0. EXECUTIVE SUMMARY

0.1 GENERAL

Ministry of Road Transport & Highways (MORT&H) has decided to implement for upgradation of road to 2-lane with paved shoulder/4-lane configuration in the State of Maharashtra.

M/s L.N.Malviya Infra Projects have been appointed as Consultants to carry out the consultancy services for preparation of Detailed Project Report for Sakri – Satana - Deola – Chandwad – Manmad – Yevla – Kopergaon – Shirdi Road in the State of Maharashtra for upgradation to Two lane with Paved shoulder/Four lane configuration.

The project road under consideration:

Sakri – Satana - Deola – Chandwad – Manmad – Yevla – Kopergaon – Shirdi Road.

From Satana (Km 64.000) to Mangrul (Km 101.140) (Design Length-37.140 Km)

0.2 PROJECT ALIGNMENT DESCRIPTION

The project Highway starts from Satana (start of Satana city) at design km 64+000 and ends at the T Junction (Major Junction,NH3) at design km 101+140 at Mangrul, in the state of Maharashtra. Total Existing Length of Project road is 37.272 km and Design Length of project is 37.140 km.

The project road under consideration is **From Satana (Km 64.000) to Mangrul (Km 101.140) (Design Length-37.140 Km)**

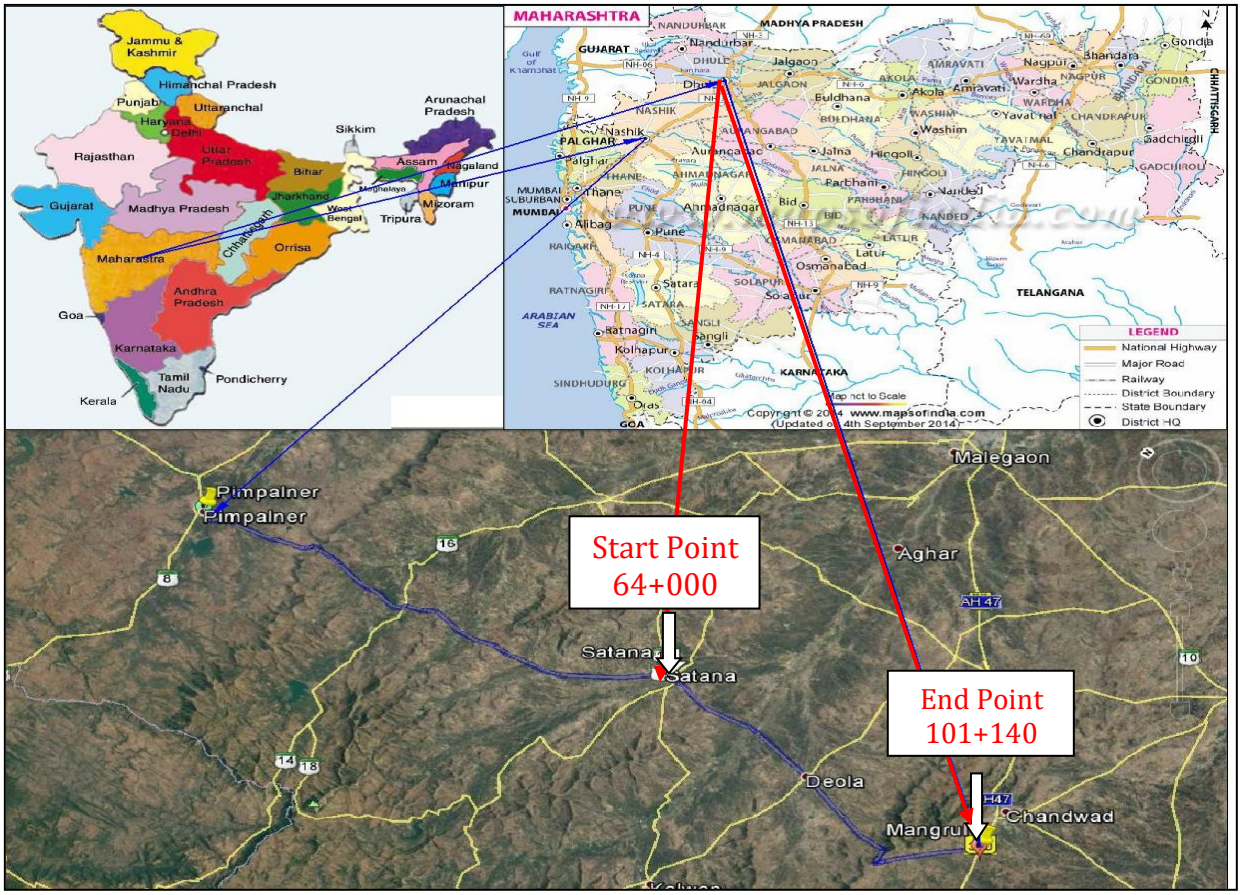


Figure 0.2: - Project Alignment of Project Road

0.3 CHAINAGE REFERENCES (EXISTING v/s DESIGN)

Table 0.1: - Chainage References

Sr. No.	Existing Chainage	Design Chainage	Remarks
1	64+090	64+000	**Start Point**
2	65+000	64+912	
3	66+000	65+913	
4	67+000	66+913	
5	68+000	67+913	
6	69+000	68+913	
7	70+000	69+913	
8	71+000	70+913	
9	72+000	71+913	
10	73+000	72+913	
11	74+000	73+913	
12	75+000	74+913	

Sr. No.	Existing Chainage	Design Chainage	Remarks
13	76+000	75+913	
14	77+000	76+913	
15	78+000	77+913	
16	79+000	78+912	
17	80+000	79+912	
18	81+000	80+912	
19	82+000	81+919	
20	83+000	82+919	
21	84+000	83+919	
22	85+000	84+920	
23	86+000	85+919	
24	87+000	86+920	
25	88+000	87+919	
26	89+000	88+918	
27	90+000	89+918	
28	91+000	-	Realignment
29	92+000	91+923	
30	93+000	-	Realignment
31	94+000	93+796	
32	95+000	94+796	
33	96+000	95+796	
34	97+000	96+796	
35	98+000	97+796	
36	99+000	98+796	
37	100+000	99+796	
38	101+000	100+796	
39	101+362	101+140	**End Point**

0.4 RIGHT OF WAY [ROW]

The available ROW is found to be 21-32 m varying at different locations except at 1-2 location where available ROW is around 18.0 m. Average available ROW is 24 m. However, In forest Area, existing available ROW shall be existing Roadway width (Around 8-10m).

Design has been done within available ROW as long as possible. ROW may be required at some locations for improvement of curves or at Realignment/toll plaza/Bus Bay/Truck Lay bye locations.

Approximate Land Detail

Total Land required = 90.049 Ha,

Total Land available = 83.81 Ha

Total Land to be acquired = 6.241 Ha

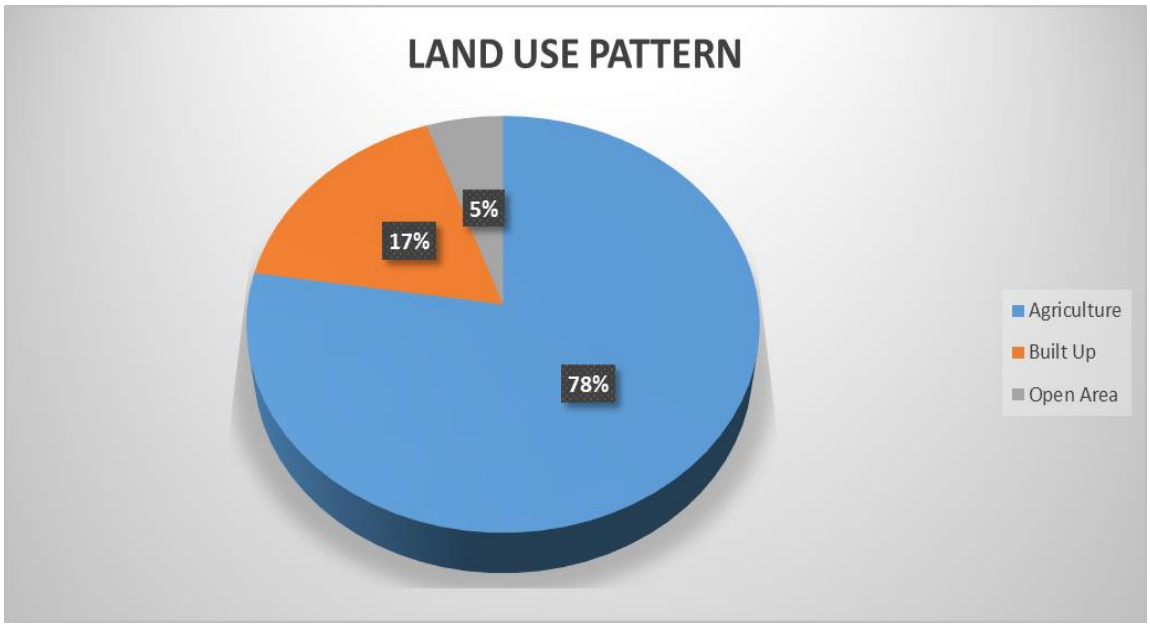
0.5 ABUTTING LAND USE PATTERN

The existing alignment is a link between Satana, Morenagar, Indiranagar, Thengode, Aher Vasti, Malwadi, Deola and Mangrul.

The pattern on both side of road is agricultural, forest and built-up. The details of land use pattern along the

project road are-

Built-up - 17.00%
Agriculture - 78.00%
Hilly Area - 5.00%



The details of land use pattern for project road is as under -

Table 0.2: - Existing Land Use Pattern

S. No.	Design Chainage		Length (m)	Carriageway		Width of Ex. Shoulders (m)	Land Use	Terrain	Remarks
	Km	Km		Type	Width (m)				
1	64+000	64+500	500	BT	7	1.5-2.6	Builtup	Plain	SATANA
2	64+500	65+250	750	BT	7	1.5-2.7	Builtup	Plain	Satana
3	65+250	66+300	1050	BT	10	1.5-2.5	Builtup	Plain	Satana
5	66+300	66+700	400	BT	10	1.5-2.5	Builtup	Plain	Satana
6	66+700	68+800	2100	BT	10	1.5-2.5	Builtup	Plain	Satana/ Morenagar
8	68+800	74+000	5200	BT	10	1.5-2.5	Agriculture	Plain	
11	74+000	75+370	1370	BT	10	1.5-2.5	Builtup	Plain	Thengode-Lohner
12	75+370	77+500	2130	BT	10	1.5-2.5	Agriculture	Plain	
13	77+500	78+400	900	BT	10	1.5-2.5	Builtup	Plain	Aher Vasti
14	78+400	80+050	1650	BT	10	1.5-2.5	Agriculture	Plain	
15	80+050	80+300	250	BT	10	1.5-2.5	Builtup	Plain	Malwadi/ Partially Built-up
16	80+300	80+500	200	BT	10	1.5-2.5	Builtup	Plain	Partially Builtup
17	80+500	82+650	2150	BT	7	1.5-2.5	Builtup	Plain	Deola

S. No.	Design Chainage		Length (m)	Carriageway		Width of Ex. Shoulders (m)	Land Use	Terrain	Remarks
	Km	Km		Type	Width (m)				
18	82+650	90+800	8150	BT	7	1.5-2.5	Agriculture	Plain	
19	90+800	91+100	300	BT	7	1.5-2.5	Forest	Plain	
20	91+100	93+100	2000	BT	7	1.5-2.5	Forest	Hilly	
21	93+100	93+500	400	BT	7	1.5-2.5	Forest	Hilly	
22	93+500	100+500	7000	BT	7	1.5-2.5	Agriculture	Plain	
23	100+500	101+140	640	BT	7	1.5-2.5	Agriculture	Plain	Mangrul

0.6 TERRAIN

The terrain along this road is generally plain. From km 91+100 to 93+500, road passes through hilly terrain.

0.7 FOREST

Forest land exists on the project land as per site inspections as follows: -

Table 0.3- Details of Forest

Sr. No	Design Chainage (km)		Length (m)	Remarks
	From	To		
1	90+800	93+100	2300	**Forest**
2	93+100	93+500	400	**Forest**
Total Length (m)			**2.70 Km**	

0.8 TRAFFIC

In this chapter, the report is concerned about **Sakri – Satana - Devla – Chandwad – Manmar – Yevla – Kopergaon – Shirdi Road.**

Traffic survey locations and schedules were, as given below: -

Table 0.4 – Different Traffic surveys and their dates of commencement

Section	Date of I Traffic Survey		Duration
	From	To	
Classified Traffic Volume Count			
Km 95+000	11.07.2016	17.07.2016	7 Days/24 Hours
Km 80+000			3 Days/24 Hours
Km 64+500			3 Days/24 Hours

The following ADT and PCU were observed on project road –

Table 0.5–ADT and PCU observed

Year	Location: km 64+500	Location: km 80+000	Location: km 95+000

	ADT	PCU	ADT	PCU	ADT	PCU
Year of TVC 2016					7445	7675
Traffic Growth Rate = 5%						
2020	6408	11386	10473	12865	9049	9329
2021	6728	11955	10997	13508	9501	9795
2022	7064	12553	11547	14183	9976	10285
2023	**7417**	**13181**	**12124**	**14892**	**10475**	**10799**
2024	7788	13840	12730	15637	10999	11339
2025	8177	14532	13367	16419	11549	11906
2026	8586	15259	14035	17240	12126	12501
2027	9015	16022	14737	18102	12732	13126
2028	**9466**	**16823**	**15474**	**19007**	**13369**	**13782**
2029	9939	17664	16248	19957	14037	14471
2030	10436	18547	17060	20955	14739	15195
2031	10958	19474	17913	22003	15476	15955
2032	11506	20448	18809	23103	16250	16753
2033	**12081**	**21470**	**19749**	**24258**	**17063**	**17591**
2034	12685	22544	20736	25471	17916	18471
2035	13319	23671	21773	26745	18812	19395
2036	13985	24855	22862	28082	19753	20365
2037	14684	26098	24005	29486	20741	21383
2038	**15418**	**27403**	**25205**	**30960**	**21778**	**22452**
2039	16189	28773	26465	32508	22867	23575
2040	16998	30212	27788	34133	24010	24754
2041	17848	31723	29177	35840	25211	25992
2042	18740	33309	30636	37632	26472	27292
2043	**19677**	**34974**	**32168**	**39514**	**27796**	**28657**

As per clause 4.6.1 of IRC: 37-2012, the projected traffic growth rate is considered as 5%.

0.9 PAVEMENT COMPOSITIONS

As per the existing CVPD & considering 8% CBR, Rigid pavement is recommended for this road.

Pavement Design

Design is performed as per "IRC-58:2015 GUIDELINES FOR THE DESIGN OF RIGID PAVEMENTS".

Hence the proposed pavement composition is-

Table 0.7

S. No.	Section	CVPD	CBR (%)	Pavement Composition (mm)		
				PQC	DLC	GSB
1	Satana to Deola	2565	8%	300	150	150
2	Satana to Deola	2339	8%	300	150	150
3	Deola to Mangrul	1802	8%	300	150	150

0.10 PROPOSED BYPASSES

No Bypasses have been proposed in this section of Highway.

0.11 ROAD JUNCTIONS/INTERSECTIONS

There are 8 major and 17 minor junctions which are important. Their details are-

Table 0.9- Details of Existing Junctions

Sr. No.	Existing Chainage	Design Chainage	Location	Type of Junction	Remarks
1	65+112	65+000	LHS-Vaikunthdham & Colony	T	Minor
2	65+295	65+180	LHS-Satana	T	Major
3	65+362	65+250	LHS-Satana	T	Major
4	65+540	65+430	LHS-Road To Colony	T	Minor
5	65+870	65+760	LHS-Satana	T	Minor
6	66+210	66+100	LHS-Malegaon Road, RHS- City Road	X	Major
7	67+072	66+960	RHS-Malegaon Tilwan Road	T	Major
8	68+110	68+000	LHS-Morenagar	T	Minor
9	72+512	72+400	LHS-Sawki	T	Minor
10	75+162	75+050	LHS-Thengode	T	Minor
11	75+712	75+600	RHS-Kaiwal(Sugar Factory)	T	Minor
12	80+472	80+360	LHS-Malwadi Fata	T	Minor
13	81+435	81+320	RHS- Village Road	T	Minor
14	81+612	81+420	RHS-Saptshringi Gadhvani	T	Major
15	81+880	81+800	LHS- Saundana/Malegaon	T	Major
16	82+000	81+920	LHS-Village Road	T	Minor
17	83+600	83+520	LHS- Rest House	T	Minor
18	84+200	84+120	LHS-Village Road, RHS- Ashram Sala Rameshwar	X	Minor
19	85+290	85+210	RHS- Rameshwar	T	Minor
20	85+880	85+800	LHS- Shubhash Nagar	T	Minor
21	89+590	89+510	LHS-Bhilwad, RHS- Vadala	X	Minor
22	94+220	93+860	RHS-Nashik Devla	T	Major
23	95+696	95+330	RHS- Shirur (Tangdi)	T	Minor
24	100+026	99+660	RHS-Asarkheda	T	Minor
25	101+362	101+000	LHS-Dhule/Indore, RHS-Washik/Mumbai	T	Major

0.13 ROAD SIDE DRAINS

Covered RCC drains cum footpath are provided in village portions.
Details and dimensions are given in TCS of drain attached after TCS for widening scheme of roads.
Chainage wise details of RCC drain is given below-

Table – 0.10 Locations of Covered RCC Drains

Sr. No.	Design Chainage		Length		Type	Remark
	From	To	LHS	RHS		

1	64+000	64+500	500.00	500.00	**RCC Rectangular Drain (1x1 m clear)**	SATANA
2	64+500	65+250	750.00	750.00		SATANA
3	65+250	66+300	1050.00	1050.00		SATANA
4	66+300	66+430	130.00	130.00		SATANA
5	74+000	75+370	1370.00	1370.00		THENGODE-LOHNER
6	80+500	82+650	2150.00	2150.00		DEOLA
	Length		**5.95**	**5.95**		
	Total Length		**11.90 Km**			

0.14 SUBMERGENCE

No area of the road falls under submergence area.

0.15 Cattle and pedestrian underpass:

Existing Pedestrian underpasses & their details are as follows:

S. No.	Ex. Chainage(Km)	Design Chainages (Km)	Location	Ex. Width	Proposed Width (m)	Remark
1	75+130	75+020	Near Thengode	12.5	22.5	Widening of Existing Pedestrian Underpass
2	82+230	82+150	Near Deola	14	22.5	Widening of Existing Pedestrian Underpass

0.16 Foot Over Bridge

Existing Foot Over Bridge & it's details are as follows:

S. No.	Chainage (km)	Type of Structure	Lateral Clearance	Vertical Clearance	Remarks
1	65+200	Steel Structure	1X25	6	Retained

0.17 CROSS DRAINAGE WORKS

Bridges

Total 17 bridges exist on the project road.

There are 2 major bridges on the Road at km 74+820 out of which one old bridge is Stone Masonry Bridge (Const. in 1944). The old bridge is proposed to be reconstructed. Other bridge is RCC Bridge (Const. in 2007), which has been retained.

15 minor bridges exist on the project road. 2 bridges are proposed for reconstruction to 4 lane standard by constructing 2 new bridges parallel to bridges being reconstructed. 3 bridges are retained (ex. 2 Lane) parallel to which 3 new bridges are being constructed for four laning. At 3 locations, Parallel minor bridges exist (1 Old & 1 New) where 3 old minor bridges are being reconstructed & 3 New bridges are being retained. 1 minor bridge is being widened to 4 lane standards & 3 minor bridges are being widened to 2 lane with paved shoulder standards.

Major Bridge:

Sr. No	Existing Chainage	Design Chainage	Type of Structure			No. of Spans with Span Length (m)	Width (m)		Proposal		
			Foundation	Sub Structure	Super Structure		Clear Width	Over all Width	Proposed Span	Width	Retained/ Widening/ Reconstruction
1	74+906	74+820	Pile Foundation	RCC	T Girder	10X20 (New)	7.5	8.0	-	-	Retain with Repair
2	74+906	74+820	Open Foundation	SM	T Girder	20X10 (Old)	6.5	7.2	10X20	11	Reconstruction

Minor Bridge:

Sr. No.	Existing Chainage	Design Chainage	Type of Structure			Span Arrangement	Width		Proposed Span	Width	Proposal
			Foundation	Sub Structure	Super Structure		Clear	Overall			
1	65+060	64+945	Open Foundation	Stone Masonry	Solid Slab	3X5.8	11.5	12	3X5.8	2X11	Reconstruction of existing bridge to 4L standard
2	65+400	66+440	Open Foundation	PCC	Solid Slab	8X7.0	8.1	12	8X7.0	11	Existing Bridge Retained & New Construction

Sr. No.	Existing Chainage	Design Chainage	Type of Structure			Span Arrangement	Width		Proposed Span	Width	Proposal
			Foundation	Sub Structure	Super Structure		Clear	Overall			
											parallel to Existing Bridge
3	67+720	67+610	Open Foundation	PCC	Solid Slab	4X5	9	12	4X5	11	Existing Bridge Retained & New Construction parallel to Existing Bridge
4	68+910	68+800	Open Foundation	PCC	Solid Slab	3X5.0	9	9.5	3X5.0	2X11	Reconstruction of existing bridge to 4L standard
5	72+030	71+910	Open Foundation	PCC	Solid Slab	3X5.0	9.5	10.5	3X5.0	11	Existing Bridge Retained & New Construction parallel to Existing Bridge
6	75+420	75+310	Open Foundation	Stone Masonry	Solid Slab	6X5.8	-	7.5			Reconstruction
7	75+420	75+310	Open Foundation	PCC	Solid Slab	6X5.8	11.3	12	6X5.8	11	Existing Bridge Retained
8	80+160	80+085	Open Foundation	PCC	Solid Slab	9X5.5(OLD)	6.2	7.3			Reconstruction
9	80+160	80+085	Open Foundation	PCC	Solid Slab	8X5.8(NEW)	8	8.7	8X5.8	11	Existing Bridge Retained
10	81+700	81+633	Open Foundation	PCC	Solid Slab	5X5.5(OLD)	5.5	6.5			Reconstruction
11	81+700	81+633	Open Foundation	PCC	Solid Slab	5X5.5(NEW)	11	11.7	5X5.5	11	Existing Bridge Retained
12	83+940	83+860	Open Foundation	PCC	Solid Slab	3X6.0	11.4	12	3X6.0	22	Widening
13	88+980	88+900	Open Foundation	PCC	Solid Slab	1X11.2	11.4	12	1X11.2	16	Widening
14	96+460	96+260	Open Foundation	PCC	Solid Slab	2X4	11.4	12	2X4	16	Widening
15	98+880	98+680	Open Foundation	PCC	Solid Slab	2X4	11.4	12	2X4	16	Widening

CULVERTS

There are total 61 culverts in the project road, out of which 46 culverts are proposed for reconstruction and 15 culverts are proposed for widening.

Sr. No.	Existing Chainage (Km)	Design Chainage (Km)	Details of Existing Structure			Details of Proposed structure		
			Type of Structure	Span Arrangement	Width of Structure (m)	Span Arrangement	Proposed Width (m)	Remark
1	64+460	64+360	HPC	1 ROW 600		1 ROW 1200	22.5	Reconstruction
2	67+200	67+105	HPC	1 ROW 1000	12	1 ROW 1000	22.5	Widening
3	67+830	67+720	HPC	1 ROW 1000		1 ROW 1200	22.5	Reconstruction
4	68+380	68+290	HPC	3ROW 1000	16.7	3ROW 1000	22.5	Widening
5	68+450	68+360	HPC	1 ROW 1000		1 ROW 1200	22.5	Reconstruction
6	68+680	68+590	HPC	3ROW 1200	16	3ROW 1200	22.5	Widening
7	69+100	69+030	HPC	1 ROW 1000	12	1 ROW 1000	22.5	Widening
8	69+400	69+310	HPC	1 ROW 900		1 ROW 1200	22.5	Reconstruction
9	69+630	69+550	HPC	1 ROW 900		1 ROW 1200	22.5	Reconstruction
10	70+110	70+000	HPC	5 ROW 1200		1 X 5.0	22.5	Reconstruction
11	70+210	70+100	HPC	5 ROW 1200		1 X 5.0	22.5	Reconstruction
12	70+530	70+420	HPC	1 ROW1200	12	1 ROW1200	22.5	Widening
13	70+690	70+600	HPC	1 ROW 900		1 ROW 1200	22.5	Reconstruction
14	70+950	70+850	HPC	1 ROW 1200	12	1 ROW 1200	22.5	Widening
15	71+390	71+300	HPC	1 ROW 900		1 ROW 1200	22.5	Reconstruction
16	72+510	72+420	HPC	1 ROW 900		1 ROW 1200	22.5	Reconstruction
17	73+400	73+310	HPC	1 ROW 1200	12	1 ROW 1200	22.5	Widening
18	74+040	73+950	HPC	2 ROW 1200	12	2 ROW 1200	22.5	Widening
19		75+020	Slab	1 x 4.4		1x4.4		Widening
20	76+340	76+225	HPC	1 ROW 900		1 ROW 1200	22.5	Reconstruction
21	76+970	76+870	HPC	2 ROW 900		2 ROW 1200	22.5	Reconstruction
22	77+165	77+070	HPC	Chocked		1 ROW 1200	22.5	Reconstruction
23	77+820	77+730	HPC	1 ROW 900		1 ROW 1200	22.5	Reconstruction
24	77+985	77+900	HPC	1 ROW 900		1 ROW 1200	22.5	Reconstruction
25	78+260	78+170	HPC	1 ROW1000		1 ROW 1200	22.5	Reconstruction
26	80+610	80+520	Slab (Canal)	1 X 4	12.6	1 X 4	22.5	Widening
27	82+080	82+000	Slab	1 X 0.5m		1 ROW 1200	22.5	Reconstruction
28	82+140	82+060	HPC	2 ROW 1000		2 ROW 1200	22.5	Reconstruction
29	84+580	84+500	HPC	1 ROW 900		1 ROW 1200	14	Reconstruction
30	86+420	86+340	HPC	1 ROW 900		1 ROW 1200	14	Reconstruction
31	87+160	87+080	HPC	1 ROW 900		1 ROW 1200	14	Reconstruction
32	90+140	90+065	Slab	1 X 2.3	12	1 X 2.3	14	Widening
33	90+480	90+400	Slab	1 X 3.3	12	1 X 3.3	14	Widening

Sr. No.	Existing Chainage (Km)	Design Chainage (Km)	Details of Existing Structure			Details of Proposed structure		
			Type of Structure	Span Arrangement	Width of Structure (m)	Span Arrangement	Proposed Width (m)	Remark
34	91+420	91+340	HPC	2 ROW 1200	11.7	2 ROW 1200	14	Widening
35	91+710	91+630	HPC	2 ROW 1000		2 ROW 1200	14	Reconstruction
36	92+380	92+300	HPC	1 ROW 900		1 ROW 1200	14	Reconstruction
37	92+580	92+500	HPC	1 ROW 900		1 ROW 1200	14	Reconstruction
38	92+740	92+650	HPC	2 ROW 900		2 ROW 1200	14	Reconstruction
39	92+940	92+800	HPC	1 ROW 900		1 ROW 1200	14	Reconstruction
40	93+410	93+210	HPC	4 ROW 1000		1 X 4.0	14	Reconstruction
41	93+620	93+420	HPC	2 ROW 1000		1 X 4.0	14	Reconstruction
42	94+020	93+820	HPC	1 ROW 1200		1 ROW 1200	14	Reconstruction
43	94+330	94+130	HPC	1 ROW 900		1 ROW 1200	14	Reconstruction
44	94+620	94+420	Slab	1 X 3.2		1 X 5.0	14	Reconstruction
45	95+160	94+960	Slab	1 X 3.1		1 X 5.0	14	Reconstruction
46	95+340	95+140	HPC	2 ROW 1200		2 ROW 1200	14	Reconstruction
47	95+990	95+790	HPC	1 ROW 1200	12	1 ROW 1200	14	Widening
48	96+360	96+150	HPC	2 ROW 1000		1 X 4.0	14	Reconstruction
49	96+920	96+720	HPC	1 ROW 1000		1 ROW 1200	14	Reconstruction
50	97+240	97+040	HPC	1 ROW 1000		1 ROW 1200	14	Reconstruction
51	97+440	97+240	HPC	1 ROW 900		1 ROW 1200	14	Reconstruction
52	97+520	97+320	HPC	1 ROW 1000		1 ROW 1200	14	Reconstruction
53	97+790	97+590	Slab	1 X 3.3	12	1 X 3.3	14	Widening
54	97+940	97+740	HPC	1 ROW 900		1 ROW 1200	14	Reconstruction
55	98+230	98+030	HPC	1 ROW 900		1 ROW 1200	14	Reconstruction
56	98+600	98+390	HPC	1 ROW 900		1 ROW 1200	14	Reconstruction
57	99+210	99+010	HPC	1 ROW 900		1 ROW 1200	14	Reconstruction
58	99+420	99+220	HPC	2 ROW 1000		2 ROW 1200	14	Reconstruction
59	99+720	99+520	HPC	1 ROW 1000		1 ROW 1200	14	Reconstruction
60	100+480	100+280	HPC	4 ROW 1200		1 X 6.0	14	Reconstruction
61	101+290	101+080	HPC	1 ROW 1000		1 ROW 1200	14	Reconstruction

0.16 RAILWAY TRACKS / CROSSINGS

No railway track exists on the project road corridor.

0.17 TOLL PLAZA

01 toll plaza is proposed on the project road. The details of which are given in **table 0.12**

Table 0.12- Details of Toll Plaza

Sr. No	Design Chainage	Remarks, if any
1	93+700	Traffic Intensity & available Space

0.18 ROADWAY FACILITIES

(a) Way Side Amenities

There is not any proposal for way side amenities.

(b) Truck/Bus Lay Byes

Truck lay byes are not proposed on the project road.

Bus shelters & Bus Lay Byes are proposed at selected villages. 3x2 Bus Bays & 4x2 Bus Shelters are proposed along the project road.

The details of which are given in **table 0.13.** Their details are given below-

Table 0.13- Locations of proposed Bus Bays & Bus Shelters in Villages

Sr. No.	Design Chainage	Side	Village/ Town Name	Remarks, if any
1	66+950	LHS	Satana/Morenagar	Bus Bays
2	68+000	RHS		
3	70+950	Both Side	Indiranagar	Bus Shelters
4	74+000	LHS	Thengode	Bus Bays
5	75+300	RHS		
6	77+600	LHS	Aher Vasti	Bus Shelters
7	78+400	RHS		
8	80+130	LHS	Malwadi	Bus Shelters
9	80+300	RHS		
10	80+770	LHS	Deola	Bus Bays
11	82+650	RHS		
12	100+500	Both Side	Mangrul	Bus Shelters

0.19 INVESTIGATIONS AND SURVEYS

In order to design various components of project road; following investigations and surveys have been carried out: -

- Traffic surveys
  - 7 days' traffic Survey
  - Axle load Survey
- Topographic surveys including GPS
- Material Surveys & Investigations
- Borrow area Identification
- Road Inventory Survey
- Pavement Condition Survey
- Culvert and Bridge Inventory Survey

0.20 DESIGN PARAMETERS

Following design standards have been adopted as per Indian Roads Congress (IRC) Guidelines, contained in IRC: SP: 73-2015, IRC: 73, IRC: 86, IRC: 38 and IRC: SP: 23 and is given in Table below:

Table 0.13- Design Parameters

Sl. No.	Item	Plain/Rolling Terrain
1	Design speed (kmph)	80 Kmph – 100 Kmph
2	Land width (m) Open / Built-up area	25-30 m
3	Width of carriageway (m)	7.00 m + 2x1.50m paved shoulders = 10m **(for 2L+PS)**
		2x7.00 m + 0.6m NJ Barrier = 10m **(for 4 Lane)**
4	Unpaved shoulders	2 x 1.00 m (Open Area)
5	Camber/cross fall	
(i)	Carriageway & paved shoulders	2.0 %
(ii)	Earthen shoulders	3.0%
6	Maximum super elevation	7%
7	Minimum Radii of horizontal curves (m)	250m ruling /155m min.
8	Minimum length of curves (m)	150 m for every deflection angle of 5^0
9	Drains	As per Design
10	Sight Distance	As per IRC 73 & IRC 86
11	Gradient	
(i)	Ruling Gradient	3.33%
(ii)	Limiting Gradient	5%
(iii)	Exceptional Gradient	6.7%
12	Vertical Clearance for power/ telecommunication lines Low Voltage up to 220 to 600 V Power Line up to 650V Electric Power line up to 132 kV Electric Power line up to 220 kV Electric Power line up to 400 kV Electric Power line up to 765 kV	 5.8m 6.1m 6.5m 7.0m 8.4m 12.4 m

0.21 TYPICAL CROSS SECTION AND WIDENING SCHEME

Rigid Pavement in Open Area (2 Lane with Paved Shoulders)

Sr. No.	Design Chainage		Length (m)	Carriageway & PS (m)	Typical cross section
	From (Km)	To (Km)			
1.	84+120	90+800	6680.00	1.5+7.0+1.5=10m	TCS 1
2.	90+800	91+100	300.00	1.5+7.0+1.5=10m	TCS 1
3.	93+500	100+500	7000.00	1.5+7.0+1.5=10m	TCS 1
4.	100+500	101+140	640.00	1.5+7.0+1.5=10m	TCS 1
	Total Length(A)		**14.620 Km**		

Rigid Pavement in Hilly Area

Sr. No.	Design Chainage		Length (m)	Carriageway & PS (m)	Typical cross section
	From (Km)	To (Km)			
1.	91+100	93+100	2000.00	1.5+7.0+1.5=10m	TCS 2
2.	93+100	93+500	400.00	1.5+7.0+1.5=10m	TCS 2
	Total Length(B)		**2.40 Km**		

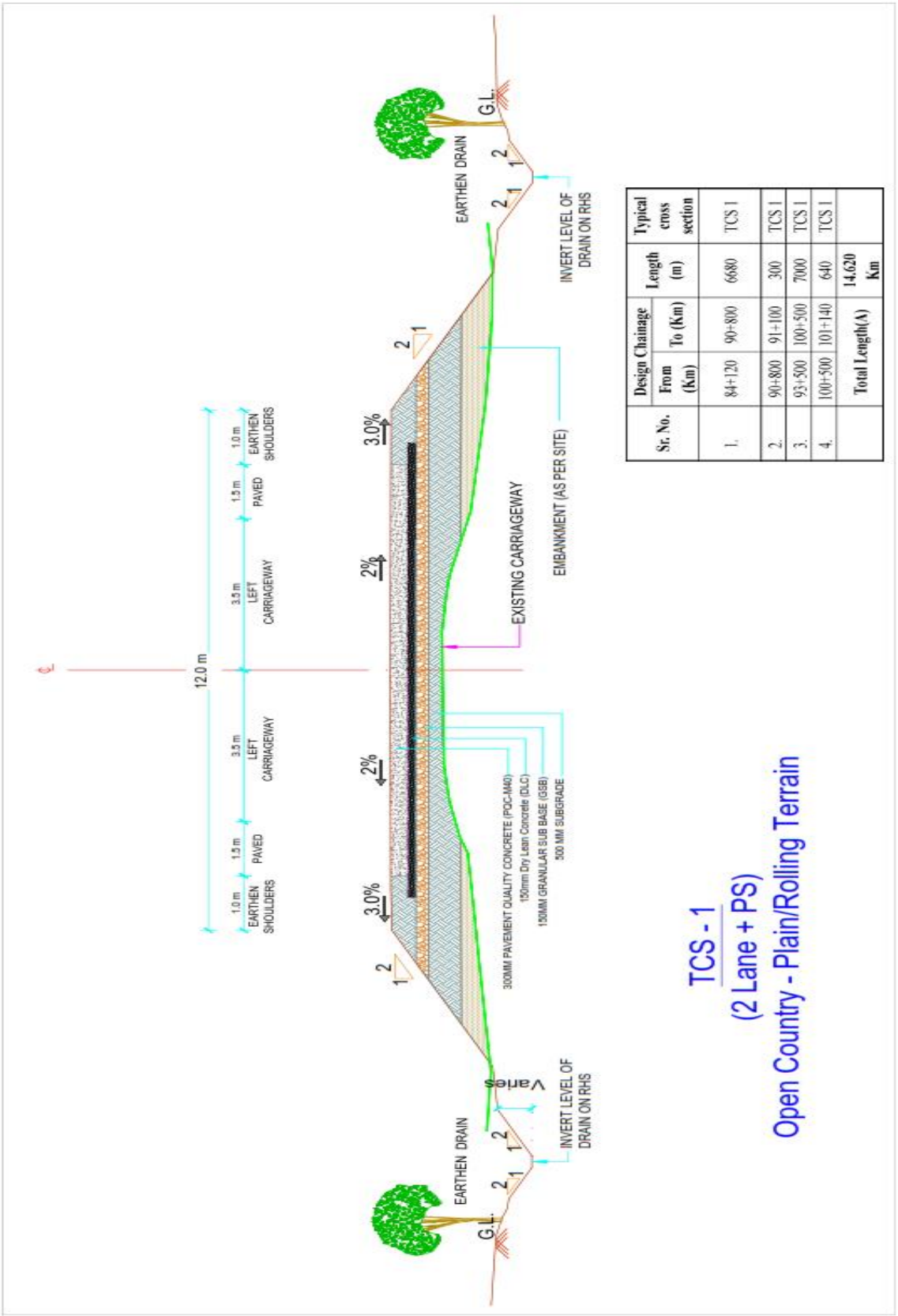
Rigid Pavement (4 Lane)

Sr. No.	Location	Design Chainage(km)		Length (m)	Carriageway Width (m)	Typical cross section
		From	To			
1	Satana	64+000	64+500	500.00	2x7=14m	TCS 3
2	Satana	64+500	65+250	750.00	2x7=14m	TCS 3
3	Satana	65+250	66+300	1050.00	2x7=14m	TCS 3
4	Satana	66+300	66+430	130.00	2x7=14m	TCS 3
5	Satana/ Morenagar	66+430	68+800	2370.00	2x7=14m	TCS 4
6		68+800	74+000	5200.00	2x7=14m	TCS 4
7	Thengode-Lohner	74+000	75+370	1370.00	2x7=14m	TCS 3
8		75+370	77+500	2130.00	2x7=14m	TCS 4
9	Aher Vasti	77+500	78+400	900.00	2x7=14m	TCS 4
10		78+400	80+050	1650.00	2x7=14m	TCS 4
11	Malwadi	80+050	80+300	250.00	2x7=14m	TCS 4
12		80+300	80+500	200.00	2x7=14m	TCS 4
13	Deola	80+500	82+650	2150.00	2x7=14m	TCS 3
14		82+650	84+120	1470.00	2x7=14m	TCS 4
	Total Length(C)			**20.120 Km**		

Total Length = A+B+C = 14.620 + 2.40 + 20.120 = 37.140 Km

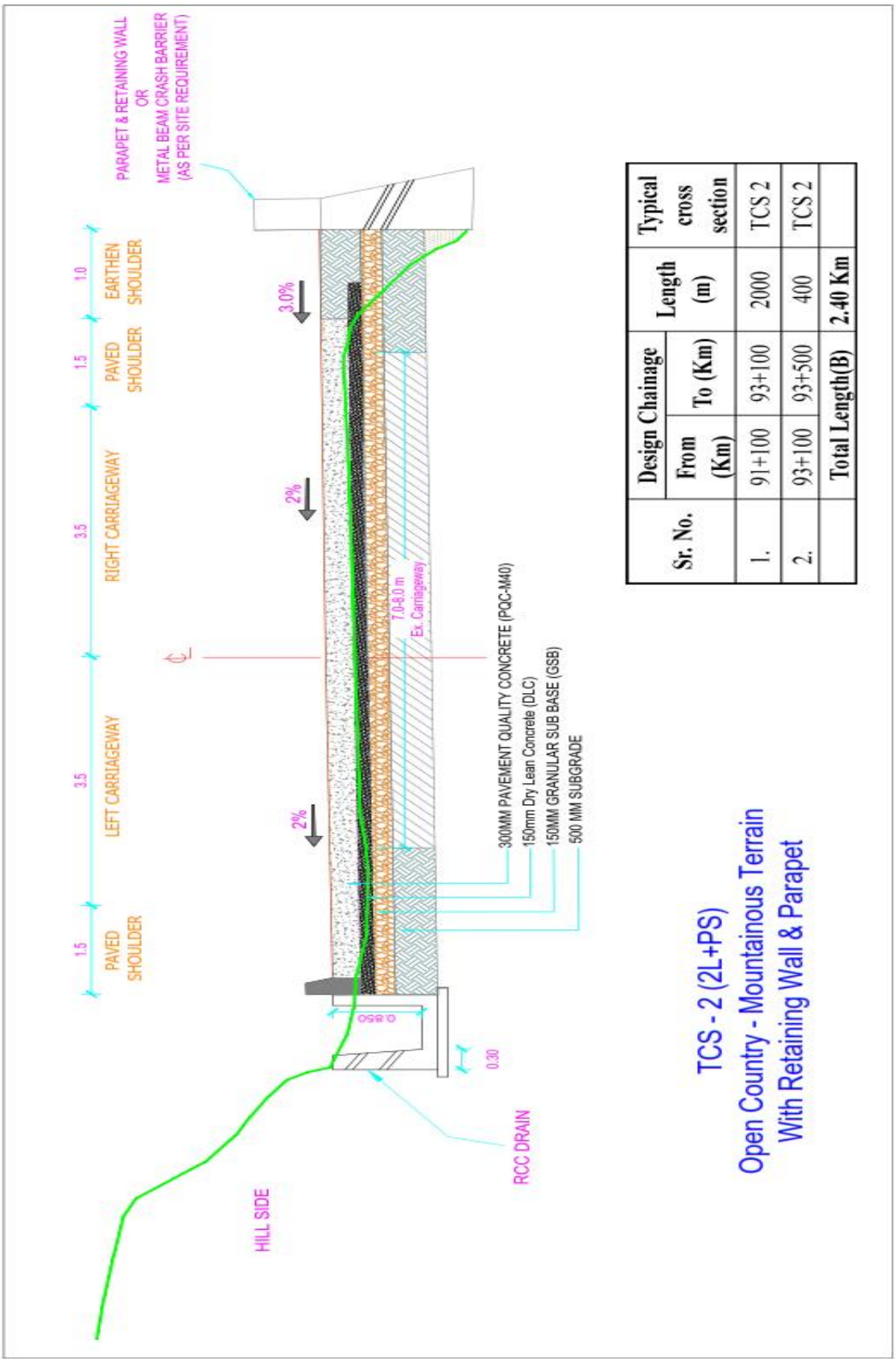
0.22 TYPICAL CROSS SECTION AND WIDENING SCHEME

TCS 1 for 2L+PS configuration for open area



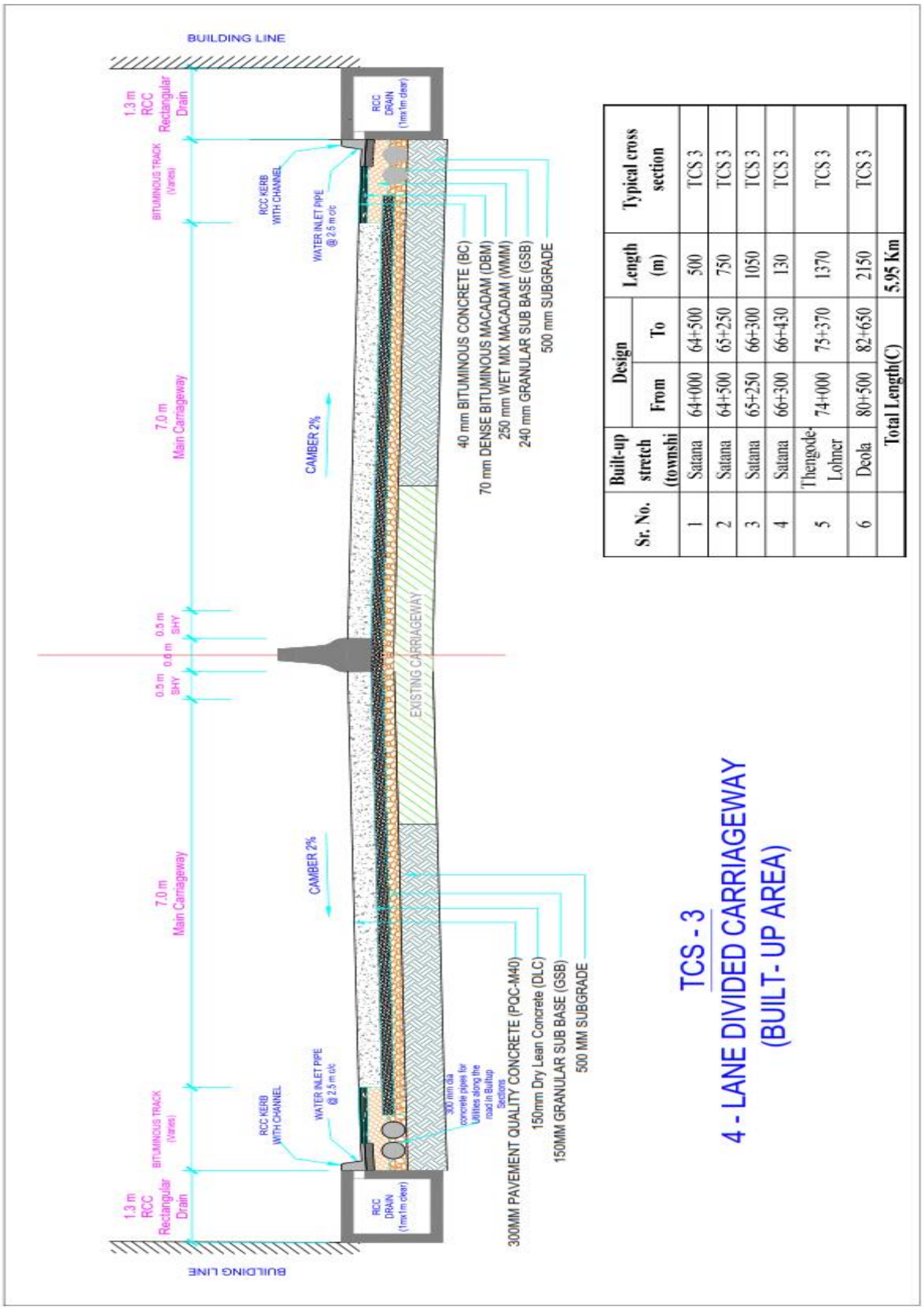
Sr. No.	Design Chainage From (Km)	Design Chainage To (Km)	Length (m)	Typical cross section
1.	84+120	90+800	6680	TCS 1
2.	90+800	91+100	300	TCS 1
3.	93+500	100+500	7000	TCS 1
4.	100+500	101+140	640	TCS 1
	Total Length(A)		14.620 Km	

TCS 2 for Rigid Pavement in hilly area



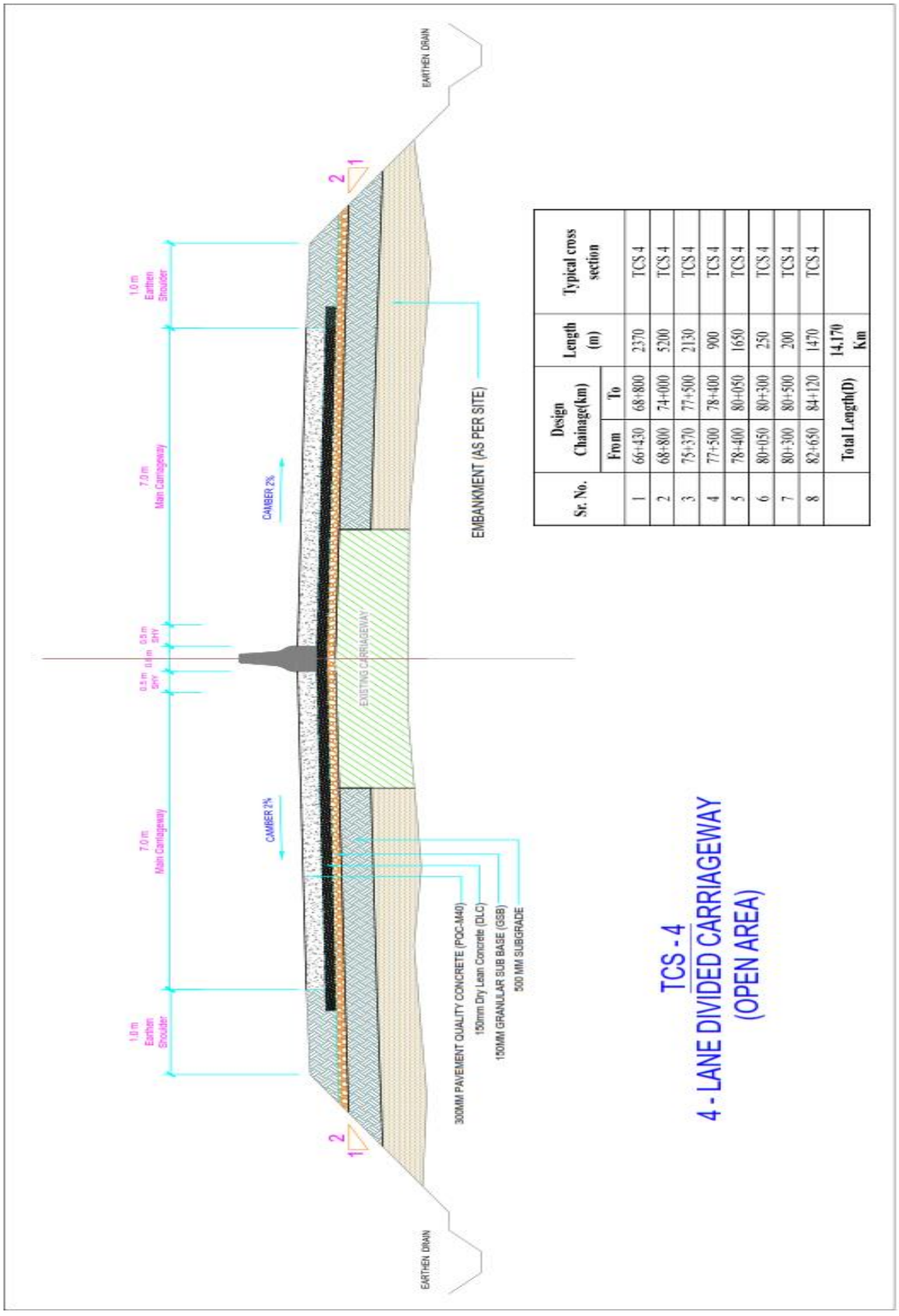
Sr. No.	Design Chainage		Length (m)	Typical cross section
	From (Km)	To (Km)		
1.	91+100	93+100	2000	TCS 2
2.	93+100	93+500	400	TCS 2
	Total Length(B)		2.40 Km	

TCS 3 for 4L configuration in builtup area with drain



Sr. No.	Built-up stretch (townshi	Design From	Design To	Length (m)	Typical cross section
1	Satana	64+000	64+500	500	TCS 3
2	Satana	64+500	65+250	750	TCS 3
3	Satana	65+250	66+300	1050	TCS 3
4	Satana	66+300	66+430	130	TCS 3
5	Thengode-Lohner	74+000	75+370	1370	TCS 3
6	Deola	80+500	82+650	2150	TCS 3
	Total Length(C)			5.95 Km	

TCS 4 for 4L configuration in open country



Sr. No.	Design Chainage(km)		Length (m)	Typical cross section
	From	To		
1	66+430	68+800	2370	TCS 4
2	68+800	74+000	5200	TCS 4
3	75+370	77+500	2130	TCS 4
4	77+500	78+400	900	TCS 4
5	78+400	80+050	1650	TCS 4
6	80+050	80+300	250	TCS 4
7	80+300	80+500	200	TCS 4
8	82+650	84+120	1470	TCS 4
	Total Length(D)		14.170 Km	

0.23 COST ESTIMATE

The total project cost is calculated based on the quantity of individual item multiplied by the rate for this item and summing up the cost of all the items.

The Project road has been considered as one homogenous section and the bill wise total project cost is tabulated in Table below for all the packages of the project.

The Cost estimate is based on rates of State PWD e-SSR 2021-22 and Rate Analysis on MoRT&H Standard Data Book (2nd Revision).

Sr. No.	Items	Cost in Rupees	Cost in crore
A1	**Widening and Upgradtion of existing road**		
1	Site Clearance including dismantling	17064941.6	1.71
2	Earthwork	358364514.8	35.84
3	Granular work (sub-base, base, shoulders)	255118128.1	25.51
4	Bituminous work		
	(a) BC	9449552	0.94
	(b) DBM	15745128	1.57
	Total Bituminous Work	**25194680**	**2.52**
5	Cement Concrete pavement work		
	(a) PQC	1261953402	126.20
	(b) DLC	307850211.5	30.79
	Total CC Work	**1569803613**	**156.98**
6	Slip Roads	0	0.00
	Sub total A1	**2225545878**	**222.55**
A2	**Major Bridge Works**	**95387109.75**	9.54
	Sub total A2	**95387109.75**	**9.54**
A3	**Culverts, minor bridges, underpasses, overpasses on existing road, realignments and bypasses:**		
1	Culverts	106286943	10.63
2	Minor bridges	156607807.2	15.66
3	Cattle / Pedestrian underpass (Foot Under Bridge)	12575980	1.26
4	Pedestrian overpass	0	0.00
5	Grade Separated structures	0	0.00
6	Light Vehicular Underpass (LVUP)	0	0.00
7	Overpass	0	0.00
	Sub total A3	**275470730.2**	**27.55**
A4	**OTHER WORKS**		
1	Toll Plaza	56232413.46	5.62
2	Road side drains	107313592.2	10.73
3	Protection Works (Retaining Wall, Toe Wall, Pitching of Stone)	53007915.05	5.30
4	W metal Beam Crash Barrier	13335000	1.33
5	Road signs, markings, km stones, Boundary stones, safety devices, utility ducts etc.	43124522	4.31
6	Bus Bays, Bus Shelter and Truck lay Bay	38830823.12	3.88
7	NJ Type Barrier for Median/Divider @ 4 Lane Locations	63297570.06	6.33
8	Junctions	110609168.5	11.06
9	Street Lighting in Towns	13601077.6	1.36
10	Utility Duct (Across the Road & Along Builtup Sections)	24631650.17	2.46
11	Horticulture (Tree Plantation & Its maintenance)	0	0.00
11	Utility Shifting Cost		
	a. Electrical works	72249661	7.22

Sr. No.	Items	Cost in Rupees	Cost in crore
	b. Water supply works	37912514.67	3.79
	Sub total A4	**634145907.8**	**63.41**
A	CIVIL COST (A) = A1+A2+A3+A4	3230549625	323.05
B	Add GST @12% of civil cost	387665955	38.77
C	**Cost of Civil Works including GST (C)**	3618215580	361.82
D	Maintenance Charges @ 5% of C	180910779	18.09
E	Contingencies @ 1% of (A)	32305496.25	3.23
F	Agency Charges 3% on (A)	96916488.76	9.69
G	Supervision 3% on (A)	96916488.76	9.69
H	Price Escalation @ 5% on C	180910779	18.09
I	**Total project cost**	4206175612	420.62
J	Land Acquisition	71648843.88	7.16
K	Tree Cutting and Compensatory Plantation	10146017	1.01
L	**Total Capital cost of the project**	**4287970473**	**428.80**

0.24 CURVE IMPROVEMENT AND LAND REQUIREMENTS

Land Acquisition (LA) has been proposed 18.73 % in realigned & geometrical improvement for certain sections.

Accordingly, PWD(NH) has proposed provision of 7.165 crores for LA. The details of Land available and required to be acquired are as under:

Total Land required = 90.049 Ha,

Total Land available =83.81 Ha,

Total Land to be acquired= 6.241 Ha,

a) Private Land= 4.17 Ha.

b) Forest Land= 2.07 Ha.

Bifurcation of land acquisition is as follows:

Realignment- 1.78 Ha. (Length=1.13 Km)

Curve Improvement- 0.44 Ha (Length=0.675 Km)

Toll Plaza= 1.56 Ha (Length=0.330 Km)

Cross Section Fitting = 2.45 Ha (Length=4.82 Km)

In this package section 81.27 % of land is available for improvement development. Remaining land shall be required for which land acquisition process is in progress.

Total Land required is 6.241 Ha. At Present 3A is submitted to PWD(NH).

SALIENT FEATURES

Sr. No.	Particulars	Discription
1.	Length of the project	37.140 Km
2.	Existing ROW	
	(i) Minimum	10.00m
	(ii) Maximum	32.00m
	(iii) Average	24.0m
3.	Existing Carriage way	Length of 2 lane with PS (14.38 Km)
		Length of 2 lane (22.042km)
		Length of Four lane (0.85 Km)
		Total length = 37.272 km
4.	Improvement proposal	2L+PS (1.5m)= 14.620 km
		4L= 20.120 km
		2L+PS(1.5m) in Hilly Terrain = 2.40 Km
		Total length= 37.140 km
5.	Traffic	At Km 64+500 (Near Satana) = 11386 PCU/Day At Km 80+000 (Before Deola) = 12865 PCU/Day At Km 95+000 (Before Mangrul) = 7675 PCU/Day
6.	Land Acquisition details	Total Land required = 90.049 Ha,
		Total Land available =83.81 Ha
		Total Land to be acquired= 6.241 Ha,
		Cost of LA= 7.165 Cr.
		Land available in terms of linear length is 81.27 %
7.	Utility shifting details	Cost = 11.01 crore
		(i) Water line= 3.79 Cr.
		(ii) Electric Line= 7.22 Cr
8.	Forest clearance and Tree Cutting	Project road passes through forest in 2.40 Km length in which geometry is improved as per minimum requirement. Forest Proposal No. FP/MH/ROAD/151377/2022 is submitted to the forest department.
9.	Cost	(i) Total Civil cost= 361.82 Cr including GST
		(ii) Total Project cost= 420.62 Cr
		(iii) Total Capital cost= 428.80 Cr.
10.	Earthwork up to the top of subgrade	35.836 crore
11.	Major Bridges	Existing = 02 Nos (Existing 2X2 lane bridge in one location), Proposed = 01 Retained with repair, 01 No. Reconstruction
12.	Minor Bridges	Existing = (15 nos),
		To be retained – 6 nos., Reconstruction – 5 nos. Widening – 4 nos. New Construction – 5 nos. Total Proposed – 20 nos.
13.	Culverts (Pipe & Slab)	Existing = 61 Nos (8 Slab, 53 HPC)
		Proposed = (13 Slab+48 HPC)=61 Nos
14.	Pedestrian Underpass	Existing = 2 Nos.
		Proposed = 2 (Widening)
15.	VUP	Existing = Nil
		Proposed = NIL

Sr. No.	Particulars	Discription
16.	ROB/Level Crossing	Existing = Nil
		Proposed = NIL
17.	Foot Over Bridge	Existing = 1 (to be Retained Near Satana)
		New Proposed = Nil
18.	Major & Minor Road Junctions	Existing = 08 Major, 17 Minor (Retained with improvement).
19.	Toll Plaza	01 at location 93+700 (Proposed)