

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.**

Package II: Kailashahar – Kurti Bridge [SectionI :: Design km 11.800 to 25.250]

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 is awarded to M/s. Technocrats Advisory Services Pvt. Ltd. in association with Vaishnavi Infratech Services Private Limited. for preparation of Detailed Project Report i.e. – **Kailashahar – Kurti bridge (near Katalitali town) – Section (NH 208 A).**

The existing length of project road is 41.865 Km and design length is 36.460 Km.

This packages has been divided into three sections and this report contains the details of section II :: design km 11.800 to km 25.250.



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**0.2 Consultancy Services**

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

Stage 1: Inception Report (IR) & Quality Assurance Plan (QAP)

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 is described as below -

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 reports for **Kailashahar-Kurti Bridge Section (NH-208A)**.

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 (minimum 3 nos.) for proposed Bypasses, As far as possible, existing road having adequate ROW shall be include in the alignment. The widening / improvement work to 2 lane 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 lane 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



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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.



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]

0.5 Key Professional Staff

Table 0.1 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	Mrs. 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 Co-Ordinates of Proposed Centre Line

The Co-ordinates of Proposed Centre line @ 20m interval are presented at the end of this chapter **Table 0.25**



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**0.7 Project Alignment Description**

The Project road starts from Chirakoti junction at Kailashahar Town (Junction of Kumarghat road, Dharmanagar Road & Kailashahar Road), passes through Chini bagan, Juboraj nagar, Dharamnagar, Lalcherra, Khailalcherra, Kadamtala and ends at Kurti bridge (500m before Kataltali town). The existing length of project road is 41.865 Km and design length is 36.460 Km.

This packages has been divided into three sections and this report contains the details of section II :: design km 11.800 to km 25.250.

Existing lane of Project road varies from two lane to single lane with fair to poor riding quality.

The Project Road alignment shown in figure below-

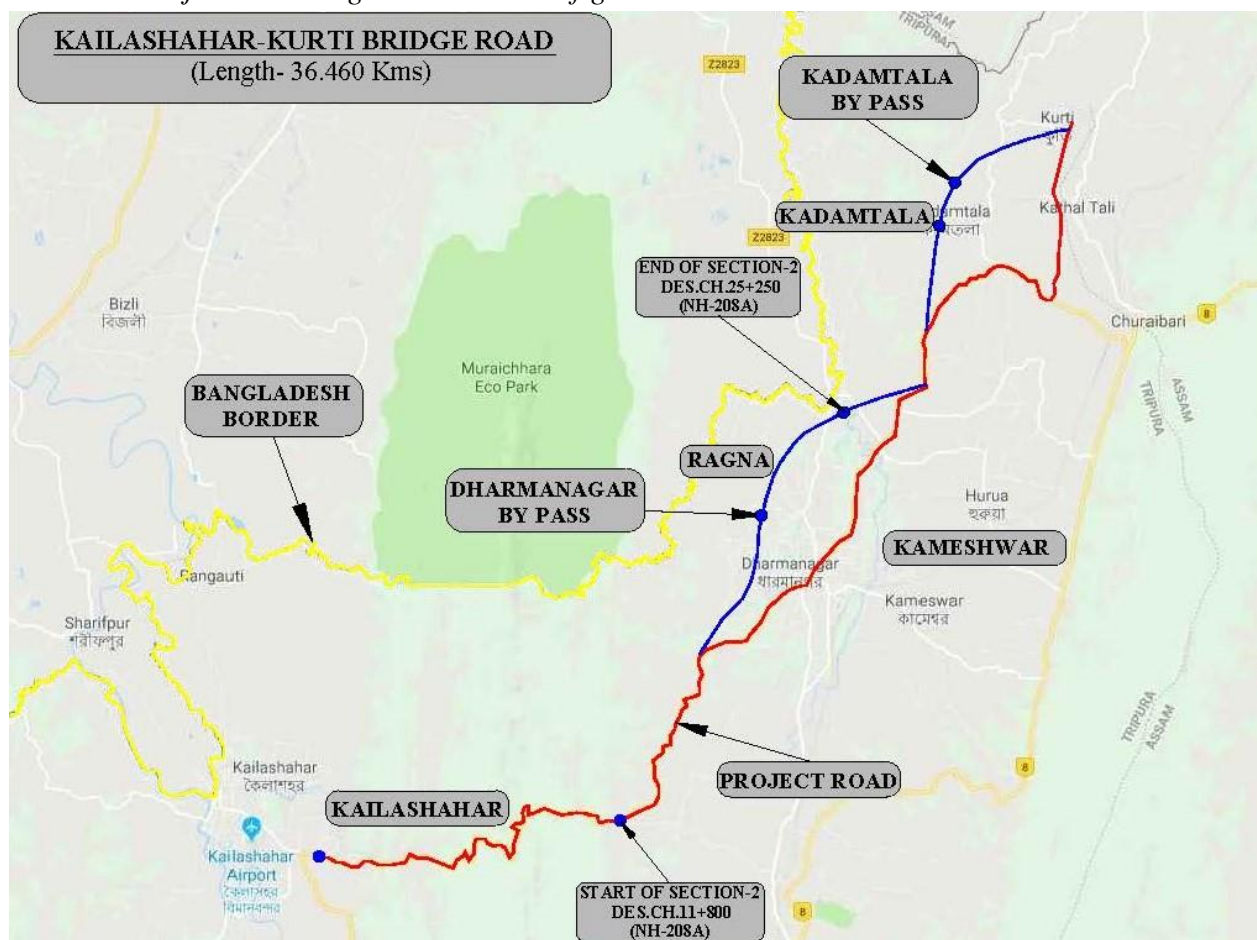


Figure 0.1– Key Map of Project Road



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**0.8 Right of Way (ROW)**

The existing RoW is varying from 15 - 25m. Due to serpentine alignment of existing road, the new alignment has been proposed in open area maximum of its length (approximate 80% of design length).

The proposed RoW kept 30m in maximum length, wherever toe width is coming more than 30m, the proposed RoW has been taken maximum of its width.

The detail of proposed RoW has tabulated below:-

Table 0.2 Details of Proposed RoW

Sl. No.	Design Chainage(km)		Length (m)	PROW		Total PROW
	From	To		LHS	RHS	
1	11+800	12+700	900	15	15	30
2	12+700	12+800	100	18	18	36
3	12+800	12+900	100	15	15	30
4	12+900	13+050	150	15	18	33
5	13+050	13+300	250	15	15	30
6	13+300	13+500	200	22	23	45
7	13+500	13+600	100	18	15	33
8	13+600	14+400	800	15	15	30
9	14+400	14+500	100	20	22	42
10	14+500	14+760	260	15	15	30
11	14+760	14+900	140	20	20	40
12	14+900	16+000	1100	15	15	30
13	16+000	16+100	100	16	18	34
14	16+100	16+500	400	15	17	32
15	16+500	16+700	200	18	18	36
16	16+700	16+870	170	15	15	30
17	16+870	16+930	60	21	21	42
18	16+930	17+600	670	15	15	30
19	17+600	17+650	50	15	15	30
20	17+650	17+800	150	15	18	33
21	17+800	18+000	200	20	20	40
22	18+000	18+150	150	15	15	30
23	18+150	18+900	750	15	15	30
24	18+900	19+630	730	15	15	30



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Sl. No.	Design Chainage(km)		Length (m)	PROW		Total PROW
	From	To		LHS	RHS	
25	19+630	19+850	220	15	15	30
26	19+850	20+500	650	15	15	30
27	20+500	20+650	150	20	15	35
28	20+650	20+900	250	18	18	36
29	20+900	21+000	100	15	15	30
30	21+000	21+300	300	18	18	36
31	21+300	21+900	600	15	15	30
32	21+900	22+100	200	17	17	34
33	22+100	25+250	3150	15	15	30

0.9 Abutting Land Use Pattern

The Project road passes through open, built-up & Forest areas. Main built-up are Chini bagan, Juboraj nagar, Dharam nagar, Lalcherra, Khailalcherra, Kadamtola. The approx. %age of land use pattern along the Project road is –

Open / Forest – 32 Km & Builtup – 9 Km

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-

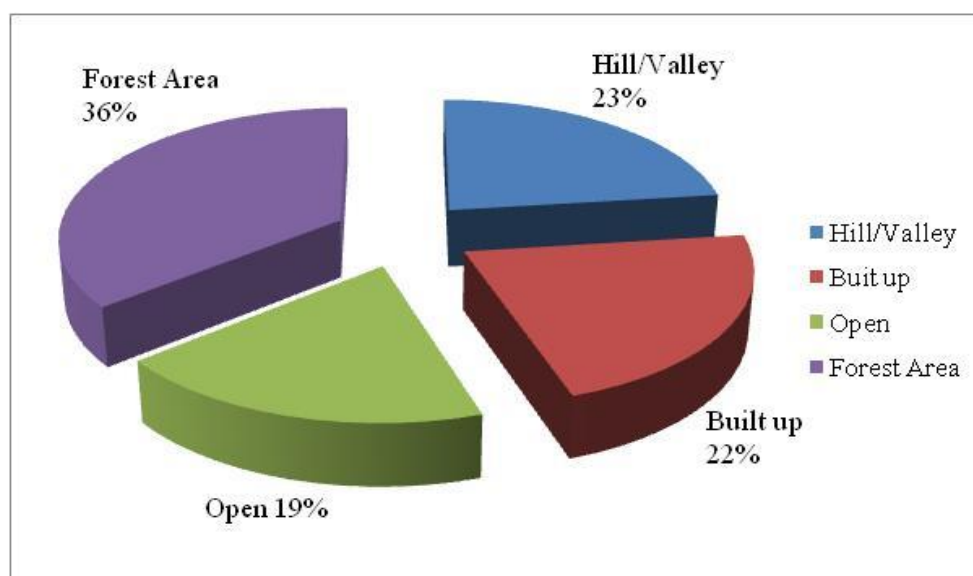


Fig 0.2 Land use pattern



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.**

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The existing terrain details with reference to design chainage is presented below:-

Table 0.3 – Details of Terrain

Sl. No	Chainage From (Km)	Chainage To (Km)	Length (m)	Terrain	Remarks
1	11+800	25+250	13+450	Plain & Rolling	

0.10 Terrain

Terrain is Plain, Rolling and 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- Design Parameters

Item	Plain / Rolling Terrain	Reference
Design Speed (kmph)	Ruling -100 Kmph (P) / 60kmph (M) Min.- 80 kmph (P) / 40kmph (M)	Table 2.1
Sight distance (minimum)	180 m (SSD) & 360m (ISD)	Table 2.6
Proposed Land width (ROW)	as per table 0.2 of “Executive summary”	
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 (IRC SP-73 : 2018	
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 upto 3.0 m)	
	1 (V): 1.5 (H) Fill (Fill height 3 m to 6.0 m)	
	1 (V): 1 (H) Cut	



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Item	Plain / Rolling Terrain	Reference									
Maximum super-elevation	7.0 %										
Radii of horizontal curves in plain/hilly terrain (m)	<table> <tr> <td></td><td>Plain</td><td>Hilly</td></tr> <tr> <td>Ruling Min</td><td>400 m</td><td>150m</td></tr> <tr> <td>Absolute Min</td><td>250 m</td><td>75m</td></tr> </table>		Plain	Hilly	Ruling Min	400 m	150m	Absolute Min	250 m	75m	Table 2.5
	Plain	Hilly									
Ruling Min	400 m	150m									
Absolute Min	250 m	75m									
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 two locations.

Table 0.5: Details of Traffic count locations

Sl. No.	Section	Chainage (Km)	Remarks to Capture
1	Section I :: Km 0 to Km 27.0 (Kailashahar – Dharamnagar section)	Near Km 22.0 near Devenpasha	Traffic coming from Agartala, Kumarghat & moving towards Dharam nagar, Assam etc (both ways)
2	Section II :: Km 27.0 to Km 41.00 (Dharamnagar – Kurti Bridge section)	Near Km 31.0, near Nutan Bazar	Traffic coming from Agartala, Kumarghat, Dharamnagar & moving towards local areas, Assam etc (both ways)

Growth Rate

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



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**AADT, CVPD & Projected Traffic****Table 0.6- Commercial Vehicle Per day**

SL. No.	Location	AADT	PCU	CVPD	Remarks
1	Km 22.00 (near Devenpasha)	2155	2015	301	
2	Km 31.00 (near Nutan bazaar)	2900	2494	196	

Projected traffic on the project road is given below:

Table 0.7- Projected traffic

<u>Year</u>	<u>Likely traffic on the Project road</u>		
	<u>PCU at km 22.00 (Near Devenpasha)</u>	<u>PCU at km 31.00 (Near Nutan Bazaar)</u>	<u>Requirement of</u>
2017	2015	2494	2 Lane with paved shoulder
2020	2779	3402	
2025	3540	4337	
2030	4509	5539	
2035	5748	7066	
2040	7331	9019	

As per the projected traffic & MoRT&H circular dated 26th May 2016, requirement of four lane is not qualifying up to year 2035 (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 two locations are found very less (301 & 196), so the Axle load survey could not carried 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).



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**0.11.3 Testing of soil from existing embankment**

The data has been collected pertaining to pavement composition by digging test pit at desired interval along the road. Following are the details:-

Table 0.8: Pavement Composition

<i>Existing Chainage (Km)</i>	<i>Position of Pit</i>	<i>Pavement Composition</i>			<i>Total (mm)</i>
		<i>Bitumen Layer(mm)</i>	<i>Brick Soling(mm)</i>	<i>Sub base Course(mm)</i>	
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
21+500	LHS	30	260	-	290
22+000	RHS	30	220	-	250
22+500	LHS	30	160	-	190
23+000	RHS	35	175	-	210
23+500	LHS	40	245	-	285
24+000	RHS	30	195	-	225
24+500	LHS	40	235	-	275

Existing crust composition details

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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**Test Result of Collected Soil samples –**

The Soil samples for sub-grade collected along the Project road as per ToR clause 4.11.3.3, page no. 51. The details of tested samples are tabulated below –

Sl.No.	Chainage No. (Km)	MDD (g/cc)	OMC (%)	Unsoaked CBR (%)	Soaked CBR (%)	Swelling Index (%)
01	5.00	1.901	12.30	19.82	10.03	2.85
02	10.00	1.843	11.65	19.57	9.48	3.02
03	15.00	1.818	16.00	16.04	8.43	3.29
04	30.00	1.824	15.0	17.43	8.86	3.13
05	35.00	1.806	14.21	15.67	7.82	3.21
06	40.00	1.862	13.48	18.57	9.62	2.92
07	Borrow Area Near Km 20.00	1.798	14.76	15.46	7.55	3.43

Location: - Kurti Bridge Section

Issue Date : 25.03.17
Issued To : TASPL
Sample Deposited by : Representative
Sample Description : Soil

Job No. : B 5533
Date of Sample received : 20.02.17
Page : 2 of 3

Prepared by
Bhannuk
25/03/17
B. Tech (Civil)
Quality 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.

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



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**0.11.4 Material survey**

Aggregate quarry for structure works and road works is identified at Silchar (Assam) which is Approx 120 km away from Dharmanagar.

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.

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. 1500 km.

0.11.5 Geotechnical Investigations

Geotechnical Investigations being carried out at site and the results has been submitted with separate volume.

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 20 years.

Accordingly design traffic has been worked out as 20MSA (as per 5.4.1 (i) of Two lane manual 2018) and considering sub-grade construction with soil of CBR not less than 8%, The Pavement compositions for Project road as per IRC 37-2018 (Plate 20) is as under:

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



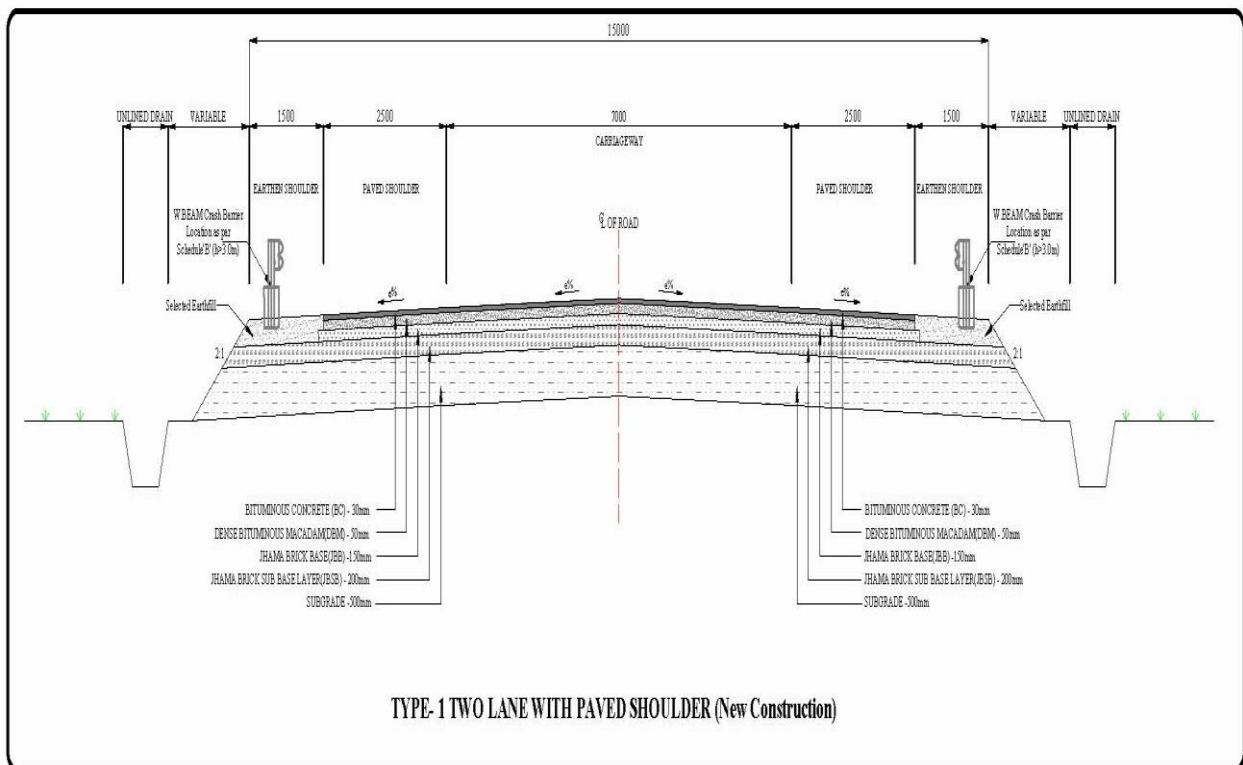
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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**0.12.2 Typical Cross Section and Widening Scheme****i) Roadway width -**

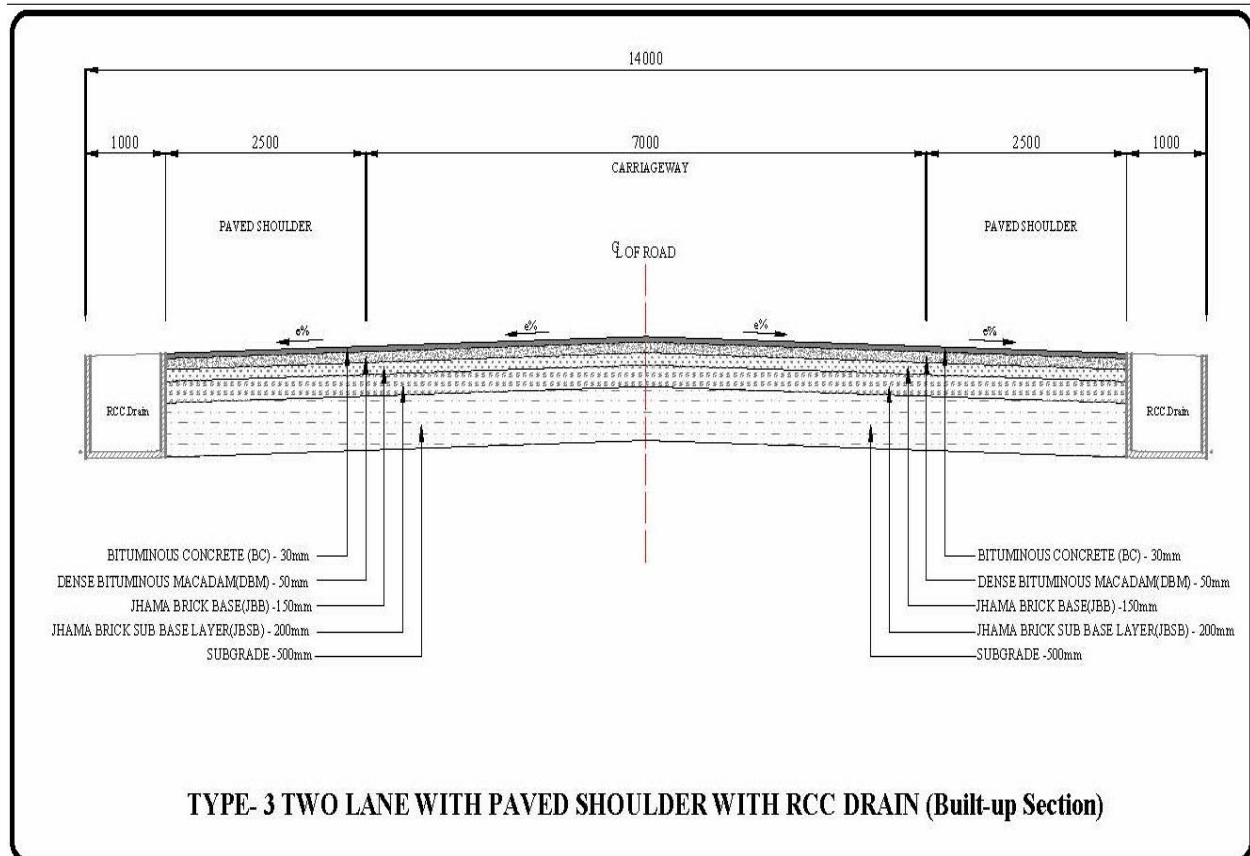
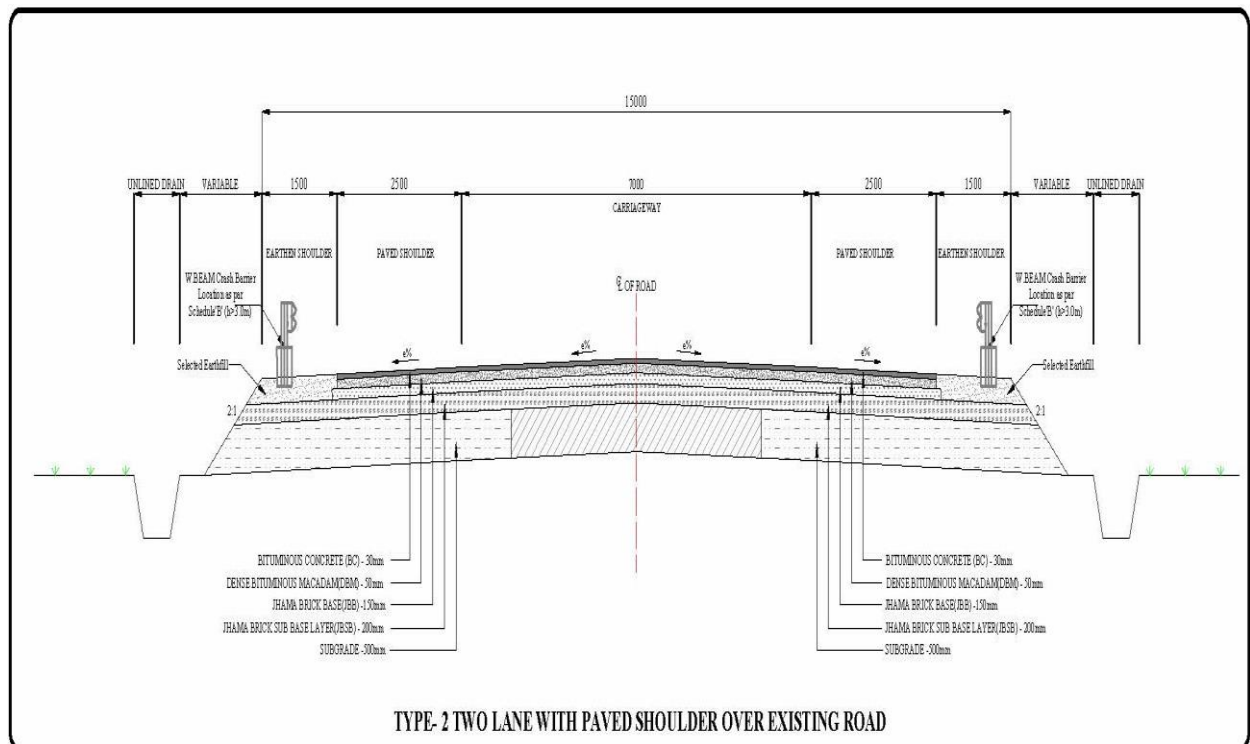
- For Plain areas -** Roadway width of 15.00 ($7.0+2 \times 2.5+2 \times 1.5$) is proposed for sections with 2 lane plus paved shoulders of 2.50m and unpaved shoulder of 1.50m on either side in plain areas and,
- For Built-up areas -** Roadway width of 12.00 ($7.0+2 \times 2.5$) is proposed for sections with 2 lane plus paved shoulders of 2.50m and RCC covered drain of 1m wide on either side of Road way,
- For Hilly areas -** Roadway width of 10.00 ($7.0+2 \times 1.5$) 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 1.50wide and paved shoulder of 2.50m are proposed on either side of the Carriage way

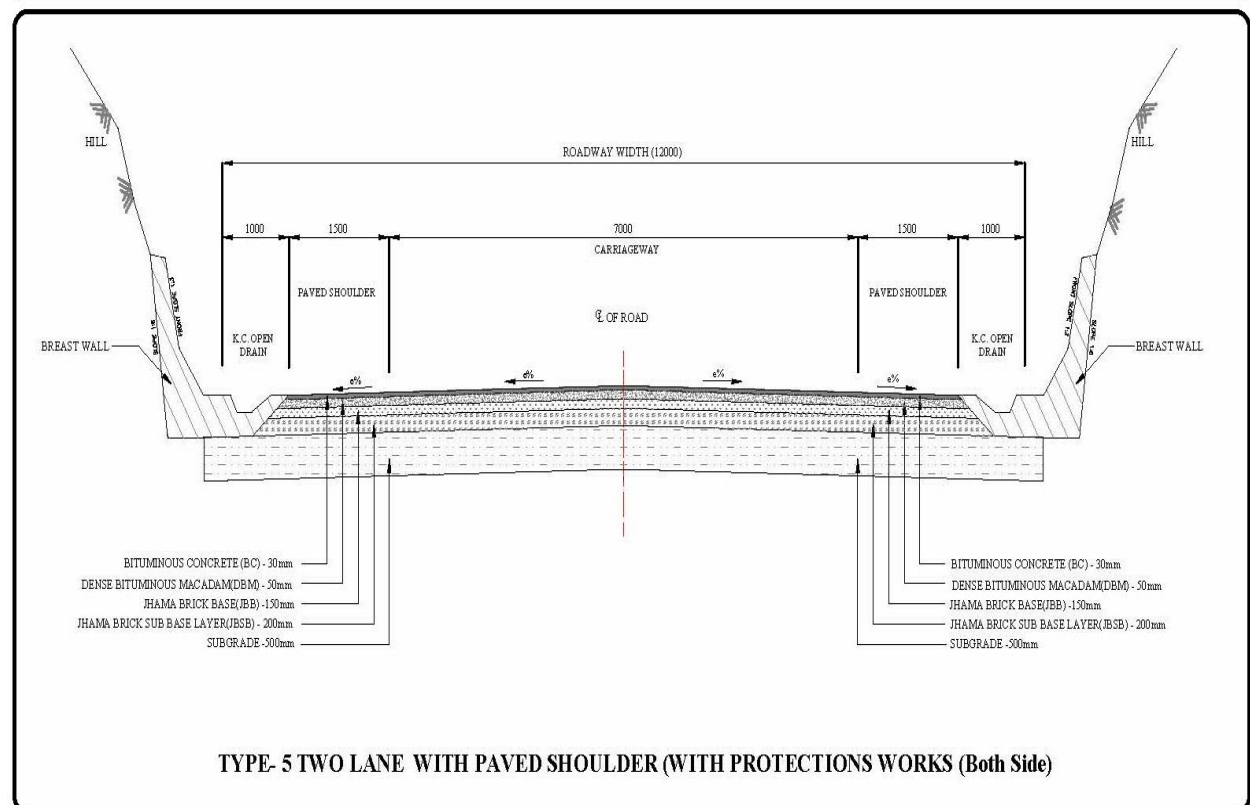
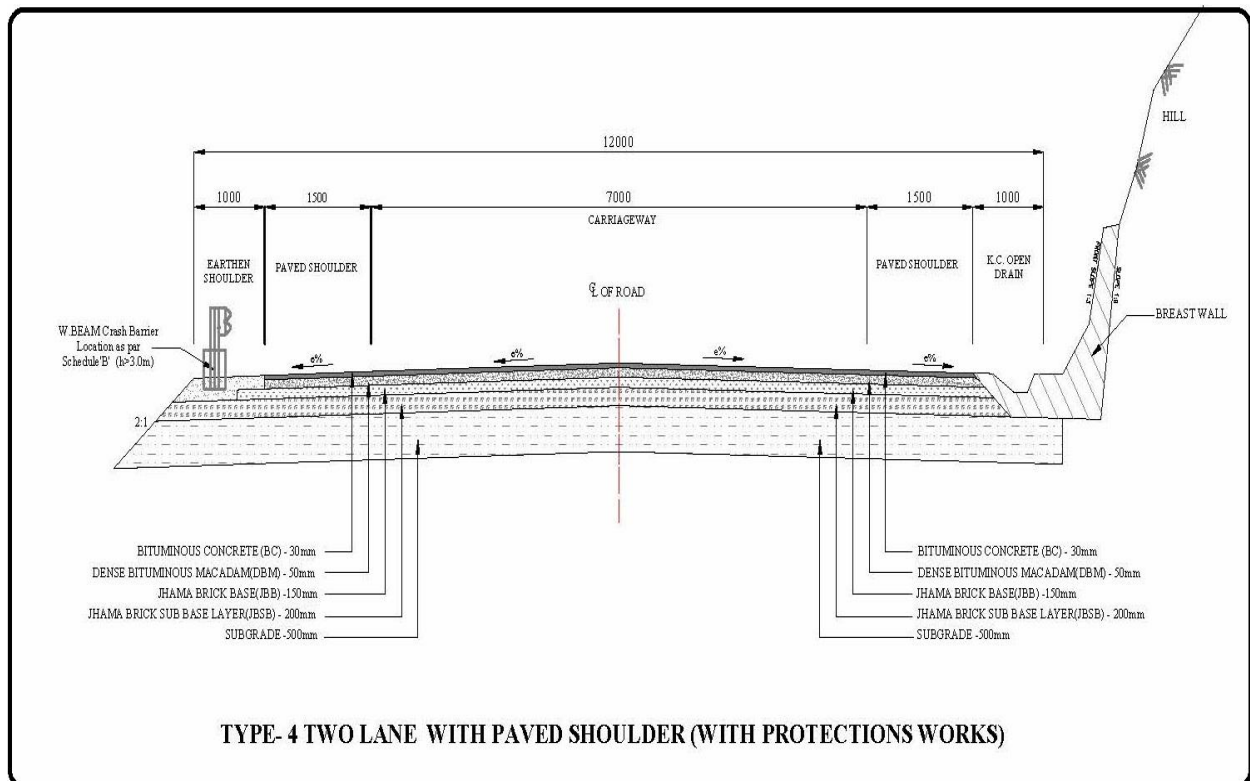
Proposed Typical cross sections (As per Flexible pavement) are shown here –



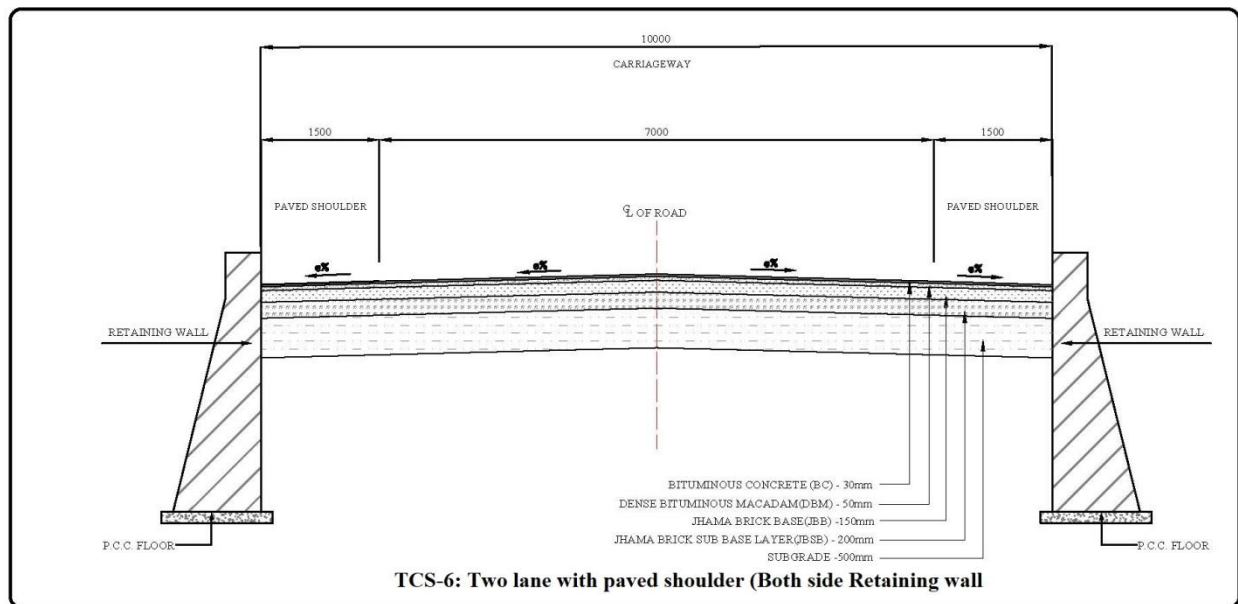
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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**0.12.3 Horizontal & Vertical alignment report of Project road****Horizontal Alignment Report****Table 0. 9 – Horizontal Design Report**

Curve No.	HORIZONTAL CURVE				Terrain	Transition length	Speed (Kmph)	Reason for Deviation
	Start Chainage	End Chainage	Radius	Direction				
1	11+944.153	12+049.804	100	Left	Hilly	20	40	
2	12+534.134	12+603.903	400	Left	Hilly	115	100	
3	13+117.660	13+179.361	800	Right	Plain	60	100	
4	13+577.328	14+088.041	400	Left	Plain	55	80	
5	14+859.284	15+214.760	600	Right	Plain	80	100	
6	17+090.776	17+951.930	1500	Left	Plain	35	100	
7	20+589.324	20+853.623	1800	Right	Plain	30	100	



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.**

Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]

Curve No.	HORIZONTAL CURVE				Terrain	Transition length	Speed	Reason for Deviation
	Start Chainage	End Chainage	Radius	Direction			(Kmph)	
8	21+650.904	21+881.731	1000	Right	Plain	50	100	
9	22+477.865	22+636.423	600	Right	Plain	80	100	
10	24+461.681	25+770.596	1800	Right	Plain	30	100	

Vertical Alignment**Table 0.10 – Vertical Design Report**

PVI	PVI		Curve Length	Gradient		Chainage(m)		Type Of Curve	K Value
No	Design Chainage (m)	Level (m)		IN	OUT	Start of Curve	End of Curve		
1	11+935.978	51.063	125	-0.244	-2.068	11+873.478	11+998.478	Hog	68.548
2	12+223.207	45.124	200	-2.068	0.021	12+123.207	12+323.207	Sag	95.744
3	13+580.000	45.41	300	0.021	0.362	13+430.000	13+730.000	Sag	879.99
4	14+308.355	48.047	400	0.362	0.849	14+108.355	14+508.355	Sag	821.474
5	15+008.667	53.992	475	0.849	-2.047	14+771.167	15+246.167	Hog	164.032
6	15+588.488	42.124	250	-2.047	0.58	15+463.488	15+713.488	Sag	95.18
7	16+041.427	44.75	150	0.58	0	15+966.427	16+116.427	Hog	258.724
8	16+273.925	44.75	125	0	-0.329	16+211.425	16+336.425	Hog	379.408
9	16+564.067	43.794	200	-0.329	1.961	16+464.067	16+664.067	Sag	87.326
10	16+915.044	50.676	200	1.961	-0.065	16+815.044	17+015.044	Hog	98.732
11	16+883.370	50.055	150	1.961	-2.837	16+808.370	16+958.370	Hog	31.261
12	17+137.550	42.843	100	-2.837	-0.75	17+087.550	17+187.550	Sag	47.917
13	17+401.953	40.859	250	-0.75	0.44	17+276.953	17+526.953	Sag	210.003
14	18+080.000	43.843	400	0.44	-1.025	17+880.000	18+280.000	Hog	272.98
15	19+210.000	32.258	350	-1.025	0.881	19+035.000	19+385.000	Sag	183.586
16	20+020.337	39.399	400	0.881	0.029	19+820.337	20+220.337	Hog	469.392
17	21+282.710	39.766	500	0.029	-0.286	21+032.710	21+532.710	Hog	1588.371
18	22+640.003	35.888	300	-0.286	-0.596	22+490.003	22+790.003	Hog	966.591
19	23+756.455	29.233	300	-0.596	-0.163	23+606.455	23+906.455	Sag	692.503
20	24+356.921	28.255	350	-0.163	-0.44	24+181.921	24+531.921	Hog	1261.461



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**0.13 Road Junctions/ Intersections**

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

Table 0.11: Details of the intersections

Sl. No.	Existing Chainage (Km)	Design Chainage (Km)	Type of Junction	Arm	Side	Village Name	Remark
1	15+300	11.87	T	3	RHS	Panisagar	
2	15+650	12.22	Y	3	LHS	Anand D Bazar	
3	15+750	12.32	Y	3	RHS	Panisagar	
4	15+950	12.5	Y	3	LHS	Lakhi pur	
5	16+600	13.15	+	4	BHS	Obisti pur (panchayat)	
6	-	17+200	Y	3	LHS	To Village	New Junction
7	-	17+220	+	4	BHS	To Village	New Junction
8	-	17+320	+	4	BHS	To Village	New Junction
9	-	17+400	T	3	RHS	To Village	New Junction
10	17+440	-	T	3	LHS	Raj Nagar	Realignment
11	17+625	14.12	T	3	RHS	raj nagar	
12	-	17+700	+	4	BHS	To Village	New Junction
13	-	17+990	+	4	BHS	To Village	New Junction
14	-	18+260	+	4	BHS	To Village	New Junction
15	-	18+400	+	4	BHS	To Village	New Junction
16	-	18+500	+	4	BHS	To Village	New Junction
17	18+550	-	Y	3	RHS	raj nagar	Realignment
18	18+700	-	T	3	LHS	Haplong	Realignment
19	-	18+890	+	4	BHS	To Village	New Junction
20	19+300	-	+	4	BHS	Kalika pur	Realignment
21	-	19+410	+	4	BHS	To Village	New



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]

Sl. No.	Existing Chainage (Km)	Design Chainage (Km)	Type of Junction	Arm	Side	Village Name	Remark
							Junction
22	-	19+470	+	4	BHS	To Village	New Junction
23	-	19+880	+	4	BHS	To Village	New Junction
24	-	20+100	+	4	BHS	To Village	New Junction
25	-	20+600	Y	3	BHS	To Village	New Junction
26	20+650	-	T	3	RHS	Radhapur	Realignment
27	21+150	-	T	3	RHS	Flour mill	Realignment
28	21+400	-	Y	3	LHS	Haplong	Realignment
29	21+650	-	T	3	LHS	Haplong	Realignment
30	22+025	-	Y	3	LHS	Haplong bazar	Realignment
31	22+150	-	Y	3	LHS	haplong chera (tea state)	Realignment
32	23+150	-	Y	3	RHS	Dewan pasa	Realignment
33	23+800	-	Y	3	LHS	Gargan tila	Realignment
34	23+850	-	T	3	LHS	Gargan tila	Realignment
35	23+980	-	T	3	LHS	Dewan pasa	Realignment
36	24+200	-	Y	3	LHS	Teen no. Devan pasa	Realignment
37	24+475	-	Y	3	LHS	Betang bari	Realignment
38	-	24+600	+	4	BHS	To Village	New Junction
39	-	25+250	+	4	BHS	To Village	New Junction

All these intersections are proposed to develop at grade only.



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.**

Package II: Kailashahar – Kurti Bridge [SectionI :: Design km 11.800 to 25.250]**0.13.1 Religious Structures**

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

Table 0.12: Details of Religious Structures

Sl. No.	Existing Chainage(Km)	Side	Remarks
1	20+850	LHS	
2	22+700	RHS	
3	24+000	RHS	

0.13.2 School Details

3 Schools exist on the project road and details of schools are presented in **Table below.**

Table 0.13 : Details of Schools

Sl. No.	Existing Chainage (Km)	Side	Name of School	Remarks
1	16+700	LHS	RK Rajnagar JB School	
2	19+250	LHS	Kalikapur JB School	
3	21+500	RHS	Haplong Cherra School	

0.13.3 Pond Details

6 no. of Ponds exist along the project road alignment and details of Ponds are presented in **Table below.**

Sl. No.	Design Chainage	Pond Length (m)	Side	Remarks
1	14+480	30	RHS	
2	15+420	25	LHS	
		25	RHS	
3	17+000	30	LHS	
4	17+120	25	LHS	
		25	RHS	
5	17+370	40	LHS	
6	17+780	25	RHS	
7	18+480	30	LHS	
		30	RHS	



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.**

Package II: Kailashahar – Kurti Bridge [SectionI :: Design km 11.800 to 25.250]

Sl. No.	Design Chainage	Pond Length (m)	Side	Remarks
8	21+510	20	LHS	
9	21+600	25	RHS	
10	25+120	30	LHS	

Table 0.14: Details of Pond**0.14 Railway Track& Proposals**

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

0.15 Submergence Areas:

This is the rolling terrain in maximum length so to avoid the alignment to be submerge, embankment in fill of 1.5m (minimum) is proposed

0.15 Cross Drainage Works**0.15.1 Bridges**

Total 05 minor bridges are falling in this section of Project road.

- ❖ all existing bridges are proposed for retained due to proposal of bypass,
- ❖ 02 new minor bridges are proposed in realignment/bypass sections.

Table 0.15: Proposal of Existing Bridges

Sl. No.	Existing Chainage (Km)	Design Chainage (Km)	No. of Spans	Span Arrangement (Expansion Joint to Expansion Joint) (m)	Clear road way width between Kerbs (m)	Width of Footpath (m)	Proposal	
							Proposal	Remarks
1	19+080	-	1	12.1	5.6	-	Retained Due to Realignment/ Bypass	19+080
2	20+660	-	1	13	5.6	-	Retained Due to Realignment/ Bypass	20+660



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.**

Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]

Sl. No.	Existing Chainage (Km)	Design Chainage (Km)	No. of Spans	Span Arrangement (Expansion Joint to Expansion Joint) (m)	Clear road way width between Kerbs (m)	Width of Footpath (m)	Proposal	
							Proposal	Remarks
3	21+015	-	1	12.7	5.5	-	Retained Due to Realignment/ Bypass	21+015
4	23+970	-	1	9.9	7.8	-	Retained Due to Realignment/ Bypass	23+970
5	24+215	-	2	17.7	11	-	Retained Due to Realignment/ Bypass	24+215

➤ **Additional Bridges Proposal****Table 0.16: Proposal of Additional Bridges**

Sl. No.	Design Chainage (Km)	Proposal			
		Proposal	Type of Structure	Width of Bridges (m)	Span Arrangement (m)
1	15+500	New Bridge	RCC Slab	16	2X25
2	16+550	New Bridge	RCC Slab	16	1X10



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.**

Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**0.15.2 Culverts**

Total **42** culverts are falling in this section of existing Project alignment

- ❖ **38 no. of existing culverts are retained** due to falling on **realignment/bypass** sections.
- ❖ **4 no. of existing culverts are proposed for reconstruction**
- ❖ **36 no. of additional culverts are proposed** as balancing culverts.

Table 0.17 : Proposal of Existing Culverts

Sl. No.	Existing Chainage (Km)	Design Chainage (Km)	Type of Structure (Pipe/Slab /Box /Arch)	Existing Details			Proposals		
				No	Vent Width (m) (Clear)	Carriage way Width (m)	Proposal	Size (m)	Type of Structure
1	15+000	-	PIPE	1	1	6	Retained due to Realignment/Bypasses		
2	15+150	-	PIPE	1	1	5.5	Retained due to Realignment/Bypasses		
3	15+500	12+080	SLAB	1	2	6	Reconstruction	1x2x2	Box culvert
4	15+620	12+200	SLAB	1	2	6.2	Reconstruction	1x2x3	Box culvert
5	15+750	12+330	PIPE	2	1	5.2	Reconstruction	1x2x2	Box culvert
6	16+150	-	PIPE	1	1	5.3	Retained due to Realignment/Bypasses		
7	16+200	-	PIPE	1	1	4.7	Retained due to Realignment/Bypasses		
8	16+380	12+930	PIPE	1	1	5.7	Reconstruction	1x2x2	Box culvert
9	16+550	-	PIPE	1	1	5	Retained due to Realignment/Bypasses		
10	16+850	-	PIPE	1	1	4.8	Retained due to Realignment/Bypasses		
11	17+200	-	SLAB	1	5.6	5.7	Retained due to Realignment/Bypasses		
12	17+400	-	PIPE	1	1	5.2	Retained due to Realignment/Bypasses		
13	17+950	-	PIPE	1	1	5.2	Retained due to Realignment/Bypasses		
14	18+150	-	PIPE	1	1	5.4	Retained due to Realignment/Bypasses		
15	18+300	-	PIPE	1	1	5.4	Retained due to Realignment/Bypasses		
16	18+420	-	PIPE	1	1	5.1	Retained due to Realignment/Bypasses		
17	18+600	-	PIPE	2	1	5	Retained due to Realignment/Bypasses		
18	18+750	-	PIPE	1	1	5.2	Retained due to Realignment/Bypasses		



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.**

Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]

Sl. No.	Existing Chainage (Km)	Design Chainage (Km)	Type of Structure (Pipe/Slab /Box /Arch)	Existing Details			Proposals		
				No	Vent Width (m) (Clear)	Carriage way Width (m)	Proposal	Size (m)	Type of Structure
19	18+950	-	PIPE	1	1	5	Retained due to Realignment/Bypasses		
20	19+450	-	PIPE	1	1	5.3	Retained due to Realignment/Bypasses		
21	19+650	-	PIPE	2	1	4.8	Retained due to Realignment/Bypasses		
22	19+750	-	PIPE	1	1	5.1	Retained due to Realignment/Bypasses		
23	19+900	-	PIPE	1	1	5.4	Retained due to Realignment/Bypasses		
24	20+000	-	PIPE	1	1	5.7	Retained due to Realignment/Bypasses		
25	20+150	-	SLAB	1	0.8	5.2	Retained due to Realignment/Bypasses		
26	20+400	-	PIPE	1	1	5.1	Retained due to Realignment/Bypasses		
27	20+500	-	SLAB	1	0.8	5	Retained due to Realignment/Bypasses		
28	20+800	-	SLAB	1	0.9	5.1	Retained due to Realignment/Bypasses		
29	22+000	-	SLAB	1	5.9	5.3	Retained due to Realignment/Bypasses		
30	22+200	-	PIPE	2	1	5	Retained due to Realignment/Bypasses		
31	23+300	-	PIPE	1	1	5.3	Retained due to Realignment/Bypasses		
32	23+650	-	PIPE	2	1	5.3	Retained due to Realignment/Bypasses		
33	23+850	-	PIPE	2	1	5.7	Retained due to Realignment/Bypasses		
34	24+450	-	PIPE	2	1	5.2	Retained due to Realignment/Bypasses		
35	28+250	-	SLAB	1	1.9	5.4	Retained due to Realignment/Bypasses		
36	28+350	-	SLAB	1	3.2	5.2	Retained due to Realignment/Bypasses		
37	28+750	-	PIPE	1	1	5.6	Retained due to Realignment/Bypasses		
38	28+750	-	SLAB	1	3	5.6	Retained due to Realignment/Bypasses		
39	28+800	-	PIPE	2	1	5.5	Retained due to Realignment/Bypasses		
40	28+900	-	PIPE	2	1	5.6	Retained due to Realignment/Bypasses		
41	29+200	-	PIPE	1	1	5.6	Retained due to Realignment/Bypasses		
42	29+600	-	SLAB	1	3	5.5	Retained due to Realignment/Bypasses		



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**The details of Additional Culverts****Table 0.18 : Proposal of Additional Culverts**

Sl. No.	Design Chainage (Km)	Proposal		Remarks
		Size (m)	Type of Structure	
1	12+170	1x2x3	New Culvert	
2	13+350	1x3x4	New Culvert	
3	13+700	1x2x2	New Culvert	
4	14+040	1x2x2	New Culvert	
5	14+350	1x3x4	New Culvert	
6	14+650	1x2x3	New Culvert	
7	14+920	1x3x4	New Culvert	
8	15+110	1x2x2	New Culvert	
9	15+500	1x3x4	New Culvert	
10	15+880	1x5x4	New Culvert	
11	16+480	1x2x2	New Culvert	
12	16+920	1x2x3	New Culvert	
13	17+610	1x2x2	New Culvert	
14	17+900	1x3x4	New Culvert	
15	18+000	1x2x2	New Culvert	
16	18+420	1x3x4	New Culvert	
17	18+490	1x3x3	New Culvert	
18	18+850	1x3x4	New Culvert	
19	19+120	1x2x2	New Culvert	
20	19+400	1x2x2	New Culvert	
21	19+780	1x2x3	New Culvert	
22	20+160	1x3x4	New Culvert	
23	20+350	1x2x2	New Culvert	
24	20+700	1x2x2	New Culvert	
25	21+220	1x2x2	New Culvert	
26	21+600	1x2x2	New Culvert	
27	22+100	1x3x4	New Culvert	
28	22+380	1x2x3	New Culvert	
29	22+720	1x2x3	New Culvert	



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]

Sl. No.	Design Chainage (Km)	Proposal		Remarks
		Size (m)	Type of Structure	
30	23+080	1x2x2	New Culvert	
31	23+460	1x2x2	New Culvert	
32	23+900	1x2x2	New Culvert	
33	24+020	1x2x2	New Culvert	
34	24+650	1x2x2	New Culvert	
35	24+950	1x2x2	New Culvert	
36	25+160	1x2x2	New Culvert	

0.15.3 Bus Lay Bys

4 Bus bays & shelters are proposed along the Project road, The Locations are –

Table 0.19:- Bus Bays

Sl. No	Design Chainage (Km)	Side	Remarks
1	12.200	LHS	
2	12.500	RHS	
3	16.500	LHS	
4	16.800	RHS	

0.15.3 Truck Lay Bye

No Truck lay bye is proposed in this section of Project road.

0.15.4 Toll Plaza

No Toll plaza is proposed.

0.16 Proposed Bypasses / Realignments

Dharmanagar bypass is proposed in this section of Project road.



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**.

Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**1. Dharmanagar Bypass**

The Project road is passing through a major dense built-up i.e. “Dharamanagar”, a bypass is proposed for this town, Length of this bypass is 14.05 km on LHS, this alignment has been presented in HQ, NHIDCL, New Delhi on 28.05.2018 and has been approved.

8.350 km out of 14.05 km length covers in this section of Project road.

The view Dharmnagar bypass is as shown below –

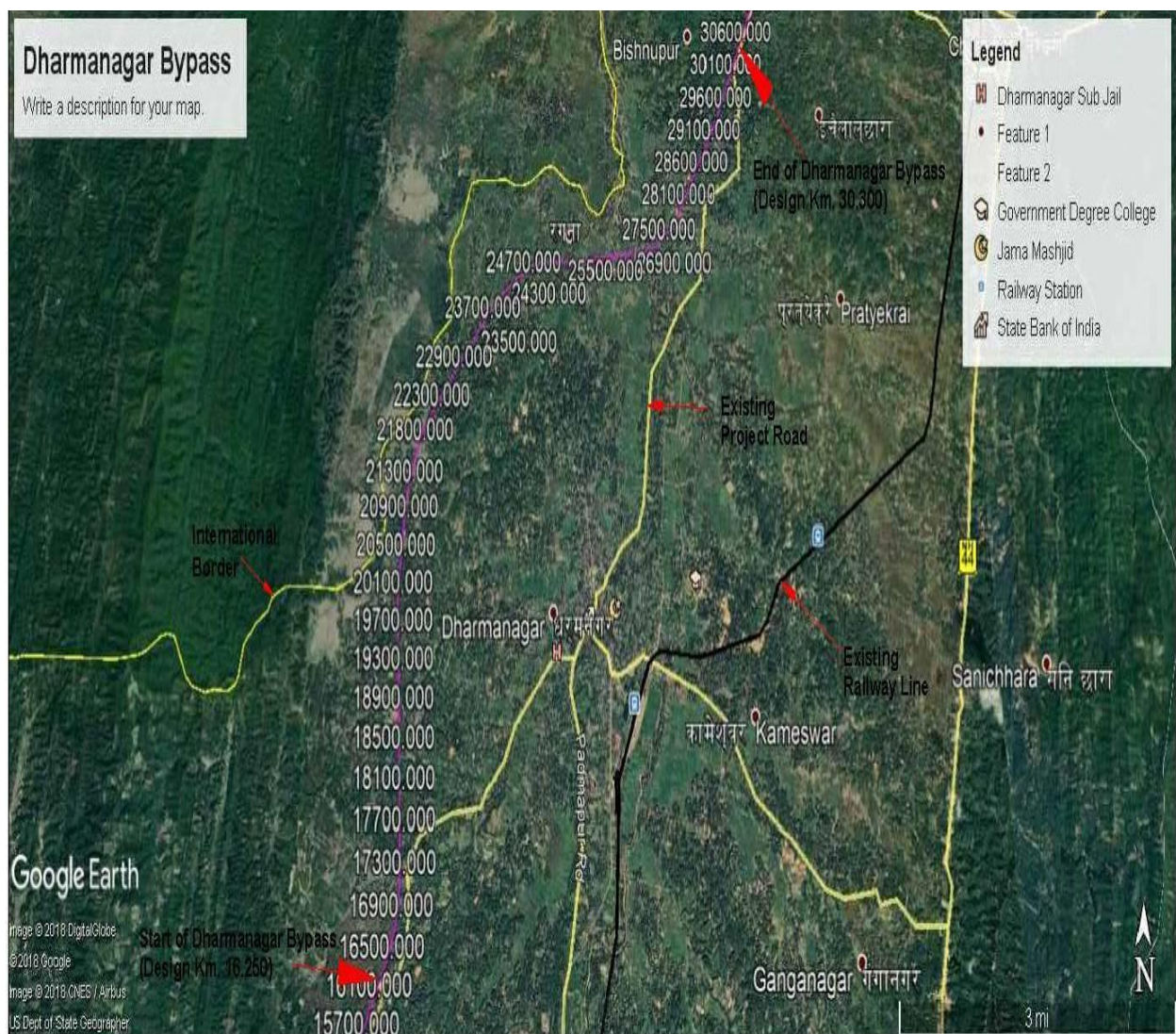


Figure 0.3 : Dharmnagar Bypass



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**.

Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]

2. **Realignments** : some realignments are proposed for improvement of geometry as per IRC standards, the location wise details of realignments are –

Table 0.20 : List of Realignments

Realignment Details							
Sl. No	Existing Chainage (km)			Design Chainage (Km)			Remarks
	From	To	Length	From	To	Length	
8	15.200	15.330	0.430	11.800	11.900	0.100	
9	15.950	20.100	4.15	12.500	16.250	3.75	
	Total..		16.45 Km	Total..		3.850 Km	

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 -

1	Breast Wall 1m height	60	60	120
2	Breast Wall 2m height	1200	1300	2500
3	Breast Wall 3m height	280	280	560
4	Breast Wall 4m height	0	0	0
		1540	1640	3180

The chainage wise details of Breast wall is presented in Vol. 9:: Bill of Quantity

- b) **Retaining Wall-** Retaining wall is proposed in 190m length along the pond side, and valley side in 2880m length the chainage wise details of retaining wall is presented in Vol. 9 :: Bill of Quantity



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**.

Package II: Kailashahar – Kurti Bridge [SectionI :: Design km 11.800 to 25.250]

- c) **W-Beam crash Barrier-** W- Beam crash barrier is proposed in 6420m length (Where height of embankment is more than 3.0m), The chainage wise detail of W-Beam crash barrier is presented in Vol. 9 :: Bill of Quantity
- d) **RCC Drain -** RCC linear drain of 1m wide is provided in 4210m length on both side.
- e) **PCC Drain -** NiL

The Details of above all protection works has been provided in Vol.9:: Bill of Quantity.

0.18 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.

0.19 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.

0.20 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.

0.21 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,



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**0.22 Utilities**

The collection of estimate for relocation of utility shifting from concerned departments is in progress and will be submitted immediate after obtaining it.

0.23 Land Acquisition

The alignment is passing through Plain, rolling & Hilly terrain; the calculation of land acquisition area is approximate 35.614 hectare, the tentative cost of land acquisition has been considered **Rs 48.75 Crs.**

The details of adjacent land of projected road is presented below, the details may change after got confirmation/ joint site visit with revenue/ forest department.

Table 0.21 : Type of Land

Sl. No	Design Chainage (km)		Length (Km)	Type of Land	
	From	To		LHS	RHS
1	11.800	14.300	2.5	Private Land	
2	14.300	16.300	2.0	Forest/ Govt. Land	
3	16.300	17.000	0.7	Govt. Land	Private Land
4	17.000	17.700	0.7	Private Land	
5	17.700	18.100	0.4	Forest/ Govt. Land	
6	18.100	25.250	7.150	Private Land	

0.24 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.



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]**0.25 Cost Estimate**

The details of the cost abstract are presented in **Tables 0.22** below –

Bill No.	Description	Amount (in RS)	Amount (in Crores)	%age of Civil Cost
	Design Length in Km	13.450		
1	Site Clearance and Dismantling	910335.00	0.09	0.09%
2	Earth Work	102180473.00	10.22	10.01%
3	Sub base and Base Course	201157676.00	20.12	19.72%
4	Bituminous Courses	223211612.00	22.32	21.88%
5	Bridges	111342217.00	11.13	10.91%
6	Culverts	135444469.00	13.54	13.27%
7	Drainage and Protection Works	219739303.00	21.97	21.54%
8	Traffic Signs, Marking and Appurtenances	2054435.00	0.21	0.20%
9	Bus Bays	5995495.54	0.60	0.59%
10	Junctions	16801926.05	1.68	1.65%
11	Truck Lay Bye	0.00	0.00	0.00%
12	Miscellaneous Items	1480000.00	0.15	0.15%
A	Civil Cost (sum of 1 to 12)	1020317941.59	102.03	
B	** GST on 'A' @ (Total 12%, 6% as VAT + 6% GST)	6.00%	61219076.50	6.12
C	Civil Cost including GST (A+B)	1081537018.09	108.15	
	Cost per km	80411674.21	8.04	
D	Contingencies charges on 'C' @	2.80%	30283036.51	3.03
E	Sub Total (C + D)....	1111820054.59	111.18	
F	Maintenance for 5 years (0.25%+0.25%+0.5%+0.5%+1%) on 'C'	2.50%	27038425.45	2.70
G	escalation (5% per year for two years) on 'C' @	10.00%	108153701.81	10.82



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Bill No.	Description		Amount (in RS)	Amount (in Crores)	%age of Civil Cost
H	Construction Supervision Charges on 'C' @	3.00%	32446110.54	3.24	
I	Agency (NHIDCL) Charges on 'E' @	3.00%	33354601.64	3.34	
J	Total Project Cost (E to I)		1312812894	131.28	
K	Approx cost of Land Acquisition		487542046.84	48.75	
L	Approx Cost of Utility Shifting		49000000.00	4.90	
M	Total Project Cost (J to M)		1849354941	184.94	

0.26 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.

0.26.1 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.

0.27 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%



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

Table 0.23 - Summary of Sensitive Analysis

Link ID	Design Length (km)	NPV (Million) @ 12%, Base Case	Economic Internal Rate of Return (%)			
			Base Case	Sensitivity S1	Sensitivity S2	Sensitivity S3
ESRR	13.450	2485	42.2%	38.9%	24.7%	16.4%

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

0.27.1 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 2017 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 I ; 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 0.24 for concession period 15 years are as under.

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Table 0.24- Summary of Financial Analysis

Scenario	Pre tax FIRR %	Returns on Equity%	Post tax FIRR%	DSCR
Alternative- I	1.20%	-1.17%	1.08%	0.22
Alternative- II	4.84%	3.02%	4.45%	0.42

0.27.2 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.**



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Centre Line Co-ordinates -

Table 0.25 – Centre Line Co-Ordinates

Chainage	X	Y	Chainage	X	Y
11800	408796.524	2689614.595	12820	409674.310	2689582.545
11820	408803.824	2689595.975	12840	409691.654	2689592.505
11840	408811.124	2689577.355	12860	409708.998	2689602.464
11860	408818.424	2689558.734	12880	409726.342	2689612.424
11880	408825.724	2689540.114	12900	409743.686	2689622.383
11900	408833.024	2689521.494	12920	409761.029	2689632.343
11920	408840.324	2689502.874	12940	409778.373	2689642.302
11940	408847.930	2689484.381	12960	409795.717	2689652.262
11960	408858.066	2689467.177	12980	409813.061	2689662.221
11980	408871.412	2689452.326	13000	409830.405	2689672.181
12000	408887.443	2689440.423	13020	409847.749	2689682.140
12020	408905.519	2689431.942	13040	409865.092	2689692.100
12040	408924.919	2689427.221	13060	409882.436	2689702.059
12060	408944.873	2689426.360	13080	409899.799	2689711.985
12080	408964.842	2689427.468	13100	409917.254	2689721.749
12100	408984.807	2689428.654	13120	409934.878	2689731.203
12120	409004.772	2689429.840	13140	409952.724	2689740.231
12140	409024.737	2689431.026	13160	409970.790	2689748.810
12160	409044.701	2689432.212	13180	409989.065	2689756.934
12180	409064.666	2689433.399	13200	410007.525	2689764.628
12200	409084.631	2689434.585	13220	410026.110	2689772.018
12220	409104.596	2689435.771	13240	410044.753	2689779.257
12240	409124.561	2689436.957	13260	410063.406	2689786.473
12260	409144.525	2689438.143	13280	410082.059	2689793.690
12280	409164.490	2689439.329	13300	410100.712	2689800.906
12300	409184.455	2689440.515	13320	410119.365	2689808.122
12320	409204.420	2689441.701	13340	410138.017	2689815.338
12340	409224.385	2689442.887	13360	410156.670	2689822.554
12360	409244.349	2689444.073	13380	410175.323	2689829.770
12380	409264.314	2689445.259	13400	410193.976	2689836.987
12400	409284.279	2689446.445	13420	410212.629	2689844.203
12420	409304.244	2689447.631	13440	410231.281	2689851.419
12440	409324.207	2689448.850	13460	410249.934	2689858.635
12460	409344.157	2689450.250	13480	410268.587	2689865.851
12480	409364.080	2689452.005	13500	410287.240	2689873.067
12500	409383.949	2689454.285	13520	410305.893	2689880.284
12520	409403.724	2689457.263	13540	410324.530	2689887.539



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Chainage	X	Y	Chainage	X	Y
12540	409423.350	2689461.104	13560	410343.048	2689895.092
12560	409442.762	2689465.911	13580	410361.296	2689903.275
12580	409461.909	2689471.682	13600	410379.130	2689912.324
12600	409480.744	2689478.403	13620	410396.489	2689922.253
12620	409499.225	2689486.043	13640	410413.330	2689933.037
12640	409517.361	2689494.471	13660	410429.611	2689944.649
12660	409535.198	2689503.515	13680	410445.291	2689957.061
12680	409552.798	2689513.014	13700	410460.331	2689970.241
12700	409570.235	2689522.809	13720	410474.694	2689984.156
12720	409587.591	2689532.748	13740	410488.343	2689998.771
12740	409604.935	2689542.707	13760	410501.245	2690014.051
12760	409622.279	2689552.667	13780	410513.367	2690029.956
12780	409639.623	2689562.626	13800	410524.679	2690046.447
12800	409656.966	2689572.586	13820	410535.153	2690063.483
13840	410544.762	2690081.021	14880	410422.713	2691096.744
13860	410553.483	2690099.017	14900	410420.821	2691116.653
13880	410561.293	2690117.427	14920	410419.593	2691136.615
13900	410568.173	2690136.204	14940	410419.031	2691156.606
13920	410574.107	2690155.301	14960	410419.136	2691176.605
13940	410579.078	2690174.671	14980	410419.907	2691196.589
13960	410583.075	2690194.266	15000	410421.344	2691216.536
13980	410586.088	2690214.035	15020	410423.445	2691236.425
14000	410588.109	2690233.931	15040	410426.208	2691256.232
14020	410589.133	2690253.902	15060	410429.629	2691275.937
14040	410589.158	2690273.900	15080	410433.705	2691295.516
14060	410588.183	2690293.874	15100	410438.431	2691314.948
14080	410586.211	2690313.775	15120	410443.802	2691334.213
14100	410583.260	2690333.554	15140	410449.812	2691353.287
14120	410579.540	2690353.204	15160	410456.455	2691372.151
14140	410575.410	2690372.773	15180	410463.722	2691390.783
14160	410571.190	2690392.323	15200	410471.606	2691409.162
14180	410566.970	2690411.873	15220	410480.099	2691427.269
14200	410562.749	2690431.422	15240	410489.141	2691445.107
14220	410558.529	2690450.972	15260	410498.588	2691462.735
14240	410554.309	2690470.521	15280	410508.289	2691480.225
14260	410550.088	2690490.071	15300	410518.098	2691497.654
14280	410545.868	2690509.621	15320	410527.917	2691515.078
14300	410541.647	2690529.170	15340	410537.736	2691532.502
14320	410537.427	2690548.720	15360	410547.555	2691549.926
14340	410533.207	2690568.270	15380	410557.374	2691567.349



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Chainage	X	Y	Chainage	X	Y
14360	410528.986	2690587.819	15400	410567.193	2691584.773
14380	410524.766	2690607.369	15420	410577.011	2691602.197
14400	410520.545	2690626.919	15440	410586.830	2691619.621
14420	410516.325	2690646.468	15460	410596.649	2691637.045
14440	410512.105	2690666.018	15480	410606.468	2691654.468
14460	410507.884	2690685.567	15500	410616.287	2691671.892
14480	410503.664	2690705.117	15520	410626.106	2691689.316
14500	410499.443	2690724.667	15540	410635.925	2691706.740
14520	410495.223	2690744.216	15560	410645.744	2691724.164
14540	410491.002	2690763.766	15580	410655.563	2691741.587
14560	410486.782	2690783.316	15600	410665.382	2691759.011
14580	410482.562	2690802.865	15620	410675.200	2691776.435
14600	410478.341	2690822.415	15640	410685.019	2691793.859
14620	410474.121	2690841.964	15660	410694.838	2691811.283
14640	410469.900	2690861.514	15680	410704.657	2691828.707
14660	410465.680	2690881.064	15700	410714.476	2691846.130
14680	410461.460	2690900.613	15720	410724.295	2691863.554
14700	410457.239	2690920.163	15740	410734.114	2691880.978
14720	410453.019	2690939.713	15760	410743.933	2691898.402
14740	410448.798	2690959.262	15780	410753.752	2691915.826
14760	410444.578	2690978.812	15800	410763.571	2691933.249
14780	410440.358	2690998.362	15820	410773.389	2691950.673
14800	410436.167	2691017.918	15840	410783.208	2691968.097
14820	410432.146	2691037.509	15860	410793.027	2691985.521
14840	410428.458	2691057.166	15880	410802.846	2692002.945
14860	410425.268	2691076.909	15900	410812.665	2692020.368
15920	410822.484	2692037.792	16960	411333.083	2692943.821
15940	410832.303	2692055.216	16980	411342.904	2692961.244
15960	410842.122	2692072.640	17000	411352.725	2692978.666
15980	410851.941	2692090.064	17020	411362.546	2692996.089
16000	410861.759	2692107.488	17040	411372.367	2693013.511
16020	410871.578	2692124.911	17060	411382.188	2693030.934
16040	410881.397	2692142.335	17080	411391.970	2693048.379
16060	410891.216	2692159.759	17100	411401.593	2693065.912
16080	410901.035	2692177.183	17120	411410.984	2693083.569
16100	410910.854	2692194.607	17140	411420.139	2693101.351
16120	410920.673	2692212.030	17160	411429.057	2693119.252
16140	410930.492	2692229.454	17180	411437.735	2693137.271
16160	410940.311	2692246.878	17200	411446.171	2693155.405
16180	410950.130	2692264.302	17220	411454.366	2693173.649



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Chainage	X	Y	Chainage	X	Y
16200	410959.948	2692281.726	17240	411462.316	2693192.000
16220	410969.767	2692299.150	17260	411470.021	2693210.457
16240	410979.586	2692316.573	17280	411477.479	2693229.014
16260	410989.405	2692333.997	17300	411484.689	2693247.669
16280	410999.224	2692351.421	17320	411491.650	2693266.418
16300	411009.043	2692368.845	17340	411498.360	2693285.259
16320	411018.862	2692386.269	17360	411504.819	2693304.187
16340	411028.681	2692403.692	17380	411511.024	2693323.200
16360	411038.500	2692421.116	17400	411516.976	2693342.294
16380	411048.319	2692438.540	17420	411522.672	2693361.465
16400	411058.137	2692455.964	17440	411528.112	2693380.711
16420	411067.956	2692473.388	17460	411533.295	2693400.028
16440	411077.775	2692490.811	17480	411538.220	2693419.412
16460	411087.594	2692508.235	17500	411542.886	2693438.860
16480	411097.413	2692525.659	17520	411547.293	2693458.368
16500	411107.232	2692543.083	17540	411551.439	2693477.933
16520	411117.051	2692560.507	17560	411555.323	2693497.552
16540	411126.870	2692577.931	17580	411558.946	2693517.221
16560	411136.689	2692595.354	17600	411562.306	2693536.937
16580	411146.508	2692612.778	17620	411565.403	2693556.695
16600	411156.326	2692630.202	17640	411568.237	2693576.494
16620	411166.145	2692647.626	17660	411570.806	2693596.328
16640	411175.964	2692665.050	17680	411573.110	2693616.194
16660	411185.783	2692682.473	17700	411575.150	2693636.090
16680	411195.602	2692699.897	17720	411576.924	2693656.011
16700	411205.421	2692717.321	17740	411578.432	2693675.954
16720	411215.240	2692734.745	17760	411579.674	2693695.915
16740	411225.059	2692752.169	17780	411580.650	2693715.891
16760	411234.878	2692769.592	17800	411581.359	2693735.878
16780	411244.696	2692787.016	17820	411581.802	2693755.873
16800	411254.515	2692804.440	17840	411581.978	2693775.872
16820	411264.336	2692821.863	17860	411581.888	2693795.872
16840	411274.157	2692839.285	17880	411581.531	2693815.869
16860	411283.978	2692856.708	17900	411580.907	2693835.859
16880	411293.799	2692874.130	17920	411580.017	2693855.839
16900	411303.620	2692891.553	17940	411578.861	2693875.805
16920	411313.441	2692908.976	17960	411577.440	2693895.755
16940	411323.262	2692926.398	17980	411575.820	2693915.689
18000	411574.140	2693935.618	19040	411486.738	2694971.939
18020	411572.459	2693955.547	19060	411485.058	2694991.868



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Chainage	X	Y	Chainage	X	Y
18040	411570.779	2693975.477	19080	411483.377	2695011.798
18060	411569.098	2693995.406	19100	411481.696	2695031.727
18080	411567.417	2694015.335	19120	411480.015	2695051.656
18100	411565.736	2694035.264	19140	411478.334	2695071.585
18120	411564.055	2694055.194	19160	411476.654	2695091.515
18140	411562.375	2694075.123	19180	411474.973	2695111.444
18160	411560.694	2694095.052	19200	411473.292	2695131.373
18180	411559.013	2694114.981	19220	411471.611	2695151.302
18200	411557.332	2694134.911	19240	411469.930	2695171.232
18220	411555.651	2694154.840	19260	411468.249	2695191.161
18240	411553.971	2694174.769	19280	411466.569	2695211.090
18260	411552.290	2694194.698	19300	411464.888	2695231.019
18280	411550.609	2694214.628	19320	411463.207	2695250.949
18300	411548.928	2694234.557	19340	411461.526	2695270.878
18320	411547.247	2694254.486	19360	411459.845	2695290.807
18340	411545.567	2694274.415	19380	411458.165	2695310.736
18360	411543.886	2694294.345	19400	411456.484	2695330.665
18380	411542.205	2694314.274	19420	411454.803	2695350.595
18400	411540.524	2694334.203	19440	411453.122	2695370.524
18420	411538.843	2694354.132	19460	411451.441	2695390.453
18440	411537.163	2694374.062	19480	411449.761	2695410.382
18460	411535.482	2694393.991	19500	411448.080	2695430.312
18480	411533.801	2694413.920	19520	411446.399	2695450.241
18500	411532.120	2694433.849	19540	411444.718	2695470.170
18520	411530.439	2694453.779	19560	411443.037	2695490.099
18540	411528.758	2694473.708	19580	411441.357	2695510.029
18560	411527.078	2694493.637	19600	411439.676	2695529.958
18580	411525.397	2694513.566	19620	411437.995	2695549.887
18600	411523.716	2694533.496	19640	411436.314	2695569.816
18620	411522.035	2694553.425	19660	411434.633	2695589.746
18640	411520.354	2694573.354	19680	411432.953	2695609.675
18660	411518.674	2694593.283	19700	411431.272	2695629.604
18680	411516.993	2694613.213	19720	411429.591	2695649.533
18700	411515.312	2694633.142	19740	411427.910	2695669.463
18720	411513.631	2694653.071	19760	411426.229	2695689.392
18740	411511.950	2694673.000	19780	411424.549	2695709.321
18760	411510.270	2694692.930	19800	411422.868	2695729.250
18780	411508.589	2694712.859	19820	411421.187	2695749.180
18800	411506.908	2694732.788	19840	411419.506	2695769.109
18820	411505.227	2694752.717	19860	411417.825	2695789.038



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]

Chainage	X	Y	Chainage	X	Y
18840	411503.546	2694772.647	19880	411416.144	2695808.967
18860	411501.866	2694792.576	19900	411414.464	2695828.897
18880	411500.185	2694812.505	19920	411412.783	2695848.826
18900	411498.504	2694832.434	19940	411411.102	2695868.755
18920	411496.823	2694852.364	19960	411409.421	2695888.684
18940	411495.142	2694872.293	19980	411407.740	2695908.614
18960	411493.462	2694892.222	20000	411406.060	2695928.543
18980	411491.781	2694912.151	20020	411404.379	2695948.472
19000	411490.100	2694932.081	20040	411402.698	2695968.401
19020	411488.419	2694952.010	20060	411401.017	2695988.331
20080	411399.336	2696008.260	21120	411377.019	2697045.395
20100	411397.656	2696028.189	21140	411378.605	2697065.332
20120	411395.975	2696048.118	21160	411380.190	2697085.269
20140	411394.294	2696068.048	21180	411381.776	2697105.206
20160	411392.613	2696087.977	21200	411383.361	2697125.143
20180	411390.932	2696107.906	21220	411384.947	2697145.080
20200	411389.252	2696127.835	21240	411386.532	2697165.017
20220	411387.571	2696147.765	21260	411388.118	2697184.954
20240	411385.890	2696167.694	21280	411389.703	2697204.891
20260	411384.209	2696187.623	21300	411391.289	2697224.828
20280	411382.528	2696207.552	21320	411392.875	2697244.765
20300	411380.848	2696227.482	21340	411394.460	2697264.702
20320	411379.167	2696247.411	21360	411396.046	2697284.639
20340	411377.486	2696267.340	21380	411397.631	2697304.576
20360	411375.805	2696287.269	21400	411399.217	2697324.514
20380	411374.124	2696307.199	21420	411400.802	2697344.451
20400	411372.444	2696327.128	21440	411402.388	2697364.388
20420	411370.763	2696347.057	21460	411403.973	2697384.325
20440	411369.082	2696366.986	21480	411405.559	2697404.262
20460	411367.401	2696386.916	21500	411407.144	2697424.199
20480	411365.720	2696406.845	21520	411408.730	2697444.136
20500	411364.040	2696426.774	21540	411410.315	2697464.073
20520	411362.359	2696446.703	21560	411411.901	2697484.010
20540	411360.678	2696466.633	21580	411413.486	2697503.947
20560	411358.997	2696486.562	21600	411415.072	2697523.884
20580	411357.343	2696506.493	21620	411416.681	2697543.819
20600	411355.839	2696526.437	21640	411418.442	2697563.741
20620	411354.553	2696546.395	21660	411420.511	2697583.634
20640	411353.490	2696566.367	21680	411422.974	2697603.481
20660	411352.648	2696586.349	21700	411425.833	2697623.275



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]

Chainage	X	Y	Chainage	X	Y
20680	411352.028	2696606.339	21720	411429.088	2697643.009
20700	411351.631	2696626.335	21740	411432.736	2697662.673
20720	411351.456	2696646.334	21760	411436.777	2697682.260
20740	411351.503	2696666.334	21780	411441.209	2697701.762
20760	411351.772	2696686.332	21800	411446.030	2697721.172
20780	411352.263	2696706.326	21820	411451.239	2697740.482
20800	411352.976	2696726.313	21840	411456.832	2697759.683
20820	411353.912	2696746.291	21860	411462.808	2697778.769
20840	411355.069	2696766.258	21880	411469.165	2697797.732
20860	411356.448	2696786.210	21900	411475.881	2697816.570
20880	411357.993	2696806.150	21920	411482.835	2697835.322
20900	411359.578	2696826.087	21940	411489.879	2697854.041
20920	411361.164	2696846.024	21960	411496.928	2697872.757
20940	411362.749	2696865.961	21980	411503.977	2697891.474
20960	411364.335	2696885.898	22000	411511.026	2697910.191
20980	411365.920	2696905.835	22020	411518.075	2697928.907
21000	411367.506	2696925.772	22040	411525.124	2697947.624
21020	411369.091	2696945.710	22060	411532.173	2697966.340
21040	411370.677	2696965.647	22080	411539.222	2697985.057
21060	411372.263	2696985.584	22100	411546.271	2698003.774
21080	411373.848	2697005.521	22120	411553.320	2698022.490
21100	411375.434	2697025.458	22140	411560.369	2698041.207
22160	411567.418	2698059.924	23200	412150.981	2698901.322
22180	411574.467	2698078.640	23220	412164.727	2698915.849
22200	411581.516	2698097.357	23240	412178.473	2698930.376
22220	411588.565	2698116.073	23260	412192.220	2698944.904
22240	411595.614	2698134.790	23280	412205.966	2698959.431
22260	411602.663	2698153.507	23300	412219.712	2698973.958
22280	411609.712	2698172.223	23320	412233.458	2698988.485
22300	411616.761	2698190.940	23340	412247.205	2699003.012
22320	411623.810	2698209.656	23360	412260.951	2699017.540
22340	411630.859	2698228.373	23380	412274.697	2699032.067
22360	411637.908	2698247.090	23400	412288.443	2699046.594
22380	411644.956	2698265.806	23420	412302.190	2699061.121
22400	411652.005	2698284.523	23440	412315.936	2699075.649
22420	411659.090	2698303.226	23460	412329.682	2699090.176
22440	411666.346	2698321.863	23480	412343.428	2699104.703
22460	411673.928	2698340.370	23500	412357.175	2699119.230
22480	411681.987	2698358.674	23520	412370.921	2699133.758
22500	411690.633	2698376.707	23540	412384.667	2699148.285



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]

Chainage	X	Y	Chainage	X	Y
22520	411699.876	2698394.442	23560	412398.413	2699162.812
22540	411709.704	2698411.860	23580	412412.160	2699177.339
22560	411720.107	2698428.940	23600	412425.906	2699191.866
22580	411731.074	2698445.664	23620	412439.652	2699206.394
22600	411742.592	2698462.013	23640	412453.398	2699220.921
22620	411754.649	2698477.969	23660	412467.145	2699235.448
22640	411767.231	2698493.515	23680	412480.891	2699249.975
22660	411780.289	2698508.662	23700	412494.637	2699264.503
22680	411793.701	2698523.499	23720	412508.383	2699279.030
22700	411807.336	2698538.131	23740	412522.130	2699293.557
22720	411821.071	2698552.668	23760	412535.876	2699308.084
22740	411834.817	2698567.196	23780	412549.622	2699322.612
22760	411848.563	2698581.723	23800	412563.369	2699337.139
22780	411862.309	2698596.250	23820	412577.115	2699351.666
22800	411876.056	2698610.777	23840	412590.861	2699366.193
22820	411889.802	2698625.304	23860	412604.607	2699380.720
22840	411903.548	2698639.832	23880	412618.354	2699395.248
22860	411917.294	2698654.359	23900	412632.100	2699409.775
22880	411931.041	2698668.886	23920	412645.846	2699424.302
22900	411944.787	2698683.413	23940	412659.592	2699438.829
22920	411958.533	2698697.941	23960	412673.339	2699453.357
22940	411972.279	2698712.468	23980	412687.085	2699467.884
22960	411986.026	2698726.995	24000	412700.831	2699482.411
22980	411999.772	2698741.522	24020	412714.577	2699496.938
23000	412013.518	2698756.050	24040	412728.324	2699511.466
23020	412027.265	2698770.577	24060	412742.070	2699525.993
23040	412041.011	2698785.104	24080	412755.816	2699540.520
23060	412054.757	2698799.631	24100	412769.562	2699555.047
23080	412068.503	2698814.158	24120	412783.309	2699569.574
23100	412082.250	2698828.686	24140	412797.055	2699584.102
23120	412095.996	2698843.213	24160	412810.801	2699598.629
23140	412109.742	2698857.740	24180	412824.547	2699613.156
23160	412123.488	2698872.267	24200	412838.294	2699627.683
23180	412137.235	2698886.795	24220	412852.040	2699642.211
24240	412865.786	2699656.738	24760	413241.875	2700014.589
24260	412879.532	2699671.265	24780	413257.996	2700026.426
24280	412893.279	2699685.792	24800	413274.247	2700038.084
24300	412907.025	2699700.320	24820	413290.626	2700049.561
24320	412920.771	2699714.847	24840	413307.132	2700060.854
24340	412934.517	2699729.374	24860	413323.763	2700071.964



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Package II: Kailashahar – Kurti Bridge [Section I :: Design km 11.800 to 25.250]

Chainage	X	Y	Chainage	X	Y
24360	412948.264	2699743.901	24880	413340.516	2700082.888
24380	412962.010	2699758.428	24900	413357.389	2700093.626
24400	412975.756	2699772.956	24920	413374.380	2700104.175
24420	412989.502	2699787.483	24940	413391.488	2700114.535
24440	413003.250	2699802.009	24960	413408.709	2700124.704
24460	413017.046	2699816.489	24980	413426.043	2700134.681
24480	413030.979	2699830.837	25000	413443.486	2700144.465
24500	413045.071	2699845.029	25020	413461.037	2700154.054
24520	413059.319	2699859.064	25040	413478.694	2700163.448
24540	413073.723	2699872.939	25060	413496.454	2700172.645
24560	413088.280	2699886.654	25080	413514.314	2700181.644
24580	413102.988	2699900.206	25100	413532.274	2700190.445
24600	413117.847	2699913.594	25120	413550.331	2700199.045
24620	413132.852	2699926.816	25140	413568.481	2700207.444
24640	413148.004	2699939.870	25160	413586.724	2700215.640
24660	413163.300	2699952.755	25180	413605.057	2700223.634
24680	413178.739	2699965.470	25200	413623.478	2700231.423
24700	413194.317	2699978.012	25220	413641.984	2700239.008
24720	413210.034	2699990.380	25240	413660.573	2700246.386
24740	413225.888	2700002.573	25260	413679.243	2700253.557

