Table of Contents

CHAPTER 0.0:

EXECUTIVE SUMMARY

0.1 Background

National Highways and Infrastructure Development Corporation (NHIDCL) has proposed the feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country in the state of Tripura.

Under this scheme, the consultancy work has awarded to M/s. Technocrats Advisory Services Pvt. Ltd. in association with Vaishnavi Infratech Services Private Limited for preparation of Detailed Project Report of **Kumarghat - Kailashahar Section (NH-208)**

The existing length of project road is 21.100 km & design length after geometric improvement of the section is 18.600 km.

0.2 Consultancy Services

The consultancy services are to be provided in four stages as brought out below.

Stage 1: Inception Report (IR)

Stage 2: Feasibility Report

Stage 3: Detailed Project Report (DPR)

Stage - 1 Report i.e. Inception Report & Quality Assurance Plan has been submitted,

Stage - 2 Report i.e. Feasibility Report (Draft & Final) has been submitted,

Stage -3 Detailed Project Report (Draft) has been submitted and Detailed Project Report (Final) is described as below -

- Main Report
- Annexure to Main Report
- Design Report (Pavement & Bridge)
- Drainage Design Report
- Material Report
- Environmental Assessment Report including Environmental Management Plan (EMP) & Resettlement Action Plan (RAP)
- Technical Specifications
- Rate Analysis

- Cost Estimates
- Bill of Quantities
- Drawing Volume
- Civil work contract agreement
- Project Clearances

0.3 Objectives

The main objective of the consultancy service is to establish the technical, economical, and financial viability of the project and prepare detailed project report for **Kumarghat - Kailashahar section.**

The viability of the project shall be established taking into account the requirements with regard to proposed alignment of Project road based on highway design, pavement design, provision of service/Slip roads wherever necessary, type of intersections, rehabilitation and widening of existing and/or construction of new bridges and structures, road safety features, quantities of various items of works and cost estimates and economic analysis.

0.4 Scope of Services

The Consultant is required to suggest alternative alignments for proposed bypasses, as far as possible, existing road having adequate ROW shall be include in the alignment. The widening / improvement work to 2 lanes with paved shoulder shall be within the existing right of way avoiding land acquisition, except for locations having inadequate width and where provisions of short alignment corrections, improvement of intersections are considered necessary and practicable and cost effective. However, new alignment should also be considered, wherever improvement to 2 lanes of the existing road is not possible. The Consultant shall furnish land acquisition details as per revenue records/maps for further processing.

The general scope of services is given in the sections that follow. However, the entire scope of services would, inter-alia, include the items mentioned in the Letter of Invitation and the ToR. The Consultant will also make suitable proposals for widening/ improvement of the existing road to 2 lanes etc. and strengthening of the carriageways, as required at the appropriate time to maintain the level of service over the design period.

All ready to implement 'good for construction' drawings shall be prepared.

Environmental Impact Assessment, Environmental Management Plan and Rehabilitation and Resettlement Studies shall be carried out by the Consultant meeting the requirements of MoEF / other statutory bodies.

Wherever required, consultant will liaise with concerned authorities and arrange all clarifications. Approval of all drawings including GAD and detail engineering drawings will be got done by the consultant from the Railways. However, if Railways require proof checking of the drawings prepared by the consultants, the same will be got done by NHIDCL. Consultant will also obtain 'No Objection Certificate 'from

Ministry of Environment and Forest and also incorporate the estimates for shifting of utilities of all types involved from concerned local authorities in the DPR. Consultant is also required to prepare all Land Acquisition papers (i.e. all necessary schedules as per L.A. act) for acquisition of land either under NH Act or State Act.

The Consultant shall prepare and submit the cost estimate and bid documents at Feasibility report stage.

Consultant shall obtain all types of necessary clearances required for implementation of the project on the ground from the concerned agencies. The client shall provide the necessary supporting letters and any official fees as per the demand note issued by such concerned agencies from whom the clearances are being sought to enable implementation.

0.5 Key Professional Staff

Table 0.1: List of Key Professional staff

Sl. No.	Position	Name
1	Team Leader	**Mr. Bhola shanker Pandey**
2	Geo-Technical and Pavement Expert	**Mr. Brijesh Mishra**
3	Environmental Specialist	**Ms. Meena Bhaduri**
4	Traffic cum Safety Expert	**Mr. Salil Pathak**
5	Hill Road / Tunnel Expert	**Mr. P.K Dubey**
6	Revenue / Survey Expert	**Mr. Mahaveer Singh**
7	Bridge Design Engineer	**Mr. D.P. Singh**
8	Contract Specialist	**Mr.Vir Bahadur Singh**

0.6 Chainage Reference

The coordinates of proposed centre line @ 20m interval are presented at the end of this chapter **Table -0.24**.

0.7 Project Alignment Description

The Project road starts from intersection with NH-8 (old no. NH-44) (1.3km from Netaji Chowmuhani towards Assam at Kumarghat town), passes through Shaidabari, Madhyabara, and Jalabari, Sunaimori bazar, Shantipur, Jalai, Kaulikura and ends at Kirtan Tali junction (Kumarghat - Kailashahar).

The existing length of project road is 21.100 km and design length are 18.600 km.

This road section improved in virgin land maximum of its length & at some short sections, it runs parallel to Deo River (having distance from river @ approx. 100-150m).

Existing road varies from two lanes to single lane of BT with fair to poor riding quality. Project Road alignment shown in figure below-

Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura**.

Section IV: Kumarghat - Kailashahar section (Design Length – 18.600km)

Figure 0.1– Proposed alignment of Project Road

0.8 Right of Way (ROW)

Earlier this road section was under control by Border Road Organization (BRO) and the department has acquired 30m RoW as informed by BRO (15m either side from

existing road centre line). However no any record with respect to chainages found for this section. The proposed RoW has been considered 30m (15m from either side proposed centre line) for entire road stretch. The proposed RoW wrt design chainages is presented below-

Table 0.2: Details of Proposed RoW

Sl. No.	Design Chainage (km)		Length(m)	PROW (m)		Total PROW (m)	Remarks
	From	To		LHS	RHS		
1	0+000	0+100	100	15	15	30	
2	0+100	0+550	450	20	20	40	
3	0+550	1+300	750	15	15	30	
4	1+300	1+800	500	18	15	33	
5	1+800	2+200	400	15	15	30	
6	2+200	2+300	100	22	20	42	
7	2+300	3+250	950	15	15	30	
8	3+250	3+400	150	20	15	35	
9	3+400	3+605	205	15	15	30	
10	3+605	3+800	195	18	18	36	
11	3+800	4+500	700	15	15	30	
12	4+500	4+600	100	15	17	32	
13	4+600	5+000	400	17	17	34	
14	5+000	5+350	350	15	15	30	
15	5+350	5+450	100	15	17	32	
16	5+450	5+600	150	18	17	35	
17	5+600	6+850	1250	15	15	30	
18	6+850	7+100	250	20	30	50	

Sl. No.	Design Chainage (km)		Length(m)	PROW (m)		Total PROW (m)	Remarks
	From	To		LHS	RHS		
19	7+100	7+300	200	30	25	55	
20	7+300	7+450	150	18	23	41	
21	7+450	7+650	200	20	17	37	
22	7+650	7+900	250	25	22	47	
23	7+900	8+050	150	20	26	46	
24	8+050	8+300	250	15	20	35	
25	8+300	8+850	550	15	33	48	
26	8+850	9+150	300	15	15	30	
27	9+150	9+300	150	25	25	50	
28	9+300	9+600	300	15	15	30	
29	9+600	9+850	250	15	30	45	
30	9+850	9+950	100	20	15	35	
31	9+950	10+350	400	15	25	40	
32	10+350	10+500	150	15	15	30	
33	10+500	10+700	200	15	30	45	
34	10+700	13+800	3100	15	15	30	
35	13+800	14+300	500	22	24	46	
36	14+300	15+750	1450	15	15	30	
37	15+750	15+900	150	20	22	42	
38	15+900	16+300	400	15	15	30	
39	16+300	16+500	200	18	23	41	

Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura**.

Section IV: Kumarghat - Kailashahar section (Design Length – 18.600km)

Sl. No.	Design Chainage (km)		Length(m)	PROW (m)		Total PROW (m)	Remarks
	From	To		LHS	RHS		
40	16+500	16+800	300	15	15	30	
41	16+800	17+300	500	20	17	37	
42	17+300	18+600	1300	15	15	30	

0.9 Abutting Land Use Pattern

The Project road passes through open, built-up & Forest areas. Main built-up are Shaidabari, Madhyabara, Jalabari, Sunaimori bazar, Shantipur, Jalai, Kaulikura. The %age of land use pattern along the Project road is –

Open / Forest – 14 kms & Built-up – 4 kms

The details of Forest length will be described after confirmation of Forest land length from concerned department.

Land use pattern in graphical view is as follows –

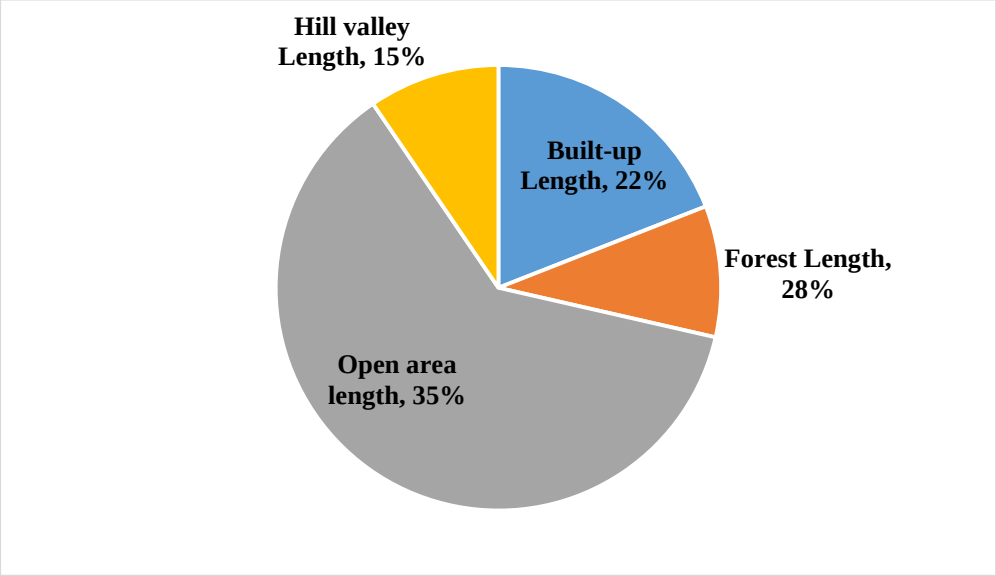


Fig 0.2- Land Use Pattern

The existing terrain details with reference to design chainages is presented below –

Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura**.

Section IV: Kumarghat - Kailashahar section (Design Length – 18.600km)

Table 0.3 - Details of Terrain

Sl. No.	Chainage From (km)	Chainage To (km)	Length (m)	Terrain	Remarks
1	0+000	6+900	6900	Plain & Rolling	BHS
2	6+900	9+600	2700	Low height hills of RHS & Plain on LHS	
3	9+600	11+100	1500	Rolling on RHS & Plain on LHS	
4	11+100	13+300	2200	Plain & Rolling	
5	13+300	18+600	5300	Plain	

0.10 Terrain

- Terrain is plain, rolling & mountainous.

• Design standards

Following design standards have been adopted as per Indian Roads Congress (IRC) guidelines, contained in IRC: 73, IRC: 86, IRC: 38, IRC 58-2011 and IRC: SP: 23 and is given in **Table 0.4**-

Table 0.4- Details of Design Standards

Item	Plain / Rolling Terrain	Reference
Design Speed(kmph)	Ruling -100 kmph (P) / 65 kmph (M) Min.- 80 kmph (P) / 40 kmph (M)	Table 2.1
Sight distance (minimum)	180 m	Table 2.6
Proposed Land width (ROW)	30m to 55m (for detail refer table 0.2, Executive summary)	Please refer section 0.8 of this chapter
Lane configuration	2-lane with paved shoulders	
Formation width	7.0 m of carriageway + 2.5 m Paved shoulder + 1.5m earthen shoulder (Fig. 2.2) of two lane manual	
Edge strip	.25m Raised median	
	.5m Depressed Median	
Camber/cross fall	2.5 %	Table 2.7
Shoulders	2.5 % for paved shoulder and 3.0 % for earthen shoulder	Clause 2.8.2
Side Slope	1 (V): 2 (H) Fill (Fill height up to 3.0 m) 1 (V): 1.5 (H) Fill (Fill height 3 m to 6.0 m) 1 (V): 1 (H) Cut	
Maximum super-elevation	7.0 %	
Radii of horizontal curves in plain/hilly terrain (m)	<table><tr><th></th><th>Plain</th><th>Hilly</th></tr><tr><td>Ruling Min.</td><td>400m</td><td>150m</td></tr><tr><td>Absolute Min</td><td>250m</td><td>75m</td></tr></table>	Table 2.5

Item	Plain / Rolling Terrain	Reference
Drains	"Rectangular "shape on either side where warranted depending on Site Condition & Kerb & Channel Drain in hill sections.	

0.11 Surveys & Investigation

0.11.1 Traffic Surveys

Traffic surveys have been conducted at one location.

Table 0.5 Details of Traffic Count Location

Sl. No.	Section	Chainage (Km)	Remarks to Capture
1	Section I:: Km 0 to Km 21.1 (Kumarghat - Kailashahar section	Near Km 16, market near Jalai	Traffic coming from Kailashahar, madhyabar, Fatikroy, & moving towards Kumarghat, chirkuti, and santipur & santipur & another project road linked with NH-44 at starting and NH-208A at the end.

Growth Rate

The Adopted Traffic Growth rate is taken an average of 5% per year for all type of vehicles.

AADT, CVPD & Projected Traffic

Table 0.6- Commercial Vehicle Per day

Sl. No.	Location	AADT	PCU	CVPD	Remarks
1	Km 16, near Jalai	1529	1347	211	In year 2018

Projected traffic on the project road is given below:

Table 0.7- Projected traffic

Year	Likely traffic on the Project road	
	PCU at Km 16, Near Jalai	Requirement of
2018	1347	**2 Lane with paved shoulder**
2020	1486	
2025	2133	
2030	2708	
2035	3450	
2040	4387	

As per the projected traffic & MoRT&H circular dated 26th May 2016, requirement of four lane is not qualifying up to year 2040 (For Plain terrain = 10000PCU per day, for Rolling terrain = 8500 PCU per day & for Mountainous terrain = 6000 PCU per day), However, keeping view of importance of Project road, it is proposed to develop the project road as two lane with paved shoulder facility.

0.11.2 Axle load survey:

Though CVPD (as per above table) on one locations are found very less (211), so the Axle load survey could not carry out and the default values of VDF as per table 4.2 of IRC -37:2018 is considered 3.9 (for initial traffic volume 150-1500).

0.11.3 Testing of soil from existing embankment

The soil samples from various locations on three existing embankments (km 7+0, km 14+0 & km 20+500) have been collected by digging bore holes and tested and laboratory based at Agartala. The CBR of these locations is found 12.43, 10.28 & 11.71 respectively.

Details of existing pavement crust is shown below:

Table 0.8- Existing Pavement Composition

Chainage (Km)	*Position of Pit*	*Pavement Composition*			*Total (mm)*
		Bitumen Layer (mm)	*Brick Soling (mm)*	*Sub base Course (mm)*	
0+000	RHS	40	180	-	220
0+500	LHS	30	150	-	180
1+000	RHS	35	160	-	195
1+500	LHS	40	145	-	185
2+000	RHS	45	170	-	215
2+500	LHS	40	205	-	245
3+000	RHS	30	255	-	285
3+500	LHS	30	225	-	255
4+000	RHS	30	240	-	270
4+500	LHS	40	170	-	210
5+000	RHS	30	210	-	240
5+500	LHS	40	190	-	230

Chainage (Km)	*Position of Pit*	*Pavement Composition*			*Total (mm)*
		Bitumen Layer (mm)	*Brick Soling (mm)*	*Sub base Course (mm)*	
6+000	RHS	45	160	-	205
6+500	LHS	35	235	-	270
7+000	RHS	40	255	-	295
7+500	LHS	40	155	-	195
8+000	RHS	45	260	-	305
8+500	LHS	35	165	-	200
9+000	RHS	40	225	-	265
9+500	LHS	40	160	-	200
10+000	RHS	45	200	-	245
10+500	LHS	30	150	-	180
11+000	RHS	40	180	-	220
11+500	LHS	35	155	-	190
12+000	RHS	30	245	-	275
12+500	LHS	35	255	-	290
13+000	RHS	40	160	-	200
13+500	LHS	35	170	-	205
14+000	RHS	40	185	-	225
14+500	LHS	40	160	-	200
15+000	RHS	45	190	-	235
15+500	LHS	45	205	-	250
16+000	RHS	35	260	-	295
16+500	LHS	40	180	-	220
17+000	RHS	35	240	-	275
17+500	LHS	40	200	-	240
18+000	RHS	35	230	-	265
18+500	LHS	40	210	-	250
19+000	RHS	45	165	-	210
19+500	LHS	35	235	-	270
20+000	RHS	35	175	-	210
20+500	LHS	30	150	-	180
21+000	RHS	40	200	-	240

Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura**.

Section IV: Kumarghat - Kailashahar section (Design Length – 18.600km)

Test results of collected soil samples –

NORTH EAST SOIL TESTING (NEST)

ISO 9001:2015 Certified

Regd. Office : Ujan Abhoynagar,
Opp. Post Office, Agartala ,
West Tripura, PIN – 799005 ,

TEST REPORT

Ref No.:- Nil dated:- 19.07.2018
Issue Date : 30.07.2018
Issued To : TASPL
Sample Deposited by : Representative
Sample Description : Soil

Job No. : NEST/2018/B-206
Date of Sample received : 19.07.2018
Page : .....1....

Chain-age No. (Km)	Soil Clas-ificati on	Insitu Dry density (g/cc)	Insitu Moist-ure (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plast-city Index (%)	MDD (g/cc)	OMC (%)	Unsoaked CBR (%)	Soaked CBR (%)	Swelling Index (%)
7+000	CL	1.14	14.15	39	41	20	26	18	08	1.84	14.9	21.5	12.4	4.76
14+000	CL	1.13	18.15	37	23	40	29	19	10	1.808	15.6	19.7	10.25	5.26
20+500	SM	1.27	12.33	77	13	10	19	16	03	1.82	16.9	21.85	11.7	4.35

Prepared by

30/07/18

Dr. B. K. BHOWMIK
(M. Tech, NITA)
Technical Manager,
North East Soil Testing
Agartala-799005

(1) This test report pertains only to the sample tested. (2) This test report is valid at the time of and under the conditions specified here in. (3) Any correction invalidates this test report. This test report should not be published in part or in full by any body without written permission from 'NEST'. (4) Samples will be destroyed after 90 days from the date of reporting unless otherwise specified (5) This report not to be reproduced wholly or in part & can not be used as an evidence in the court of Law & should not be used in any advertising media without our special permission in writing.

Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura**.

Section IV: Kumarghat - Kailashahar section (Design Length – 18.600km)

NORTH EAST SOIL TESTING (NEST)

Regd. Office : Ujan Abhoynagar,
Opp. Post Office, Agartala ,
West Tripura, PIN – 799005 ,
License No. 02/15/185

ISO 9001 : 2015 Certified

TEST REPORT

Ref no:- Nil Date:- 19.07.2018

Issue Date	:	30.07.18	Job No.	:	NEST/2018/B-206
Issued To	:	TASPL	Date of Sample Received	:	19.07.18
Sample Deposited by	:	Representative	Page	:	3....of....30
Sample Description	:	SOIL			

Sample:- 1 (Chainage No.- 7+000 Km)

Grain Size Analysis

IS Sieve (mm)	Percent Finer(%)	Test Method
2	99.27	IS 2720(Part 4)-1985
1.18	98.94	
0.6	98.41	
0.425	93.18	
0.3	89.34	
0.15	62.81	
0.075	60.77	

Sand (%)	39
Silt (%)	41
Clay (%)	20

Reviewed by
Er. B. M. [illegible] (WMIK, NITA)
30/07/18
Technical Manager,
North East Soil Testing

The details of laboratory test of these samples has been presented as Annexure-1.9 in Vol. I A - Annexure to Main Report"

0.11.4 Material survey

Aggregate quarry for structure works and road works is identified at Silchar (Assam) which is approx 170 km away from kumarghat & kailashahar.
Sand source has been located from Local River with average lead of 15 km.
Borrow earth can be obtained from number of locations along the project road, however the road excavated earth may also use for embankment & subgrade as its CBR found more than 8,
Cement for concrete works may purchase from local vendors of different grades of OPC & PPC.
Steel for concrete work May also use from local suppliers.
Bitumen supply is considered from Haldia IOCL with lead of approx. 1550 km.

0.11.5 Geotechnical Investigations

Geotechnical Investigations has been done. Report is presented in separated volume of Design Report as "Geotechnical Report" submitted with this report.

0.12 Development Proposals

0.12.1 Pavement Design

Considering a growth rate of 5% and VDF as 3.9 obtained from the IRC, design of pavement as per IRC 37 -2018 for a design life of minimum 15 years.

Accordingly design traffic has been worked out as 20 MSA (as per 5.4.1 (I) of Two lane manual 2018) and considering sub-grade construction with soil of CBR not less than 10%, The Pavement compositions for Project road as per IRC 37-2018 (Plate 14) is as under:

- BC - 30 mm
- DBM - 50 mm
- CT Base - 150 mm
- CT Sub Base - 200 mm

0.12.2 Typical Cross Section and Widening Scheme

i) **Roadway width -**

a. **For Plain areas -** Roadway width of 15.00 (7.0+2x2.5+2x1.5) is proposed for sections with 2 lane plus paved shoulders of 2.50m and unpaved shoulder of 1.5m on either side in plain areas and,

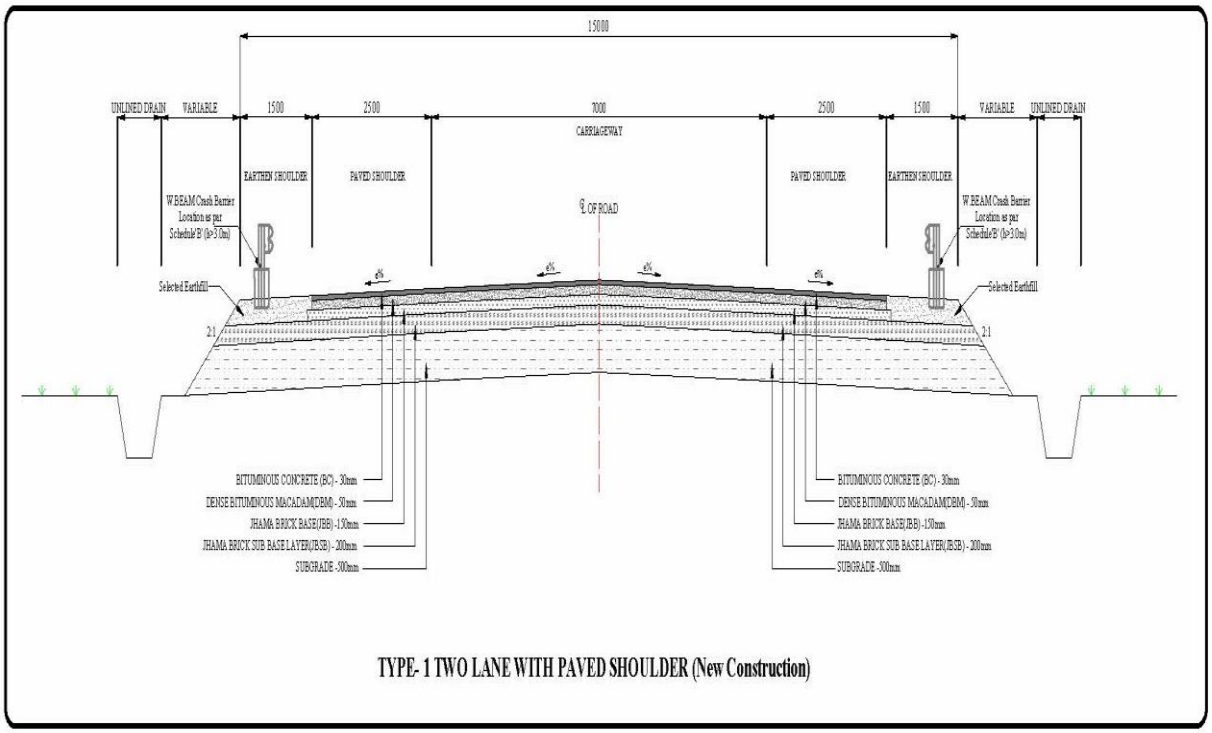
b. **For Built-up areas -** Roadway width of 12.00 (7.0+2x2.5) is proposed for sections with 2 lane plus paved shoulders of 2.50m and RCC covered drain of 1m wide on either side of Road way,

c. **For Hilly areas -** Roadway width of 10.00 (7.0+2x1.5) is proposed for sections with 2 lane plus paved shoulders of 1.50m (as per attached cross sections),

ii) **Carriageway Width -** Two Lane Carriage way (3.5m for each lane) is proposed,

iii) **Shoulders -** Unpaved shoulders of 1.50 wide and paved shoulder of 2.50m are proposed on either side of the Carriage way

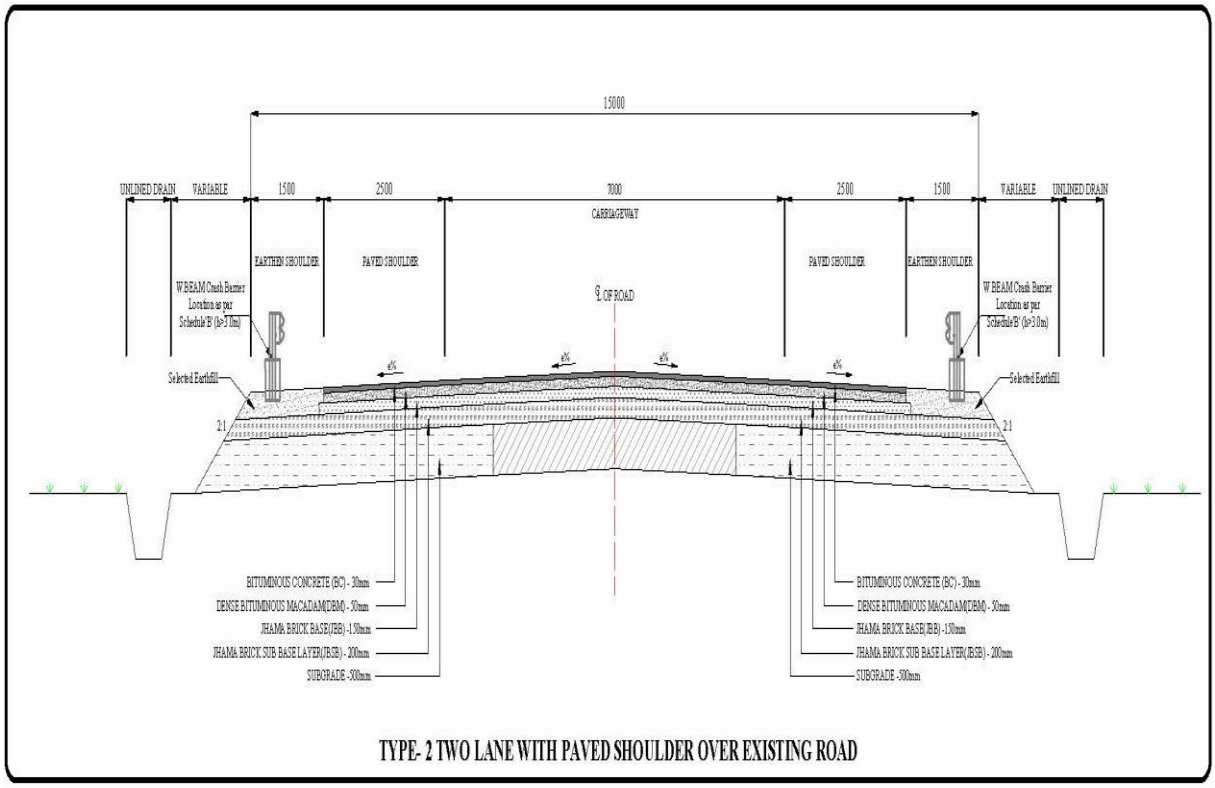
Proposed Typical cross sections are shown here –



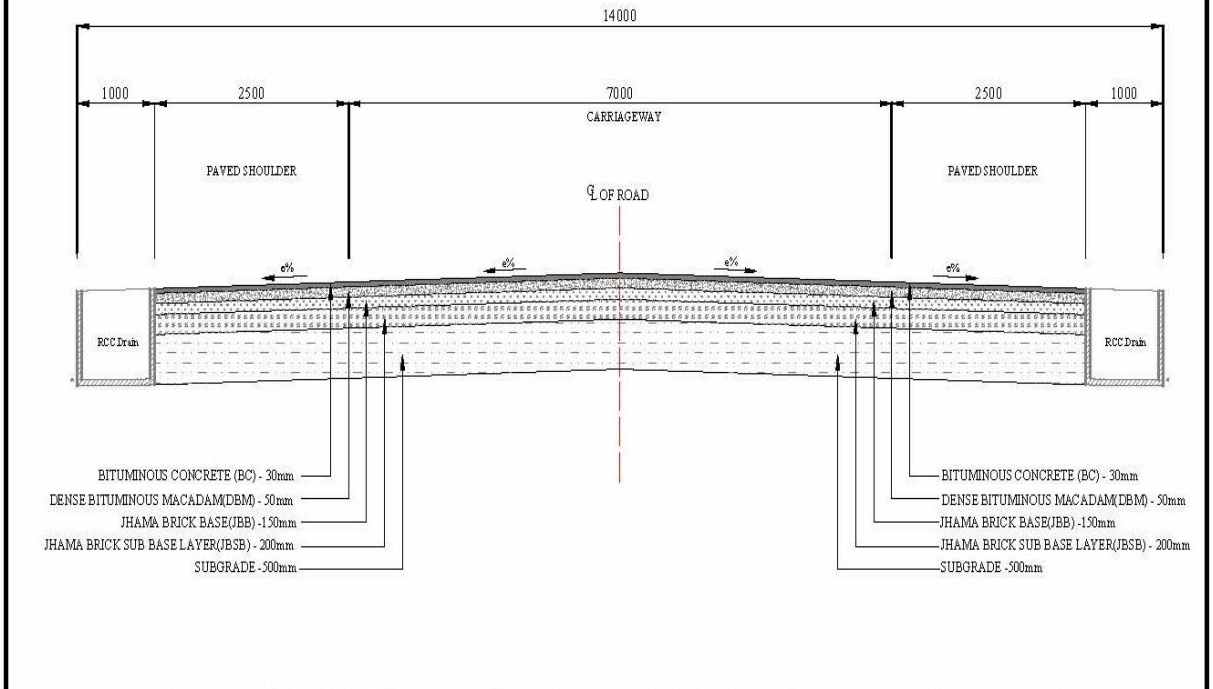
TYPE- 1 TWO LANE WITH PAVED SHOULDER (New Construction)

Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura**.

Section IV: Kumarghat - Kailashahar section (Design Length – 18.600km)



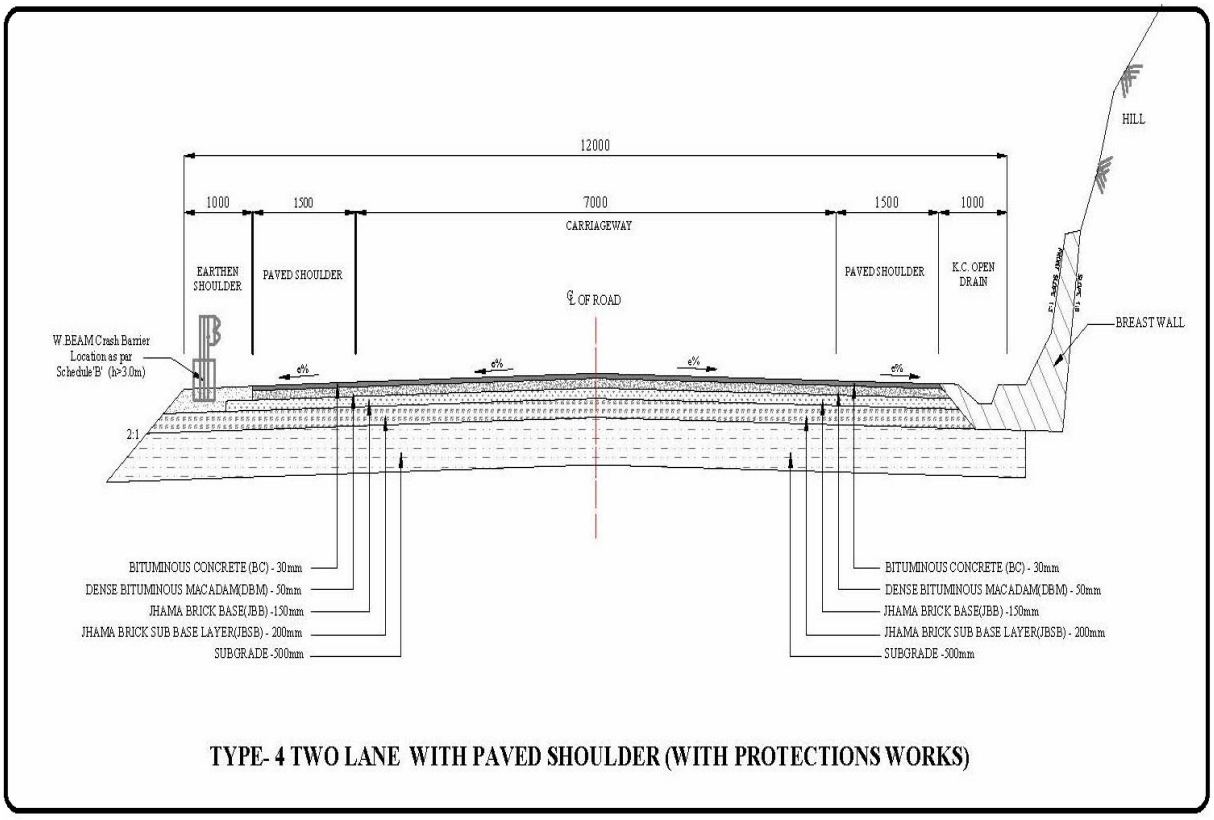
TYPE- 2 TWO LANE WITH PAVED SHOULDER OVER EXISTING ROAD



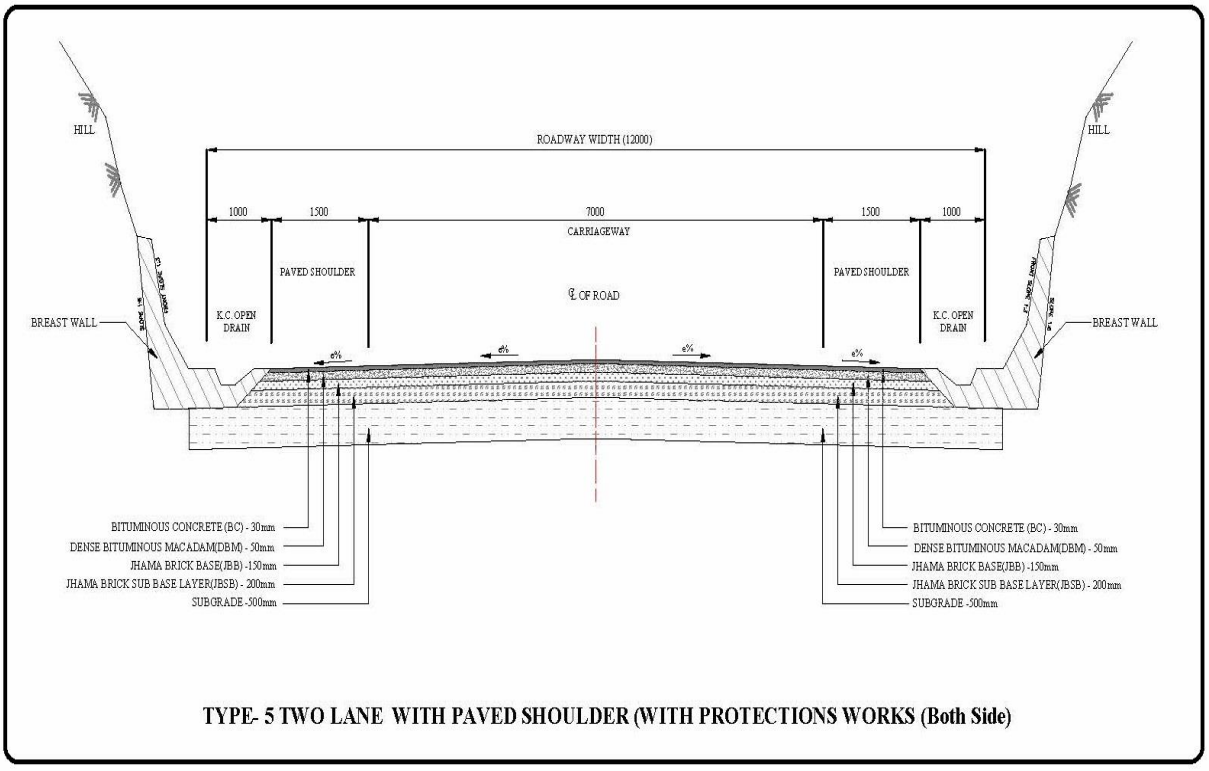
TYPE- 3 TWO LANE WITH PAVED SHOULDER WITH RCC DRAIN (Built-up Section)

Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura**.

Section IV: Kumarghat - Kailashahar section (Design Length – 18.600km)



TYPE- 4 TWO LANE WITH PAVED SHOULDER (WITH PROTECTIONS WORKS)



TYPE- 5 TWO LANE WITH PAVED SHOULDER (WITH PROTECTIONS WORKS (Both Side)

Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura**.

Section IV: Kumarghat - Kailashahar section (Design Length – 18.600km)

0.12.3 Horizontal Design of Project road

Horizontal Alignment Report

Table 0.9 - Horizontal Design Report

Curve No.	HORIZONTAL CURVE				Terrain	Transition length(m)	Speed
	Start Chainage (km)	End Chainage (km)	Radius (m)	Direction			(Kmph)
1	0+468.610	0+528.559	800	Right	Rolling	60	100
2	0+653.002	0+905.853	400	Left	Rolling	55	80
3	1+129.640	1+588.452	350	Right	Rolling	60	80
4	2+266.199	2+399.603	800	Left	Rolling	60	100
5	2+684.931	2+984.907	2000	Right	Rolling	0	100
6	3+225.288	3+428.907	800	Right	Rolling	60	100
7	3+981.646	4+073.698	1000	Right	Rolling	50	100
8	4+399.108	4+546.524	1500	Right	Rolling	30	100
9	5+080.486	5+849.085	900	Right	Rolling	55	100
10	6+462.685	7+299.198	600	Left	Rolling	80	100
11	7+955.271	8+074.345	1200	Right	Rolling	40	100
12	8+623.346	9+072.463	1000	Left	Rolling	50	100
13	9+339.568	9+562.676	500	Right	Rolling	95	100
14	10+996.088	11+428.896	1500	Left	Rolling	35	100
15	11+600.251	11+702.759	2000	Right	Rolling	0	100
16	11+831.029	12+172.445	1200	Right	Rolling	40	100
17	12+546.070	12+796.096	1200	Left	Rolling	40	100
18	14+284.101	14+349.216	1800	Right	Rolling	30	100
19	15+010.192	15+227.843	600	Right	Rolling	80	100
20	15+540.949	16+411.373	600	Left	Rolling	80	100
21	16+979.488	17+471.207	900	Right	Rolling	55	100
22	17+623.965	18+155.551	1200	Right	Rolling	40	100

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Section IV: Kumarghat - Kailashahar section (Design Length – 18.600km)

Curve No.	HORIZONTAL CURVE				Terrain	Transition length(m)	Speed
	Start Chainage (km)	End Chainage (km)	Radius (m)	Direction			(Kmph)
23	18+327.509	18+340.373	50	Left	Rolling	50	30

At only one location (at km 18+327, junction with NH 208 A:: Kailashahar – Kurti bridge section), the horizontal curve is coming under deviation, rest no any deviation comes in Horizontal improvement under this proposed alignment.

Vertical Alignment Report

Table 0.10- Vertical Design Report

PVI No.	PVI		Curve Length (m)	Gradient (%)		Chainage(m)		Level (m)		Type of Curve	K Value
	Design Chainage (km)	Level (m)		IN	OUT	Start of Curve	End of Curve	Start of Curve	End of Curve		
1	0+250.000	42.760	100	1.718	0.000	0+200.000	0+300.000	41.901	42.760	Hog	58.207
2	0+420.000	42.760	80	0.000	-0.666	0+380.000	0+460.000	42.760	42.493	Hog	120.047
3	1+267.535	37.112	350	-0.666	1.926	1+092.535	1+442.535	38.278	40.482	Sag	135.023
4	1+940.000	50.062	500	1.926	-1.554	1+690.000	2+190.000	45.248	46.178	Hog	143.702
5	2+689.181	38.422	200	-1.554	2.112	2+589.181	2+789.181	39.976	40.534	Sag	54.562
6	3+210.000	49.421	400	2.112	-2.200	3+010.000	3+410.000	45.197	45.021	Hog	92.768
7	3+757.897	37.367	400	-2.200	0.016	3+557.897	3+957.897	41.767	37.399	Sag	180.526
8	5+481.559	37.639	300	0.016	-0.128	5+331.559	5+631.559	37.615	37.447	Hog	2084.798
9	6+691.302	36.089	250	-0.128	3.058	6+566.302	6+816.302	36.249	39.912	Sag	78.459
10	7+380.934	57.180	700	3.058	-1.621	7+030.934	7+730.934	46.476	51.508	Hog	149.609

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Section IV: Kumarghat - Kailashahar section (Design Length – 18.600km)

PVI	PVI		Curve Length (m)	Gradient (%)		Chainage(m)		Level (m)		Type of Curve	K Value
No.	Design Chainage (km)	Level (m)		IN	OUT	Start of Curve	End of Curve	Start of Curve	End of Curve		
11	8+339.022	41.653	300	-1.621	-0.474	8+189.022	8+489.022	44.084	40.942	Sag	261.713
12	9+338.451	36.913	350	-0.474	0.126	9+163.451	9+513.451	37.743	37.133	Sag	583.302
13	10+628.590	38.535	400	0.126	-0.285	10+428.590	10+828.590	38.283	37.965	Hog	974.589
14	11+301.792	36.618	150	-0.285	-1.069	11+226.792	11+376.792	36.832	35.816	Hog	191.272
15	11+648.634	32.911	300	-1.069	0.494	11+498.634	11+798.634	34.514	33.651	Sag	191.999
16	12+205.242	35.658	200	0.494	0.331	12+105.242	12+305.242	35.164	35.989	Hog	1233.627
17	13+249.289	39.119	300	0.331	-0.122	13+099.289	13+399.289	38.621	38.935	Hog	660.849
18	13+720.000	38.542	150	-0.122	1.730	13+645.000	13+795.000	38.634	39.839	Sag	80.974
19	14+088.395	44.915	350	1.730	-2.025	13+913.395	14+263.395	41.888	41.372	Hog	93.221
20	14+451.731	37.559	200	-2.025	-0.084	14+351.731	14+551.731	39.584	37.475	Sag	103.057
21	15+006.000	37.094	200	-0.084	1.720	14+906.000	15+106.000	37.178	38.814	Sag	110.890
22	15+700.000	49.029	600	1.720	-2.359	15+400.000	16+000.000	43.870	41.951	Hog	147.093
23	16+340.000	33.929	200	-2.359	-0.070	16+240.000	16+440.000	36.288	33.859	Sag	87.358
24	17+500.440	33.117	150	-0.070	-0.346	17+425.440	17+575.440	33.170	32.858	Hog	543.976

0.13 Road Junctions/ Intersections

55 junctions exist on the project road and details of junctions are presented in **Table below**.

Table 0.11: Details of the intersections

Sl. No.	Design Chainage (km)	Type of Junction	Side	To Village	Remarks
1	0+000	3 Arm	BHS	LHS - To Agartala RHS - To shilong	Major Junction
2	0+710	T	LHS	-	
3	0+720	Y	RHS	-	
4	0+820	T	RHS	-	
5	1+250	T	RHS	-	
6	1+350	Y	LHS	-	
7	1+650	T	LHS	-	
8	1+860	T	LHS	-	
9	1+900	T	LHS	-	
10	1+960	T	LHS	-	
11	2+050	Y	RHS	-	
12	2+400	4 Arm	BHS	-	
13	2+430	Y	LHS	-	
14	2+440	Y	RHS	-	
15	2+480	Y	LHS	-	
16	3+030	Y	LHS	-	
17	3+525	4 Arm	BHS	-	
18	3+620	T	LHS	-	
19	3+790	Y	RHS	-	
20	3+980	Y	LHS	-	
21	4+500	4 Arm	BHS	-	

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Section IV: Kumarghat - Kailashahar section (Design Length – 18.600km)

Sl. No.	Design Chainage (km)	Type of Junction	Side	To Village	Remarks
22	5+180	4 Arm	BHS	-	
23	5+540	T	LHS	-	
24	5+580	Y	RHS	-	
25	5+690	Y	RHS	-	
26	5+940	Y	LHS	-	
27	6+020	Y	RHS	-	
28	6+040	Y	LHS	-	
29	6+550	Y	RHS	-	
30	6+610	Y	LHS	-	
31	7+725	4 Arm	BHS	-	
32	8+470	Y	LHS	To Notinchera	Major Junction
33	8+520	T	RHS	To Notinchera	
34	9+325	Y	LHS	-	
35	10+100	Y	LHS	-	
36	10+510	T	RHS	-	
37	10+780	T	RHS	-	
38	11+880	T	RHS	-	
39	12+250	T	LHS	To Chhantail	
40	12+390	T	RHS	-	
41	12+910	T	LHS	-	
42	12+950	T	LHS	-	
43	12+960	T	RHS	-	
44	13+300	Y	LHS	-	
45	14+800	Y	LHS	-	
46	15+110	Y	LHS	-	

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Section IV: Kumarghat - Kailashahar section (Design Length – 18.600km)

Sl. No.	Design Chainage (km)	Type of Junction	Side	To Village	Remarks
47	16+660	T	LHS	-	
48	17+280	4 Arm	BHS	-	
49	17+500	Y	LHS	-	
50	17+590	Y	LHS	-	
51	17+970	Y	LHS	-	
52	18+020	T	LHS	-	
53	18+220	T	LHS	-	
54	18+300	Y	RHS	LHS - To Kailshahar	
				RHS - To Dharmanagar	
55	18+400	T	RHS	-	

All these intersections are proposed to develop at grade only.

0.13.1 Religious Structures

10 Religious Structures exist on the project road and details are presented in **Table below**.

Table 0.12- Details of Religious Structures

Sl. No.	Existing Chainage (km)	Design Chainage (km)	Side	Type
1	2+320	2+400	RHS	Temple
2	3+150	3+210	LHS	Temple
3	3+800	3+870	LHS	Temple
4	12+130	12+180	LHS	Temple
5	12+200	12+260	LHS	Temple
6	12+350	12+400	RHS	Temple
7	12+480	12+520	LHS	Temple
8	12+500	12+550	RHS	Temple
9	17+320	17+610	LHS	Temple
10	17+700	18+000	LHS	Temple

0.13.2 School Details

3 Schools exist on the project road and details are presented in Table below

Table 0.13: Details of Schools

Sl. No	Existing Chainage (Km)	Design Chainage (km)	Side	Type
1	5+500	5+550	LHS	School
2	8+350	8+400	LHS	School
3	14+800	14+860	LHS	School

0.13.3 Pond Details

37 Ponds exist on the project road and details are presented in Table below –

Table 0.14: Details of Ponds

Sl. No.	Design Chainage (km)	Side	Length (m)	Remarks
1	0+650	LHS	20	
2	2+700	RHS	105	
		LHS	85	
3	3+360	LHS	45	
4	3+700	RHS	15	
5	3+800	LHS	55	
		RHS	35	
6	4+550	LHS	15	
7	4+800	LHS	25	
		RHS	20	
8	5+400	RHS	30	
9	5+670	RHS	30	
10	5+750	LHS	25	
11	5+800	RHS	20	
12	5+810	LHS	25	
13	5+900	RHS	35	
		LHS	20	

Sl. No.	Design Chainage (km)	Side	Length (m)	Remarks
14	8+100	LHS	20	
15	9+100	RHS	30	
16	9+500	RHS	30	
17	9+640	RHS	15	
18	9+750	RHS	35	
19	9+850	LHS	50	
20	10+200	RHS	50	
21	10+400	RHS	25	
22	11+600	LHS	45	
23	11+950	RHS	15	
24	12+810	RHS	30	
25	12+940	RHS	20	
26	12+960	LHS	45	
27	13+210	LHS	25	
28	14+380	RHS	15	
29	14+530	RHS	20	
30	14+650	RHS	35	
31	15+110	RHS	25	
32	15+750	BHS	15	
33	16+750	LHS	45	
34	17+100	RHS	25	
35	17+760	LHS	15	
36	17+900	LHS	20	
37	17+950	LHS	30	
			1285	

0.14 Railway Track & Proposals

No any railway track is falling on the Project road section.

0.15 Submergence areas

As per enquire with local people, the following areas found submerge during heavy rain, the locations are –

Table 0.15 Details of Submergence

Sl. No.	Locations	Submergence depth (approx)	Remarks
1	Km 4+400 to km 5+100	2.0 – 2.5m	
2	Km 5+500 to km 6+000	2.0 – 2.5m	
3	Km 11+200 to km 11+800	2.5 – 3 m	
4	Km 12+300 to km 13+00	2.5 – 3 m	
5	Km 16+400 to km 17+000	2.0 – 3.5m	

0.15 Cross Drainage Works

0.15.1 Bridges

1 major and 3 minor bridge existing on Project alignment and all these bridges are existing. The detail is given in **Table 0.16-**

Table 0.16- Proposal of Bridge

Sl. No.	Survey Location (Km)	No. of Spans	Span Arrangement (m)	Clear Span	Length of Bridge (m)	Design Chainage (km)	Proposal	Span Arrange-ment (m)	Remarks
1	0+150	4	1x13.5 + 1x20.6 +1x42.2 + 1x18.2	97	95	0+300	New Construction	4x30	Old bridge retained
2	8+450	2	2x6	12		8+510	Reconstruction	1x20	-
3	11+725	1	22	20	20	11+780	New Construction	1x30	Old bridge retained
4	15+025	1	1x6.7	6.7	6.7	15+060	New Construction	1x10	Old bridge retained

0.15.2 Culverts

Total 46 culverts are falling on existing project alignment.
14 existing culverts are proposed for reconstruction.
32 existing culverts are retained due to realignment.
49 additional culverts are proposed as balancing culverts.

The details of existing culverts are shown in Annexure volume

Table 0.17: Proposal of Existing Culverts

Sl. No.	Exisitng Chainage (km)	Type of Structure	No. of span	Vent Width (m)	C/C of Exp. Joint.	Design Chainage (Km)	Proposal	Span Arrangement	Type of Structure
1	-	Slab	1	2.7		0+850	reconstruction	1x2x2	Box
2	-	Slab	1	1.5		1+240	reconstruction	1x2x2	Box
3	1+060	Slab	1	2.7	-	-	Retained due to realignment	-	-
4	1+150	Slab	1	2.0	-	-	Retained due to realignment	-	-
5	1+300	Slab	1	2.0	-	1+370	reconstruction	1x3x4	Box
6	2+025	Slab	1	1.0	-	-	Retained due to realignment	-	-
7	2+700	Slab				-	Retained due to realignment	-	-
8	3+380	Slab	1	1.5	2.2	-	Retained due to realignment	-	-
9	3+500	Slab	1	1.0	2.2	-	Retained due to realignment	-	-
10	3+675	Slab	1	2.0	3.5 X 2 2.6	-	Retained due to realignment	-	-
11	5+445	Slab	1	2.0	-	-	Retained due to realignment	-	-
12	5+580	Slab	1	2.0	-	-	Retained due to realignment	-	-
13	6+000	Slab	1	1.5	2.5	6+060	reconstruction	1x2x2	Box
14	6+300	BOX	1	2.0 X 2.0	-	-	Retained due to realignment	-	-
15	6+500	Slab	1	1.0	-	-	Retained due to realignment	-	-
16	7+250	Slab	1	2.0	-	-	Retained due to realignment	-	-
17	7+500	Slab	1	2.0	-	-	Retained due to realignment	-	-
18	7+740	Slab	1	1.5	-	-	Retained due to realignment	-	-
19	7+800	Slab	1	1.5		-	Retained due to realignment	-	-
20	7+850	Slab	1	2.5		-	Retained due to realignment	-	-
21	7+980	Slab	1	1.5	-	-	Retained due to realignment	-	-
22	8+240	Slab	1	1.5	-	-	Retained due to realignment	-	-
23	8+640	Slab	1	1.5	-	-	Retained due to realignment	-	-

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Section IV: Kumarghat - Kailashahar section (Design Length – 18.600km)

Sl. No.	Exisitng Chainage (km)	Type of Structure	No. of span	Vent Width (m)	C/C of Exp. Joint.	Design Chainage (Km)	Proposal	Span Arrangement	Type of Structure
24	8+850	Slab	1	2.0	-	8+900	reconstruction	1x2x2	Box
25	9+050	Slab	1	1.5	-	9+100	reconstruction	1x2x2	Box
26	9+425	Slab	1	1.5	-	9+480	reconstruction	1x2x2	Box
27	9+550	Slab	1	1.5	-	9+620	reconstruction	1x2x2	Box
28	9+700	Slab	1	1.5	-	9+760	reconstruction	1x2x2	Box
29	9+850	Slab	1	5.8	-	-	Retained due to realignment		
30	10+200	Slab	1	5.8	-	-	Retained due to realignment	-	-
31	10+360	Slab	1	5.8		-	Retained due to realignment	-	-
32	10+700	Slab	1	1.6		10+750	reconstruction	1x3x4	Box
33	11+180	Slab	1	1.5	-	11+250	reconstruction	1x2x2	Box
34	11+900	Slab	1	1.5	-	11+950	reconstruction	1x2x3	Box
35	12+260	Slab	1	1.5		-	Retained due to realignment	-	-
36	12+580	Slab	1	1.0	-	12+630	reconstruction	1x2x3	Box
37	12+850	Slab	1	1.5	-	12+890	reconstruction	1x2x2	Box
38	13+325	Slab	1	1.5	-	-	Retained due to realignment	-	-
39	14+675	Slab	1	1.5	-	-	Retained due to realignment	-	-
40	14+800	Slab	1	1.5	-	-	Retained due to realignment	-	-
41	15+125	Slab	1	1.5	-	-	Retained due to realignment	-	-
42	15+200	Slab	1	1.0	-	-	Retained due to realignment	-	-
43	15+390	Slab	1	1.0	-	-	Retained due to realignment	-	-
44	15+500	Slab	1	1.0	-	-	Retained due to realignment	-	-
45	15+660	Slab	1	1.0	-	-	Retained due to realignment	-	-
46	18+040	Slab	1	1.0	-	-	Retained due to realignment	-	-

The details of Additional Culverts –

Table 0.18: Proposal of additional Culverts

Sl. No	Design Chainage (Km)	Size (m)	Proposal	Remarks
1	0+110	1x3x4	Box Culvert	New Construction
2	0+550	1x3x3	Box Culvert	New Construction
3	1+600	1x2x2	Box Culvert	New Construction
4	1+900	1x2x2	Box Culvert	New Construction
5	2+120	1x2x2	Box Culvert	New Construction
6	2+250	1x4x5	Box Culvert	New Construction
7	2+720	1x4x3	Box Culvert	New Construction
8	3+340	1x4x4	Box Culvert	New Construction
9	3+530	1x4x3	Box Culvert	New Construction
10	3+730	1x3x3	Box Culvert	New Construction
11	4+000	1x2x3	Box Culvert	New Construction
12	4+400	1x3x3	Box Culvert	New Construction
13	4+620	1x4x4	Box Culvert	New Construction
14	4+860	1x4x4	Box Culvert	New Construction
15	5+140	1x3x3	Box Culvert	New Construction
16	5+480	1x3x4	Box Culvert	New Construction
17	5+840	1x3x3	Box Culvert	New Construction
18	6+350	1x3x4	Box Culvert	New Construction
19	6+560	1x3x3	Box Culvert	New Construction
20	6+860	1x3x3	Box Culvert	New Construction
21	7+080	1x3x3	Box Culvert	New Construction
22	7+500	1x5x5	Box Culvert	New Construction
23	7+700	1x5x5	Box Culvert	New Construction
24	8+720	1x2x2	Box Culvert	New Construction
25	9+900	1x5x4	Box Culvert	New Construction
26	10+240	1x4x4	Box Culvert	New Construction
27	10+440	1x4x4	Box Culvert	New Construction
28	11+100	1x2x2	Box Culvert	New Construction
29	12+100	1x2x2	Box Culvert	New Construction
30	12+300	1x3x3	Box Culvert	New Construction

Sl. No	Design Chainage (Km)	Size (m)	Proposal	Remarks
31	13+150	1x2x2	Box Culvert	New Construction
32	13+370	1x5x4	Box Culvert	New Construction
33	13+590	1x5x4	Box Culvert	New Construction
34	13+700	1x3x3	Box Culvert	New Construction
35	14+380	1x3x3	Box Culvert	New Construction
36	14+720	1x4x4	Box Culvert	New Construction
37	14+850	1x3x4	Box Culvert	New Construction
38	15+250	1x3x3	Box Culvert	New Construction
39	15+450	1x3x3	Box Culvert	New Construction
40	15+820	1x4x4	Box Culvert	New Construction
41	16+380	1x3x3	Box Culvert	New Construction
42	16+550	1x3x3	Box Culvert	New Construction
43	16+850	1x3x4	Box Culvert	New Construction
44	17+150	1x3x4	Box Culvert	New Construction
45	17+400	1x3x4	Box Culvert	New Construction
46	17+650	1x3x3	Box Culvert	New Construction
47	17+850	1x3x3	Box Culvert	New Construction
48	18+050	1x2x3	Box Culvert	New Construction
49	18+620	1x2x2	Box Culvert	New Construction

0.15.3 Bus Lay Byes

6 bus bays are proposed along the Project road, the details are –

Table 0.19:-Proposal of Bus Bays

Sl. No.	Design Chainage (Km)	Side	Remarks
1	4+900	LHS	
2	4+950	RHS	
3	10+600	LHS	
4	10+950	RHS	
5	16+500	LHS	
6	16+600	RHS	

0.15.3 Truck Lay Bye

No Truck lay bye is proposed along the Project road.

0.15.4 Toll Plaza

No Toll plaza is proposed.

0.16 Proposed Bypasses / Realignments

No any bypass is proposed in this Project road sections, however due to geometric improvement, realignments are proposed, the locations of major realignments are –

Table 0.20- Details of Realignment / New alignment

Sl. No.	Design Chainage (km)			Existing Chainage (km)		
	From	To	Length (km)	From	To	Length (km)
1	0+000	1+350	1+350	0+000	1+300	1+300
2	2+100	2+450	0+350	2+000	2+350	+0350
3	2+500	3+980	1+480	2+400	3+900	1+500
4	4+470	5+580	1+110	4+400	5+500	1+100
5	5+700	6+000	0+300	5+650	5+950	0+300
6	6+080	6+500	0+420	6+000	6+400	0+400
7	6+600	8+450	1+850	6+550	8+400	1+850
8	8+600	8+800	0+200	8+550	8+750	0+200
9	9+200	9+460	0+260	9+150	9+400	0+250
10	10+100	10+700	0+600	10+050	10+650	0+600
11	12+280	12+500	0+220	12+200	12+450	0+250
12	13+320	14+850	1+530	13+300	14+800	1+500

Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura**.

Section IV: Kumarghat - Kailashahar section (Design Length – 18.600km)

Sl. No.	Design Chainage (km)			Existing Chainage (km)		
	From	To	Length (km)	From	To	Length (km)
13	15+100	17+330	2+230	15+050	17+050	2+000
	Total…		**11+900**	**Total…**		**11+600**

Fig : Major Realignment at the start of project road kumarghat

0.17 Protection Works

The Protection work like retaining walls, breast walls, W Beam crash barrier are provided at different locations as per site requirement, the details of protection works with their details are presented below –

a) Breast Walls –

		LHS	RHS	Total
1	Breast Wall 1m height	220	160	380
2	Breast Wall 2m height	420	570	990
3	Breast Wall 3m height	380	550	930
4	Breast Wall 4m height	350	420	770
		1370	**1700**	**3070**

The Chainage wise detail of breast wall is presented in Vol. 8:: Bill of Quantity

b) Retaining Wall – retaining wall is proposed in 1285m length at pond locations, The Chainage wise detail of retaining wall is presented in Vol. 8:: Bill of Quantity

c) W Beam Crash Barrier - W Beam crash barrier is proposed in 9,440m length (where height of embankment is more than 3.0m), The Chainage wise detail of W Beam crash barrier is presented in Vol. 8:: Bill of Quantity

d) RCC Drain – RCC linear drain is provided in 4840m length,

e) PCC Drain – PCC drain is provided in 8350m length,

The Details of above all protection works has been provided in Vol.8:: Bill of Quantity

0.17 Road Side furniture

Road side furniture shall be provided in accordance with Section 11 of the Manual of Specification and Standards for Two Laning of Highways through PPP.

0.18 Landscaping and Tree Plantation

Landscaping and tree plantation shall be provided in accordance with Section 12 of the Manual of specification and Standards for Two Laning of Highways through PPP.

0.19 Highways Lighting

Street lighting shall be provided in accordance with para 13.3 of Section 13 of the

Manual of Specification and Standards for Two Laning of Highways through PPP.

0.20 Safety

Keeping view of these all features, a proper safety precautions are recommended on roadway width, the safety items to be provided are –

i) W Beam Crash Barrier/ Concrete Crash Barrier on either side of carriageway,
ii) Pavement Marking on Centre and edges lines,
iii) Provide adequate warning of hazards,
iv) Providing Bio-turfing for Slope protection,

0.21 Utilities

The collection of estimate for relocation of utility shifting from concerned departments is obtained and attached separately with project clearances volume.

0.22 Land Acquisition

The detail of Land acquisition village wise list is given bellow and the amount of Land acquisition is Rs 82.0 crore is considered.

SI. NO	MOUJA / VILLAGE	TOTAL NO OF PLOT	TOTAL AREA (H)	AREA TO BE ACQUIRED	Pvt. Land	Govt. Land
1	Bhagaban Nagar	46	9.2189403	2.9542694	2.9057061	0.0485633
2	Gournagar	94	7.0416838	2.9461762	2.8814251	0.0647511
3	Jalai	165	41.9789554	5.3014961	3.6017797	1.6997164
4	Kaulikura	77	6.8555239	2.3229465	1.8130315	0.509915
5	Kumarghat	168	21.4326177	6.0218509	4.8846596	1.157426
6	Natingchhara	27	43.2699319	8.4059082	8.0048561	0.4010521
7	Pabiachara	29	13.9660058	1.740186	0.5665723	1.1736137
8	Sonaimuri	179	23.4884661	7.2602175	6.3415615	0.918656
9	Sonamukhi	8	56.2484832	3.8445972	0.0647511	3.7798461
10	**Total**	**793**	**223.5006081**	**40.797648**	**31.2424086**	**9.5228638**

0.23 Resettlement and Rehabilitation (R & R) Policy

The Ministry of Rural Development (Department of Land resources) has prepared the National Policy on Resettlement and Rehabilitation for the people who will be affected by the project. The policy describes the principle and approach to minimize and mitigate the negative social and economic impacts caused by the project. The R & R policy broadly addresses all issues such as compensation, assistance, replacement value, vulnerable group, etc. The policy ensures that people affected by project must be able to restore their livelihood to the pre-project level.

0.24 Cost Estimate

Table 0.21 - Abstract of Cost

Bill No.	Description		Amount (in RS)	Amount (in Crores)
	Design Length in Km	**18.600**		
1	**Site Clearance and Dismantling**		**459124.00**	**0.05**
2	**Earth Work**		**145257395.00**	**14.53**
3	**Sub base and Base Course**		**246375570.00**	**24.64**
4	**Bituminous Courses**		**245264597.00**	**24.53**
5	**Bridges**		**265123935.00**	**26.51**
6	**Culverts**		**226486334.00**	**22.65**
7	**Drainage and Protection Works**		**252596099.00**	**25.26**
8	**Traffic Signs, Marking and Appurtenances**		**2942810.00**	**0.29**
9	**Bus Bays**		**17013015.80**	**1.70**
10	**Junctions**		**47011868.96**	**4.70**
11	**Miscellaneous Items**		**2932000.00**	**0.29**
A	**Civil Cost (sum of 1 to 11)**		**1451462749**	**145.15**
B	**** GST on 'A' @ (Total 12%, 6% as VAT + 6% GST)**	**6.00%**	**87087765**	**8.71**
C	**Civil Cost including GST (A+B)**		**1538550514**	**153.86**
	Cost per km		**82717770**	**8.27**
D	**Contingencies charges on 'C' @**	**2.80%**	**43079414**	**4.31**
E	**Sub Total (C + D)….**		**1581629928**	**158.16**
F	**Maintenance for 5 years (0.25%+0.25%+0.5%+0.5%+1%) on 'C"**	**2.50%**	**38463763**	**3.85**
G	**escalation (5% per year for two years) on 'C' @**	**10.00%**	**153855051**	**15.39**
H	**Construction Supervision Charges on 'C' @**	**3.00%**	**46156515**	**4.62**

Bill No.	Description		Amount (in RS)	Amount (in Crores)
I	Agency (NHIDCL) Charges on 'E' @	3.00%	47448898	4.74
J	Total Project Cost (E to I)		1867554156	186.76
K	Cost of Land Acquisition as per CALA		820000000	82.00
L	Cost of Utility Shifting		107295289	10.73
M	Total Project Cost (J to M)		2794849445	279.48

0.25 Economic Analysis -

The consultants carried out the economic appraisal using the appraisal methodology and economic costs and benefits described in the preceding paragraphs of this report.

0.25.1 Base case

Derivation of passenger time costs always remained controversial issue, especially in respect of developing nations as saving in leisure time is mostly not appreciated that constitute majority except for commercially developed urban centres. Economic analysis for the base case has therefore, been carried out without considering the benefits on account passenger time savings.

0.25.2 Sensitivity Analysis

Two critical factors could affect the viability of the project and these are the Capital Cost and traffic level. The capital cost can increase or the expected traffic growth could not materialize or both factors could occur simultaneously sensitivity check using the following parameters has been carried out:

Sensitivity Option S1 Increase in base costs by 15%

Sensitivity Option S2 Decrease in base benefits by 15%

Sensitivity Option S3 Increase in base costs by 15% and decrease in base benefits by 15%

The EIRR and NPV (at 12%) for each link and section along with sensitivity analysis have been presented as follows:

Table 0.22 - Summary of Sensitive Analysis

Link ID	Length (km)	NPV (Million) @12%, Base Case	Economic Internal Rate of Return (%)			
			Base Case	Sensitivity S1	Sensitivity S2	Sensitivity S3
ESRR	18.600	279.48	39.01%	32.8%	15.9%	14.7%

The project road is found to be economically viable with EIRR more than the resource cost of capital @ 12%.

0.25.3 Financial Analysis -

Based on the project structure, study of all possible sources of revenue, financial feasibility analysis has been carried out as per the methodology outlined in earlier sections. The objective of the financial analysis is to ascertain the existence of sustainable project returns, which shall successfully meet the expectations of its financial investors. The analysis reveals various FIRR values corresponding to each year of operation. FIRR for the Returns on Investment and Returns on Equity for the years from 2019 and 2034 (concession period 15 years including 2 years construction period) for the following alternatives with varying subsidy options are: -

Alternative I **:** With Nil Grant.

Alternative II ; With 40%. Grant

With the above mention options financial analysis has been carried out for 15 years concession period when grant is 40% of the Capital Cost. The results are given below in **Table 0.23** for concession period 15 years are as under.

Table 0.23- Summary of Financial Analysis

Scenario	Pre tax FIRR %	Returns on Equity%	Post tax FIRR%	DSCR
Alternative- I	1.18%	-1.06%	0.89%	0.16
Alternative- II	3.83%	2.82%	3.16%	0.28

0.25.4 Conclusion

As it is clear from the results of the both the alternatives that the project is financially not viable even with 40% Grant. This is because of high cost of Construction and very low toll able traffic. **Therefore, it is strongly recommended to construct the road on EPC basis and not on BOT basis.**