct	-	4	-	4	-	-	-	8	8
5	Underpass	-	7	3	1	-	-	3	8	11
6	PUP	-	3	1	2	-	-	1	5	6
Total Nos		0	18	5	8	0	1	5	27	32

Table 15: Summary of Bearings & Expansion Joints

S. No	Type of Str	Expansion joints		Bearings					
				Pot PTFE		Elastomeric		Rocker Roller	
		Old	New	Old	New	Old	New	Old	New
1	ROB	4	8	-	-	16	60	32	-
2	Main Bridge	-	5	-	52	-	-	-	-
3	Viaduct	-	66	-	-	-	480	-	-
Total Nos		4	79	0	52	16	540	32	0
		83		52		556		32	
				640					

Table 16: Summary of Superstructures

S. No	Type of Str	RCC & PSC Girders	RCC Box	PSC Box Girder and RCC Solid Slab	PSC Box Girder	RCC Solid Slab and PSC Box Girder	Total No. of Structures
1	ROB	3	-	-	-	-	3
2	RUB	-	3	-	-	-	3
3	Main Bridge	-	-	-	1	-	1
4	Viaduct	-	-	2	2	4	8
5	Underpass	-	11	-	-	-	11
6	PUP	-	6	-	-	-	6
Total Nos		3	20	2	3	4	32

Table 17: Summary of Substructures

S. No	Type of Str	ABUTMENT		PIER		
		Spill through	RCC BOX	RCC wall Type	RCC trestle Type	RCC Rectangular Column Type
1	ROB	3	-	2	1	-
2	RUB	-	3	-	-	-
3	Main Bridge	-	-	-	-	1
4	Viaduct	6	-	-	-	8
5	Underpass	-	11	-	-	-
6	PUP	-	6	-	-	-
Total Nos		9	20	2	1	9

Table 18: Details of Major Structures

S.No.	Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Deck Width (m)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
									Abutment	Pier		
1	655+665	ROB	LHS	TFR	New	1 x 15 + 1 x 36 + 1 x 15	12.00	Not visible	Spill through	RCC wall Type	RCC & PSC Girders	Elastomeric
2	655+665	ROB	LHS	MCW	New	1 x 15 + 1 x 36 + 1 x 15	15.00	Not visible	Spill through	RCC wall Type	RCC & PSC Girders	Elastomeric
3	655+665	ROB	RHS	MCW	Old	1 x 15 + 1 x 36 + 1 x 15	15.00	Not visible	Spill through	RCC trestle Type	RCC & PSC Girders	Elastomeric & Rocker Roller
4	656+145	RUB	LHS	MCW	New	1 x 12 x 5.4	53.00	RCC Box				-
5	656+145	RUB	RHS	MCW	New	1 x 12 x 5.4	53.00	RCC Box				-
6	658+475	RUB	LHS	Ramp A	New	1 x 12 x 5.4	63.00	RCC Box				-
7	656+286.600 to 656+664.900	Viaduct	LHS	MCW	New	1 x 15 + 6 x 35.33 + 1 x 20 + 1 x 25 + 3 x 35.5	13.65	Pile	Spill through	RCC Rectangular Column Type	PSC Box Girder and RCC Solid Slab	Elastomeric
8	656+286.600 to 656+664.900	Viaduct	RHS	MCW	New	1 x 15 + 6 x 35.33 + 1 x 20 + 1 x 25 + 3 x 35.5	13.65	Pile	Spill through	RCC Rectangular Column Type	PSC Box Girder and RCC Solid Slab	Elastomeric
9	656+664.907 to 657+544.907	Main Bridge	BHS	MCW	New	8 x 110	29.00	Well	-	RCC Rectangular Column Type	PSC Box Girder	Pot PTFE
10	657+545 to 657+825	Viaduct	LHS	MCW	New	7 x 35.05	13.65	Pile	-	RCC Rectangular Column Type	PSC Box Girder	Elastomeric
11	657+545 to 657+826	Viaduct	RHS	MCW	New	7 x 35.05	13.65	Pile	-	RCC Rectangular Column Type	PSC Box Girder	Elastomeric
12	657+825 to 658+271	Viaduct	LHS	Ramp-A	New	11 x 35.15 + 1 x 23.85 + 1 x 27.93 + 1 x 36.33 + 1 x 11	8.50	Pile	Spill through	RCC Rectangular Column Type	RCC Solid Slab and PSC Box Girder	Elastomeric
13	657+825 to 658+265	Viaduct	RHS	Ramp-B	New	11 x 35.03 + 1 x 23.68 + 1 x 32.6 + 1 x	8.50	Pile	Spill through	RCC Rectangular	RCC Solid Slab and PSC Box Girder	Elastomeric

S.No.	Chainage (Km)	Type of Structure	Side	Str on	Age of Structure	Span Arrangement (No x Length)	Deck Width (m)	Type of Foundation	Type of Substructure		Type of Superstructure	Type of Bearings
									Abutment	Pier		
						25.78 + 1 x 10				Column Type		
14	657+825 to 658+628	Viaduct	LHS	Ramp-C	New	2 x 37.18 + 17 x 35.04 + 4 x 32.34 + 2 x 20.98 + 1 x 10	8.50	Pile	Spill through	RCC Rectangular Column Type	RCC Solid Slab and PSC Box Girder	Elastomeric
15	657+825 to 658+618	Viaduct	RHS	Ramp-D	New	19 x 35.143 + 2 x 31.49 + 1 x 25.01 + 3 x 21.1 + 1 x 10.1	8.50	Pile	Spill through	RCC Rectangular Column Type	RCC Solid Slab and PSC Box Girder	Elastomeric
16	653+445	Underpass	LHS	MCW	New	1 x 9 x 5.4	16.50	RCC Box				-
17	653+445	Underpass	RHS	MCW	New	1 x 9 x 5.4	16.50	RCC Box				-
18	653+781	PUP	LHS	MCW	New	1 x 3.6 x 2.5	27.00	RCC Box				-
19	653+781	PUP	RHS	MCW	New	1 x 3.6 x 2.5	27.00	RCC Box				-
20	653+781	PUP	RHS	SR	New	1 x 3.6 x 2.5	15.00	RCC Box				-
21	654+755	Underpass	LHS	TFR	New	1 x 3.6 x 3	10.00	RCC Box				-
22	654+755	Underpass	LHS	MCW	New	1 x 3.6 x 3	16.50	RCC Box				-
23	654+755	Underpass	RHS	MCW	Old	1 x 3.6 x 2.5	16.50	RCC Box				-
24	655+181	Underpass	LHS	TFR	New	1 x 3.6 x 6.0	12.00	RCC Box				-
25	655+181	Underpass	LHS	MCW	New	1 x 3.6 x 6.0	14.00	RCC Box				-
26	655+181	Underpass	RHS	MCW	Old	1 x 3.6 x 4.0	14.00	RCC Box				-
27	655+739	Underpass	LHS	TFR	New	1 x 7.5 x 6.5	12.00	RCC Box				-
28	655+739	Underpass	LHS	MCW	New	1 x 7.5 x 6.5	14.00	RCC Box				-
29	655+739	Underpass	RHS	MCW	Old	1 x 7.5 x 4.0	14.00	RCC Box				-
30	656+019	PUP	LHS	TFR	New	1 x 5 x 3	12.00	RCC Box				-
31	656+019	PUP	LHS	MCW	New	1 x 5 x 3	16.00	RCC Box				-
32	656+019	PUP	RHS	MCW	Old	1 x 5 x 3	16.00	RCC Box				-

4.1 PAVEMENT CONDITION

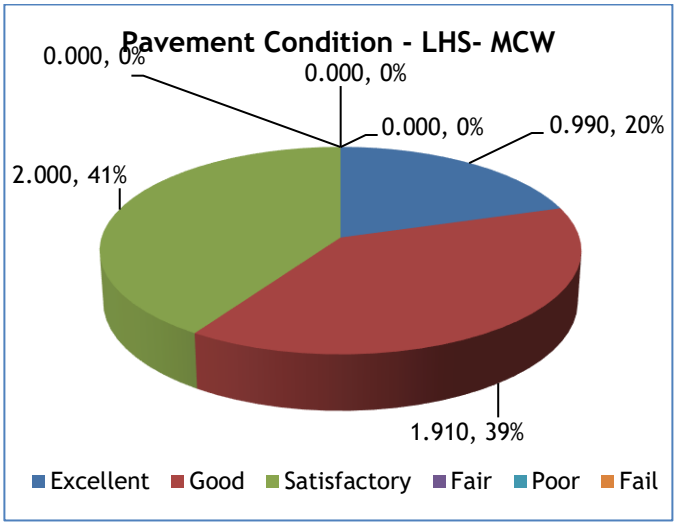
The data collected from NSV, at 10-meter intervals for each km length in each direction has been analyzed in line with Pavement Condition rating (PCI) as per IRC:82-2023

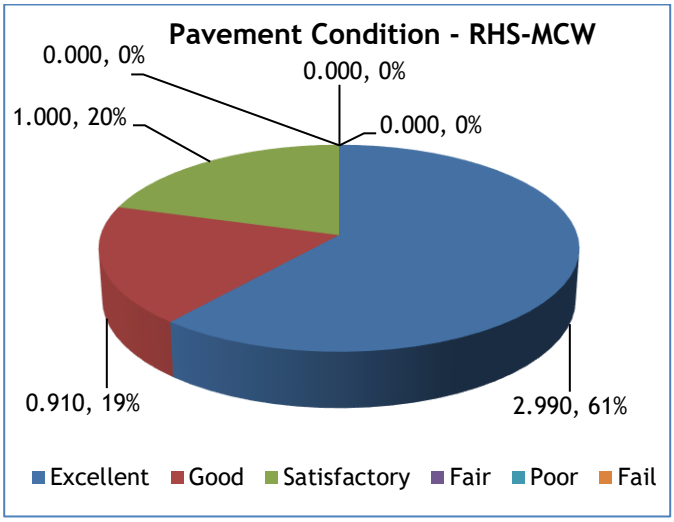
The project corridor has been provided with flexible pavement over entire length including service roads and ramps. Rigid pavement is only provided at Toll Plaza.

Few pavement distresses like cracking associated with rutting, raveling and potholes are observed at isolated locations.

- **Main Carriageway**

The overall pavement condition of the project corridor is a presented below.





Following table represents overall condition of the Main carriageway:

	LHS Pavement Condition		
Overall PCI		Condition Rating	Length (km)
>	<=		
90	100	Excellent	0.990
80	90	Good	1.910
60	80	Satisfactory	2.000
40	60	Fair	0.000
20	40	Poor	0.000
0	20	Fail	0.000
Total Length			4.900

RHS Pavement Condition		
Overall PCI		Length (km)
>	<=	
90	100	2.990
80	90	0.910
60	80	1.000
40	60	0.000
20	40	0.000
0	20	0.000
Total Length		4.900

From NSV pavement condition (PCI) analysis, entire length falls under Excellent to Satisfactory.

❖ **Ramps**

Following table represents overall condition of the Ramps:

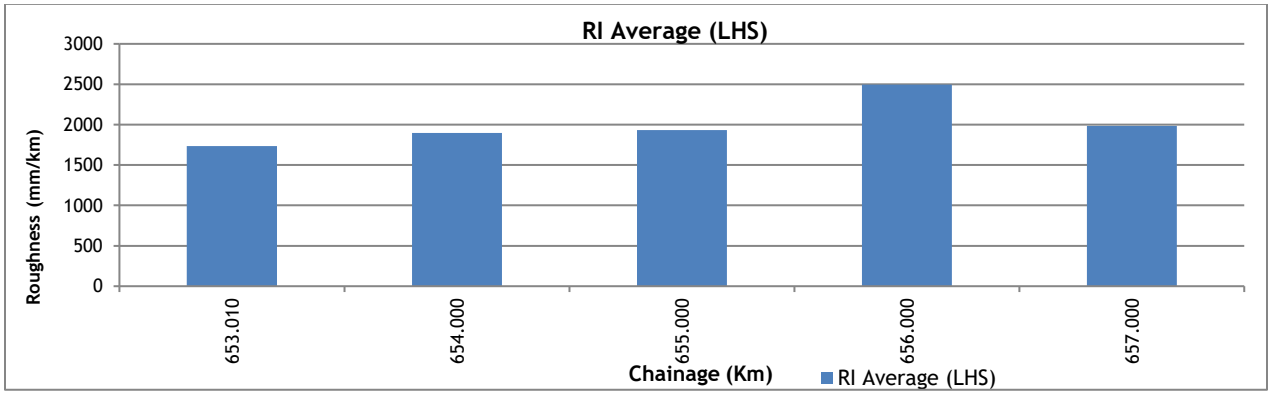
Pavement Condition			Length (km)									
Overall PCI			Loop G	Loop H	Ramp A	Ramp B	Ramp C	Ramp D	Ramp E	Ramp F	PWD UP	PWD DN
>	<=											
90	100	Excellent	-	-	-	0.200	0.100	0.100	0.310	0.100	0.260	0.580
80	90	Good	-	0.110	0.200	0.100	0.370	0.200	-	0.220	0.500	0.300
60	80	Satisfactory	0.100	0.100	0.680	0.700	0.400	0.550	0.200	0.100	0.400	0.100
40	60	Fair	0.130	-	0.200	-	-	-	-	-	-	-
20	40	Poor	-	-	-	-	-	-	-	-	-	-
0	20	Fail	-	-	-	-	-	-	-	-	-	-
Total Length, km			0.230	0.210	1.080	1.000	0.870	0.850	0.510	0.420	1.160	0.980

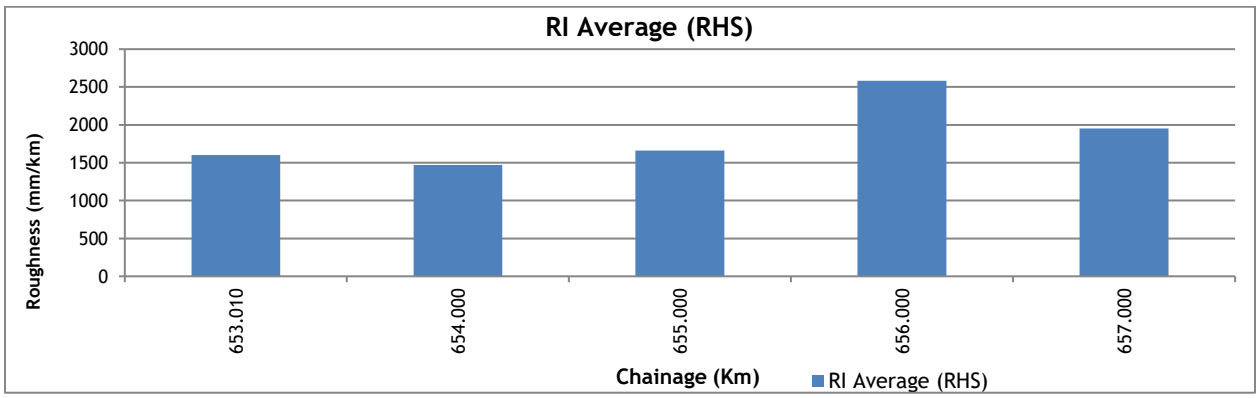
From NSV pavement condition (PCI) analysis, ramps pavement condition falls under Excellent to fair.

4.2 ROUGHNESS

➢ **Flexible Pavement**

The Roughness represented in Bar charts for the main carriageway are as presented below:





Based on the above, considering the Km-stone reference system the summary of Lane-Km having varying roughness values are as presented below

RI (mm/Km)				Length (Km)			
>=	<	LHS Inner Lane	LHS Middle Lane	LHS Outer Lane	RHS Inner Lane	RHS Middle Lane	RHS Outer Lane
	2000	1.900	2.900	2.990	3.900	2.990	3.900
2000	2200	2.000	1.000	0.910	-	0.910	-
2200	2500	1.000	-	1.000	-	-	1.000
2500		-	1.000	-	1.000	1.000	-
Total Length		4.900	4.900	4.900	4.900	4.900	4.900

From the above, roughness values are considered to be within the limits (<2500 mm/km). However, high roughness values(>2500mm/km) are recorded on main bridge and viaduct portion are likely due to the influence of segmental joints and these high values can be ignored.

❖ **Ramps Pavement Roughness:**

Roughness		Length (km)									
>=	<	Loop G	Loop H	Ramp A	Ramp B	Ramp C	Ramp D	Ramp E	Ramp F	PWD UP	PWD DN
	2000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.400	1.150	0.970
2000	**2200**	0.000	0.000	0.000	0.000	0.860	0.000	0.500	0.000	0.000	0.000
2200	**2500**	0.000	0.200	0.000	0.990	0.000	0.840	0.000	0.000	0.000	0.000
2500		0.220	0.000	1.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Length		**0.220**	**0.200**	**1.060**	**0.990**	**0.860**	**0.840**	**0.500**	**0.400**	**1.150**	**0.970**

From the above graph, 0.220 km of Loop-G km & 1.060 km of Ramp-A requires rectifications to be bring the roughness threshold limit (<2500 mm/km).

4.3 STRUCTURES

Inventory and asset condition of all the existing structures falling within project road have been verified as per IRC: SP-35 procedures and guidelines with following field surveys

- Inventory of existing highway bridges / structures
- Visual condition survey of existing highway bridges / structures

Based on these surveys following structural rehabilitation measures have been considered.

Overall condition of few of the major structures are presented on sample basis of below. However, each and every structure details are presented in **Appendix-5** of this report

Chainage: 655+665
General Description
LHS TFR (New)

- Type of Structure : ROB
- Span Arrangement : 1 x 15 + 1 x 36 + 1 x 15 m
- Total length of Structure : 66 m
- Total deck width of Structure : 12 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : Spill through & RCC wall Type
- Type of Superstructure : RCC & PSC Girders
- Type of Bearing : Elastomeric
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Drainage spouts clogged and down take pipes not provided.




Chainage: 655+665
General Description
LHS MCW (New)

- Type of Structure : ROB
- Span Arrangement : 1 x 15 + 1 x 36 + 1 x 15 m
- Total length of Structure : 66 m
- Total deck width of Structure : 15 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : Spill through & RCC wall Type
- Type of Superstructure : RCC & PSC Girders
- Type of Bearing : Elastomeric
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> PVC down take pipe damaged in span 1, 2, 3.
> Cracks observed on the Girder G1 centre at bottom flange.
> Some of the repair works done.




Chainage: 655+665
General Description
RHS MCW (Old)

- Type of Structure : ROB
- Span Arrangement : 1 x 15 + 1 x 36 + 1 x 15 m
- Total length of Structure : 66 m
- Total deck width of Structure : 15 m
- Type of Foundation : Not visible
- Type of Substructure (Abutment & Pier) : Spill through & RCC trestle Type
- Type of Superstructure : RCC & PSC Girders
- Type of Bearing : Elastomeric & Rocker Roller
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Drainage spouts not provided.
> Some of the repair works done.
> External pre-stressing done in Girder G1 and G8 in span 2.
> Spalling and Reinforcement exposed on the Deck slab in span 2.
> Vegetation growth observed on abutments A1 & A2.




Chainage: 656+145
General Description
LHS MCW (New)

- Type of Structure : RUB
- Span Arrangement : 1 x 12 x 5.4 m
- Total length of Structure : 12 m
- Total deck width of Structure : 53 m
- Type of Superstructure : RCC Box
- Type of Railing / Crash Barrier : Not Available
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Vegetation growth observed on wing walls and over the box structure.
> Seepage observed at construction joint locations.

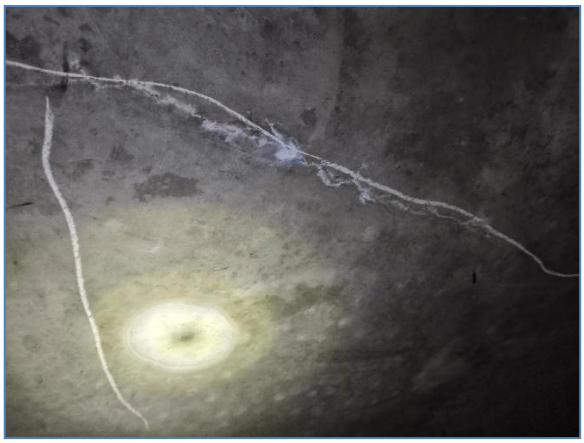



Chainage: 656+286.600 to 656+664.900
General Description
LHS MCW (New)

- Type of Structure : Viaduct
- Span Arrangement : 1 x 15 + 6 x 35.33 + 1 x 20 + 1 x 25 + 3 x 35.5 m
- Total length of Structure : 378.48 m
- Total deck width of Structure : 13.65 m
- Type of Foundation : Pile
- Type of Substructure (Abutment & Pier) : Spill through & RCC Rectangular Column Type
- Type of Superstructure : PSC Box Girder and RCC Solid Slab
- Type of Bearing : Elastomeric
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Cracks observed on inside of the box segments in all spans.



Chainage: 653+445
General Description
LHS MCW (New)

- Type of Structure : Underpass
- Span Arrangement : 1 x 9 x 5.4 m
- Total length of Structure : 9 m
- Total deck width of Structure : 16.5 m
- Type of Superstructure : RCC Box
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Concrete portion damaged and Reinforcement exposed on the top slab due to vehicle hitting.
> Cracks observed on the wing wall and side wall at A1.

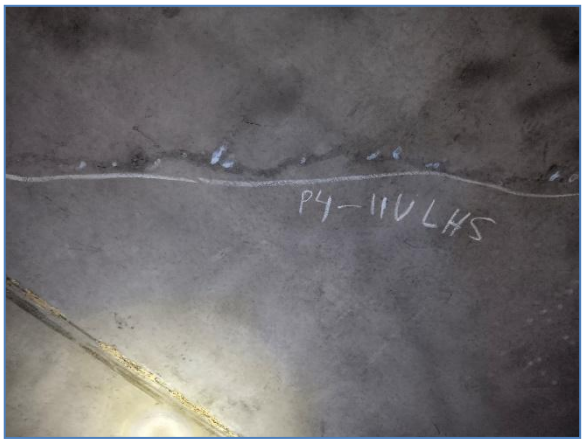



Chainage: 656+664.907 to 657+544.907
General Description
BHS MCW (New)

- Type of Structure : Main Bridge
- Span Arrangement : 8 x 110 m
- Total length of Structure : 880 m
- Total deck width of Structure : 29 m
- Type of Foundation : Well
- Type of Substructure (Abutment & Pier) : RCC Rectangular Column Type
- Type of Superstructure : PSC Box Girder
- Type of Bearing : Pot PTFE
- Type of Railing / Crash Barrier : Crash barrier
- Method of Inspection : Visual

Observations

Visual Observations on condition of the structure are as below:
> Cracks and leaching observed on inside of the box segments in all spans.



❖ ***General Observations on Structures:***

- ✓ The Project stretch have 16 No's of Major structures, in which 1 ROBs, 2 RUBs, 6 Viaducts, 1 Main Bridge, 4 Underpasses & 2 PUPs.
- ✓ The Project Road has various superstructure types such as RCC & PSC Girders, RCC Box, PSC Box Girder and RCC Solid Slab, PSC Box Girder & RCC Solid Slab and PSC Box Girder.
- ✓ There are Elastomeric (Old-16 No's & New-540No's), Rocker Roller (Old- 32No's) & Pot PTFE (New-52No's) observed in Girder type Structures.
- ✓ Structures are having 83 No's of Expansion joints in that 4 No's on old structures and 79 No's on new structures.
- ✓ There are 5 No's of old bridges existing on right side. (1 ROB's, 3 Underpass's & 1 PUP's)
- ✓ All the structures appear to be in fair condition with some minor issues, except for the viaducts and main bridge, which exhibit structural cracks and leaching on the box segments at several locations. These structures may require immediate intervention to ensure continued service.

Few Photos Depicting Culverts Are Presented Below:

Box Culvert at 653+607

Box Culvert at 655+052

4.4 DRAINAGE AND SLOPE PROTECTION

- ✓ Lined Covered drains observed at urban locations and at service road Locations along the corridor.
- ✓ Trapezoidal toe drain observed at the toe of the embankment and are found to be intact.
- ✓ Median drains at curve locations are in good condition. No major distress is observed on the carriageway on downstream side at median drain locations.

4.5 TRAFFIC SAFETY AND ROAD FURNITURE

- ✓ Metal beam crash barriers provided along the project road appear to be intact over entire length except for few locations where it got damaged.
- ✓ Pedestrian guard rails installed on the Ramps locations.
- ✓ Median Opening locations appear to be in good condition. But, these are temporarily closed.
- ✓ Solar blinkers are in Fair condition and these are observed at Ramp and Toll Free Service Road location.
- ✓ Street lightings and High masts are observed ***in the entire stretch which includes*** Toll Plaza, ***ramps and service road*** Locations.

4.6 STRUCTURAL REHABILITATION

All the structure found to be in fair except minor treatment like crack repairs, repair of stone pitching, cleaning of drainage spouts, cleaning of vegetation etc. may be required. Detailed structural rehabilitation quantities have been worked out based on the prevailing condition of existing structures. This methodology describes in detail the procedure for the execution of each item of rehabilitation work of the Existing Bridges of the project.

The scope of this methodology covers the items mentioned below for rehabilitation work of all the existing Bridges.

- *Repair/ Replacement of Existing Bearings*
- *Repair / Replacement of Existing Expansion Joints*
- *Repair / Replacement of Existing Wearing Coat*
- *Profile Correction for Existing Deck Slab by Cement Concrete*
- *Sealing of Cracks for Bridges by Epoxy Resin*
- *Replacement of Spalled Concrete of ECW by Epoxy Mortar*
- *Cement Grouting for Repair of Existing Bridges*
- *Guniting / Shotcrete for Repair of Existing Bridges*
- *Providing & Fixing of Drainage Spouts*
- *Repair of Substructure Component*
- *Repair / Replacement of Railing & Crash Barrier*
- *Epoxy Bonding between New and Old Concrete.*

CHAPTER 5.OPERATION AND MAINTENANCE

5.1 HIGHWAY PERIODIC MAINTENANCE STRATEGY

The balance concession period is left with 8 years. Accordingly, as per good industry practice 2cycles have been envisaged. The following is the MMR has been considered for Road works:

S. No	Year	Side	MCW	Ramps & service road
Cycle-1	FY2027	LHS & RHS	50mm BC + 50mm DBM in 5% length	40mm BC
Cycle-2	FY2033	LHS & RHS	50mm BC + 50mm DBM in 5% length	40mm BC

5.2 STRUCTURAL PERIODIC MAINTENANCE STRATEGY

Expansion joints:

- Visual inspection is shall be carried out to check for seal breakages, Armor angle, Weld failures, cracks between deck & Expansion joints concrete and Joints filled with debris. However, no damages were observed.
- In the absence of records pertaining to Expansion joint replacements it is highly difficult to predict the date of replacement needed for compliance to IRC codal requirements. However, periodic maintenance is considered.

Bearings:

- All types of Bearings are considered for periodic maintenance.

Wearing Coat:

- Wearing coat is a very weak component on the bridge structure which is subjected to severe deterioration due to Loading, Environment etc. This requires periodic maintenance and is considered in BOQ.

Periodic Maintenance strategy for Replacement of Bearings & Expansion joint:

Below strategy has been considered for periodic major maintenance of the structures.

S no	Description	Bridge components
1	Old structure	Structures retained at the time of 6-laning
2	New Structure	Structures newly constructed during 6-laning works

Age	Description	Item	structures-Assumption-MMR % of Replacement of Major components				
			2026	2027	2028	2030	2033
New	Super structure lifting with Pot bearings	Pot	11%	11%	11%	25%	32%
New	Super structure lifting with Elastomeric bearings	Ela	11%	11%	11%	25%	32%
New	Super structure lifting with Rocker bearings	Rocker	11%	11%	11%	25%	32%
Old	Super structure lifting with Pot bearings	Pot	0%	0%	100%	0%	0%
Old	Super structure lifting with Elastomeric bearings	Ela	11%	11%	11%	25%	32%
Old	Super structure lifting with Rocker bearings	Rocker	0%	0%	100%	0%	0%
New	Pot bearing cost	Pot	11%	11%	11%	25%	32%
New	Elastomeric bearing cost	Ela	11%	11%	11%	25%	32%
New	Rocker bearing cost	0	11%	11%	11%	25%	32%
Old	Pot bearing cost	Pot	0%	0%	100%	0%	0%
Old	Elastomeric bearing cost	Ela	11%	11%	11%	25%	32%
Old	Rocker bearing cost	0	0%	0%	100%	0%	0%
New	Expansion joint Replacement	0	0%	0%	0%	0%	0%
Old	Expansion joint Replacement	0	12%	12%	13%	27%	35%
New	Water proofing over Deck slab, Filler joint, Micro Concrete, Structural steel, Pointing for old structures, Epoxy paint (4 mic)	LS	0%	0%	0%	0%	0%
Old	Water proofing over Deck slab, Filler joint, Micro Concrete, Structural steel, Pointing for old structures, Epoxy paint (4 mic)	LS	12%	12%	13%	27%	35%

5.3 MAJOR MAINTENANCE OF TMS & ATMS

TMS equipment: This activity includes Toll Fee collection equipment pertaining to Lane level and plaza level as mentioned below:

- includes Lane Level Equipment - Hybrid ETC Lane such as RFID readers, User fare display (UFD), Automatic Barrier Gate), Over Head Lane Signal (OHLS), Incident Capture Camera with mounting pole, Booth CCTV Camera, License Plate Image Capture Camera with mounting poles, Plaza surveilance PTZ cameras with all accessories etc
- includes Plaza Level Equipment- Plaza Server in hot standby configuration, Workstation for MIS, Cash-up, Audit, POS & LSDU (Lane status Display in Control room), Broadband Internet Connection with Min 2 Mbps Link, UPS System as required for Complete Hybrid ETC Toll Plaza System, 55" LED TV for CCTV monitoring, CCTV cameras for Plaza building surveillance (server room, control room, cash-up room, admin) etc
- Upon review it is understood that approximately 65% of the Cost contributes electronic equipment and balance for civil works such as foundation, poles etc.

Major maintenance of TMS is planned every 5 to 6 years, in line with best industry practices. Accordingly, 2 maintenance cycles are envisaged over the Concession Period. Considering the continuous usage/operation of the TMS equipment, a cumulative cost equivalent to approximately 1.2 time the total TMS cost has been factored in and distributed across these 2 cycles. Capacity augmentation has no impact on TMS operation/equipment as tolling is a continuous process including its maintenance.

ATMS equipment: Includes Automatic Traffic Counter and Classifier (ATCC) with all accessories, Traffic Monitoring Camera System Equipment (TMCS), VMS Systems, Meteorological Data System (MET) with all accessories, RFID readers with antenna, Vehicle Speed Detection System Equipment(VSDS) etc, These equipment spread across the project length such as at junctions, grade separator structures, merging/diverging locations etc, all being controlled from a central monitoring system usually located at Toll Plaza Building.

The following assumptions have been considered while finalizing the MMR cost for ATMS:

- The cost of electronic components typically constitutes 60% of the total ATMS cost, with the remaining balance attributed to civil works.
- Major maintenance of ATMS is planned every 5 to 6 years, in line with best industry practices. Accordingly, 2 maintenance cycles are envisaged over the Concession Period. A cumulative cost equivalent to approximately 1.0 times of the electronic components cost of ATMS equipment has been factored in and distributed across these 2 cycles. In stretches involving capacity augmentation, this cost may vary, as ATMS components will be upgraded under EPC Contract. Accordingly, enhancement of maintenance cost of ATMS equipment shall be considered in line with capacity augmentation requirements.
- Any change in the Capacity Augmentation year or Concession end period will lead to a variation in the distribution of ATMS/TMS costs.
- It is assumed that the ATMS/TMS equipment is insured against risks such as theft, accident, and loss.
- The calculated MMR cost for ATMS/TMS is in addition to the Annual Comprehensive AMC.

Cost Component for various items and activities have been worked out by considering the Best Industry practice and most appropriate methods. Detailed quantities for work items have been estimated based on the details presented in previous chapters for various heads.

The gist of the cost components considered are presented below:

- Immediate Repair's Cost
- Routine Maintenance Cost
- Incident Management Cost
- Periodic Maintenance Cost
- Operations Cost
- Year by Year Total O&M Costs

6.1 RATE ANALYSIS

Detailed rate analysis has been carried out based on MORTH guidelines to arrive at the unit rates of various items. Material rates and their leads from the project corridor are considered as per the material investigations done on the project road. Summary of unit rates arrived at are presented in table below:

Table 19: Unit Rates of Material (excluding GST)

Sl.no	Description	Units	Source	Basic rate excluding Transportation & GST	Lead in Kms
1	VG-40 (CAPEX)	MT	Haldia	47597	129
2	VG-40 (MMR)	MT	Haldia	45092*	129
3	PMB - CAPEX	MT	Haldia	58102	129
4	Good earth	Cu.m	BA	120	12
5	40 mm	Cu.m	Crusher	1200	23
6	20 mm	Cu.m	Crusher	1200	23
7	12 mm	Cu.m	Crusher	1200	23
8	6 mm	Cu.m	Crusher	1200	23
9	Dust	Cu.m	Crusher	1200	23
10	M sand	Cu.m	Crusher	1440	23
11	Bitumen 60/70	MT	Haldia	42851	129
12	Bitumen 80/100	MT	Haldia	44471	129
13	CRMB-55	MT	Haldia	50612	129
14	SS1	MT	Haldia	45000	129
15	Steel	MT	Kolkata	47000	18
16	HTS Strands	MT	Kolkata	75000	18
17	Cement	MT	Kolkata	6700	18

Note: *For future asphalt pavement rehabilitation works, a discount of 10% is applied on Bitumen (VG-40) to the present market rate

Table 20: Cost of Major Material (excluding GST)

S No	Item	Unit	Rate (INR) Excluding GST
1	BC - G1-VG-40-CAPEX	Cum	11,542
2	BC - G1-VG-40-MMR	Cum	11,170
3	PMB-CAPEX	Cum	13,102
4	PMB-MMR-Gr1	Cum	12,239
5	Tack coat on bituminous surface	Sqm	15
6	DBM G-1-VG-40	Cum	9,641
7	Tack coat on granular	Sqm	17
8	Prime Coat	Sqm	49
9	WMM	Cum	3,034
10	GSB G-2	Cum	2,936
11	CTSB	Cum	3,420
12	CTB	Cum	3,842
13	PQC	Cum	7,917
14	DLC	Cum	4,531
15	SG	Cum	557
16	Road Marking	Sqm	447
17	Embankment - borrow	Cum	538
18	Embankment - Excavation	Cum	73
19	Select Fill	Cum	612
20	RE wall	Sqm	2,999
21	Filter Media	Cum	1,796
22	M15	Cum	6,722
23	M20	Cum	7,396
24	M25	Cum	8,002
25	M30	Cum	7,936
26	M35	Cum	8,208
27	M40	Cum	8,343
28	PSC M45	Cum	9,953
29	PSC M50	Cum	12,235
30	PSC M55	Cum	12,389
31	HYSD	MT	69,091

NOTE: 1. Item rates are considered for medium projects

2. Labour: Central Minimum Wages as on April'2025 for "A-area" Category of construction workers

6.2 INITIAL IMPROVEMENT COSTS

Costs associated with immediate repairs are estimated based on the detailed asset inventory and condition assessment surveys, Pavement condition and structural condition assessment surveys. Items which are not executed as part of scope or in damaged condition have been considered for immediate costs as a part of 1-year capex. Following items are mainly considered for immediate costs:

- Road work items
- Bridge Work Items
- Pavement Rehabilitation works
- Structural Rehabilitation works
- Drainage Works
- Slope Protection works
- Safety Works

Summary of Immediate costs are included in table below:

Table 21: Initial Improvement Cost (Capex, FY2026)

S. No.	Particulars	Amount Rs
1	Immediate Repair's (Highway)	9,95,039
2	Immediate Repair's - Structures	83,70,170
3	TMS	1,37,760
4	ATMS	4,61,711
	Total Cost (in Rs.)	**99,64,680**
	Total Cost Including GST @ 18% (in Rs.)	**1,17,58,322**
	Total Amount (in Crore Rs.)	**1.18**

The Immediate Repair cost for Highway works is as follows

S. No.	Description	Unit	Quantity	Rate in Rs	Amount in Rs
1	Milling & Overlay with BC	Cum	11	17052	1,90,978
2	Fog Seal	Sqm	35	52.91	1,826
3	Crack Seal	Sqm	9	109.53	980
4	Road Marking (MCW & SR)-Poor marking	Sqm	1248	549	6,84,840
5	Km Stones - Missing	Nos	2	5236	10,473
6	Hectometer Stone - Missing	Nos	22	1470	32,340
7	Rectangular - Damage	Nos	2	6535	13,070
8	Triangular - Damage	Nos	1	6214	6,214
9	Circular	Nos	3	6293	18,878
10	Chevron - Damage	Nos	2	4971	9,942
11	Lights	Nos	3	8500	25,500
Immediate Repair cost (Highways)					**9,95,039**

The cost for Structure works is as follows:

S. No.	Description	Amount in Rs
1	Structures: Cracks, Reinforcement exposed & spalling, Cracks, Epoxy painting, Honeycomb etc.	69,85,272
2	Protection works	13,84,899
Immediate repair for Structures excluding GST (18%)		**83,70,170**

The cost for TMS works is as follows:

S No.	Activity	Cost of shortage / Not covered in WO (Excluding Tax)
1	TMS works of Toll Plaza	1,37,760

The cost for ATMS works is as follows:

S No.	Activity	Cost of damaged, not working items (Excluding Tax)
1	ATMS works for balance installation at site	4,61,711

6.3 ROUTINE MAINTENANCE & INCIDENT MANAGEMENT COSTS

Routine maintenance costs include general maintenance costs of road elements, bridge elements and road furniture and appurtenances. This can be mainly divided into two parts as:

- ✓ General Maintenance of Works
- ✓ Repairs to Highway & Bridge Elements

6.3.1 GENERAL ROUTINE MAINTENANCE

General Routine Maintenance of Roads generally include following items:

- Cleaning of Project facilities
- Structures cleaning,
- Cleaning of ROW
- Cleaning and Maintenance of Toll Plaza
- Unlined Drain Maintenance
- Lined Drain Maintenance
- Maintenance of Highway Lighting at Toll Plaza and other project locations
- Median Plantation maintenance & Avenue plantation maintenance:
- Maintenance of Road Furniture
- Maintenance of Road Safety Items

The above items are estimated by considering the detailed break-up of following items:

- Manpower including Managers/Labour etc
- Vehicles for Labour Transport/Water Tankers/Sweeping Machines Etc
- Resources/Equipment's such as grass cutters, tools, jet sprayers, hydraulic trimmers etc

6.3.2 REPAIRS TO HIGHWAY & BRIDGE WORKS

Repairs to highway and bridge works have been estimated based on the assumed quantities (Percentage basis) of execution for every year.

These items include the following:

A. Roads

1	Providing treatment for sealing of road surface / isolated cracks at scattered locations
	i) covered with 6.7 mm size stone chipping @ 0.1 cum/ 10 sqm.
	ii) covered with dry coarse sand passing through 2.36 mm sieve and retained on 180-micron sieve @ 0.03 cum/10 sqm heated to 600 C
	iii) filling discrete cracks with slow curing bitumen emulsion as per Technical Specification Clause 3004.3.3
2	Providing treatment to bleeding bituminous surface at scattered locations
3	Providing localized repair to rutted portion and edge breaking of bituminous surface
4	Providing treatment and repair to pot-holes and patch work
5	Providing and laying dense bituminous macadam using bitumen grade 60/70 complete as per Technical Specification Clause 507
6	Proving and laying bituminous concrete (asphaltic concrete)
	(a) Using bitumen (VG-40) as per IRC: SP: 53
7	Road Roughness survey
8	Turfing on embankment slopes and at all other Project Facilities
9	Providing repair to stone pitching/apron at scattered locations
10	Rain Cuts Maintenance: Restoration of rain cuts soil, moorum, gravel or a mixture of these
11	Cleaning of Lined Drain
12	Repair of damaged lined drain
13	Unlined drain cleaning
14	Filling in median island with approved materials with all leads and lifts complete as per TS Clause No. 407
15	Replacing damaged / broken railing with new pre-cast / cast-in-situ, concrete railing to match with existing design and pattern.
24	Carrying out repair to road signs including strengthening resetting or otherwise repairing signs and delineators
	a) Road sign board mounted on single post
	b) Road sign board mounted on double post
	c) Overhead/ Gantry Sign boards
	d) Delineator
25	Supplying and fixing at site retro-reflectorized type sign boards/signs
	90cm Equilateral triangle
	60cm circular
	90 cm circular
	90cm high octagon

	80cm x 60cm rectangle
	Chevron signs 60cm x 45cm
	Place identification signs (Fig 15.7 of IRC 67)
	Providing and fixing Object Markers
	Providing and fixing of retro-reflectorized Route Marker signs (size 450mm x 600mm)
26	Hazard Marker Sign:
	a) size 90 x 30 cm
	b) size 30cm triangular side cluster of red reflectors (screen printed)
27	Cats Eyes/Raised pavement marker (NMC Nails Less)
28	Painting two coats on old surface after minor repairs to give an even and smooth surface and printing letters and figures with synthetic enamel paint
	a) Hectometer stones
	b) Kilometer Stone
	c) 5 Kilometer stone
	d) Boundary stone
	e) Guard stone
29	Providing painting lettering and fixing of distance measurement stones including dismantling of old damaged/ broken ones, confirming to TS Clause 804
	a) Hectometer stones
	b) Kilometer Stone
	c) 5 Kilometer stone
	d) Boundary stone
	e) Guard stone
30	Providing and fixing road delineators conforming to TS Clause No. 805 as directed by the Engineer.
31	Repainting the Kerb stones and separation barrier with first quality synthetic enamel paint of approved brand
32	Painting all types of pavement markings including lines, dashes, arrows etc. on roads as per relevant IRC/MOST standards after cleaning the surface complete in all respects as directed by the Engineer.
	a) Hot applied Thermoplastic compound
	(i) Lane / Centre Line / Edge Line
	(ii) Direction Arrows, Diagonal Chevrons Markings, PC etc.,
	(iii) Transverse bar Marking
33	Supplying and laying cast-in-situ cement concrete Kerb without channel section
	a) by Manual/machine including formwork
34	Major repair / replacement of metal beam crash barrier (W profile guard rails)
35	Providing and fixing chain link/ welded mesh fencing / square bars fencing
36	Dismantling the old damaged chain link/welded mesh / square bars fencing and replacing it with new chain link/ welded mesh/square bars fencing
37	Provision of rumble strips
38	Shoulder Maintenance
39	synthetic enamel paint of approved brand on metal pedestrian guard rail
40	Dismantling of wearing course
41	Toll Plaza building repairs, booths, canopy and also maintenance of TP buildings
42	Median plantation maintenance
43	RE wall Maintenance

B. Bridges

1. Wearing coat comprising of 53 mm thick BC including water proofing material.
2. Cleaning and adding rubber sealant near expansion joints.
3. Modular Expansion joints.
4. Replacement of Damaged Concrete Railing all complete as per Technical specifications and as directed by the Engineer
5. Provision of an RCC crash barrier (0.35sqm cross sectional area) constructed with M-40 grade concrete including reinforcement
6. Cleaning of rocker & roller bearing using high pressure water jet, free from rust scales, re-setting & greasing the bearings using graphite grease including cost of materials, labour etc., complete.
7. POT PTF Bearings greasing and maintaining (sand plastering).
8. Elastomeric Bearings and maintaining.
9. Cutting of groove of 15 mm x 15 mm along crack and sealing the same with epoxy putty including cost of material, labour etc.
10. Carrying out 50 to 60 mm thick shortcreting using a mix proportion of 1:2:2 (cement: sand:6 mm down aggregate) added with Polypropylene fibers at a dosage rate of 125 gms/bag of cement including cost of labour, material, scaffolding, equipment etc complete.
11. Repair of Floor Aprons, pitching and other protection works
12. Cleaning of Drainage Spouts
13. M-25-M-35 Concrete
14. Providing and filling joint sealing compound as per drawings of pourable grade, (Bit mastic sealant in the gap b/w Abutment & Approach slab. As per Technical specifications
15. Providing and laying Filter material underneath pitching in slopes.
16. Providing and laying Pitching on slopes laid over prepared filter media including boulder apron laid dry in front of toe of embankments.
17. Test s UPV, RHT and Load test for span 15m and above as per Schedule I.
18. Vegetation cleaning before and after monsoon.
19. Repair of damaged structure portion due accidents and any others.
20. Level of Service if applicable.

6.3.3 INCIDENT MANAGEMENT COST

Incident Management & Safety items include the following:

- ✓ ATMS control room operations,
- ✓ Regular patrolling & reaching accident/incident site,
- ✓ providing relief to injured persons including taking them to nearest hospital and attending to the safety requirements at the location (putting cones, safely guide & manage the traffic using signs, safety barricades, etc.),
- ✓ removal of accident /breakdown vehicles, removing of dead animals/birds lying on the highway and loading, unloading, transportation & disposal of surplus material left over by accidental vehicle or otherwise lying on road (on carriageway) and
- ✓ Encroachment prevention & removal with all lead & lifts complete with proper communication equipment,
- ✓ consumables, materials, suitable Towing vehicles, Ambulance, patrolling vehicles and manpower like drivers, helpers, para-medical staff, labours including deployment of crane and all works shall be done as per requirement and as directed by Client representative and as per Relevant Specifications as applicable.

6.4 PERIODIC MAINTENANCE COSTS

Cost towards major maintenance include following:

- ✓ Cost of Periodic maintenance of Pavement based on Finalized MM schedule
- ✓ Cost of Periodic Maintenance of Structures
- ✓ Cost of Periodic replacement of ATMS &Toll Equipment's & Software

Following table includes the cost of Major Maintenance works for the project:

Table 22: Major Maintenance Cost

S. No	Financial Year	MMR - Flexible Pavement	MMR - Rigid Pavement	Replacement of ATMS	Replacement of TMS	MM - Structures
1	2026		-			1.04
2	2027	29.18	0.40			1.04
3	2028		-	1.16	3.49	1.71
4	2029		-			-
5	2030	0.33	-			2.35
6	2031		-			-
7	2032		-			-
8	2033	28.06	0.40	1.16	3.49	3.36
-	**Total:**	**57.57**	**0.80**	**2.31**	**6.99**	**9.49**

Note: 1. The amount is Crores inclusive of GST (18%) and without escalation, considering FY2026 rates

2. Capacity Augmentation is not envisaged and Concession end date is 25.04.2033

6.5 OPERATIONS COSTS

The Consultant has indecently estimated bottom-up Operation & Maintenance cost considering the following activities:

- SPV Cost
- Toll Operation
- ATMS including Control Centre
- Incident Management
- Routine Maintenance of Highway & Structures
- Power Consumption
- AMC for TMS, ATMS etc.,
- Survey Costs
- Insurance Cost
- Audit charges
- IE Fee
- Administrative Cost

The Consultant has estimated O&M cost considering the fact that project length is small, located in metro-city region, and its unique project features, such as multi-span, single-plane cable-supported extradosed bridge. Even though the project is of small in size, considering the minimum contractual operational requirement all the required manpower and Vehicles need to be provided thus this cost is appeared to be higher compared to similar type of road assets.

Further to the above, Consultant has also reviewed the Budgeted cost provided by the client based on the previous years expenditure and the manpower in payrolls.

The comparison of O&M cost estimated by consultant and the SPV budgeted cost is presented below,

Table 23: Summary of 1st Year O&M Cost, FY2026

S No	Description	Samarth Estimated Cost in Crs.	SPV shared Budgeted Cost in Crs.
	SPV - Expenditure		
1	Corporate Manpower Cost/Total Manpower Cost	15.13	24.10
2	Highway lighting	1.57	1.72
3	Tolling and ATMS AMC/ Spare Parts	0.76	3.25
4	Surveys & Investigations (BBD, Roughness)	0.06	0.21
5	IE fees	1.30	0.40
6	Insurance Charges	2.00	1.58
7	Professional charges (Audit, legal, Financial etc.)	1.46	0.72
8	Insurance Charges		-
	Agency - Expenditure		
9	Toll Operation - Agency	1.90	1.90
10	Incident Management	1.87	1.01
11	TAP & MAP		-
12	Routine maintenance	7.06	8.66
13	Repair of Road - BoQ Items	1.30	5.50
14	Repair of Structures		-
15	Manpower other than SPV, Toll Operations, Incident Management, RM		-
	Total Amount in CRs	**34.41**	**49.04**

Note: 1. The amount is Crores inclusive of GST (18%) and without escalation, considering FY2026 rates
2. Capacity Augmentation is not envisaged and Concession end date is 25.04.2033

It is further noted that Manpower cost considered by SPV is on much higher side than the Consultant's estimate. Enquiries revealed that this variation is largely due to the influence of strong local labour unions in Kolkota region. Considering this the consultant opinion that there is a scope for optimisation of cost under man power head.

6.6 TOTAL OPERATION & MAINTENANCE COSTS

Year on year operation cost is summation of following:

- ✓ Immediate Costs
- ✓ Toll Operation Cost
- ✓ Routine Maintenance & Incident Management
- ✓ Periodic Maintenance
- ✓ Operations Cost

Following table presents the summary of Operations & Maintenance cost for the project

Table 24: Cost Abstract

Project Years	Calendar Year	SUMMARY OF VARIOUS EXPENSES in Rs. Crs				
		Immediate Repair's Cost	Toll Operation	Routine & Incident Management Expenses	Periodic Maintenance (Functional +Struc Overlay+ Toll collection system)	Total Operation Cost (Rs. Cr.)
-						
1	2025-2026	1.18	1.90	47.00	1.04	51.10
2	2026-2027		1.90	47.00	30.62	79.51
3	2027-2028		1.90	47.34	6.36	55.59
4	2028-2029		1.90	47.00	-	48.89
5	2029-2030		1.90	47.00	2.68	51.57
6	2030-2031		1.90	47.00	-	48.89
7	2031-2032		1.90	47.00	-	48.89
8	2032-2033		1.90	47.41	36.47	85.77
9	2033-2034		0.13	5.83	-	5.96
	Total Cost:	**1.18**	**15.29**	**382.57**	**77.15**	**476.19**

Note: 1. The amount is Crores inclusive of GST (18%) and without escalation, considering FY2026 rates

2. Capacity Augmentation is not envisaged and Concession end date is 25.04.2033