EXECUTIVE SUMMARY

0.1 BACKGROUND

MPRDC a Premier Corporation of the Govt. of M.P. engaged in the reconstruction and widening of State Highways/ Major Districts roads across the state, intends to across the services of technically experts consultancy firm to prepare Feasibility report for Two/Four lanning with paved shoulder configuration including project design, planning and project preparation, surveys, devise suitable financing model and contract award structure for making the project viable under Private Sector Participation, bid management and preparation of tender documents, to perform detail engineering for the project including detailed cost estimates and land acquisition plans etc.

0.2 CONSULTANCY SERVICES

Consultant is to provide the Consultancy Services for Preparation of feasibility study & detailed project report for Widening of Road to suitable Lane Configuration i/c Construction of Bridges & Culvert.

The consultant has to ensure:

- enhanced safety and level of service for the road users;
- superior operation and maintenance enabling enhanced operational efficiency of the Project;
- minimal adverse impact on the local population and road users due to road construction;
- minimal adverse impact on environment;
- Minimal additional acquisition of land.

0.2.1 Objectives

- The main objective of the consultancy is to establish the technical, economical and financial viability of the project and prepare Detailed Project Report for rehabilitation and up gradation of the existing road to 2-lane / 4-lane with paved shoulder configuration and/ or it strengthening.
- The viability of the project shall be established taking into account the requirements with regard to rehabilitation, upgrading and improvement based on highway design, pavement design, provision of services 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 work, cost estimates and economic analysis.
- The Detailed Project Report would inter-alia include detailed highway design, design of pavement and overlay with options for flexible or rigid pavements, design of bridges and cross drainage structures and grade separated structures, design of service roads, quantities of various items, detailed working drawings, detailed cost estimates, economic and financial viability analyses, environmental and social feasibility, social and environmental action plans as appropriate and documents required for tendering the project on commercial basis for intonations/ local

competitive bidding.

- The detailed project preparation incorporating aspects of value engineering, quality audit and safety audit requirement in design and implementation.

0.2.2 Scope of Services

The Scope of Services, inter-alia, covers the following main activities:

(i) Traffic surveys and demand assessment

(ii) Engineering surveys and investigations.

(iii) Location and layout of toll plazas

(iv) Location and layout of truck lay byes

(v) Location and layout of bus bays and bus shelters

(vi) Social impact assessment

(vii) Environment impact assessment& obtaining TOR from MoEF for environmental clearance and conduct Public hearing. Consultant shall complete the process of final environmental clearance from MoEF.

(viii) Preliminary Designs of road, bridges, structures, etc. including GAD of ROB's and RUB's. The consultant shall be responsible for getting approval of Railways for GAD's of ROB/RUB's.

(ix) Preparation of Land Plan Schedules as per revenue records. Preparation of Land documents to publish notification of various stages as per Land Acquisition Act.

(x) Preparation of proposal of forest land diversion as per forest conservation act and obtaining clearance from MoEF.

(xi) Preparation of proposal for obtaining clearance from State Wild Life Board and National Wild Life Board.

(xii) Preparation of strip plan for relocation of utility shifting and their estimates for relocation approved by concerned Competent Authority.

(xiii) Preparation of indicative BOQ and rough Cost Estimates

(xiv) Financial analysis to assess the viability of the project.

(xv) Preparation of Schedules A, B, C, D and H of the Concession Agreement.

(xvi) Survey & Investigation of bypasses on the alignment.

(xvii) Obtaining Project related clearances from the concerned department/agencies like MOEF, Pollution control board, forest, wild life boards, Railways etc.

0.3 PROJECT ALIGNMENT DESCRIPTION

- The Project road **Siddikaganj-Hatpipaliya Road** is Ex. MDR.
- The Existing Length of the Project road is Km 21.236.
- The Project Corridor starts in Siddikaganj from Km Stone 98/127, at T-Junction (LHS-Kannod& RHS-Astha) of SH-41 of Latitude & Longitude (22° 52'20.72"N& 76° 46'6.58"E). The Road Terminates at Hatpipaliyaon Km Stone-27, of Latitude & Longitude (22° 51'14.62"N& 76°31'40.65"E) of SH-41.

Figure02:-Start & End point of the project road

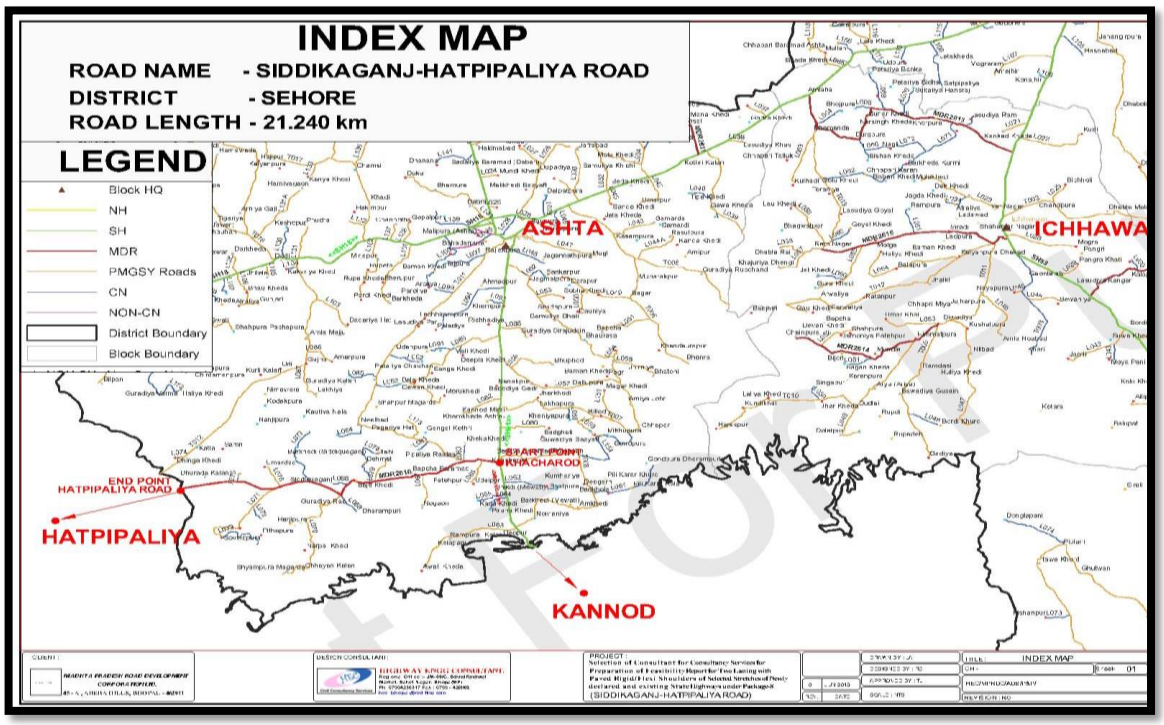
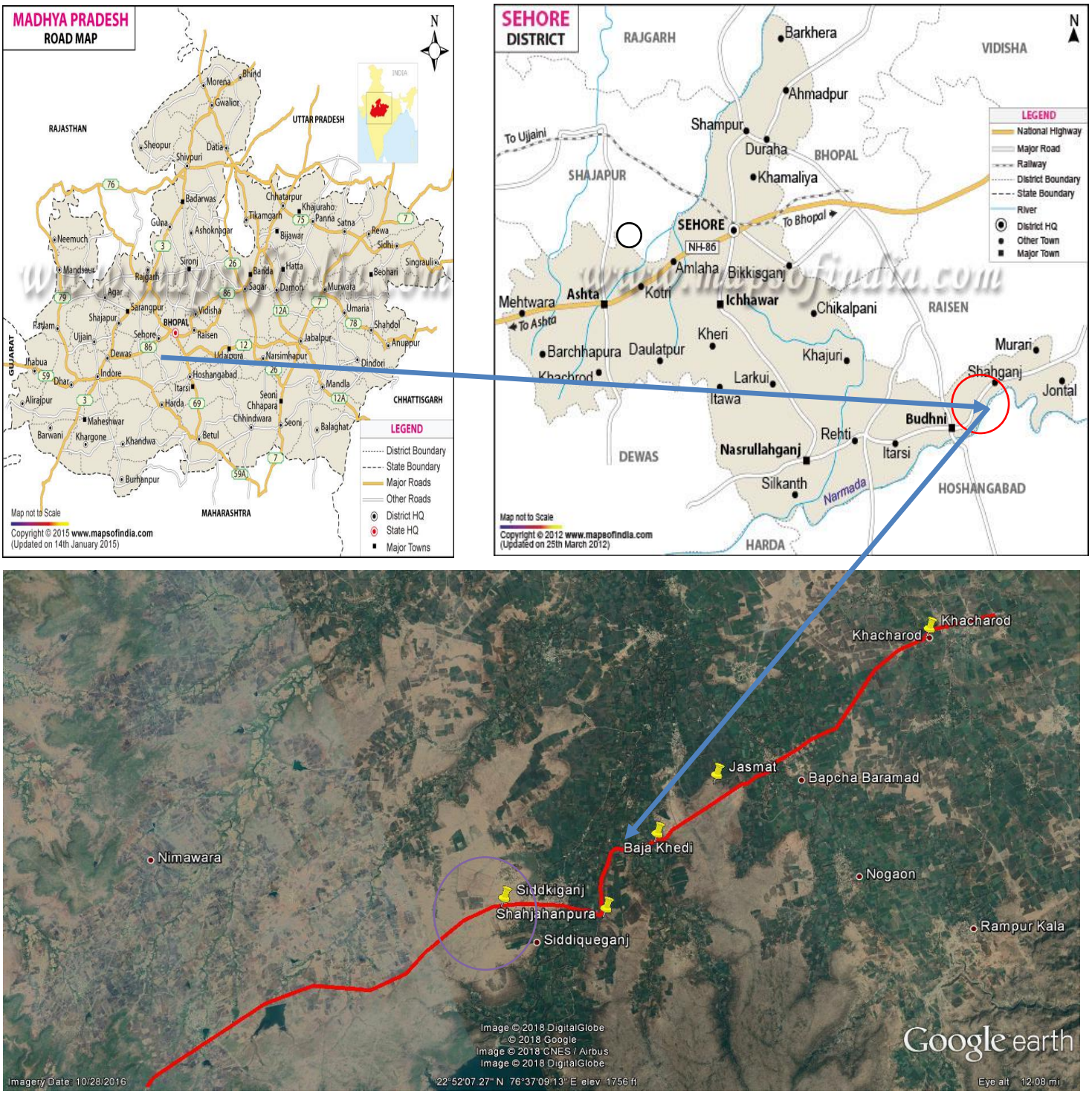


Figure 0.3:- Location Map showing Project Road

Figure 0.4:-Location Map showing Project Road



0.3 CHAINAGE REFERENCES (EXISTING v/s DESIGN)

Table 0.1:- Chainage References

Sr. No.	Existing Chainage	Design Chainage	Locations
1.	00+000	00+000	Start Point of Road (Khacharod Village)
2.	05+000	05+000	Bapcha Baramda village
3.	11+600	11+605	Siddikaganj village
4.	19+400	19+405	Dhurada kalan

0.4 RIGHT OF WAY [ROW]

Available ROW is 12-15m in Built up Area and 15-20 in Open Area along the project corridor.

0.5 ABUTTING LAND USE PATTERN

The existing alignment is a link between Kachrod, Siddikiganj, Duralakala.The pattern on both side of road is agricultural/open and built-up. The details of land use pattern along the project road are-

Built-up	-	13 %
Agricultural	-	49%
Forest	-	38%

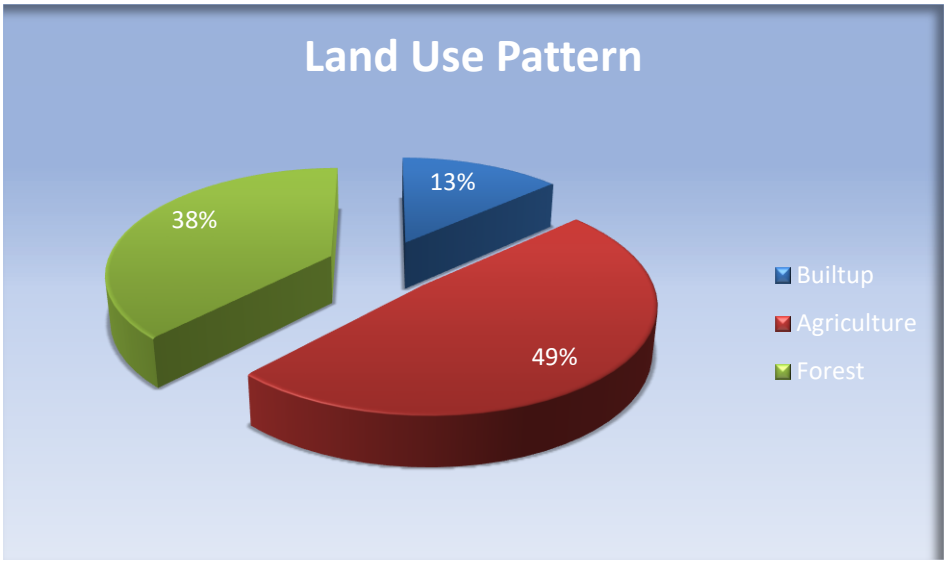


Figure0.5: Land Use Pattern

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

Table 0.2:- Existing Land Use Pattern

Sr. No.	Existing Chainage		Length (m)	Design Chainage		Length (m)	Type of Terrain	Land Use	Name of village/ town
	Km	Km		Km	Km				
1	00+000	01+000	01+000	00+000	01+000	01+000	plain	BUILTUP	KACHROD
2	01+000	05+200	04+200	01+000	05+200	04+200	plain	AGRICULTURE	
3	05+200	05+900	00+700	05+200	05+900	00+700	plain	BUILTUP	BAPCHA BARAMDA
4	05+900	08+900	03+000	05+900	08+900	03+000	plain	FOREST	
5	08+900	11+600	02+700	08+900	11+605	02+705	plain	AGRICULTURE	
6	11+600	12+300	00+700	11+605	12+600	00+995	plain	BUILTUP	SIDDHIKIGANJ
7	12+300	16+300	04+000	12+600	16+300	03+700	plain	FOREST	
8	16+300	19+400	03+100	16+300	19+400	03+100	plain	AGRICULTURE	
9	19+400	20+000	00+600	19+400	20+000	00+600	plain	BUILTUP	DURALAKALA
10	20+000	21+236	01+236	20+000	21+240	01+240	plain	FOREST	

Figure 07:-Existing Pavement condition

Figure 08:-Existing Pavement condition

0.6 TERRAIN

The terrain is plane at most of the stretch and has normal gradient throughout the Plain and hilly portion terrain in **21+236.** The details of which are given below:

Table 0.3 – Detail of terrain

Sr. no.	Existing Chainage		Length (Km)	Design Chainage		Length (Km)	Type of Terrain
	Km	Km		Km	Km		
1	0+000	21+236	21+236	0+000	21+240	21+240	PLAIN

0.7 FOREST

Detail of forest land on the project highway as per site inspection – **8.038 km**

0.8 TRAFFIC

In this chapter, the report is concerned about **Siddikiganj-Hatpipaliya Road**. Traffic Survey Locations and Schedules were, as given below:-

Figure 09

Figure 10

Table 0.4 – Different Traffic surveys and their dates of commencement

Location	Date of Traffic Survey		Duration
	From	To	
Classified Traffic Volume Count			
4+000	20/04/2018	27/04/2018	7 Days/24 Hours
Axle load Survey			
4+500	21/04/2018	21/04/2018	24 Hours

The following ADT and PCU were observed on project road –

Table 0.5– Total ADT & PCU

Vehicle Category	AT Km 4+000	
	ADT	PCU
Two wheeler	391	196
Three Wheeler	7	4
Car/Jeep/Van/Taxi	36	36
Mini Bus	0	0
Bus	10	30
LCV	4	6
2 - Axle Truck	4	12
3 Axle Truck	4	12
Multi Axle Truck	0	0
Tractor with Trailer	8	37

Vehicle Category	AT Km 4+000	
	ADT	PCU
Tractor without Trailer	0	0
Total Fast Moving Vehicles (FMV)	**465**	**332**
Cycles	10	5
Cycle Rickshaw	0	0
Bullock Cart	0	0
Horse Drawn	0	0
Hand Cart	0	0
Total Slow Moving Vehicles	**10**	**5**
Total	**475**	**337**

The projected traffic growth rate is taken as 5%.

Table 0.6-ESAL Calculation

At Chainage - 4+000 Km

Year	Traffic						Growth Rate (%)								VDF						ESAL (MSA)	
	LCV	2-Axle	3-Axle	MAV	BUS	Tractor With Trailor	LCV	2-Axle	3-Axle	MAV	BUS	Tractor With Trailor	Lane Distribution Factor	Directional Distribution Factor	LCV	2-Axle	3-Axle	MAV	BUS	Traffic (CVD)	Yearly	Cummulative
Present Year-2018	4	4	4	0	10	8	5.00	5.00	5.00	5.00	5.00	5.00								30		
Base Year-2021	5	4	4	0	12	10	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0.000	1.238	23.642	8.611	0.000	25	0.02	**0.02**
Year-2022	5	5	5	0	12	10	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	27	0.02	**0.03**
Year-2023	5	5	5	0	13	11	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	28	0.02	**0.05**
Year-2024	6	5	5	0	13	11	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	29	0.02	**0.07**
Year-2025	6	5	5	0	14	12	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	31	0.02	**0.08**
Year-2026	***6***	***6***	***6***	***0***	***15***	***12***	***5.00***	***5.00***	***5.00***	***5.00***	***5.00***	***5.00***	***0.75***	***0.5***	***0***	***1.24***	***23.64***	***8.61***	***0***	***33***	***0.02***	***0.10***
Year-2027	7	6	6	0	16	13	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	34	0.02	**0.12**
Year-2028	7	6	6	0	16	13	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	36	0.02	0.15
Year-2029	7	7	7	0	17	14	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	38	0.02	**0.17**
Year-2030	8	7	7	0	18	15	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	40	0.02	**0.19**

Year	Traffic						Growth Rate (%)						Lane Distribution Factor	Directional Distribution Factor	VDF					Traffic (CVD)	ESAL (MSA)	
	LCV	2-Axle	3-Axle	MAV	BUS	Tractor With Trailor	LCV	2-Axle	3-Axle	MAV	BUS	Tractor With Trailor			LCV	2-Axle	3-Axle	MAV	BUS		Yearly	Cummulative
Year-2031	***8***	***7***	***7***	***0***	***19***	***16***	***5.00***	***5.00***	***5.00***	***5.00***	***5.00***	**5.00**	***0.75***	***0.5***	***0.00***	***1.24***	***23.64***	***8.61***	***0.00***	***41***	***0.02***	***0.22***
Year-2032	8	8	8	0	20	16	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	44	0.03	**0.24**
Year-2033	9	8	8	0	21	17	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	46	0.03	**0.27**
Year-2034	9	8	8	0	22	18	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	48	0.03	**0.30**
Year-2035	10	9	9	0	23	19	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	50	0.03	**0.33**
Year-2036	***10***	***9***	***9***	***0***	***24***	***20***	***5.00***	***5.00***	***5.00***	***5.00***	***5.00***	**5.00**	***0.75***	***0.5***	***0.00***	***1.24***	***23.64***	***8.61***	***0.00***	***53***	***0.03***	***0.36***
Year-2037	11	10	10	0	25	21	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	56	0.03	**0.39**
Year-2038	11	10	10	0	27	22	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	58	0.03	**0.43**
Year-2039	12	11	11	0	28	23	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	61	0.04	**0.46**
Year-2040	13	11	11	0	29	24	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	64	0.04	**0.50**
Year-2041	***13***	***12***	***12***	***0***	***31***	***25***	***5.00***	***5.00***	***5.00***	***5.00***	***5.00***	**5.00**	***0.75***	***0.5***	***0.00***	***1.24***	***23.64***	***8.61***	***0.00***	***68***	***0.04***	***0.54***
Year-2042	14	12	12	0	32	27	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	71	0.04	**0.59**
Year-2043	15	13	13	0	34	28	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	74	0.04	**0.63**
Year-2044	15	14	14	0	36	29	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	78	0.05	**0.68**
Year-	16	14	14	0	37	31	5.	5.0	5.0	5.	5.	5.00	0.75	0.5	0	1.2	23.	8.6	0	82	0.0	**0.73**

Year	Traffic						Growth Rate (%)						Lane Distribution Factor	Directional Distribution Factor	VDF					Traffic (CVD)	ESAL (MSA)	
	LCV	2-Axle	3-Axle	MAV	BUS	Tractor With Trailor	LCV	2-Axle	3-Axle	MAV	BUS	Tractor With Trailor			LCV	2-Axle	3-Axle	MAV	BUS		Yearly	Cummulative
2045							00	0	0	00	00					4	64	1			5	
Year-2046	17	15	15	0	39	32	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	86	0.05	**0.78**
Year-2047	18	16	16	0	41	34	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	91	0.05	**0.83**
Year-2048	19	17	17	0	43	36	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	95	0.06	**0.89**
Year-2049	19	18	18	0	45	38	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	100	0.06	**0.95**
Year-2050	20	18	18	0	48	39	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	105	0.06	**1.01**
Year-2051	21	19	19	0	50	41	5.00	5.00	5.00	5.00	5.00	5.00	0.75	0.5	0	1.24	23.64	8.61	0	110	0.07	**1.08**

0.9 PAVEMENT COMPOSITIONS

The existing crust of project alignment is in fair condition. The existing crust consists of BC, DBM, WMM & GSB.

The method of design followed is a modification of the CBR method incorporating mechanistic approach.

The traffic used in design is in terms of the cumulative number of standard axles to be carried during the design life of the road.

Use of the CBR method for pavement design, the sub grade strength of the new two lanes and widening were assessed in terms of the CBR value as per the procedure prescribed in the standards. (Details of samples taken & CBR values attached in material report table - 1.3)

Pavement design catalogues giving standard pavement compositions as given in IRC-37-2012 for various CBR values ranging from 2% to 10% six levels of design traffic 10,20,30,50,100 and 15O MSA are used with necessary extrapolations to obtain required pavement thicknesses.

It was found that suitable material for sub grade with 8% CBR is available at borrow areas.

Using 8% CBR for sub grade and from the curves as mentioned in IRC: 37- 2012 pavement thickness were computed for the relevant millions of standard axles and furnished in Table 0.7.

Pavement thickness required for the designed MSA and as per IRC guidelines is shown in following table-

Table – 0.7

Sr. No.	Section	Calculated MSA	Adopted MSA	CBR (%)	Pavement Composition (mm)			
					BC	DBM	WMM	GSB
1	**Km 4+000**	0.30	10	7%	40	50	250	230

0.10 PROPOSED BYPASSES /REALIGNMENT DETAILS

There no any bypass Proposed on the project road.

Table 0.8 (a) - Details of proposed Bypasses

S. No.	Design Chainage (Km)		Length (Km)	Remark
	Start	End		

NIL

Table 0.8 (b) - Details of Realignment

S. no.	Existing Chainage		Length (m)	Design Chainage		Length (m)	Area Required (Ha)
	Start	End		Start	End		
NIL							

0.11 ROAD JUNCTIONS/INTERSECTIONS

There are junctions which are very important. Their details are-

- **Major Junctions :**

Figure 11:-Major Junction at chaiage 0+000

Figure 12:-Major Junction at Chainage 21+238

Table 0.9- Details of Major Junctions

Sr. No.	Existing Ch. (Km)	Design Ch. (Km)	Type of Junction	Direction		Remark
				Towards LHS	Towards RHS	
1	00+000	00+000	T	KANNOUJ	ASTHA	

- **Minor Junctions :-**

Figure 13:- Minor Junction at chainage 8+050

Table 0.10-Details of Minor Intersections

Sr. No.	Existing Ch. (Km)	Design Ch. (Km)	Type of Junction	Direction		Remark
				Towards LHS	Towards RHS	
1	00+960	0+970	T		PRAGYA COLONY	
2	01+150	1+140	T	UDAIPUR		
3	02+150	2+150	T		PAGRIYAGHAT	
4	04+880	4+880	T	NOAGAON		
5	05+900	5+900	X	VILLAGE	VILLAGE	
6	08+050	8+050	T		JASMAT	
7	08+400	8+450	T		BAJAKHEDI	
8	10+850	10+850	Y	SHYAMPUR		
9	11+650	11+650	T		ASHTA	
10	11+800	11+800	T		VILLAGE	
11	11+950	11+960	T		VILLAGE	

Sr. No.	Existing Ch. (Km)	Design Ch. (Km)	Type of Junction	Direction		Remark
				Towards LHS	Towards RHS	
12	14+960	14+970	T		BARKHEDI	
13	15+340	15+340	T	GOVINDPURI		
14	17+750	17+740	T		JHAJHANPURI	
15	19+805	19+800	T		JAWAR	

0.12 ROAD SIDE DRAINS

V Shape PCC drains are provided in village portions, wherever required.
Details and dimensions are given in TCS of drain of roads.
Chainage wise details of V Shape PCC drain is given below-

Proposed Ch. (Km)		
From	To	Length (Km)
0+000	1+000	1+000
5+200	5+900	0+700
11+660	12+600	0+950
19+400	19+900	0+500
Total (Km)		**3+140**

Table – 0.11 Locations of Covered RCC Drains

0.13 SUBMERGENCE

Nil.

0.14 CROSS DRAINAGE WORKS

Bridges-

There are total existing 3 Minor Bridges out of which, 02 structures are reconstruction and 01 structure is under reconstruction.

S.no.	Existing Ch.	Design Ch.	Detail of Existing Structure			Proposal	Detail of Proposed Structure		
			Type of Structure	Span	Outer Width		Type of Structure	Span	Outer Width
1	1+100	1+100	vcw	7x1200	8.0	RECONSTRUCTION	MNB	2X10	12
2	1+750	1+775	HPC	4X900	7.5	RECONSTRUCTION	MNB	1X6	12
3	5+600	5+620	MNB	1X10	8.0	RECONSTRUCTION	MNB	1X10	12
4	8+700	8+715	HPC	3X1200	8.5	RECONSTRUCTION	MNB	1X6	12
5	9+080	9+080	MNB	3X6.8	7.0	RECONSTRUCTION	MNB	3X8	12
6	16+580	16+560	SKEW HPC	4X1200	8.0	RECONSTRUCTION	MNB	1X10	12
7	18+060	18+060	VCW	3X1200 + 1X1200	7.5	RECONSTRUCTION	MNB	1X6	12

Culverts

There are total existing 28 culverts out of which, 24 structures are reconstruction and 02 are for widening and 02 Structures are for retain.

Table 0.13- Details of culverts

S.no.	Existing Ch.	Design Ch.	Detail of Existing Structure			Proposal	Detail of Proposed Structure		
			Type of Structure	Span	Outer Width		Type of Structure	Span	Outer Width
1	2+500	2+505	HPC	2x900	7.5	RECONSTRUCTION	HPC	2X1200	12
2	3+300	3+325	HPC	2x1000	7.5	RECONSTRUCTION	HPC	2X1200	12
3	4+050	4+065	HPC	2x1000	7.5	RECONSTRUCTION	HPC	2X1200	12
4	4+200	4+225	HPC	1x1000	7.5	RECONSTRUCTION	HPC	1X1200	12
5	4+400	4+415	HPC	1X1000	7.5	RECONSTRUCTION	HPC	1X1200	12
6	4+600	4+610	HPC	1X100	7.5	RECONSTRUC	HPC	1X120	12

S.no.	Existing Ch.	Design Ch.	Detail of Existing Structure			Proposal	Detail of Proposed Structure		
			Type of Structure	Span	Outer Width		Type of Structure	Span	Outer Width
				0		TION		0	
7	4+920	4+935	HPC	2X900	7.5	RECONSTRUCTION	HPC	2X1200	12
8	5+150	5+170	HPC (CANAL)	2X1000	8.0	RETAIN	HPC (CANAL)	2X1000	12
9	6+450	6+430	HPC (CANAL)	2X1000	8.0	RECONSTRUCTION	HPC	2X1200	12
10	7+550	7+585	HPC	2X300	8.5	RECONSTRUCTION	HPC	2X1200	12
11	8+400	8+420	SKEW HPC (CANAL)	2X1000	9.5	RECONSTRUCTION	HPC	2X1200	12
12	9+400	9+415	HPC (CANAL)	1X1000	8.0	WIDENING	HPC (CANAL)	1X1200	12
13	9+520	9+540	HPC (CANAL)	1X1000	7.5	RETAIN	HPC (CANAL)	1X1000	12
14	10+100	10+120	HPC	1X600	7.5	RECONSTRUCTION	HPC	1X1200	12
15	10+300	10+290	HPC	2X300	7.5	RECONSTRUCTION	HPC	1X1200	12
16	10+880	10+880	HPC	2X900	8.5	RECONSTRUCTION	HPC	2X1.2	12
17	14+280	14+280	HPC	2X600	7.5	RECONSTRUCTION	HPC	1X1200	12
18	15+800	15+825	HPC	3X600	7.5	RECONSTRUCTION	HPC	3X1200	12
19	17+050	17+085	HPC	2X1200	7.5	WIDENING	HPC	2X1200	12
20	17+970	17+970	HPC	1X1000	7.5	RECONSTRUCTION	HPC	1X1000	12
21	19+050	19+070	HPC	1X900 + 1X600	7.5	RECONSTRUCTION	HPC	2X1200	12
22	19+950	19+950	vcw	3X900	7.5	RECONSTRUCTION	HPC	4X1200	12
23	20+480	20+480	vcw	3X600	7.5	RECONSTRUCTION	HPC	3X1200	12

0.15 RAILWAY TRACKS / CROSSINGS

No any Railway Crossing passes along the project corridor.

0.16 TOLL PLAZAS

- **Existing Toll Plaza** – Nil
- **Proposed Toll Plaza -** Nil

0.17 ROADWAY FACILITIES

(a) Way Side Amenities

There is not any proposal for way side amenities.

(b) Truck/Bus Lay Byes

Truck lay byes is not provided. Bus Lay Byes & Bus shelters are is not proposed for the project road.

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
- Origin-Destination and Commodity Movements Surveys
- Turning Movement Surveys
- Topographic surveys including GPS
- Longitudinal and Cross-Sections
- Details of utility Services and Other Physical Features
- Material Surveys & Investigations
- Borrow area Identification
- Road Inventory Survey
- Pavement Condition Survey
- Pavement Composition
- Pavement Structural Strength
- Subgrade Characteristics and Strength
- Culvert and Bridge Inventory Survey
- Hydraulic and Hydrological Investigations
- Geo-technical Investigations and Sub-Soil Exploration

0.20 DESIGN PARAMETERS

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

Table 0.14- Design Parameters

Sl. No.	Item	Plain/Rolling Terrain
1	Design speed (kmph)	80 Kmph - 100 Kmph.
2	Land width (m) Open / Built-up area	7.0 m/7.0 m
3	Width of carriageway (m)	7.0 m
4	Paved shoulders	2 x 1.5 m (Built-up)
5	Unpaved shoulders	2 x 1.5 m
6	Camber/cross fall	
(i)	Carriageway & paved shoulders	2.5%
(ii)	Earthen shoulders	3.5%
7	Maximum super elevation	7%
8	Minimum Radii of horizontal curves (m)	400m ruling /250m min.
9	Minimum length of curves (m)	150 m for every deflection angle of 50
11	Drains	As per Design
12	Sight Distance	As per IRC 73 & IRC 86
13	Gradient	
(i)	Ruling Gradient	3.33%
(ii)	Limiting Gradient	5%
(iii)	Exceptional Gradient	6.7%
14.	Vertical Clearance for power/ telecommunication lines Low Voltage up to 110 V Power Line up to 650V Electric Power line more than 650 V	 5.5m 6.0m 6.5m

0.21 RECOMMENDATIONS FOR CRUST

Depending upon detailed design for sections, the following lane configuration & pavement composition is proposed for Project Road.

Vehicle Damage Factor

The guidelines use Vehicle Damage Factor (VDF) in estimation of cumulative msa for thickness design of pavements. In case of cemented bases, cumulative damage principle is used for determining fatigue life of cementations bases for heavy traffic and for that spectrum of axle loads is required.

The Vehicle Damage Factor (VDF) is a multiplier to convert the number of commercial

vehicles of different axle loads and axle configuration into the number of repetitions of standard axle load of magnitude 80 kN. It is defined as equivalent number of standard axles per commercial vehicle. The VDF varies with the vehicle axle configuration and axle loading.

The equations for computing equivalency factors for single, tandem and tridem axles given below should be used for converting different axle load repetitions into equivalent standard axle load repetitions. Since the VDF values in AASHO Road Test for flexible and rigid pavement are not much different, for heavy duty pavements, the computed VDF values are assumed to be same for bituminous pavements with cemented and granular bases.

Single axle with single wheel on either side = $\left(\frac{\text{axle load in kN}}{65}\right)^4$

Single axle with dual wheels on either side = $\left(\frac{\text{axle load in kN}}{80}\right)^4$

Tandem axle with dual wheels on either side = $\left(\frac{\text{axle load in kN}}{148}\right)^4$

Tridem axles with dual wheels on either side = $\left(\frac{\text{axle load in kN}}{224}\right)^4$

Computation of Design Traffic

The design traffic in terms of the cumulative number of standard axles to be carried during the design life of the road should be computed using the following equation:

$$N = \frac{365 \times [(1+r)^n - 1]}{R} \times A \times D \times F$$

Where,

N = Cumulative number of standard axles to be catered for in the design in terms of Msa.

A = Initial traffic in the year of completion of construction in terms of the number Commercial Vehicles per Day (CVPD).

D = Lane distribution factor (as explained in Para 4.5.1 of IRC 37: 2012).

F = Vehicle Damage Factor (VDF).

n = Design life in years.

r = Annual growth rate of commercial vehicles in decimal (e.g., for 5 per cent annual growth rate, r = 0.05).

The traffic in the year of completion is estimated using the following formula:

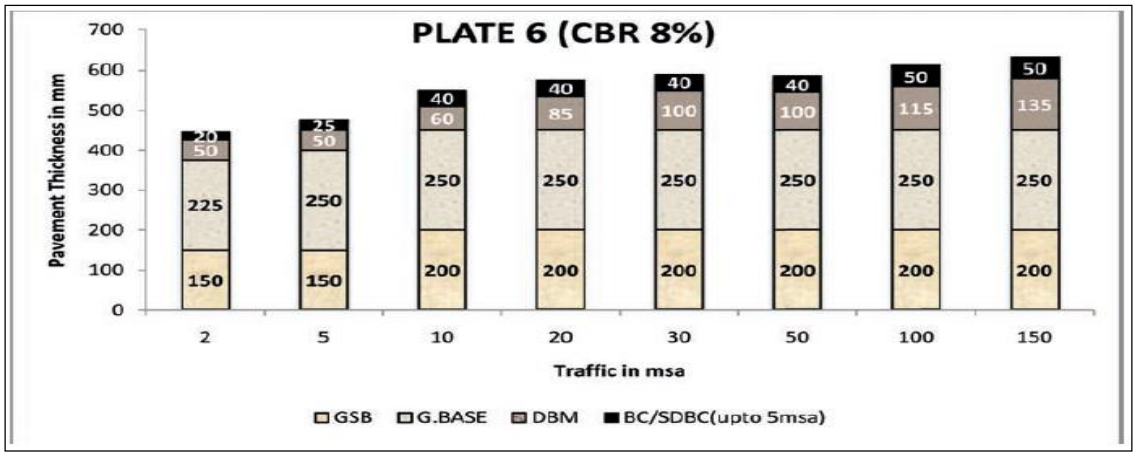
$A = P(1 + r)^x$

Where,

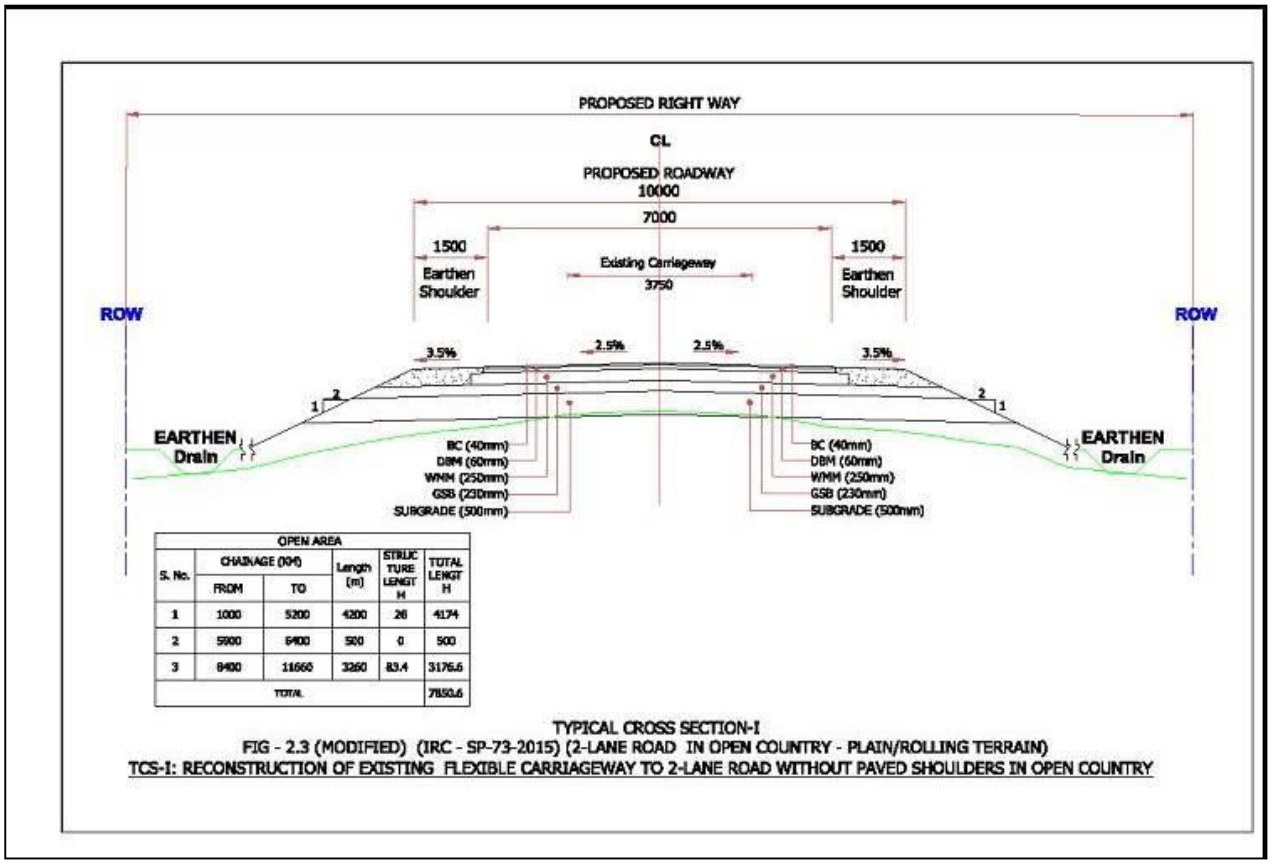
P = Number of commercial vehicles as per last count.

x = Number of years between the last count and the year of completion of construction.

From IRC 37:2012(**PLATE 6)**



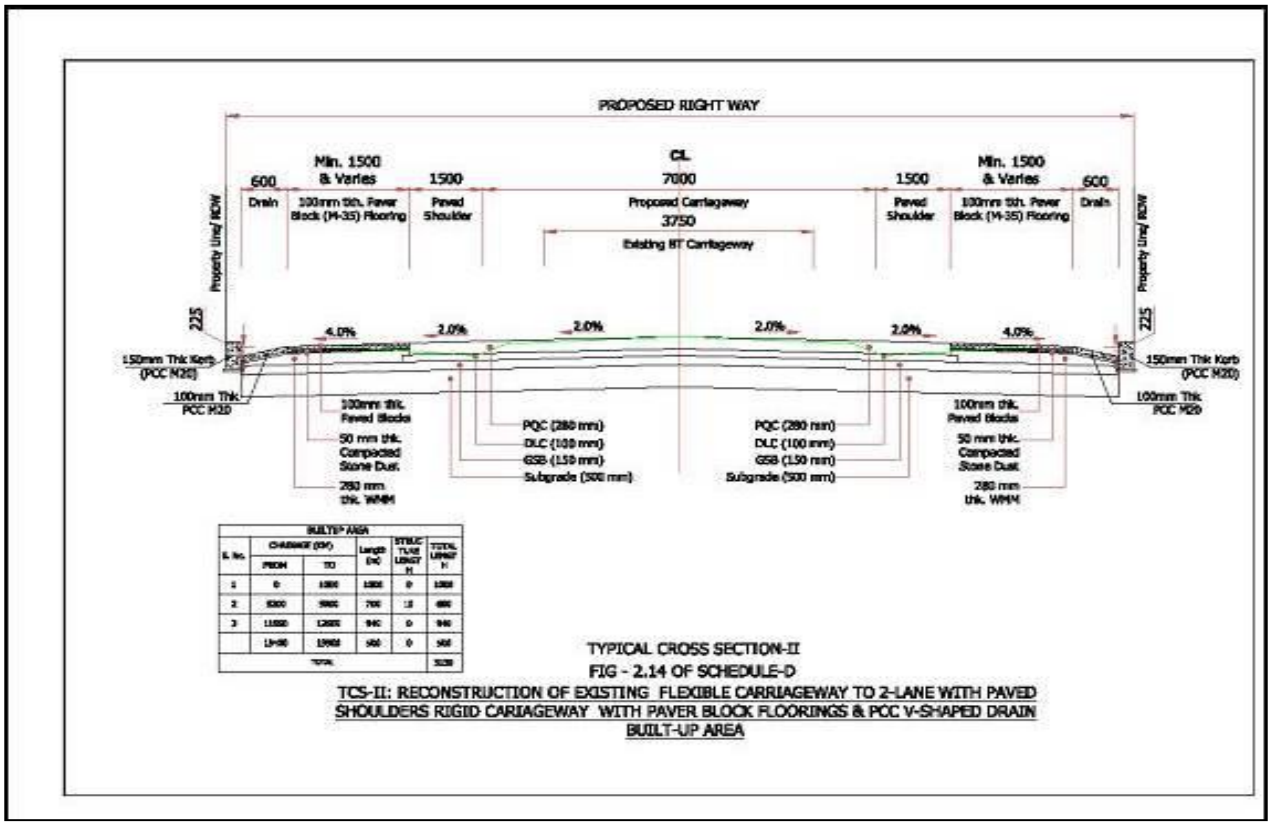
0.22 TCS for Open Area



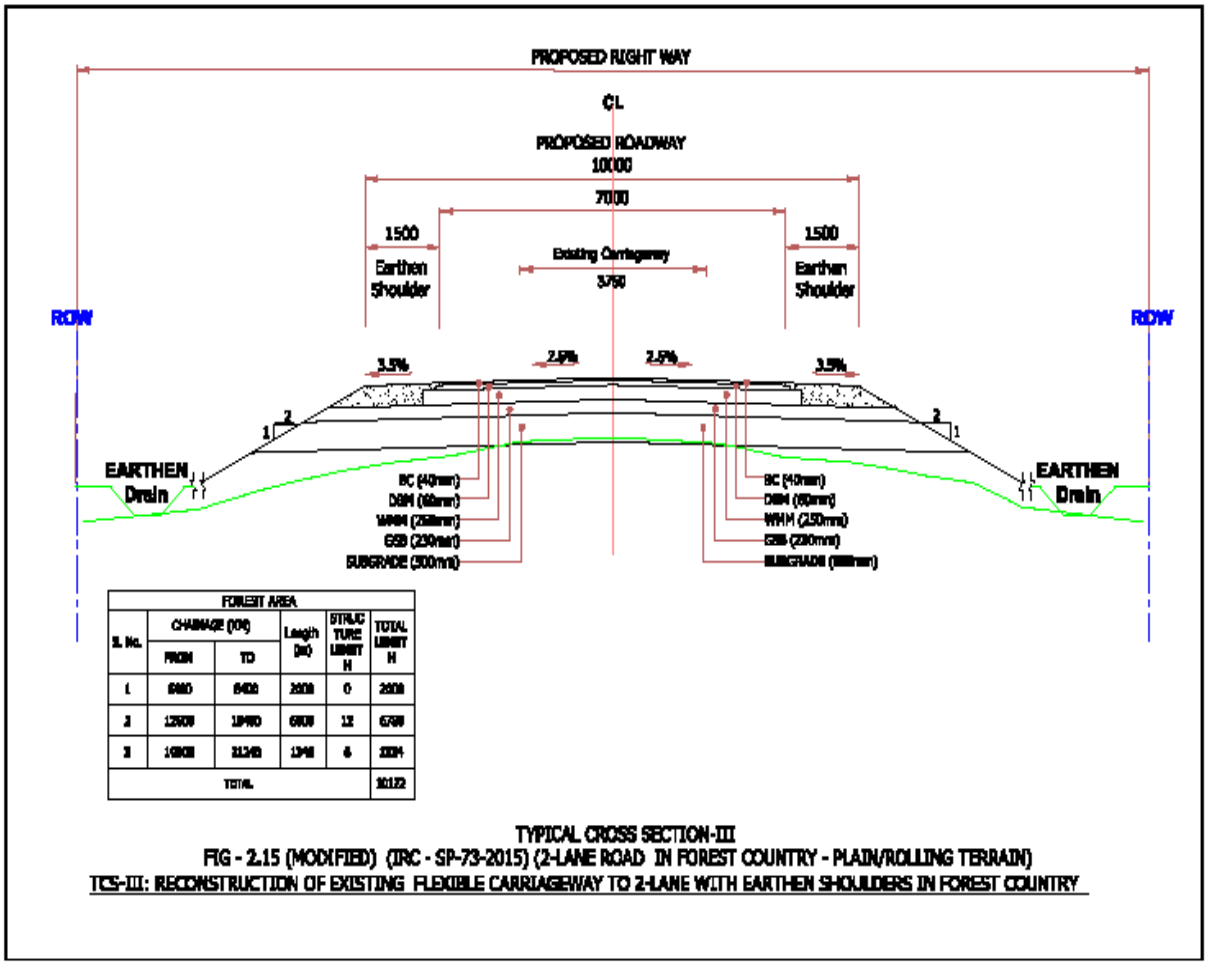
OPEN AREA					
S. No.	CHAINAGE (KM)		Length (m)	STRUCTURE LENGTH	TOTAL LENGTH
	FROM	TO			
1	1000	5200	4200	26	4174
2	5900	6400	500	0	500
3	8400	11660	3260	83.4	3176.6
TOTAL					7850.6

TYPICAL CROSS SECTION-I
FIG - 2.3 (MODIFIED) (IRC - SP-73-2015) (2-LANE ROAD IN OPEN COUNTRY - PLAIN/ROLLING TERRAIN)
TCS-I: RECONSTRUCTION OF EXISTING FLEXIBLE CARRIAGEWAY TO 2-LANE ROAD WITHOUT PAVED SHOULDERS IN OPEN COUNTRY

0.23 TCS for Built-Up Area



0.24 TCS for Forest Area



FOREST AREA					
S. No.	CHAINAGE (KM)		Length (m)	STRUCTURE LIBERTH	TOTAL LIBERTH
	FROM	TO			
1	6480	8400	2808	0	2808
2	12600	18480	6808	12	6788
3	19808	21240	1348	6	1304
TOTAL					10122

TYPICAL CROSS SECTION-III
FIG - 2.15 (MODIFIED) (IRC - SP-73-2015) (2-LANE ROAD IN FOREST COUNTRY - PLAIN/ROLLING TERRAIN)
TCS-III: RECONSTRUCTION OF EXISTING FLEXIBLE CARRIAGEWAY TO 2-LANE WITH EARTHEN SHOULDERS IN FOREST COUNTRY

0.24 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.

Table 0.18- Abstract of Cost Estimate

Madhya Pradesh Road Development Corporation Limited, Bhopal			
Road Name : Siddiqiganj To Hatpipaliya			
Section : Siddiqiganj To Hatpipaliya (from km 0 to km 21240)			
Two Lane Flexible Carriageway		**Length= 21.240 Kms.**	
SUMMARY			
Bill No.	**Description**	**Amount in Figure (INR)**	**Amount in Cr.**
A	**Civil Works**		
	(a) Road Works		
1	Site-Clearance	2285032.37	0.229
2	Earthwork	36741575.17	3.674
3	Sub-base, Base Courses	96472494.08	9.647
4	Bituminous & Cement Concrete Pavement	149476051.33	14.948
5	Traffic Signs, Marking and Road Appurtenances	12815403.75	1.282
6	Horticulture	6686138.00	0.669
7	Miscellaneous Items	16576305.01	1.658
8	Other Facilities & Protection Works		
	(8.1) Paver Block Flooring with Compacted Dust	7145790.00	0.715
	(8.2) PCC V-Shaped Drain in Built-up Area	6785395.09	0.679
	(8.3) RCC Drain in Built-up Area	0.00	0.000
	(8.4) Bus Stop	948488.48	0.095
	(8.5) Junction Improvement	10240616.01	1.024
	(8.6) Protection Work (Retaining wall, Toe wall, Stone Pitching etc.)	0.00	0.000
9	**(b) Structure Works**		
	HPC	15526846.00	
	Slab Culverts	21465151.67	
	Box Culverts	0.00	0.000
	Minor Bridges	16443998.99	1.644
	Major Bridges	0.00	0.000
(A)	**Total Cost of Civil Works**	**399609285.94**	**39.961**
	Cost per Km	**18813996.51**	**1.881**
10	Add 8% for Contingencies/ Interest	31968742.88	3.197

11	O&M charges including Periodic Renewal during concession period 25% of Civil Cost	99902321.48	9.990
(B)	**Total (B)**	**131871064.36**	**13.187**
	Total Cost to be born by Developer (A+B)	**531480350.30**	**53.148**
	Cost per Km	**25022615.36**	**2.502**
	Cost to be Born by MPRDC		
12	Social Forestry @ 0.75% of civil cost	2997069.64	0.300
13	Training and Capacity Building of Engineer of MPRDC/Concessionaire/IE@ 0.05% of Civil Cost	199804.64	0.020
14	Development of E-Maintenance System @ 0.1% of Civil Cost	399609.29	0.040
15	Land Acquisition and R&R cost	0.00	0.000
16	Shifting of Electrical Lines	11988278.58	1.199
17	Shifting of Water Supply Lines/ Hand Pumps	7992185.72	0.799
18	Forest Clearance	1062000.00	0.106
	Total Cost to be Born by MPRDC	**24638947.87**	**2.464**
	Cost per Km	**1160025.79**	**0.116**
	Total Capital Cost of the Project	**556119298.17**	**55.612**
	Cost per Km	**26182641.16**	**2.618**