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प्रोजेक्ट पर विस्तृत टीप ।



सत्यमेव जयते

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण

National Highways Authority of India

(सड़क परिवहन और राजमार्ग मंत्रालय, भारत सरकार)

(Ministry of Road Transport and Highways Govt. of India)

कार्यालय परियोजना निदेशक, प.का.ई. कोरबा (छ.ग.)

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Project Name- Development of Economic corridor, Inter Corridors, Feeder Routes and National Corridors to improve the efficiency of freight movement in India under Bharatmala Pariyojana [Lot-3/Chhattisgarh/Packge-1(Urga- Pathalgaon Section of NH-130A Raipur Dhanbad Economic Corridor)]

JUSTIFICATION FOR LOCATING THE PROJECT IN FOREST AREA

The proposed project shall enhance and improve the current route between Urga and Pathalgaon which is two lane and proposed for 4- lane with paved shoulder. There is some of the locations present road is very narrow and zig-zag and thus needs to be straightened and propose widening from 2- lane to 4- lane which reduce the traffic congestion and enhance the traffic safety and mobility of the road users.

The current route between Urga and Pathalgaon measures about 106 km which shall be reduced up to 87.545 km (17.5 % reduction) with re-alignment/by-passes.

The Project will further have following benefits at national and regional level:

- **High-speed connectivity and access:** The projected corridor is a proposed economic corridor. This will avoid traffic congestion and speed-up the freight movement.
- **Aiding economic growth:** The seamless connectivity will provide better access to vehicles. The Project will reduce travel time and provide boost to trade and commerce linked to the regions connected through this economic corridor.
- **Growth of backward areas:** The biggest strength of the alignment is that it plans to cover backward districts of Chhattisgarh. As a result of connectivity and access to other parts of the country, these backward areas will be aided to integrate with rest of the world. Further, freight and passenger traffic on the economic corridor will help promoting ancillary economy of these regions.

- **Decongestion of existing Highways:** The proposed corridor will take away traffic pressures from existing highways passing through various cities. Also, long-distance traffic will shift to the proposed corridor, thereby leaving the existing NH and SH for regional and local usage.

- **Usage shift:** Long-distance traffic will shift from existing roads to the proposed Economic Corridor, resulting in lesser congestion on these highways.

- **Improved safety:** Due to access control, the Roadway & Travel Safety of the traffic connecting the cities will be enhanced as there will be minimum distractions & conflict zones.

- **Support to industry:** Different types of industries like Manufacturing, Tourism etc. along the proposed corridor will be facilitated in their business operation and reachability.

Hence, the proposed RoW which crosses the Reserve forest involving an area of 169.0231 ha has been chosen for the following reason s: -

- The proposed RoW involves minimum forest area.
- The proposed RoW involves minimum tree felling.
- The proposed RoW involves minimum number of crossings over streams, canals, and rivers.
- The proposed RoW involves minimum demolition of private and government structures.
- The proposed Road gradients are suitable for traffic.

Date:- 12/05/2023

Place:- Korba



(D.D.Parlawar)
Project director
NHAI, PIU Korba

Executive Summary

E. Executive Summary

E.1 General

- The Ministry of Road Transport & Highways (MoRT&H), Gov. of India, has announced a comprehensive programme to improve road connectivity across the nation under proposed Bharatmala Pariyojana. Many defined highway stretches totalling about 50,000 km are proposed to be developed as "Economic Corridors, Inter Corridors & Feeder Routes" under "Bharatmala Pariyojana".
- The Consultancy Services for preparation of DPR for development of Economic Corridors, Inter Corridors & Feeder Routes to improve the efficiency of freight movement in India (Lot-3/Chhattisgarh/Package-1) under Bharatmala Pariyojana for a total length of 405.04 km was awarded to M/s. Transys Consulting Pvt. Ltd., in association with Accrete Consulting Engineers (P) Ltd. by the National Highways Authority of India.
- The project road under consideration aims at developing Urga-Pathalgaon section of NH-130A in the state of Chhattisgarh to four lane access controlled Highway. The project highway alignment is green field in most of the length and starts from Chitapali village at ch. 8/150 of SH-04 and terminates near Turua Ama village, 10km away from Pathalgaon along NH-43 towards Jharkhand border. Length of proposed alignment is 87.545 km, whereas the existing length is 107.3km. This section is a part of Raipur-Dhanbad economic corridor.

E.2 Present Submission

- Final Feasibility Report (DFR) was submitted on 10/01/2019. This report had been prepared as per office memorandum no. NHAI/ Planning/ EC/ DPR/ 2016 dated 03.05.2018 issued by MORTH regarding "Design specifications for various category of roads under Bharatmala Pariyojana including Economic corridors and cost optimisation". Proposed ROW was 70m in Final feasibility stage.
- Subsequently, The Consultants presented the Final Feasibility Report in the presence of CGM, GM and PD PIU Bilaspur at NHAI HQ Delhi on 14.09.2018. Once the TOR for Environmental Clearance has been granted on 13 Aug 2019, it has been mentioned that the proposed ROW shall be restricted to 60m in general and 30m in forest area. The same has been approved from LA committee during the meeting held on 27.12.2019. Finally RO Raipur instructed to propose 45m ROW in forest area and 60m ROW in general vide letter to NHAI HQ dated 13.02.2020. Final Feasibility Report was submitted incorporating the above observations.
- Later on amendment in TOR (environmental clearance) was issued on 28.12.2020 stating that in general ROW shall be 60m and in forest area ROW may varies from 30m to 65m as per annexure 1 of amended TOR. The same has been approved from LA committee.



- Peer review has been made with Mr. A. K. Pandey and joint site visit was made on 28 and 29 of Aug 2021. Peer review observation was placed on 04.09.2021 and compliance of the observation replied by consultant on 24.09.2021.
- With a view of safety issue and maintenance issues in cutting stretch during operation stage, PD PIU Korba also suggested vide PIU letter 1254 dated 27.09.2021, to replace overpass with VUP so that main carriageway will be on embankment than on cutting. Also since the project road is passing through the forest area, it has been mandatory to provide elephant underpass on forest area, forest department suggested 12 nos of elephant underpasses where as earlier there are only 4 nos. Meanwhile CGM Tech NHAI HQ also visited site on 01.10.2021 and inspection note has been issued for compliance. So for these reasons, profile of the project road has been redesign.
- Hence ROW of the project road has been revised and proposals are made fit to the amended ROW and **Final Detailed Project Report has been prepared. For present submission.**
- This Final Detailed Report is being submitted in response to the Terms of Reference Clause 10.7, Stage 4 – Final Detailed Project Report. This report contains the findings of survey and investigations, design of highway, pavement, bridges, CD structures and grade separated structures, cost estimate etc. The consultants throughout the preparation of this report has endeavoured to ensure safety of road users and enhanced operational efficiency of the highway.
- Several meetings were held to come up with finalisation of improvement proposals with its cost implication on 03.10.2019, 07.10.2019 with CGM, GM NHAI HQ. Finally it has been instructed to follow IRC: SP: 84-2019 and since project IRR is low so mode of construction has been change from EPC to HAM mode. Also pavement design also referred from IRC: 37-2018.
- Following changes have been incorporated in this report:

1	IRC:SP:84-2019 – to be followed.
2	As per IRC:SP:84-2019, Paved shoulder – 2.5m and earthen shoulder – 1.5m
3	ROW boundary stone – As per IRC:SP:84-2014, para 9.8 which states that Road boundary stones shall be provided on both sides of Right of Way. These shall be spaced at 50m. The boundary stones shall be of cement concrete as per Type Design given in IRC:25.
4	ROW width – 60m in general and 30m-70m in forest area
5	Construction mode – HAM mode
6	Pavement Design – IRC:37-2018 and pavement crust are as follows: BC – 40 mm DBM – 120 mm WMM – 150 mm



Development of Economic Corridors, Inter Corridors, Feeder Routes to improve the efficiency of freight movement in India (Lot-3/Chhattisgarh/Package-1) under Bharatmala Pariyojana	
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	CT GSB – 200 mm Total – 510mm
7	12 nos of elephant underpass/Overpass with aggregate span length of 1290m has been introduced as per requirement of MOEF&CC.

The project has been appraised by Project Appraisal and Technical Scrutiny committee (PATSC), NHAI in its meeting held on 17.01.2022.

The project has been sanctioned during the SFC (Standing Finance Committee) meeting held on 23 March 2022.

E.3 Project Description

- Existing road is a section of Urga-Hati-Dharmjaygarh-Pathalgaon road which starts at its junction with NH-149B, near Urga, and terminates at its junction with NH-43 near Pathalgaon. Total existing length of the Project Road is 105.000 km as per RFP. The project stretch lies geographically within three districts Korba, Raigarh & Jaspur in the State of Chhattisgarh. The existing road is a State Highway (SH-04) and recently been declared as National Highway (NH-130A) vide Gazette notification dated 5th Dec 2017. This road is proposed to be developed as an Economic corridor of Raipur - Dhanbad section.
- Stretch of project road from Urga to Hati from exist. Km. 0/000 to 46/800 and from Dharamjaigarh to Pathalgaon from Km. 71/500 to 105/000, falls under jurisdiction of (CGRDC) Chhattisgarh Road Development Corporation Limited, Raipur. Balance portion i.e. from Hati to Dharmjaygarh is under State PWD NH Division-02, Bilaspur, Chhattisgarh.
- Existing Carriageway width is two lane from Urga to Dharmjaygarh for length of 70km. and intermediate lane carriageway from Dharmjaygarh to Pathalgaon for a length of 35km. The alignment passes through plain terrain with isolated sections of rolling terrain. The existing geometry is very substandard and requires geometric correction at many locations. The pavement condition for most of the stretch is very poor. The existing ROW from 12m to 18m.
- The existing road passes through various major/minor built-up areas with restricted RoW. These settlements require bypasses at frequent interval. The geometry of existing road is also very sub-standard and improvement of this road to National Highway standards requires major geometric corrections/re-alignments at many locations. Hence, to improve the geometry of existing road to National Highway standards and to avoid bypasses at frequent intervals and to provide shortest possible alignment, green field alignment has been proposed in most of the length.
- The proposed alignment starts from km 8.15 of SH-04 near Bhaisma (Chitapali) village and terminates near Turua Ama village, 10km away from Pathalgaon along NH-43 towards Jharkhand border. Length of proposed alignment is 87.545 km, whereas length of existing road is 105 km. The proposed alignment follows existing



road in a length of 12.8 km with required geometric improvements and in remaining length of 74.745 km it is green field.

- The proposed alignment runs through nearby villages of Bhaisma, Nonbira, Kartala, Kudmura, Hati, Bayasi, Dharmjaygarh, and Pathalgaon etc. bypassing all major/minor built-up areas en-route. The proposed alignment passes through three districts namely Korba, Raigarh and Jaspur. The terrain along proposed alignment is mostly plain, with an isolated locations of rolling terrain. The proposed alignment runs through cultivated/barren land except at the following stretches, where it passes through forest area.

Table E-1 : Summary of Forest Area along proposed alignment

S. no.	Design Chainage			Forest area (Ha)	District	Remarks
	From	To	Length (km)			
1	71090	106094	17.589	73.0969	Korba	forest areas are in patches in between said chainages
2	106650	144949	20.998	95.1262	Raigarh	
3	155532	155860	0.328	0.77027	Jaspur	
	Total		38.915	168.9934		

E.4 Traffic

- Korba, which is located at approx. 9km from Urga is an industrial area. It is famous for coal fields and power plants. It is the power hub of Chhattisgarh state. It boasts of the gevara mines which are India's largest open cast mines catering 11% of the nation's coal needs. Major power plants such as NTPC, CSEB, and Bharat Aluminium Company (BALCO) are located at Korba. The major traffic in the project influence area is bound to Korba.
- The traffic along existing road is varying between 2431 to 6030 PCU. Traffic in the initial section up to Hati junction is 2431 PCU and gradually increases due to the addition of traffic from Kharsia-Hati road and Raigarh-Dharmjaygarh road. At present the traffic on project road is less due its single lane configuration and poor pavement condition. Following table gives details of present traffic along Urga - Pathalgaon road section:

Table E-2 : Present Traffic along existing road/parallel routes

Sl. No	Homogenous Section	Existing Chainage		Length (km)	Present Traffic			
		From	To		ADT (pcu)	Car (Nos)	LCV (nos)	Truck (nos)
1	Urga to Hati	0+000	46+800	46800	2431	291	29	235
2	Hati to Dharmjaygarh	46+800	71+400	24600	4952	242	58	801
3	Dharmjaygarh to Pathalgaon	71+400	105+300	33900	6030	452	106	878



- As the project road is being developed as part of Raipur-Dhanbad corridor and in continuation to Bilaspur-Urga section, the traffic on the project road will increase because of reduced distance and improved connectivity. The likely amount of diverted traffic have been assessed considering the road network in the project influence area and Inter-zonal movements on the basis of O-D. The following table gives details of expected traffic on to the proposed alignment once open to traffic.


Table E-3 : Summary of expected traffic on proposed alignment

Year	2018	2021	2025	2030	2035	2040	2045	2050
Tollable								
AADT (Nos)	5514	7116	10290	14072	18232	23269	29698	37903
AADT (pcu)	13393	16714	23240	30804	39609	50552	64518	82343
Non Tollable								
AADT (Nos)	2464	2852	3467	4425	5648	7208	9199	11741
AADT (pcu)	1377	1595	1938	2474	3157	4029	5143	6563
Total								
AADT (Nos)	7978	9969	13757	18497	23880	30477	38897	49644
AADT (pcu)	14771	18308	25178	33278	42766	54581	69661	88907

Year	AADT (nos)							
	Car	Mini Bus	Bus	LCV	2A Truck	3A Truck	MA Truck	Total
2018	2552	0	139	483	285	267	1787	5514
2021	3454	0	177	654	336	325	2170	7116
2025	5253	0	250	997	441	436	2914	10290
2030	7454	0	335	1415	562	560	3746	14072
2035	9742	0	427	1849	718	715	4780	18232
2040	12434	0	545	2360	916	913	6101	23269
2045	15869	0	696	3012	1169	1165	7787	29698
2050	20254	0	888	3844	1492	1487	9938	37903

Year	AADT (pcu)							
	Car	Mini Bus	Bus	LCV	2A Truck	3A Truck	MA Truck	Total
2017	2552	0	418	724	855	802	8042	39
2021	3454	0	531	982	1009	974	9764	45
2025	5253	0	749	1495	1322	1308	13113	55
2030	7454	0	1004	2122	1687	1681	16855	70
2035	9742	0	1282	2773	2153	2145	21512	89
2040	12434	0	1636	3540	2748	2738	27456	114
2045	15869	0	2088	4518	3508	3494	35041	145
2050	20254	0	2665	5766	4477	4460	44722	185



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- Level of service (LOS) 'B' (Design service volume for LOS B - 40000 pcu per day) offered by the proposed 4-lane facility will cease by year 2034 and Level of Service (LOS) 'C' (Design service volume for LOS C - 60000 pcu per day) will be cease by year 2042. Hence, 6/8-lane facility shall be required by the end of 2042.

E.5 Proposed Cross-Sectional Elements

- The project road is to be developed as fully access controlled highway with 4-lane configuration at present and the proposed RoW is 60m in general and varies from 30m to 70m in forest area as per amended TOR (environmental) dated 28.12.2020. Accordingly following typical cross sections have been developed in accordance with the 4-lane manual and directions from NHAI HQ. Drawings of these cross-sections are given at the end of this chapter.

Table E-4 : Typical Cross Sections

S. no.	TCS type	Description	Length (m)
1	TCS 1A	4-lane Divided Highway without Service Road (in Embankment)	40345
2	TCS 1B	4-lane Divided Highway without Service Road (in Cutting)	2170
3	TCS 1C	4-lane Divided Highway with Service Road on both sides	1460
4	TCS 1D	4-lane Divided Highway with Service Road on one side	1810
5	TCS 1E	4-lane Divided Highway with RE Wall on both sides	2400
6	TCS 1F	4-lane Divided Highway with RE Wall on one side	420
7	TCS 1G	4-lane Divided Highway with Service Road on both sides	420
8	TCS 1H	4-lane Divided Highway with Service Road on both sides (Both MCW & SR in Cutting)	300
9	TCS 1I	4-lane Divided Highway with Service Road on both sides (MCW in Cutting & SR in Embankment)	1210
10	TCS 1J	4-lane Divided Highway with Service Road on both sides (in Embankment)	0
11	TCS 1K	4-lane Divided Highway with Service Road on both sides (MCW in Cutting & SR in Embankment)	0
12	TCS 1L	4-lane Divided Highway with Service Road on one side (in Embankment)	1380
13	TCS 1M	4-lane Divided Highway with Service Road on one side (in Embankment)	1950
14	TCS 1N	4-lane Divided Highway with Service Road and RE Wall on both sides	0
15	TCS 2A	4-lane Divided Highway without Service Road (in Embankment)	22130
16	TCS 2B	4-lane Divided Highway without Service Road (in Cutting)	4390
17	TCS 2C	4-lane Divided Highway (Embankment on one side and Cutting on other side)	410




PROJECT DIRECTOR
NHAI, PIU, KORBA (C.G.)

S. no.	TCS type	Description	Length (m)
18	TCS 2D	4-lane Divided Highway with Service Road on both sides	100
19	TCS 2E	4-lane Divided Highway with Service Road on RHS	2020
20	TCS 2F	4-lane Divided Highway with Service Road on LHS - MCW in cut and Service Road in Emb.	660
21	TCS 2G	4-lane Divided Highway with Service Road on LHS - Both MCW and Service Road in Embankment	1140
22	TCS 2H	4-lane Divided Highway With Service Road - Both MCW and Service Road in Embankment	930
23	TCS 2I	4-lane Divided Highway With RE wall on both sides	1900
Total (m)			87545

E.6 Access Control Measures

- The project road cuts across Nationals Highways, State Highways, and Major District Roads at a number of locations. In addition, there are many crossings of village roads. Since the project road is being developed as fully access controlled highway, access to project road has been provided at NH/SH crossings and any other road connecting to major built-up areas. At all other roads only crossings have been provided with suitable grade separated structures. The type and span grade separated structures have been decided based on the classification of cross road.

Rationalisation of grade separated structures:

- Maintaining the existing mobility or better at cross roads, controlled access to Project Highway and minimum rise and fall along the Project Highway are the primary guiding factors while deciding the type of grade separation facility.
- At all NH crossings interchanges have been provided with Overpass as per the terrain condition. At SH/MDR crossings VUP/LVUP/ Overpass has been provided with at-grade junction below the VUP/LVUP. At all other 2-lane roads 1x12x4m, (1x20m, 2x20m), 6x30m, 2x30m span LVUP, VUP, Flyover and Overpasses respectively has been provided. For single-lane village roads, if any other connecting road exists for the village 1x7x4.0m span small vehicular underpass has been provided. At all cart track crossings, 1x7x4.0m span small vehicular underpass has been provided. If any road is not provided with grade separation facility due to site condition, the same is connected through service road with the nearest grade separator. Span arrangement and total length of flyovers, VUP, LVUP and SVUP are proposed as per requirement of highway geometry to facilitate smooth flow of traffic. For grade separated structures overall width shall be equal to width of approaches.
- Since the project alignment passes through the forest area in a aggregate length of 39km. There is a movement of elephant within the forest area as per forest official. Probable location of elephant underpass has been proposed.



The details of proposed grade separated structures are given below:

Table E-5 : Summary of Grade-Separated Structures

Type of Structure		Nos.
EUP	(2x30x7, 3x30x7, 4x30x7, 5x30x7 & 8x30x7)	11
EOP	2x25x5.5	1
VUP	2x20x5.5	1
VUP	1x20x5.5	10
Flyover	6x30x5.5	1
LVUP	1x12x4	6
SVUP	1x7x4	18
Overpass	2x30x5.5	2
Total		50

E.7 Slip roads/Service roads

- Slip roads have been provided to provide access to Project Highway at certain grade separated structures.
- The service roads were proposed under 2 scenarios: a) At built-up areas to facilitate the movement of local traffic. b) If any road is not provided with grade separation facility due to site condition, the same is connected through service road with the nearest grade separator.
- Total length of slip road/service road is 22.190 km in total comprising 12.840 km on LHS and 9.35 km on RHS respectively. Details are given below:

Table E-6 : Details of Slip/Service Roads

Sl. No	LHS				RHS			
	From	To	Length (m)	Min. Width (m)	From	To	Length (m)	Min. Width (m)
A.	Slip Road							
1	93750	94750	1000	7.5	93750	94750	1000	7.5
2	117600	117710	110	7.5	117600	117710	110	7.5
3	117710	117790	80	7.5	117710	117790	80	7.5
4	117790	117850	60	7.5	117790	117850	60	7.5
5	117850	117930	80	7.5	117850	117930	80	7.5
6	117930	118190	260	7.5	117930	118190	260	7.5
7	118190	118270	80	7.5	118190	118270	80	7.5
8	118270	118330	60	7.5	118270	118330	60	7.5
9	118330	118410	80	7.5	118330	118410	80	7.5
10	118410	118470	60	7.5	118410	118580	170	7.5
11	143480	143590	110	7.5	143480	143590	110	7.5
12	143590	143620	30	7.5	143590	143620	30	7.5

Sl. No	LHS				RHS			
	From	To	Length (m)	Min. Width (m)	From	To	Length (m)	Min. Width (m)
13	143620	143680	60	7.5	143620	143680	60	7.5
14	143680	143710	30	7.5	143680	143710	30	7.5
15	143710	144450	740	7.0	143710	144450	740	7.0
16	144450	144480	30	7.5	144450	144480	30	7.5
17	144480	144540	60	7.5	144480	144540	60	7.5
18	144540	144570	30	7.5	144540	144570	30	7.5
19	144570	144730	160	7.5	144570	144730	160	7.5
20	155990	156080	90	7.5	155990	156080	90	7.5
21	156080	156160	80	7.5	156080	156160	80	7.5
22	156160	156220	60	7.5	156160	156220	60	7.5
23	156220	156300	80	7.5	156220	156300	80	7.5
24	156300	157050	750	7.5	156300	157050	750	7.5
25	157050	157130	80	7.5	157050	157130	80	7.5
26	157130	157190	60	7.5	157130	157190	60	7.5
27	157190	157270	80	7.5	157190	157270	80	7.5
28	157270	157360	90	7.5	157270	157360	90	7.5
	Sub total		4490				4600	
B	Service road in lieu of existing NH-130A							
1	70+200	70+720	520	7.0	70+200	70+720	520	7.0
2	70+720	71+100	380	7.5	70+720	71+200	480	7.5
3	78+900	79+030	130	7.0	83+670	84+830	1160	7.0
4	81+200	81+400	200	7.0	122+600	123+650	1050	7.0
5	130+350	134+630	4280	7.0	124+450	124+870	420	7.0
6	136+260	136+700	440	7.0	125+300	125+600	300	7.0
7	136+700	137+270	570	7.5				
	Sub total		6520				3930	
C	Other Service roads							
1	71+100	71+620	520	7.0	78+360	78+460	100	7.0
2	87+620	87+700	80	3.5	111+870	112+290	420	7.0
3	114+430	114+850	420	7.0	126+630	126+810	180	7.5
4	128+310	128+430	120	3.5	128+290	128+430	140	3.5
5	129+520	129+630	110	3.5	129+560	129+630	70	3.5
6	149+600	150+090	490	7.0	137+180	137+270	90	7.5
7	154+520	154+610	90	3.5	154+520	154+640	120	3.5
	Sub total		1830				1120	
	Total (A+B)		12840		Total		9650	



E.8 Exit/Entry ramps

- Since the project road is being developed as fully access controlled highway access to project road has been provided at NH/SH crossings and any other road connecting to major built-up areas. Entry/Exits have been provided at 6 locations at proposed toll plaza. Details are given below. Details are given below:

Table E-7 : Entry/Exit locations

Sl.No	Design Chainage	LHS	RHS	Remarks
1	70620	Exit		At Toll Plaza location
	70620		Entry	
2	94110	Exit		At Toll Plaza location
	94110		Entry	
	94500	Entry		
	94500		Exit	
3	117820	Exit		At Toll Plaza location
	117820		Entry	
	118300	Entry		
	118300		Exit	
4	143650	Exit		At Toll Plaza location
	143650		Entry	
	144510	Entry		
	144510		Exit	
5	156190	Exit		At Toll Plaza location
	156190		Entry	
	157160	Entry		
	157160		Exit	

E.9 Proposed Pavement

- The design traffic for 20 year design period is given below:

Table E-8 : Design MSA

Sl. No	Section	Minimum Design MSA
1	Main Road	150
2	Slip Road/	60
3	Service road in lieu of existing NH-130A	60
4	Other Service Roads	10



- Three options have been explored for the type of pavement to be adopted for the project road. The details of the options and proposed crust in each option is given below:

Table E-9 : Proposed Pavement Crust

	MCW	Service Road	Present Const. Cost	% w.r.t to option 2
Option 1 – Conventional - BC+DBM+WMM+GSB (Flexible)				
Bituminous Concrete (BC)	0.040	30	442.78	115%
Dense Bituminous Macadam (DBM)	0.155	50		
Wet Mix Macadam (WMM)	0.250	250		
Granular Sub-base (GSB)	0.200	200		
Option 2 – CTSB - BC+DBM+WMM+CTGSB (Flexible)				
Bituminous Concrete (BC)	0.040	30	386.59	100%
Dense Bituminous Macadam (DBM)	0.120	50		
Wet Mix Macadam (WMM)	0.150	250		
Cement Treated GSB (CTGSB)	0.200	-		
GSB	-	200		
Option 3 – PQC+DLC+GSB (Rigid)				
PQC	0.300	280	450.39	117%
DLC	0.150	150		
GSB	0.150	150		

- The option selected is based on the principle of minimum net present value of costs, estimated by adopting life cycle cost analysis method. The estimated NPV at 12% interest rate and 5% inflation for 30 years life cycle of the project is as given below:

Table E-10 : Life Cycle Costing of Pavement Options

Options			Pavement Layers	NPV of Const. Cost	Percent age (%)
Flexible Pavement	Option 1	Conventional	BC+DBM+WMM +GSB 40+155+250+200 = 645 mm	586.09	114%
	Option 2	CTSB	BC+DBM+WMM + CT GSB 40+120+150+200 = 510 mm	521.14	102%
Rigid Pavement	Option3	Rigid Pavement	PQC+DLC+GSB 300+150+130 = 600 mm	511.99	100%

As the NPV of Option 2 and option 3 is nearly equal at 30 years of life, Option 2 – Flexible pavement with cement treated subbase layer has been recommended.

E.10 Bridges and Culverts

- 27 nos of bridges are required along the project road consisting of 6 major bridges and 21 nos minor bridges on main carriageway. Overall deck width of 2x13.5 m has been proposed as per 4-lane manual. One major bridge at km. 82+560 and one minor bridge at km. 80+985 has been converted into elephant underpass cum bridges.

Table E-11 : Details of Major Bridges

Sl.No	Design Chainage	Name of Nallah	Span (m)	Total Length (m)	Total Width of Structure (m)
1	89+150	Kortimasara Nala	3x30	90	2x13.5
2	92+520	Dhawan Nala	2x30	60	2x13.5
3	99+825	Chuiya Nadi	6x30	180	2x13.5
4	106+375	Mand River	11x30	330	2x13.5
5	120+470	Chikatwani Nala	6x30	180	2x13.5
6	145+498	Bharari Nala	3x30	90	2x13.5

Table E-12 : Details of Minor Bridges

Sl. No	Design Chainage	Name of Nallah	Span (m)	Total Width of Structure (m)
1	72+054	Dom Nala	2x25	2x13.5
2	73+630	Nala	1 x 10	2x13.5
3	74+200	Nala	2x8.5	2x13.5
4	74+376	Canal	1x10	2x13.5
5	86+510	Nala	2x10	2x13.5
6	86+880	Nala	2x11	2x13.5
7	88+420	Nala	2x12	2x13.5
8	93+965	Nala	2x10	2x13.5
9	97+620	Nala	2x7.5	2x13.5
10	100+230	Diwan Nala	2x25	2x13.5
11	101+723	Nala	2x8.5	2x13.5
12	104+580	Nala	2x11	2x13.5
13	119+610	Nala	1x12	2x13.5
14	120+960	Nala	1x10	2x13.5
15	127+150	Nala	2x12	2x13.5



Sl. No	Design Chainage	Name of Nallah	Span (m)	Total Width of Structure (m)
16	128+768	Canal	1x10	2x13.5
17	129+302	Canal	1x10	2x13.5
18	129+463	Nala	3x10	2x13.5
19	129+723	Nala	1x10	2x13.5
20	139+840	Nala	1x10	2x13.5
21	142+443	Nala	1x10	2x13.5

Table E-13 : Summary of cross-drainage structures

Culvert type	Culverts size	Cross drainage works	Cross roads	For junctions	Total
Box	2x2			69	69
Box	1x2x2	2	0		2
Box	1x3x3	106	1		107
Box	1x5x3	1	4		5
Box	1x5x4	17	22		39
Box	1x6x4	0	6		6
	Total	126	33	69	228

E.11 Summary of proposed improvements

- Salient features of the proposed road are given below.

Table E-14 : Summary of proposed improvements

S. No.	Description	Unit	Total
1	Length of Main Road	Km	87.545
2	Length of Slip Road	Km	9.090 4.49 (LHS) + 4.6 km. (RHS)
3	Length of Service Road	Km	13.40 8.35 (LHS) + 5.05 (RHS)
4	Lane Configuration		4-lane
5	Mode of construction		H/M
6	Proposed Crust thickness		
	MSA		150
	BC	MM	40
	DBM	MM	120
	WMM	MM	150
	CTGSB	MM	200
7	No. of Entry/Exits	Nos	9 entry / 9 exist



S. No.	Description	Unit	Total
8	Overpass (2x30x5.5)	Nos	2
9	Flyover (6x30x5.5)	Nos	1
10	EUP (2x30, 3x30, 4x30, 5x30 & 8x30x7)	Nos	11
	EOP (2x25mx55m)	Nos	1
11	VUP (2x20x5.5)	Nos	1
	VUP (1x20x5.5)	Nos	10
12	LVUP (1x12x4)	Nos	6
13	SVUP (1x7x4)	Nos	18
14	Total No. grade separated Structures	Nos	50
15	ROB	Nos	1
16	Major bridges	Nos	6
17	Minor bridges	Nos	21
18	Box culverts	Nos	159
	Box culvert for Junctions	Nos	69
19	Toll Plaza on Main road	Nos	NIL
20	Toll Plaza on Entry/exit	Nos	18
21	Truck Lay Bye	Nos	4
22	Rest Area	Nos	2

E.12 Environmental & Social Impact Assessment

- Environmental Screening – Since this is green field alignment, Environmental clearance is required and the same is in progress
- Social Screening – Since the project corridor is green field alignment, minimum RoW of 60m in general and minimum 30m to 70m in forest area are to be acquired as per the Directives of NHAI, which would result in an acquisition of approximately 500 ha of land and displacement of around 55 households. The Entitlement Framework shall provide for adequate compensation and assistance. During design, adequate care has been taken to minimize impacts on structures adjacent to the road.

E.13 Cost Estimate

- The cost estimate has been worked out using quantities of different items of works derived from the preliminary designs and drawings. The cost estimate has been prepared both with the rates as per PWD Chhattisgarh Schedule of Rates (SOR) for Road Works 2021 and analysed rates. The items which are not listed in the SOR, analysed rates have been adopted.



Executive Summary

- The machinery rates are adopted based on the rate given in Standard Data Book of MoRT&H 2009. Material rates have been referred from PWD Chhattisgarh Schedule of Rates (SOR) for Road Works 2021, internet sources like inampro.nic.in (from MORTH), IOCL website, and SAIL web site etc. Labour rates have been referred from minimum wages rule in Labour Commissioner of Chhattisgarh w. e. f 01.04.2021. Since Urga, - Pathalgan in Chhattisgarh falls on category C, minimum wages of industrial labour under category C has been adopted for analysis rates
- GST has been excluded from materials rate and has been used in the Item rate analysis. In the abstract of cost estimate 12% GST has been added in the total cost of construction.
- Depending on the location of the quarries, the following average lead of materials for the project road were worked out and considered in the rate analysis

Sl.No.	Description	Unit	Total Lead	Source
1	Average lead from plan location to site	Km.	24.00	
2	Borrow earth	Km.	11.00	Private land
3	Sand			Maand River
	Average lead from source to plant location	Km.	12.00	
	Average lead to site	Km.	19.00	
4	Stone Material			Kharsia village, Tejpur and Chaparnni village
	Average lead from source to plant location	Km.	40.00	
	Average lead to site	Km.	36.00	
5	Bitumen			Haldia, WB
	Average lead from source to plant location	Km.	669	
6	Cement	Km.	146.00	Bilaspur
7	HYSD/TMT Bars	Km.	275.00	Bhilai
8	Fly ash	Km.	67.00	NTPC Korba

- The summary of cost as per SoR rates is given below and abstract of cost estimate is given in the next page.

	Cost (in Rs. Crores)								Total
	Civil Works	Utility shifting cost	Cent ages	Contingencies @ 1%	12% GST	Supervision charges on Utility shifting cost	LA and RR Cost	Environmental cost	
Total	1591.24	70.88	77.19	15.91	190.95	1.77	267.13	46.22	2261.30



Urga-Pathalgaon section of NH-130A (Ch. 70+200 to 157+745)

GENERAL ABSTRACT OF COST

Bill No.	Item of works	Cost (Rs. Cr.)	%
A	Highways		
1	Site Clearances	3.78	0.24%
2	Earthwork	262.09	16.47%
3	Granular Sub-Base & Base Courses	148.89	9.36%
4	Flexible pavement (Bituminous courses)	259.91	16.33%
5	Drain Works	40.20	2.53%
6	Protection Works	203.16	12.77%
7	Traffic Signs, Markings & Road Appurtenances	111.18	6.99%
8	Miscellaneous works	44.97	2.83%
9	Toll plaza including Rigid Pavement on its approaches	23.88	1.50%
	Subtotal (A)	1098.07	69.01%
B	Structures		
10	Culverts		
10.a	Pipe Culverts for junctions	2.84	0.18%
10.b	Box culverts	80.16	5.04%
11	Minor Bridges	65.90	4.14%
12	Major bridges	117.08	7.36%
13	SVUP	14.20	0.89%
14	LVUP	7.97	0.50%
15	VUP	33.29	2.09%
16	EUP	117.30	7.37%
17	VUP/Flyovers	24.35	1.53%
18	ROB	30.08	1.89%
	Subtotal (B)	493.18	30.99%
C	Base Civil Construction Cost without GST (A+B)	1591.24	100.00%
D	Utility shifting cost (except supervision charges)	70.88	
E	Total Civil Construction Cost (In Crores) (C+D)	1662.12	
F	IC/Pre-operative expenses @ 1% of (E)	16.62	1%
G	Financing expenses on Debt	5.97	
H	IDC (Interest During Construction) on Debt	54.60	
I	Estimated Project Cost as on Bid Date (E+F+G+H)	1739.31	
J	Contingencies @1% on (C)	15.91	
K	GST @ 12% of Civil Construction Cost (C)	190.95	12.0%
L	Supervision charges @ 2.5% on Utility shifting cost (D)	1.77	2.5%
M	Land Acquisition Cost and R&R Cost	267.13	
N	Environmental cost	46.22	
O	Total Project Cost (J+K+L) (in Crores)	2261.30	
	Length of the project road	87.545	
	Civil Cost per km. length (in Crores)	18.18	
	Total Project Cost per km. (in Crores)	25.83	

