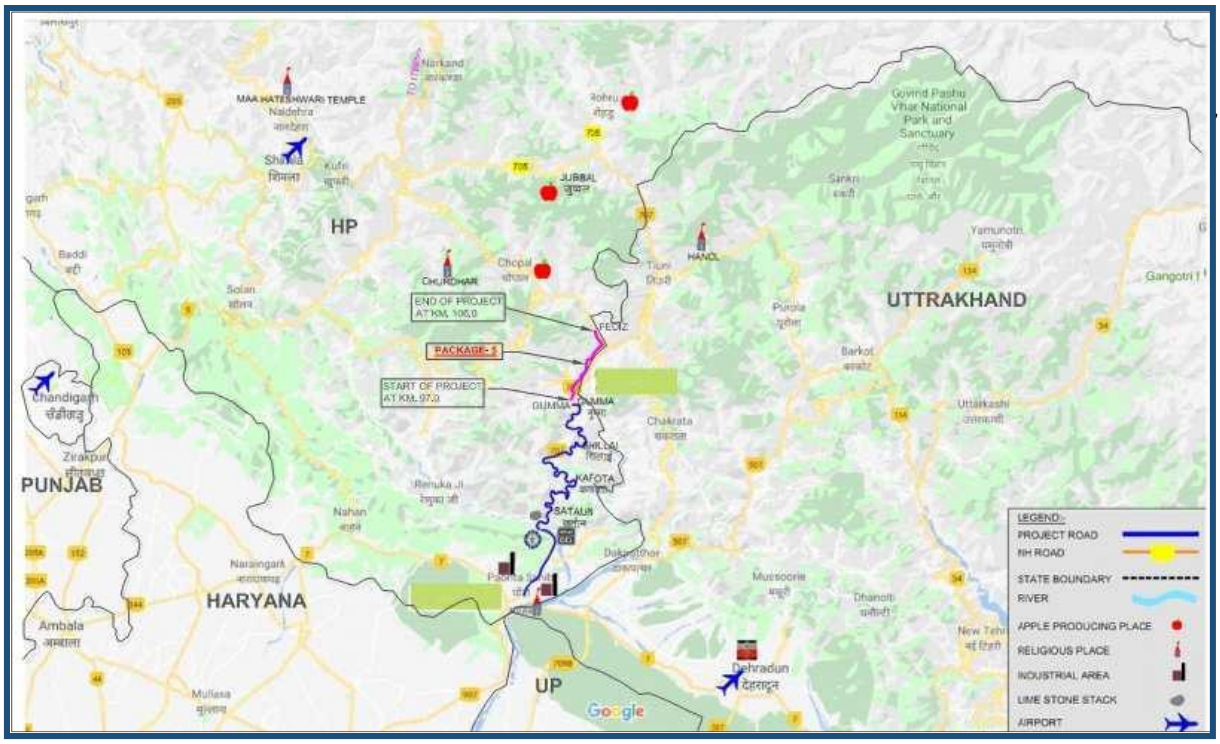
"REHABILITATION AND UPGRADATION TO INTERMEDIATE LANE OF PAONTA SAHIB RAJBAN SHILLAI MEENUS HATKOTI ROAD PORTION BETWEEN KM 97+000 TO 106+120 (GUMMA TO FEDIZ)(DESIGN RD 94+900 TO 103+550) OF NH 707 IN THE STATE OF HIMACHAL PRADESH"

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)



Submitted By:

Consulting Engineering Associates
S.C.O. 51, 2nd Floor, Swastik Vihar
Mansa Devi Road, Sector-5, Panchkula
Tel: 0172-2555529, Cell: 099145-75200
E-mail: ho@theghai.com

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1. INTRODUCTION

1.1 BACKGROUND

1.1.1 General

The Ministry of Road Transport & Highways, Govt. Of India has taken up massive development work of existing National Highways in the country. Up gradation, improvement, widening and strengthening of main and important arteries of National Highway network is taken up under National Highway Development Programme (NHDP). Also substantial length of single lane or intermediate lane National Highways (non-NHDP roads) has already been taken up for improvement in one scheme or the other. The Ministry of Road Transport and Highways with an aim to improve interconnectivity has under taken development of many single or intermediate lane National Highways to 2 lane/2 lane with hard shoulders configuration under National Highways Interconnectivity Project (NHIIP) aided by the World Bank. The total number of Project Roads under this scheme is 33. One of these roads is Paonta- Gumma–Fediz section of NH-707 Km 96+180 to Km. 104+890 in Himachal Pradesh. The Ministry of Road Transport and Highways (MORT&H), has already got prepared DPR of Paonta-Sahib-Gumma Section (Km 0.000 to Km 96.180), for Rehabilitation and Upgrading to 2 Lane/2 Lane with paved shoulder configuration and strengthening.

Further a length of about 9 Kms from Gumma to Fediz (Km.96+180 to Km.104+890) has also been proposed to be upgraded under GNHP (Green National Highway Project). M/s Consulting Engineers Associates, Panchkula have been assigned the consultancy job for preparation of DPR of this section (Gumma to Fediz) on 08th March 2019 by the Executive Engineer NH-Division, Nahan. The survey work at site has been completed with a planning to complete the independent activities and submit the DPR in a month's time.

The main objective of the consultancy service is to establish the technical, environmental, social, economic and financial viability of the project and prepare detailed project reports for rehabilitation and upgrading of the existing single lane road to intermediate lane configuration.

1.1.2 Importance of Project

This project road is a part of the main road which continues from RD 96+180 near village Gumma on New NH 707 and ends at Fediz Km 104+890 on existing NH-707 which further leads to state capital Shimla via NH-705 (Rohru-Hatkoti-Theog).The complete length of this NH-707 has either been improved/upgraded or proposed to be improved/upgraded by MORT&H except this section i.e. from Gumma to Fediz. For the optimum utilization of the Highway (NH-707), this missing section (Km 96+180 to Km 104+890 of NH-707) needs to be upgraded to National Highway Standards. This complete NH project road is a vital life line for the people living in interiors of Shimla District. Many villages having substantial population will be directly benefitted from this project road besides many other small habitats living in close vicinity of this road since it is the only highway connecting the area for commutation of people. People of this area grow cash crops like Ginger, Potato, Cauliflower, Peas, Capsicum, Tomato, Walnuts etc. Rajmah, Kulth, Maize & Urd lentils of this area are known for their taste. All these produces are transported through this Highway for marketing at New Delhi,

Chandigarh and Panchkula. Presently approx.500 trucks per day ply on this highway to transport apple crop from Rohru, Jubbal and Chopal to New Delhi via Yamuna Nagar. On upgradation of this Highway it is expected that the number of trucks will increase as the part of the traffic presently using Solan-Parwanoo route will use this Highway being the shortest route to New Delhi via Yamuna Nagar.

Lime stone mines are situated in this area between (Sataun) Km 18/0 to (Bohrad) Km 48/0. This Highway is used to transport the lime stone to various industrial units all over India. On up gradation there will be a lot of saving in running and maintenance of these vehicles, ultimately leading to saving of fuel, transportation cost, time and environment. The project road will further improve the connectivity for tourists visiting various famous destinations like much famous Chanshal Valley Himalayan Raid de, pilgrimage places like Churdhar, Maa Hateshwari Temple, famous Mahasu Temple at Hanol and leading to much famous Chardham yatra.

This highway is important and strategic from defence point of view as it connects the other routes leading to Indo-China Border. Defence Research and Development Organization has their unit/base at RD 12/0 near Rajban on this highway. This highway will become a boon for the migratory Gaddi Communities who migrate to lower heights during winter. About 71 industrial units are operational along this highway and 17 more industries are expected to become operational along this highway in near future. Planning of setting up a major cement plant at Gumma is in pipeline. This highway will facilitate the transportation of goods to and fro from these industries. This highway will ease the movement of traffic to Yamunotri, Gangotri etc. With up gradation of this highway the most backward Chopal area of district Shimla will also get benefitted by way of improvement of their social and economic life. From the above it can be concluded that this project is of utmost importance as it will have direct impact on life of a common man and boost the industries of this area, ultimately leading to multi-dimensional growth of the area and raising the socioeconomic standards of people along this highway.

The map showing connectivity to different important states and roads is shown below:

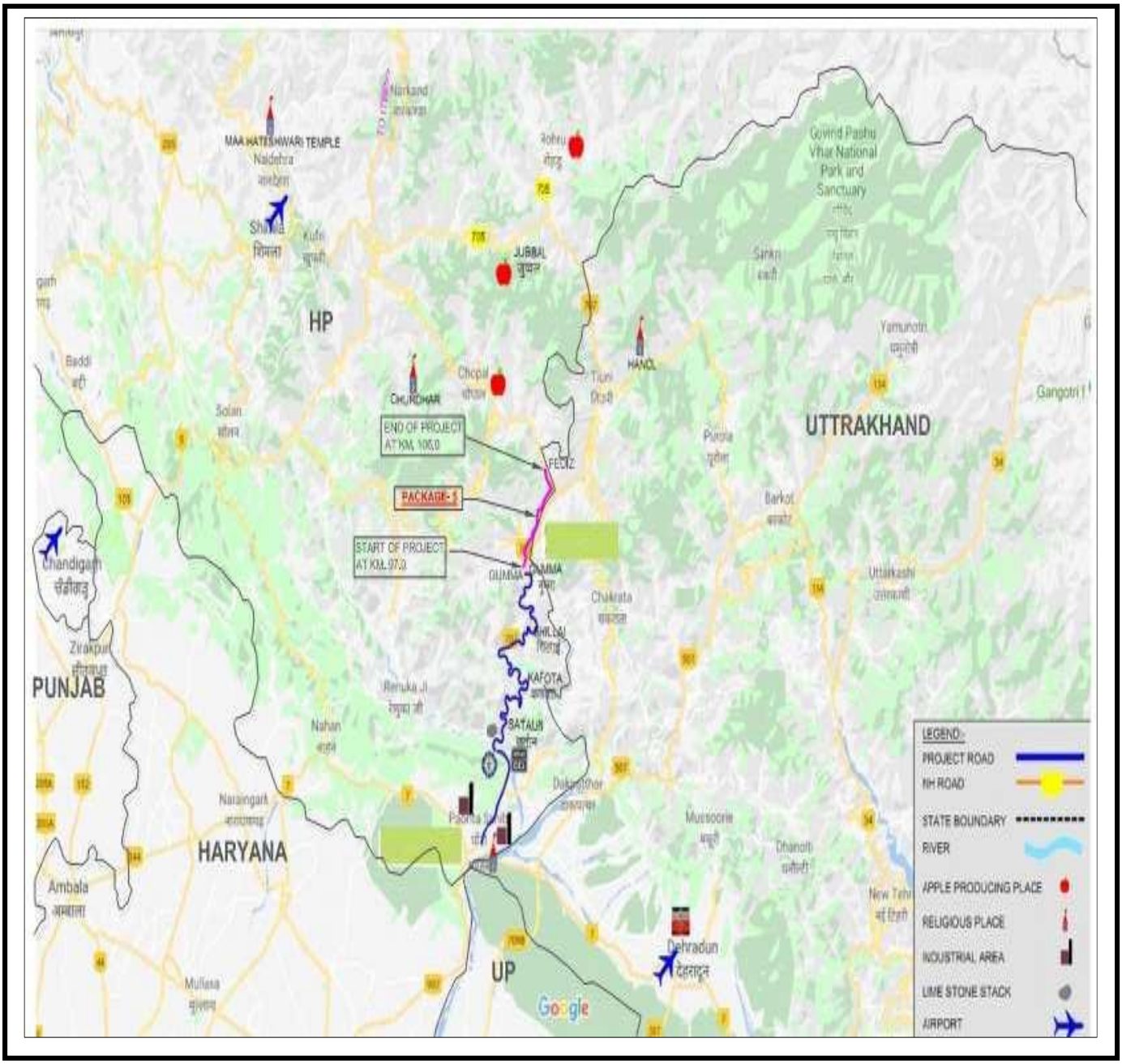

Figure 1-1 Connectivity of Different Important States and Roads

1.2 THE STUDY METHODOLOGY

The process of Environmental Impact Assessment is a detailed process, which requires considering of all aspects of environment which may be impacted due to the proposed project.

EIA process mainly consists of following broad steps:

- **i.** Reconnaissance & Study of Background information on project
- **ii.** Screening Report Preparation
- **iii.** Survey Part-1 (Baseline Survey or Baseline Data Collection).
- **iv.** Survey Part-2 (socio-economic survey)
- **v.** Analysis of practical Impacts.
- **vi.** Meeting with concerned Stakeholders
- **vii.** Mitigation Measures Adoption
- **viii.** Environment Management Plan

1.2.1 Environmental Assessment

The latitude and longitude of project road are as follows:

- **a)** Start Point: Gumma (30°48'1.21"N, 77°43'41.23"E)
- **b)** End Point: Fediz (30°50'59.34"N, 77°44'40.37"E)

The existing highway alignment passes through North Eastern part of Himachal Pradesh. The Existing project road predominantly passes through 8.650 km mountainous terrain. The project influence area is predominantly a mountain with deep valleys lying between ranges of varying elevations, longest length from west to east 77 km & maximum width from north to south are 80 km. This part has undulated topography of varying thicknesses of overburden consisting of reddish lateritic soil mixed with boulders of up to 1 m in diameter. The slope is well covered by trees. The uphill slope has good catchment, and the rainwater generally drains out through the natural streams on both flanks of the slide.

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1.3 STRUCTURE OF THE OF REPORT

The report has been divided into 8 chapters including this Introduction as follows:

1. **Chapter 2: Project Description**. In this section Project road details are described from an environmental perspective with salient features such as ROW, roadway improvements proposed, cross sections, cross drainage structures etc.
2. **Chapter 3: Policy, Legal and Institutional** Framework within which the project is set. The major stakeholder departments of the State and Central Governments with their specific roles along with applicable Acts and Laws are described. At the end of this chapter clearance requirements are presented.
3. **Chapter 4: Baseline Environmental** situation includes the meteorological baseline, components of the biophysical and natural environments.
4. **Chapter 5: Public Consultation** was carried out during the project preparation stage.
5. **Chapter 6: Analysis** of Alternatives considered during the project design. The minimization of environmental impacts by considering design alternatives.
6. **Chapter 7: Potential** Environmental Impacts on each of the environmental components due to the proposed project.
7. **Chapter 8: Mitigation**, Avoidance and Enhancement Measures for the adverse impacts identified in earlier section. This section forms the basis for Environmental Management Plan.

2. DESCRIPTION OF THE PROJECT

2.1 GENERAL DESCRIPTION

Total length of the NH-707 is 161 km., out of which 117 km is in the state of Himachal Pradesh and remaining 42.13 km is in the state of Uttarakhand. This NH takes off from junction with NH-07 at Badripur Chowk near Paonta Sahib and terminate at Hatkoti in Himachal Pradesh. The first section from Km.0.00 to Km.104+890 (Paonta to Fediz) traverses in Himachal Pradesh and it enters Uttarakhand at Fediz. After traversing for a length of about 42.13 Kms in Uttarakhand it re-enters Himachal Pradesh at v.Snail. Further about 12.75 Km length of this NH from Snail to Hatkoti is in Himachal Pradesh. This highway connects built-up areas like Rajban, Sataun, Kafota, Shillai, Meenus, Gumma, Antrauli & Fediz in Himachal Pradesh, Tuini in Uttrakhand and Hatkoti in Himachal Pradesh. The detailed project report for widening and upgradation of section Km.0.00 to Km.96.180 (Design Ch. 94+900) stands already submitted to the MORT&H/World Bank. The section from Km.0.00 to Km.94+900 is proposed to be got executed in four packages. To upgrade the missing link from Gumma (Design Ch. Km.94+900) to Fediz (Design Km. 103+550), the DPR is being prepared now. The existing bridge on river Tons at Fediz falling in the present project is being constructed under NH (O). The existing section of this NH in Uttarakhand has been repaired and strengthened. Further the section from Snail to Hatkoti in Himachal Pradesh state has also been strengthened by MORT&H. This (Design Ch. km 94+900 to 103+550) is the only stretch left out which is neither widened nor strengthened. DPR of this remaining stretch i.e. from Gumma to Fediz km 94+900 to km 103+550 (Design Chainage) is now proposed to be prepared.

This report deals with the section from Gumma to. Fediz (Existing Chainage Km.96+180 to Km.104+890 and Design Chainage km 94+900 to 103+550 Km.).This section of NH- 707, ends at RD 103+550 which falls after Fediz bridge which is under construction on Tons river/HP-UK Border. Total length of the project road as per existing Chainage is 8+710 Km and passes entirely through Himachal Pradesh.

2.2 ENGINEERING DESIGNS AND IMPROVEMENT PROPOSALS

2.2.1 Design Standards [Including Geometric Design and Regulation of Access]

a) Introduction

The design standards for the project highway has been adopted after reviewing the relevant latest Indian Roads Congress Codes (IRC) such as IRC:SP:48-1998 Hill Road Manual , IRC :37:2018 , IRC:78 - 2014 and international standards such as AASHTO etc.

The various design elements and factors, which govern the functioning of any highway, can be broadly grouped under the following:

- ❖ Geometric Design Standards;

- Terrain classification & Design Speed
- Cross sectional Element
- Horizontal Alignment
- Vertical Alignment
- Standards for Interchange elements
- Subsurface drainage
- Design parameters for Bridges and Cross drainage Structures

The basic design philosophy is based on the consideration of providing suitable alignment, cross-sectional layout, geometrics, safety and access control to cater to the fast and uninterrupted movement of through traffic. It is also based on the consideration that the widening proposals will be adjusted in the existing ROW to the extent feasible, involving minimum land acquisition for curves ,intersections, improvement of geometrics ,realignment and bypasses ,uprooting of trees, dismantling of structures/ buildings and maximum utilization of existing road / structures.

b) Terrain Classification & Design Speed

The design speed is the guiding criteria for correlating features such as sight distance, curvature and super elevation upon which the safe operation of the vehicle depends.

The terrain in the project stretch is virtually all mountainous with the general cross slope of the country remaining more than 25 % and less than 60%.

The ruling design speed considered in this project is 50 Km/Hr as per hill road manual.

c) Right Of Way (Row):

The available Right of Way (ROW) along the existing alignment of the project highway varies from 24.0 m to 25.0 m.

2.2.2 CROSS SECTIONAL ELEMENTS

The details of cross sectional elements adopted for the project road are as per Hill road Manual: IRC:SP:48

2.2.2.1 Carriageway: -

The carriageway width in open and built up areas as well shall be 5.5 m.

2.2.2.2 Shoulders:-

As the project road is proposed as intermediate lane configuration so the earthen shoulder on BHS have been provided 1.5 m.

2.2.2.3 Cross fall

- The cross fall on straight sections of road carriageway, paved shoulders and paved portion of median shall be 2- 2.5 percent for thin bituminous surface and 2.0 percent for high bituminous surface.
- The cross fall shall be unidirectional for either side carriageway sloping towards the shoulder in straight reaches and towards the lower edge on horizontal curves. The camber on the existing road shall be modified to unidirectional cross fall.
- The cross fall for earthen shoulders on straight portions shall be at least 0.5 percent steeper than the slope of the pavement and paved shoulder subject to a minimum of 3.0 percent. On super elevated sections, the earthen portion of the shoulder shall have the same cross fall as the pavement.

2.2.2.4 Typical Cross-Sections

Broadly typical cross-sections of Project Highway for various locations are given as below:

Typical cross sections (TCS) for various configurations proposed in built up area and open country area in rolling/hilly terrain are shown on pages from 16 to 19. Improvement proposal along with type of cross-section are given below:

Table 2-1 Type of cross-section

S. No.	Configuration of road	Type of Cross - Section	Existing Chainage		Proposed Chainage		Design Length (km)	Terrain
			from	to	from	to		
1	Inter-lane carriageway	TCS-3 a to TCS 3 f	96+180	104+890	94+900	103+550	8.650	Steep

Table 2-2 The Typical cross section

S. No.	Configuration of road	Type of Cross - Section	Design Chainage		Main carriage way width (m)	Earthen shoulders	Design Length (km)	Remarks
			from	to				
1	Inter-lane carriageway	TCS-A TO TCS 3 F	94+900	103+550	5.5	1.5 m on BHS	8.650	--

Complete Plan and Profile along with TCS have been provided in separate volume of Drawings.

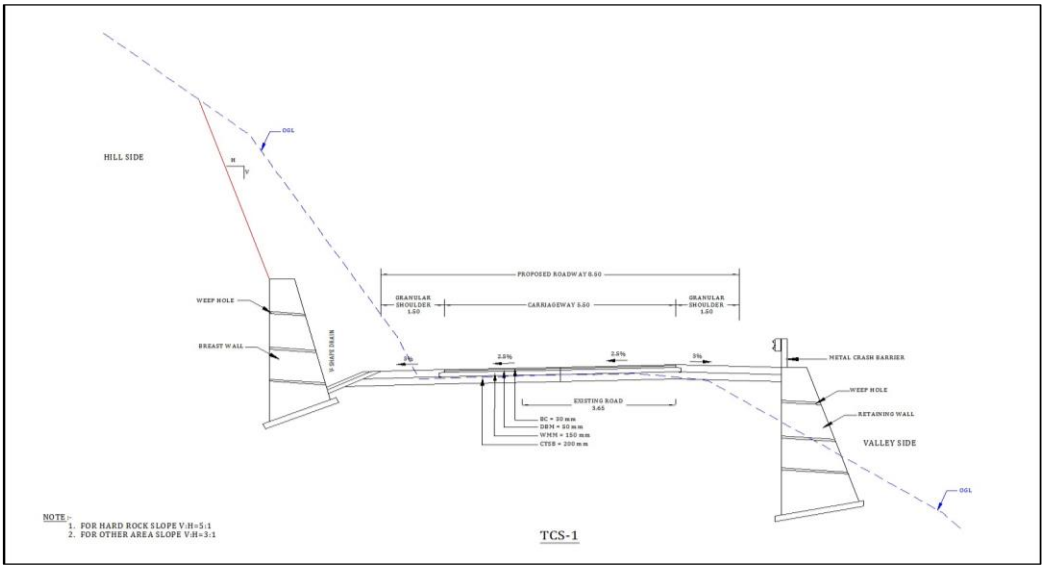

Figure 2-1 TCS for Proposed intermediate lane new construction

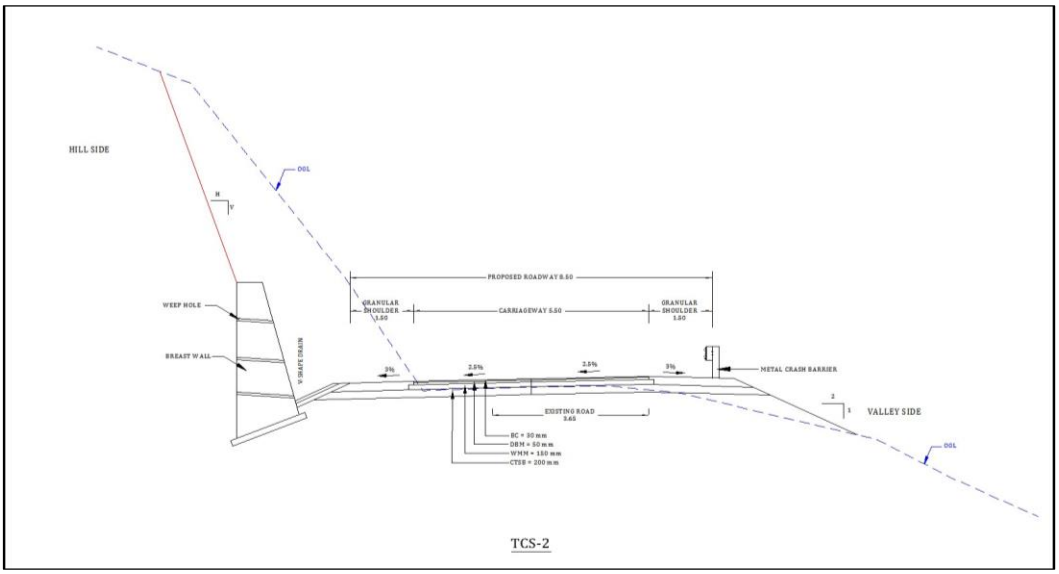

Figure 2-2 TCS for Proposed intermediate lane new construction

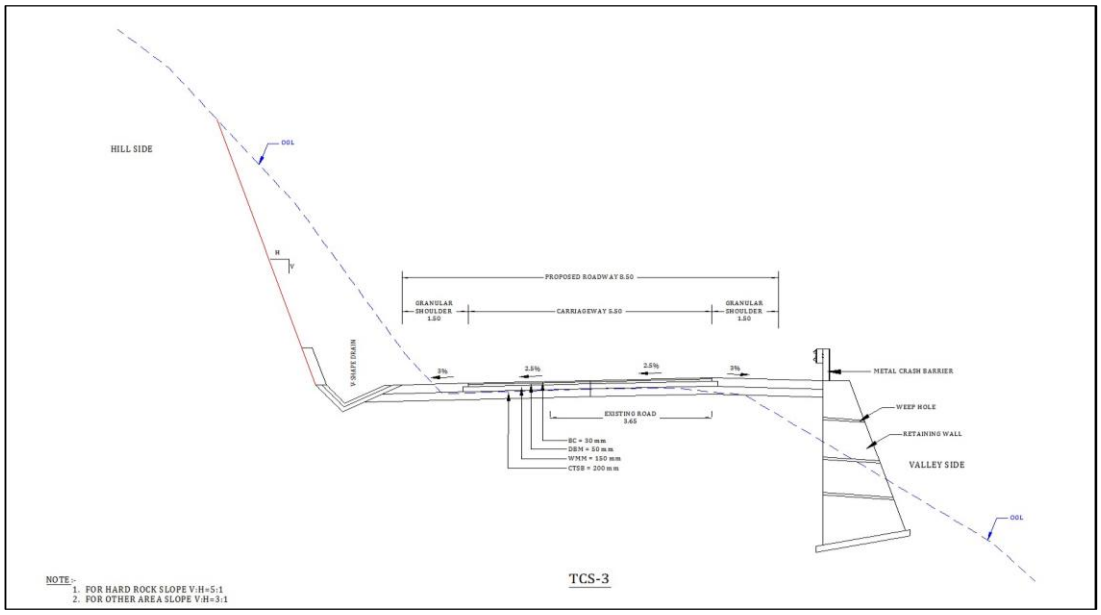

Figure 2-3 TCS for Proposed intermediate lane new construction

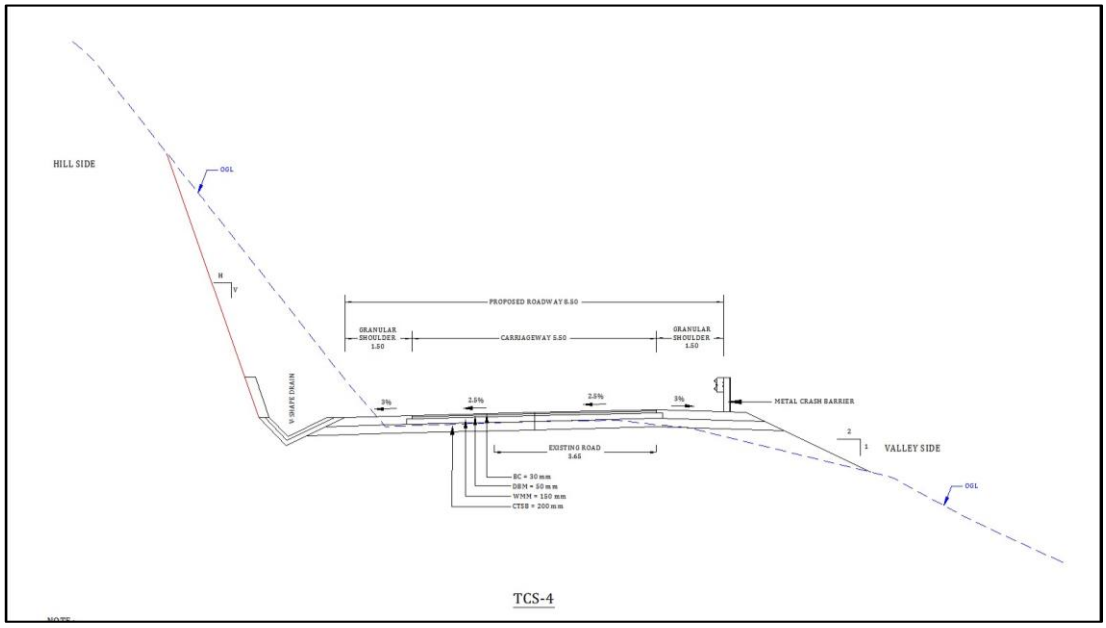

Figure 2-4 TCS for Proposed intermediate lane new construction

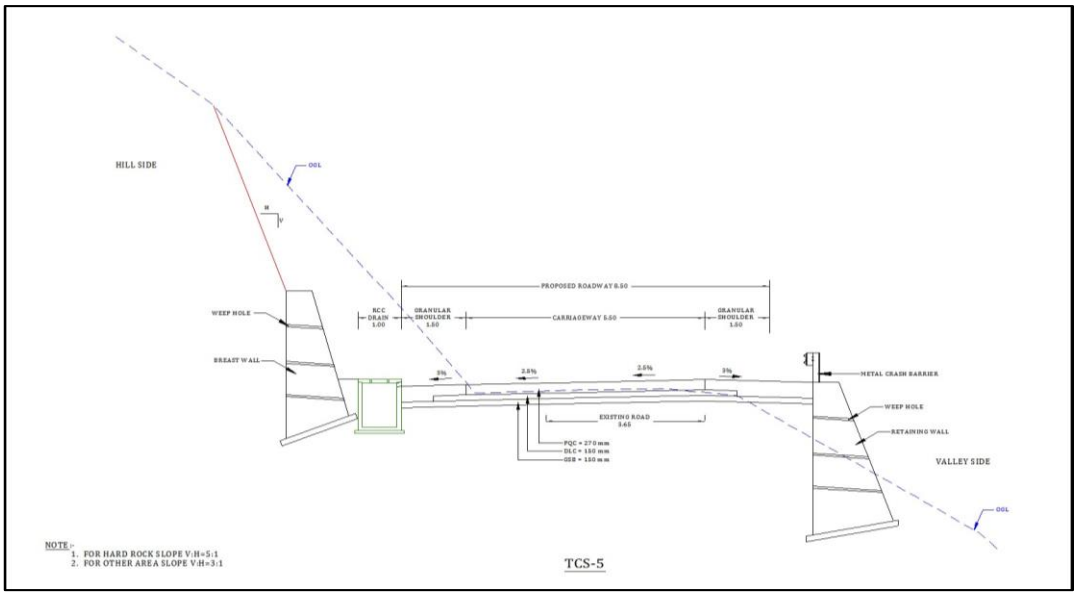

Figure 2-5 TCS for Proposed intermediate lane new construction

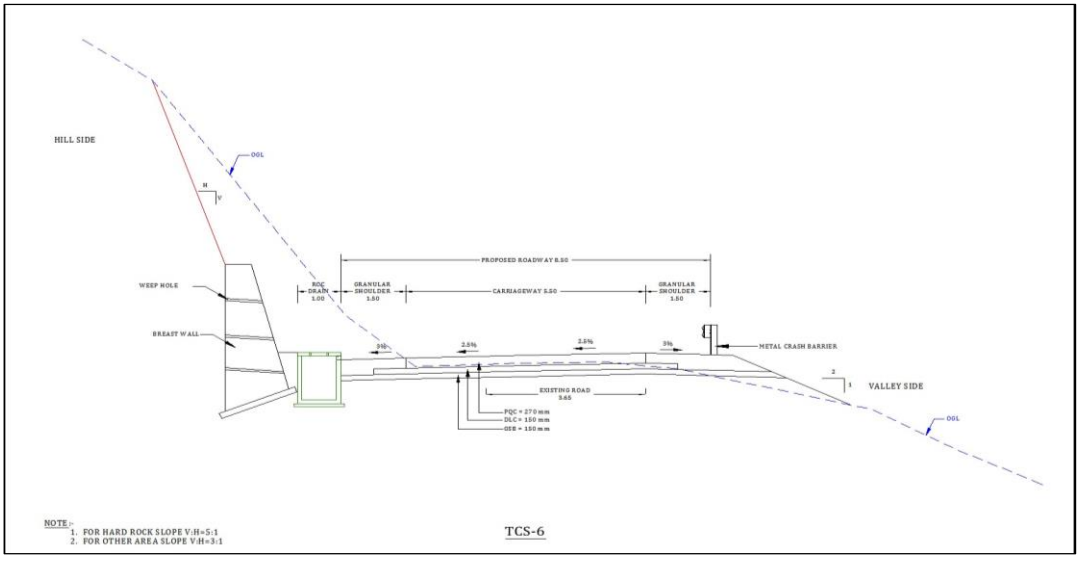

Figure 2-6 TCS for Proposed intermediate lane new construction

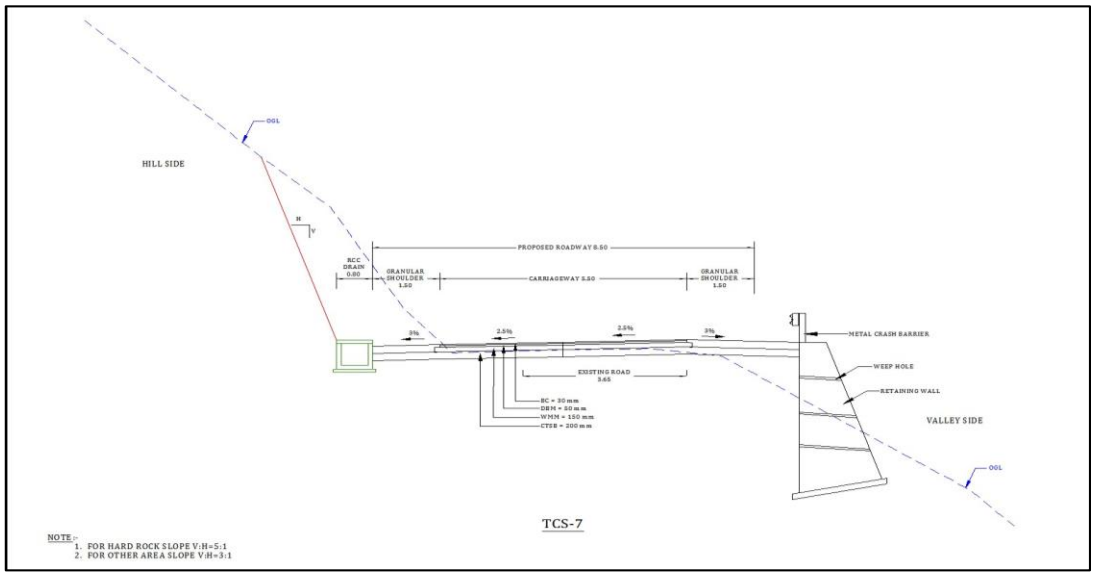

Figure 2-7 TCS for Proposed intermediate lane new construction

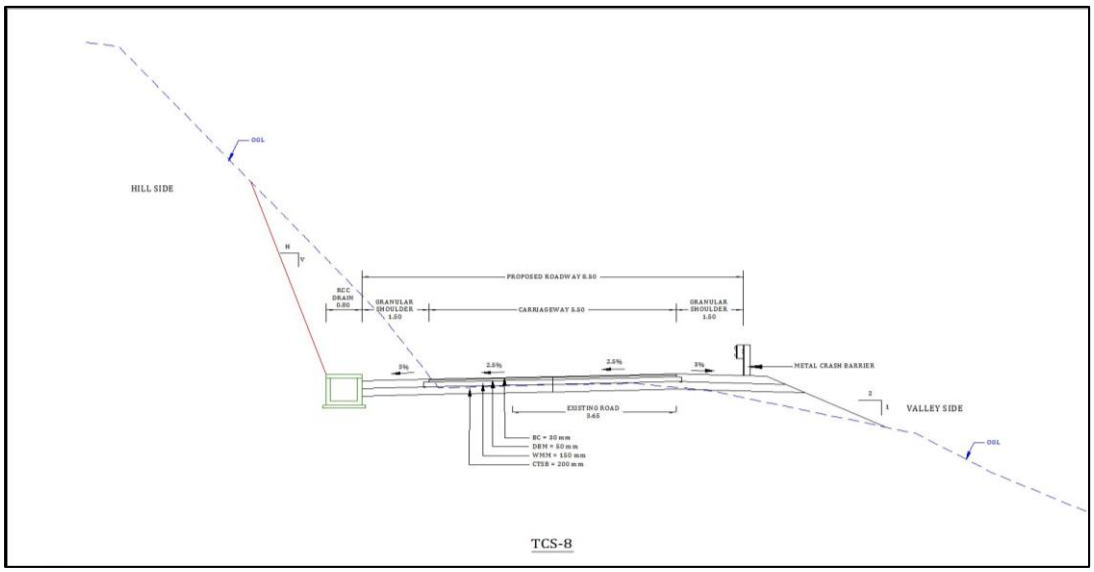

Figure 2-8 TCS for Proposed intermediate lane new construction

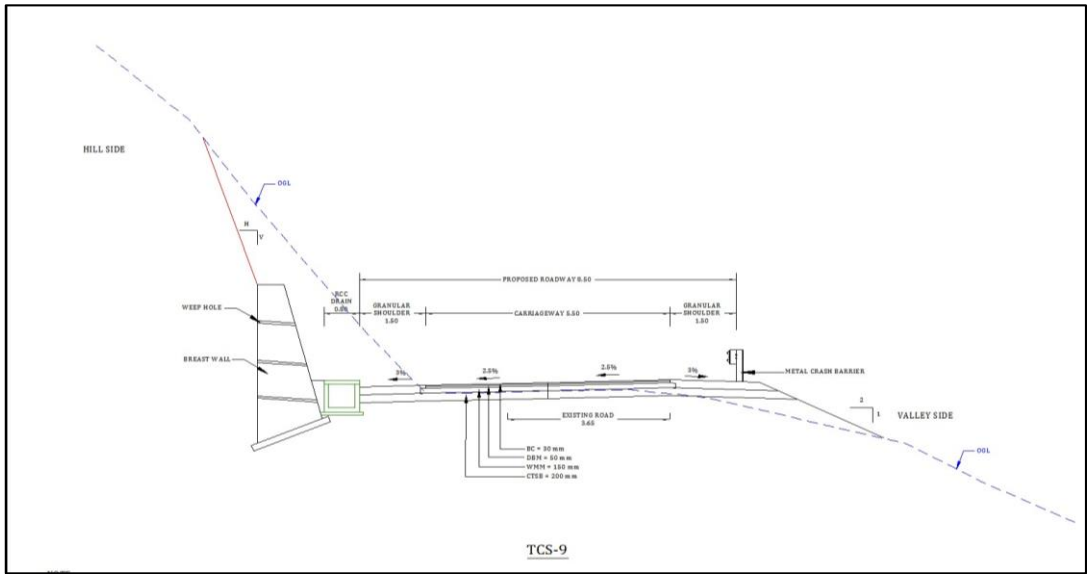

Figure 2-9 TCS for Proposed intermediate lane new construction

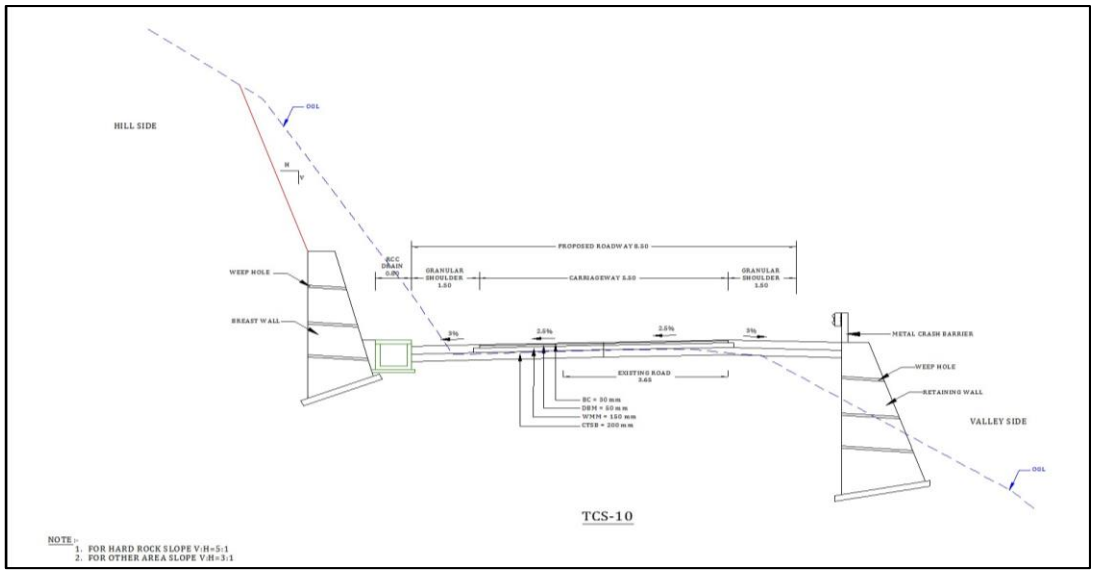

Figure 2-10 TCS for Proposed intermediate lane new construction

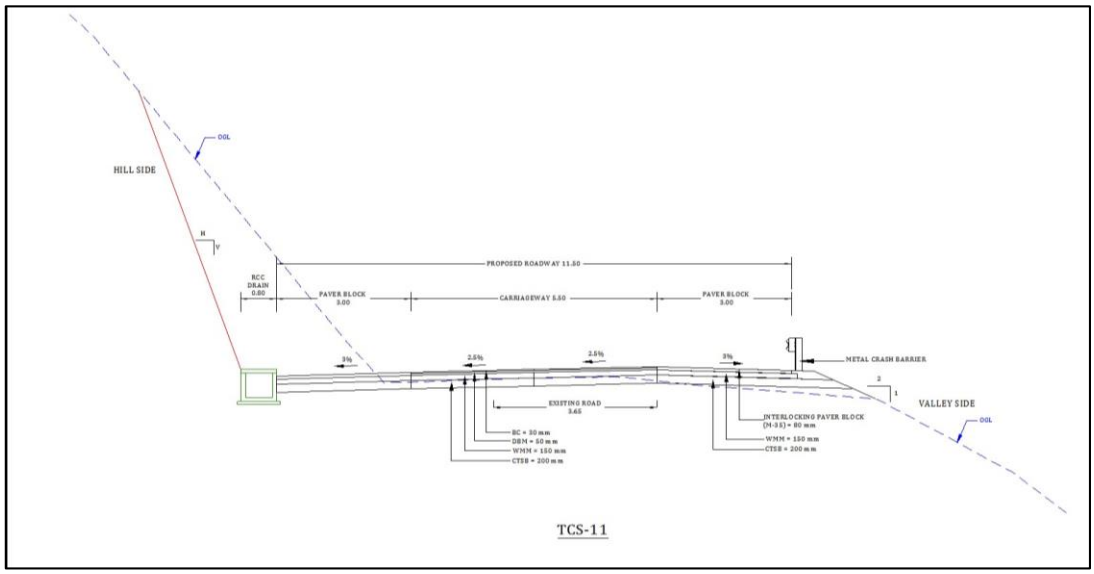

Figure 2-11 TCS for Proposed intermediate lane new construction

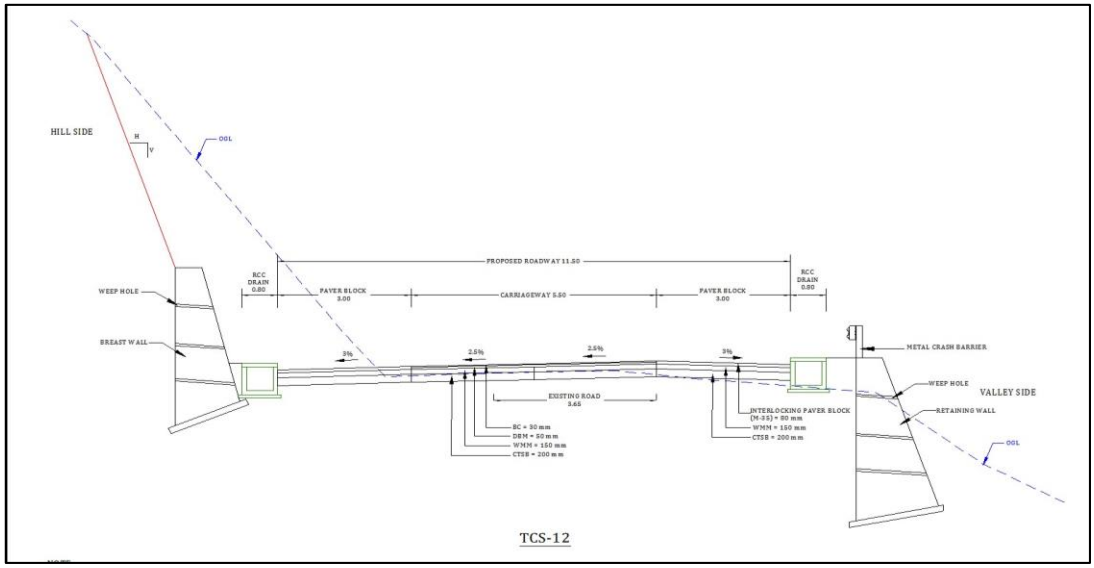

Figure 2-12 TCS for Proposed intermediate lane new construction

2.2.2.5 Intersections

The existing 01 Nos. of major junction and 5 No. minor junctions are proposed to be developed and the details of the same is shown in the table below:

Table 2-3 Details of Intersection

S. No.	Chainage	Type of Junction	Side	Remarks
1	103+250	T	LHS	-

Table 2-4 Intersection description

S. No.	Chainage	Type of Junction	Side	Remarks
1	94+900	y	LHS	Road to vill. Bohar
2	95+250	y	RHS	Road to residences
3	97+960	y	LHS	Village road
4	98+350	y	LHS	Road to vill. Pawana
5	102+750	y	LHS	Road to village

2.2.2.6 Improvement Proposals

These improvements will include widening, realignment, design and strengthening of pavement with the improvements of geometrics; widening and reconstruction of culverts; providing drainage; junction improvements; providing road marking; signs and other safety devices etc. to enable all road users to use the facility without degrading the environment. The summary of improvement proposal is shown in the table below:

Table 2-5 Summary of Improvement Proposal

S. No.	Particulars	Details
1	Length (km)	8.650 Km (Design Chainage from km 94+900 to km 103+550) Flexible Pavement length=7.4 km and Rigid pavement length=1.25 km

2	Carriageway Width (m)	Carriageway–5.5 m+ Earthen Shoulders–1.5m BHS		
3	Right of Way (m)	24.0-25.0 m		
4	**Junctions:**			
A	Major Junction	1 at RD 103+250		
B	Minor Junction	5 Nos. At RD 94+900, RD 95+250, RD 97+960 ,98+350 & RD 102+750		
5	**Cross Drainage Structure:**			
A	Major Bridge	1 No. But not in the scope of this project .Taken separately under NH(O) project		
B	Minor Bridge	Nil		
C	Culverts	2x2 m box culverts in place of existing hume pipe culverts =29 no. Reconstruction of slab culverts with: Box culvert size 3x3 m=2 no. Box culvert size 4x4 m=1 no Box culvert size 6x6 m=2 no New Construction Box Culverts of size 2x2=4 no. Total no of culverts=38 no.		
6.	**RCC COVERED DRAIN**	**FROM**	**TO**	**LENGTH (m)**
	RCC Covered Drain LHS	97+950	98+340	390
	RCC Covered Drain LHS	99+220	99+450	230
	RCC Covered Drain BHS	103+050	103+190	140X2=280

	RCC Covered Drain at Junction LHS	103+260	-	150
			TOTAL LENGTH	1050
7.	**Paver Blocks on shoulders:**			
	Paver Blocks on shoulders up to drain 3 m wide BHS	99+300	99+450	150x2=300
	Paver Blocks on both side of shoulders	103050	103190	140x2=280
			Total length	580 m or 0.58 km
8.	**Slope Protection Work:**			
A	Boulder apron in wire Crates	0.200 km		
B	Breast Wall	3.390 km		
C	Retaining Wall	2.000 km		
D	Toe Wall	NIL		
9.	**Road Safety and Appurtenances:**			
A	Metal Beam Crash Barriers	km 94+850 to km 103+550 on Valley side		
B	Road Sign	3819 no.		
10	**Project Facilities:**			
A	Bus lay bye/bus stops	At 98+300 (RHS existing), 99+420(RHS), 101+700 (RHS), 102+125 (RHS) and 103+115 (RHS)		

B	Passing Place	3 no. at RD 95+360 (RHS), RD 98+680 (RHS) and RD 102+240 (RHS)
C	Wayside Amenities	1 no. at RD 98+030 ON LHS
D	Medical Aid Centre	1 no. at RD 98+030 ON LHS
E	Traffic Aid Centre	1 no. at RD 98+030 ON LHS
F	Field lab., site office and labour camp Hutments	1 no. at RD 98+030 ON LHS
H	Solar Lighting	In Built up area at RD 98+050-98+400, RD 99+300-99+450
I	Electric Lighting	At Junction RD 103+260

2.2.2.7 Roadside Drainage

Design of drains in plain/rolling terrain has been carried out for self-cleansing velocity, for the runoff it will carry, considering the available fall. For trapezoidal drain on hill side, standard section as given in Hill Road Manual (IRC SP 48) is opted. It has been ensured that there are minimum three nos. of cross drainage structures are present in each km to carry the run-off of the roadside drainage. The details of roadside drainage is shown in the table below,

Table 2-6 Summary of Proposed RCC Drain

S. No.	Type of Cross - Section	Design Chainage		Length (km)	Terrain	Remarks
1	Rectangular	97+950	98+340	0.390	steep	LHS
2	Rectangular	99+220	99+450	0.230	steep	LHS
3	Rectangular	103+050	103+190	0.140	steep	BHS

Table 2-7 Detail of Proposed V Shaped PCC Drain

S. No.	Type of Cross - Section	Design Chainage		Net Length (km)	Terrain	Remarks
1	V Shaped Without Breast Wall	94+850	103+550	8.565	steep	LHS
2	V Shaped With Breast Wall	94+850	103+550	3.390	steep	LHS

2.2.2.8 Pavement Design

The existing pavement thorough out the project length is flexible. Green highway design has been adopted in place of conventional design.

(i) Design life for flexible pavement - 20 years

(ii) Effective CBR value for subgrade soil - 12%

(iii) Design traffic - 20 msa

(iv) Bituminous concrete BC - 30 mm

(v) Dense bituminous macadam DBM - 50 mm

(v) Granular Base course - Wet Mix Macadam 150 mm

(vi) CTSB - Granular mix material 200 mm

The details of proposed pavement crust is shown in the table below,

Table 2-8 Summary of Proposed Pavement Crust composition

S. No.	Existing Chainage (km)		Length (km)	Existing crust layers	Design Chainage (km)		Crust layers proposed for new construction			
	From	To			From	To	CTSB (mm)	WMM (mm)	DBM (mm)	BC (mm)
1	96+180	104+890	8.710	To be scraped and removed	94+900	103+550	200	150	50	30

2.2.2.9 Improvement Proposal for Cross Drainage Structures

Culverts

Culverts less than 10 m wide in hills and 12 m wide in plain/rolling terrain shall be widened. All 33 nos. of existing culverts (29 nos. of pipe culvert and 04 nos. of slab culvert) and 1 no. causeway shall be reconstructed being in poor condition, having inadequate waterway and damaged condition. All the existing pipe culverts (29 no.) and slab culverts (4 no.) shall be replaced with new construction box culverts. Additional 4 nos. of new box culverts are proposed at the locations where cross drainage is found inadequate. One no. culvert of box size 6x6 m in place of causeway shall also be constructed for proper drainage at the existing location. Thus finally there will be in all 38 nos. of culverts in the project road.

The details of improvement proposal of culverts are shown in the table below.

Table 2-9 Detail of culverts proposed for new construction

Sr. no.	Design Chainage (km)	Type of culvert	No. of span & Size of culvert in m	Outer to outer width of culvert in m	Remarks
1.	94+920	Box	1x2x2	11.0	New
2.	95+218	Box	1x2x2	11.0	Reconstruction
3.	95+318	Box	1x2x2	11.0	Reconstruction
4.	95+415	Box	1x2x2	11.0	Reconstruction
5.	95+603	Box	1x2x2	11.0	Reconstruction
6.	95+820	Box	1x2x2	11.0	Reconstruction
7.	96+008	Box	1x2x2	11.0	Reconstruction
8.	96+152	Box	1x2x2	11.0	Reconstruction

9.	96+300	Box	1x2x2	11.0	Reconstruction
10.	96+620	Box	1x2x2	11.0	New
11.	96+940	Box	1x2x2	11.0	Reconstruction
12.	97+188	Box	1x2x2	11.0	Reconstruction
13.	97+494	Box	1x2x2	11.0	Reconstruction
14.	97+702	Box	1x2x2	11.0	Reconstruction
15.	97+955	Box	1x3x3	11.0	Reconstruction
16.	98+150	Box	1x3x3	11.0	Reconstruction
17.	98+470	Box	1x2x2	11.0	New
18.	98+959	Box	1x2x2	11.0	Reconstruction
19.	99+220	Box	1x2x2	11.0	New
20.	99+618	Box	1x2x2	11.0	Reconstruction
21.	99+912	Box	1x2x2	11.0	Reconstruction
22.	100+117	Box	1x2x2	11.0	Reconstruction
23.	100+247	Box	1x2x2	11.0	Reconstruction
24.	100+378	Box	1x2x2	11.0	Reconstruction
25.	100+615	Box	1x2x2	11.0	Reconstruction
26.	100+808	Box	1x2x2	11.0	Reconstruction
27.	100+968	Box	1x2x2	11.0	Reconstruction
28.	101+176	Box	1x2x2	11.0	Reconstruction
29.	101+494	Box	1x2x2	11.0	Reconstruction
30.	101+745	Box	1x4x4	11.0	Reconstruction
31.	101+838	Box	1x2x2	11.0	Reconstruction
32.	102+088	Box	1x2x2	11.0	Reconstruction
33.	102+288	Box	1x6x6	11.0	Reconstruction
34.	102+483	Box	1x2x2	11.0	Reconstruction
35.	102+780	Box	1x2x2	11.0	Reconstruction

36.	103+014	Box	1x2x2	11.0	Reconstruction
37.	103+386	Box	1x2x2	11.0	Reconstruction
38.	103+500	Box	1x6x6	11.0	Reconstruction

2.2.2.10 Stability of Slopes

Stability of slopes is important for hill road. Disturbance can occur due to erosion caused by rainfall and run-off and consequent slides. Therefore slope stability and erosion control becomes very vital for control and prevention of landslides/slips.

2.2.2.11 Landslide Zone

Weak spots which are chronic by way of hill slides are identified. The most active sliding zone is in km 95 – km 99 & km 101-km 103. Thorough study of these spots reveals that the causes of landslides may be mechanical weathering, chemical alteration, influence of seasonal fluctuation of temperature, rains, which generally result in the deterioration of the strength characteristics of slope forming materials.

2.2.2.12 Breast Wall

Other areas where hill slopes are made of soft and highly weathered rocks, earthen boulders etc. and the cut slopes fail by slumping, sliding and toe failures due to erosion. Such spots are identified and toe protection of slopes is proposed by constructing the breast walls. The height of breast wall is proposed as 1.5m as suggested in 'Hill Road Manual'. The front batter is kept 1:3 and top width 60 cm. The breast walls are provided in Stone Random Rubble masonry in 1:6 cement mortars. Road side drains are also constructed with breast wall.

Table 2-10 Details of Breast Wall (3 m Height)

S. No.	Proposed Chainage		Length (in m)	Side
	From	To		
1.	94+840	94+890	50	LHS
2.	95+100	95+215	115	LHS
3.	95+400	95+430	30	LHS
4.	95+520	95+570	50	LHS
5.	96+250	96+280	30	LHS

6.	96+630	96+660	30	LHS
7.	98+090	98+140	50	LHS
8.	98+800	98+850	50	LHS
9.	100+000	100+230	230	LHS
10.	100+230	100+500	270	LHS
11.	100+800	101+000	200	LHS
12.	101+840	102+270	430	LHS
13.	102+600	102+760	160	LHS
14.	102+785	102+850	65	LHS
15.	103+130	103+180	50	LHS
Total			**1810**	

Table 2-11 Details of Breast Wall (5 m Height)

S. No.	Proposed Chainage		Length (in m)	Side
	From	To		
1.	95+000	95+050	50	LHS
2.	95+720	95+750	30	LHS
3.	95+900	95+930	30	LHS
4.	96+050	96+100	50	LHS
5.	96+450	96+570	120	LHS
6.	97+750	97+800	50	LHS
7.	97+850	97+950	100	LHS
8.	98+160	98+340	180	LHS
9.	98+350	98+450	100	LHS

10.	98+520	98+550	30	LHS
11.	98+850	98+990	140	LHS
12.	99+550	99+680	130	LHS
13.	99+920	100+000	80	LHS
14.	100+500	100+800	300	LHS
15.	101+000	101+270	270	LHS
16.	101+370	101+470	100	LHS
17.	101+690	101+735	45	LHS
18.	102+490	102+600	110	LHS
19.	103+050	103+130	80	LHS
Total			**1995**	LHS

2.2.2.13 Retaining Wall

Retaining wall is provided on the earthen shoulder edge of valley side of the project road where the existing slope does not allow construction of embankment and the road is to be retained by means of a solid protection work. The details of the retaining wall is shown in the table below:

Table 2-12 Schedule of Retaining Wall (4, 6 and 8m Heights)

S. No.	Design Chainage		Length (m)	Side
	From	To		
1.	94+900	94+930	30	RHS (valley side)
2.	95+020	95+085	65	RHS(valley side)
3.	95+100	95+140	40	RHS(valley side)
4.	95+205	95+255	50	RHS(valley side)
5.	95+260	95+275	15	RHS (valley side)
6.	95+300	95+340	40	RHS(valley side)

7.	95+400	95+430	30	RHS(valley side)
8.	95+590	95+620	30	RHS(valley side)
9.	95+805	95+835	30	RHS (valley side)
10.	95+930	95+920	20	RHS(valley side)
11.	96+000	96+020	20	RHS(valley side)
12.	96+130	96+170	40	RHS(valley side)
13.	96+290	96+310	20	RHS (valley side)
14.	96+370	96+400	30	RHS(valley side)
15.	96+510	96+530	20	RHS(valley side)
16.	96+610	96+630	20	RHS(valley side)
17.	96+710	96+740	30	RHS (valley side)
18.	96+770	96+795	25	RHS(valley side)
19.	96+920	96+960	40	RHS(valley side)
20.	96+980	97+005	25	RHS(valley side)
21.	97+040	97+060	20	RHS (valley side)
22.	97+180	97+200	20	RHS(valley side)
23.	97+470	97+`500	30	RHS(valley side)
24. `	97+690	97+710	20	RHS(valley side)
25.	97+830	97+850	20	RHS(valley side)
26.	97+930	97+980	50	RHS (valley side)
27.	98+130	98+160	30	RHS(valley side)
28.	98+315	98+335	20	RHS(valley side)
29.	98+460	96+480	20	RHS(valley side)
30.	98+630	98+650	20	RHS (valley side)
31.	98+700	98+720	20	RHS(valley side)

32.	98+860	98+900	40	RHS(valley side)
33.	98+945	99+000	55	RHS(valley side)
34.	99+080	99+100	20	RHS(valley side)
35.	99+210	99+230	20	RHS (valley side)
36.	99+470	99+500	30	RHS(valley side)
37.	99+530	99+550	20	RHS(valley side)
38.	99+590	99+630	40	RHS(valley side)
39.	99+900	99+920	20	RHS (valley side)
40.	100+100	100+150	50	RHS(valley side)
41.	100+235	100+255	20	RHS(valley side)
42.	100+300	100+340	40	RHS(valley side)
43.	100+370	100+390	20	RHS(valley side)
44.	100+605	100+625	20	RHS (valley side)
45.	100+800	100+820	20	RHS(valley side)
46.	100+960	100+980	20	RHS(valley side)
47.	101+170	101+200	30	RHS(valley side)
48.	101+485	101+510	25	RHS (valley side)
49.	101+550	101+580	30	RHS(valley side)
50.	101+720	101+770	50	RHS(valley side)
51.	101+735	101+750	15	LHS(valley side)
52.	102+000	102+020	20	RHS(valley side)
53.	102+080	102+100	20	RHS (valley side)
54.	102+250	102+310	60	RHS(valley side)
55.	102+280	102+295	15	LHS(valley side)
56.	102+470	102+490	20	RHS(valley side)

57.	102+760	102+790	30	RHS (valley side)
58.	103+005	103+020	15	RHS(valley side)
59.	103+050	103+125	75	RHS(valley side)
60.	103+135	10+175	40	RHS(valley side)
61.	103+270	103+400	130	RHS(valley side)
62.	103+430	103+530	100	RHS(valley side)
Total length			**2000 m**	

2.2.2.14 CC Interlocking Paver blocks:

CC Interlocking Paver blocks have been provided along the project highway in gap between RCC drain and main carriageway for vegetable market as below:

Table 2-13 Interlocking Paver blocks

S. No.	Design Chainage		Length (m)	Side
	From	To		
1	99+300	99+450	150	BHS
2	103+050	103+190	140	BHS

2.3 RIGID PAVEMENT IN WATER LOGGED AREA

There is water logged area from Chainage 100+200 to 102+300 along the project road. The road is not stable and durable in this area and gets badly damaged in short spell. To overcome this problem rigid pavement has been proposed with detail as below:

Table 2-14 Rigid Pavement

Sr. No.	Design Chainage (km)	Length in km	PQC (mm)	DLC(mm)	GSB(mm)
1.	99+920 to 101+170	1.250	280	150	150

2.3.1 Dumping Area

Additional land has been proposed to be acquired for dumping of remaining cut materials in the form of rock, soil and debris after maximizing its utilization in new construction of pavement, structures and slope protection work. After proper compaction and slope protection such locations can be used as medical/traffic aid center, wayside amenities and parking space. The details of such area along with its intake capacity is shown in the table below:

Table 2-15 Details of Dumping Area

S. No.	Design Chainage		Length in m	Side
	From	To		
1	96+220	96+350	130	Valley Side
2	99+050	99+250	200	Valley Side

2.4 ROAD SAFETY AND APPURTENANCES

Various provisions like w beam crash barriers, road studs, Road Signs and Road Markings is proposed along the project road to improve the safety for the commuters. The details of such provisions is shown in the section below:

2.4.1 Road Side Crash Barrier-

Metal W beam crash barrier is proposed in valley side throughout the complete project stretch (except the structures where RCC crash Barrier shall be provided) along the steep terrain and high embankment sections. The details of the same is shown in the table below:

Table 2-16 Details of Metal Beam Crash Barriers

S. No.	Design Chainage		Side of Crash Barrier	Net Length (m)
	From	To		
1	94+850	103+550	RHS	8185

2.4.2 Project Facilities

The project facilities proposed along the project stretch are shown in the below section.

2.4.3 Bus Shelter

The location of Bus Shelter is shown in the table below,

Table 2-17 Details of Proposed Bus Shelter

S. No.	Design Chainage	Side
1	98+300	RHS improvement of existing Bus lay bye
2	99+420	RHS
3	101+700	RHS
4	102+125	RHS
5	103+115	RHS

2.4.4 Passing Places

Passing Places have been proposed for convenience of HCV drivers so that they can park their trucks in some open space for some time for taking short rest or repairs, if need be. Detail of Passing Places is given as below.

Table 2-18 Detail of Passing Places

S. No.	Design Chainage	Side
1	95+360	RHS
2	98+680	RHS
3	102+240	RHS

2.4.5 Wayside Amenities

In compliance to the order of Hon'ble High Court of Himachal Pradesh CWPIL 06/2017 provision of wayside amenities along the project road has been made. The locations of the wayside amenities are shown in the table below:

Table 2-19 Details of Wayside Amenities

S. No.	Design Chainage	Name of the Village	Side
1	99+250	Near Vegetable market, Vill. Antrauli	LHS

2.4.6 Medical Aid Centre

One no. medical aid center equipped with Ambulance and emergency are proposed at the following location:

Table 2-20 Details of Medical Aid Centre

S. No.	Design Chainage	Name of the Village	Side
1	99+300	Near Vegetable market, Vill. Antrauli	LHS

2.4.7 Loading/Unloading Platform

A platform is proposed to be developed as Loading/Unloading Platform and shown in the table below:

Table 2-21 Details of Loading/Unloading Platform

S. No.	Design Chainage	Name of the Village	Side
1.	99+425	Near Vegetable market, Vill. Antrauli	LHS

2.4.8 Solar Lighting

Provision for solar lighting will be made in all the built-up areas along the project stretch. The details of the same are shown in the table below:

Table 2-22 Details of Solar Lighting Location

S. No.	Name of village/ town	Design Chainage		Lengths (Km)
		From	To	
1	Antrauli	98+050	98+400	0.350
2	Vegetable Market (Subzi Mandi)	99+300	99+450	0.150

The design parameters of the project are given below:

Table 2-23 Design Parameters of the Project

Sr. no.	Description	Details
1	Design Speed	30-40 kmph
2	Intermediate lane carriageway	5.5 m
3	Camber	
	i) Carriageway	2.5%
	ii) Earthen shoulders	3.0%
5	Maximum Super Elevation	7.0%
6	Minimum stopping sight distance	45 m
7	Minimum Intermediate sight distance	90 m
8	Minimum radius of horizontal curve	20 m
9	Minimum radius of horizontal curve without transition	Nil
10.	Ruling vertical gradient	5.0 %
11	Minimum length of Vertical curve	50 m
12	Maximum grade change not requiring vertical Curve	1.2 %
13	Vertical Clearance in mountainous areas	5.0 m

3. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 ENVIRONMENTAL POLICY FRAMEWORK

The chapter presents a review of the existing institutions and legislations relevant to the project at the International, National and State levels. The various statutory clearances from various state and central government authorities and the institutional framework are discussed below.

3.1.1 National Environmental Policy Framework

Development of environmental protection and enhancement measures in India has been determined to a considerable extent by the central legislation. The Ministry of Environment and Forest (MoEF), set up in 1980, is the controlling institution in this regards. The MoEF has two wings as Environment and Forests.

The Central Pollution Control Board (CPCB) is another technical wing of the MoEF entrusted with the responsibilities for detection and abatement of pollution.

The various national environmental policies prevalent in India are listed below:

- The National Forest Policy, 1988
- National Water Policy, 2012
- National Environment Policy, 2006
- National Conservation Strategy
- Wildlife Conservation Strategy, 2002 and Policy Statement on Environment and Development
- National Policy on Resettlement and Rehabilitation for Project Affected Families, 2007

3.2 LEGAL FRAMEWORK

The Government of India has laid out various policy guidelines, acts and regulations pertaining to sustenance of environment. The Environment (Protection) Act, 1986 provides umbrella legislation for the protection of environment. As per this Act, the responsibility to administer the legislation has been jointly entrusted to the Central Ministry of Environment and Forests (MOEF) and the Central Pollution Control Board (CPCB) / State Pollution Control Board (SPCB).

The legislations/acts followed for present study has been summarized in Table below:

Table 3-1 Summary of Key Legislations Relevant to the Project

Act or Notification	Year	Objective	Applicable Yes/No	Responsible Agency
The Environment (Protection) Act. The Environment (Protection) Rules	1986	To protect and to improve the quality of the environment and to prevent, control and abate Environmental pollution.	Yes	MoEF, CPCB, HPSPCB
The Forest (Conservation) Act The Forest (Conservation) Rules as amended in 2003 and 2004	1980	To check deforestation by restricting conversion of forested areas into non-forested areas.	Yes	MoEF, State Deptt. Of Forests
The Wildlife (Protection) Act as amended in 2002	1972	To protect wildlife through creation of National Parks and Sanctuaries.	No	Chief Conservator, Chief Wildlife Warden, Wildlife Wing, DOEF.
The Air (Prevention and Control of Pollution) Act	1972 amended in 1981	To prevent, control and reduce air pollution including noise pollution as per the prescribed standards.	Yes	HPSPCB & CPCB
The Water (Prevention & Control of Pollution) Act The Water (Prevention & Control of Pollution) Cess Act	1974 1977	To control water pollution and restoration of water quality as per the prescribed standards. To levy and collect Cess from industries based on water consumption.	Yes	HPSPCB & CPCB
The EIA Notification and its subsequent amendments	2006	To issue environmental clearance to development projects based on EIA report.	No	MOEF, SEIAA
Ancient Monuments and Archaeological Sites and Remains Act.	1958 amended in 2010	Conservation of Cultural and historical remains found in India	No	Archaeological Survey of India and State Department of Archaeology
Notification of use of Fly Ash	2009	Utilization of Fly ash	No	HPSPCB, MoEF
The Factory Act	1948	To Maintain hygiene and health for workers	Yes	HPSPCB

		during the construction period.		
The Building and Other Construction Workers (Regulatation of Employment and conditions of services	1996	For welfare of Employees/labour/ workers	Yes	State Labour Commissioner
Hazardous Wastes (Management and Handling) Rules	1989	For protection against improper handling and disposal of hazardous waste	Yes	HPSPCB
Chemical Accidents (Emergency Planning, preparedness and response)Rules	1996	Protection against chemical accident while handling any chemical	Yes	HPSPCB

Other State Level Legislations and Acts

- Consent to Establish (CTE) and Consent to operate (CTO) will be required for setting up hot-mix plants, batching plants, etc., under the Air (Prevention and Control of Pollution) Act of 1981 and the Water (Prevention and Control of Pollution) Act of 1974 from the Himachal Pradesh State Pollution Control Board (HPSPCB).
- All Construction vehicles and off-road equipment are to be registered with Regional Transport Office as required under Central Motor Vehicles Act and possess appropriate PUC certificate.

3.3 ENVIRONMENTAL CLEARANCE REQUIREMENTS

3.3.1 GOI Requirements

With reference to the EIA notification dated 14th Sept 2006 **(Published in the Gazette of India, Extraordinary, Part-II, and Section 3, Sub-section (ii))**, Item No. 7(f) of Schedule (Highway Projects), Environmental Clearance are not required from the MoEF, Govt. of India as;

(a) This project is widening of existing State Highway; it does not fall under any category for the environment clearance as per the EIA notification 2006 (and its subsequent amendments till date)

(b) It does not pass through ecologically sensitive areas, and

(c) It is not a highway include expressway.

3.3.2 State Level Clearance Requirements

Besides, the GOI environmental clearance requirements, the project also requires clearance from some of the state level agencies as discussed below.

Forest Clearances: Permission has to be taken from the Forest Department for cutting of the trees at junctions under the Forest (Conservation) Act, 1980 as the road side plantation in the state of Himachal Pradesh has been designated as Protected Forests. Forest clearance has also to be taken for cutting of private tree in the proposed bypasses.

State Pollution Control Board: The Project also requires obtaining 'No Objection Certificate' (NOC) from HPSPCB in pursuant of the Water (Prevention and 'Control of Pollution) Act of 1974, The Cess Act of 1977 and the Air (Prevention and Control of Pollution) Act of 1981. Consent for the Establishment and Operation has to be taken during the Construction stage of the Project for the operation of all Construction Plants.

State/Central Ground Water Board: Clearance from the State/Central Ground Water Boards/Authorities is required for extraction of ground water.

State Environmental Impact Assessment Authority (SEIAA): Clearance is required from SEIAA for mining of normal earth from borrow areas, if required.

3.3.3 World Bank Requirements

The World Bank environmental impact assessment (EIA) requirements are based on a three- category classification system (Category A, B and C) as defined by the World Bank OP 4.01. A project designated as Category A, requires a full environmental impact assessment (EIA), Category B projects require a lesser level of environmental investigation. Category C projects require no environmental analysis beyond that determination. This project has been classified as Category 'B' project due to the cumulative impacts from the project on the environmental and social components.

The various clearances required for highway project and their applicability viz this project is given in Table below:

Table 3-2 Clearances Required for the Project

S. No.	Regulatory Clearances	Corresponding Regulations	Approving Authority	Applicability to the Project	Typical Time Required	Responsibility for compliance	
						Execution	Supervision
Pre-Construction Stage							
01	Environmental Clearance	EIA Notification, 2006 and amended till date	State Environmental Impact Assessment Authority or CEIAA in MoEF, GoI	Not applicable	-	-	-
02	Consent to Establish	Water (Prevention and Control of Pollution) Act 1974; Air (Prevention and Control of Pollution) Act 1981	Himachal Pradesh State Pollution Control Board (HPSPCB)	Subject to establishing Labour camps, Hot mix plants, DG sets units, cement batching plant or any water/air pollution generating units.	3 Months	Contractor	HP PWD/CMU
03	Wild Life Clearance	Wild Life Act 1972	Hon'ble Supreme Court	Not applicable	-	-	-
05	Permission for felling & trimming of trees	Forest (Conservation) Act, 1980 and its amendments;	Regional Office MoEF Chandigarh	Applicable.	6 months	CMU/PWD	HP PWD
Construction Stage							
06	Permission for locating and operating Borrow pits	-	Mining Department/SEIAA, Local Administration –	Applicable if Earth is required	1 Month	Contractor	HP PWD

S. No.	Regulatory Clearances	Corresponding Regulations	Approving Authority	Applicability to the Project	Typical Time Required	Responsibility for compliance	
						Execution	**Supervision**
			Municipal Government/ Panchayat				
07	Permission for Withdrawal of Ground Water	Environment Protection Act 1986	Central Ground Water Board	Applicable, if withdrawal is proposed	1 month	Contractor	HP PWD/CMU
08	Permission for withdrawal of Surface Water from River/Irrigation Canals		Irrigation Authorities for use of water from Irrigation Canal. River Board / Authorities for withdrawal of water from Rivers	Applicable if withdrawal is proposed	1 month	Contractor	HP PWD/CMU
09	Authorization to generate, store, transport and dispose of Hazardous Waste	The Hazardous Wastes (Management, Handling and Trans-boundary Movement) Rules, 2008 and amendments till date	Himachal Pradesh State Pollution Control Board (HPSPCB)	Applicable, if hazardous waste is generated in the project (disposal of bituminous wastes – verify with PPCB)	2 months	Contractor	HP PWD
10	Consent to Operate	Water (Prevention and Control of Pollution) Act 1974; Air (Prevention and	Himachal Pradesh State Pollution Control Board (HPSPCB)	Subject to establishing, Hot mix plants or any water/air pollution	3 Months	Contractor	HP PWD/CMU

S. No.	Regulatory Clearances	Corresponding Regulations	Approving Authority	Applicability to the Project	Typical Time Required	Responsibility for compliance	
						Execution	**Supervision**
		Control of Pollution) Act 1981		generating units, Labour camps			
11	Traffic Police Clearance for diversion of routine traffic	Local Traffic Police Regulations and Bye-laws	Traffic Police Department	Applicable if diversion is required in urban/semi urban areas	1 Month	Contractor	CMU/ HP PWD
12	NOC from Archaeological Survey of India	The Ancient Monument and Archaeological sites and Remains Act 1958.	Department of Archaeology Govt. of Himachal Pradesh	Subject to chance finds, if any	2 Months	Contractor	CMU/ HP PWD
13	Permission for Sand Mining from river bed	Himachal Pradesh Mines and Minerals Concession Rules 1969	River Board Authorities/ Department of Mining Govt. of Himachal Pradesh	Applicable, if river sand is mined	6 Months	Contractor	CMU/ HP PWD
14	Permission for Opening of new Quarry sites	Himachal Pradesh Mines and Minerals Concession Rules 1969	Department of Mining Govt. of Himachal Pradesh Himachal Pradesh State Pollution Control Board	Applicable only if Contractor opens a new quarry site	6 Months 3 Months	Contractor	HP PWD /CMU

4. BASELINE ENVIRONMENTAL STATUS

4.1 GENERAL

Physiographical, most of the areas form a part of hilly tract with undulating terrain. The elevation varies from 2500m to 3500m above mean sea level. The Shiwalik hills standing to a height of about I 100m in the south of limestone deposits are separated from the bare lofty ridges of the lesser Himalayas in the north by the deep valley of river Giri, The project influence area is marked by deep valleys, river terraces, steep escapements and innumerable streams.

The latitude and longitude of project road are as follows:

(a) Start Point: Gumma (30°48'1.21"N, 77°43'41.23"E)

(b) End Point: Fediz (30°50'59.34"N, 77°44'40.37"E)

Figure 4-1 Hilly Terrain Topography Features of the Project Road

Figure 4-2 Plain Terrain Topography Features of the Project Road

The project road passes through North Eastern part of Himachal Pradesh. The project road section is of 8.650 km mountainous terrain. There is lot of undulations in the topography of the area. The uphill slope has good catchment, and the rainwater generally drains out through the natural streams on both flanks of the slide.

Different types of topographic pictures are given in Fig 4-1 & Fig 4-2.

4.1.1 Geological analysis of the Area

The project area primarily consists of alluvial deposits. The other geological formations in the project area comprise of sandstone. Primarily clay forms the top zone of project area. There is presence of variable sizes and types of rocks in the area. The geological features map of project area is given in **Fig 4-3.**

Figure 4-3 Geological Map of India

4.1.2 Seismology

The area is moderately earthquake prone. Earthquakes have been experienced in many parts of the state. The epicenters of various earthquakes experienced in the past lies outside the state boundaries as well.

As per the Bureau of the Indian Standards (BIS) map IS: 1983-1984, the district of Sirmour and Shimla lies in Zone V. Zone V is the highest earthquake zone. Map showing seismic zone of India is given below in **Figure 4-4.**

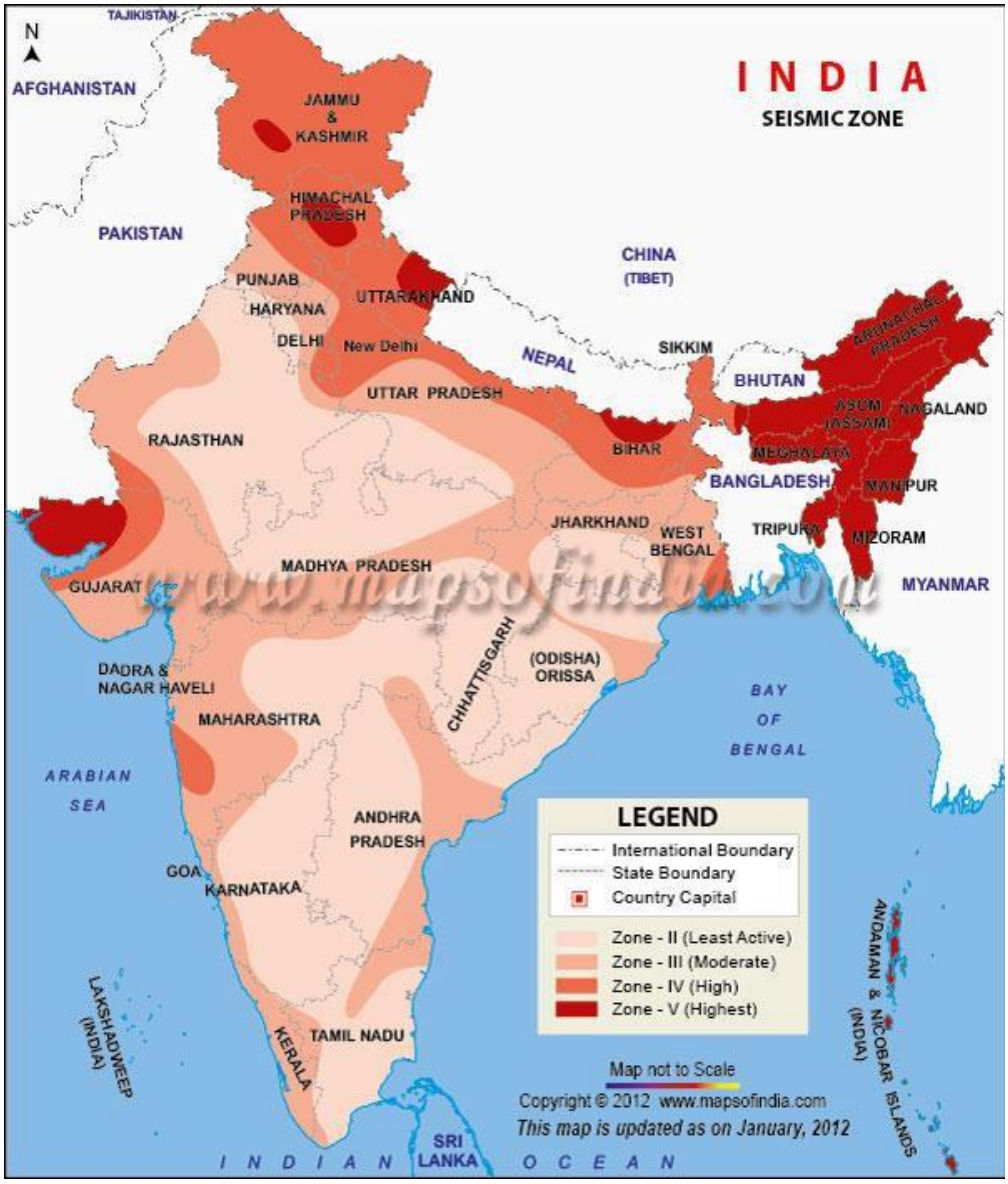

Figure 4-4 Seismic Zones of India

4.1.3 Soil Characteristics

Major soil types that are scattered throughout the state are alluvial soils and Brown Podzoic soils and similiar variety is found in the Project area as well.

The problem of soil erosion is one of the major environmental problems affecting the Himalayan region, with millions of tons of soil being either washed or blown away in due course of time. This in turn affects soil fertility adversely.

4.1.4 Landslides

There is major issue of soil stability in the hilly terrain of the project area. This is accompanied by landslips, mud flows and flash floods affecting the entire area. The problem rises during rainy season and adversely affects the road structure. The environmental survey team has observed some weak areas as geologically unstable along the project road.

Landslide Zone: Weak spots which are chronic by way of hill slides are identified. The most active sliding zones are tabulated in the Table No. 1 below. Some other small spots are also observed. Thorough study of these spots reveals that the causes of landslides may be mechanical weathering, chemical alteration, influence of seasonal fluctuation of temperature, rains, which generally result in the deterioration of the strength characteristics of slope forming materials.

Table 4-1 SLIDING ZONES (As per Design Chainage)

S. No.	FROM (Km)	UPTO (Km)
1	95.530	95.580
2	95.400	95.430
3	96.520	96.570
4	98.800	98.850
5	101.170	101.270
6	101.370	101.470
7	101.690	101.730
8	102.630	102.690

4.1.5 Climate

The Project corridor (NH-707) is located in Humid Sub-Temperate region and the climate is distinguished by three distinct seasons.

a. Summer Season (April to June)

b. Rainy Season (July to Aug.)

c. Winter Season (Nov. to Feb)

4.1.6 Rainfall

Annual average rainfall of the area lies between 1400mm to 1600mm, 75 % of which is received during monsoon season. The distribution throughout the year depends upon various other factors. During summers the area gets average of 130mm rainfall, during winters the area gets average of 60mm rainfall and during monsoon the area gets average of 1251mm rainfall.

During a heavy rainstorm may wash away as much as 90 tons of soil per acre. Most of the splashed soil particles don't leave the field; they clog surface pores, which in turn reduce water infiltration, increases water runoff, and increases soil erosion.

4.1.7 Variation in Temperature

The temperature in the project area varies, according to season and elevation. There is change from moderately hot to freezing cold temperature depending upon the time of the year or season. The period from 15th December to 15th February is the coldest period. Temperature increases gradually till June. The winter prevails from November to February, spring in March, summer from April to June and monsoon in July-August. The minimum temperature in winters is as low as 0°C and rises to 42°C in summers.

4.1.8 Humidity Condition

There is variation of relative humidity in the project area from 19.91 to 98%. However, mostly the relative humidity remains high throughout year. It is recorded lowest around the month of May and highest around the month of August.

4.1.9 Wind Characteristics

Intensity of wind is moderately blows throughout the season and keeps within the range of 1-19 km/hr. Some increase in the month of September is observed in recent years. During monsoon it varies from 0.6 to 1.12 m/sec. The direction of wind is mostly towards south. After monsoon is over the direction of wind is from East to West.

4.2 PHYSICAL ENVIRONMENT

4.2.1 Air Environment

The ambient air quality status of the project area forms the basis for prediction of the impacts due to the proposed project. Degradation of ambient air quality is the most commonly identified adverse impact on the natural and bio-physical environment during the construction and operation of the road projects.

The National Ambient Air Quality Standards (NAAQS) and ambient air quality monitoring results of previous studies carried out in the adjoining area are presented in tables below:

Table 4-2 National Ambient Air Quality Standards

Pollutant	Time Weighted Average	Concentration in Ambient Air		Methods of measurement
		Industrial, Residential, Rural and other areas	Ecologically sensitive area(notified by central government)	
(1)	(2)	(3)	(4)	(5)
Sulphur dioxide (SO2), µg/m3	Annual*	50	20	-Improved West & Gaeke-Ultraviolet fluorescence
	24 hours**	80	80	
Nitrogen Dioxide (NO2), µg/m3	Annual*	40	30	-Modified Jacob & Hochheiser (Na-Arsenite) chemiluminescenc
	24 hours**	80	80	
Particulate Matter (Size less than 10m) or PM10µg/m3	Annual*	60	60	- Gravimetric - TOEM - Beta attenuation
	24 hours**	100	100	
Particulate Matter (Size less than 2.5m) or PM2.5µg/m3	Annual*	40	40	- Gravimetric - TOEM - Beta attenuation
	24 hours**	60	60	
Carbon Monoxide (CO) mg/ m3	8 hours**	02	02	-Non Dispersive Infra Red (NDIR) spectroscopy
	1 hour**	04	04	
Avg. SPM (µg/m3)	Annual*	360 & 140	70	- Gravimetric
	24 hours**	500 & 200	100	- TOEM - Beta attenuation

(Source: National Ambient Air Quality Standards, CPCB)

Annual average: Annual Arithmetic Mean of minimum 104 measurements in a year taken twice a week 24-hourly at uniform interval

****24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.***

4.2.1.1 Methodology

High volume ambient air samplers were used for the collection of samples in ambient air for 3 locations (One location at upwind direction and two locations at downwind direction) near the proposed alignment. The selection of the receptors was based on the following considerations:

- Covering the proposed ROW;
- Covering land use characteristics and socio-economic conditions observed along the route.

Samples were collected on 24 hourly basis for PM10, PM 2.5, NO_X, CO, Pb and SO_2. Samples for CO were collected for one-hour duration. The sampling and analysis has been done according to the relevant IS code and practices and guideline of PPCB.

4.2.1.2 Ambient Air Quality in Study Area

Out of total three (3) locations, at each location samples were collected for parameters PM10, SO2 and NO_x and PM2.5 were collected for 24 hrs. Basis. The details of Locations are given in the **Table 4-3.**

Table 4-3 Details of Ambient Air Quality Monitoring Locations

Station Code	Location Name	Chainage	Land Use	Offset from pavement edge
AAQ-01	Gumma	95/00	Residential/ Commercial	45 m
AAQ-02	Antroli Village	98/300	Residential/ Commercial	05 m
AAQ-07	Fediz	104/00	Residential/ Commercial	6m

The Details of minimum, maximum and mean values of the ambient air quality parameters monitored along the project bypass are presented in **Table 4-4.**

Table 4-4 Onsite 24-Hourly Ambient Air Quality along the Project*

Station Code	Land Use	PM_{10}	$PM_{2.5}$	SO_2	NOx (µg/m3)	CO (ppm)
AAQ - 1	Commercial	63.5	27.0	7.5	19.4	0.46
AAQ - 2	Commercial	53.0	21.1	6.85	16.0	0.34
AAQ - 7	Commercial	40.0	17.8	BDL (<6.5)	7.4	0.25
Maximum		63.5	27.0	7.5	19.4	0.46
Minimum		40.0	17.3	6.85	7.4	0.25
Mean		51.75	22.15	7.18	13.4	0.71

***Samples were collected in June 2015.

Note: Conversion Factor for Carbon Monoxide 1ppm CO = 1157 µg/m3

4.2.2 Noise Environment

Noise attributed to roads depends on factors such as traffic intensity, the type and condition of the vehicles plying on the road, acceleration/deceleration/gear changes by the vehicles depending on the level of congestion and smoothness of road surface (IRC: 104-1988).

4.2.2.1 Sampling Criteria

Hourly noise levels were recorded at 03 locations identified along proposed ***Gumma to Fediz Section of NH-707***. Details of the locations are presented in table below.

The hourly noise values were used to calculate daytime and night time equivalent noise levels. In order to arrive at daytime noise levels the logarithmic average of hourly values was taken from 6:00 AM to 10:00 PM. The night time noise levels were derived by taking logarithmic average of hourly values from 10:00 PM to 06:00 AM. The hours of day and night were considered as specified durations for 'day' and 'night' in Noise Rules Published by the MoEF. Details of the recorded noise levels are given below:

Table 4-5 Recorded Noise Levels at Various Locations*

Location Code	Description of Location	Distance from Proposed ROW (m)	Noise Levels dB (A) Leq.	
			Day time	Night
Gumma to Fediz Section of NH-707				
NQ-1	Gumma	10m	63.8	43.3
NQ-2	Antroli Village	5m	54.2	40.2
NQ-3	Fediz at 104/00	7m	51.6	38.2

*Noise Quality (NQ) recorded in September, 2019.

Table 4-6 National Ambient Noise Levels Standards (as per CPCB)

Area Code	Category	Limits in Decibels (dBA)	
		Day Time	Night Time
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence	50	40

Note: (1) **Day Time:** 6 AM to 10 PM, **Night Time:** 10 PM to 6 AM

(2) Silence zone is an area up to 100 m around premises as hospitals, educational institutions and courts. Source: Central pollution Control Board, New Delhi.

4.2.3 Water Environment

There are 1 Number of river flowing along the **Gumma to Fediz Section of NH-707**, which comprises the surface water resources of the Project area. The water resources of the Project Area is summarized in **table below:**

Table 4-7 Surface and Groundwater Sources in the Project Area

S. No.	Name of Project corridor	Water sources Nearby project		Water sources in direct influence area of road.			
		Canals	River	Wells	Tube wells	Hand pumps	Ponds/ Tanks
1	***Gumma to Fediz Section of NH-707***	-	01	-	-	-	-

4.2.3.1 Surface Water

Rivers Details of the Rivers in the project study area are as follows:

Yamuna River:-Yamuna is the most important and measure river of project region. It flows along the border of Himachal Pradesh and Uttarakhand. Project start at Paonta Sahib is situated near the bank of Yamuna.

Giri River: - The River Giri is an important tributary of the Yamuna River. It drains a part of South-Eastern Sirmour. The Giri rises from Kupar peak just above Jubbal town and flows down in the South- Eastern direction and divides the Sirmour district and crosses project highway in km 18 near Sataun.

Minus River: - The Minus River is a tributary of the Tonns River, which in turn drains into the river Yamuna. The Minus River crosses project highway in km 88 in Minus.

Tonns River: - This River is an important tributary of the Yamuna River and joins it at Kalsi in the North-Western part of Dehradun valley. It flows along about 25 kin length of the project highway which lies between km 90 and end point of the road i.e. Guinina.

4.2.3.2 Groundwater

The ground water resource occurs mainly in unconsolidated sediments of intermountain valleys and in sub mountain tract. The project districts, particularly their valley areas depend upon ground water. The exploitation is done through open wells and infiltration galleries. However to establish baseline quality of ground water four sampling locations were selected along the project highway. Samples were analyzed as per APHA and IS-3025 procedures.

4.2.3.3 Water Quality

Water quality is a concern for the numerous surface water sources and the groundwater sources. Two surface and one ground water samples have been collected from sources present along the proposed alignment to ascertain the baseline conditions of water quality. Location details of the surface water and ground water samples collected are **presented in table below:**

Table 4-8 Details of the Sampling Locations of the Surface and Ground Water

Sample Code	Description of source	Name of the Settlement	Type of Sample
GWHP-01	Hand Pump near Gumma	Gumma	Ground Water
SWHP-01	River at start of the project	Gumma	Surface Water
SWHP-02	River near Fediz Bridge	Fediz	Surface Water

The water quality of the surface water and ground water samples are presented in Table 4-9 and Table 4-10 respectively. These samples were analyzed for all essential characteristics and for most of the desirable characteristics specified in IS 10500: 2012, and are analyzed in accordance with the standard methods specified by IS codes.

Table 4-9 Characteristics of Surface Water*

S. No.	Parameters	Unit	SWHP-01	SWHP-02
1	PH Value at 25°C	-	7.82	8.12
2	Turbidity	NTU	1	3
3	Conductivity		455	410
4	Total Dissolved Solids	Mg/l	278	265
5	Total Suspended Solids	Mg/l	<5	<5
6	Total Hardness (as $CaCO_3$)	Mg/l	156	198
7	Chlorides (as Cl)	Mg/l	52	43
8	Total Alkalinity	Mg/l	126	138
9	Sulphate (as SO4)	Mg/l	19	15
10	Nitrate (NO3)	Mg/l	4.8	5.6
11	Fluoride (as F)	Mg/l	0.1	0.1
12	Iron (as Fe)	Mg/l	<0.05	0.07
13	Zinc (as Zn)	Mg/l	<0.05	<0.05
14	Calcium (as Ca)	Mg/l	34	52
15	Magnesium (as Mg)	Mg/l	17.3	16.6
16	Cadmium as cd		<0.01	<0.01
17	Copper (As Cu)	Mg/l	<0.05	<0.05
18	Nickel (as Ni)	Mg/l	<0.01	<0.01
19	Lead (as Pb)	Mg/l	<0.1	<0.1

20	Mercury (as Hg)	Mg/l	<0.001	<0.001
21	Total Arsenic (as As)	Mg/l	<0.025	<0.025
22	Phenolic Compound (as C_6H_5OH)	Mg/l	<0.001	<0.001
23	Phosphorous as (P)	Mg/l	<0.03	<0.03
24	Manganese (As Mn)	Mg/l	<0.01	<0.01
25	Cyanide as CN	Mg/l	<0.05	<0.05
26	Total Chromium (as Cr)	Mg/l	<0.05	<0.05
27	Anionic Detergent (MBAS)	Mg/l	<0.01	<0.01
28	Aluminum (as Al)	Mg/l	<0.03	<0.03
29	Oil & Grease	Mg/l	<2	<2
30	Chemical Oxygen Demand	Mg/l	6	10
31	Biological Oxygen Demand (27^oC 3 Days)	Mg/l	<1	1.4
32	Dissolved Oxygen	Mg/l	8.3	7.8
33	Total Coliform	MPN/100ml	18	24

*Samples were collected in September, 2019.

Table 4-10 Characteristics of Ground Water*

S. No.	Parameters	GWHP-01	Max. Requirement as per(IS-10500-2012) Amend 1	
			Acceptable Max.	Permissible (in Absence of alternate source) Max.
1	Color	5	5	15
2	Taste	Agreeable	Agreeable	Agreeable
3	Odour	Agreeable	Agreeable	Agreeable
4	Turbidity (NTU)	<1	1	5
5	Ph Value	7.54	6.5 to 8.5	No Relaxation
6	Total Hardness as CaCO3, (mg/l)	162	200	600
7	Iron as Fe (mg/l)	0.09	0.1	No Relaxation
8	Chloride as Cl (mg/l)	52	250	1000
9	Total dissolved Solids (mg/l)	281	500	2000
10	Calcium as Ca (mg/l)	35	75	200
11	Copper as Cu (mg/l)	<0.02	0.05	1.5
12	Manganese as Mn (mg/l)	<0.05	0.1	0.3
13	Sulphate as SO4 (mg/l)	18	200	400
14	Nitrate as NO3 (mg/l)	4.6	45	No Relaxation
15	Fluoride as F (mg/l)	0.2	1.0	1.5
16	Phenolic compounds as C_6H_5OH (mg/l)	<0.001	0.001	0.002
17	Selenium as Se (mg/l)	<0.01	0.01	No Relaxation
18	Zinc as Zn (mg/l)	0.07	5	15
19	Anionic detergents as MBAS	<0.01	0.2	1.0
20	Total Alkanity (mg/l)	128	200	600
21	Aluminium as Al (mg/l)	<0.02	0.03	0.2

22	Boron	<0.1	0.5	1.0
23	Cadmium as Cd (mg/l)	<0.003	0.003	No Relaxation
24	Cyanide as CN (mg/l)	<0.005	0.05	No Relaxation
25	Lead as Pb. (mg/l)	<0.01	0.01	No Relaxation
26	Total Chromium (mg/l)	<0.05	0.05	No Relaxation
27	Magnesium as Mg (mg/l)	18.1	30	100
28	Mineral Oil	<0.5	0.5	No Relaxation
29	Mercury as Hg (mg/l)	<0.001	0.001	No Relaxation
30	Arsenic as As (mg/l)	<0.01	0.01	No Relaxation
31	Coliforms (MPN/100 ml)	Not Detected	Shall not be detected	
32	E. Coli/100 ml	Absent	Absent	

*Samples were collected in September, 2019.

The characteristics of the ground water and surface water samples were found to be well within the standard limits specified for the water quality characteristic for the desirable limits as specified in BIS10500: 2012 except a few deviations for the surface water and ground water.

4.2.4 Land Environment

Land and soil constitute the basic components of the physical environment. The alignment of a road may cause changes in land, land use, soil and denudation processes in different intensities.

4.2.4.1 Geology and Soils

Geology and Soil Types of the Area:

Major soil types that are scattered throughout the state are described here. Alluvial soils and Brown Podzoic soils variety is found in Sirmour and Shimla district (Project influence area).

4.2.4.2 Soil Analysis

For the assessment of the base line soil quality, soil samples were collected at 2 locations from near the proposed alignment of the project road. Details of the soil sampling locations are presented in **Table 4-11**. Soil samples were collected for 15 cm and 100 cm depth for each location.

Table 4-11 Location Details of Soil Samples

Sample Code	Location of Sample	Depth	Land Use
Gumma to Fediz Section of NH-707			
SQHP-01	Gumma	15 cm	Agricultural Field
SQHP-02	Fediz	100cm	Agricultural Field

The characteristics of the soil along the proposed project road are presented in **Table 4-12.**

Table 4-12 Soil Characteristics of along the Project *

S. No.	Parameter	Unit	SQHP-01	SQHP-02
1	pH (1:2.5)	-	7.11	7.68
2	Electrical Conductivity of Saturation Extract (1:2)	umhos/cm	510	498
3	Soil Moisture Content	%	56.48	49.85
4	Soil Texture	-	Sandy clay	Sandy clay
5	Organic Matter	%	1.48	0.98
6	Lead (pb)	mg/kg	0.11	BDL
7	Permeability	mm/hr	53.24	52.61

*Samples were collected in September, 2019.

Note: BDL - Below Detection Limit Meq - milli Equivalent

4.3 ECOLOGICAL RESOURCES

Ecological resources are among the most important resources impacted by the proposed bypass. In this section baseline details of the flora and fauna are presented.

4.3.1 Flora

The natural vegetation follows a climatic altitudinal zonation. In the altitude range of 300 900m, as in Rajban, the vegetation is tropical and subtropical in character. 'Sal' is the main species of the broad leaved hill forest. Some patches on the hill slopes are clad in dense forests which are `reserved'. The important species of plants found in the project study area are:- *Shorea robusta* :(Sal), *Quercus* intone : (Oak),Alnus glutinoa:(Alder), *Albizzia Lebbek* :(Seris), *Dalbergia sissoo*:(Shisham), *Adinacard folia*:(Holdu), *Bachananania lot folio* : (Bhilova), *Condia mysea* : (Lasors), *Eugenia jambolana* : (Jamun), *Ruododenron arboretum*, *Terminate tomentos* : (Asin).

Among the shrubs there area Vitex, Munj, Ber, Dodenea, Bamboo etc and among grasses Vetiver, Sanchrus, Munj are common.

Road side vegetation is likely to be impacted due to proposed road widening project. The major trees to be affected/ cut are Pine, Khadig, Deodar, Gular, Saal and Kachnar. The tree removal will take place from Corridor of Impact of project road.

4.3.2 Protected Areas and Fauna

The existing network of protected areas (PA's) in Himachal Pradesh has 32 Wildlife sanctuaries (5664 sq.km) and two National parks (1440sgkm) covering a total geographical area of 7,104 sq.km. However, No wild life sanctuary/National Park is located within 10 km aerial distance from the alignment of project road or none of the same has their Eco-sensitive zone in the project study area. Survey was carried out in 10km of the proposed road project. The ground studies along the alignment, together with Forest Department and stakeholder consultation have revealed that there are some wild mammalian species such as Sloth bear,

Sambhar deer and Leopard found near the study area occasionally, while livestock of local people i.e. goat, sheep, cow etc. and common animals as field mouse, Squirrel, flare, dog, cat, bats, monkeys etc. are significantly using the area.

There are many river channels present in the buffer zone of study area which are the major attraction sites for avifauna. Birds like Himalayan Bulbul, Red Vented bulbuls, Purple Sunbird, Rufous Tree Pie, White Capped Water Redstart, Whistling Thrush, Red Jungle Fowl, Parakeet, and Common Myna are found common in occurrence.

Due to diversified forest lying along and across the riverbed, the area is equally important for butterfly diversity. Butterflies form important part of the food chain components for the birds, reptiles, spiders and other predatory insects making them inevitable part of present ecosystem.

The information of important animal groups such as Birds, Reptiles, Fishes and Mammals were collected by trekking inhabiting area, along the river banks, adjoining forest on the slopes, nallahs, hill top and agricultural fields present in the project influence area.

4.3.3 Biodiversity and Endangered Fauna

4.3.3.1 Reptiles

Out of the species of reptiles recorded (Table 3.13), two species of lizard i.e. Monitor Lizard and Common Garden Lizard are reported common in occurrence. Among reptiles, three species of snake such as Russells Viper and Rat Snake recorded in study area also, which are listed in Schedule II, Part II of the Indian Wildlife (Protection) Act 1972. None of the reptile species is present in the IUCN Red List of Threatened Animals (2007).

Table 4-13 List of Species of Reptiles Recorded in the Study Area

S. No.	Zoological Name	Common Name	Conservation Status as per IUCN
1	*Daboia russelii*	Russell's Viper	LC
2	*Bungarus caeruleus*	Indian Krait	LC
3	*Varanus spp.*	Monitor Lizard	VU
4	*Calotes versicolor*	Indian Garden Lizard	LC
5	*Pi Pas mucosa*	Rat Snake	LC

Source: CEA sunoeto, LC=Least Concern, VU= Vulnerable

4.3.3.2 Birds

Many species of birds are found in the study area (Table 3.14). Most of the species of birds are protected as their respective families have been listed under Schedule IV of Indian Wildlife (Protection) Act 1972 and none under IUCN red listed endangered, threatened and vulnerable species of birds are recorded in the study area.

Table 4-14 Species of Birds Found in the Study Area

S. No.	Zoological Name	Common name
1	*Psittacula hinzalarana*	Slaty-headed Parakeet
2	*Columba Livia*	Blue Rock Pigeon
3	*Streptopelia chinensis*	Spotted Dove
4	*Streptopelia senegalensis*	Laughing Dove
5	*Dicrurus macrocercus*	Black Drongo
6	*Acridotheres tristis*	Common Myna
7	*Hr psipetes leucocephalus*	Black Bulbul
8	*Pyconotus leucogenys*	Himalayan Bulbul
9	*Pvcononotus cafer*	Red-vented Bulbul
10	*Passer domesticus*	I louse Sparrow

Source: *CEA, survey*

4.3.3.3 Mammals

Area is not rich in wild mammals, but many domesticated mammal species are reported from buffer zone during the field survey. Common grazing animals like buffalo, cow, goat etc. can be noticed in open grass fields. Small mammals like Indian palm squirrel *(Funambulus palmarum)* and field mouse *(Apodemus svlvaticus)* are noticed in vicinity of village. Inquiry from village people regarding wild animals reveals that Rhesus macaque *(Macaca mulatta*), Indian hare (*Lepus nigricollis*), fruits bat (*Pteropus conspicillatus*), etc. are often seen in the area. As per discussed wirh Rajban Forest Range officials it was found that Sloth bear (*Melursus ursinus*), Sambhar (*Rusa unicolor*) and Leopard (*Panthera Pardus*) are seen occasionally in the upper reaches of the project study area.

Table 4-15 List of important Mammal species recorded in the study area

S. No	Zoological Name	Common Name	Conservation Status
1	*Macaca mtdatto*	Rhesus Macaque	LC
2	*Semnopithecus entellus*	Common Langur	NT
3	*Lepus nigricollis*	Indian Hare	LC
4	*Funambulus pennanti*	Five-striped Palm Squirrel	LC
5	*Pteropus giganteus*	Indian Flying Fox Bat	LC
6	*Apodemus svlvaticus*	Field Mouse	LC
7	*Melursus ursinus*	Sloth bear	VU
8	*Rusa unicolor*	Sambhar	VU
9	*Panthera pardus*	Leopard	VU

Source: *CEA survey, LC=Least Concern. VU= Vulnerable, AT=near threatened*

4.3.3.4 Fishes

During survey some fish species were identified from the Giri, Tons and Yamuna rivers. Most common and predominant fish present in the catch was endemic golden mahseer (Tor spp) followed by other fishes including Schizothorax spp., Barilius spp., Channa spp., Glyptothorax spp, Bagarius spp, Puntius spp. None of the fish species recorded from the study area are listed in various schedules of the Indian Wildlife (Protection) Act 1972 or listed in the IUCN Red List as Threatened Animals (2006).

The common fishes of the study area are as follows (Table 4-16)**:**

Table 4-16 Resident Fish Species Recorded in Study Area

Fish Species	Local Name	Common Life Stage		Dwelling habits	Feeding habits	Breeding period
		Name	encountered			
Family: Cyprinidae						
Tor puNlora (Hamilton	Mahseer chiniaru	Golden mahseer	Fingerlings and Adults	Column and mid water dweller scavenger	Column Ormnivorous: green matters, insects and their larvae, phyto benthos, Zoo benthos.	Monsoon months
Sclrrolborax richardsoii (Gray)	Sal	Himalayan trout	Fingerlings and Adults	Midwater dweller	Herbivorous: green matters, algae attached on stones, phytobenthos etc.	August to October
Labeo deco (Hamilton)	Gid	Sairu	Fingerlings and Adults	Midwater dweller scrapper	Herbiomnivorous: macrophytes, Insects, Phytobenthos, Zoobenthos	March to June
Barilius spp. i. B. bendelesis ii. B. barila iii.B. vagra	i.Patha ii.----- iii. Lohari	Hillstream carp	Juveniles, fingerlings and Adults	Column of side waters/ ditches on the bank of small tributaries	Omnivorous: small insects, phytoplankton, zooplankton	February to June *Found in Sep-Nov.

Puntius spp. i. P. ticto ticto ii. P. sarana	ii. Khangni	Minnows	Adults	Shallow pools and riffles	Column feeder, Planktonic feeder	-
Family: Siluroidie						
Bagarius bagarius	Goonch	Hillstrear catfish	Adult	Bottom dweller beneath stones	Scavengers: Feed upon animal flash, Insects	-
Family: Sisroidie						
Gly*ptothorax* spp.	catfish	Hillstream	Adults	Bottom dweller beneath stones	Scavangers: Feed upon animal flash, Insects	-
Family: Channidae						
Channa orientalis	Dauli	Snake head	Adults	Shallow pools and muddy water	Carnivores, small insects and zoo benthos	-

*None of the Fish is in IUCN Red List

Source: CEA, surrey

4.4 SOCIO-CULTURAL ENVIRONMENT

4.4.1 Demographic Features

Gumma to Fediz Section of NH-707: Project road falls in two districts of Himachal Pradesh state. Demographic and socioeconomic details of Himachal state and both districts namely Shimla and Sirmaur are given below:

4.4.2 Socio-economic Profile of Project Affected People

The majority of the potentially affected / benefited persons living in the project Influence zone frequently travel down the existing roads or proposed alignment of the project. Their purpose of visit brings them generally to the prominent market places by the roadside or transport boarding points alongside the road. Other beneficiaries also pass through the important junctions of the feeder roads connecting the project roads / proposed alignment. There are administrative offices, places of worship, community structures, in the major settlements within the project impact zone.

Table 4-17 Socio Economic Profile

State/District	Himachal		Shimla		Sirmaur	
Population	2001	2011	2001	2011	2001	2011
Persons	60,77,900	68,56,509	7,22,502	8,13,384	4,58,593	4,72,926
Male	3087940	34,73,892	38,0,996	4,24,486	2,41,299	2,46,599
Female	2989960	33,82,617	3,41,506	3,88,898	2,17,294	2,26,327
Population Density per Sq. km	109	123	141	159	162	188
Literacy Rate %						
Male	86.02	90.83	87.72	90.73	63.2	79.73
Female	68.08	76.6	70.68	77.8	38.45	60.93
Sex ratio	970	988	898	916	897	901
Human Development Index	0.518		0.409		0.433	

Source: District Statistical office. Nahan, Dist.

4.4.3 Agriculture

The agricultural sector of the Himachal Pradesh Economy contributes over 45% to the net state domestic product and nearly the entire population of the state depends directly upon agriculture.

Gumma to Fediz road section of Himachal located in the Plains & Rolling and Hilly both terrains. There is paddy, maize, sugar cane etc., cultivated intermittently. Since there is no water scarcity along this alignment, the area is used for cultivation. Around 17% of project area population are doing agriculture related works.

Himachal Pradesh is known as the Apple State of India. However, apples are grown in upper parts of the project highway as Rohru, Jubbal and Chaupal and transported through the project road.

5. PUBLIC CONSULTATION

5.1 INTRODUCTION

The ***Gumma to Fediz Section of NH-707*** project will bring overall benefits to the people in the area as well as to those living close to the corridor. However, a few are likely to experience negative impacts, which can be overcome through proper mitigation measures. Throughout the process of consultation, the focus was on understanding community impacts and to obtain their feedback to effectively establish appropriate road design and implementation.

5.2 METHODOLOGY ADOPTED FOR PUBLIC CONSULTATIONS

5.2.1 Levels of Public Consultations and Profile of Stakeholders

Public consultation was conducted at project preparation stage. Public consultations have been held at the levels as follows:

Local level:

Public consultations in the project area were held at local level. The following steps have been adopted for carrying out public consultations in this project:

- Disseminating information and requesting villagers to attend the public consultation meetings through village Sarpanch and field staff.
- Sharing the opinions and identify the local environmental issues.
- Involving the PAPs to avoid/mitigate the impacts.

Institutional level:

- Institutional level consultations were held with Himachal Pradesh Forest Department and Himachal Pradesh State Pollution Control Board.

5.3 CONSULTATION PROGRAMME

Focus Group Discussions (FGDs) were held at two (2) locations along the ***Gumma to Fediz Section of NH-707 project road.*** During the FGD, interaction/discussion was held with the general public and the village Sarpanch. The public consultations in the project area were mainly conducted at the local level i.e. at village level

The details of the stakeholder consultations including the date, location, participants, the issues discussed and the outcome / mitigation measures (design) is summarized in table below:

Detailed Attendance sheets of these consultations are presented in **Annexure –I.**

Table 5-1 Summary of Local level Consultations at *Gumma to Fediz Section of NH-707*

Project Corridor	Location	Chainage	No. of participants	Typical Issues	Remarks
Gumma to Fediz Section of NH-707	Antroli Village	98+300	18	• Drainage problem • Road Safety • Bus Stop • Dust suppression measures should be adopted • Provision of speed breaker • Relocation of Structures • Junction Improvement	Issues considered in design
	Near Starting Point Gumma Village	95/000	16		

5.4 DETAILED ISSUES RAISED

Some of the general issues raised during the different consultation sessions can be summed up as follows.

Loss of Income Restoration Options

This issue was raised by most villagers as loss of fertile land will deteriorate their income sources. Instead of lump sum money they were more interested in limited regular income.

Road Safety

Safety issues were paramount in all the consultation sessions i.e. curve improvement, Traffic calming measures etc. Woman participants raised the issue of their children's safety.

Drainage

Water logging and divide of agricultural land in two parts are one of the important concerns of public.

Higher Level of Pollutants due to Increase in Traffic

People were concerned about pollution levels in the area after construction of the project road. Some of the participants were also concerned about noise pollution after construction. Vegetative noise barrier are proposed to minimize the noise pollution at several locations as specified in above table.

5.5 REDRESS OF ISSUES

The project has tried to address all the issues raised during consultations under the constraints of suitability from engineering point of view. A table of general issues that arose during public consultations and their redress has been presented in Table 5-2.

Table 5-2 Address of General Issues and Concerns under the Project

Issue/Concern	Redress Under the Project
Loss of Income Restoration Option	People will be compensated a s per R&R framework (The detail is provided in RAP document prepared by HPSPCB).
Road Safety	Traffic calming measures (at all intersections), crossing points have been proposed for the safety of local people. Hazard markers, RRPM, road marking etc. have also been provided. Crash barrier has also been proposed throughout the alignment
Land Acquisition and Mode of Compensation	Compensation will be made as per RAP
Flood Problem	Total 38 nos. culverts have been provided at various locations
Drainage	Drainage has been provided throughout the alignment
Loss of Trees	Compensatory forestation would be done at the ratio of two trees for each tree to be cut. Local species of trees have been selected for plantation.
Impact on Health	Further study has been suggested to study the impact of bypass on community's health. Roadside plantation has been proposed to screen emissions from the traffic reaching the settlement areas.
Utilities and Basic Infrastructure	All the utilities and basic infrastructures to be impacted will be relocated under the project cost.
Employment During Construction	The locals will be given preference for employment during construction provided they meet job requirements.

5.6 PHOTOGRAPHS

LOCATION: VILLAGE-ANTROLI (98+300)

LOCATION: NEAR STARTING POINT GUMMA VILLAGE (96/200)

6. ANALYSIS OF ALTERNATIVES

6.1 GENERAL

The mandate of the current project is to widen the existing road to 2 lanes with provision of paved shoulder in the build-up sections and hence there is no alternative site is involved. However, the chapter discusses on the “With” and “Without" project scenarios. The methodology that has been adopted for the evaluation of the alternate alignment route for construction of Project Road and the selection is based on engineering, economic, environmental and social considerations have been highlighted. The minimization of environmental impacts by considering design alternatives determines the extent of mainstreaming of the environmental component. This chapter looks at the decisions made during the project when alternatives were available and describes the rationale behind each decision. The EIA study with EMP and without EMP has also been discussed in the context of Gumma to Fediz project.

6.2 WITH AND WITHOUT PROJECT ALTERNATIVES

Keeping in view the site conditions and the scope of development of the area, the `with' and `without' project scenarios have been compared as given in **Table 6-1.**

By looking at the table it can be concluded that "With" project scenario positive/beneficial impacts will improve the environment and enhance social and economic development of the region compared to the "Without" project scenario, which will further deteriorate the present environmental setup and quality of life. Hence the "With" project scenario with minor reversible impacts is an acceptable option than the "Without" project scenario. The implementation of the project therefore will be definitely advantageous to achieve the all - round development of the economy and progress of the region.

Impacts on vegetation are expected during construction phase. Little increase in the pollution levels of the air is possible. Dust and particulate matter during construction will affect the air quality on a short-term basis. However, an important benefit which is not represented in this assessment will be major reduction in the Particulate Matter (PM 10 and PM2.5) levels from vehicles using a surfaced road (with project scenario) in the build condition, compared to a continued use of dusty unsurfaced/tracks (without project scenarios). The minor impacts due to air; noise, vegetative cover and soil erosion will be remunerated by adopting appropriate mitigated measures such as roadside plantation, arboriculture and landscaping, compensatory afforestation, and providing underpasses and bio-engineering measures with retaining structures.

Table 6-1 'With' and 'Without' Project Scenario

Component	Without' Project Scenario	With' Project Scenario
Connectivity and development	Without' Project Scenario The connectivity between the other National and State Highways is not good. Existing connectivity with Delhi, Haryana and Uttarakhand need to be apples Pavement conditions are in poor condition resulting in high travel time, bad vehicle conditions, and more pollution. Poor pavement conditions restricting people's access to local market, Medical facilities, education centers, work zones etc.	It will improve inter-connectivity between other National Highways (NH-707, NH-124 and various PMGSY roads). Connectivity with Haryana, Delhi and Uttarakhand will improve. Travel time will be reduced due to improved pavement conditions and road geometry and hence Pollution levels will be reduced as well. Trade of local produce like dairy products, agriculture products, and small scale industrial product will also be increased.
Flora	There will not be any impact on existing terrestrial ecology.	With project scenario involves felling of 186 trees due to proposed widening. As per the Forest Conservation Act (1980), Compensatory Afforestation will be done through Forest Department in 1:3 ratio. Avenue Plantation will be done as 558 roadside trees will be planted.
Social and Cultural Environment	There will not be any impact on existing social and cultural environment.	03 structures (Encroachments) including and none of the common property resources will be affected due to proposed widening. Necessary R&R plan has been developed to reduce the socio economic impact due to the proposed project.
Carriageway	2 lane/ intermediate / earthen shoulder	2 lane with paved shoulder has been proposed to improve the road condition

Drainage/ Water logging	Water logging issues are observed along the road side specially settlement area due to absence/non-functional drains.	Will be improved by reconstruction of culverts/ bridges with adequate hydraulic (details are provided in Chapter-2 Project Description) New cross drainage structures and drains are also provided to address the flooding and water logging issues.
Financial Implications	Without project scenario does not involve any capital cost, but there will be recurring maintenance cost to maintain the smooth flow of traffic.	The environmental cost as per environment assessment will be about 24,94,16,431/- crore.

Therefore, "With" project scenario, with its minor adverse impacts is more acceptable than the "Without" project scenario which would mean an aggravation of the existing problems. The potential benefits of the proposed road improvements are substantial and far-reaching both in terms of the geographical spread and time. Hence, it is clear that the implementation of the project will be a definite advantage to State of Himachal Pradesh in order to achieve all-round development of its economy and progress of its people.

The project will have multiple benefits. The project will release the potential of the area and fast connectivity between Himachal Pradesh Uttarakhand and Haryana. Being improved limestone linkage from Sataun, there is further scope of installation of 17 Nos. new factories at Gumma, which is under active consideration of Government of Himachal Pradesh.

Further, there is vast scope for many pharmaceutical industries and limestone industries after up-gradation of NH707. This project will also reduce the travel time substantially. In addition this project road will provide further other benefits like:

- Fast and safe connectivity resulting in saving in fuel, travel time and Total Transportation cost to the society;
- Employment opportunities to local people during road construction;
- Development of local industries, agriculture and handicrafts;
- Development of tourism and pilgrimage;
- Transporting, processing and marketing of agricultural products; Reduction in accidents;

Reduction in pollution;

- Opening of opportunities for new occupations;
- Better approach to medical & educational services and quick transportation of perishable goods like fruits, vegetables and dairy products; and
- Improved quality of life for people and so on

However, there would be an increase in the vehicular pollution-air and noise, in the vicinity of the

highway. This road construction will result in loss of private properties and loss of living.

If the project is not implemented, there is likelihood that the roads presently carrying the traffic between Paonta Sahib and Gumma will deteriorate further and rampant traffic disruptions will hinder the free flow of the traffic. Increased air pollution, due to slow moving traffic and congestion, will follow suit. Noise levels in built up portions will rise due to deterioration of the pavement as well as increased honking.

SAFETY ASPECTS

While assessing the impacts, safety of the road users and the roadside communities has been found to be a major concern. A number of measures have been proposed to reduce the risk of traffic accidents. In some places, these safety measures are co-terminus with the project's impact minimization measures. Horizontal profile correction and intersection improvement has been suggested for betterment of the project corridor. Other safety measures taken are:

- Improvement of existing curves,
- Improvement of existing Curve at bridge approaches.
- Provision of adequate traffic signage,
- Widening of bridge with footpath in built-up location,
- Embankment protection in approaches to bridge
- Foot path and pedestrian guard rails in built up zone,
- Improvement of existing highway junction
- Retro-reflective painting on roadside plantations.

6.3 EIA WITHOUT EMP

The Environment Impact Assessment (EIA) without Environment Management Plan (EMP) will not be complete. The Coverage for project will be limited to establishment of baseline scenario and extent of impact due to project implementation. Without EMP the project implementation will be difficult, as inconvenience to local public will increase. This will result in resistance of local public to the project.

Environmental Management Plan suggests the environmental treasures to monitor, mitigate and manage the adverse impacts of the project on the components of valued ecosystem. If a project is implemented without EMP it will be environmentally disastrous.

6.4 EIA WITH EMP

The EIA with EMP will be more fruitful as it will have detailed mitigation measures, budget and monitoring plan for the project - for pre-construction, construction and operation phases. The EMP will help to mitigate adverse impacts of project, a plan for monitoring to check the efficacy of mitigation measures is also laid out in the design of EMP. The implementation of EMP will also reduce inconvenience to local public during construction and the project will become environmentally sustainable and human friendly.

6.5 CONCLUSION

The analysis indicates little choice of alignment alternatives for the Gumma to Fediz Project. Socioeconomic and Environmental considerations have been given due weightage in the finalization of

the alignment.

The minor adverse impacts are manageable to an acceptable level by implementing Environmental Management Plan and the unavoidable loses will be compensated as per the applicable R&R guiding principles.

7. ENVIRONMENTAL IMPACTS

7.1 GENERAL

Due to the activities of the proposed improvement there will be some potential impacts on the surrounding environment of varying magnitude. Impacts have been assessed based on the information collected from field surveys, baseline data collection studies and additional secondary data collected as part of the study.

The impacts on the natural, biological and social environment can be direct or indirect. Areas of pollution generated include the Corridor of Impact and Operational Facilities of the Contractor. Environmental Impacts due to the project are summarized in **Table 7-1.**

Table 7-1 Environmental Impact Summary

Sr. No.	Parameter	Gumma to Fediz Section of NH-707
I. Negative Impacts		
1	Hand Hand Pumps/Tube Relocation (Nos.)	2
2	Pond Area (sq. m)	0
3	Relocation of Religious properties	0
4	Transfer of Agricultural land (ha.)	0
5	Borrow Earth (Cum)	Nil
6	Quarry Material (Cum)	130879
7	Water (cum)	107675
8	No. of trees to be felled	186
II. Positive Impacts		
1	**Enhancement sites**	
A	Cultural/Religious Properties	0
B	Surface water body	River tons
C	Educational Institute	0
D	Safe Access to educational institution	0
E	Enhancement of Bus bays/Bus shelter	1
F	Vegetative Screen Barrier	0
G	Tree Saving (Nos.)	-
1	**Proposed Plantation – Bamboo plantation**	5700 sqm
2	**Road safety Measures - "W" : Metal Beam Crash Barrier on valley side**	
A	Major junction improvement (nos.)	1
B	Proposal for Rotary Junctions (nos.)	0
C	Bus Shelter (nos.)	5
D	City Lights/ solar light in buildup area	26
	ELECTRIC LIGHTS single arm	10

7.2 IMPACTS ON PHYSICAL ENVIRONMENT

7.2.1 Impact on Soil

Loss of Productive Soil

Top soil will not be used in the road construction work.

Soil Erosion

Construction Stage

Slopes of the project road are relatively stable as the embankment of the road is not high compared to the adjacent lands.

Operation Stage

There will not be any soil erosion during the operation stage as slope of embankments will be protected with appropriate slope protection measures.

Compaction of soil

Compaction of soil may occur, particularly on haul roads during site clearance due to movement of heavy machinery and vehicles and during setting up of construction camps and stockyards. During construction, there is a possibility of compaction beyond the COI, due to the movement of vehicles and heavy machinery.

Contamination of Soil during the Construction Stage

In this project contamination of the soil may take place, from the following activities at the construction zones, construction labour camps, construction plant sites and other auxiliary facilities required for the construction. Details of the activities from which the contamination can occur are presented below;

- Scarified bitumen wastes.
- Maintenance of the machinery and operation of the diesel generator sets on site.
- Oil Spill from the operation of the mechanical works hops, diesel pumps and diesel storage, during transportation and transfer, parking places, and diesel generator sets.
- Operation of the emulsion sprayer and laying of hot mix.
- Operation of the residential facilities for the labour and officers.
- Storage and stock yards of bitumen and emulsion.
- Excess production of hot mix and rejected materials.

Table 7-2 gives the details of debris generated and reused. From the table it can be observed that all excavated material can be used for embankment fill. The remaining quantity of earth will be procured from approved borrow areas.

Table 7-2 Details of the Quantities of Debris and Spoil

Excavated Material	Qty. likely to be generated (Cum)	Qty. Required for Embankment Fill (Cum)	Debris Unused/ disposal qty. (Cum)
Scarified Bituminous	4745.183	74439.64	298178.722
Concrete	4861.179		
Spoils/earth/other debris	363012		
Total	**372618.362**	**74439.64**	**298178.722**

7.2.2 Impact on Water Resources

Due to the proposed project there will be some impacts on the water resources. The impacts are due to relocation of hand pumps, use of water for the construction and construction facility operations and accident spills during operation stage.

Details of the water resources affected due to the project are presented in **Table 7-3.**

Table 7-3 Affected Hand Pumps and Wells

Hand Pumps (Nos.)	Bore Wells (Nos.)
2	-

Increased surface run-off

Due to the construction of new pavement and construction of the paved shoulder, the surface runoff may marginally increase as the increased paved surface area reduces the infiltration of water into the ground. There will not be a significant impact on the ground water levels.

Impacts on Water Quality

The sources of water pollution from the construction activities are as follows:

- Water flow from scarified bitumen materials.
- Oil spills from the Maintenance of the machinery and operation of the diesel generator sets on site.
- Oil Spill from the operation of the mechanical workshops, diesel pumps and diesel storage, transportation and transfer, parking places, and diesel generators.
- Operation of the emulsion sprayer and laying of hot mix.
- Operation of the residential facilities for the labour and officers and offices.
- Storage and stock yards of bitumen and emulsion.
- Degradation of water quality is also possible due to accidental discharges into watercourses from drainage of workers camps and from spillages from vehicle parking and/or fuel and lubricant storage areas.

Water requirements for construction

With the following assumptions the approximate water quantity required for the Project has been calculated.

1. 8-10% of weight of soil for the embankment construction.
2. 7-8% of weight of soil for sub grade construction
3. 5-6% of weight of GSB materials for GSB and WMM
4. 150 liters/ cum for concrete

Domestic requirement of 100 liters per worker/day has been assumed. For this project about 50 resident workers have been considered. Details of the water requirement assessed for the project is presented in **Table 7-4.**

Table 7-4 Requirement of Water for Proposed Construction Works

Sr. No.	Purpose	Qty. (Cum)
1	Permanent works (Total quantity in cum)	15
2	Dust Suppression at work zone in (cum/day)	30
3	Curing (cum/day)	15
4	Laboratory (cum/day)	10
5	Haul Roads (cum/day)	20.5
6	Crusher (cum/day)	22
7	Plant Cleaning and workshop washing in (cum/day)	15
8	Domestic Purpose in (cum/day)	20
Total Requirement(cum/day)		**147.5**

Daily water requirement for the permanent works has been calculated based on the total working days (i.e. 730 days) .

7.2.3 Impact on Air Environment

In addition to the direct impacts during the preconstruction, construction and operation phases, the ribbon development adds to the pollution load along the road and will increase the closeness of the receptors.

The Air pollution sources and types has been described in **Table 7-5.**

Table 7-5 Summary of Air Pollution during different stages

Stage	Likely Impacts	Reasons/Activities for Impacts	Remarks
1. Pre-Construction Stage	• Dust Generation	• Site clearance/Grubbing • Cutting of Trees/Shrubs • Transportation of Man and Material • Construction of Stock Yard and office buildings • Installation of Construction plants • Activities performed in Dry	• The impacts are temporary and location specific. • The width of impact is limited.

		Weather	
2. Construction Stage	• Increases the level of PM10 and PM2.5. • Increases the Gases Pollutant level (i.e. CO, SOx and NOx) • Carbon based emission from HMP • Impact on agricultural land having crops, vegetation etc.	• Clearing and grubbing, material dumping, drying of material etc. • Movement of vehicles in Construction camp, • Transportation of quarries/aggregate and soil from borrow area. • Operation of HMP, WMM and Batching Plant. • Emission of fine dust/ rejected material from bag filters of HMP. • Material Storage and handling (loading and uploading). • Construction machinery and vehicle uses.	• The impact area is particularly near working zones, plant sites.
3. Operation Stage	• Dust generation • Emission from vehicular tyres. • Increase the gases pollutant from diesel vehicles (i.e. trucks, buses, cars, utilities etc.)	• Increases the Vehicle moment in rural area. Presently the area is agricultural land and does not have commercial vehicle moments. • Abrasive action of tyres on bypass road.	• The impact is permanent

7.2.4 Noise Environment

The impacts of noise due to the project will be of temporary significance locally in the construction phase and slight increase may occur during the operation stages. However as the present noise levels are already high the impact will be relatively low. The impact is tabulated in **Table 7-6**.

Table 7-6 Summary of Noise Impacts at different stages

Stage	Likely Impacts	Reasons/Activities for Impacts	Remarks
1. Pre-Construction Stage	• Noise level/exposure will increases for the local communities as the proposed road will passes through agricultural and residential rural area.	• Use of heavy Machinery and Equipment for Site Clearance/Grubbing. • Transportation of Man and Material • Construction of plant sites.	• The impacts are temporary and location specific. • The width of impact is limited and not significant.

2. Construction Stage	• The impacts of noise exposure will be on the community residing near to the work zones. • The activities of plants (i.e. HMP, WMM etc.) and DG sets shall produce significaly high noise level.	• The use of machinery involved in the construction operation i.e. dozer, roller, grader, paver, tractors, brooms/rotary brushing, tippers, generators, excavators etc. • Operation of HMP, WMM, Batching Plant and DG sets.	• The impact area is particularly near work sites, plant sites and will also vary for different receptors. • The impact will be quite significant but will be localized to the plant sites.
3. Operation Stage	• Possibly Higher Ambient Noise level on Day and Night time in agricultural and rural residential area near to proposed bypass.	• Uninterrupted movement of heavy and light vehicle on high speed.	• The impact is permanent

The impact on village noise pollution may be significant caused by traffic. Therefore, measures are required to reduce noise from traffic passing through project area.

7.3 NATURAL ENVIRONMENT IMPACT ON ROAD SIDE TREE

The major impact in this project on flora involves the removal of trees to permit construction and to provide clear zone for safety of the road users.

Pre-Construction Stage

There will be a significant, direct impact on cutting of the roadside trees during the pre-construction stage. A total of about 186 trees are required to be cut for the proposed project. The major trees to be affected/ cut are Pine, Khadig, Deodar, Gular, Saal, Kachnar etc. The detail is given in **Table 7-7.** Girth wise details of Tress are given in **Annexure-II.**

Table 7-7 Details of Diverted Protected Forest Area and Trees to be cut within ROW

Name of the Corridor	Forest Area (within ROW) to Be Diverted (ha.)	Number of trees to be cut along the road up to proposed toe line		
		LHS	RHS	Total
Gumma to Fediz Section of NH-707	14.412 Ha	86	100	186

Cutting of trees for fuel by workers, especially near their camps is of major concern. Therefore adequate training of the workers and availability of their fuel requirements are to be ensured by the Contractor.

Operation Stage

Trees and shrubs will be planted along the project corridor; aesthetic view of the corridor will be improved.

Under the proposed project the road aesthetics will be improved by the way of tree plantation, landscaping of embankment slopes, improving the road cross sections providing more bus bays, foot paths, medians and drains. The aesthetics may be reduced during the pre-construction and construction stage and will be improved during the operation phase.

Construction Stage

During construction, the initial visual impacts will be associated with the removal of encroachments from Corridor of Impact and structures from the acquired land, removal of cultural properties, clearing of mature trees and vegetation for the construction activities. These activities create significant differences in the local aesthetics of which some are negative and some are positive. Some activities pose positive impacts such as creation of clearer views along roads or from roadside houses and other buildings that were previously blocked by encroachments. Changes in the aesthetics during the construction stage are generally temporary negative impacts.

7.4 IMPACT ON SOCIO-CULTURAL ENVIRONMENT

7.4.1 Economic Impacts

The direct economic benefits from the strengthening of the state road transport infrastructure include:

- Reduction of Vehicle Operating Cost.
- Lower transport costs by reducing road roughness and improved alignment.
- Improving financial sustainability for road development and maintenance.
- Increased vehicle speeds.
- Reduced passenger time costs.

The relatively short-lived economic impacts of the construction stage are likely to be experienced in local communities for the duration of construction as workers make everyday purchases from local market. This is likely to give a short-lived stimulus to these vendors that will disappear as soon as the construction is complete.

7.4.2 Impact on Religious and Historic Sites

Along the proposed Road no cultural, heritage and religious structures of National and State importance are present.

7.5 IMPACT ON SAFETY AND PUBLIC HEALTH

7.5.1 Impact on Safety

Construction stage

During the road construction operations there will be some discomfort, even after providing proper safety measures, to the pedestrians, community residing near the construction zone. The levels of discomfort can be reduced with proper planning of construction works and providing required construction zone safety measures. Special attention must be given while working in urbanized work zones.

Operation stage

After construction of Project road there will be some negative impacts. The negative impacts are due to increase of traffic volumes and speeds, which would have a direct bearing on the risk exposure to accidents. There will be potential for increased collisions between vehicular traffic travelling at higher speeds between traffic travelling through link roads (i.e. Gumma to Fediz) as well as pedestrians using the roads.

7.5.2 Impact on Public Health

Pre-Construction and Construction Stage

The following health hazards will result due to the project activities:

- Due to the influx of the workers for the construction works there will be some discomfort to the local environmental system if the proper sanitation facilities are not constructed and operated. These include setting up of labour camps near the road alignment, at construction plant sites. There will also be some increased demands on the local infrastructure such as electricity, water supply and medical facilities.
- Due to migration of the workers from other places there is possibility of transmission of the communicable diseases. During the construction stage work, crews and their dependents may bring with them a multitude of communicable diseases including sexually transmitted diseases (STDs) like AIDS. This is likely, as the project requires more male-workers, who have migrated from other parts of the state or country.
- During Corridor construction and its allied activities dust will be generated, which will create discomfort to the local people.
- Noise generated during the construction activities may cause temporary local nuisance to nearby communities.

Operation stage

After the completion of the project there will be both positive and negative impacts on the public health. The positive impacts include increased speed of accessibility to local and regional health centers and other community support facilities.

Health impacts due to vehicular pollution: Health impacts associated with road projects in operation stage are long-term impacts. General health impacts will be respiratory infections and lung infections. Respirable Particulate Matter (RPM) i.e., particulates of size less than 10µm are a major cause of the infections and allergies. They enter human body through inhalation. These particulates are more in the emissions of heavy diesel vehicles. Hence, higher volumes of heavy vehicles increase the pollution load and consequent health impacts. Hydrocarbons from exhaust emissions are carcinogenic at high concentrations. Though impacts due to higher emissions exist, such severe impacts shall be at concentrations higher than those generated by the project. However, there will be the potential for adverse impacts on public health related to increases in noise, especially as traffic volumes increase. Impacts associated with noise are also long term and restricted to the direct area of influence.

8. AVOIDANCE, MITIGATION AND ENHANCEMENT MEASURES

8.1 OVERVIEW

The best way of impact mitigation is prevention but this would stop all development. As far as possible avoidance and reduction of adverse impacts approaches were adopted during the design stage with consideration of the views of environmental and social experts. This is reflected in the designs of the cross sections, construction methods, construction materials and alignment.

The main impacts identified have been addressed during design wherever possible and will be further mitigated by the construction procedures and specific measures provided in the contract drawings and specifications. These are summarized in **Table 8-1.**

Table 8-1 Key Environmental Impacts and Management in the Project

Issue	Addressed in design	Addressed in Implementation	Operation
Flooding/ Drainage	Total 38 nos. culverts have been provided at various locations and Drainage has been provided throughout the alignment	Keep channels clear prior to monsoon period.	Maintain culvert channels
Tree removal	Tree cutting largely unavoidable. Minimize by alignment selection for proposed ROW.	Control tree cutting operations for minimize the possibility of damage to nearest plants/ shrubs during construction stage Implement afforestation Programme in 1:3 ratio.	Monitor plantation Programme and check survival rates
Erosion	Identification of erodible soils. Treatment of embankment slopes and stream inlet and outlet.	Close control of timing of embankment treatment after earthwork operations.	Monitor and maintenance.
Borrow Areas	Minimized borrow requirements with reuse of the excavated material /earth in embankment formation.	Select suitable sites with land owners and cultivators Rehabilitate with topsoil	No action required
Road Safety	Provided median for all section to avoid head on collision.	Provide safe traffic management methods as specified in	Monitor Accidents

	Provided traffic calming measures near junctions and village area. Provided pedestrian crossings. Crash barriers has been proposed throughout the alignment. Provide high standard of road signs, RRPM, hazard marker and markings as per IRC codes	documents.	
Air Pollution	Wider road with paved shoulders will reduce use of unpaved shoulders.	Siting of work areas/camp site etc. away from sensitive receptors. Modern well maintained construction equipment with PUC certificates. Dust suppression measures on plant i.e. maximum paved area, sprinkling of water etc., diversions and haul roads.	National Motor Vehicle emission controls.
Noise Pollution	Impossible for project to lower existing high noise levels. Selected flexible pavement. Vegetation barrier for noise reduction at source	Sitting o f work areas away from sensitive receptors. Use of well-maintained construction equipment and machinery. Acoustic enclosures for DG sets.	No action required
Aggregate / Sand	Use only controlled renewable resources	Conform to regulations	No action required
Debris disposal	Minimized the debris generation.	Use scarified material and spoils in embankment fill as filling is required for the project.	No action Required
Land	Provide shortest alignment for corridor where social disruption outweighs loss of agricultural land.	Reinstate site working areas on completion of works	No action Required

8.2 PHYSICAL ENVIRONMENT

8.2.1 Environmental Management at Quarries

The Contractor will ensure that the quarries have all appropriate licenses.

8.2.2 Soil

Soil Erosion Control Measures

For control of the soil erosion from the embankments the slopes have been restricted to 1 vertical: 2 horizontal for entire sections;
Surface erosion is prevented and controlled by adopting following methods:

A. Hedge Brush Layer-

This shall be provided in the landslide zone or places having soft rock/ soil to protect the hill slope from crumbling/weathering. This shall be provided over the embankment on valley side throughout the project road (except the stretches in built-up area, Bridges and Culverts) to prevent the compacted material from sliding into the valley.

Figure 8-1 Hedge Brush Layer

Hedge brush layer method is proposed from 97+750 to 99+200 total length is 640 RM. The detail is given below:

Table 8-2 Details of Proposed Hedge Brush Layer

Chainage		Side	Length of Treatment (in RM)
From	To		
97+750	97+950	LHS	200
98+160	98+350	LHS	190
98+450	98+500	LHS	50
99+200	99+400	LHS	200

B. Bamboo Net Plantation

This shall be provided in the proposed dumping sites to check sliding of dumped material. Bamboo for the said technique may be procured from the low lying parts of the state. A National Bamboo Mission (NBM) under Centrally Sponsored Scheme-Mission for Integrated Development of Horticulture (MIDH) is being implemented in Himachal Pradesh since 2006-07.

Figure 8-2 Bamboo Net Plantation

Bamboo Plantation method is proposed from 97+550 to 103+550 total length is 1900 RM. The detail is given below:

Table 8-3 Details of Proposed Bamboo Plantation

Chainage		Side	Length of Treatment (in RM)
From	To		
97+550	97+950	LHS	400
97+900	98+000	LHS	100
99+200	99+400	LHS	200
99+650	99+800	LHS	150
101+700	102+150	LHS	450
102+950	103+550	LHS	600

C. Hydroseeding

Hydroseeding is a method of seeding that consists of applying a mixture of water, seed, wood fiber, and soil stabilizer (if used) with hydroseeding equipment.

INSTALLATION/CONSTRUCTION PROCEDURES Hydroseeding will be done immediately after completion of a phase of grading. Hydroseeding can be accomplished using a multiple-step or one-step process. The multiple-step process ensures maximum direct contact of the seeds to soil. When the one-step process is used to apply the mixture of seed, fiber, etc., the seed rate shall be increased to compensate for all seeds not having direct contact with the soil. Follow-up applications shall be made as needed to cover weak spots. Avoid overspray on existing vegetation, waterways, sidewalks, and roadways. Straw or other mulch should be applied to reduce the erosive capacity of storm water and keep soil and seed in place.

Figure 8-3 Hydroseeding

Hydroseeding method is proposed from 95+520 to 102+690 total length is 1740 RM. The detail is given below:

Table 8-4 Details of Proposed Hydroseeding

Chainage		Side	Length of Treatment (in RM)
From	To		
95+520	95+570	LHS	50
95+900	95+930	LHS	30
96+520	96+570	LHS	50
98+800	98+850	LHS	50
101+170	101+270	LHS	100
101+370	101+470	LHS	100
101+690	101+740	LHS	50
102+630	102+690	LHS	60
96+050	96+100	LHS	50
95+50	95+700	LHS	150
96+600	96+700	LHS	100
98+500	98+650	LHS	150
99+200	99+400	LHS	200
99+500	99+700	LHS	200
101+050	101+250	LHS	200
101+400	101+600	LHS	200

D. Rock Anchoring

In mountainous areas where there are numerous rock-fall hazards that may result in a significant cost to the operator of the transportation system, a stabilization program is often justified.

Rock anchors or rock bolts, as they are commonly known as, are important structural tools used in stabilizing rocky slopes.

Rock and soil anchoring technique is a technique that we people uses the rock bolt (cable) to reinforce the rock or soil mass. Rock anchors or rock bolts is a long anchor bolt, for stabilizing rock excavations, which may be used in tunnels or rock cuts. It transfers load from unstable exteriors to the confined interior of the rock mass.

Figure 8-4 Rock Anchoring

Rock Anchoring method is proposed from 95+520 to 102+690 total length is 3020 RM. The detail is given below:

Table 8-5 Details of Proposed Rock Anchoring

Chainage		Side	Length of Treatment (in RM)
From	To		
94850	97030	LHS	2180
99370	99920	LHS	550
103260	103550	LHS	290

Soil Contamination

For the prevention of the soil contamination the following control measures shall be implemented effectively:

Construction Stage

- Impervious concrete base and a sump will be constructed at all the fuel, waste oil and bitumen, emission and chemical storage yards. A berm will also be constructed along the periphery of the concrete platforms. An oil interceptor will be constructed for providing for treating the oil wastes collected in the sumps.
- All non-toxic wastes generated from the construction sites shall be used appropriately in the Project construction.
- Some of the wastes can be reused for the development of the access roads to the construction plant sites, labour camps, internal roads, access roads to the soil borrow areas, granular sub base quarries and quarries and for any other auxiliary sites.
- Landfills of contaminated soils with the bitumen, oil and chemicals shall be avoided as far as possible, these materials shall be buried in the construction of slopes or shoulders.
- Proper collection, storage and disposal mechanism shall be in place for the solid and liquid wastes generated from site facilities during the construction stage.
- All petroleum products and chemicals meant for construction shall be stored in accordance with guidelines provided in Materials Safety Data Sheet (MSDS).
- Procedures and Plans shall be in place for cleaning up of any accidental spills.
- Checks for ensuring erosion control structures are in place before earthworks are started.
- Concrete platforms will be constructed for the parking bays.
- Washing bay with oil interceptor will be constructed for the effective collection of oil spills generated during washing.
- Platforms of the workshop shall be paved for the effective collection of oil spills.
- Oil trays shall be used for the collection of oil spills during emergency repairs of the machinery on site.

Operation Stage

During the operation stage, the probability of contamination of soil is only from spillage and road runoff. Provision has been made in the design for the collection and discharge of the runoff from the bypass road into nearest water bodies through well-designed lateral drains.

Loss of Productive Top Soil

Efforts have been made for the minimization of the use of the soil from good agricultural soil areas. As far as possible the soil excavated from the roadside will be used for the construction of embankments and sub grade construction. The borrow areas; construction camp locations; traffic detours during the construction and other construction sites shall be selected to minimize loss of the agricultural land. To conserve the productive topsoil in affected areas,

The following mitigation measures will be adopted:

- The topsoil from all areas to be restored as agricultural areas shall be stripped to 150 mm and stored in stockpiles.
- The stockpile shall be designed such that the slope does not exceed 1:2 (vertical to horizontal), and the height of the pile will be restricted to 2m.
- Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum and stock pile shall be covered with gunny bags or tarpaulin.
- It shall be ensured that the topsoil will not be trafficked either before stripping or when in stockpiles.
- To prevent any compaction of soil in the adjoining productive lands, the movement of construction vehicles, machinery and equipment will be restricted to CoI as far as possible.
- The stored topsoil will be utilized for; covering all disturbed areas including for the redevelopment of borrow areas after filling and dressing of the slopes of road embankment.

Borrow Areas Management:

The usage of soil borrow areas is at the discretion of the Contractor who may identify set of borrow areas based on the haulage and suitability of materials. Location of source of supply of material for embankment or sub-grade and the procedure for excavation or transport of material shall be in compliance with the environmental requirements of the MoRTH specifications and as specified in IRC: 10-1961.

The Contractor has to comply with the regulatory compliance for excavation of earth from borrow area and also to the World Bank is guidelines for use and redevelopment of borrow areas .These will be provided in EMP.

8.2.3 Water Environment

Relocation of Ground Water Supply Sources

- Total 2 nos. of ground water source i.e. Hand pumps will be relocated before the construction of work, with the consent of private owner and local gram Panchyat.
- The relocation site will be identified with the consent of the local community for whom the water source is intended.

Minimize the use of natural water resources

The water required for construction will be extracted in such a manner that there will be very little disruption to the local community. The total quantity required for the Project is about 30.5 cum/day.

Mitigation for water quality degradation:

Oil Interceptor: Oil and grease from polluting run-off is another major concern. During construction, discharge of Oil and Grease is most likely from workshops, oil and waste oil storage areas, diesel oil pumps, vehicle parking areas from the construction camps.

The source is well defined and restricted. Gravity separation technique will be used for the separation of oil and water. Enough detention time is provided to allow oil to float to the surface.

For each construction camp one oil interceptor will be constructed. Wastewater contaminated with oils and waste oils and grease will be treated in the oil interceptor to remove all oil and grease spills before discharging appropriately. As far as possible the ground will be leveled in such manner that the wastewater will flow in one direction. The wastewater channels will be constructed with a slope of 1: 150 to ensure that

wastewater flows into the interceptor before discharge. Oil and grease of the oil interceptors will be cleaned once in a fortnight from outside by skimming of oil film over the surface. Figure 8-4 provides the details of the arrangement for the oil interceptor for the removal of oil and grease.

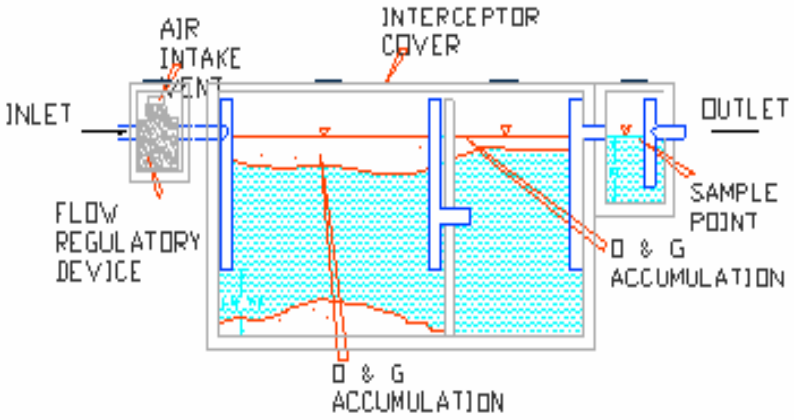

Figure 8-5 Oil Interceptor

The location of all fuel storage and vehicle cleaning areas will be at least 300 m from the nearest drain/ water body. In addition, the maintenance and repairs of vehicles will be carried out in such a way that contamination of water bodies and drainage channels can be avoided. The slopes of embankments leading to water bodies will be modified and re channeled to prevent entry of contaminants into the water body.

8.2.4 Air Environment

From the impact analysis it was observed that the expected levels of pollutants emitted from different sources over and above the contribution from back ground sources reflected that major air pollutants of concern are dust and gaseous pollutants.

Details of the mitigation measures proposed are detailed below.

The specific mitigation measures for working zone include:

- Vehicles delivering fine materials like soil and fine aggregates shall be covered to reduce spills on existing roads.
- Water will be sprayed on earthworks, temporary haulage and detours on a regular basis.
- All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that the emission levels conform to the SPCB/CPCB norms.
- Air pollution monitoring plan has been delineated for construction phase separately for checking the effectiveness of the mitigation measures adopted during the construction phase of the Contract.

Mitigation Measures for Plant Sites:

- HMP plant should be well mounted with Exhaust control and dispersion system.
- Batch type hot mix plants fitted with the bag filter / cyclone and scrubber will be installed for the reduction of the air pollution
- Plant sites shall be located at a significant distance from nearest human settlement in the predominant down wind direction.
- Regular sprinkling of water should be done on plant site.
- The maximum area within the camp site should be paved to reduce the possibility of dust generation at camp site.

8.2.5 Noise Environment

An integrated strategy is proposed for the prevention and control at different stages for the reduction of noise propagation from sources to receptors. The first step is to control emission of noise at the source itself, followed by noise control within the sound transmission path and lastly is the option of protection at the receiving end like construction of the masonry walls.

Details of noise prevention and control measures for the proposed Project are described in the following sub sections.

Construction Stage

The impacts due to noise and vibration will be significant during construction stage where the settlements are located near the road alignment. For the reduction of the noise levels during the construction stage the following mitigation measures will be implemented.

- Noise standards will be strictly enforced for all site vehicles, plants, equipment, and construction machinery.
- Machinery and vehicles will be maintained regularly, with particular attention to silencers and mufflers, to keep construction noise levels to minimum. Workers in the vicinity of high noise levels must wear earplugs/ earmuffs and be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 90dB(A) per 8-hour shift.
- Construction camps shall be located at about 1000 m from settlement areas. No hot mix, batching and aggregate crushing plants shall be located within 1000 m on the down wind direction of sensitive land uses such as schools, hospitals etc. In unavoidable circumstances, the time of the operation of the plant shall be limited. All the diesel generator sets to be used for the Project shall be fitted with the noise control systems such as acoustic enclosures.
- Noise levels were monitored at various locations along the road covering different land use pattern. Based on the field monitoring and other reconnaissance surveys noise barriers are proposed as follows:

8.2.6 Construction Camp

8.2.6.1 Layout of Construction Camp

The construction camps for labour accommodation, offices and construction plant sites shall be identified based on the RPCB guidelines and World Bank Guideline for Setting out of Construction Camp. Detailed guidelines are given in EMP.

8.2.6.2 Facilities at Workers Camps

During the construction stage of the Project the construction Contractor will construct and maintain necessary (temporary) living accommodation and ancillary facilities for labour. It will be ensured that all the temporary accommodation will be provided with uncontaminated water for drinking, cooking and washing. Adequate washing and bathing places shall be provided, and kept in clean and drained condition. Construction camps will be sited away from vulnerable people and adequate health care will be provided for the work force.

Sanitation Facilities: Construction camps shall be provided with sanitary latrines and urinals. Closed drainage systems and the proper treatment systems according to the local conditions should be constructed for the proper flow and effective treatment. The sewage system built for the camp will be operated properly to avoid health hazard, ground water and soil pollution. Compost pits will be constructed for the disposal of the garbage and other biodegradable wastes generated from the camps. Proper collection, transportation and disposal of the wastes will be ensured.

Shelter at Workplace: At such workplaces where the duration of the works will prevail for more than one month some form of shelters will be provided for meals, resting, change of clothes and for keeping the tools of the work and personal protective equipment. The height of shelter shall not be less than 3m from floor level to lowest part of the roof. Sheds shall be kept clean and the space provided shall be on the basis of at least 1m2 per head.

Canteen Facilities: A cooked food canteen on a moderate scale shall be provided for the benefit of workers wherever it is considered necessary. All the wastes generated from the canteen will be treated/ disposed of as detailed in the other sections of waste disposal.

Health Care Facilities: Health problems of the workers should be taken care of by providing basic health care facilities through a health center set up at the construction camps. The health center will have at least a doctor (part time), nurses, duty staff, medicines and minimum medical facilities to tackle first-aid requirements for minor accidental cases. Some arrangements will be made with the nearest hospital to refer patients of major illnesses or critical cases.

The design layout of construction camp will be provided in the EMP for ensuring the implementation of effective pollution control measures at the construction base camps and construction plant sites, redevelopment/ closure plans for the closure of these sites will be made part of the Environmental Management Plan of the construction Contract.

8.3 NATURAL ENVIRONMENT

The environment along the project road shall be enhanced, principally through plantation of various types of shade and ornamental trees along with shrubs and grasses. Tree plantations have manifold benefits. During the construction stage, all precautions will be taken to ensure that the trees outside the CoI or those not marked will not be removed. To compensate for the tree cutting, two times of the diverted protected forest area will be afforested in accordance with the Forest (Conservation) Act, 1980.

8.3.1 Landscaping Strategy for Project Corridor

Landscape strategy has been developed to enhance the visual quality and safety concern at intersection of proposed corridor.

The following improvements are incorporated in Design:

a. Plantation Scheme

Shrubs will be planted at road as part of the compensatory afforestation. Shrubs will be planted at median as antiglares for the road users and increase the aesthetic value of the road. With due importance to aesthetic value and comfort along a new road, 25 % of the species selected should be flowering species and the rest will be shade providing and fruit bearing species.

8.4 SOCIO-CULTURAL ENVIRONMENT

Relocation of the CPR affected by the Project is detailed in the Resettlement Action Plan. Relocation process will be monitored to ensure that all the structures totally affected will be relocated as desired by the local community requirements.

8.5 ENHANCEMENT MEASURES

For the proposed corridor alignment no enhancement is involved except the necessary inherently enhancements i.e. landscaping, traffic calming etc.

8.6 SAFETY MEASURES

8.6.1 Health/Safety Measures for Labors

First Aid Boxes will be placed at all work places and in the Construction Camp. Some of the workers should have received First Aid training to respond to the emergencies at the working zones and at auxiliary sites. Arrangements with nearby health centers and local doctors should be made for treating injuries. During the construction phase, workers should be provided personal protective equipment's based on the nature of the work. Details of the personal protective equipment which are to be given to the workers are presented in **Table 8-6.**

Table 8-6 List of Personal Protective Equipment

S. No.	Part of the Body	Personal Protective Equipment
1	Eye	Safety Glasses, Goggles
2	Face	Face Shields
3	Nose	Nose Masks
4	Head	Helmets
5	Feet	Safety Shoes
6	Hands and arms	Gloves
7	Bodies	Vests
8	Hearing	Earplugs, Earmuffs

8.6.2 Traffic Safety Plans

Design Stage

Safety of pedestrians as well as vehicles on the road will be of highest importance and adequate measures have been incorporated in the design of the Project. For the safety and convenience of the local people, traffic calming measures, traffic control systems and unpaved shoulders for pedestrians in the village areas has been incorporated. The details of traffic calming measures adopted along the project corridors are presented in **Table 8-7.**

Table 8-7 Locations of Traffic/Road Safety Measures at Junctions

Section	Chainage	Type of Measures
J 01	94+900	Traffic Calming & Junction Improvement
J 02	95+250	Traffic Calming , Junction Improvement & Pedestrian Crossing
J 03	97+960	Traffic Calming & Junction Improvement
J 04	98+350	Traffic Calming & Pedestrian Crossing
J 05	102+750	Traffic Calming & Pedestrian Crossing

Construction Stage

Safety during the construction will be considered as an integral part and high priority element of the road Project. All precautions required will be taken to ensure closure of the road is for minimum period and traffic delay is as limited as possible. It will also be ensured that inconvenience to the road users, community residing near the work site and the work crew and machinery will be minimized. All safety precautions will be ensured during temporary and permanent works for the road construction.

The safety practices, therefore, are oriented towards reducing the conditions that lead to such hazards and consequent stress on the driver, so as to control and regulate his behavior as warranted by the site conditions through the construction zone.

Components of the Construction Zone

- **Construction Zone** is the area of the road which is affected by the works and which affects traffic flow resulting in a conflict between the road users and the construction activities.
- **Work Zone** is the area where workmen are working i.e. excavation, overlaying improvements etc.
- **Working Space** is the space around the work area that allows the workmen to move around to do the job and will include space required for storing excavated material, plant and equipment and clear space required for swinging of equipment and excavation arms.
- **Safety Zone** is provided to protect the workmen from the moving traffic. This includes providing lateral and longitudinal buffer zones.

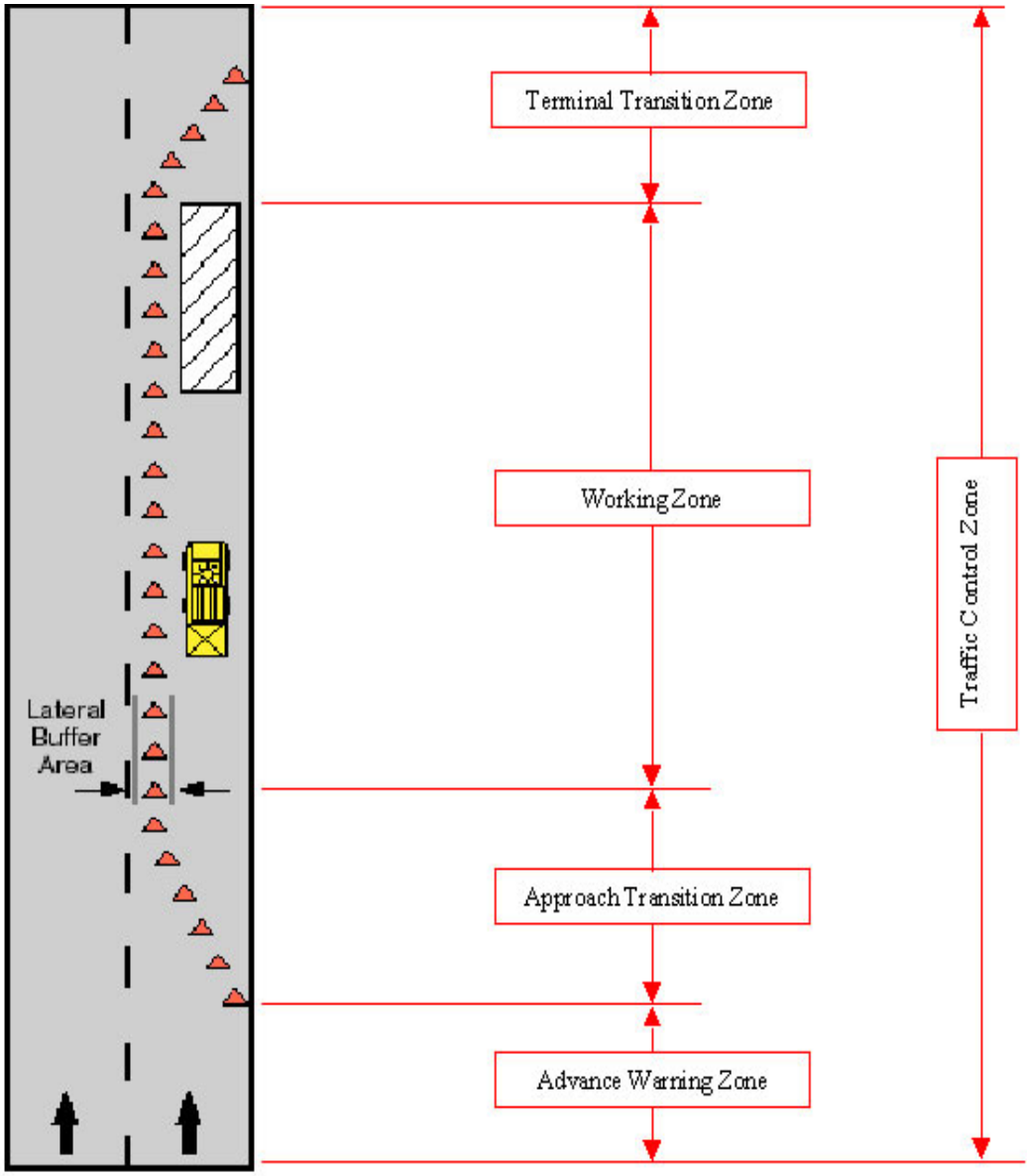

Figure 8-6 Traffic Control Zone

- **Traffic Control Zone** includes those areas in advance of the actual work site that are required for advance working as well as safety zones, the transition zones and the working zones itself.
- For providing all required safety precautions specific traffic management plans will be prepared and implemented during construction in accordance with the IRC: SP: 55:2014 (Guidelines on Safety in Road Construction Zones). Some guiding drawings for the general safety measures are provided below:

Though each construction zone will pose unique problems there is a basic layout that should be followed for all schemes but that will need to be amended to suit local conditions. These will be influenced by:

- Environment: Rural, Urban;
- Type of Carriageway such as single-lane, two-lanes, 4-lanes, multi-lanes, divided carriageway;
- Traffic Volume and Speed, with and without work in progress on road;
- Type of Traffic such as mixed or segregated;
- Available Sight Distance in construction zone; and
- Mobility of Work Zone, that is, for minor pot hole repairs, lane marking etc. the workers and equipment may move along the road.

Figures 8-7 and 8-8 below shows the basic layout that would permit two-way working of traffic past the working zone.

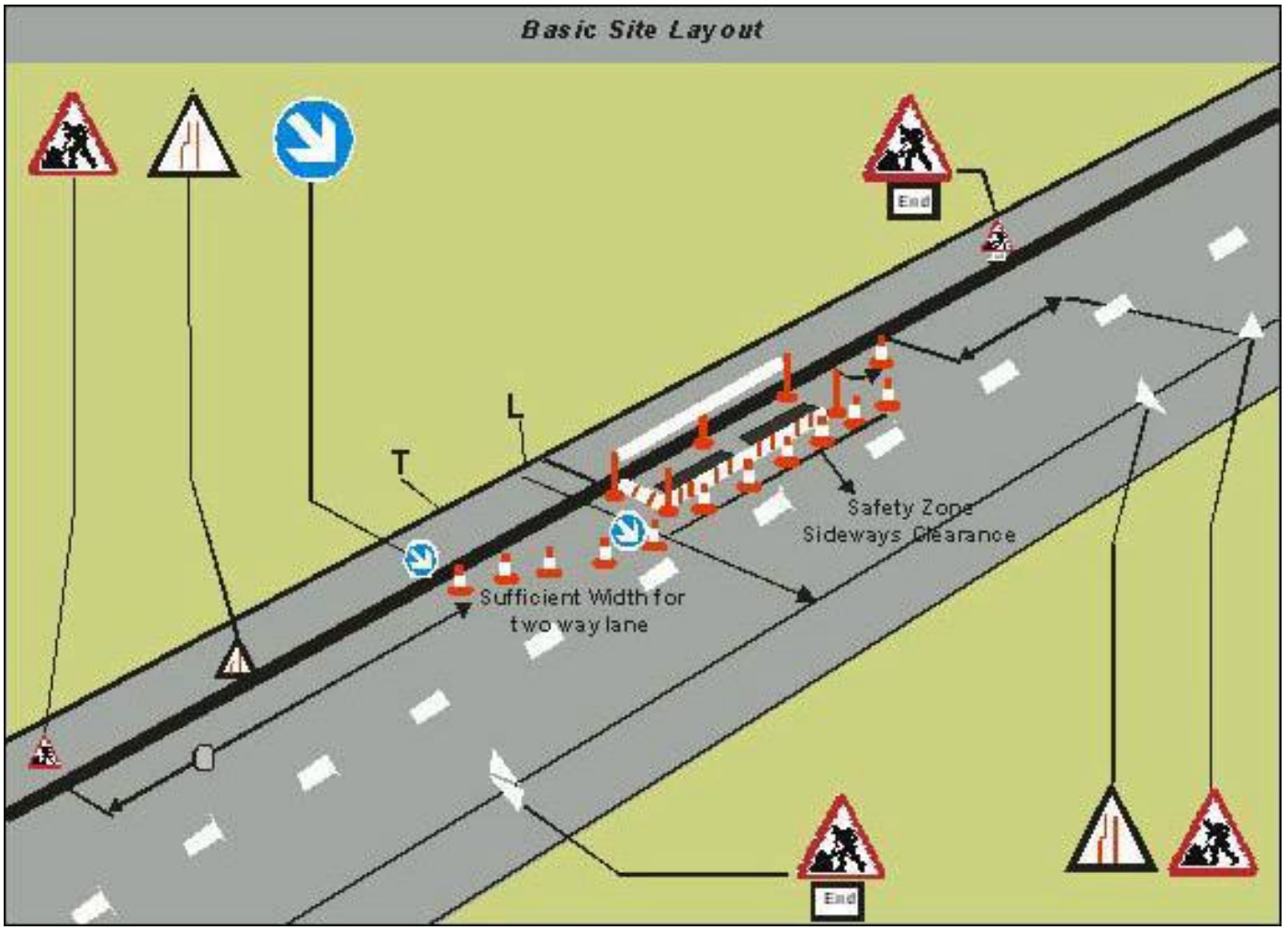

Figure 8-7 Basic Layout for Signs at a Road Works Site, Including Work Space and a Safety Zone.

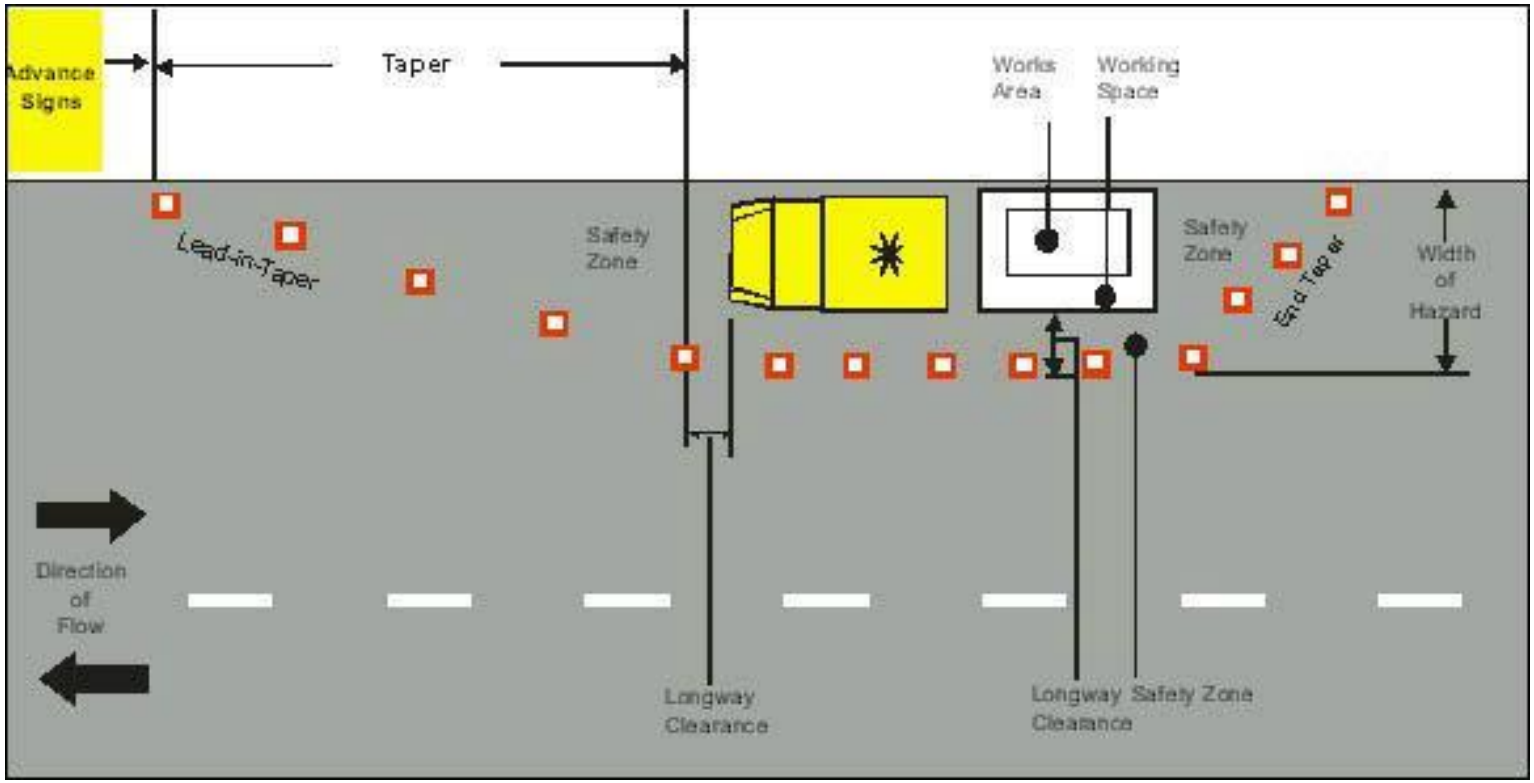

Figure 8-8 Basic Layout with Works Vehicle

8.7 HANDLING OF PETROLEUM PRODUCTS

Petroleum products such as petrol, diesel, light diesel oil, bitumen and emulsion will be handled, stored and used in accordance with the relevant rules, acts and guidelines to avoid any damage to the environment and reduce the probability of the occurrence accidents. Wastes generated from the use of the petroleum products will also disposed of safely as detailed in the relevant rules, regulations and guidelines. The rules and regulations applicable for the handling of these products are listed below;

- Environmental Protection Act, 1986
- Petroleum Act, 1934
- Petroleum Rules, 2002

Petroleum products such as petrol, diesel, light diesel oil, bitumen and emulsion will be handled, stored and used in accordance with the relevant rules, acts and guidelines to avoid any damage to the environment and reduce the probability of the occurrence accidents. Wastes generated from the use of the petroleum products will also disposed of safely as detailed in the relevant rules, regulations and guidelines. The rules and regulations applicable for the handling of these products are listed below;

- Environmental Protection Act, 1986
- Petroleum Act, 1934
- Petroleum Rules, 2002

8.8 HANDLING OF PETROLEUM PRODUCTS

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- Environmental Protection Act, 1986
- Petroleum Act, 1934
- Petroleum Rules, 2002

8.9 ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan (EMP) has been prepared for corridor project and will be part of the contract document between the Contractor and HP PWD. It is expected that implementation of all the environmental measures proposed in the EMP are adopted. The implementation actions, responsibilities and timeframes have been specified for each component and adverse impact anticipated. The following sections details the monitoring plan, a comprehensive monitoring system and budgetary estimate.

8.9.1 Monitoring Plans

To ensure the effective implementation of the EMP, it is essential that an effective monitoring program be designed and carried out.

Various physical, biological and social components identified as of particular significance in affecting the environment at critical locations in various stages of the Project have been suggested as Performance Indicators (PIs). These are listed below and shall be the focus for monitoring.

- Air quality (PM10, PM2.5, NOx, SO2,Pb and CO);
- Water quality (Physical, chemical and Biological parameters)
- Noise levels around sensitive locations/residential area
- Plantation success / survival rate.

The monitoring plans during construction and operation stages have been described in detail in the EMP documents and summary of monitoring plan and locations are presented in **Table 8-8 & Table 8-9.** For each of the environmental components, the monitoring plan specifies the parameters to be monitored; location of monitoring sites; frequency and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities.

Table 8-8 Environmental Monitoring Plan

Attribute	Project Stage	Parameter	Special Guidance	Standards	Frequency	Duration	Location	Implementation	Monitoring/ Supervision
Air	Construction	CO, NOx, SPM, RPM, and SO2	High volume sampler to be located 50 m from the plant in the downwind direction. Use method specified by CPCB for analysis	Air (prevention and Control of Pollution) Rules, CPCB, 1994	Quarterly	24 hours Sampling	Ref. Table No. 8.6	Contractor	HP PWD
Water	Construction	All essential characteristics and some of desirable characteristics as decided by the PRBDB	Grab sample collected from source and analyse as per Standard Methods for Examination of Water and Wastewater	Indian Standards for Inland Surface Waters (IS: 2296, 1982) and for Drinking Water (IS : 10500 - 1991)	Quarterly	Grab Sampling	Ref. Table No. 8.6	Contractor	HP PWD

Noise	Construction	Noise levels on dB (A) scale	Equivalent noise levels using an integrated noise level meter kept at a distance of 15 from edge of pavement Equivalent noise levels using an integrated noise level meter kept at a distance of 15 from edge of pavement	MoEF Noise Rules, 2000	Quarterly	Leq. in dB(A) of day time and night time	Ref. Table No. 8.6	Contractor	HP PWD
Soil	Construction	Monitoring of Pb, SAR and Oil & Grease	Sample of soil collected to acidified and analysed using absorption spectrophotometer	Threshold for each contaminant set by IRIS database of USEPA until national standards are promulgated	Once in Six Months	Grab Sampling	Ref. Table No. 8.6	Contractor	HP PWD
Borrow area	Construction	As per Guidelines	Visual Observation	-	Once in a Month	-	Borrow area location	Contractor	CMU/ HP PWD
Tree plantation	Operation stage	As per Rehabilitation			Quarterly	-	Areas where	-	CMU/ HP PWD

Table 8-9 Environmental Monitoring Locations

Environmental Component	S. N.	Location	Remarks
Air Quality	1.	Upstream of proposed Gumma Fediz Section of NH-707	Rural Residential/ Commercial
	2.	Middle of proposed Gumma Fediz Section of NH-707 near village Antroli	Residential/Commercial
	3.	Near End of Gumma Fediz Section of NH-707	Rural Residential/Commercial
	4	HMP Camp Site	Residential/Commercial
Water quality	1.	HMP Camp Site	Surface water / Ground water
	2.	Hand Pump at village Gumma	Ground water
	3	Hand Pump at Village Antroli	Ground water
	4	Giri River near disposal site -1	Surface water
	5	Giri River near disposal site -2	Surface water
	6	Giri River at Nearest point to HMP Camp Site	Surface water
Noise Monitoring	1.	Upstream of proposed Gumma Fediz Section of NH-707	Residential/Commercial
	2.	Middle of proposed Gumma Fediz Section of NH-707 near village Antroli	Rural Residential
	3.	Near End of Gumma Fediz Section of NH-707	Rural Residential
	4.	HMP Camp Site	Residential/Commercial
Soil quality	1.	Random Location at Completed section of Gumma to Fediz section of NH-707	Agricultural
	2	Near Construction Site	Agricultural
	3.	HMP Plant site	Agricultural

8.9.2 Reporting System

The Monitoring and Evaluation of the management measures envisaged are critical activities in implementation of the Project. The rationale for a reporting system is based on accountability to ensure that the measures proposed as part of the Environmental Management Plan get implemented in the Project. Detail is provided in EMP.

8.9.3 Environmental Budget

An indicative estimate of the cost component involved in mitigation of impacts, enhancements (through landscaping or specific enhancement measures), road safety, monitoring and evaluation of various components in pre-construction, construction and operation period has been estimated.

A summary of the environmental budget is presented in **Table 8-10.**

Table 8-10 Environmental Budget

S.N.	Component	Description	Unit Rate (Rs.)	Quantity	Amount (Rs.)
1.	**Forest Clearances**	Cutting of trees, diversion of forest land and compensatory afforestation Ha.)	-	14.412	1400000/-
Total (A)					**14,000,00/-**
2.	**Mitigation Measures**				
2.1	Air Pollution	Dust Management measures, Covers for vehicles transportation of construction material etc.	Lump sum	-	400000
2.2	Oil Inceptor	Provision at workshop in construction camp site	200000	1 Nos.	200000
2.3	Top Soil Preservation	Stripping of Top Soil, Staking and reuse	200	15000	3000000
2.4	Soil Erosion Control Measures	A. Hedge Brush Layer B. Hydroseeding C. Bamboo Plantation D. Rock Anchoring	AS per BOQ	AS per BOQ	195935000
Total (B)					**19,95,35,000/-**
3.	**Enhancement Measures**				
3.1	Landscaping	Landscaping at all intersections, median with fine grass and shrubs including maintenance for one year	Lump sum	-	500000
Total (C)					**5,000,00/-**
4.	**Road Safety Measures**				

4.1	Junction Improvement	Traffic Calming measures, Pedestrians crossing facilities	AS per BOQ	AS per BOQ	2612481
4.2	Road Safety Furniture	Road Safety signs/boards, hazard markers, RRPM, delineators, Solar Blinker, High must Light, safety cones etc.	AS per BOQ	AS per BOQ	6848647
4.3	Road Safety Item	Crash Barrier	AS per BOQ	AS per BOQ	26339330
Total (D)					**35,80,0458/-**
5.	**Environmental Monitoring Cost**				
5.1	Air	Sampling, monitoring & analysis of ambient air quality and gaseous pollutant.	10000	24 Nos.	240000
5.2	Water	Sampling, monitoring & analysis of surface & drinking quality.	10000	36 Nos.	360000
5.3	Noise	Sampling, monitoring & analysis of ambient noise quality.	5000	24 Nos.	120000
5.4	Soil	Sampling, monitoring & analysis of Soil quality.	7000	12 Nos.	84000
Total (E)					**8,04,000/-**
6	**Miscellaneous Cost**				
6.1	Logistics and Administrative	Uses of vehicle for environmental cell , data processing, administrative support, stationary, remuneration of Environment Expert etc.	Lump sum	-	2400000
Total (F)					**24,000,00/-**
Total Environmental Budget (A+B+C+D+E+F)					**23,61,39,458/-**
Contingency @ 5 % on Total Environmental Budget					**1,18,76,973/-**
GRAND TOTAL					**24,94,16,431/-**

Annexures

Annexure-I
Attendance Sheets of Consultations at Antroli and Gumma Village

PUBLIC/STAKEHOLDER'S CONSULTATION MEETING ATTENDANCE SHEET

Project	Gumma-Fediz section (NH 707)			Antsoli - Panchyat - Pawan.			
District		**Taluka**		**Block/ward No**		**GP/MC**	
Settlement		**PS/Thana**		**Chainage/km**		**Venue**	
Date	22-09-2019.	**Time**		**Total No. of participants**	**Male**	**Female**	**Total**

S. No	Name	Age	Gender	Contact Details	Occupation	Caste	Signature
1.	Virender Singh	32		9805267773			[signature]
2.	Anil Kumar	30		[illegible]380899			[signature]
3.	KEWAL RAM	33		9805163066			[signature]
4.	Bhagmal	40		9805730780			[signature]
5.	Hera Singh	36		8894238891			Hera Singh
6.	Pawan Singh	35		9816719060			[signature]
7.	Jeesthe Chewa	41		9805087490			[signature]
8.							
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22/9/19

PUBLIC/STAKEHOLDER'S CONSULTATION MEETING ATTENDANCE SHEET

Project	Gumma-Fediz section (NH 707)			Antroli - (Panchyat Bawan)			
District		**Taluka**		**Block/ward No**		**GP/MC**	
Settlement		**PS/Thana**		**Chainage/km**		**Venue**	
Date	22-09-2019.	**Time**		**Total No. of participants**	**Male**	**Female**	**Total**

S. No	Name	Age	Gender	Contact Details	Occupation	Caste	Signature
1.	[illegible]	60		9816640730	किसान		[signature]
2.							
3.	मानपाल चौहान	61		9816527221	किसान		मानपाल
4.							
5.	भगतराम	60		—	किसान		[signature]
6.	कुलदीप चौहान	41		9805087493	"		[signature]
7.	जगदीप सिंह	30		9816248374	"		[signature]
8.	[illegible]	35	M.	NIL			[signature]
9.	Tara Chauhan	36	F	9816575900			[signature]
10.							
11.	Geeta Devi						
12.	Pradhan G.P. Fabay	40		9816311913			
13.							
14.	Mani Ram Sharma	53		8894801372			[signature]
15.							
16.	Seea Ram	43		9816311247			[signature] 22/9/19
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PUBLIC/STAKEHOLDER'S CONSULTATION MEETING ATTENDANCE SHEET

Project	Gumma-Fediz section (NH 707)						
District		**Taluka**		**Block/ward No**		**GP/MC**	
Settlement		**PS/Thana**		**Chainage/km**	94+900	**Venue**	Gumma - Market
Date	21/09/2019	**Time**	5:00 PM	**Total No. of participants**	**Male**	**Female**	**Total**

S. No	Name	Age	Gender	Contact Details	Occupation	Caste	Signature / issue raised
1.	Arje Singh Bharawaj	65	M.	9816182437	Farmer	[illegible]	DSBharawaj
2.	Tarun Gaur	28	M	9885453410	Farmer	[illegible]	[illegible]
3.	Lakhi Ram	48	M	9816324814	Cultivation	[illegible]	[illegible]
4.	Rajender Singh	39	Male	8219499947	Business	Rajput	[illegible]
5.	Gyan Singh	47	male	9805517500	Business	Rajput	[illegible]
6.	Gaj. M	28	M.	8894814508	Student	Gen.	[illegible]
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ग्राम पंचायत [illegible] तह. नैपाल, जिला सिरमौर

हस्ताक्षर .....

दिनांक 21-9-2019

PUBLIC/STAKEHOLDER'S CONSULTATION MEETING ATTENDANCE SHEET							
Project	Gumma-Fediz section (NH 707)						
District		Taluka		Block/ward No		GP/MC	
Settlement		PS/Thana		Chainage/km	44+900	Venue	Gumma - Market
Date	21/09/2019	Time	5:00PM	Total No. of participants	Male	Female	Total
S. No	Name	Age	Gender	Contact Details	Occupation	Caste	Signature
1.	Rati Ram.	58	M.	9816484858			Rati Ram
2.	Ratan Lal	33	M	8219224679			[illegible]
3.	[illegible]	33	M	9816507474			[illegible]
4.	Surender Kumar	35	M	8278877191			[illegible]
5.	Narayan Shorrie	42	M	8894548648			[illegible]
6.	Gian Ram	47	M	9805267781			[illegible]
7.	Lig Ram.	60	M.	9805878895			[illegible]
8.	AJENDER SINGH	29	M	8219233143			[illegible]
9.	SARLA JOSHI			9805926333			[illegible]
10.	KAR ky						[illegible]
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21.							
22.							हस्ताक्षर [signature]
23.							दिनांक 21-9-2019
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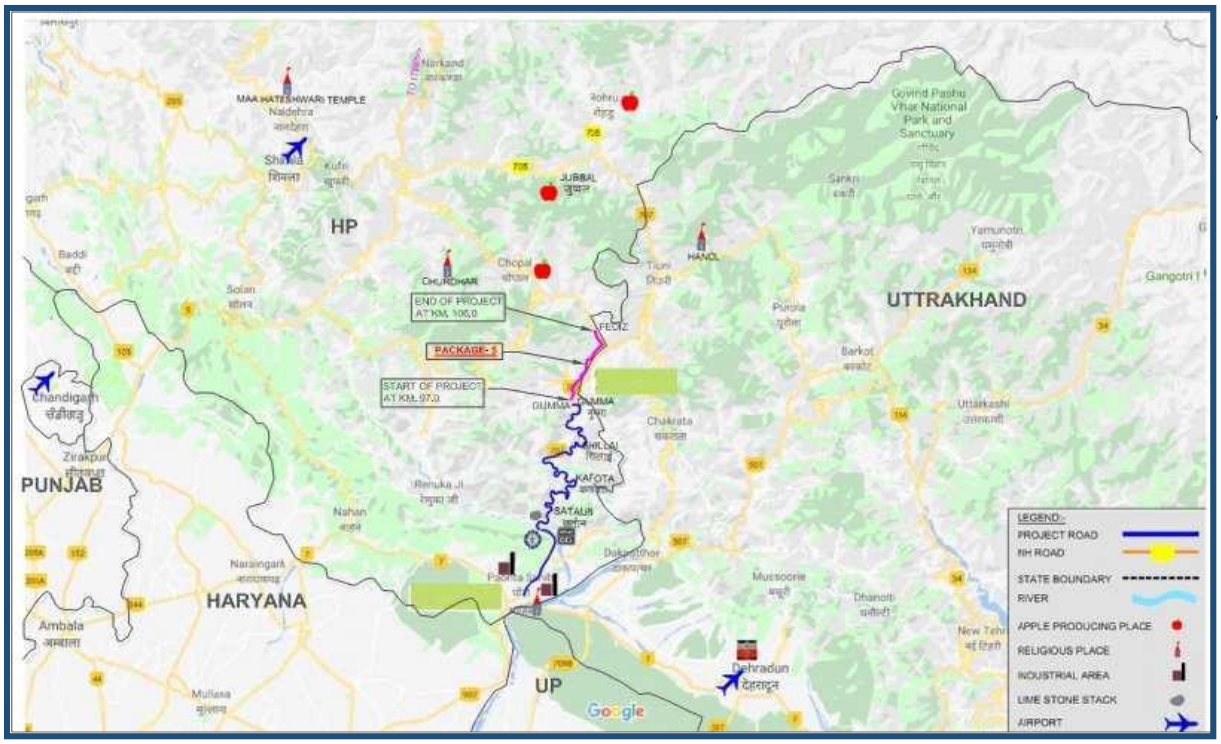
25.							
26.							
27.							
28.							

प्रधान ग्राम पंचायत बोहट • वि.ख. चौपाल, जिला शिमला •

Annexure- II
Girth Wise details of Tress

"REHABILITATION AND UPGRADATION TO INTERMEDIATE LANE OF PAONTA SAHIB RAJBAN SHILLAI MEENUS HATKOTI ROAD PORTION BETWEEN KM 97+000 TO 106+120 (GUMMA TO FEDIZ)(DESIGN RD 94+900 TO 103+550) OF NH 707 IN THE STATE OF HIMACHAL PRADESH"

ENVIRONMENTAL MANAGEMENT PLAN (EMP)



Submitted By:

Consulting Engineering Associates
S.C.O. 51, 2nd Floor, Swastik Vihar
Mansa Devi Road, Sector-5, Panchkula
Tel: 0172-2555529, Cell: 099145-75200
E-mail: ho@theghai.com

Submitted To:

Executive Engineer, NH Division,
HPPWD Nahan.

CONTENTS

TABLES

FIGURES

1. INTRODUCTION

1.1 BACKGROUND

In coordination with the World Bank, Government of India via Ministry of Road Transport & Highways (MoRTH) has decided to take up the work of upgrading all single lane National Highways to at least 2 Lane/Intermediate Lane standards with provision of paved/earthen shoulders. The basic idea for up-gradation of the corridor is to provide better riding comfort along with safety for the commuters in the long hilly terrain and continuous stretch. There are more than 30 different National Highway stretches selected by Ministry of Road Transport & Highways (MoRTH) with approx. total length of more than 3000 km for up gradation. The present report pertains to Gumma to Fediz Section (Km 94.900 to Km 103.550) of NH-707 in the State of Himachal Pradesh. The MoRTH intends to rehabilitate and up-grade the existing single lane of 3.65m between Gumma to Fediz Section to intermediate lane of 5.5m with earthen shoulders of 1m on the valley side and 3m on the hill side keeping in mind the future widening option. The implementation of rehabilitation and up- gradation of this corridor is likely to be taken up with World Bank assistance. The World Bank has agreed to support this sub-project in-principle provided the implementation conforms to environmental and social safeguard policies of the World Bank and the legal framework of the country.

The Project 'Preparation of Detailed Project Report for up gradation to 2-lane/2- lane with paved shoulders for Paonta Sahib - Gumma section of from Km 0.000 to Km 97.000 of NH 707 in the state of Himachal Pradesh' has already been prepared which being longer stretch of 94 km on NH-707. The present project is extension of the same road stretch of 8.65 km only. The tests and other findings at the Gumma station holds equally good for the similar and continuous stretch of 8.65km.

1.2 ENVIRONMENTAL ASSESSMENT (EA) PROCESS

The Environmental Assessment process for the project corridor is based statutory requirements and the World Bank Safeguard Policy requirements.

1.3 OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The objectives of the Environmental Management Plan (EMP) are to:

- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels.
- Identify measures that could optimize beneficial impacts.
- Create management structures that address the concerns and complaints of all the stakeholders with regards to the development.
- Establish a method of monitoring and auditing environmental management practices during all phases of development.
- Describe the practical mitigation measures that should be implemented on road improvement works and ancillary sites (quarry and borrow areas) to prevent or mitigate any negative environmental impacts and to enhance the positive issues.
- Ensure that the construction and operational phases of the project continue within the principles of Integrated Environmental Management.
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project.

- Ensure that the safety recommendations are complied with.
- Propose mechanisms for monitoring compliance with the EMP and reporting thereon.
- Specify time periods within which the measures contemplated in the draft environmental management plan must be implemented, where appropriate.
- Establish the roles and responsibilities of all parties which includes HPPWD/NHAI, Contractor, PWD involved in the implementation of environmental controls;
- Establish monitoring and reporting system for facilitating appropriate implementation of the EMP.

1.4 ENVIRONMENTAL REGULATIONS APPLICABLE TO THE PROJECT

Summary of environmental clearances/ permits/ approvals required for the sub-project is presented in Table 1-1.

1.5 METHODOLOGY OF PREPARING EMP

The methodology adopted for the preparation of EMP is based on EIA Notification, dated 4thSeptember 2006 and subsequent amendments, World Bank's OP and GoI Guidelines.

Table 1-1 List of Environmental Regulations Applicable to the Project Road

S. No.	Regulatory Clearances	Corresponding Regulations	Approving Authority	Applicability to the Project	Typical Time Required	Responsibility for compliance	
						Execution	Supervision
Pre-Construction Stage							
01	Environmental Clearance	EIA Notification, 2006 and amended till date	State Environmental Impact Assessment Authority or CEIAA in MoEF, GoI	Not applicable	-	-	-
02	Consent to Establish	Water (Prevention and Control of Pollution) Act 1974; Air (Prevention and Control of Pollution) Act 1981	Himachal Pradesh State Pollution Control Board (HHPSPCB)	Subject to establishing Labour camps, Hot mix plants, DG sets units, cement batching plant or any water/air pollution generating units.	3 Months	Contractor	HPPWD/CMU
03	Wild Life Clearance	Wild Life Act 1972	Hon'ble Supreme Court	Not applicable	-	-	-

S. No.	Regulatory Clearances	Corresponding Regulations	Approving Authority	Applicability to the Project	Typical Time Required	Responsibility for compliance	
						Execution	**Supervision**
05	Permission for felling & trimming of trees	Forest (Conservation) Act, 1980 and its amendments;	Regional Office MoEF	Applicable.	6 months	CMU/PWD	HPPWD
Construction Stage							
06	Permission for locating and operating Borrow pits	-	Mining Department/SEIAA, Local Administration – Municipal Government/ Panchayat	Applicable	1 Month	Contractor	HPPWD
07	Permission for Withdrawal of Ground Water	Environment Protection Act 1986	Central Ground Water Board	Applicable, if withdrawal is proposed	1 month	Contractor	HPPWD/CMU
08	Permission for withdrawal of Surface Water from River/Irrigation Canals		Irrigation Authorities for use of water from Irrigation Canal. River Board / Authorities for	Applicable if withdrawal is proposed	1 month	Contractor	HPPWD/CMU

S. No.	Regulatory Clearances	Corresponding Regulations	Approving Authority	Applicability to the Project	Typical Time Required	Responsibility for compliance	
						Execution	**Supervision**
			withdrawal of water from Rivers				
09	Authorization to generate, store, transport and dispose of Hazardous Waste	The Hazardous Wastes (Management, Handling and Trans-boundary Movement) Rules, 2008 and amendments till date	Himachal Pradesh State Pollution Control Board (HHPSPCB)	Applicable, if hazardous waste is generated in the project (disposal of bituminous wastes – verify with HHPSPCB)	2 months	Contractor	HPPWD
10	Consent to Operate	Water (Prevention and Control of Pollution) Act 1974; Air (Prevention and Control of Pollution) Act 1981	Himachal Pradesh State Pollution Control Board (HHPSPCB)	Subject to establishing, Hot mix plants or any water/air pollution generating units, Labour camps	3 Months	Contractor	HPPWD/CMU

S. No.	Regulatory Clearances	Corresponding Regulations	Approving Authority	Applicability to the Project	Typical Time Required	Responsibility for compliance	
						Execution	**Supervision**
11	Traffic Police Clearance for diversion of routine traffic	Local Traffic Police Regulations and Bye-laws	Traffic Police Department	Applicable if diversion is required in urban/semi urban areas	1 Month	Contractor	CMU/ HPPWD
12	NOC from Archaeological Survey of India	The Ancient Monument and Archaeological sites and Remains Act 2010	Department of Archaeology Govt. of Himachal Pradesh	Subject to chance finds, if any	2 Months	Contractor	CMU/ HPPWD
13	Permission for Sand Mining from river bed	Himachal Mines and Minerals Concession Rules 1969	River Board Authorities/ Department of Mining Govt. of Himachal Pradesh	Applicable, if river sand is mined	6 Months	Contractor	CMU/ HPPWD
14	Permission for Opening of new Quarry sites	Himachal Mines and Minerals Concession Rules 1969	Department of Mining Govt. of Himachal Pradesh HHPSPCB	Applicable only if Contractor opens a new quarry site	6 Months 3 Months	Contractor	HPPWD/CMU

2. ENVIRONMENTAL MANAGEMENT PLAN

2.1 INTRODUCTION

Environmental Management Plan (EMP) is the key to ensure that the environmental quality of the direct project influence area and indirect project influence area does not deteriorate beyond the expected levels due to the construction and operation of the project. The EMP comprises a set of measures to be taken in different stages like the design, construction and operation to eliminate, offset or reduce adverse environmental impacts to acceptable levels. Elimination/prevention is possible through the elimination of impacts or by avoiding the action.

The detailed Environmental Impact Assessment (EIA) for Gumma to Fediz Section of NH-707 has been done by the CEA, Panchkula and available for with HPPWD/Employer.

EMP as the Table2-1 called 'EMP' lists those measures, which are for this road for the improvement work lists those measures which are specific to this link.

2.2 Objective of EMP

The EMP is a plan of action for mitigation / management / avoidance of the negative impacts of the project and enhancement of the project road. Table 2-1 explains the environmental issues and the avoidance/ mitigation/ minimization or enhancement measures adopted and/or to be adopted during different phases of the project. It also provides the references for the suggested measures, responsible agency for its implementation/ management as well as its time frame.

2.3 COMPLIANCE WITH THE EMP

A copy of the EMP must be kept at the construction site office during the construction period at all times. The EMP will be made binding on contractor operating on the site and must be included as Contractual Clauses in any contractual agreement for the Contractor.

- All persons employed by the contractor or his sub-contractors will abide by the requirements of the EMP.
- Contract conditions to include measures to be taken.
- The Contractor will not direct a person to undertake any activity which would place them in breach of the specifications contained within the EMP.
- Should the Contractor be in breach of any of the specifications contained in the EMP, the HPPWD will in writing, instruct the Contractor responsible for the incidence of non-compliance regarding corrective and/or remedial action required, specify a timeframe for implementation of these actions, implement a penalty and/or indicate that work could be suspended should non-compliance continue.
- Should non-compliance continue, further written notification will be forwarded to the contractor responsible for the incident of non-compliance outlining the required corrective and/or remedial action, the timeframe for implementation, penalties and/or work could be suspended as specified previously.

- Contracts with contractor to include Clauses to hold the contractor responsible for the cost of any delays, corrective or remedial actions required as a result of non-compliance with the specifications and Clauses of the EMP.
- An appropriate reporting schedule for frequent reporting (of compliance with the EA/EMP) to the HPPWD will be developed. The process to be followed for the auditing of the EA conditions / EMP, as well as the reporting procedure to be followed, will be outlined in this document.

2.4 NON-CONFORMANCE AND CORRECTIVE ACTION

The Contractor is deemed not to have complied with the EMP if:

- Within the boundaries of the site, site extensions and haul/ access roads there is evidence of a contravention of Clauses.
- If environmental damage ensues due to negligence.
- The contractor fails to comply with corrective or other instructions issued by the HPPWD within a specified time.
- The Contractor fails to respond adequately to complaints from the public.

2.5 PENALTY CLAUSE FOR NONCONFORMITY TO EMP

The duration over which the Contractor's controls shall be in place to cover the construction period of the project as well as the limited time after the contract completion in terms of the contract as the defects liability period. The Contractor shall implement all mitigation measures for which responsibility is assigned to him as stipulated in the EMP Report.

Application of a penalty Clause to the contractor will apply to incidents of non-compliance. The penalty imposed will be per incident and will be deducted from the contractor's payment. Unless stated otherwise in the project specification, the penalties imposed per incident or violation will be determined in consultation with the HPPWD and depending on the severity and/or regularity of the incidence occurring. Any lapse in implementing the EMP will attract the penalty Clause as detailed below:

- All lapse in obtaining clearances/permissions under statutory regulations and violations of any regulations shall be treated as a major lapse.
- Any complaints of public, within the scope of the Contractor, formally registered with the HPPWD, or with the NHAI and communicated to the contractor, which is not properly addressed within the time period intimated by the HPPWD shall be treated as a major lapse.
- Non-conformity to any of the mitigation measures stipulated in the EMP Report (other than stated above) shall be considered as a minor lapse.
- On observing any lapses, HPPWD shall issue a notice to the Contractor, to rectify the same.
- Any minor lapse for which notice was issued and not rectified, first and second reminders shall be given after one month from the original notice date and first reminder date respectively. Any minor lapse, which is not rectified shall be treated as a major lapse from the date of issuing the second reminder.
- If a major lapse is not rectified upon receiving the notice, HPPWD shall invoke the penalty Clause, in the subsequent interim payment certificate.
- Penalty for major lapses shall be with-holding of 10% of the interim payment certificate, subject to a maximum limit of ₹ 3,000,000.
- If the lapse is not rectified within one month after withholding the payment, the amount withheld shall be forfeited.

HPPWD will issue each notice of noncompliance to the contractor. The notice for invoking penalty Clause will also be issued.

2.6 INTERNATIONAL PRACTICES FOR CONSIDERATION DURING EMP IMPLEMENTATION

The contractor while implementing the EMP will develop procedures to achieve the following:

- Minimum air emissions from construction activities to maintain better levels of ambient air quality in the surroundings of construction sites and construction camps
- Minimise energy consumption in construction activities
- Minimise waste water generation at camp and construction sites
- Use of optimum natural resources
- Effective reutilisation of waste and proper disposal of waste which cannot be reused/recycled
- Minimum disturbance to the population on account of noise generation
- Minimise/avoid pollution to water sources
- Safe working environment to the construction crew through safe operating procedures and encouraging use of personal protective equipment by the work force. For this contractor will procure adequate personal protective equipment.
- Effective traffic management on the project road to achieve better safety of construction crew and road users
- Prevention of communicable diseases through awareness campaign for STD/HIV-AIDS and Hepatitis

Further, the contractor will prepare an 'On Site Emergency Plan' to deal with any mishap such as fire, explosion, and spillage of hazardous materials at camp and construction sites.

Table 2-1 The Environmental Management Plan (EMP)

ENVIRONMENTAL MANAGEMENT PLAN

<table>
<tr><th rowspan="2">Sl. No.</th><th rowspan="2">Environmental Issue</th><th rowspan="2">Management Measures</th><th colspan="2">Responsibility</th></tr>
<tr><th>Planning and Execution</th><th>Supervision/ Monitoring</th></tr>
<tr><td colspan="3">PRE-CONSTRUCTION STAGE</td><td></td><td></td></tr>
<tr><td colspan="3">Pre-construction activities by HPPWD/NHAI</td><td></td><td></td></tr>
<tr><td>P.1</td><td>Clearance & Approvals</td><td>Secure the following clearances & NOCs prior to start of construction activity:
<table>
<tr><th>Type of Clearances</th><th>Applicability</th></tr>
<tr><td>NOC & Consents for Air, Water & Environment Protection Acts and Noise rules from HHPSPCB.</td><td>For Establishment of Construction Camp</td></tr>
<tr><td>Consent to Operate (CTO) and Consent to Establish (CTE) from HHPSPCB.</td><td>For establishment & Operating Construction Plant and HMP.</td></tr>
<tr><td>Explosive License from Chief Controller of Explosive</td><td>For Storing Fuel, Lubricant, Diesel etc.</td></tr>
<tr><td>NOC from State Ground Water Board</td><td>For utilization of Ground Water.</td></tr>
<tr><td>Labour Licenses</td><td>Engagement of Labour</td></tr>
</table></td><td>Contractor</td><td>Employer/ HPPWD/NHAI</td></tr>
<tr><td>P.2</td><td>Preservation of Trees</td><td>A total of about 186 trees are required to be cut for the proposed project and total area for diversion of forest land is 14.412 sqm. The major trees affected are Pine, Khadig, Deodar, Gular, Saal and Kachnar etc.</td><td>HPPWD/NHAI
Contractor</td><td>Employer/ HPPWD/NHAI</td></tr>
</table>

Sl. No.	Environmental Issue	Management Measures	Responsibility	
			Planning and Execution	Supervision/ Monitoring
		All efforts will be made to preserve other trees including evaluation of minor design adjustments/alternatives to save trees. Specific attention will be given for protecting giant trees, green tunnels and locally important trees (religiously important etc.). Tree cutting is to proceed only after all the legal requirements including attaining of In-principle and Formal Clearances from the Forest Dept./DoEF/MoEF are completed and subsequently a written order is issued to the Contractor. In the event of design changes, additional assessments including the possibility to save trees shall be made. Stacking, transport and storage of the wood will be done as per the relevant norms. Systematic corridor level documentation for the trees cut and those saved will be maintained with "HPPWD/NHAI".		
P.3	Relocation of Community Utilities and Common Property Resources	Due to proposed corridor 2 hand pump will be relocated and compensated as per R&R plan before execution of work. Environmental considerations with suitable/required actions including health and hygiene aspects will be kept in mind while relocating all community utilities and resources.	PWD (B&R)/Contractor	Employer/ HPPWD/NHAI
P.4	Field Verification and Modification of the Contract Documents			

Sl. No.	Environmental Issue	Management Measures	Responsibility	
			Planning and Execution	Supervision/ Monitoring
P.4.1	Joint Field Verification	The Environmental Expert of HPPWD/NHAI and the Contractor will carry out joint field verification to ascertain any additional possibility to saving trees, environmental and community resources. The verification exercise should assess the need for additional protection measures or changes in design/scale/nature of protection measures including the efficacy of enhancement measures suggested in the EMP. Proper documentation and justifications/reasons shall be maintained in all such cases where deviation from the original EMP is proposed.	Contractor/ Environmental Expert of HPPWD/NHAI	Employer/ HPPWD/NHAI
P.4.2	Assessment of Impacts due to Changes/Revisions/Additions in the Project Work	The Environmental Expert of HPPWD/NHAI will assess impacts and revise/modify the EMP and other required sections of the project document/s in the event of changes/revisions (including addition or deletion) in the project's scope of work.	Contractor/ Environmental Expert of HPPWD/NHAI	Employer/ HPPWD/NHAI
P.4.3	Crushers, hot-mix plants and Batching Plants Location	Hot mix plants and batching plants will be sited sufficiently away from settlements and agricultural operations or any commercial establishments. Such plants will be located at least 1000 m away from the nearest village/settlement preferably in the downwind direction. The Contractor shall submit a detailed layout plan for all such sites and approval of Environmental Expert of HPPWD/NHAI shall be necessary prior to their establishment. Arrangements to control dust pollution through provision of windscreens, sprinklers, dust encapsulation will have to be provided at all such sites.	Contractor	Employer/ HPPWD/NHAI

Sl. No.	Environmental Issue	Management Measures	Responsibility	
			Planning and Execution	Supervision/ Monitoring
		Specifications of crushers, hot mix plants and batching plants will comply with the requirements of the relevant current emission control legislations and Consent/NOC for all such plants shall be submitted to the "HPPWD/NHAI/ PWD. The Contractor shall not initiate plant/s operation till the required legal clearances are obtained and submitted. The engineer will ensure that the regulatory and legal requirements are being complied with. Form P4 shall be used for reporting to Engineer/Employer.		
P.4.4	Other Construction Vehicles, Equipment and Machinery	All vehicles, equipment and machinery to be procured for construction will confirm to the relevant Bureau of India Standard (BIS) norms. The discharge standards promulgated under the Environment Protection Act, 1986 will be strictly adhered to. Noise limits for construction equipment to be procured such as compactors, rollers, front loaders concrete mixers, cranes (moveable), vibrators and saws will not exceed 75 dB (A), measured at one meter from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986. The Contractor shall maintain a record of PUC for all vehicles and machinery used during the contract period, which shall be produced for HPPWD/NHAI/ PWD's verification whenever required. Mobile equipment shall be placed at least 100metres away from the nearest dwelling. Form C1 shall be used for reporting to Engineer/Employer.	Contractor	Employer/HPPWD/NHAI

Sl. No.	Environmental Issue	Management Measures	Responsibility	
			Planning and Execution	Supervision/ Monitoring
P.6	Identification and Selection of Material Sources			
P.6.1	Borrow Areas	The estimated quantity of good earth required for the project is around 7980 cum. For finalizing borrows areas for borrowing earth and all logistic arrangements as well as compliance to environmental requirements, as applicable, will be the sole responsibility of the contractor. Sitting of the construction camps will be as per the guidelines given in Annexure-2 The Contractor will not start borrowing earth from select borrow area until the Environmental Clearance obtained from SEIAA and formal agreement is signed between landowner and contractor and a copy is submitted to the "HPPWD/NHAI through the Engineer. Planning of haul roads for accessing borrow materials will be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas as far as possible (in case such a land is disturbed, the Contractor will rehabilitate it as per Borrow Area Rehabilitation Guidelines) and will use the existing village roads wherever available. Reporting will be as per the Reporting Format for Borrow Area and will include a reference map. Form P3 shall be used for reporting to Engineer/Employer.	Contractor	Employer/HPPWD/NHAI
P.6.2	Quarry	The estimated quantity of quarry required for the project is around 20681 cum.	Contractor	Employer/HPPWD/NHAI

Sl. No.	Environmental Issue	Management Measures	Responsibility	
			Planning and Execution	Supervision/ Monitoring
		Contractor will finalize the quarry for procurement of construction materials after assessment of the availability of sufficient materials, quality and other logistic arrangements. The contractor will procure the material from authorized/approved quarry sites. Contractor will also work out haul road network and report to PWD/HPPWD/NHAI.		
P.6.3	Arrangement for Construction Water	An estimated quantity of approx. 107675 Cum of water may be consumed during the construction period. The Contractor will provide a list of locations and type of sources from where water for construction will be used. The contractor will seek approval from the Environment Expert of HPPWD/NHAI prior to the finalization of these locations. Form P6 shall be used for reporting to Engineer/Employer. The contractor will not be allowed to pump from any irrigation canal and surface water bodies used by community. The contractor will need to comply with the requirements of the State Ground Water Department and seek their approval for doing so and submit copies of the permission to "HPPWD/NHAI/ PWD" prior to initiation of any construction work.	Contractor	Employer/HPPWD/NHAI
P.7	Labour Requirements	The contractor preferably will use unskilled labour drawn from local communities to give the maximum benefit to the local community. The contractor would notify requirement of unskilled labours in nearby/surrounding village Panchayats.	Contractor	Employer/HPPWD/NHAI

Sl. No.	Environmental Issue	Management Measures	Responsibility	
			Planning and Execution	Supervision/ Monitoring
P.8	Construction Camp Locations – Selection, Design and Lay-out	Sitting of the construction camps will be as per the guidelines given in Annexure 1. Locations identified by the contractor will be reported. Form P2 shall be used for reporting to Engineer/Employer. Construction camps will not be proposed within 1000 m from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community applies only in case where a construction camp doesn't house plant sites. Location for stockyards for construction materials will be identified at least 1000 m from watercourses. The waste disposal and sewage system for the camp will be designed, built and operated such that no odour is generated.	Contractor	Employer/HPPWD/NHAI
P.9	Arrangements for Temporary Land Requirement	The contractor as per prevalent rules will carry out negotiations with the landowners for obtaining their consent for temporary use of lands for construction sites/hot mix plants/traffic detours/borrow areas etc. The Contractor will submit a copy of agreement to the HPPWD/NHAI. The Environmental Expert of HPPWD/NHAI will be required to ensure that the clearing up of the site prior to handing over to the owner (after construction or completion of the activity) is included in the contract.	Contractor	Employer/HPPWD/NHAI
P.10	Orientation of Implementing	The Contractor shall organize orientation sessions and regular training sessions during all stages of the project. This shall include on-site training (general as well as in the specific context of a sub-project). These sessions shall involve, field level	Contractor	Employer/HPPWD/NHAI

Sl. No.	Environmental Issue	Management Measures	Responsibility	
			Planning and Execution	Supervision/ Monitoring
	Agency and Contractors	implementation staff of PWD and Contractor, Environmental Experts of HPPWD/NHAI and Contractors. The contractor will ensure that his staff including engineers, supervisors and operators attend the training sessions.		

ENVIRONMENTAL MANAGEMENT PLAN

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
CONSTRUCTION STAGE				
Activities to be Carried Out by the Contractor				
C.1	**Site Clearance**			
C.1.1	Clearing and Grubbing	Vegetation will be removed from the construction zone before commencement of construction. All works will be carried out such that the damage or disruption to flora other than those identified for cutting is minimum. The Contractor under any circumstances will not cut trees other than those identified for cutting and for which he has written instructions from the PWD. The PWD will issue these instructions only after receiving all stages of clearances from the Forest Department/ MoEF. Vegetation only with girth of over 30 cm will be considered as trees and shall be compensated, in the event of PWD's instruction to undertake tree cutting. The sub grade of the existing pavement shall be used as embankment fill material. The existing base and sub-base material shall be recycled as sub-base of the haul road or access roads.	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		The existing bitumen surface may be utilized for the paving of cross roads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes etc.		
C.1.2	Disposal of debris from dismantling structures and road surface	The estimated quantity for generation of debris is 3, 76,612 Cum, it includes scarified material, concert and spoil/earth. Approximate 90,000 cum will be reused. The CEA has identified two (2) disposal sites at RD 96+220 and 99+050. The contractor may identify new disposal sites as per requirements. The identified locations will be reported to the PWD/HPPWD/NHAI. These locations will be checked on site and accordingly approved by Environmental Expert of HPPWD/NHAI prior to any disposal of waste materials. All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris, will be considered incidental to the work and will be planned and implemented by the contractor as directed by the Environmental Expert of HPPWD/NHAI. The pre-designed disposal locations will be a part of Comprehensive Solid Waste Management Plan to be prepared by Contractor in consultation and with Environmental Expert of HPPWD/NHAI. Debris generated from pile driving or other construction activities shall be disposed such that it does not flow into the surface water bodies or	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		form mud puddles in the area. Form P1 shall be used for reporting to Engineer/Employer.		
C.1.3	Other Construction Wastes Disposal	The pre-identified disposal locations will be a part of Comprehensive Waste Disposal Solid Waste Management Plan to be prepared by the Contractor in consultation and with approval of Environmental Expert of HPPWD/NHAI. The HPPWD/NHAI/PWD will approve these disposal sites after conducting a joint inspection on the site with the Contractor. Contractor will ensure that any spoils of material unsuitable for embankment fill will not be disposed-off near any water course, agricultural land, and natural habitat like grass lands or pastures. Such spoils from excavation can be used to reclaim borrow pits and low-lying	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		areas located in barren lands along the project corridors (if so desired by the owner/community and approved by HPPWD/NHAI). All waste materials will be completely disposed and the site will be fully cleaned and certified by Environmental Expert of HPPWD/NHAI before handing over. The contractor at its cost shall resolve any claim, arising out of waste disposal or any non-compliance that may arise on account of lack of action on his part.		
C.1.4	Stripping, stocking and preservation of Top Soil	The top soil from land where construction camp will be established and all areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles. A portion of the temporarily acquired area and/or Right of Way will be earmarked for storing topsoil. The locations for stock piling will be pre-identified in consultation and with approval of Environmental Expert of HPPWD/NHAI. The following precautionary measures will be taken to preserve them till they are used: Stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and height of the pile is restricted to 2 m. To retain soil and to allow percolation of water, silt fencing will protect the edges of the pile. Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles shall be covered with gunny bags or vegetation.	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be utilized for -covering all disturbed areas including borrow areas only in case where these are to be rehabilitated as farm lands (not those in barren areas) top dressing of the road embankment and fill slopes filling up of tree pits, in the median and in the agricultural fields of farmers, acquired temporarily. Residual topsoil, if there is any will be utilized for the plantation at median and side of the main carriageway.		
C.1.5	Accessibility	The contractor will provide safe and convenient passage for vehicles, pedestrians and livestock to and from project site and property accesses connecting the project road worksite, providing temporary connecting road. The contractor will also ensure that the work on / at existing accesses will not be undertaken without providing adequate provisions as per IRC:SP:55:2014.	Contractor	Employer/HPPWD/NHAI
C.1.6	Planning for Traffic Diversions and Detours	A temporary diversion route is being identified by PWD/HPPWD/NHAI. The temporary diversion will be provided by PWD, before handing over the site for Project road. The contractor will disclose local community for changes in traffic routes, conditions and pedestrian access arrangements with assistance of PWD.	Contractor/PWD	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
C.2	**Procurement of Construction Material**			
C.2.1	Earth from Borrow Areas for Construction	No borrow area will be opened without EC obtained from the SEIAA. The location, shape and size of the designated borrow areas will be as recommended by SEIAA and in accordance to the IRC recommended practice for borrow pits for road embankments (IRC 10: 1961). The unpaved surfaces used for the haulage of borrow materials, if passing through the settlement areas or habitations; will be maintained dust free by the contractor. Sprinkling of water will be carried out thrice a day to control dust along such roads during their period of Execution. Contractor will rehabilitate the borrow areas as soon as borrowing is over from a particular borrow area as suggested by Environmental Expert of HPPWD/NHAI. Form C4 shall be used for reporting to Engineer/Employer.	Contractor	Employer/HPPWD/NHAI
C.2.2	Quarry Operations	The Contractor shall obtain materials from new quarries only after the consent of the Department of Mining / HHPSPCB/ District Administration or will be use the existing approved sources of such materials. A copy of the consent/ approval for opening or use of a quarry source will be submitted to Environmental Expert and PWD. The quarry operations will be undertaken within the rules and regulations in force.	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
C.2.3	Transporting Construction Materials and Haul Road Management	The Contractor will maintain all roads (existing or built for the project), which are used for transporting construction materials, equipment and machinery. In case of spillage of material during transportation, the contractor is liable for undertaking all remedial measures, including ensuring safe operations involving other road users/public and to rectify or resolve the issue at his own cost. All existing highways and roads used by vehicles of the contractor or any of his sub-contractor or suppliers of materials and similarly roads, which are part of the works, will be kept clear of all dust/mud or other extraneous materials dropped by such vehicles. Contractor will arrange for regular water sprinkling as necessary for dust suppression of all such roads and surfaces with specific attention to the settlement areas. The unloading of materials at construction sites/close to settlements will be restricted to daytime only.	Contractor	Employer/HPPWD/NHAI
C.2.4	Construction Water	Contractor will arrange adequate supply and storage of water for the whole construction period at his own costs. The Contractor will submit a list of source/s from where water will be used for the project to HPPWD/NHAI through the Engineer. The contractor will source the requirement of water preferentially from ground water but with prior permission from the Ground Water Board. A	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		copy of the permission will be submitted to HPPWD/NHAI through the Engineer. The contractor will take all precaution to minimize the wastage of water in the construction process/ operation.		
C.3	**Construction Work**			
C.3.1	Disruption to Other Users of Water	While working across or close to any perennial water bodies, contractor will not obstruct/ prevent the flow of water. Construction over and close to the non-perennial streams shall be undertaken in the dry season. If construction work is expected to disrupt users of community water bodies, notice shall be served well in advance to the affected community by the contractor.	Contractor	Employer/HPPWD/NHAI
C.3.2	Drainage	The Contractor will ensure that construction materials like earth, stone, fly ash are disposed-off so as not to block the flow of water of any watercourse and cross drainage channels. The Contractor will take all necessary measures to prevent the blockage of water flow. In addition to the design requirements, the Contractor will take all required measures as directed by the Environmental Expert to prevent temporary or permanent flooding of the site or any adjacent area.	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		Form O1 shall be used for reporting to Engineer/Employer.		
C.3.3	Siltation of Water Bodies and Degradation of Water Quality	The Contractor will not excavate beds of any stream/canals/any other water body for borrowing earth for embankment construction. The Contractor will ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water does not drain into nearby water course.	Contractor	Employer/HPPWD/NHAI
C.3.4	Slope Protection and Control of Soil Erosion	The contractor will take slope protection measures as per design, or as directed by the Environmental Expert to control soil erosion and sedimentation. All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earth work or other items of work and as such as no separate payment will be made for them. Contractor will ensure the following aspects: During construction activities on - project roads, the side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications. Turfing works will be taken up as soon as possible provided the season is favourable for the establishment of grass sods. Other measures of slope stabilization will include mulching netting and seeding of batters and drains immediately on completion of earthworks.	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		In borrow pits, the depth shall be so regulated that the sides of the excavation will have a slope not steeper than 1 vertical to 2 horizontal, from the edge of the final section of the bank. Along sections abutting water bodies, stone pitching as per design specification will protect slopes.		
C.4	**Pollution**			
C.4.0	Pollution Monitoring	The periodic monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil quality at/near project road locations will be done as per MoEF and CPCB guidelines. Form C3 shall be used for reporting to Engineer/Employer.	Contractor	Employer/HPPWD/NHAI
C.4.1	Water Pollution			
C. 4.1.1	Water Pollution from Construction Wastes	The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering into streams, water bodies or the irrigation system. Contractor will avoid construction works close to the streams or water bodies during monsoon. All waste arising from the project is to be disposed of in the manner that is acceptable and as per norms of the Himachal State Pollution Control Board.	Contractor	Employer/HPPWD/NHAI
C.4.1.2	Water Pollution from Fuel and Lubricants	The contractor will ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		maintenance and refuelling sites will be located at least 500 m from rivers and irrigation canal/ponds. All location and layout plans of such sites will be submitted by the Contractor prior to their establishment and will be approved by HPPWD/NHAI. Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refuelling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptors will be provided for vehicle parking, wash down and refuelling areas as per the design provided. Guidelines For Silt Fencing and Oil Interceptor is given in Annexure-5 In all, fuel storage and refuelling areas, if located on agricultural land or areas supporting vegetation, the top soil will be stripped, stockpiled and returned after cessation of such storage. Contractor will arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites and approved by HPPWD/NHAI. All spills and collected petroleum products will be disposed of in accordance with MoEF and HHPSPCB guidelines.		
C.4.2	Air Pollution			
C.4.2.1	Dust Pollution	The contractor will take every precaution to reduce the level of dust from crushers/hot mix plants, construction sites involving earthwork by	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		sprinkling of water, encapsulation of dust source and by erection of screen/barriers at worksite/campsites. All the plants will be sited at least 1 km in the downwind direction from the nearest human settlement. PM2.5, PM10, SO2, CO and NOx should be in permissible limit as stated in National Ambient Air Quality Standards during the construction phase. Dust screening vegetation will be planted on the edge of the camp site. Hot mix plant will be fitted with dust extraction units.		
C.4.2.2	Emission from Construction Vehicles, Equipment and Machineries	Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of HPSPCB. The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project. Monitoring results will also be submitted to HPPWD/NHAI.	Contractor	Employer/HPPWD/NHAI
C.4.3	Noise Pollution			
C.4.3.1	Noise Pollution: Noise from Vehicles, Plants and Equipment	The Contractor will confirm the following: All plants and equipment used in construction (including the aggregate crushing plant) shall strictly conform to the MoEF/CPCB/HHPSPCB noise standards.	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		All vehicles and equipment used in construction will be fitted with exhaust silencers. Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced. Limits of noise emission for construction equipment used in the project such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A) (measured at one meter from the edge of equipment in the free field), as specified in the Environment (Protection) rules, 1986. Maintenance of vehicles, equipment and machinery shall be regular and up to the satisfaction of the Environmental Expert to keep noise levels at the minimum. At the construction sites within 150 m of the nearest habitation, construction work such as crushing, concrete mixing, batching will be stopped during the night time between 9.00 pm to 6.00 am. No construction activities will be permitted around educational institutes/health centres (silence zones) up to a distance of 100 m from the sensitive receptors i.e., school, health centres and hospitals between 9.00 am to 6.0 pm.		
C.5	**Occupational Health & Safety**			

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
C.5.1	Personal Safety Measures for Labour	The Contractor will provide: Protective footwear and protective goggles to all workers employed on mixing asphalt materials, cement, lime mortars, concrete etc. Welder's protective eye-shields to workers who are engaged in welding works Protective goggles and clothing to workers engaged in stone breaking activities Earplugs to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation. Adequate safety measures for workers during handling of materials at site. The Contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, harness, stairwells, excavations, trenches and safe means of entry and egress. The Contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labour Organization (ILO) Convention No. 62 as far as those are applicable to this contract. The Contractor will not employ any person below the age of 14 years for any work and no woman will be employed on the work of painting with products containing lead in any form. The Contractor will also ensure that	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		no paint containing lead or lead products is used except in the form of paste or readymade paint.He will provide facemasks for use to the workers when paint is applied in the form of spray or a surface having lead paint is rubbed and scraped. Luminous jacket, Regulation (industrial or safety) shoes and hard hats shall be made mandatory for all workers at site. The Contractor will mark 'no smoking' in high risk areas and enforce non-compliance of use of PPE with zero tolerance. These will be reflected in the Construction Safety Plan to be prepared by the Contractor during mobilization and will be approved by Engineer and HPPWD/NHAI.		
C.5.2	Traffic and Safety	The Contractor will take all necessary measures for the safety of traffic during construction as per IRC:SP:55:2014 and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as proposed in the Traffic Control Plan/Drawings and as required by the Environmental Expert for the information and protection of traffic approaching or passing through the section of any existing cross roads. The Contractor will ensure that all signs, barricades, pavement markings are provided as per the IRC SP 55:2014 / MoRTH specifications or as directed by the Engineer. Before taking up construction on any section of the existing lanes of the highway, a Traffic Management Plan will be devised and implemented to the satisfaction of the Environmental Expert and the Engineer. Rash driving by the Contractor's vehicle drivers must	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		be strictly controlled. Guidlines for Traffic Management plan is attached as Annexure -3 Form P5 shall be used for reporting to Engineer/Employer.		
C.5.3	Risk from Electrical Equipment(s)	The Contractor will take all required precautions to prevent danger from electrical equipment and ensure that - No material will is so stacked or placed as to cause danger or inconvenience to any person or the public. All necessary fencing and lights is provided to protect the public in construction zones. All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, are free from patent defect, are kept in good working order, regularly inspected and properly maintained as per IS provision and to the satisfaction of the Environmental Expert .	Contractor	Employer/HPPWD/NHAI
C.5.4	Risk Force Measure	The Contractor will take all reasonable precautions to prevent danger to the workers and public from fire, flood etc. resulting due to construction activities. The Contractor will make required arrangements so that in case of any mishap all necessary steps can be taken for prompt first aid treatment.	Contractor	Employer/HPPWD/NHAI
C.5.5	First Aid	The contractor will arrange for -	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		a readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in project road work zone availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital equipment and trained nursing staff at construction camp		
C.5.6	Informatory Signs and Hoardings	The contractor will provide, erect and maintain Informatory/safety signs, hoardings written in English and local language, wherever required as per IRC:67:2012 , IRC:SP:55:2014, IRC:35:2015 and MoRTH specifications.	Contractor	Employer/HPPWD/NHAI
C.5.7	Prevention of Mosquito Breeding	Measures shall be taken to prevent breeding at site. The measures to be taken shall include: -Empty cans, oil drums, packing & other receptacles, which may retain water shall be deposited at a central collection point & shall be removed from the site regularly. -Still waters shall be treated at least once every week with oil in order to prevent mosquito breeding. -Contractor's equipment & other items on the site, which may retain water, shall be stored, covered or treated in such a manner that water could not be retained. -Water storage tanks shall be provided.		Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		-Posters in Hindi & English which draw attention to the dangers of permitting mosquito breeding shall be displayed prominently on the site. -Contractor periodic interval shall arrange to prevent mosquito breeding by fumigation / spraying of insecticides		
C.5.8	Transmission of Diseases & HIV/ AIDS prevention & control	The Contractor shall conduct an HIV/AIDS awareness programme via an approved service provider or specialized NGO to reduce the risk of the transfer of the HIV virus between and among the contractors' personals and local community. The contractor shall throughout the contract period – (i) Conduct information, education and consultation communication (IEC) campaigns, at least every alternate month. (ii) Provide male or female condoms for all workforce as appropriate; (iii) Provide for Sexually Transmitted Infections (STI) and HIV/AIDS screening, diagnosis, counselling and referral to a dedicated national STI and HIV/AIDS program.	Contractor	Employer/HPPWD/NHAI
C.6	**Flora and Fauna: Plantation/Preservation/ Conservation Measures**			
C.6.1	Flora and Chance found Fauna	The Contractor will take reasonable precaution to prevent his workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal.	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		If any wild animal is found near the construction site at any point of time, the Contractor will immediately upon discovery thereof sensitize the Environmental Expert and carry out the ENGINEER's instructions for dealing with the same. The Environmental Expert will report to the nearby forest office (range office or divisional office) and will take appropriate steps/ measures, if required in consultation with the forest officials.		
C.6.2	Chance Found Archaeological Property	All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation. The Contractor will take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He will, immediately upon discovery thereof and before removal acquaint the Environmental Expert of such discovery and carry out the Engineer's instructions for dealing with the same, waiting which all work shall be stopped. The Engineer will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.	Contractor	Employer/HPPWD/NHAI
C.7	**Labour Camp Management**			

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
C.7.1	Accommodation	The Contractor will follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp. The location, layout and basic facility provision of each labour camp will be submitted to Engineer and PIU prior to their construction. Form P2 shall be used for reporting to Engineer/Employer. The Contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the Engineer.	Contractor	Employer/HPPWD/NHAI
C.7.2	Potable Water	The Contractor will construct and maintain all labour accommodation in such a fashion that uncontaminated water is available for drinking, cooking and washing. The Contractor will also provide potable water facilities within the precincts of every workplace in an accessible place, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. The contractor will also guarantee the following: Supply of sufficient quantity of potable water (as per IS) in every workplace/labour camp site at suitable and easily accessible places and regular maintenance of such facilities.	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
		If any water storage tank is provided that will be kept such that the bottom of the tank at least 1mt. from the surrounding ground level. If water is drawn from any existing well, which is within 30mt. proximity of any toilet, drain or other source of pollution, the well will be disinfected before water is used for drinking. All such wells will be entirely covered and provided with a trap door, which will be dust proof and waterproof. A reliable pump will be fitted to each covered well. The trap door will be kept locked and opened only for cleaning or inspection, which will be done at least once in a month. Testing of water will be done as per parameters prescribed in relevant IS Standards.		
C.7.3	Sanitation and Sewage System	The contractor will ensure that - the sewage system for the camp are designed, built and operated in such a fashion that no health hazards occurs and no pollution to the air, ground water or adjacent water courses take place separate toilets/bathrooms, wherever required, screened from those from men (marked in vernacular) are to be provided for women adequate water supply is to be provided in all toilets and urinals all toilets in workplaces are with dry-earth system (receptacles) which are to be cleaned and kept in a strict sanitary condition.	Contractor	Employer/HPPWD/NHAI

S. No.	Environmental Aspect/Issue	Management Measures	Responsibility	
			Execution /Civil Work	Supervision/ Monitoring
C.7.4	Waste Disposal	The Contractor will provide segregated garbage bins in the camps and ensure that these are regularly emptied and disposed-off in a hygienic manner as per the Comprehensive Solid Waste Management Plan approved by the Environmental Expert. (Form C2 shall be used for reporting to Engineer/Employer). Comprehensive waste management plan is given in Annexure-4	Contractor	Employer/HPPWD/NHAI
C.8	**Contractor's Demobilization**			
C.8.1	Clean-up Operations, Restoration and Rehabilitation	The clean-up and restoration operations are to be implemented by the Contractor prior to demobilization. The Contractor will clear all temporary structures, dispose all garbage, night soils and POL waste as per Comprehensive Waste Management Plan and as approved by Engineer. All disposal pits or trenches will be filled in and effectively sealed off. Residual topsoil, if any will be distributed on adjoining/ proximate barren land or areas identified by Environmental Expert in a layer of thickness of 75 mm-l50 mm. Environmental Expert will certify in this regard. All construction zones including river-beds, culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, at the contractor's expense, to the entire satisfaction to the Environmental Expert. Form O2 shall be used for reporting to Engineer/Employer.	Contractor	Employer/HPPWD/NHAI

3. IMPLEMENTATION ARRANGMENTS

3.1 GENERAL

This chapter summarizes the institutional arrangements and reporting system arrangements for the implementation of the environmental management plan.

3.2 EXISTING INSTITUTIONAL ARRANGEMENTS

3.2.1 Existing Institutional Capacity in NH Division, HPPWD

Himachal Pradesh Public Works Department (HPPWD) has been entrusted the responsibility of successful implementation of the Gumma to Fediz Section of NH-707 funded by the World Bank.

The HPPWD comes under the Secretary Public Works Himachal Pradesh. Presently, NH Division of HPPWD is headed by the Chief Engineer of NH Division. The Chief Engineer NH Division is responsible for the successful implementation of the Project. Executive Engineers and his supporting staff are responsible as Employers representatives for the project implementation. NHAI/HPPWD may appoint Environment Expert for the supervision/monitoring of environmental issues for this project execution.

3.3 PROPOSED IMPLEMENTATION SETUP

The proposed set up for implementation of EMP is given in Figure 3.1.

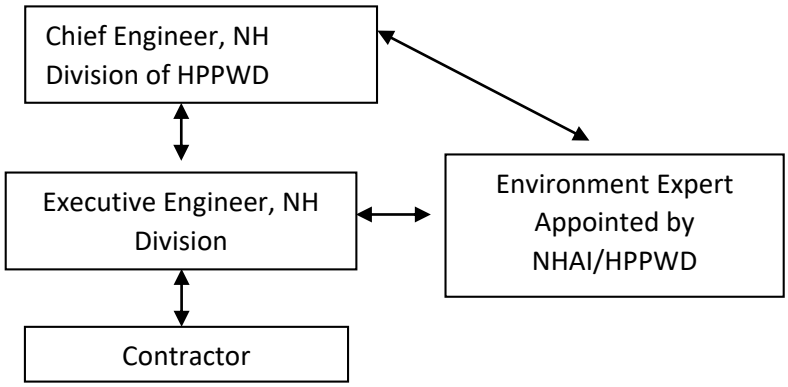


Figure 3-1 Proposed Implementation Setup

3.4 CONTRACTOR

The Construction Contractor is responsible for the physical implementation of the mitigation measures proposed in the Environmental Management Plan (EMP). To ensure the effective implementation of the EMP, the EMP will be made as part of the Contract Document between the Construction Contractor and Client. It follows that the Contractor has to have an Environmental Expert to incorporate environmentally sound construction methods.

3.5 GRIEVANCE REDRESSAL MECHANISM

Grievance Redress Mechanism at HPPWD: The HPPWD will form a Grievance Redressal Cell (GRC) at PWD and it shall be headed by the Executive Engineer. The Environmental Specialist HPPWD and Social Specialist, HPPWD will also be a member of this cell to redress complaints pertaining to environmental issues. The contact details of the members (email and phone numbers) of this cell will be available at HPPWD Web site and the details will also be available at construction camp of contractors, local PWD offices.

This GRC shall discuss the issue/complaint in its monthly meeting and resolve the issues within two weeks' time after receiving the grievance. If the matter is not resolved by GRC at PWD level within stipulated time, it shall be referred to the Chief Engineer, NH Division who will resolve the complaint within a period of two months.

Complaints register with the Contractor: The contractor shall keep and maintain a complaint register report at his site office along the project road as well as project facilities like construction camp, labour camp etc., for public to register their complaints. The Contractor, after taking necessary action based on the complaint, shall also incorporate the same, in the complaint register. This report shall also be part of the monthly report, for HPPWD /AE to monitor and take necessary action, if needed. It has to be noted that, inaction upon the complaint of the public shall be considered as a major lapse from the side of the Contractor, leading to invoking of penalty Clause, which is given in Chapter 2 of this report as well as the Contract document.

4. ENVIRONMENTAL MONITORING AND REPORTING REQUIREMENTS

4.1 MONITORING AND REPORTING OF ENVIRONMENTAL MANAGEMENT MEASURES

A robust monitoring and reporting system is mandatory to ensure compliance to EMP by the contractor.

A) Monitoring Plan

- To ensure the effective implementation of the EMP, it is essential that an effective monitoring program be designed and carried out.
- Various physical, biological and social components identified as of particular significance in affecting the environment at critical locations in various stages of the Project have been suggested as Performance Indicators (PIs). These are listed below and shall be the focus for monitoring.
- Air quality (PM10, PM2.5, NOx, SO2,Pb and CO);
- Water quality (Physical, chemical and Biological parameters)
- Noise levels around sensitive locations/residential area
- Plantation success / survival rate.

The monitoring plans during construction and operation stages have been described in detail in the EMP documents and summary of monitoring plan is presented in Table 4.1 & Table 4.2. For each of the environmental components, the monitoring plan specifies the parameters to be monitored; location of monitoring sites; frequency and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities.

Table 4-1 Environmental Monitoring Plan

Attribute	Project Stage	Parameter	Special Guidance	Standards	Frequency	Duration	Location	Implementation	Monitoring/ Supervision
Air	Construction	CO, NOx, SPM, PM2.5,PM10 and SO2	High volume sampler to be located 50 m from the plant in the downwind direction. Use method specified by CPCB for analysis	Air (prevention and Control of Pollution) Rules, CPCB, 1994	Quarterly	24 hours Sampling	Ref. Table No. 5.7	Contractor	HPPWD/NHAI
Water	Construction	All essential characteristics and some of desirable characteristics as decided by the HPPWD/NHAI	Grab sample collected from source and analyse as per Standard Methods for Examination of Water and Wastewater	Indian Standards for Inland Surface Waters (IS: 2296, 1982) and for Drinking Water (IS: 10500 - 1991)	Quarterly	Grab Sampling	Ref. Table No. 5.7	Contractor	HPPWD/NHAI

Noise	Construction	Noise levels on dB (A) scale	Equivalent noise levels using an integrated noise level meter kept at a distance of 15 from edge of pavement Equivalent noise levels using an integrated noise level meter kept at a distance of 15 from edge of pavement	MoEF Noise Rules, 2000	Quarterly	Leq in dB(A) of day time and night time	Ref. Table No. 5.7	Contractor	HPPWD/NHAI
Soil	Construction	Monitoring of Pb, SAR and Oil & Grease	Sample of soil collected to acidified and analysed using absorption spectrophotometer	Threshold for each contaminant set by IRIS database of USEPA until national standards are promulgated	Once in Six Months	Grab Sampling	Ref. Table No. 5.7	Contractor	HPPWD/NHAI

Borrow area	Construction	As per Guidelines	Visual Observation	-	Once in a Month	-	Borrow area location	Contractor	HPPWD/NHAI
Tree plantation	Operation stage	As per Rehabilitation Plan			Quarterly	-	Areas where plantation is being done	-	HPPWD/NHAI

Table 4-2 Environmental Monitoring Locations

Environmental Component	S. N.	Location	Remarks
Air Quality	1.	Upstream of proposed Gumma Fediz Section of NH-707	Rural Residential/ Commercial
	2.	Middle of proposed Gumma Fediz Section of NH-707 near village Antroli	Residential/Commercial
	3.	Near End of Gumma Fediz Section of NH-707	Rural Residential/Commercial
	4	HMP Camp Site	Residential/Commercial
Water quality	1.	HMP Camp Site	Surface water / Ground water
	2.	Hand Pump at village Gumma	Ground water
	3	Hand Pump at Village Antroli	Ground water
	4	Giri River near disposal site -1	Surface water
	5	Giri River near disposal site -2	Surface water
	6	Giri River at Nearest point to HMP Camp Site	Surface water
Noise Monitoring	1.	Upstream of proposed Gumma Fediz Section of NH-707	Residential/Commercial
	2.	Middle of proposed Gumma Fediz Section of NH-707 near village Antroli	Rural Residential
	3.	Near End of Gumma Fediz Section of NH-707	Rural Residential
	4.	HMP Camp Site	Residential/Commercial
Soil quality	1.	Random Location at Completed section of Gumma to Fediz section of NH-707	Agricultural
	2	Near Construction Site	Agricultural
	3.	HMP Plant site	Agricultural

4.2 REPORTING REQUIREMENT

The reporting system evolved for Gumma- Fediz Project is given in table 4.3 below:

Table 4-3 List of Reporting Requirement

P2: Setting-Up Construction Camp and Storage Area

P3: Establishment of Borrow Areas

P4: Establishment of Hot Mix Plant / Batch Mix Plant

P5: Road Safety Reporting Formats

P6: Identification of Source of Water For Construction

C1: Detail of Machinery in Operation

C2: Detail of Waste Management

C3: Environmental Pollution Monitoring

C4: Detail of Earth Works

C5: Redevelopment of Borrow Areas

O1: Cleaning of Culvert Opening and Longitudinal Drain

O2: Restoration of Construction Sites

P1: IDENTIFICATION OF DISPOSAL SITE LOCATIONS

(To be filled by the Contractor)

Name of Project:

(Give Chainages and nearest settlements from both ends) Chainage No. –

Sl. No.	Criteria on which information for each site is to be collected	Site 1
1.	Existing Land Use.	
2.	Area covered (m2).	
3.	Total Material that can be dumped within the site (m3).	
4.	Height to which dumping is feasible (m).	
5.	Distance of nearest water course (m).	
6.	Nearest Settlements (m).	
7.	Date/s Community Construction/s.	
8.	Whether the community is agreeable to sitting of dumping site (Y/N).	
9.	Date of Permission from Villager/local community.	
10.	Proposed future use of the Site.	
11.	Selected Site (Tick any one column only).	

Enclosures (Tick as appropriate):

Map of each location.

Photographs.

Each Disposal Location.

Photo copy of Agreement.

Remarks:

Submitted By:

Signature…….
Name ……
Designation……
(Contractor)

Checked By:

Signature ……
Name……
(Environmental Expert)

Approved By:

Signature ……
Name ……
(The Engineer, PWD)

P2: SETTING-UP CONSTRUCTION CAMP AND STORAGE AREA

(To be filled by the Contractor)

Name of Project:

Construction Stage Report: Date - Month - Year - .

(Site Layout of Construction camp and working drawings of dwelling units with allied facilities to be attached with format. Format to be submitted before target date of establishing camps.)

Location of Camp:

Sl. No.	Item	Unit	Details	Remarks if any
1.	Detail of Item Camp			
a.	Size of camp.	mxm		
b.	Area of Camp.	Sq. m		
c.	Distance from Nearest			
d.	Distance from Nearest Water Source.	Type Size/Capacity Present		
	Date of camp being operational dd/mm/yy.			
	Present land use.			
	No. of trees with girth > 0.3m.			
e.	Details of Storage area (Availability of impervious surface)	mxm		
f.	Availability of separate waste disposal from storage area.	Cum		
2.	Details of Topsoil Stacking			
a.	Quantity of top soil removed	Sqm		
b.	Detail of storage of topsoil.	Describe attacking arrangement		
3.	Details of Workforce.			
a.	Total No. of Labours	Nos.		

Sl. No.	Item	Unit	Details	Remarks if any
b.	Total No. of Male Workers.	Nos.		
c.	No. of Male Workers below 18	Nos.		
d.	Total No of Female Workers.	Nos.		
e.	No. of Female Workers below 18	Nos.		
f.	No. of Children.	Nos.		
4.	Details of Dwelling Units.			
a.	No of dwelling/huts	Nos.		
b.	Minimum Size of Dwelling.	mxm		
c.	No. of opening per dwelling.	Nos.		
d.	Minimum size of opening.	mxm		
e.	Walls	Specifications		
f.	Roofing	Specifications		
g.	Flooring	Specifications		
h.	Drinking Water Tank	Specifications		
i	Capacity of drinking Water Tank	Cum		
J	Size of Drinking Water Tank.	mxm		
K	Total no of WC	Nos.		
l.	No, of Wcs for female workers	Nos.		
m.	Minimum size of WC	mxm		
n.	Total No. of Bathrooms for	Nos		
o.	Size of septic tank for WC/Baths.	mxm		
p.	Capacity of Water			
q.	Fencing around camp.	Y/N		
5.	Details of facilities.			
a.	Availability of security guard 24	Yes/No		
b.	Details of First Aid Facility	Yes/No		

Sl. No.	Item	Unit	Details	Remarks if any
c.	Availability of Day Care centre.	Yes/No		
d.	Availability of dust bins	Yes/No		

Remarks:

Submitted By:

Signature……..
Name ……
Designation……
(Contractor)

Checked By:

Signature ……
Name……
(Environmental Expert)

Approved By:

Signature ……
Name ……
(The Engineer, PWD)

P3: ESTABLISHMENT OF BORROW AREAS

(To be submitted by Contractor for taking consent for opening of Borrow area)

Name of Project

Date:

Sl. No.	Location				Area (m2)	Quantity of Available Material	Type of Material	Distance from nearest Water Course (m)	Distance from nearest Settlement	Land Use		No. of Trees to be Affected	Approved by EO (Y/N)	Remarks
	Name of Village	Chainage (Km)	Side (LHS/ RHS)	Haul road length (m)						Before	After			
1.														

Attach Photograph of Proposed Site, Location Map, and Agreement

Submitted By:

Signature……..
Name ……
Designation……
(Contractor)

Checked By:

Signature ……
Name……
(Environmental Expert)

Approved By:

Signature ……
Name ……
(The Engineer, PWD)

P4: ESTABLISHMENT OF HOT MIX PLANT / BATCH MIX PLANT

(To be submitted by Contractor for taking permission from PWD)

Name of Project:

Date:

Sl. No.	Location				Area (m2)	Distance from nearest Water Course (m)	Distance from nearest Settlement	Existing Land Use	Prevalent Wind Direction	Whether in Down Wind Direction (Y/N)	Approved by EO (Yes/ NO)	Remarks
	Name of Village	Chainage (Km)	Side (LH S/ RHS)	Haul road length (m)								
1.												

Attach Photograph of Proposed Site

Submitted By:

Signature……..
Name ……
Designation……
(Contractor)

Checked By:

Signature ……
Name……
(Environmental Expert)

Approved By:

Signature ……
Name ……
(The Engineer, PWD)

P5: ROAD SAFETY REPORTING FORMATS

(Reporting by Contractor)

Name of Project:

One time reporting before commencement of construction in the Construction Zone.

Sketch of construction zone showing all sub zones and location of signs, etc. to be attached with format. Format on Acquisition of Temporary diversions to be attached with format.

Construction stage: Monthly Report:

Date …… Month …… Year…… .

DIVERSION NO. Location (Km).

Sl.	Item	Unit	Compliance	Remarks
	Details of Construction Zone.			
1.	Length of Construction Zone	Km		
2.	Distance between this and next construction zone.	Km		
3.	Length of transition sub zone (should be min 50 for a speed of 50 km/ hr).			
4.	Length of work sub zone in urban stretch (should be <	Km		
5.	Length of work sub zone in rural stretch (5-10 Km)	Km		
6.	Distance between two work sub zones			
	Signage's in Construction Zones			
1.	Sign saying 'Men at Work' 1 Km ahead of transition	Y/N		
2.	Supplementary sign saying diversion 1 Km provided.	Y/N		
3.	Sign saying 'Road Closed Ahead' provided	Y/N		
4.	Compulsory Right Turn / left sign provided	Y/N		
5.	Detour sign placed.			
6.	Sharp deviation sign placed at end of advance warning	Y/N		
	Signage in Transition Sub Work Zone.			
1.	Signage saying 'Keep Right / Left' provided.	Y/N		
2.	Delineators placed along length of transition.	Y/N		

	Signage in Work Sub Zone			
1.	Hazard Marker placed where railing for CD structure on diversion starts.	Y/N		
2.	Barricade on either side of work sub zone.			
	Signage in Termination sub zone.			
1.	Sign for indication of end of work zone 120 m from end of termination sub zone.	Y/N		
	Road Delineator			
1.	Roadway indicators provided.			
2.	Hazard Makers Provided.			
3.	Object Makers Provided.			

Remarks:

Submitted By:

Signature……..
Name ……
Designation……
(Contractor)

Checked By:

Signature ……
Name……
(Environmental Expert)

Approved By:

Signature ……
Name ……
(The Engineer, PWD)

P6: IDENTIFICATION OF SOURSE OF WATER FOR CONSTRUCTION

(To be filled by the Contractor)

Name of Corridor:

Construction Stage Monthly Report- Date: Month: Year:

S.No.	Source Name	Location/ Ch.	Distance from Road	Permission Required	Remarks
1.					

Remarks:

Submitted By:

Signature……..
Name ……
Designation……
(Contractor)

Checked By:

Signature ……
Name……
(Environmental Expert)

Approved By:

Signature ……
Name ……
(The Engineer, PWD)

C.1: DETAILS OF MACHINERY IN OPERATION

(To be filled by the Contractor)

Name of Project Road:

Date:

(Attach copy of HHPSPCB emission control certificate every 3 months)

1. Details of Machinery Operation

1.1	Total machinery in operation (Nos.)	
1.2	Number of pavers	
1.3	Number of rollers	
1.4	Number of excavators	
1.5	Number of graders	
1.6	Number of dumpers	
1.7	No. of workshops with repairs facility (furnish location and type of facility provided)	
1.8	Number of vehicles in repair at each at each location	
1.9	Number of oil interceptor provided in each Repair / fuelling site	
1.10	Total quantity of oil and wastes recovered in each interceptor during last month.	
1.11	Details of waste disposal. (Whether Sold/Disposed)	

Remarks:

Submitted By:

Signature……..
Name ……
Designation……
(Contractor)

Checked By:

Signature ……
Name……
(Environmental Expert)

Approved By:

Signature ……
Name ……
(The Engineer, PWD)

C.2: WASTE MANAGEMENT

(To be filled by the Contractor)

Name of Project Road:

Date:

Sl. N.	Characteristics of Waste	Type of Waste	Total Quantity generated (cum/l)	Reused/ Recycled, If any (Quantity in cum/l)	Final Quantity of waste generated (cum/l)	Disposed Quantity (cum/l)	Disposal Practices	Disposal site	Remarks

Remarks:

Submitted By:

Signature…….
Name ……
Designation……
(Contractor)

Checked By:

Signature ……
Name……
(Environmental Expert)

Approved By:

Signature ……
Name ……
(The Engineer, PWD)

C.3 :ENVIRONMENTAL POLLUTION MONITORING

(To be filled by the Contractor)

Project Name:

Time Period: Date:

(Location at which monitoring to be conducted as per EMP)

Parameter	Chainage (Km)	Details of Locations	Duration of Monitoring	Instruments used	Standard	Results	Reasons for exceedingstandards	Mitigation Measures suggested	Type (Residential / Industrial / Commercial)	Remarks
Air Quality					PM2.5	PM2.5				
					PM10	PM10				
					CO	CO				
					SOX	SOX				
					NOX	NOX				
Water Quality					pH	pH				
					TSS	TSS				
					TDS	TDS				
					Turbidity	Turbidity				
					Hardness	Hardness				
					Coliform	Coliform				
					BOD	BOD				
					COD	COD				
					Oil & Grease	Oil & Grease				
					pH	pH				
					Organic	Organic				
					Matter	Matter				
					Alkalinity	Alkalinity				

Soil Quality					Conductivity	Conductivity				
					Water Holding Capacity	Water Holding Capacity				
					Pb	Pb				
Noise Quality					L day equivalent	L day equivalent				
					L night equivalent	L night equivalent				
					L equivalent	L equivalent				

Remarks:

Submitted By:

Signature……..
Name ……
Designation……
(Contractor)

Checked By:

Signature ……
Name……
(Environmental Expert)

Approved By:

Signature ……
Name ……
(The Engineer, PWD)

C.4: DETAILS OF EARTHWORK

(To be filled by the Contractor)

Name of the Project Road:

Date of Submission

1.	Name of Village	Chainage (Km)	Side (LHS / RHS)	Haul road

(Show on a Sketch Plan clearly indicating distance and approach roads.)

Details of Borrow Areas.

2.1	Capacity of the Borrow Area.	
2.2	Percentage of the capacity exhausted	
2.3	Total Quality of the Earth Excavated In cum)	
2.4	Quality of Top Soil removed from the Borrow Areas	
2.5	Location of Top Soil stored removed	
2.6	Quantity of Top Soil stored at the beginning of the month	
2.7	Quantity of Top Soil utilized at the end of the month	
2.8	Location (s) where Top Soil has been utilized (Specify on a location	
2.9	Quantity of earthwork excavation from existing road	
2.10	Total quantity of earthwork reused in cum. (5%)	
2.11	Location disposal (if other than sites) (Specify clearly on a location	
2.12	Quantity of earthwork re-used in filling operation	
2.13	Location of borrow areas in disuse / exhausted	
2.14	Outline a rehabilitation plan for each of the exhausted borrow areas with special reference to Erosion Protection Measures. Also, submit at separate detailed rehabilitation plan for exhausted borrow areas for approval supported adequately with layouts, plans and drawings.	

Remarks:

Submitted By:

Signature……..
Name ……
Designation……
(Contractor)

Checked By:

Signature ……
Name……
(Environmental Expert)

Approved By:

Signature ……
Name ……
(The Engineer, PWD)

C5: Redevelopment of Borrow Areas

(To be filled by the Contractor)

Name of Project:

Construction stage: Monthly Report –

Date: ……Month ……Year

Drawing for Redevelopment to be attached for each Borrow Area, (photography of sites before use &after rehabilitation to be attached)

Sl. No.	Borrow Area No.	Borrow Area Location					Land Use	Rehabilitation Measures	Date of approval of Rehabilitation	Date of Handing Over to Owner	Remarks
		Name of Village	Chainage (Km)	Side (LHS /RHS)	Area (m2)	Haul road length (M)					

Submitted By:

Signature……..
Name ……
Designation……
(Contractor)

Checked By:

Signature ……
Name……
(Environmental Expert)

Approved By:

Signature ……
Name ……
(The Engineer, PWD)

O: 1 CLEANING OF CULVERT OPENING AND LOGITUDINAL DRAIN

(To be filled by the Contractor)

Name of the Corridor: Pkg. No.:

Construction stage Monthly Report - Date: _Month: Year:

Sl. No.	Structure No.	Pre monsoon	Date	Post monsoon	Date
Name of the Corridor					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Remarks:

Submitted By:

Signature…….
Name ……
Designation……
(Contractor)

Checked By:

Signature ……
Name……
(Environmental Expert)

Approved By:

Signature ……
Name ……
(The Engineer, PWD)

O2.: RESTORATION OF CONSTRUCTION SITES

(To be filled by the Contractor)

Name of the Project Road:

Construction stage Monthly Report - Date: _Month: Year:

Sl. No.	Contract Package	Labour Camp		Construction Camp		Plant Site		Borrow Areas		Disposal Locations		Top Soil	
		O	R	O	R	O	R	O	R	O	R	Preserved	Reused
1													
2													

Remarks:

Submitted By:

Signature……..
Name ……
Designation……
(Contractor)

Checked By:

Signature ……
Name……
(Environmental Expert)

Approved By:

Signature ……
Name ……
(The Engineer, PWD)

5. ENVIRONMENTAL BUDGET

5.1 COST ESTIMATE FOR ENVIRONMENTAL MANAGEMENT

Mitigation measures proposed in the EMP will be implemented by the Contractor. The works to be undertaken by the Contractor have been quantified and the quantities included in the respective BoQ items such as earthworks, slope protection, noise barriers, road safety features, and shrub plantation. Ref. EIA prepared by CEA, Panchkula for reference.

6. Annexures

6.1 ANNEXURE 1: GUIDELINES FOR SETTING, MANAGEMENT AND REDEVELOPMENT OF CONSTRUCTION CAMPS

A. OVERVIEW

Construction camp accommodates a mix of activities, which are highly polluting in nature causing considerable environmental impact and its proper siting, management and redevelopment is crucial to avoid, minimize and mitigate those impacts. The EMP clearly distinguishes between various impacts that may occur at various stages of the camp like

- Siting,
- Setting up,
- Operation and
- Closure / redevelopment and provide respective mitigation measures to some extent.

In addition to that, this guideline has been prepared to provide the Contractor with comprehensive and systematic information on the various steps to be undertaken during these four stages, so that s/he can execute his/her role in an environmentally sound manner. Various mitigation measures have been synthesized into this guideline so that it serves as a single and standalone document for the Contractor.

B. CRITERIA FOR SETTING THE CAMP

To the extent, possible barren land or wastelands shall be preferred during site selection and fertile land and agricultural land shall be avoided. All such sites must be above the HFL with adequate drainage facility. In areas prone to floods, cyclones, cloudbursts or heavy rainfall, selection of the site should be made keeping in mind the safety of the camp and the workers. In addition, the Contractor should take care of the following criteria for locating the site:

- A minimum of 250 m away from any major settlement or village in downwind direction.
- A minimum of 200 m of any major surface water course or body
- Not within 500 m from ecologically sensitive areas like wildlife sanctuary, mangroves etc.
- Sufficiently wide access roads (at least 5.5 m Wide) for heavy vehicle movements

After identification of the site the Contractor should fill up the prescribed reporting format and submit the same for approval to the HP PWD without which any activity shouldn't be started on the site.

C. FINALIZATION OF SELECTED SITE/S

After identification of the site, the Contractor should fill up the prescribed reporting format provided in EMP and submit the same for approval to the HP PWD /PWD. Environmental Engineer of HP PWD /PWD shall approve the selected site/s, after considering the compliance with the EMP Clauses. No agreements or payments shall be made to the landowner/s prior to receipt of a written approval from the HP PWD /PWD. Any consequence of rejection prior to the approval shall be the responsibility of the contractor and shall be made good at his own cost. After obtaining a written approval for the selected site, the contractor has to enter into an agreement with the landowner to obtain his/her consent before commencing any operation / activities in the land. The agreement should also mention its type, duration, amount and mode of payment as well as the preferences of the owner regarding site maintenance and redevelopment.

In the absence of site meeting the stipulated criteria, an alternate site can be selected specifying the reasons. In such a case, the construction camp management plan should incorporate additional measures specific to the site as suggested by the HP PWD /PWD.

D. DESIGNING OF CAMP / PREPARATION OF LAYOUT PLAN

The contractor should design a layout plan of the camp with adequate space for (i) site office along with store room, rest area and sanitary facilities, (ii) plants, machineries, (iii) workshops, (iv) vehicle washing area, (v) fuel handling area, (vi) room for raw material unloading and stocking, (vii) space for storage and handling of solid wastes (viii) security cabin etc. The laying out of these should be undertaken in such a manner that it facilitates smooth functioning of both man and machine. Fuel pumps, storage facility for inflammable and hazardous chemicals/ materials shall be provided inside the camp, but at a safe distance from office. Electric safety practices shall be integrated/ incorporated during the lay-out plan preparation.

Prevailing wind direction shall be kept in mind while planning out the lay-out of internal facilities. Cutting of trees should be minimum and the existing ones need to be integrated into the lay-out plan with proper planning. The roads within the camp should be well planned with adequate space for movement of vehicles and their parking.

E. SETTING UP OF CONSTRUCTION CAMP

(i) Site preparation: The stripping, stacking and preservation of top soil will be mandatory in case of farm lands and fertile areas and absolutely no material stacking or equipment instalment or vehicle parking or any other activity should be allowed prior to the satisfactory completion of this activity as per guidelines in EMP. Thereafter, the site should be graded and rendered free from depressions such that the water does not get stagnant anywhere. A compound wall of 2.4 m height should be constructed all around the camp to prevent the trespassing of humans and animals. Green belt should be provided along the boundary and as detailed in the EMP, it should be integrated with storm water drain and sedimentation trenches as given in annexure in EMP. No. of trees

planted should not be less than ten times the number of trees cut. The approved layout plan should be strictly adhered to while setting up the camp.

(ii) Setting up of plants and machineries: Adequate arrangements should be made for avoiding fugitive emissions from plants and camp premises. This will include (a) control of air pollution through provision of in-built dust extraction systems like bag filter, damper and cyclone filter for bitumen hot mix plant, (b) a chimney of appropriate height (as per HPSPCB guideline) from ground level attached with dust extraction system and scrubber for the hot mix plant, (c) a chimney of appropriate height for the DG set (d) water sprinkling facilities for the concrete batching plant, wet mix macadam plant as well as in the camp premises and (e) garden net to prevent fugitive emissions from storage place of cement and aggregates. It has to be also ensured that effluent from the sludge tank of the scrubber is recycled and reused and the sludge is used for land filling with top soil spread on it.

To ensure that noise levels are within the limit, all plants and machineries should have their own silencers or any other noise control devices. All pollution control devices should be provided with backup power. Following conditions should be complied regarding the sound level conditions:

The sound level (Leq) measured at a distance of 1 m from the boundary of the site shall not exceed 55dB (A) during day time (6am - 6pm) and 45 dB (A) during night time (6 pm - 6am).

The total sound power level of the DG set shall be less than 96+10 log 10(kava) dB(A) where kVA is the nominal power rating of DG set.

The DG set shall be provided with acoustic enclosure/acoustic treatment with an insertion loss of minimum 25 dB (A).

The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB (A).

A proper, routine and preventive maintenance procedure for the DG set shall be set and followed in consultation with the DG set manufacturer.

Concrete flooring with slope drains and oil interceptors should be proposed for hot mix plant area and workshop, vehicle washing and fuel handling area as per EMP, so that oil and lubricants that may spill on the floor does not contaminate any soil or water body. In case of any oil spills, it should be cleaned properly. There shall also be provisions for storage of used oil until it is disposed as per comprehensive waste management plan prepared by Contractor and approved by HP PWD/PWD.

(iii) Sanitation Facilities: Adequate no. of toilets shall be provided separately for males and females (depending on their strength), screened from those of men and provided with markings in vernacular language. All such facilities must have adequate

water supply with proper drainage and effluent treatment system like septic tank with soak pit. Soak pit should have a sealed bottom, honey comb wall and 75 cm. thick, 2 mm sand envelope around that. The sewage system for the camp must be properly sited, designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place.

Portable toilets may be brought to use and the night soil from such units has to be disposed through designated septic tanks so as to prevent pollution of the surrounding areas. In the construction camp, no night soil or sewerage shall be disposed of at any place other than the septic tanks constructed at the site.

(iv) Waste Disposal: While preparing the layout plan, the Contractor should allocate adequate space for storage and handling of various wastes generated until they are disposed off in pre-identified disposal sites. The Contractor should provide separate garbage bins for biodegradable, non-biodegradable and domestic hazardous wastes in the camps and ensure that these are regularly emptied and disposed of in a hygienic manner. No incineration or burning of wastes shall be carried out by the Contractor. The disposal of any biodegradable matter shall be carried out in pits covered with a layer of earth within the camp site. Discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipe scrubber and poly urethane foam, auto mobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or sold /given out for recycling. POL (petroleum, oil and lubricants) waste shall be disposed of by transfer only to recycler/ re-refiners possessing valid authorization from the Tamil Nadu Pollution Control Board and valid registration from the Central Pollution Control Board. Used lead batteries, if any, should be disposed as per the Batteries (Management and Handling) Rules 2001.

(v) First aid / safety facilities: At every camp site, a readily available first-aid unit including an adequate supply of sterilized dressing materials, appliances and basic medicine should be provided. Workplaces which are remote and far away from regular hospitals should have indoor health units with one bed for every 250 workers. Details of nearest clinics as well as major hospitals like their location, distance from camp, phone nos. facilities offered by the hospital should be displayed in the camp office at clearly visible location in a legible manner. Suitable transport should be provided to facilitate taking injured and ill persons to the nearest hospital. Adequate personal protective equipment and firefighting equipment as detailed out in EMP should be made available in the camp and provided to the staff / workers. Operation manuals and training should be provided to machine operators. Warning signs should be placed at accident prone areas as well as at the entrance of the site.

(vi) Training to workers: Workers shall be trained in smooth operation of plants and machines, their regular maintenance and various safety measures to be followed as well as about the need for adherence to these measures.

(vii) Information dissemination: There should be a sign board of size 6' x 4' mentioning the project details and Contractor's details to disseminate the information to the public. There should be a second sign board displaying the latest air and noise monitoring data against the standards specified.

Warning signboards should be set up at the entrance gate for the public as well as at other required places for the workers to alert them about the nature of operation being undertaken at those respective places.

Once the construction camp is set up, the date of commissioning of the camp should be intimated to the Head Office and concerned District Office of the HPSPCB.

F. **OPERATION OF CONSTRUCTION CAMP**

During the operation phase of the camp it is important to ensure that all vehicles and machineries are maintained regularly and their PUC certificates are renewed at regular intervals. All pollution control devices should be monitored and maintained properly at regular intervals. In case of process disturbance/ failure of pollution control equipment, the respective units should be shut down and should not be restarted until the control measures are rectified to achieve the desired efficiency. All units should operate only between 6 am and 10 pm. or as specified by HPSPCB in the consent letter.

Oil and grease waste generated from garages in construction camps should be drained out through oil interceptors and they should be maintained properly. Necessary arrangements should be made for regular sprinkling of water for dust suppression. Raw materials and products should be transported with proper cover to prevent spreading of dust.

Hygienic environment must be ensured by (i) provision of safe drinking water, (ii) proper maintenance of toilets including daily cleaning and disinfection using proper disinfectants, (iii) regular cleaning of drains by removing the silt and solid waste, (if any) and iv) appropriate waste management practices. While it is of utmost importance to ensure that firefighting equipment like fire extinguishers are in working condition, it should also be monitored that construction workers use the personal protective equipment provided to them and they are replaced when necessary. All these facilities should be inspected on a weekly basis to achieve the desired levels of safety and hygiene standards.

Environmental monitoring should be undertaken by the Contractor as stipulated in the EMP. If any standard is set by HPSPCB for hot mix plant emissions, the Contractor should collect samples of emission from all the chimneys and analyse for the parameters at least once in a month. The Consent to Operate (CTO) certificate from HPSPCB should be renewed at regular intervals and the same should be intimated to HP PWD/PWD.

A register should be maintained at the site office which provides (i) a one page format for each migrant labourer which will give their personal profile (including name, age, sex, educational qualification, address, blood group and any major illness), along with a

copy of any ID proof and an original photograph, (ii) a copy of the ID card of local labourers. A copy of the details of the migrant labourers should be submitted to the local police station.

G. **PREPARATION OF CONSTRUCTION CAMP MANAGEMENT AND REDEVELOPMENT PLAN**

After the site for the construction camp has been finalized and approved by HP PWD, the Contractor should prepare a construction camp management plan to be submitted to HP PWD/PWD for approval prior to setting up of the camp and it should comprise the following details:

Section–1: Details of site: Copy of approved site identification report along with location plan on a village map or an FMB, showing the site, its survey no., access road, project stretch, distance from the project stretch, surrounding features and land use like residences, agricultural land, water bodies etc., photograph of the site showing the topography and other existing features.

Section-2: Site preparation: Activities that will be undertaken for preparing the site based on EMP and this guideline.

Section-3: Arrangements/ facilities within the camp: List of plants / machineries to be set up within the camp like hot mix plant, batching plant, DG set etc., and other facilities to be provided like site office, store room, rest room, toilet room, material stocking yard etc. layout plan showing all these details along with vehicular movement path, green belt etc. Species wise no. of trees to be cut shall be provided.

Section-4: Mitigation measures that will be undertaken as per the EMP and this guideline while setting up of the camp and operation of the camp should be separately listed out here.

Sectoin-5: Other details: Any other relevant detail like list of trainings to be provided to workers, details of information dissemination, date of CTE certificate from HPSPCB, its validity, additional conditions laid down in it etc. should be included.

Section 6: Re-development plan, which should indicate the following points: (i) List of structures to be demolished and list of the clean-up activities that needs to be undertaken, (ii) Proposed use of the land after demobilizing and (iii) Presence of facilities that could be put in use by the land owner if it is a leased out private land or community in case of a public property.

Section-7: Annexure- (a) Working drawings: Electrical plan showing the electrical network planned for the site, location of plants, generators, master switch boards etc. and plumbing drawing showing the network of water supply lines, sewerage line and drainage line, (b) Copy of certificates / permissions obtained from regulatory authorities

/ local governing body /community etc. as applicable, (c) Copy of agreement entered with the owner of the site if it is a leased out land.

All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The construction camp management plan should be submitted to the HP PWD/PWD for a written approval before any physical work (includes storage of materials, equipment etc.) is undertaken on a particular site. The HP PWD/PWD shall carefully examine the proposals considering the specific conditions of each site as well as various EMP and regulatory provisions and provide suggestions, as necessary to the Contractor who shall incorporate it in the management plan.

H. **DEMOBILIZATION AND REDEVELOPMENT OF THE SITE**

The Contractor should clear all temporary structures; dispose all building debris, garbage, night soils and POL waste as per the approved debris management plan. All disposal pits or trenches should be filled in, disinfected and effectively sealed off. All the areas within the camp site should be levelled and spread over with stored top soil. Residual topsoil, if any will be distributed or spread evenly in plantation sites, on adjoining/near-by barren land or affected agricultural land adjacent to the RoW that has been impacted on account of any accidental spillage. Entire camp area should be left clean and tidy, in a manner keeping the adjacent lands neat and clear, at the Contractor's expense, to the entire satisfaction of landowner and HP PWD.

These activities should be completed by the Contractor prior to demobilization. Once the Contractor finishes his job, he needs to obtain a certificate from the owner, stating that the site has been re- developed to his/her satisfaction and in tune with the agreement. Then following documents needs to be submitted to the HP PWD by the Contractor:

Copy of approved site identification report

Photographs of the concerned site 'before' and 'after' setting up the camp.

Certificate from the owner stating his/her satisfaction about status of re-development of the site.

HP PWD shall ensure, through site verification that all clean-up and restoration operations are completed satisfactorily and a written approval should be given to the Contractor mentioning the same before the 'works completion' certificate is issued/recommended. The PWD shall ensure through site inspection that the Contractor has complied with all these provisions. The site can then be handed over to the concerned owner or local bodies or for local communities as the case may be.

Certification/documentation pertaining to approval for clean-up and restoration operations and thereafter handing-over to the owner shall be properly maintained by the Contractor.

6.2 ANNEXURE 2: GUIDELINES FOR SITING, MANAGEMENT AND REDEVELOPMENT OF BORROW AREAS

A. BORROW AREA SELECTION

A borrow describes an area where material (usually soil or sand) has been dug for use at another location, for example, soil might be excavated to fill an embankment for a highway. In some cases, the borrow pits may become filled with ground water posing a danger to the surrounding community. If properly redeveloped, it can be turned into recreational areas or sustainable wildlife habitats. In other cases, borrow pits may be used for landfill and waste disposal also.

B. CRITERIA FOR SITE SELECTION

The Contractor in addition to the established practices, rules and regulation shall also use the following criteria before finalizing the locations of borrow areas:

The borrow area should not be located in agriculture areas especially in paddy fields unless unavoidable i.e. barren land is not available. In case borrowing needs to be done on an agricultural land, top-soil stripping, stacking and preservation is a must.

Borrow pits shall not be located within a distance of 100m from any NH, SH or other roads.

Site shall be located 30m away from toe of the embankment along road side.

Site should be located not less than 30m from the toe of the bank along the river side or irrigation tank bund.

Borrow area shall be located at a minimum distance of 30m from the toe of the irrigation tank bund.

Borrow site shall be located at a minimum distance of 500 m in down-wind direction of villages and settlements.

No borrow pits shall be located within 250 m. from schools, colleges, playgrounds, religious structures and health centres.

No borrow area shall be opened within 500 m. from a reserved or protected forest area/sites, wildlife movement zone and cultural heritage site.

Loss of vegetation shall be almost nil or minimum.

Borrow area near any surface water body will be at least 100 m. away from the toe of the bank or high flood level, whichever is maximum. After identification of borrow area location/s, the Contractor will fill the prescribed reporting format and submit the same for approval to the “Site Engineer” at least 7 working days before commencement of earth works. A written approval from HP PWD/PWD shall be necessary before any activity/work is commenced.

Borrow pit location shall be located at least 0.8 km from villages and settlements. If unavoidable, they should not be dug for more than 30 cm and should be drained.

C. FINALIZATION OF THE SELECTED AREA

After identification of the site, the Contractor should fill up the prescribed reporting format provided in EMP and submit the same for approval to the HP PWD/PWD. The selected site/s shall be approved by Environmental Engineer of HP PWD, after considering the compliance with the EMP Clauses. No agreements or payments shall be made to the land owner/s (in case of a leased or rented out land) prior to receipt of a written approval from the HP PWD/PWD. Any consequence of rejection prior to the approval shall be the responsibility of the Contractor and shall be made good at his own cost. After obtaining a written approval for the selected site, the Contractor has to enter into an agreement with the land owner to obtain his/her consent before commencing any operation / activities in the land. The agreement should also mention its type, duration, amount and mode of payment as well as the preferences of the owner regarding site maintenance and redevelopment.

D. BORROW AREA MANAGEMENT

Before the start of operations, the area to be borrowed shall be marked by the Contractor with wooden or stone pegs to ensure that the land required for slope stabilization or bund creation is maintained.

After receiving the approval, the Contractor will begin operations keeping in mind the following points.

Top soil conservation is to be undertaken only if its reuse is envisaged for the proposed activity in the borrow area rehabilitation. Top soil that cannot be re-used in rehabilitation of borrow areas shall be used in the plantation belt/zone along the road.

Damage to productive and fertile areas has to be minimum. This includes appropriate planning of haul roads.

No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Contractor should be permitted to remove acceptable material from the site to suit his operational procedure, and then be shall make good any consequent deficit of material arising there from.

Where the excavation reveals a combination of acceptable and un-acceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carryout the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the un-acceptable materials. The acceptable material shall be stockpiled separately.

The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants or siting of temporary buildings or structures.

The following principles shall be adhered to during borrow area operations:

A 15 cm topsoil layer will be stripped off from the borrow pit and this will be preserved in stockpiles in a designated area with a height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).

Borrowing of earth will be allowed up to a depth of 1.5 m from the existing ground level only.

Ridges of not less than 8m width will be left at intervals not exceeding 300m.Small drains will be cut through the ridges, if necessary, to facilitate drainage.

The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal).

Rehabilitation shall be satisfactorily undertaken immediately after the use has ceased and at least three weeks prior to monsoon.

If the rehabilitation plan envisages re-use of top soil, then preserved top soil has to be spread uniformly over the land used as a borrow area.

Bunds and temporary fencing (using barbed wire) along with plantation should be provided in case the borrow area is developed as a pond to ensure safety of the residents and the cattle. However, the depth shall not exceed 1.5 m.

E. PREPARATION OF BORROW AREA MANAGEMENT AND REDEVELOPMENT PLAN

The Contractor after getting approval from the competitive authority for the selected site should submit a detailed Borrow Area Management and Redevelopment Plan comprising the following details:

Section–1: Details of site: Copy of approved site identification report along with location plan on a village map or an FMB, showing the site, its survey no., access road, project stretch, distance from the project stretch, surrounding features and land use like residences, agricultural land, water bodies etc., photograph of the site showing the topography and other existing features.

Section-2: Site preparation: Activities that should be undertaken for preparing the site based on EMP and this guideline.

Section-3: Layout plan: A layout plan showing all these details along with vehicular movement path, green belt locations where digging of contour trenches should be undertaken etc.

Section-4: Mitigation measures that will be undertaken as per the EMP and this guideline while setting up of the camp and operation of the camp should be separately listed out.

Sectoin-5: Other details: Any other relevant detail like list of awareness camps to be provided to workers, details of information dissemination etc. date of quarry license obtained from Dept of Mines, its validity, additional conditions laid down in it etc. should be included in the quarry management plan. Species wise no. of trees to be cut and the details of top soil to be removed and conserved like quantity, location of storing etc. shall also be provided.

Section 6: Re-development plan: which should indicate following points: (i) proposed use of the land in the post construction phase, (ii) preferences of land owner with respect to redevelopment, (iii) Presence of existing facilities that could be put in use by the land owner if it is a leased out private land or by the community in case of a public property, (iv) Extent of community involvement.

Section-7: Annexure-(a) Copy of permissions obtained from local governing body / community etc. as applicable, (b) Copy of agreement entered with site owner, in case of leased out sites.

All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The

management plan should be submitted to the PWD for a written approval before any physical work (includes storage of materials, equipment etc.) is undertaken on a particular site.

F. REHABILITATION OR RE-DEVELOPMENT OF BORROW AREAS

The objective of the borrow area rehabilitation is to return the borrowing sites to a safe and environmentally sound condition. The concept entails enhancing benefits (including those linked to livelihood) for the community and individuals. Top soil preservation (and its re-use) and proper stabilization of slopes are the fundamental requirements of the rehabilitation process. Re-development plan shall be prepared and submitted along with reporting format by the Contractor before the borrowing operation is permitted by the PWD. The redevelopment is to be prepared in consultation with land owner/s (whether public, private or institutional) and by within the environmental and safety requirements of the EMP. Some key points on borrow area rehabilitation are presented in the table provided below. However, the Contractor is free to prepare other rehabilitation scheme/s subject to the approval by the Environmental Engineer of the HP PWD.

Type/Form of Rehabilitation	Re-Use of Top Soil	Actions Required for Rehabilitation
Farm land	Yes	Levelling Slope Stabilization along the edges if there is a level difference
Ponds including creation of new ones and enhancing capacity of existing ones (for irrigation; pisiculture and general uses by people and/or cattle)	No	Slope Stabilization (angle/benching) Access / Approach Ramp Bund creation and Temporary Fencing Plantation in the periphery
Water recharging areas/percolation tanks (depth up to one meter)	No	Slope Stabilization Small bund creation
Levelled lands that can be developed later for various uses (such as residential areas, parking lots, community grounds etc.)	Generally no	Levelling Top soil re-use depends on the type of developmental work envisaged
Construction waste disposal sites (for non-toxic/non-hazardous wastes) (reinstated with top-soil with plantation over the rehabilitated site)	No	Depression after filling-in of wastes to be levelled-up Top soil re-use depends on the type of developmental work envisaged

Type/Form of Rehabilitation	Re-Use of Top Soil	Actions Required for Rehabilitation
Plantation Zones	Yes	Levelling Selection of Species as per TNRSP Project Guidelines
Water holes for animals and birds (outside forest and protected areas)	No	Gentle Slopes on all sides Plantation in the periphery Depth up to 1.5 m.

Rehabilitation works shall be undertaken immediately upon the exhaustion of the approved quantity and shall not be delayed.

These activities should be completed by the Contractor prior to demobilization. Once the Contractor finishes his job, he needs to obtain a certificate from the owner, stating that the site has been re- developed to his/her satisfaction and in tune with the agreement. Then following documents needs to be submitted to the HP PWD by the Contractor:

Copy of approved site identification report

Photographs of the concerned site 'before' and 'after' setting up the camp.

Certificate from the owner stating his/her satisfaction about status of re-development of the site.

PWD shall ensure, through site verification that all clean-up and restoration operations are completed satisfactorily and a written approval should be given to the Contractor mentioning the same before the 'works completion' certificate is issued/recommended. The PWD shall ensure through site inspection that the Contractor has complied with all these provisions. The site can then be handed over to the concerned owner or local bodies or for local communities as the case may be.

Certification/documentation pertaining to approval for clean-up and restoration operations and thereafter handing-over to the owner shall be properly maintained by the Contractor.

6.3 ANNEXURE 3: GUIDELINES FOR PREPARATION OF TRAFFIC MANAGEMENT PLAN

Traffic Safety Plans (Design Stage)

Safety of vulnerable road users i.e. pedestrians, cyclist, school children etc. as well as vehicles on the road will be of highest importance and adequate measures have been incorporated in the design of the Project. For the safety and convenience of the local people, traffic calming measures, school zone treatment, village gate treatment, traffic control systems and unpaved shoulders for pedestrians in the village areas has been incorporated. IRC:67:2012 and IRC 35:2015 have been referred for sign boards and pavement marking.

Construction Stage

Safety during the construction will be considered as an integral part and high priority element of the road Project. All precautions required will be taken to ensure closure of the road is for minimum period and traffic delay is as limited as possible. It will also be ensured that inconvenience to the road users, community residing near the work site and the work crew and machinery will be minimized.

All safety precautions will be ensured during temporary and permanent works for the road construction.

The safety practices, therefore, are oriented towards reducing the conditions that lead to such hazards and consequent stress on the driver, so as to control and regulate his behaviour as warranted by the site conditions through the construction zone.

Components of the Construction Zone

Construction Zone is the area of the road which is affected by the works and which affects traffic flow resulting in a conflict between the road users and the construction activities.

Work Zone is the area where workmen are working i.e. excavation, overlaying improvements etc.

Working Space is the space around the work area that allows the workmen to move around to do the job and will include space required for storing excavated material, plant and equipment and clear space required for swinging of equipment and excavation arms.

Safety Zone is provided to protect the workmen from the moving traffic. This includes providing lateral and longitudinal buffer zones.

Traffic Control Zone includes those areas in advance of the actual work site that are required for advance working as well as safety zones, the transition zones and the working zones itself.

For providing all required safety precautions specific traffic management plans will be prepared and implemented during construction in accordance with the IRC: SP:55:2014 (Guidelines on Safety in Road Construction Zones). Some guiding drawings for the general safety measures are provided below

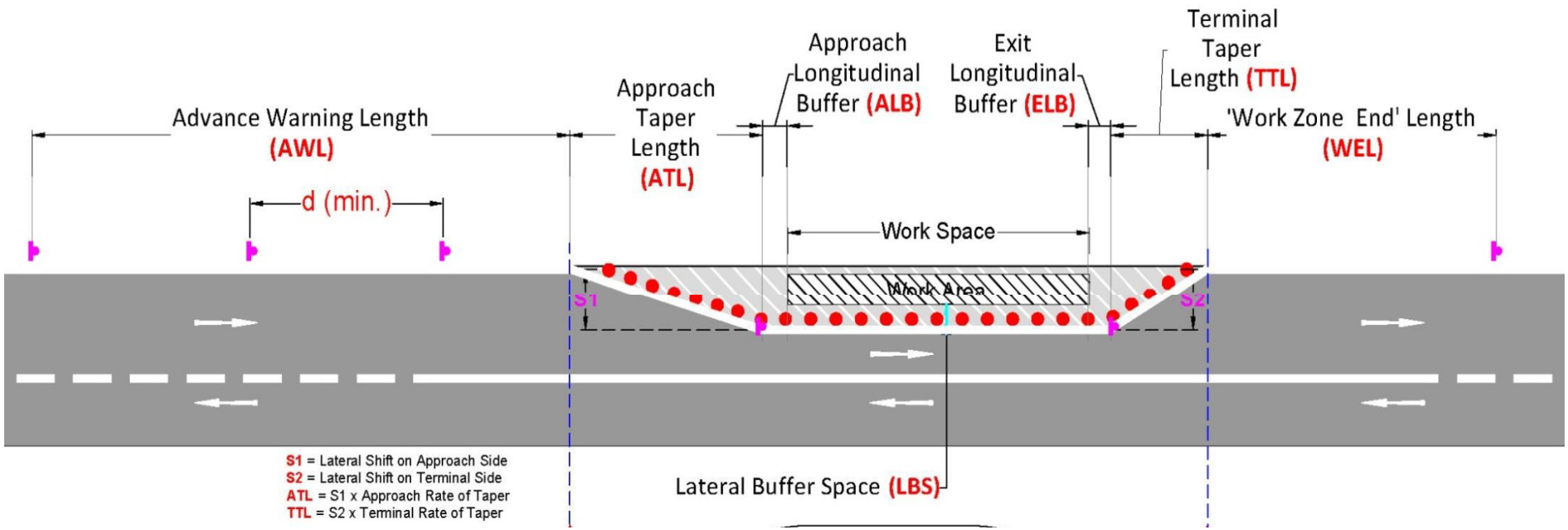


Figure 2 Traffic Control Zone

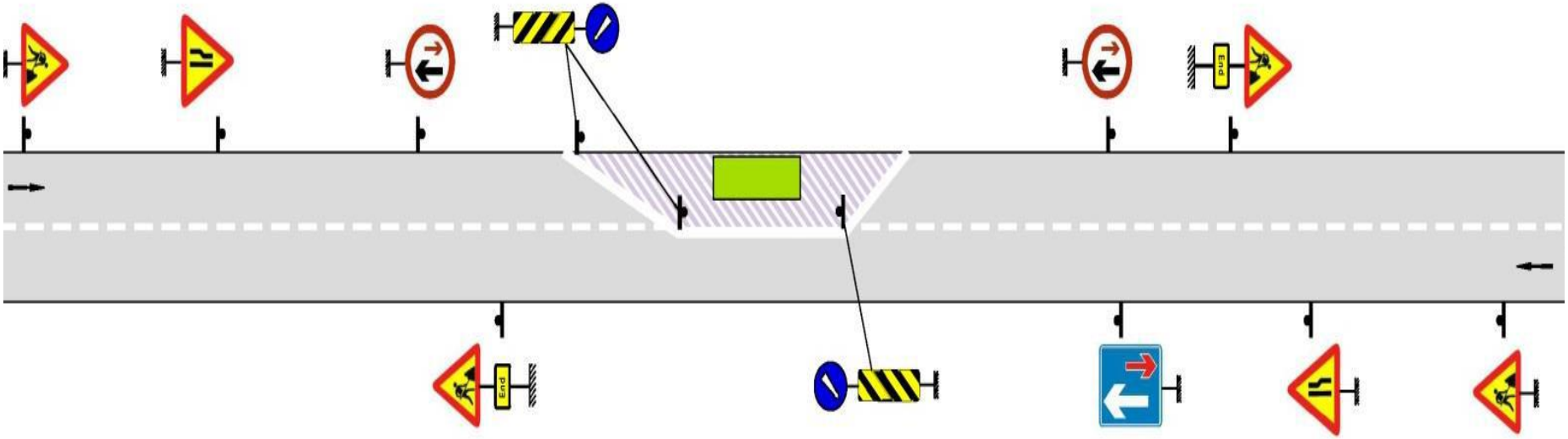
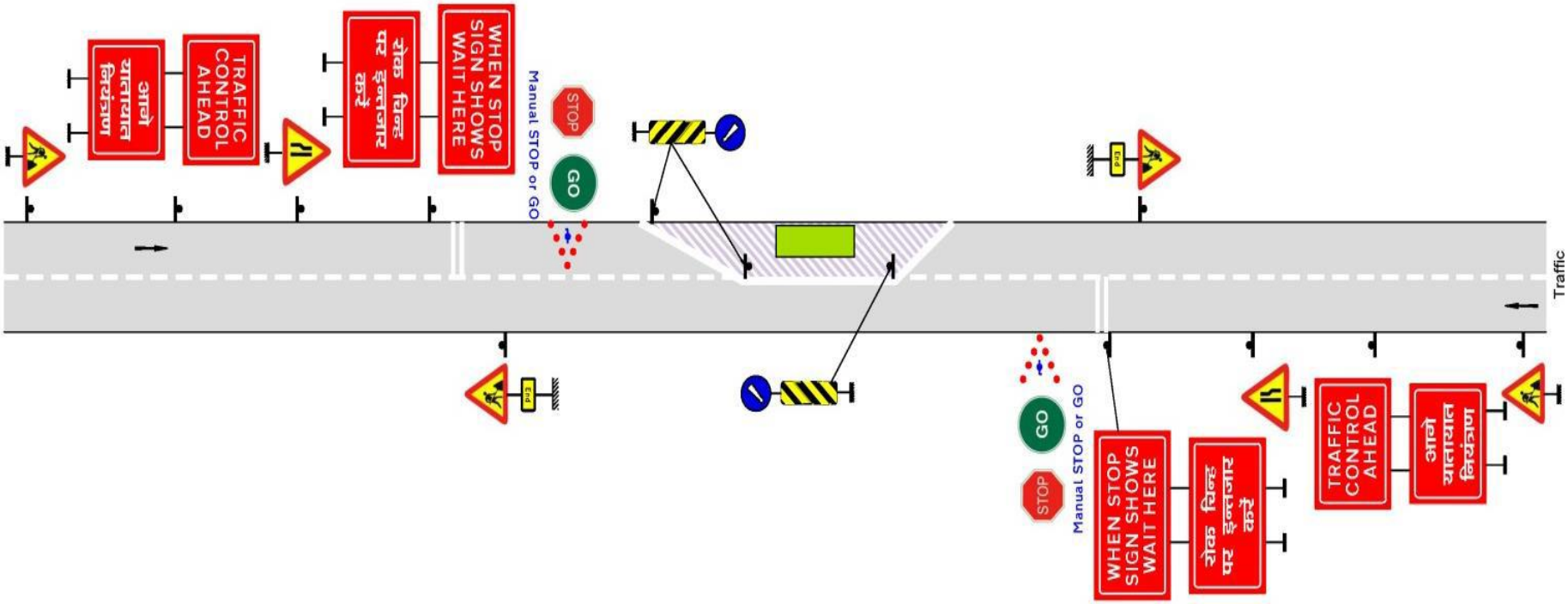


Figure 3 Basic Layout with priority Signs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TRAFFIC CONTROL AHEAD
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WHEN STOP SIGN SHOWS WAIT HERE
Manual STOP or GO
STOP
GO
Traffic

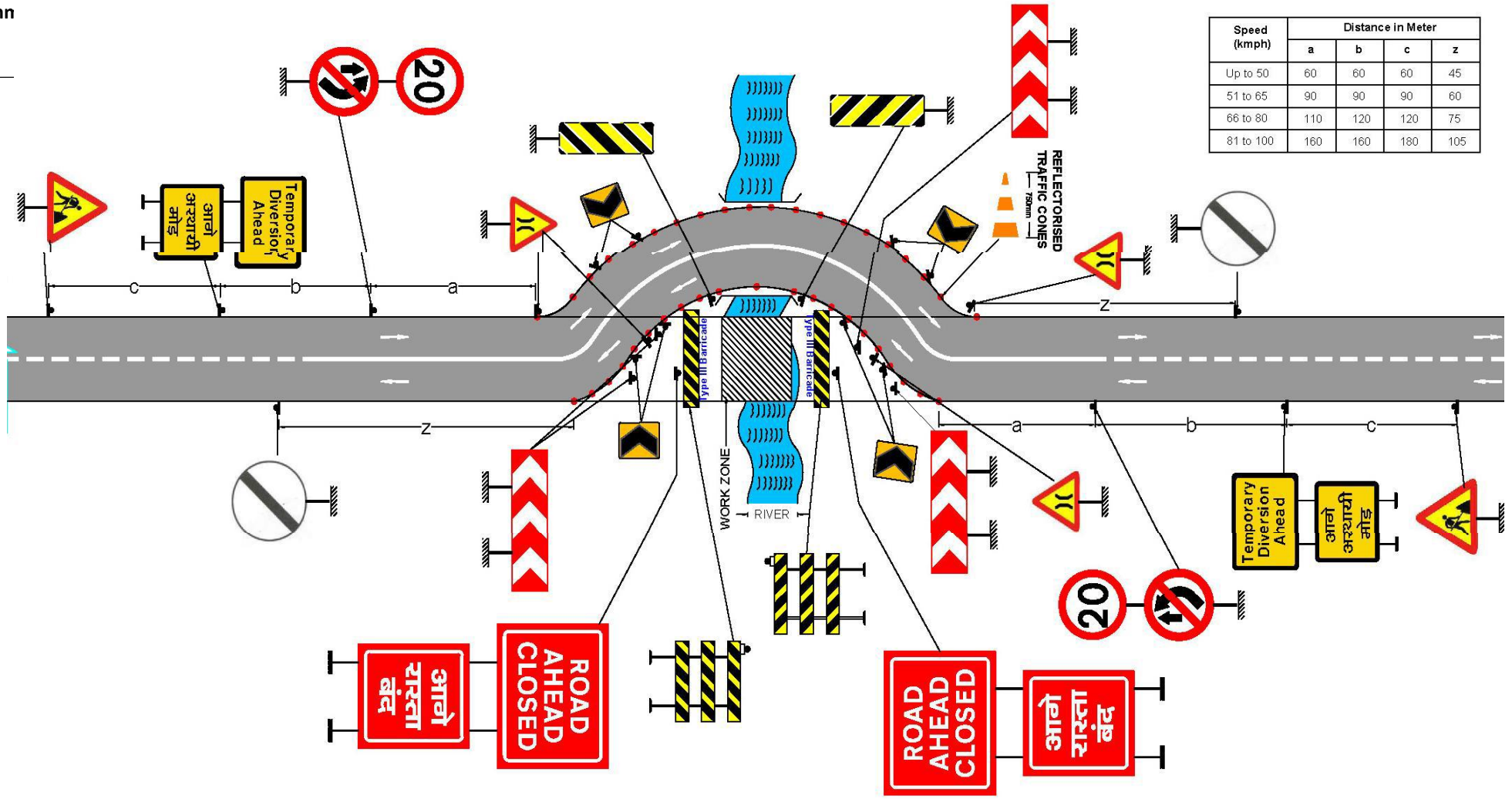


Figure 4 Basic Layout with Traffic Diversion

6.4 ANNEXURE 4: COMPREHENSIVE WASTE MANAGEMENT PLAN

Introduction

Construction and demolition waste is generated whenever any construction/demolition activities take place during construction and widening of roads, bridges, flyover, subway, and resurfacing and rehabilitation works involved in the road projects. It consists mostly of inert and non-biodegradable material such as concrete, plaster, metal, wood, plastics etc. These wastes are having high density and very heavy, often bulky and occupy considerable storage space either on the road or Community waste bin/container. It is estimated that the construction industry in India generates about 10-12 million tons of waste annually. Projections for building material requirement of the housing sector indicate a shortage of aggregates to the extent of about 55,000 million cum and for highway projects 750 million cum aggregate material from construction and demolition waste may reduce the demand-supply gap in both these sectors. While retrievable items such as bricks, wood, metal, titles are recycled, the concrete and masonry waste, accounting for more than 50% of the waste from construction and demolition activities are not being currently recycled in India. Concrete and masonry waste can be recycled by sorting, crushing and sieving into recycled aggregate. This recycled aggregate can be used to make concrete and WMM for road constructions and building materials. Works on recycling of aggregate has been done at Central Building Research Institute (CBRI), Roorkee and Central Road Research Institute (CRRI) New Delhi.

Characteristics

This category of waste is complex due to the different types of construction materials being used but in general may comprise the following materials:

- Clearing and Grubbing (C&G)
- Scarified/Dismantled Bituminous materials
- Dismantled Concrete/Bricks waste
- Oil/Battery/Tyre waste
- Waste from Hot Mix Plant (Aggregate dust)
- Settling Tank waste (Concrete Batching Plant)
- Organic Waste from camp site and Kitchen of different workers' camp

Storage/ Collection and Reuse of Construction and Demolition Waste

These waste are best stored at source; i.e., at the point of generation. If they are scattered around or thrown on the road, they may not only cause obstruction to traffic but also add to the workload of the local body. Following methods shall be adopted such as:

Clearing and Grubbing (C&G):

The material collected after C&G at site stored within the ROW or at approved disposal site so that waste does not get scattered and does not become an eyesore. The waste material is carted to disposal site in tippers properly covered and disposed of at disposal site.There are various types of materials collected during C&G process like weeds, stumps of trees, or other organic matters.Attempts are made to keep the waste segregated into different heaps as far as possible so that further gradation and reused is facilitated. These materials are generally self-degrading and are not health hazard and some of the material are may be used for land fill if required.

Scarified / Dismantled Bituminous Material:

The material collection for scarification of bituminous road or from dismantling of existing road are stored at site and preserved.These materials may be mixed in required percentage with WMM material to achieve the desired gradation.The material is carted by tippers to the stockyard and preserved for reuse.

Dismantled Concrete/Bricks Waste:

The materials are collected from different location of dismantling of bridges and other structures during the road construction.They are generally heavy and bulky in nature and require huge effort to handle such type of waste.The material is generally stacked at or near the site and later is disposed in suitable locations. The suitable and reusable materials are stacked separately for reuse.

Oil/ Battery/ Tyre Waste:

The oil waste is collected in the oil interceptor constructed at each workshop location. Further, the oil is collected the in the drums. Similarly, the batteries/ Tyres those are out of service and become un-usable are stored at safe place. Those wastes when collected in sufficient amount are generally sold in the market for re-use.Hazard to the surrounding due to such waste are prevented and income to the pocket is added by just good practices. The proper record of such waste must be maintained at site.

Waste from hot Mix Plant (Aggregate Dust):

The aggregate waste is collected near the plant and considerable amount of waste shall be reused as filled in the bituminous works.Dust at plant site is to be reduced at considerable extent.

Settling Tank Waste (Concrete Batching Plant):

The waste generated at batching plant is allowed to settle in the settling tank. Further this will be collected and reused for the haul road to the plant site.This helps in the reducing of dust during the movement of heavy vehicles. Further, the haul road shall be regularly watered and kept moist.

Organic Waste from Kitchen/Workers Mess:

The waste generated in the kitchen at camp site is to be collected in proper covered container (20 kg /day)

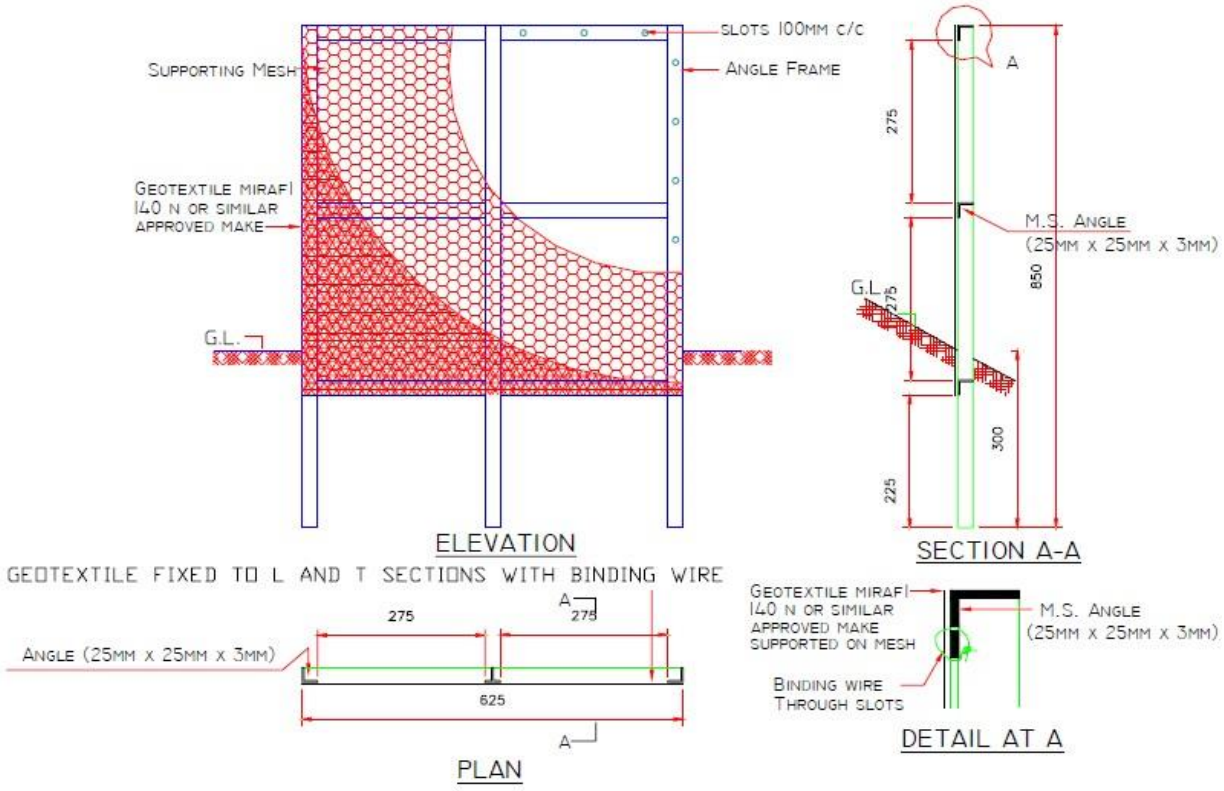
The waste is further carried away and disposed to the municipal committee waste disposal areas and after that shall be send for composting.

6.5 ANNEXURE 5: GUIDELINES FOR SILT FENCING AND OIL INTERCEPTOR

Silt fencing will be provided to prevent sediments from the construction site entering into the nearby watercourses, if required. The silt fencing consists of geo textile with extremely small size supported by a wire mesh mounted on a panel made up of angle / wooden frame and post. It is expected a single person will be able to drive the angles by pressing from the top. The frame will be installed at the edge of the water body along which construction is in progress. The number of such units to be installed can be decided depending upon the length of the water body along the side of the road construction

Locations of silt traps will depend on Contractor's proposals for site facilities and work sites and should be provided in the Contractors Proposals. This will be checked by the PWD and monitored by HP PWD. The probable locations where silt fencing proposed are given in the following table:

Design and locations of Silt Fencing:



Design and locations of Oil interceptor:

Oil and grease from road run-off is another major concern during construction as well as operation. During construction, discharge of oil and grease is most likely from workshops, oil and waste oil storage locations and vehicle parking areas of Construction camps. A total of 1 Oil interceptors shall be provided at Camp site to arrest oil and grease, as per given figure. The arrested products shall be disposed as per MoEF and HPSPCB guidelines. The location of all fuel storage and vehicle cleaning area will be at least 300 m from the nearest drain / water body.

Oil Interceptor