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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 Pvt. Ltd. for preparation of Detailed Project Report of **Teliamura - Sabroom section (NH-208).**

The existing length of project road is 132.882 Km and design length (after geometric improvements) is 107.654 km.

- **This Report describe the details from design km 0.0 to km 18.0 (herein called Package VII)**

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** i.e. Inception Report & Quality Assurance Plan has been submitted,
- **Stage – 2** i.e. Feasibility Report (Draft & Final) has been submitted,
- **Stage – 3** i.e. Detailed Project Report (Draft) has been submitted,

Detailed Project Report (Final) is described as below –

- Main Report
- Annexure to Main Report
- Design Report (Pavement & Bridge)
- 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 reports for **Teliamura-Sabroom 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 (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 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 – Key Professional staff

S. No.	Position	Name
1	Team Leader	**Mr. Babban Ram**
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 Project Alignment Description

- As per contract agreement, the Project alignment starts from Ompi chowmuhani (T-Junction with NH-08 at Teliamura) passes through Twidu, Sonacherra, Amarpur, Nutan Bazar, Karbook, Ailmara, Khedacherri, Ropaichari and ends at Harina (T-Junction with NH-08 near km 132.882). Sabroom is 8.1 km away from Harina junction.
- The Project road runs parallel to International border (India – Bangladesh) in some of its length.
- **The start of project road in first 2.4 km length passes through Teliamura town, a heavy congestion of traffic / buildings exist at this section. To avoid these congestions, a bypass of 1.3 km is proposed for Teliamura town. This bypass starts at NH-08 (at South Pulinpur, 1.24 km from Khowai chowmuhani towards Agartala) and merges at existing km 2+600 of Project road.**
- The existing length of project road is 132.882 km and design length (after geometrical improvement) is 107.654 km.
- Existing lane of Project road is maximum single lane with poor riding quality of PMGSY category.

➢ **This Report describe the details from design km 0.0 to km 18.0 (herein called Package VII)**

- The section VII starts from South Pulinpur NH-08 (NH Km 127.319), (1.4 km from Khowai chowmuhani, Teliamura towards Agartala), passes through Twidu and ends at NH km 145.319) of NH 208.

	NH km	Topo Survey Chainage (km)	Package Design Chainage (km)
Start of Project	127.319	0.000	0.000
End of Project	145.319	22.200	18.000

The Project Road alignment shown in figure below-

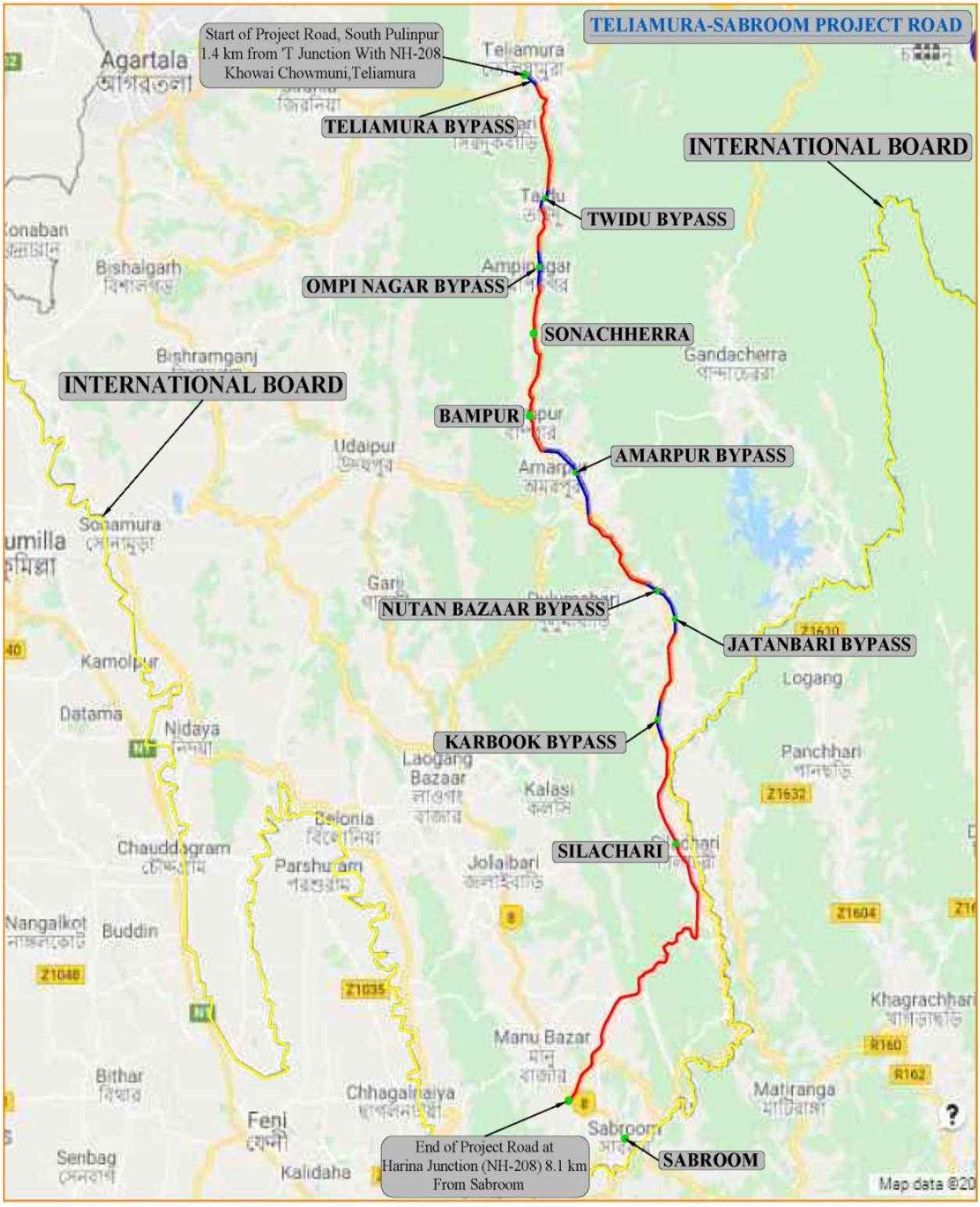


Figure 0.1– Proposed Alignment of Project Road

0.7 Right of Way (ROW)

There is no marking of existing RoW at ground along the Project road, the details of existing RoW is not available with PWD also, however, as per visual inspection and local people enquire, it is found the available land is only 6-15m.

The proposed RoW has been considered 15-45m for entire road stretch and details are presented below:

Table 0.2:- Details of Proposed RoW

Si. No.	Chainage		Length	PROW		Total PROW	Remarks
	From	To		LHS	RHS		
1	0	550	550	22.5	22.5	45	
2	550	900	350	12.5	12.5	25	
3	900	1340	440	22.5	22.5	45	
4	1340	2600	1260	15	15	30	
5	2600	3100	500	10	10	20	
6	3100	4600	1500	15	15	30	
7	4600	4900	300	10	10	20	
8	4900	7320	2420	15	15	30	
9	7320	7440	120	20	20	40	
10	7440	11320	3880	15	15	30	
11	11320	12850	1530	22.5	22.5	45	
12	12850	13500	650	10	10	20	
13	13500	15200	1700	15	15	30	
14	15200	15400	200	22.5	22.5	45	
15	15400	17100	1700	15	15	30	
16	17100	18000	900	22.5	22.5	45	

0.8 Abutting Land Use Pattern

Project road passing maximum in rolling terrain. Approx in 20% of total length, it passes through mountainous terrain also (From km 4+500 to km 12+500, km 13+500 to km 14+700 & km 84+500 to km 96+500).
Built-up and partially built-up are existing along the both side of Project road.

The land use pattern in chart view is shown below –

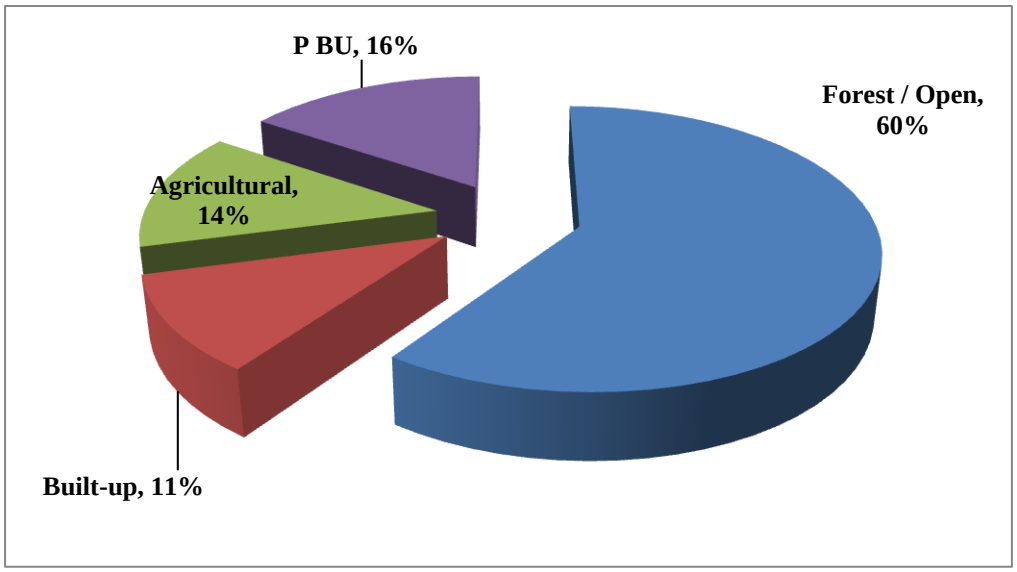


Fig 0.2 Land Use Pattern

Table 0.3 :- Details of Land

Sl. No.	Design Chainage (Km)		Length (Km)	Terrain	Remarks
1	0.00	4.80	4.80	Rolling	
2	4.50	12.50	8.00	Hilly	
3	12.50	13.50	1.00	Rolling	
4	13.50	14.70	1.20	Hilly	
5	14.70	84.50	69.80	Rolling	
6	84.50	96.50	12.00	Hilly	
7	96.50	107.65	11.15	Rolling	

0.9 Terrain

Terrain is plain, rolling and mountainous.

0.10 Carriageway

The carriageway of the Project highway as per data collected at the time of reconnaissance survey is as shown below –

Table 0.4 :-Carriageway Width

Sl. No.	Chainage (km)		Carriage way width (m)	Remarks
	From	To		
1	0+000	5+500	5.5	
2	5+500	42+500	3.5	
3	42+500	58+000	5 – 6	
4	58+000	103+000	3.5 – 4	
5	103+000	132+882	3.5 - 4	

0.11 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 Table0.5.

Table 0.5- Design Parameters

Item	Plain / Rolling / Mountainous 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	Table 2.6
Proposed Land width (ROW)	15-45m (refer table 0.2 of Executive Summary)	
Lane configuration	2-lane with paved shoulders	
Formation width	7.0 m of carriageway + 1.5 m Paved shoulder + 1.0 m earthen shoulder	Refer MoRT&H circular dated 17.07.2020
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

<table>
<tr><th>Item</th><th>Plain / Rolling / Mountainous Terrain</th><th>Reference</th></tr>
<tr><td>Side Slope</td><td>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): 0.5 (H) Cut</td><td></td></tr>
<tr><td>Maximum super-elevation</td><td>7.0 %</td><td></td></tr>
<tr><td>Radii of horizontal curves in plain/hilly terrain (m)</td><td><table><tr><th></th><th>Plain</th><th>Hilly</th></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></td><td>Table 2.5</td></tr>
<tr><td>Drains</td><td>“Rectangular “shape on - either side where warranted depending on Site Condition&U shaped Drain in hill sections.</td><td></td></tr>
</table>

0.12 Survey & Investigation

0.12.1 Traffic Surveys

Traffic surveys have been conducted at three locations.

Table 0.6: Traffic count survey locations

Sl. No.	Homogenous Section	Location	Remarks to Capture
1	Section I :: Km 0 to Km 45.0 (Teliamura – Amarpur section)	Km 42.300(near angamati)	Traffic coming from Agartala, Manu bazar & moving towards Amarpur, Harina, Sabroometc (both ways)
2	Section II :: Km 45.0 to Km 88.00 (Amarpur – Ailmara section)	Km 88.000(near Ailmara)	Traffic coming from Agartala, Manu bazar, Amarpur& moving towards Harina, Sabroom also to Agartala via Harina (both ways)
3	Section III :: Km 88.0 to Km 133.00 (Ailmara – Harina section)	Km 132.800(near Harina)	Traffic coming from Agartala, Manu bazar, Amarpur& moving towards Harina, Sabroom also to Agartala via Harina (both ways) Inclusion of local traffic.

0.12.2 Growth Rate

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

0.12.3 AADT, CVPD & Projected Traffic

Table 0.7- Commercial Vehicle Per day

Sl. No.	Location	AADT	PCU	CVPD	Remarks
1	Km 42.30 (near Rangamati)	1579	1583	302	
2	Km 88.00 (near Ailmara)	246	225	35	
3	Km 132.80 (near Harina)	251	241	45	

Projected traffic on the project road is given below:

Table 0.8- Projected traffic

Year	Likely traffic on the Project road			
	PCU at km 42.30(Near Rangamati)	PCU at km 88.00 (Near Ailmara)	PCU at km 132.80 (Near Harina)	Requirement of
2017	1583	224	241	2 Lane
2020	2162	299	334	
2025	2750	368	423	
2030	3500	451	532	
2035	4457	559	666	
2040	5673	696	854	

As per the projected traffic & MoRT&H circular dated 26th May 2016, requirement for four lane is not qualifying upto year 2040 (For Plain terrain = 10000 PCU per day, for Rolling terrain = 8500 PCU per day & for Mountainous terrain = 6000 PCU per day), However, considering the connectivity of Project road with adjacent towns / NH-08 & development of backward areas/ Religious / Tourist Places, it is proposed to develop the project road as two lane with paved shoulder facility.

0.12.4 Axle load survey

Though CVPD (as per above table) on all three locations are found very less (302, 35 & 45), 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 1.5 for km 88 & 132.800 and value adopted as 3.9 for km 42.300.

0.12.5 Testing of soil from existing embankment

The soil samples from various locations on the existing embankment have been collected and subjected to laboratory testing for determination of various engineering properties. The CBR is found an average of 8%.

Table 0.9: - Existing Pavement Crust

Chainage (Km)	*Position of Pit*	*Pavement Composition*			*Total (mm)*
		Bitumen Layer	*Brick Soling*	*Sub base Course*	
		(mm)	*(mm)*	*(mm)*	
0+000	LHS	40	265	-	305
0+500	RHS	35	205	-	240
1+000	LHS	40	215	-	255
1+500	RHS	50	155	-	205
2+000	LHS	40	210	-	250
2+500	RHS	40	200	-	240
3+000	LHS	50	265	-	315
3+500	RHS	30	245	-	275
4+000	LHS	30	255	-	285
4+500	RHS	45	245	-	290
5+000	LHS	50	210	-	260
5+500	RHS	35	210	-	245
6+000	LHS	45	235	-	280
6+500	RHS	40	210	-	250
7+000	LHS	40	155	-	195
7+500	RHS	30	175	-	205
8+000	LHS	35	180	-	215
8+500	RHS	40	195	-	235
9+000	LHS	35	215	-	250
9+500	RHS	40	275	-	315
10+000	LHS	45	245	-	290
10+500	RHS	40	255	-	295
11+000	LHS	40	150	-	190
11+500	RHS	45	210	-	255
12+000	LHS	50	155	-	205
12+500	RHS	50	175	-	225

Chainage (Km)	*Position of Pit*	*Pavement Composition*			*Total (mm)*
		Bitumen Layer	*Brick Soling*	*Sub base Course*	
		(mm)	*(mm)*	*(mm)*	
13+000	LHS	40	180	-	220
13+500	RHS	50	195	-	245
14+000	LHS	35	215	-	250
14+500	RHS	40	275	-	315
15+000	LHS	35	250	-	285
15+500	RHS	40	245	-	285
16+000	LHS	50	215	-	265
16+500	RHS	40	245	-	285
17+000	LHS	40	260	-	300
17+500	RHS	35	280	-	315
18+000	LHS	35	195	-	230

0.12.6 CBR Test Results of soil samples

ISO 9001:2008 Certified

NORTH EAST SOIL TESTING (NEST)

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

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 :3.of..3....

Location: - Teliamura - Sabroom Section

Sl.No.	Chainage No. (Km)	MDD (g/cc)	OMC (%)	Unsoaked CBR (%)	Soaked CBR (%)	Swelling Index (%)
01	10.00	1.756	15.71	15.43	7.54	3.86
02	20.00	1.878	11.55	18.86	8.14	2.65
03	30.00	1.782	15.26	16.52	7.86	3.79
04	55.00	1.794	14.78	17.47	7.98	3.79
05	65.00	1.802	13.92	18.58	8.04	2.98
06	75.00	1.816	14.11	18.61	8.12	2.78
07	95.00	1.823	13.75	17.94	7.96	2.71
08	105.00	1.787	15.78	16.76	7.89	3.73
09	115.00	1.796	14.74	17.33	7.85	3.81
10	Borrow Area Near Km 44.00	1.778	15.55	17.27	8.43	3.77
11	Borrow Area Near Km 82.00	1.800	13.76	17.78	8.16	3.02

Prepared by
Bhaumik
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.

0.13 Material survey

Aggregate quarry for structure works and road works is identified at Silchar (Assam) which is Approx300km away from Teliamura.

Sand source has been located from Local River with average lead of 20 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 Guwahati depot (For packed bitumen) with lead of approx. 510Km. the rate of bitumen has been provided at Agartala with price of Rs 42000/- per MT + 18% GST, at Teliamura site it will be Rs 41000/- per MT +18% GST (a quotation is shown here)

Swastik Petrochem
Factory: Vill. Bheleuguri,
Samaguri, Nagaon, Assam – 782003
Mob.: +91-98120-39009
e-mail: petro.swastik@gmail.com

Ref:- SP/Q-108/2020-21 Dated: 06.01.2020

To,
M/s.Technocraft Advisory Services Pvt Ltd,
Ghaziabad,

Plant at :-Teliamura Tripura

Sub.: Offer for Sale of Bitumen VG-30 and Bitumen VG-40 (Packed in Drums)

Dear Sir,

This is with reference to your requirement of Bitumen and telephonic conversation had with you. We are pleased to offer our competitive rates for sale of Bitumen VG-30 and Bitumen VG-40 (Packed in Drums) as under:-

Sr. No.	Description	Quantity	Rates (in Rs.)
1	Bitumen VG-30 (Packed in Drums) HS Code : 27132000	1000 M.T. (Approx)	41000/- per M.T. + 18% GST
2	Bitumen VG-40 (Packed in Drums) HS Code : 27132000	1000 M.T. (Approx)	42000/- per M.T. + 18% GST

Note:-

1. These rates are F.O.R at Agartala.
2. Payment 100% advance before dispatch of Material.
3. GST @18% will be charged.
4. This offer is valid for 7 days.

Thanking you,
For Swastik Petrochem

Amit Monga
Mob. No : 80530-52130

0.14 Geotechnical Investigations

Geotechnical investigations have been completed and the results shown in other volume "Material Report".

0.15 Development Proposals

0.15.1 Pavement Design

Pavement design shall be adopted with 8% CBR & 20msa as following –

a) Bituminous concrete (BC) - 40mm,
b) Bituminous stabilized material - 100mm,
c) Cement treated sub base - 200mm &
d) Subgrade - 500mm

0.15.2 Typical Cross Section and Widening Scheme

i) **Roadway width -**

a. **For Plain areas -** Roadway width of 12.00 (7.0+2x1.5+2x1.0) is proposed for sections with 2 lane plus paved shoulders of 1.50m and unpaved shoulder of 1.00m on either side in plain areas and,

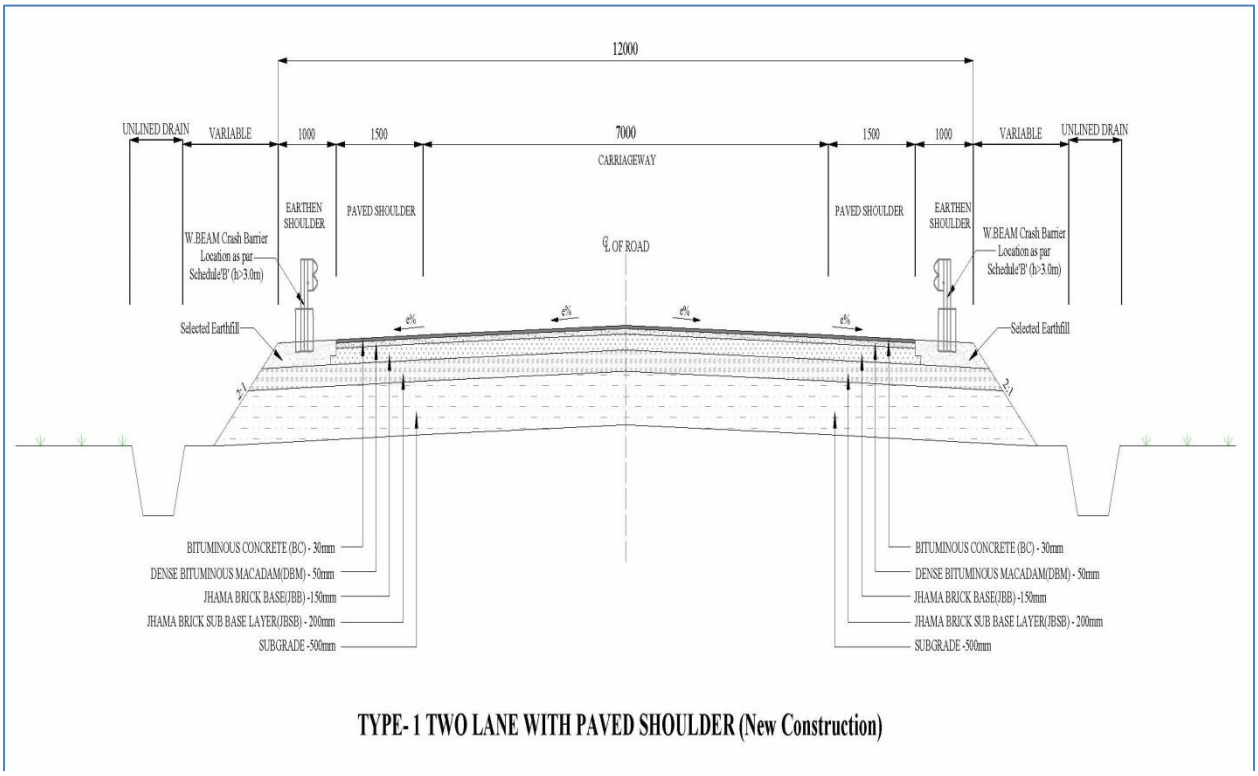
b. **For Built-up areas -** Roadway width of 12.00 (7.0+2x1.5 + 2x1.0 drain) is proposed for sections with 2 lane plus paved shoulders of 1.50m and RCC covered drain of 1m wide on either side of Road way,

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),

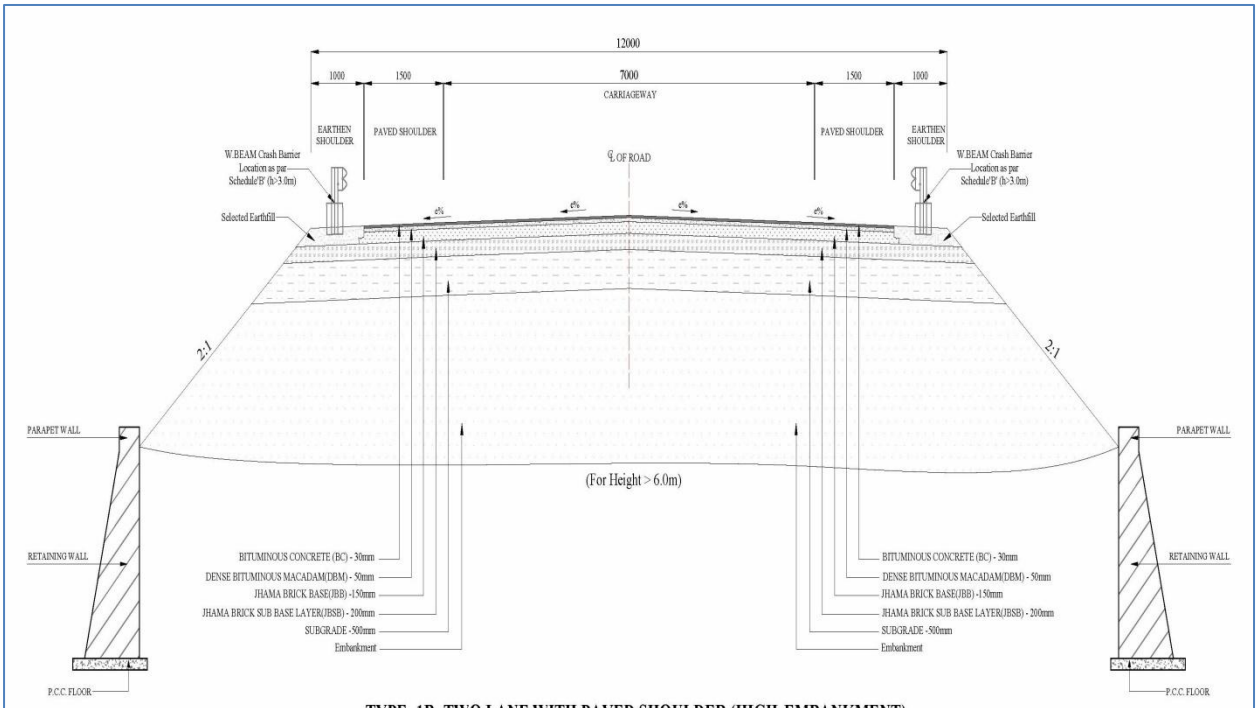
ii) **Carriageway Width -** Two Lane Carriage way (3.5m for each lane) is proposed,

iii) **Shoulders -** Unpaved shoulders of 1.0 wide and paved shoulder of 1.50m are proposed on either side of the Carriage way.

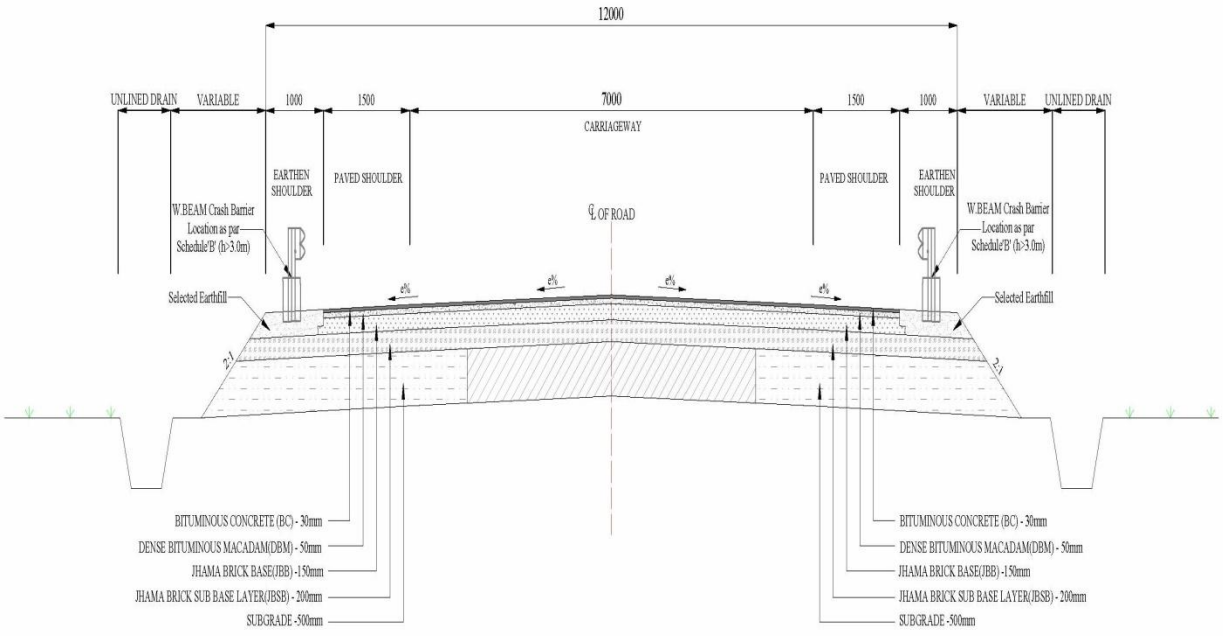
Proposed Typical cross sections are shown here –



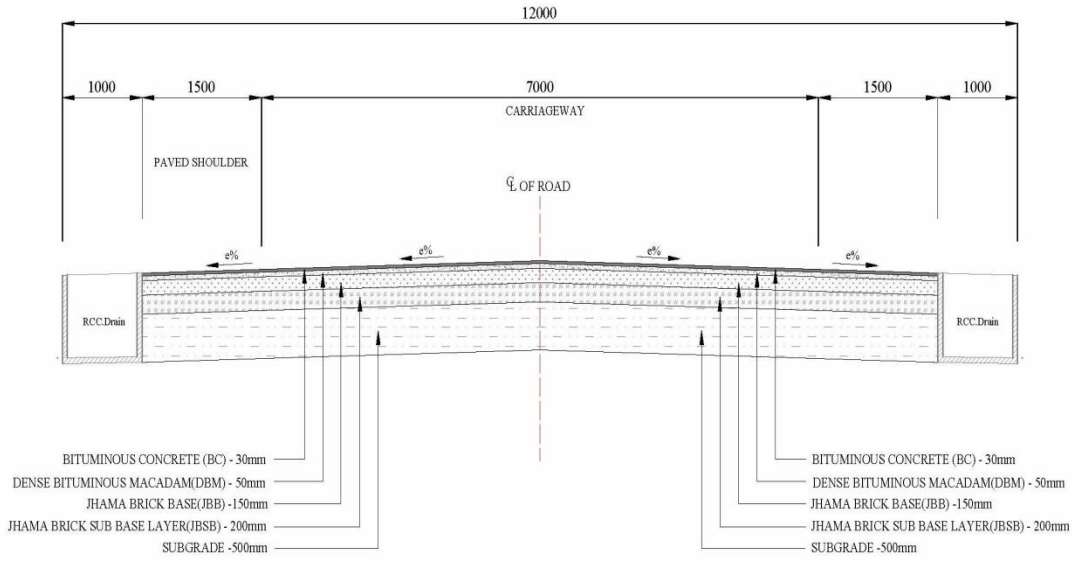
TYPE- 1 TWO LANE WITH PAVED SHOULDER (New Construction)



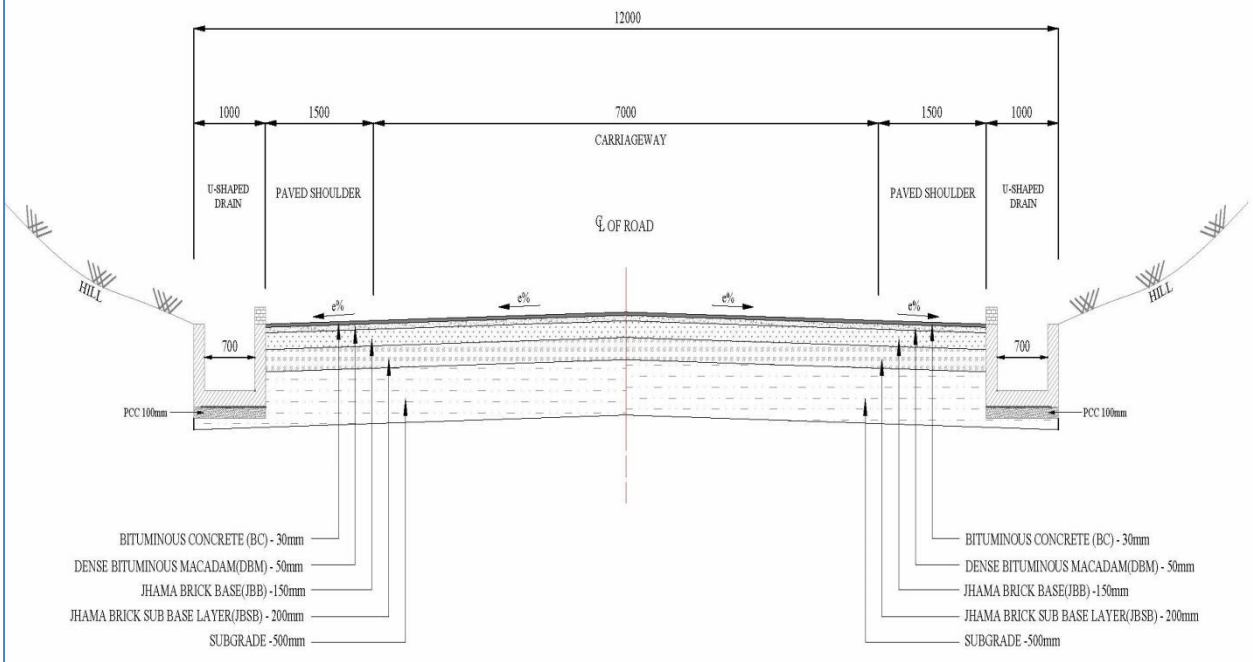
TYPE- 1B -TWO LANE WITH PAVED SHOULDER (HIGH EMBANKMENT)



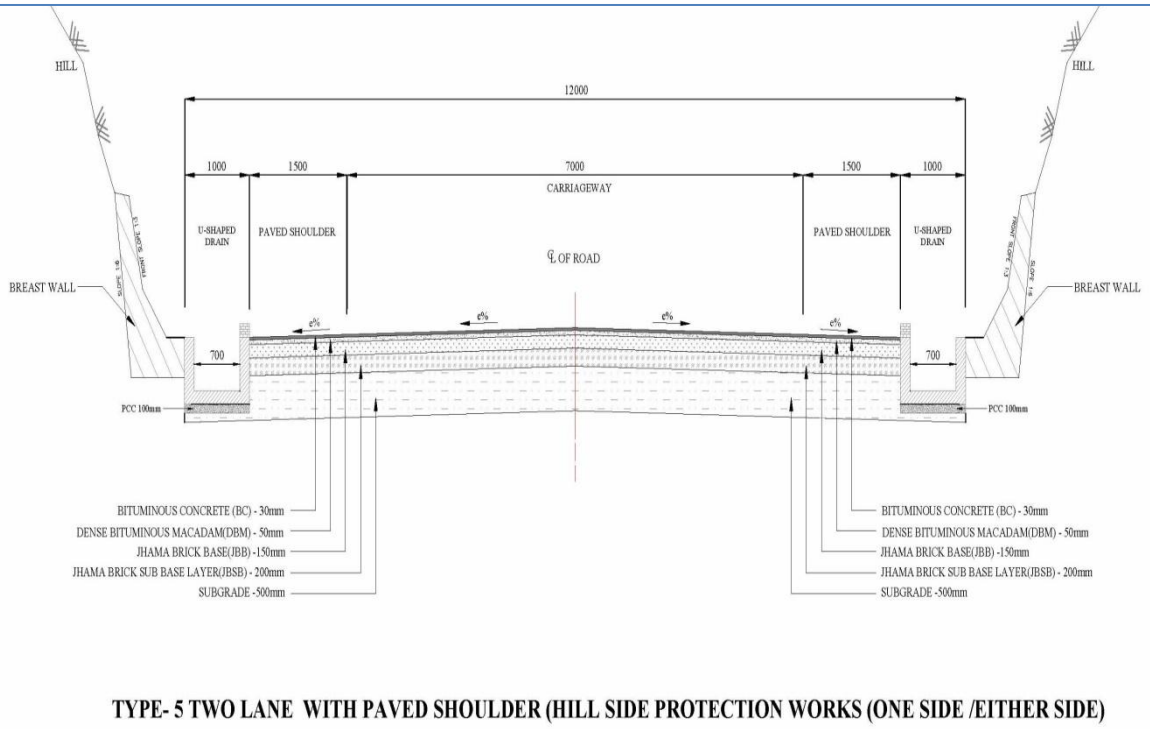
TYPE- 2 TWO LANE WITH PAVED SHOULDER (PARTIALLY EXISTING / NEW ALIGNMENT)



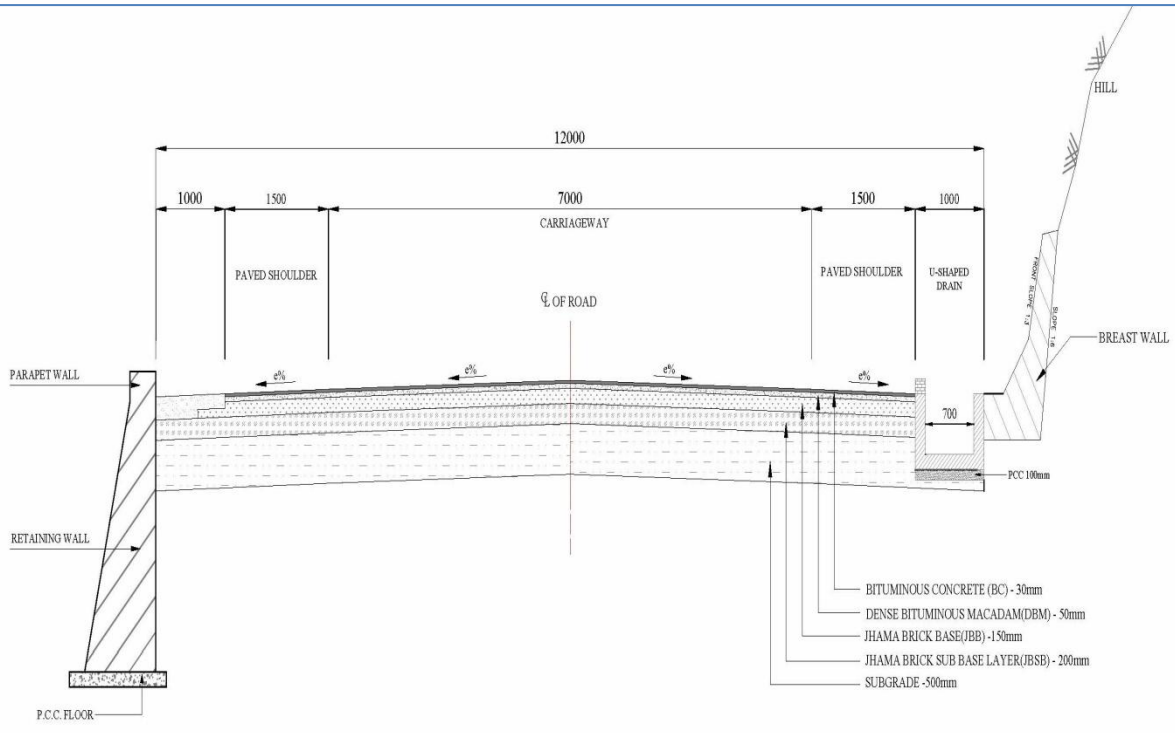
TYPE- 3 TWO LANE WITH PAVED SHOULDER (Built-up Section)



TYPE- 4 TWO LANE WITH PAVED SHOULDER (WITH U-SHAPED DRAIN)



TYPE- 5 TWO LANE WITH PAVED SHOULDER (HILL SIDE PROTECTION WORKS (ONE SIDE /EITHER SIDE)



TYPE- 6 TWO LANE WITH PAVED SHOULDER (B/W & R/W)

0.16 Horizontal Design of Project road

The horizontal alignment design report is tabulated below.

Table 0.10: Horizontal Report

Curve No.	HORIZONTAL CURVE				Terrain	Transition Length (m)	Speed
	Start Chainage (Km)	End Chainage (Km)	Radius	Direction			(Kmph)
1	0+128.086	0+205.912	400	Left	Plain	55	80
2	0+433.205	0+682.957	1200	Right	Plain	40	100
3	1+131.439	1+283.253	600	Right	Plain	80	100
4	1+737.048	1+928.826	1500	Left	Plain	35	100
5	2+476.917	2+574.951	500	Left	Plain	95	100
6	2+824.288	3+054.713	150	Right	Plain	30	50
7	3+162.272	3+395.525	350	Left	Plain	60	80
8	4+011.147	4+104.363	250	Right	Plain	90	80
9	4+294.157	4+350.609	250	Left	Plain	90	80
10	4+657.901	4+781.670	800	Left	Plain	60	100
11	4+872.000	4+906.430	75	Right	Hill	30	40
12	4+970.383	5+062.749	75	Left	Hill	30	40
13	5+108.072	5+188.064	125	Right	Hill	15	40
14	5+608.954	5+641.001	150	Left	Hill	30	50
15	5+799.979	5+864.850	150	Right	Hill	30	50
16	6+156.127	6+305.712	400	Left	Hill	20	50
17	6+571.660	6+628.751	300	Right	Hill	20	65
18	6+759.957	6+769.582	80	Left	Hill	25	40
19	7+194.796	7+252.657	80	Right	Hill	25	40
20	7+359.932	7+460.994	80	Left	Hill	25	40
21	7+581.661	7+711.885	150	Right	Hill	30	50
22	8+232.089	8+296.623	80	Left	Hill	25	40
23	8+393.893	8+491.034	80	Right	Hill	25	40
24	8+665.305	8+732.076	150	Left	Hill	30	50
25	8+826.022	8+850.531	80	Right	Hill	25	40
26	9+000.991	9+008.033	80	Left	Hill	25	40
27	9+157.806	9+203.680	400	Right	Hill	15	50
28	9+326.276	9+383.248	80	Left	Hill	25	40
29	9+434.672	9+527.116	80	Right	Hill	25	40
30	9+822.168	9+891.689	100	Left	Hill	45	50
31	10+017.055	10+115.932	100	Right	Hill	45	50
32	10+233.841	10+420.449	150	Left	Hill	40	65
33	10+560.956	10+640.064	100	Right	Hill	55	65
34	10+812.456	10+897.103	100	Left	Hill	55	65

Curve No.	HORIZONTAL CURVE				Terrain	Transition Length (m)	Speed (Kmph)
	Start Chainage (Km)	End Chainage (Km)	Radius	Direction			
35	11+023.317	11+077.957	80	Right	Hill	25	40
36	11+155.129	11+369.591	400	Left	Hill	10	50
37	11+478.997	11+930.098	400	Right	Plain	55	80
38	12+217.662	12+678.408	500	Left	Plain	45	80
39	13+010.587	13+189.139	300	Left	Plain	75	80
40	13+322.908	13+521.848	400	Right	Plain	55	80
41	13+673.972	13+803.024	300	Left	Hill	20	65
42	13+911.715	13+979.207	100	Right	Hill	55	65
43	14+176.342	14+544.929	350	Left	Hill	30	65
44	14+653.475	14+694.046	100	Right	Hill	55	65
45	15+084.875	15+181.884	400	Right	Plain	55	80
46	15+531.325	15+799.487	400	Left	Plain	55	80
47	16+538.364	16+648.352	1500	Left	Plain	35	100
48	18+656.906	18+927.069	2000	Right	Plain	0	100

Table 0.11: Deviation in Horizontal curves

Curve No.	HORIZONTAL CURVE				Terrain	Transition Length (m)	Speed (Kmph)	Reason of Deviation
	Start Chainage (Km)	End Chainage (Km)	Radius	Direction				
1	2+824.288	3+054.713	150	Right	Plain	30	50	College area

0.17 Vertical Design of Project road

Vertical design report is tabulated below.

Table 0.12: Vertical 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 (km)	End of Curve (km)	Start of Curve (m)	End of Curve (m)		
1	0+500.529	50.583	200	0.367	2.406	0+400.529	0+600.529	50.216	52.989	Sag	98.105
2	1+591.364	76.825	475	2.406	-1.943	1+353.864	1+828.864	71.111	72.209	Hog	109.226
3	2+154.383	65.884	250	-1.943	1.097	2+029.383	2+279.383	68.313	67.256	Sag	82.229
4	4+540.483	92.063	500	1.097	-0.635	4+290.483	4+790.483	89.32	90.475	Hog	288.657

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 (km)	End of Curve (km)	Start of Curve (m)	End of Curve (m)		
5	5+812.726	83.984	300	-0.635	2.846	5+662.726	5+962.726	84.937	88.252	Sag	86.192
6	6+771.396	111.264	500	2.846	-4.351	6+521.396	7+021.396	104.15	100.387	Hog	69.479
7	7+565.569	76.711	250	-4.351	3.842	7+440.569	7+690.569	82.149	81.513	Sag	30.513
8	8+323.279	105.824	250	3.842	-0.357	8+198.279	8+448.279	101.021	105.378	Hog	59.536
9	9+490.000	101.661	300	-0.357	-0.702	9+340.000	9+640.000	102.196	100.608	Hog	869.1
10	10+742.699	92.867	400	-0.702	-1.864	10+542.699	10+942.699	94.271	89.139	Hog	344.231
11	11+420.000	80.242	300	-1.864	-3.76	11+270.000	11+570.000	83.038	74.602	Hog	158.216
12	12+060.000	56.177	300	-3.76	0.351	11+910.000	12+210.000	61.817	56.703	Sag	72.977
13	13+010.208	59.51	400	0.351	3.95	12+810.208	13+210.208	58.808	67.409	Sag	111.139
14	13+885.008	94.063	400	3.95	-1.22	13+685.008	14+085.008	86.163	91.622	Hog	77.365
15	14+928.187	81.331	400	-1.22	-4.754	14+728.187	15+128.187	83.772	71.823	Hog	113.205
16	15+444.836	56.77	300	-4.754	2.266	15+294.836	15+594.836	63.901	60.168	Sag	42.738
17	16+090.240	71.392	200	2.266	0.935	15+990.240	16+190.240	69.126	72.327	Hog	150.281
18	16+900.000	78.961	650	0.935	-3.343	16+575.000	17+225.000	75.923	68.097	Hog	151.959
19	17+678.041	52.953	150	-3.343	-0.334	17+603.041	17+753.041	55.46	52.703	Sag	49.848

0.18 Extra Width on Curves

Details of Extra width area & Road Delineators

Table 0.13: Extra width on curves

Sl. No.	HORIZONTAL CURVE					Terrain	Transition length (m)	Extra width (m)	Surfeace Area		Road Delineators	
	Start Chainage (km)	End Chainage (km)	Length of curve (m)	Radius (m)	Direction				Curve surface	Taper surface	Spacing	Numbers
1	2824.288	3054.713	230.425	150	Right	Plain	30	0.6	138.26	18.00	12	20
2	4011.147	4104.363	93.216	250	Right	Plain	90	0.6	55.93	54.00	20	5
3	4294.157	4350.609	56.452	250	Left	Plain	90	0.6	33.87	54.00	20	3
4	4872.000	4906.43	34.43	75	Right	Hill	30	0.9	30.99	27.00	8	5
5	4970.383	5062.749	92.366	75	Left	Hill	30	0.9	83.13	27.00	8	12
6	5108.072	5188.064	79.992	125	Right	Hill	15	0.6	48.00	9.00	12	7
7	5608.954	5641.001	32.047	150	Left	Hill	30	0.6	19.23	18.00	12	3
8	5799.979	5864.85	64.871	150	Right	Hill	30	0.6	38.92	18.00	12	6
9	6571.660	6628.751	57.091	300	Right	Hill	20	0.6	34.25	12.00	25	3
10	6759.957	6769.582	9.625	80	Left	Hill	25	0.9	8.66	22.50	8	2
11	7194.796	7252.657	57.861	80	Right	Hill	25	0.9	52.07	22.50	8	8
12	7359.932	7460.994	101.062	80	Left	Hill	25	0.9	90.96	22.50	8	13
13	7581.661	7711.885	130.224	150	Right	Hill	30	0.6	78.13	18.00	12	11
14	8232.089	8296.623	64.534	80	Left	Hill	25	0.9	58.08	22.50	8	9
15	8393.893	8491.034	97.141	80	Right	Hill	25	0.9	87.43	22.50	8	13
16	8665.305	8732.076	66.771	150	Left	Hill	30	0.6	40.06	18.00	12	6
17	8826.022	8850.531	24.509	80	Right	Hill	25	0.9	22.06	22.50	8	4
18	9000.991	9008.033	7.042	80	Left	Hill	25	0.9	6.34	22.50	8	1
19	9326.276	9383.248	56.972	80	Left	Hill	25	0.9	51.27	22.50	8	8
20	9434.672	9527.116	92.444	80	Right	Hill	25	0.9	83.20	22.50	8	12
21	9822.168	9891.689	69.521	100	Left	Hill	45	0.9	62.57	40.50	12	6
22	10017.055	10115.932	98.877	100	Right	Hill	45	0.9	88.99	40.50	12	9
23	10233.841	10420.449	186.608	150	Left	Hill	40	0.6	111.96	24.00	12	16
24	10560.956	10640.064	79.108	100	Right	Hill	55	0.9	71.20	49.50	12	7
25	10812.456	10897.103	84.647	100	Left	Hill	55	0.9	76.18	49.50	12	8
26	11023.317	11077.957	54.64	80	Right	Hill	25	0.9	49.18	22.50	8	7
27	13010.587	13189.139	178.552	300	Left	Hill	75	0.6	107.13	45.00	25	8

Details of Extra width area & Road Delineators

Table 0.13: Extra width on curves

Sl. No.	HORIZONTAL CURVE					Terrain	Transition length (m)	Extra width (m)	Surfeace Area		Road Delineators	
	Start Chainage (km)	End Chainage (km)	Length of curve (m)	Radius (m)	Direction				Curve surface	Taper surface	Spacing	Numbers
28	13673.972	13803.024	129.052	300	Left	Plain	20	0.6	77.43	12.00	25	6
29	13911.715	13979.207	67.492	100	Right	Hill	55	0.9	60.74	49.50	12	6
30	14653.475	14694.046	40.571	100	Right	Hill	55	0.9	36.51	49.50	12	4
									1802.73	858		**228**
									2660.73			

0.19 Sight Distance

Table 0.14: Sight Distance

PVI No.	PVI Design Chainage (km)	PVI Level (m)	Curve Length	Type of Curve	K Value	Safe stopping Sight Distance	Speed
1	501	50.583	200	Sag	98.105		
2	1550	76.825	600	Hog	137.969	246.304	
3	2154	65.884	250	Sag	82.229		
4	4540	92.063	500	Hog	288.657	356.264	
5	5813	83.984	300	Sag	86.192		
6	6771	111.264	500	Hog	69.479	174.787	
7	7566	76.711	250	Sag	30.513		
8	8323	105.824	250	Hog	59.536	161.797	
9	9490	101.661	300	Hog	869.1	786.914	
10	10743	92.867	400	Hog	344.231	389.05	
11	11420	80.242	300	Hog	158.216	263.758	
12	12060	56.177	300	Sag	73.306		
13	13204	59.977	400	Sag	85.642		
14	13885	94.063	400	Hog	64.274	168.112	
15	14928	81.331	400	Hog	113.205	223.108	
16	15445	56.77	300	Sag	42.738		
17	16090	71.392	300	Hog	150.281	257.06	
18	16957	74.021	500	Hog	118.718	228.476	
19	17641	47.279	200	Sag	45.041		
20	18270	50.627	250	Hog	268.314	360.959	

0.20 Road Junctions/ Intersections

The detail of major junction are as follows:

Sl. No.	Location (Km)		At grade	Separated	Category of Cross Road			
	From	To			NH	SH	MDR	Others
1	0.000		At Grade		08			

Table 0.15: minor intersection

Sl. No.	Design Chainage (Km)	Side	Type of Junction
1	0+575	BHS	Minor Junction
2	0+760	BHS	Minor Junction
3	0+870	BHS	Minor Junction
4	1+310	LHS	Minor Junction
5	1+580	LHS	Minor Junction
6	1+640	RHS	Minor Junction
7	1+900	LHS	Minor Junction
8	2+850	LHS	Minor Junction
9	3+000	BHS	Minor Junction
10	3+400	LHS	Minor Junction
11	3+840	LHS	Minor Junction
12	3+840	RHS	Minor Junction
13	4+300	RHS	Minor Junction
14	4+980	RHS	Minor Junction
15	6+350	RHS	Minor Junction
16	6+920	RHS	Minor Junction
17	7+430	LHS	Minor Junction
18	7+600	LHS	Minor Junction
19	11+480	BHS	Minor Junction
20	12+150	BHS	Minor Junction
21	12+425	BHS	Minor Junction
22	12+650	RHS	Minor Junction
23	12+830	LHS	Minor Junction
24	13+050	LHS	Minor Junction
25	13+110	RHS	Minor Junction
26	14+100	RHS	Minor Junction

Sl. No.	Design Chainage (Km)	Side	Type of Junction
27	14+750	LHS	Minor Junction
28	14+980	LHS	Minor Junction
29	15+250	LHS	Minor Junction
30	15+600	RHS	Minor Junction
31	15+850	RHS	Minor Junction
32	17+100	RHS	Minor Junction
33	17+600	BHS	Minor Junction

0.21 Railway Track& Proposals

No any Railway track exists on this Project road.

0.22 Cross Drainage Works

0.22.1 Bridges

- **01 bridges** exist on project alignment.
- 2 additional new bridges are proposed on the realignment and bypass.

Details of existing bridges & the proposal of new bridges are tabulated below –

Table 0.16: Major Bridge (Existing)

Sl. No.	Survey Chainage (km)	Type of Structure			No. of Spans with span length (m)	Width (m)
		Foundation	Sub-Structure	Super structure		
Nil						

Table 0.17: Major Bridge (Re-construction)

Sl. No.	Chainage	Type of Structure	No. of Spans	Width

	(km)	Foundation	Sub-Structure	Super structure	with span length (m)	(m)
Nil						

Table 0.18: Major Bridge (New-construction)

Sl. No.	Chainage (km)	Type of Structure			No. of Spans with span length (m)	Width (m)
		Foundation	Sub-Structure	Super structure		
Nil						

Table 0.19: Minor Bridge (Existing)

Sl. No.	Survey Chainage (km)	Type of Structure			No. of Spans with span length (m)	Width (m)
		Foundation	Sub-Structure	Super structure		
1	15+650	CONCRETE BRIDGE			20.5+19.0 = 39.5	7.5

Table 0.20: Proposal of Minor Bridges (Re-construction)

Sl. No.	Chainage (km)	Type of Structure			No. of Spans with span length (m)	Width (m)
		Foundation	Sub-Structure	Super structure		
Nil						

Table 0.21: Proposal of Minor Bridges (New Construction)

Sl. No.	Chainage (km)	Type of Structure			No. of Spans with span length (m)	Width (m)
		Foundation	Sub-Structure	Super structure		
1	12+915	PSC Girder			2x25	18m
2	17+900	PSC Girder			1x25	18m

Tapper width @ 1:15m shall be adopted to match the road width with CD structure width.

0.22.2 Culverts

Total 26 culverts exist on Project alignment in which -

- 7 culverts are proposed for reconstruction.
- 19 culverts are retained due to proposal of realignments/bypasses.
- 47 new culverts are proposed in entire length as balancing culverts.

Table 0.22 – Proposal of Existing Culverts

Existing Detail						New Proposal			
Sl. No.	Existing Chainage (Km)	Type of Structure (Pipe/Slab /Box /Arch)	Span Arrangement		C'way Width (m)	Design Chainage (Km)	Proposal	Type	Size(m)
			No	Vent Width (m) (Clear)					
1	0+400	SLAB	1	1.1	5.8	-	Retained due to Realignment/Bypass		
2	0+450	SLAB	1	1.1	5.8	-	Retained due to Realignment/Bypass		
3	0+500	SLAB	1	1.0	5.7	-	Retained due to Realignment/Bypass		
4	0+800	SLAB	1	0.9	6.7	-	Retained due to Realignment/Bypass		
5	0+900	SLAB	1	0.9	5.0	-	Retained due to Realignment/Bypass		
6	1+100	SLAB	1	1.2	4.9	-	Retained due to Realignment/Bypass		
7	1+250	SLAB	1	2.0	6.4	-	Retained due to Realignment/Bypass		
8	1+400	SLAB	1	2.0	5.8	-	Retained due to Realignment/Bypass		
9	1+700	SLAB	1	3.5	7.1	-	Retained due to Realignment/Bypass		
10	1+950	SLAB	1	1.5	5.5	-	Retained due to Realignment/Bypass		
11	2+000	SLAB	1	1.5	5.5	-	Retained due to Realignment/Bypass		
12	3+500	SLAB	1	0.9	5.2	2+150	Reconstruction	Pipe Culvert	1x1.2m
13	7+450	SLAB	1	1.5	4.2	5+830	Reconstruction	Pipe Culvert	1x1.2m
14	7+750	SLAB	1	1.5	4.2	-	Retained due to Realignment/Bypass		
15	9+250	SLAB	1	1.4	4.1	7+425	Reconstruction	Pipe Culvert	1x1.2m
16	9+550	SLAB	1	1.4	4.1	-	Retained due to Realignment/Bypass		
17	9+600	SLAB	1	1.4	4.0	-	Retained due to Realignment/Bypass		
18	9+750	PIPE	1	1.0	4.3	7+880	Reconstruction	Box Culvert	1x2x2m
19	10+000	PIPE	1	1.0	4.0	-	Retained due to Realignment/Bypass		
20	10+100	PIPE	1	1.0	4.0	-	Retained due to Realignment/Bypass		
21	10+500	SLAB	1	1.0	5.1	8+490	Reconstruction	Box	1x5x4m

Existing Detail						New Proposal			
Sl. No.	Existing Chainage (Km)	Type of Structure (Pipe/Slab /Box /Arch)	Span Arrangement		C'way Width (m)	Design Chainage (Km)	Proposal	Type	Size(m)
			No	Vent Width (m) (Clear)					
								Culvert	
22	12+600	PIPE	1	1.0	4.1	10+475	Reconstruction	Pipe Culvert	1x1.2m
23	13+150	PIPE	1	1.0	4.1	10+930	Reconstruction	Box Culvert	1x2x2m
24	14+490	SLAB	1	1.3	3.7	-	Retained due to Realignment/Bypass		
25	14+750	SLAB	1	1.3	3.7	-	Retained due to Realignment/Bypass		
26	15+100	SLAB	1	0.7	4.2	-	Retained due to Realignment/Bypass		

Culverts (Reconstruction)

Table 0.23 – Proposal of Existing Culverts (Reconstruction)
Details have been shown in table 0.22

Additional Culverts

Table 0.24 – Proposal of additional culverts

Sl. No.	Design Chainage (Km)	Type of Culvert	Span / Opening with span length (m)	Width (m)
1	0+150	Box Culvert	1x2x3	12m
2	0+550	Box Culvert	1x4x3	12m
3	0+785	Box Culvert	1x2x2	12m
4	1+200	Box Culvert	1x2x2	12m
5	1+540	Box Culvert	1x2x2	12m
6	1+850	Box Culvert	1x2x2	12m
7	2+500	Box Culvert	1x2x2	12m
8	2+835	Box Culvert	1x2x3	12m
9	3+170	Pipe Culvert	1x1.2	20m
10	3+570	Box Culvert	1x2x2	12m

Sl. No.	Design Chainage (Km)	Type of Culvert	Span / Opening with span length (m)	Width (m)
11	3+850	Box Culvert	1x2x2	12m
12	4+200	Box Culvert	1x2x2	12m
13	4+550	Box Culvert	1x2x2	12m
14	4+900	Box Culvert	1x2x2	12m
15	5+150	Box Culvert	1x2x2	12m
16	5+500	Box Culvert	1x2x2	12m
17	6+120	Pipe Culvert	1x1.2	20m
18	6+500	Box Culvert	1x2x2	12m
19	6+850	Pipe Culvert	1x1.2	22.5m
20	7+710	Pipe Culvert	1x1.2	27.5m
21	8+100	Pipe Culvert	1x1.2	30m
22	8+780	Box Culvert	1x2x2	12m
23	9+100	Pipe Culvert	1x1.2	20m
24	9+500	Box Culvert	1x2x2	12m
25	9+800	Box Culvert	1x2x2	12m
26	10+100	Box Culvert	1x2x2	12m
27	10+700	Pipe Culvert	1x1.2	20m
28	11+410	Pipe Culvert	1x1.2	22.5m
29	11+750	Box Culvert	1x2x2	12m
30	12+110	Box Culvert	1x2x2	12m
31	12+525	Pipe Culvert	1x1.2	27.5m
32	12+690	Box Culvert	1x5x4	12m
33	13+130	Box Culvert	1x2x2	12m
34	13+440	Box Culvert	1x2x2	12m
35	13+740	Box Culvert	1x2x2	12m
36	14+040	Box Culvert	1x2x2	12m
37	14+390	Box Culvert	1x2x2	12m
38	14+690	Box Culvert	1x2x2	12m
39	15+040	Box Culvert	1x2x2	12m
40	15+190	Pipe Culvert	1x1.2	27.5m
41	15+650	Box Culvert	1x2x2	12m
42	15+970	Box Culvert	1x2x2	12m
43	16+290	Box Culvert	1x2x3	12m
44	16+590	Box Culvert	1x2x2	12m
45	16+850	Box Culvert	1x2x2	12m
46	17+390	Box Culvert	1x2x2	12m
47	17+790	Box Culvert	1x5x4	12m

0.23 Bus Lay Byes

4 Bus bays are proposed on both side of Project road.
The locations are–

Table 0.25- Proposed Bus Bays

Sl. No.	Design Chainage (Km)		Remarks
	LHS	RHS	
1	1.430	1.020	
2	17.200	16.965	

0.24 Truck Lay Bye

- No Truck lay bye exist & proposed along the Project road,

Table 0.26- Proposed Truck Lay Bye

Sl. No.	Proposed Chainage (Km)	Side
Nil		

0.25 Religious Structures

1 religious structures exist along the project road and their details are presented in table below-

Table 0.27: Religious Structures

Sl. No.	Design Chainage (km)	Existing Chainage (km)	Side	Type	Remarks
1	2+720	4+100	LHS	Temple	Refer Existing Chainage

0.26 School Details

1 School exist along the project road and details are presented in table below:

Table 0.28: School Details

Sl. No.	Design Chainage (km)	Existing Chainage (km)	Side	Type	Remarks
1	3+200	4+550	RHS	School	Refer Existing Chainage

0.26 Pond Location

15 ponds exist along the project road and details are presented in table below:

Table 0.29: Pond Locations

Sl. No.	Design Chainage (Km)	Side	Remarks
1	0+050	LHS	
2	0+150	RHS	
3	0+200	LHS	
4	0+670	BHS	
5	0+760	BHS	
6	11+850	BHS	
7	11+900	RHS	
8	12+220	LHS	
9	12+370	BHS	
10	12+650	LHS	
11	12+750	BHS	
12	15+300	LHS	
13	15+360	BHS	
14	17+500	BHS	
15	17+750	LHS	

Retaining wall with sad filling is proposed on above locations to protect seepage in embankment.

0.27 Toll Plaza

No toll plaza is exist and proposed.

0.28 Submergence Details

The existing road found submergence at some locations, although realignments are proposed in maximum length for betterment of its geometry and a minimum height of 2.5m is considered of embankment to keep away from submergence.

0.29 Proposed Bypasses& Realignments

0.29.1 Bypasses

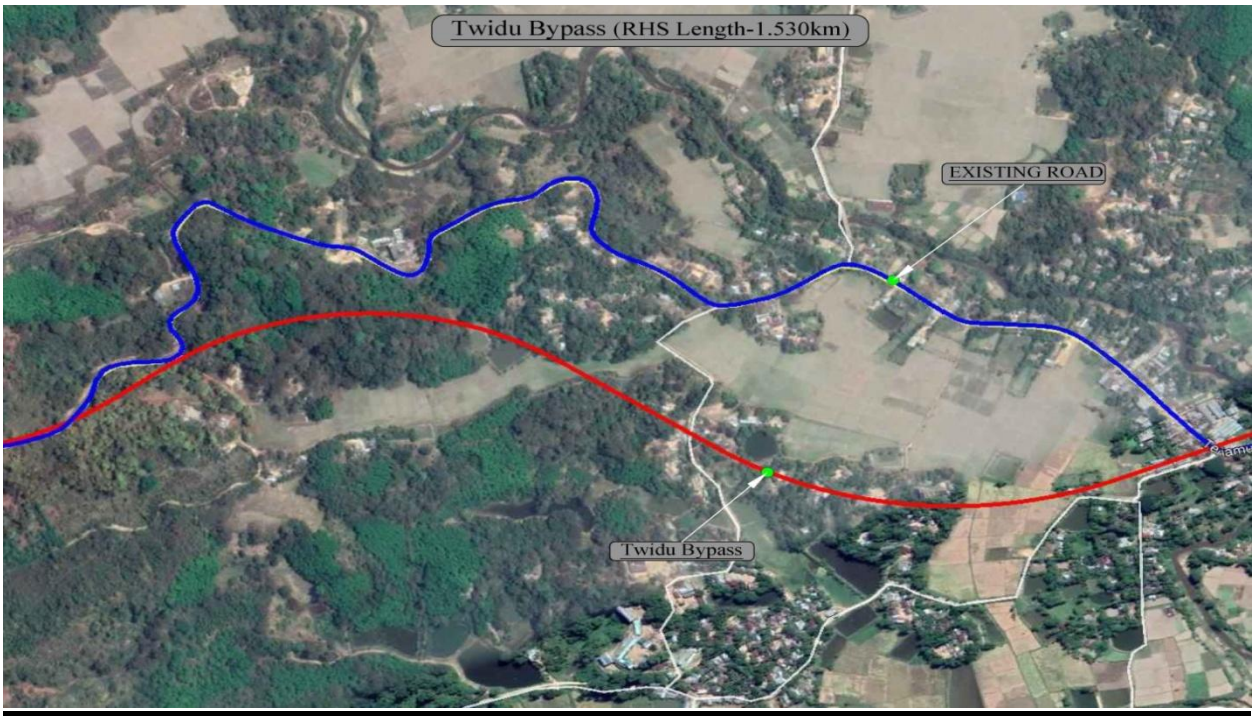
Total 2 bypasses of 2.832 km are proposed in entire Project length, the details are –

Table 0.30: Details of Bypass

Sl. No	Existing Chainage (Km)			Design Chainage (Km)			Bypass Name
	From	To	Length (m)	From	To	Length (m)	
1	0+000	2+560	2.560	0+000	1+300	1.300	Teliamura Bypass
2	13+550	15+550	2.000	11+300	12+830	1.530	Twidu Bypass

1. Teliamura Bypass

2. Twidu Bypass



0.29.2 Realignments

Except above bypasses some re-alignments are also proposed for improvement of existing geometry, the details of these realignments are:

Table 0.31: Details of Realignments

Sl. No	Existing Chainage (Km)			Design Chainage (Km)			Remarks
	From	To	Length	From	To	Length	
1	2560	4490	1.93	1300	3130	1.83	
2	4675	5475	0.80	3320	4100	0.78	
3	5850	10825	4.98	4470	8800	4.33	
4	11600	12875	1.28	9550	10650	1.10	
5				12830	17075	4.25	

0.30 Protection Works

Protection works 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 –

Table 0.32

Sl. No	Description	LHS (m)	RHS (m)
1	Breast Wall 1m height	299	331
2	Breast Wall 2m height	429	475
3	Breast Wall 3m height	338	374
4	Breast Wall 4m height	234	260
		1300	**1440**

The chainage wise details of Breast wall is presented in Vol. 8:: Bill of Quantity

b) **Retaining Wall** - Retaining wall is proposed for length given below:

Table 0.33

Sl. No	Description	LHS & RHS (m)
1	Retaining Wall 1.5m height	1226
2	Retaining Wall 3.0m height	214
3	Retaining Wall 1.5m height (Pond areas)	360
		1800

The chainage wise details of retaining wall is presented in Vol. 8:: Bill of Quantity

c) **W-Beam crash Barrier**- W- Beam crash barrier is proposed in **7120m** 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) **Drain** –

Sl. No.	Design Chainage (km)		Drain Length = (Length – Bridge length) (m)	Side	Remarks
	From	To			
A	**RCC Drain (1.75m wide)**				

Sl. No.	Design Chainage (km)		Drain Length = (Length – Bridge length) (m)	Side	Remarks
	From	To			
1	2+600	3+100	1000	BHS	TCS-3
2	12+920	13+250	660	BHS	TCS-3
	Total Length (m) (Both Side)		**1660**		
B	**PCC Drain**				
	PCC (U-shaped) drain along hill sections (where cut height > 2.5m)		**6220**	Refer TCS 4,5 & 6	Refer fig e of IRC SP 48-1998 (Page71)
C	**Unlined Surface drain**		**17588**		

e) **Providing PCC** on embankment slope at bridge approaches (46 bridges)

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

0.31 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.

0.32 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.

0.33 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.

0.34 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,

0.35 Utilities

The detail of utilities to be shifted is enclosed with drawing volume and the estimate of relocation will be submitted after obtaining it from concerned departments.

0.36 Land Acquisition

The alignment is passing through plain, rolling & Hilly terrain; the calculation of land acquisition area is approximate **360 hectare for entire length of Project (Length – 107.654 km),**

0.37 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.

0.38 Cost Estimate

The details of the cost abstract are as under table –

Bill No.	Description		Amount (in RS)	Amount (in Crores)	%age of Civil Cost
	Design Length in Km	**18.000**			
1	**Site Clearance and Dismantling**		**1673533.00**	**0.17**	**0.13%**
2	**Earth Work**		**89361769.00**	**8.94**	**7.05%**
3	**Sub base and Base Course**		**189340693.00**	**18.93**	**14.94%**
4	**Bituminous Courses**		**343347425.00**	**34.33**	**27.09%**
5	**Bridges**		**143667979.00**	**14.37**	**11.33%**
6	**Culverts**		**148579127.87**	**14.86**	**11.72%**
7	**Drainage and Protection Works**		**306698223.00**	**30.67**	**24.20%**
8	**Traffic Signs, Marking and Appurtenances**		**6928265.00**	**0.69**	**0.55%**
9	**Bus Bays**		**6478384.90**	**0.65**	**0.51%**
10	**Truck Lay Bye**		**0.00**	**0.00**	**0.00%**
11	**Junctions**		**26028359.18**	**2.60**	**2.05%**
12	**Miscellaneous Items**		**5430000.00**	**0.54**	**0.43%**
A	**Civil Cost (sum of 1 to 12)**		**1267533758.95**	**126.75**	
	Cost per km		**70418542.16**	**7.04**	
B	**Contingencies charges on 'A' @**	**1.00%**	**12675337.59**	**1.27**	
C	**Sub Total (A + B)….**		**1280209096.54**	**128.02**	
D	**Maintenance for 5 years (0.25%+0.25%+0.5%+0.5%+1%) on 'A"**	**2.50%**	**31688343.97**	**3.17**	
E	**escalation (5% per year for two years) on 'A' @**	**10.00%**	**126753375.89**	**12.68**	
F	**Construction Supervision Charges on 'A' @**	**3.00%**	**38026012.77**	**3.80**	

Bill No.	Description		Amount (in RS)	Amount (in Crores)	%age of Civil Cost
G	Agency (NHIDCL) Charges on 'C' @	3.00%	38406272.90	3.84	
H	Total Project Cost (C to G)		1515083102	151.51	
I	Approx Cost of Utility Shifting		28136669.00	2.81	
J	Total Cost (A + I)		1295670428	129.57	