1. INTRODUCTION

The Ministry of Road Transport & Highways, Government of India has decided to take up the development of the Golden Quadrilateral connecting the four metros of India i.e. Delhi, Mumbai, Chennai and Kolkata and North-South East-West (NSEW) corridors i.e. from Kashmir to Kanyakumari (North - South) and Silchar to Saurashtra (East - West) under the Prime Minister's dream project **National Highway Development Programme (NHDP).** The Ministry authorised the **National Highways Authority of India** (NHAI) to implement the development projects for these corridors.

The project road, namely **Harangajo – Udarband – Silchar** section of **NH-54 (Extension)** from Km 244.0 to Km 309.0 is the starting stretch of the East - West Corridor. For providing the needed Consultancy Services for Feasibility Study, Detailed Engineering Surveys / Investigations, Designs and Preparation of Detailed Project Report (DPR), the **National Highways Authority of India** has appointed **M/s. Feedback Ventures Private Limited, New Delhi**.

2. PROJECT ROAD

The Project Road covers "Harangajo (Km 244.00) – Balachera (Km 275.00) section of NH-54 (Extension) in Cachar and North Cachar Districts of Assam State and is a part of road section from Silchar to Daboka, which has been declared as Extension of NH-54 by Ministry of Road Transport and Highways (MoRTH), Government of India.

This Detailed Project Report pertains to Harangajao to Ballacherra Section of NH 54.

(a) Terrain

The project road from Km 244 (Harangajo) to Km 275 (Balachera) passes entirely through hilly terrain. Hills are on Left Hand Side (Eastern side) whereas river Jatinga flows in the valley on the other side (Western side).

(b) Land Use

There are no major towns, villages or marketing places on the project road as almost entire road passes through reserved forests.

(c) Geometrics of the Project Road

Along the existing alignment, at many places, there are number of sharp horizontal curves and steep gradients (due to hilly terrain) and these are required to be improved as per **IRC: SP: 48 – 1998 "Hill Road Manual"** to the NH standards. The formation width from Harangajo to Balachera is varying from 5.0 m to 7.5 m with carriageway width of 3.0 m to 5.0 m.

(d) Pavement Condition of the Project Corridor

No repair / maintenance or protective works have been carried out since many years on this section. Therefore, the pavement condition of this entire stretch is in extremely bad condition. During pavement condition survey hardly any bituminous surface could be noticed except in the first couple of kilometers. The entire stretch is full of potholes, cracks and ruts etc.

(e) Bridges and Structures

There are total 5 minor bridges (Bailey Bridges) on the existing alignment. There is no major bridge. In addition there are three RCC culverts of spans of 6.5 m which have been clubbed up in catorgory of minor bridges.

(f) Culverts

There are total 153 existing culverts in the project corridor, out of which 143 are RCC Slab / Box culverts and 10 are Pipe culverts. The total width of these culverts is less than 7 m. All these culverts are in very bad shape and need to be reconstructed to meet IRC Standards.

(g) Road Junctions and Intersections

There is no major junction / intersection existing in this package. At couple of places, where side tracks are merging with the project road, improvements will be required as per IRC Standards for minor junctions.

(h) Railway Level Crossings and ROBs

There is no railway line crossing the existing or proposed alignment. Therefore, no ROB / RUB is required in this package.

3. Socio-Economic Profile of the Project Influence Area

The major portion of this section from Km 244 to Km 275 of NH-54 Extension falls in the Cachar district of the Assam state Km 244.000 to Km 247.200 which falls in North Cachar Hills Disteict of Assam.

The Cachar district covers an area of 37861.1 Sq Km with a population of 12,15,385 as per 1991 census. The rural population is 10,96,161 whereas urban population is only 1,19,224.Thus, the majority of the population lives in rural area and their main source of livelihood is agricultural activities. Almost 70% of the total population is dependant on primary sector, i.e. agriculture. According to 1971 census, 42.70% of total workers are cultivators and 19.60% are agricultural labourers. The percentage of workers to total population is 29.16. Other than agriculture, allied activities such as mining, quarry, livestock, forestry, fisheries etc are pursued nearly by 14.77% of the total work force of the district. The rest are engaged in trade and commerce, household industries, construction, manufacturing, transport and storage etc.

The socio-economic condition of the district still remains backward due to lack of major industrial establishments in the district. However, there are potentialities for improving the economic condition of the district in view of the huge water courses, forest products, oil and natural gas reserves, present project, exploration of natural gas, Development of East - West Corridor and extension of existing meter gauge railway line to Broad Gauge railway line up to the Head Quarter of the district, will help in a great way to accelerate the process of socio - economic development in the district.

Despite being rich in mineral deposits, oil and gas exploration possibilities on large scale, attractive tourist destinations, world famous games sanctuary, attractive handicrafts, all the states in the Northeastern part of India and particularly south of Assam, Mizoram, Tripura,

Manipur etc, remained under privileged since independence because of lack of transportation and communication network. No significant industrialization and infrastructure development could take place in these parts of India. The main factor behind this was difficult geographical location.

But now, Government of India and State Government have undertaken number of infrastructure development projects funded by either internal resources or with the help of international funding agencies like World Bank, Asian Development Bank etc.

4. Traffic Studies

The following traffic surveys were carried out:

- Classified traffic volume count surveys
- Origin-Destination (O - D) surveys for 24 hours
- Axle – Load Survey
- Willingness to pay survey on the project road,

There is hardly any traffic on this section at present because of the following reasons:

- Very bad condition of the existing carriageway, pavement, bridges and culverts, etc.;
- Disturbances due to frequent conflicts between local tribal communities etc.;
- Sharp horizontal curves and steep gradients;
- No major township, commercial or business centre(s) along the alignment;
- No tourist spot, which can attract tourists in this region.

Therefore, despite our efforts and preparations, following traffic surveys could not be conducted at all in this section due to reasons indicated below:

- Turning movement surveys at junctions on the project road, since there is no major junction along the alignment,

- Pedestrian and cattle crossing counts. Since there is no significant town or village existing along the alignment, no pedestrian and cattle crossing is considered to be a requirement.

a. Classified Traffic Volume Counts

The entire existing road alignment passes through similar type of terrain i.e. hilly terrain and there is no major link connected to this road between Km 244 to Km 275. Thus, the entire section is considered to be a single homogeneous link and the survey location considered for volume count in this stretch is only at Balachera at Km 275.000. **The other locations within the project influence area, which will directly affect the traffic pattern of this section**, are given in the table below:

Link	Link Description	Survey Station	Survey Location	Survey Dates
1	Harangajo to Balachera (Project Road, ***Km 244 to Km 275***)	Balachera	Km 275	05/04/2007 to 11/04/2007

2	Balachera to Udarband (Project Road, ***Km 276 to Km 299.4***)	Dolu	Km 283	05/04/2007 to 11/04/2007
3	Badarpur to Silchar (NH53)	Salchapra	Km 3 (from Silchar)	17/04/2007 to 19/04/2007

The traffic intensity (ADT) observed at various count locations is as given below:

ADT Observed at Various Count Locations							
Location	**Road**	**Fast Vehicles**	**Slow Vehicles**	**Total Vehicles**	**Fast PCU**	**Slow PCU**	**Total PCU**
Balachera	NH54 (Km 275)	152	108	260	227	83	310
Dolu	NH54 (Km 284)	1531	1253	2784	2451	1283	3734
Salchapra	NH53 (Km 16)	4186	1025	5211	7255	752	8007

The analysis for hourly variation reveals that generally the night traffic is very less and the PHF observed at various count locations are in the range 7.0 to 10.0%

Directional distribution of traffic has been analysed and the directional distribution is between 47% and 53% on the project road and is 49% and 51% on NH53.

The AADT derived from ADT observed at various count locations is given below:

AADT Observed at Various Count Locations							
Location	**Road**	**Fast Vehicles**	**Slow Vehicles**	**Total Vehicles**	**Fast PCU**	**Slow PCU**	**Total PCU**
Balachera	NH54 (Km 275)	183	108	291	259	83	342
Dolu	NH54 (Km 284)	1751	1253	3004	2676	1283	3959
Salchapra	NH53 (Km 16)	4780	1025	5805	7939	752	8691

b. Axle Load Surveys

Axle load survey has been carried out near Udarband, within the project influence area, to obtain information on spectrum of axle loads for all types of goods vehicles plying on the project road. The VDF estimated from axle loads observed are:

- Light Goods Vehicle: 0.029
- 2-axle Truck: 9.060

c. Willingness to use the Project Road and Pay

In order to determine the willingness of the road users to pay toll, roadside interviews were conducted along the project road and on NH53. In this survey, cars, minibuses, private buses and

all types of goods vehicles were targeted. The willingness to pay of the road users of the project road and NH53 and NH44 is as under:

Table 0.1 Willingness to Pay of Road Users of Project Road

Vehicle Type	Tolls derived from NHAI toll rates (Rs.)	Willing to Pay NHAI Toll Rates (%)	Average Willingness to Pay of Users (excluding those who were willing to pay NHAI toll rates) (Rs.)
Car	35	40	24
Bus	125	56	50
LGV & Minibus	65	27	20
2-Axle Truck	125	48	44
MAV	125	86	75

d. Traffic Growth Rates

The growth rates are derived (based on past traffic growth and economic indicators) for various classes of vehicles for the three growth scenarios and time periods considered. The growth rates under normal scenario are:

Table 0.2 Growth Rates under Normal Scenario

Vehicle Type	Growth Rates (%)		
	2003-2008	2009-14	Beyond 2014
Two Wheeler	7.066	5.139	3.738
Car (Old Technology)	6.578	4.784	3.479
Car (New Technology)	6.578	5.263	3.827
Bus	7.923	5.762	4.191
LGV	7.762	5.645	4.106
2-axle Truck	7.762	5.645	4.106
MAV	7.762	6.210	4.516

e. Traffic Forecasts

The traffic forecasts for the three sections of the project road are worked out by combining the traffic due to (i) normal growth of the traffic on the project road, (ii) diverted traffic (when the project is not tolled), and (iii) induced traffic. The traffic forecasts in terms of Passenger Car Units (PCU) for the three sections are as under:

Year	Harangajo - Balachera Section	Balachera - Udarband Section	Udarband - Rongpur Section
2003	**342**	4007	5061
2007	**3092**	7673	9613
2012	**4543**	10853	14040
2017	**6401**	14823	19194
2022	**9340**	20270	25959
2029	**14678**	30426	38661

Capacity and Level of Service (LOS) analysis reveals that capacity augmentation from 2 - lane to 4 - lanes is required in the following years:

5. Engineering Surveys: Road and Bridges

a. Road Inventory Survey

Pavement Condition Survey

The general condition of the pavement from Km 244 to Km 275 of NH-54 extension is very poor. Out of 31 Km of road, only in about 2.0 Km length, pavement is in fair condition and balance 20 Km of road is in poor to very poor condition and can be further classified as failed section, as bituminous layer is almost absent and only few patches of bituminous surface can be seen in this stretch. The summary of Pavement Condition is given in the table below:

Table 0.3 Summary of Pavement Condition

Sl. No.	Pavement Condition	Length (Km)
1	Excellent	0
2	Good	0
3	Fair	1.0
4	Poor	3.0
5	Very poor	27.0
Total		**31.0**

Benkelman Beam Survey

Because of very poor condition of the existing pavement, Benkelman Beam Survey could not be conducted in this section according to IRC – 81: 1997. In addition, due to very poor geometrics of the existing alignment, almost entire section requires realignments. **Therefore, construction of totally new pavement is recommended. Overlay in this section is not recommended.**

b. Inventory & Condition Survey of Cross Drainage Structures

Bridges:

There are 8 bridges on the project road and all are minor. Five Bailey bridges are semi-permanent structures with spans varying from 18.0m to 27.0m and three bridges are RCC slab bridges of span lengths 6.5m. As Bailey bridges are temporary structures, widening of these bridges to even two lanes is difficult. Structural condition of all the Bailey bridges is unsatisfactory. All the bridges have to be constructed new on the proposed alignment that is mostly away from the existing alignment because of improvements to the geometrics of the existing alignment. The proposed structures on the project corridor are given at para 8.

Culverts:

There are total 153 existing culverts in the project corridor, out of which 143 are RCC Slab / Box culverts and 10 are Pipe culverts. The total width of these culverts is less 7 m with few exceptions. All the Hume Pipe culverts and many Slab culverts are either partly or fully choked due to siltation on upstream and / or downstream side or due to landslides. However, on detailed assessment, it

is felt that although the waterway provided for these culverts is adequate, lack of regular maintenance has resulted in siltation of these culverts and consequent reduction in their waterway and discharge capacity.

6. Pavement Design:

Design of Flexible Pavement with IRC: 37 -2012 for New Pavement

Design Input:

Design life:	15 years
MSA:	60
Lane Distribution factor:	0.50
Direction Distribution factor:	0.5 (After 2013)
CBR of Subgrade:	8 percent

Design Procedure

For MSA = 60 & CBR = 8%, the design as per the IRC:37 –2012 for 15 years design life leads to the crust thickness of pavement as given in **Table 3.8.**

Table 3.5: Flexible Pavement Composition (As Per IRC: 37-2012)

Pavement Thickness (mm)				
BC	**DBM**	**WMM**	**GSB**	**Total**
40	105	250	200	595

Subgrade of 500 mm thickness of CBR value not less 8% and Subbase material of CBR not less than 30% shall be used.

7. Widening Schedule & Typical cross-sections applicable for Project Highway:

S. No.	Design Chainage		Design Length (in km)	TCS	TCS Description
	From	To			
1	244	244.75	0.75	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
2	244.75	244.95	0.2	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
3	244.95	246	1.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
4	246	246.1	0.1	2	TCS- 2: Road Cross Section in Cut & Filling
5	246.1	246.15	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
6	246.15	246.2	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
7	246.2	246.6	0.4	1	TCS-1 : Road Cross Section in Cut Section

S.	Design Chainage		Design Length	TCS	TCS Description
8	246.6	246.7	0.1	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
9	246.7	246.75	0.05	1	TCS-1 : Road Cross Section in Cut Section
10	246.75	246.95	0.2	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
11	246.95	247	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
12	247	247.15	0.15	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
13	247.15	247.2	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
14	247.2	247.35	0.15	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
15	247.35	247.4	0.05	1	TCS-1 : Road Cross Section in Cut Section
16	247.4	247.5	0.1	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
17	247.5	247.55	0.05	1	TCS-1 : Road Cross Section in Cut Section
18	247.55	247.7	0.15	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
19	247.7	247.75	0.05	1	TCS-1 : Road Cross Section in Cut Section
20	247.75	247.8	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
21	247.8	247.85	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
22	247.85	247.95	0.1	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
23	247.95	248.05	0.1	1	TCS-1 : Road Cross Section in Cut Section
24	248.05	248.25	0.2	2	TCS- 2: Road Cross Section in Cut & Filling
25	248.25	248.3	0.05	1	TCS-1 : Road Cross Section in Cut Section
26	248.3	248.35	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
27	248.35	248.4	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
28	248.4	248.5	0.1	1	TCS-1 : Road Cross Section in Cut Section
29	248.5	248.6	0.1	2	TCS- 2: Road Cross Section in Cut & Filling
30	248.6	248.65	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
31	248.65	248.7	0.05	1	TCS-1 : Road Cross Section in Cut Section
32	248.7	248.75	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
33	248.75	248.95	0.2	1	TCS-1 : Road Cross Section in Cut Section
34	248.95	249	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
35	249	249.15	0.15	2	TCS- 2: Road Cross Section in Cut & Filling
36	249.15	249.2	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
37	249.2	249.25	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall

S.	Design Chainage		Design Length	TCS	TCS Description
38	249.25	249.3	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
39	249.3	249.35	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
40	249.35	249.45	0.1	2	TCS- 2: Road Cross Section in Cut & Filling
41	249.45	249.8	0.35	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
42	249.8	249.9	0.1	1	TCS-1 : Road Cross Section in Cut Section
43	249.9	249.95	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
44	249.95	250	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
45	250	250.2	0.2	1	TCS-1 : Road Cross Section in Cut Section
46	250.2	250.25	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
47	250.25	250.3	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
48	250.3	250.35	0.05	1	TCS-1 : Road Cross Section in Cut Section
49	250.35	250.6	0.25	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
50	250.6	250.7	0.1	2	TCS- 2: Road Cross Section in Cut & Filling
51	250.7	250.75	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
52	250.75	250.8	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
53	250.8	250.85	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
54	250.85	250.95	0.1	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
55	250.95	251.1	0.15	1	TCS-1 : Road Cross Section in Cut Section
56	251.1	251.15	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
57	251.15	251.4	0.25	1	TCS-1 : Road Cross Section in Cut Section
58	251.4	251.45	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
59	251.45	251.5	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
60	251.5	251.55	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
61	251.55	251.6	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
62	251.6	251.7	0.1	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
63	251.7	251.85	0.15	2	TCS- 2: Road Cross Section in Cut & Filling
64	251.85	251.95	0.1	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
65	251.95	252.4	0.45	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall

S.	Design Chainage		Design Length	TCS	TCS Description
66	252.4	252.45	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
67	252.45	252.5	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
68	252.5	252.55	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
69	252.55	252.6	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
70	252.6	252.9	0.3	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
71	252.9	253.05	0.15	1	TCS-1 : Road Cross Section in Cut Section
72	253.05	253.1	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
73	253.1	253.2	0.1	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
74	253.2	253.25	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
75	253.25	253.3	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
76	253.3	253.7	0.4	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
77	253.7	253.75	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
78	253.75	253.95	0.2	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
79	253.95	254	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
80	254	254.05	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
81	254.05	254.1	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
82	254.1	254.15	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
83	254.15	254.25	0.1	2	TCS- 2: Road Cross Section in Cut & Filling
84	254.25	254.3	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
85	254.3	254.4	0.1	2	TCS- 2: Road Cross Section in Cut & Filling
86	254.4	254.5	0.1	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
87	254.5	254.75	0.25	1	TCS-1 : Road Cross Section in Cut Section
88	254.75	254.8	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
89	254.8	254.9	0.1	2	TCS- 2: Road Cross Section in Cut & Filling
90	254.9	255	0.1	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
91	255	255.1	0.1	1	TCS-1 : Road Cross Section in Cut Section

S.	Design Chainage		Design Length	TCS	TCS Description
92	255.1	255.2	0.1	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
93	255.2	255.25	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
94	255.25	255.4	0.15	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
95	255.4	255.5	0.1	2	TCS- 2: Road Cross Section in Cut & Filling
96	255.5	255.65	0.15	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
97	255.65	255.7	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
98	255.7	255.75	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
99	255.75	256	0.25	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
100	256	256.05	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
101	256.05	256.25	0.2	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
102	256.25	256.3	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
103	256.3	256.35	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
104	256.35	256.4	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
105	256.4	256.5	0.1	2	TCS- 2: Road Cross Section in Cut & Filling
106	256.5	256.55	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
107	256.55	256.65	0.1	2	TCS- 2: Road Cross Section in Cut & Filling
108	256.65	256.7	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
109	256.7	256.75	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
110	256.75	256.8	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
111	256.8	257	0.2	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
112	257	257.2	0.2	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
113	257.2	257.25	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
114	257.25	257.5	0.25	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
115	257.5	257.55	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
116	257.55	257.6	0.05	1	TCS-1 : Road Cross Section in Cut Section
117	257.6	257.65	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
118	257.65	257.95	0.3	2	TCS- 2: Road Cross Section in Cut & Filling
119	257.95	258	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m

S.	Design Chainage		Design Length	TCS	TCS Description
120	258	258.35	0.35	1	TCS-1 : Road Cross Section in Cut Section
121	258.35	258.45	0.1	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
122	258.45	258.5	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
123	258.5	258.7	0.2	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
124	258.7	258.75	0.05	1	TCS-1 : Road Cross Section in Cut Section
125	258.75	258.8	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
126	258.8	258.85	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
127	258.85	258.9	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
128	258.9	258.95	0.05	1	TCS-1 : Road Cross Section in Cut Section
129	258.95	259.05	0.1	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
130	259.05	259.1	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
131	259.1	259.3	0.2	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
132	259.3	259.45	0.15	1	TCS-1 : Road Cross Section in Cut Section
133	259.45	259.5	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
134	259.5	259.55	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
135	259.55	259.65	0.1	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
136	259.65	259.7	0.05	1	TCS-1 : Road Cross Section in Cut Section
137	259.7	259.75	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
138	259.75	259.9	0.15	2	TCS- 2: Road Cross Section in Cut & Filling
139	259.9	260	0.1	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
140	260	260.05	0.05	1	TCS-1 : Road Cross Section in Cut Section
141	260.05	260.1	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
142	260.1	260.15	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
143	260.15	260.2	0.05	1	TCS-1 : Road Cross Section in Cut Section
144	260.2	260.25	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
145	260.25	260.3	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
146	260.3	260.35	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
147	260.35	260.4	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
148	260.4	260.45	0.05	2	TCS- 2: Road Cross Section in Cut & Filling

S.	Design Chainage		Design Length	TCS	TCS Description
149	260.45	260.5	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
150	260.5	260.55	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
151	260.55	260.6	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
152	260.6	260.7	0.1	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
153	260.7	260.75	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
154	260.75	260.95	0.2	2	TCS- 2: Road Cross Section in Cut & Filling
155	260.95	261	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
156	261	261.6	0.6	1	TCS-1 : Road Cross Section in Cut Section
157	261.6	261.7	0.1	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
158	261.7	261.75	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
159	261.75	261.85	0.1	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
160	261.85	261.95	0.1	2	TCS- 2: Road Cross Section in Cut & Filling
161	261.95	262	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
162	262	262.05	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
163	262.05	262.15	0.1	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
164	262.15	262.35	0.2	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
165	262.35	262.4	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
166	262.4	262.45	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
167	262.45	262.55	0.1	1	TCS-1 : Road Cross Section in Cut Section
168	262.55	262.6	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
169	262.6	262.7	0.1	1	TCS-1 : Road Cross Section in Cut Section
170	262.7	262.85	0.15	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
171	262.85	262.95	0.1	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
172	262.95	263	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
173	263	263.05	0.05	1	TCS-1 : Road Cross Section in Cut Section
174	263.05	263.15	0.1	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
175	263.15	263.2	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall

S.	Design Chainage		Design Length	TCS	TCS Description
176	263.2	263.35	0.15	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
177	263.35	263.55	0.2	1	TCS-1 : Road Cross Section in Cut Section
178	263.55	263.6	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
179	263.6	263.65	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
180	263.65	263.7	0.05	1	TCS-1 : Road Cross Section in Cut Section
181	263.7	263.75	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
182	263.75	263.95	0.2	1	TCS-1 : Road Cross Section in Cut Section
183	263.95	264.05	0.1	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
184	264.05	264.25	0.2	1	TCS-1 : Road Cross Section in Cut Section
185	264.25	264.3	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
186	264.3	264.35	0.05	1	TCS-1 : Road Cross Section in Cut Section
187	264.35	264.4	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
188	264.4	264.45	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
189	264.45	264.55	0.1	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
190	264.55	264.6	0.05	1	TCS-1 : Road Cross Section in Cut Section
191	264.6	264.65	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
192	264.65	264.7	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
193	264.7	264.75	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
194	264.75	264.85	0.1	1	TCS-1 : Road Cross Section in Cut Section
195	264.85	264.9	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
196	264.9	265	0.1	2	TCS- 2: Road Cross Section in Cut & Filling
197	265	265.1	0.1	1	TCS-1 : Road Cross Section in Cut Section
198	265.1	265.15	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
199	265.15	265.2	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
200	265.2	265.25	0.05	1	TCS-1 : Road Cross Section in Cut Section
201	265.25	265.3	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
202	265.3	265.4	0.1	1	TCS-1 : Road Cross Section in Cut Section
203	265.4	265.45	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
204	265.45	265.5	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
205	265.5	265.55	0.05	1	TCS-1 : Road Cross Section in Cut Section
206	265.55	265.6	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall

S.	Design Chainage		Design Length	TCS	TCS Description
207	265.6	265.65	0.05	1	TCS-1 : Road Cross Section in Cut Section
208	265.65	265.8	0.15	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
209	265.8	265.9	0.1	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
210	265.9	266.15	0.25	1	TCS-1 : Road Cross Section in Cut Section
211	266.15	266.2	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
212	266.2	266.25	0.05	1	TCS-1 : Road Cross Section in Cut Section
213	266.25	266.3	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
214	266.3	266.35	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
215	266.35	266.5	0.15	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
216	266.5	266.55	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
217	266.55	266.6	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
218	266.6	267.05	0.45	2	TCS- 2: Road Cross Section in Cut & Filling
219	267.05	267.1	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
220	267.1	267.15	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
221	267.15	267.25	0.1	2	TCS- 2: Road Cross Section in Cut & Filling
222	267.25	267.55	0.3	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
223	267.55	267.6	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
224	267.6	267.65	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
225	267.65	267.8	0.15	2	TCS- 2: Road Cross Section in Cut & Filling
226	267.8	268	0.2	1	TCS-1 : Road Cross Section in Cut Section
227	268	268.25	0.25	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
228	268.25	268.35	0.1	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
229	268.35	268.4	0.05	1	TCS-1 : Road Cross Section in Cut Section
230	268.4	268.45	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
231	268.45	268.5	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
232	268.5	268.6	0.1	1	TCS-1 : Road Cross Section in Cut Section
233	268.6	268.65	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
234	268.65	268.7	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
235	268.7	268.85	0.15	1	TCS-1 : Road Cross Section in Cut Section

S.	Design Chainage		Design Length	TCS	TCS Description
236	268.85	268.95	0.1	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
237	268.95	269	0.05	2	TCS- 2: Road Cross Section in Cut & Filling
238	269	269.1	0.1	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m
239	269.1	269.15	0.05	3	TCS-3 : Road Cross Section with Breast wall & Retaining wall
240	269.15	269.2	0.05	1	TCS-1 : Road Cross Section in Cut Section
241	269.2	269.25	0.05	4	TCS 4 - Road Cross section for Embankment Height up to 3.0 m

8. Proposed Structures:

Following Structures have been proposed on the project highway

Construction of new major bridges

Sl. No.	Design Chainage (Km)	Structure No.	Type of Structure	Span Arrangement
1	246+820	247/2	PSC	2 X 30.0m
2	250+215	251/1	PSC	2 X 30.0m
3	253+050	254/1	PSC	2 X 30.0m
4	254+890	255/5	PSC	4 X 30.0 m
5	256+870	257/4	PSC	3 X 30.0 m
6	260+820	261/4	PSC	2 X 30.0m
7	263+270	264/2	PSC	2 X 30.0m
8	266+190	267/1	PSC	20+30+20 m

Construction of new minor bridges:

Sl. No.	Design Chainage (Km)	Structure No.	Type of Structure	Span Arrangement
1	249+920	250/6	PSC	2 X 20.0m
2	250+870	251/6	PSC	1 X 30.0m
3	251+920	252/5	PSC	1 X 30.0m
4	256+030	257/1	PSC	1 X 30.0m
5	263+080	264/1	PSC	2 X 20.0m
6	266+050	266/1	Box type MNB	4 X 3.0m
7	267+425	268/3	PSC	1 X 30.0m
8	268+115	269/1	PSC	1 X 20.0m
9	269+030	270/1	PSC	2 X 20.0m

Construction of Culverts:

S. No.	Prop. Chainage	Structure No.	Type of Structure	Span Arrangement (axb)
1	244+465	245/01	BOX	2 X 3.0M
2	244+565	245/02	BOX	2 X 3.0M
3	244+700	245/03	BOX	2 X 3.0M
4	244+770	245/04	BOX	2 X 3.0M
5	244+835	245/05	BOX	2 X 3.0M
6	244+880	245/06	BOX	2 X 3.0M
7	245+090	246/01	BOX	2 X 3.0M
8	245+265	246/02	BOX	2 X 3.0M
9	245+465	246/03	BOX	2 X 3.0M
10	245+665	246/04	BOX	2 X 3.0M
11	245+945	246/05	BOX	2 X 3.0M
12	246+095	247/01	BOX	2 X 3.0M
13	247+050	248/01	BOX	3 X 3.0M
14	247+260	248/02	BOX	3 X 3.0M
15	247+420	248/03	BOX	3 X 3.0M
16	247+603	248/04	BOX	2 X 3.0M
17	247+765	248/05	BOX	2 X 3.0M
18	247+870	248/06	BOX	3 X 3.0M
19	248+065	249/01	BOX	2 X 3.0M
20	248+345	249/02	BOX	2 X 3.0M
21	248+515	249/03	BOX	3 X 3.0M
22	248+950	249/04	BOX	3 X 3.0M
23	249+105	250/01	BOX	2 X 3.0M
24	249+145	250/02	BOX	2 X 3.0M
25	249+375	250/03	BOX	3 X 3.0M
26	249+620	250/04	BOX	2 X 3.0M
27	249+675	250/05	BOX	2 X 3.0M
28	250+535	251/03	BOX	2 X 3.0M
29	250+625	251/04	BOX	2 X 3.0M
30	250+745	251/05	BOX	2 X 3.0M
31	251+440	252/01	BOX	3 X 3.0M
32	251+535	252/02	BOX	3 X 3.0M
33	251+675	252/03	BOX	3 X 3.0M
34	251+850	252/04	BOX	2 X 3.0M
35	252+100	253/01	BOX	2 X 3.0M

36	252+305	253/02	BOX	2 X 3.0M
37	252+550	253/03	BOX	2 X 3.0M
38	253+205	254/02	BOX	2 X 3.0M
39	253+310	254/03	BOX	2 X 3.0M
40	253+520	254/04	BOX	2 X 3.0M
41	253+680	254/05	BOX	2 X 3.0M
42	253+945	254/06	BOX	2 X 3.0M
43	254+130	255/01	BOX	2 X 3.0M
44	254+225	255/02	BOX	2 X 3.0M
45	254+380	255/03	BOX	2 X 3.0M
46	254+450	255/04	BOX	2 X 3.0M
47	255+120	256/01	BOX	2 X 3.0M
48	255+400	256/02	BOX	2 X 3.0M
49	255+700	256/03	BOX	2 X 3.0M
50	255+865	256/04	BOX	2 X 3.0M
51	256+340	25-Feb	BOX	2 X 3.0M
52	256+480	257/03	BOX	2 X 3.0M
53	257+050	258/01	BOX	2 X 3.0M
54	257+165	258/02	BOX	2 X 3.0M
55	257+260	258/03	BOX	2 X 3.0M
56	257+360	258/04	BOX	2 X 3.0M
57	257+590	258//05	BOX	2 X 3.0M
58	257+800	258/06	BOX	2 X 3.0M
59	258+080	259/01	BOX	3 X 3.0M
60	258+355	259/02	BOX	3 X 3.0M
61	258+635	259/03	BOX	2 X 3.0M
62	258+735	259/04	BOX	2 X 3.0M
63	258+865	259/05	BOX	2 X 3.0M
64	259+025	260/01	BOX	2 X 3.0M
65	259+125	260/02	BOX	3 X 3.0M
66	259+245	260/03	BOX	2 X 3.0M
67	259+460	260/04	BOX	2 X 3.0M
68	259+705	260/05	BOX	3 X 3.0M
69	259+915	260/06	BOX	3 X 3.0M
70	260+060	261/01	BOX	2 X 3.0M
71	260+300	261/02	BOX	2 X 3.0M
72	260+600	261/03	BOX	3 X 3.0M

73	261+620	262/01	BOX	2 X 3.0M
74	261+700	262/02	BOX	2 X 3.0M
75	261+820	262/03	BOX	2 X 3.0M
76	261+960	262/04	BOX	3 X 3.0M
77	262+070	263/01	BOX	2 X 3.0M
78	262+280	263/02	BOX	2 X 3.0M
79	262+385	263/03	BOX	2 X 3.0M
80	262+710	263/04	BOX	2 X 3.0M
81	262+810	263/05	BOX	2 X 3.0M
82	262+940	263/06	BOX	3 X 3.0M
83	263+545	264/03	BOX	2 X 3.0M
84	263+700	264/04	BOX	2 X 3.0M
85	263+825	264/05	BOX	2 X 3.0M
86	263+965	264/06	BOX	2 X 3.0M
87	264+010	265/01	BOX	2 X 3.0M
88	264+375	265/02	BOX	3 X 3.0M
89	264+475	265/03	BOX	2 X 3.0M
90	264+630	265/04	BOX	2 X 3.0M
91	264+685	265/05	BOX	2 X 3.0M
92	264+925	265/06	BOX	2 X 3.0M
93	265+135	266/01	BOX	2 X 3.0M
94	265+285	266/02	BOX	3 X 3.0M
95	265+450	266/03	BOX	3 X 3.0M
96	265+660	266/04	BOX	2 X 3.0M
97	265+740	266/05	BOX	2 X 3.0M
98	265+825	266/06	BOX	2 X 3.0M
99	266+350	267/02	BOX	2 X 3.0M
100	266+420	267/03	BOX	3 X 3.0M
101	266+525	267/04	BOX	2 X 3.0M
102	266+685	267/05	BOX	2 X 3.0M
103	266+760	267/06	BOX	2 X 3.0M
104	266+885	267/07	BOX	2 X 3.0M
105	266+985	267/08	BOX	2 X 3.0M
106	267+120	268/01	BOX	2 X 3.0M
107	267+370	268/02	BOX	2 X 3.0M
108	267+645	268/04	BOX	2 X 3.0M
109	267+755	268/05	BOX	2 X 3.0M

110	267+995	268/06	BOX	2 X 3.0M
111	268+225	269/02	BOX	2 X 3.0M
112	268+450	269/03	BOX	2 X 3.0M
113	268+590	269/04	BOX	2 X 3.0M
114	268+960	269/05	BOX	2 X 3.0M
115	269+195	270/02	BOX	2 X 3.0M

Vehicular Underpass:

Sl. No.	Existing Chainage (km)	Design Chainage (km)	Span Arrangement	Width of Structure (m)	Remarks
Nil					

9. PROJECT FACILITIES:

Parking Areas cum Truck laybyes

Truck lay-bye have been proposed at one location near Bandarkal village towords the hill side (i.e. left side of the carriageway while travelling from Harangajao to Balachera) for the stretch.

Bus Bays

Bus bays with proper shelter and landscape are required near every important town and village to facilitate local residents. There are no major towns / villages on the road stretch. Locations of bus-bays are generally finalised in such a manner that neither these are too far from the village nor these should cause any problem like accidents, noise pollution, air pollution, local traffic congestions etc. for the local residents.

A typical layout plan as per IRC Standards of the Bus Bay is given in the drawing volume.

A location-wise list including the name of the nearest village is given in the **Table below;**

Table: Proposed Bus Bays

S. NO.	PROP. CH.	SIDE	TYPE OF STRUCTURE
1	245+050	LHS	BUS BAY
2	245+150	RHS	BUS BAY
3	251+050	RHS	BUS BAY
4	251+100	LHS	BUS BAY
5	255+100	LHS	BUS BAY
6	255+200	RHS	BUS BAY
7	260+100	LHS	BUS BAY
8	260+200	RHS	BUS BAY
9	264+100	RHS	BUS BAY
10	264+150	LHS	BUS BAY
11	269+100	RHS	BUS BAY
12	269+150	LHS	BUS BAY