# Consultancy Services for conducting an Environmental and Social Impact Assessment (ESIA) of Urban Roads (Town roads) and non-urban roads and Major/Minor bridges and preparation of Environmental and Social Management instruments under MITP (World Bank) initiative.

**ESIA Report of Williamnagar Town Roads**


CETEST
Engineering Consultants

**C. E. TESTING COMPANY PRIVATE LIMITED**
**Report No PI/CETKI21-19/R1**

# Table of Contents

**List of Tables:**

**List of Figures:**

# 1 CHAPTER-I: INTRODUCTION AND PROJECT BACKGROUND

Meghalaya is one of the northeastern States of India with undulating terrain and sharing international boundaries with Bangladesh at south and west and state boundaries with Assamat north and east. Being landlocked and with difficult terrain there are major challenges of connectivity, be it road, power lines or telecom connectivity. The State is heavily dependent on sustenance agrarian economy and low industrial outputs. The Road Network is the majorbackbone, yet the density is only about 43.10 Km /100 sq Km (2015)[1].

The Government of Meghalaya has taken up initiative for the development of transport infrastructure using financial assistance (loan) from the World Bank (IBRD) under its MeghalayaIntegrated Transport Project (MITP). The Public Works Department (PWD) of Meghalaya is the executing agency with given responsibility for planning, designing and, implementing civil worksthat includes rehabilitation/ up-gradation of existing roads and construction of missing links/ bypasses/ bridges in across the State in phases. Under Phase I, rehabilitation of ten (10) existing strategic road stretches across east and west parts of the State covering mix of state highways, MDRs and bridges have been taken up. Under Phase II, Urban and other Non-Urban Roads have been selected including Jowai Town roads (32.601 km), Nongstoin Town roads (20.915 km) and Williamnagar Town roads (13.989 km) as urban stretches and Nongstoin- Maweit Road (35 km) and Umsning- Jagi Road (40.13 km) as non-urban stretches. This Environmental and Social Impact Assessment (ESIA) report covers only Williamnagar Town road.

## 1.1 The Project Road (Williamnagar Town Roads)

Williamnagar Town Road is extended up to 13.451 km length in the East Garo Hills district of Meghalaya state. The road project involves the improvement of 13 road stretches. The first seven project road stretches lie in plain terrain whereas the last two roads lie in hilly terrain. Thecarriageway width varies from 2.4m to 7m. The Project Roads for the Williamnagar Town is shown in the Figure 1.

[1] PWD, Government of Meghalaya, https://megpwd.gov.in/roads.html

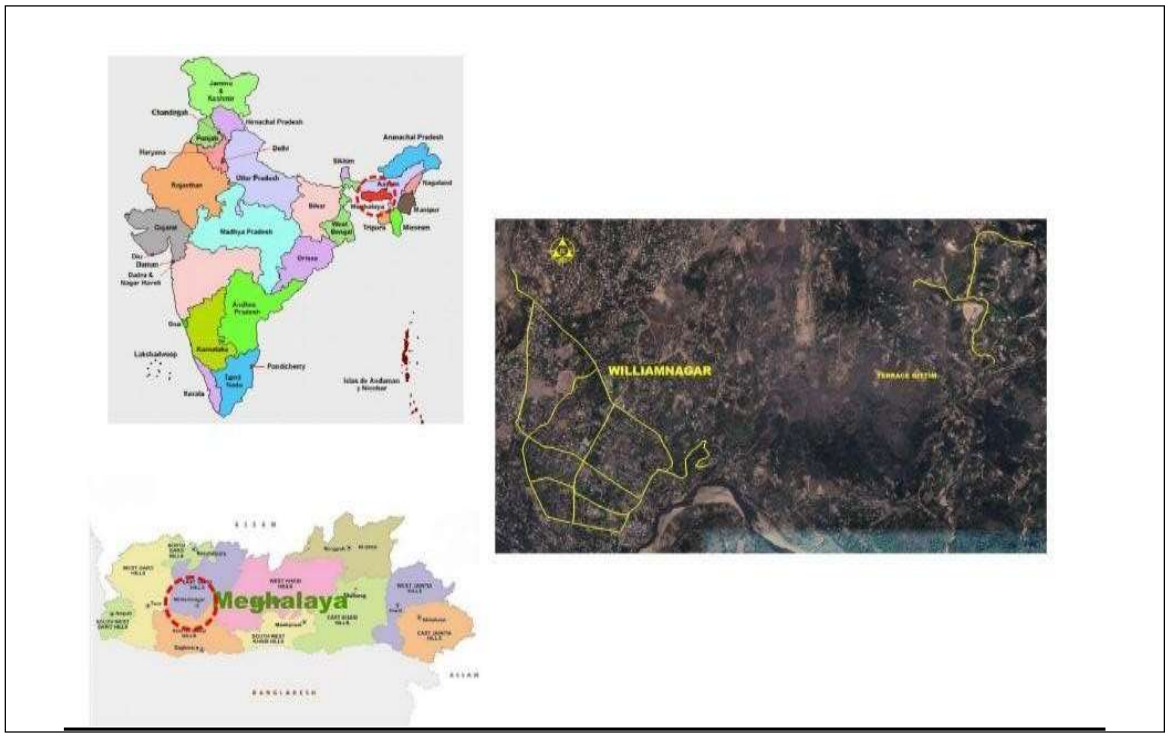



Figure 1: Location Map of the Williamnagar Town Roads

**Scope of the ESIA Study**

The scope of the ESIA study is: -

- Capturing the baseline condition of environmental and social parameters of the project area;
- Conducting Initial Impact Screening, Public Consultation and defining the scope of detailed assessment and safeguards instruments required based on outcome of initial screening exercise;
- Identification of the potential impacts during pre-construction, construction and operation phases;
- Defining mitigation measures for avoiding, minimizing and mitigating adverse impacts;
- Preparing Environmental and Social Management and Monitoring Plan.

**Project's Area of Influence**

The effects of the Project activities on a particular resource or receptor will have spatial (distance) and temporal (time) dimensions. Some activities would impact a larger radius than other identified impact sources. Thus, impacts were assessed both within area of impact of 50 meter either side of the alignment and project 's area of influence up to 10 km. This area of influence encompasses project associated facilities, construction camps, labour camps, access roads, borrow pits and disposal areas.

**Corridor of Impact (CoI):** The project RoW on either side of the proposed road centre line is considered as the corridor of impact. This area is more vulnerable to the project's directimpacts.

## 1.2 Approach for Environmental and Social Assessment

To identify the possible environmental and social issues arising out of the project road's planning, designing, and construction, the environmental and social conditions along the project's Row were assessed. During these visits, consultations through group discussions with local communities, road users and panchayat/ village members were conducted as follows:

**Task 1: Field Reconnaissance Survey and Review of Earlier Studies:**
The field reconnaissance survey was carried out to understand salient environmental and socialfeatures that are likely to be exposed to adverse impacts during construction and operation of project road. The salient feature includes the topography of the land, road geometry, environmental features like trees, any forest area, water bodies like ponds, rivers, etc.The social and physical features like settlement pattern, its density, typology of buildings, especially the presence of cultural, religious, and educational buildings, medical facilities land use, etc.

**Task 2: Review and Assessment of Applicable Environmental and Social Regulations:** The various rules/regulations and guidelines applicable to the project roads vis-à-vis central (GoI) and state (GoM) statutory requirements and World Bank policies were reviewed andreferred to for assessing current environmental and social impacts that are likely to emanate.

**Task 3: Assessment of Baseline Environmental and Social Conditions:**
This task comprises a collection of baseline data for the project road locations primarily based on physical, biological and socio-economic conditions. The secondary source of informationwas utilized for giving a generic snapshot of socio environment features. In addition, existing environmental and social quality/features along the project roads were assessed based on a walk-through survey, public consultations, FGD's and discussions with line department officials.

**Task 4: Public Consultations/ Focus Group Discussions:**
To cover a wide range of stakeholders in the study area, corner meetings were conducted at selected places with women groups, men and road users to understand the people's perception about the project as well as their issues and concerns. Overall project features, social safeguards, issues related to women's safety and security, environmental safeguards, and enhancement measures that would be implemented in the project was also discussed with the public.

**Task 5: Preparation of ESIA Report including Impact Identification, Mitigation Planning and preparation of ESMP.**
Identified likely impacts that would arise due to the construction of project roads, through changes in the physical, biological or socio-economic baseline environment. The impacts were also analyzed with respect to pre-construction, construction and operation phases and were categorized in terms of magnitude and significance. The assessment considered both positive and negative impacts at different stages of implementation, i.e., pre-construction, construction and operation stages of the project roads.

A comprehensive Environmental and Social Management Plan (ESMP) was prepared which included mitigation measures for all the negative impacts of sub-projects and enhancement measures for the positive impacts.

**Task 6: Preparation of Environmental and Social Management Budget:**
Based on environmental and social mitigation and monitoring plans a suitable budget has been estimated for enhancing the positive impact, implementing the mitigation plan, train the relevant staff and contractual employees on importance of Safeguards Measures, World Bank's Safeguards Requirement and Implementation of ESMP and last but not least implementation monitoring.

**Task 7: Environmental Safeguard Clauses in the Bid Document:**
Suitable safeguard clauses have been prepared based on the ESIA, the prepared clauses shall form part of the bid document either in the General conditions or Specific conditions of the contract agreement/ bid document. The prepared ESMP shall also be part of the bid document.

# 2 CHAPTER-II: PROJECT DESCRIPTION

## 2.1 Need for the Project

The project stretch has bitumen surface throughout. However,70% of the road stretches are poor in condition. The safety provision of road is also inadequate. Therefore, it is imperative to upgrade this road section to standard configuration with adequate safety measures in order to enhance traffic operational efficiency and to ensure safety to road users, so that the objective of improving the connectivity of the roads to the others parts of the district and state is realised.

As all of the proposed roads are urban roads passing through dense settlements, which further make the roads narrow and congested. Poor road conditions and geometry of the project road results in slow economic growth and poor infrastructure facilities in the area. Therefore, rehabilitation and upgradation of the project road is needed with proper traffic engineering along with enforcement of rules and regulations on the road, so that there should also be a marked reduction in road traffic accidents and smooth flow of traffic is ensured.

## 2.2 Project Location

All the project roads of 13.989 km are well within the town of Williamnagar, East Garo Hills district of Meghalaya. The project is located in the Universe Transverse Meter (UTM) zone 46. The height of the dissected Meghalaya Plateau is 150 meters - 1961 meters above sea level. Location map of the project roads is given in Figure 1.

## 2.3 Existing Features of the Project

The existing project features are given below.

| Sl. no | Project Component | Details |
|---|---|---|
| 1 | Location of Project | Williamnagar Town (13.989 km). Project road is situated in East Garo Hills in the state of Meghalaya. |
| 2 | Administrative locations | East Garo Hills |
| 3 | State | Meghalaya |
| 4 | Length of the project Section | 13.989 km |
| 5 | Terrain | Few road stretches of Williamnagar passes through Plain terrain and others pass through hilly terrain |
| 7 | Land use | The land use pattern along the project stretches consists mostly of built-up areas; forest area constitutes only 20%. |
| 8 | Forest area | 20% area of the project road is under forest area |
| 9 | Bridge | There are total 5 Nos. of minor Bridges along the project road |
| 10 | Road Configuration | Most of the roads are of single lane, some arewith intermediate or two-lane configuration. |
| 11 | Pavement condition | Existing road is not motorable, thus 70% of the roads are poor in condition. |
| 12 | High embank road stretches | Nil |

## 2.4 Right of Way (RoW)

The carriageway width of the existing road varies from 2.4 to 7 meter. Width of earthenshoulder varies from 0 to 1.5 meter. The Proposed Right of Way is within the existing Right of Way.

## 2.5 Proposed Land Acquisition

As the Proposed improvement is well within the existing Right of Way, so there is No New Land is required and thus No Land Acquisition.

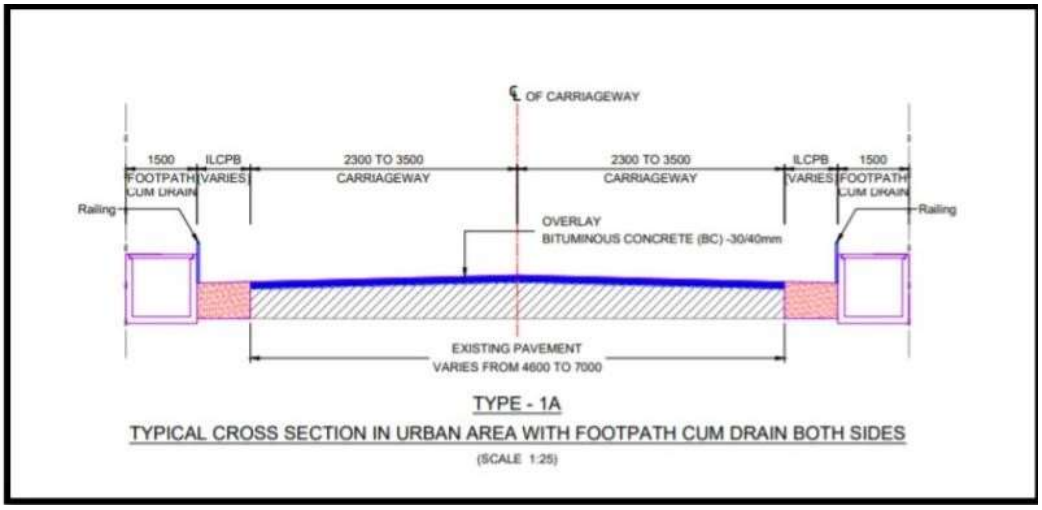
## 2.6 Proposed Cross Section Details

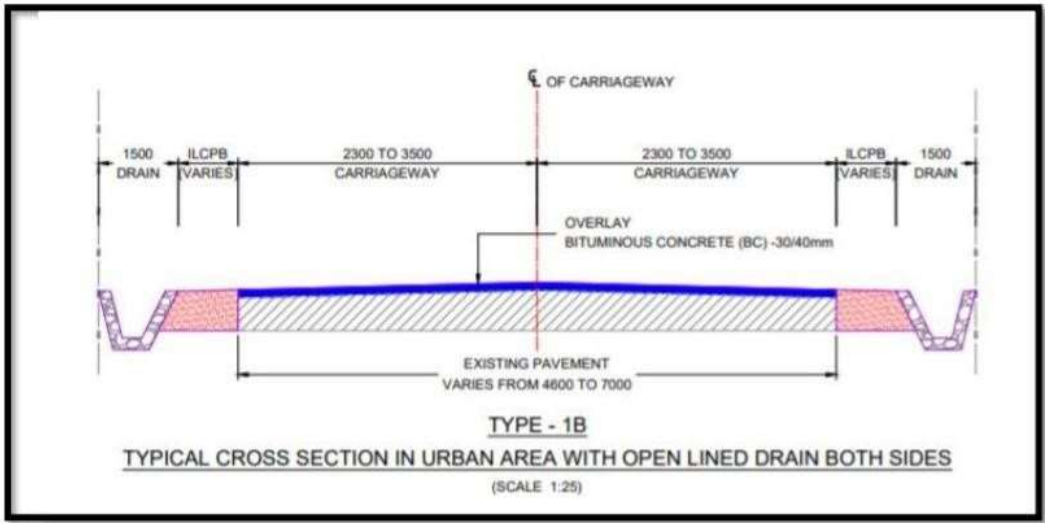
**Carriageway Width**: The carriageway configuration of two lanes with a paved and hardshoulder is proposed for the project road having 2.4 to 7m carriageway width.

**Shoulder**: Earthen shoulders are proposed to be 0 TO 1.5 m on both sides of theCarriageway.

**Typical Cross Section:**

Typical cross sections (TCS) for various configurations proposed in built up area andopen country area in rolling/hilly terrain are shown below:

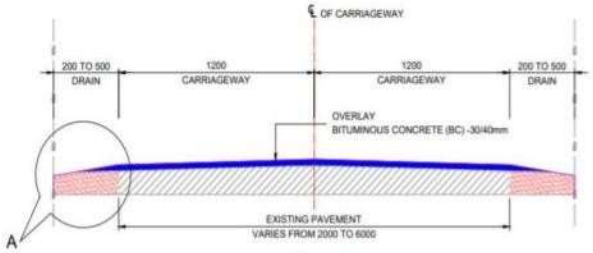





TYPE - 1B

TYPICAL CROSS SECTION IN URBAN AREA WITH OPEN LINED DRAIN BOTH SIDES

(SCALE 1:25)




TYPE - 1C

TYPICAL CROSS SECTION IN URBAN AREA WITH OPEN LINED DRAIN BOTH SIDES

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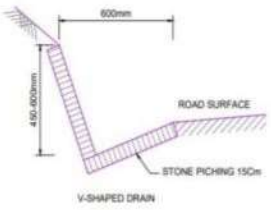
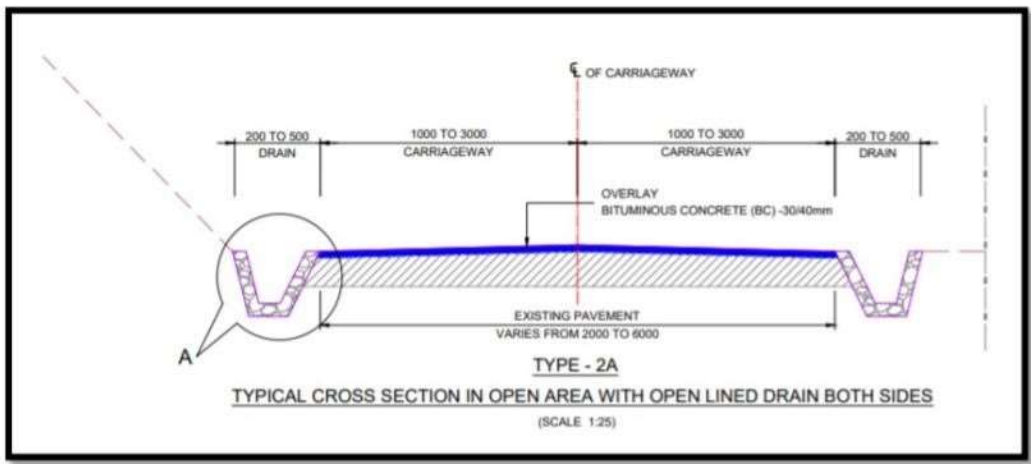



DETAIL 'A'

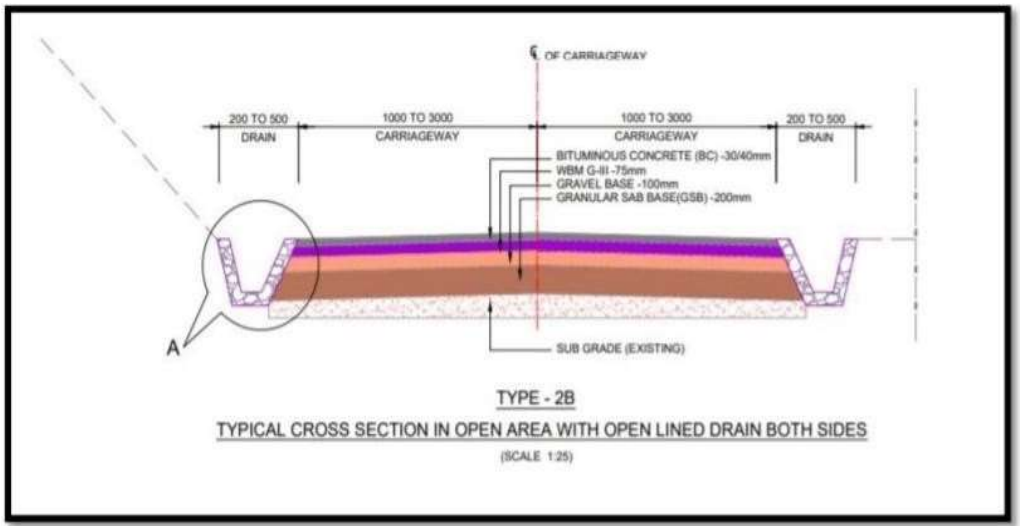
(SCALE 1 : 25)




TYPE - 2A

TYPICAL CROSS SECTION IN OPEN AREA WITH OPEN LINED DRAIN BOTH SIDES

(SCALE 1:25)




## 2.7 Current and Projected Daily Traffic

Meghalaya government had restricted traffic movement in the state due to unprecedented increase in Covid-19 cases. Due to these restrictions, traffic surveys were not carried out earlierduring field surveys. The traffic survey data used is provided by PWD, Meghalaya and was conducted in the month of August, 2019 at different road stretches of Williamnagar as listed below:

- Internal Link Road at Kusimolgre:

| Vehicle Type | No. of Vehicles |
|---|---|
| Bus | 0 |
| Mini Bus | 0 |
| Truck | 10 |
| Tractor | 5 |
| Car/Jeep | 15 |
| Three-Wheeler | 24 |
| LCV | 20 |
| Two-Wheeler | 30 |
| Rickshaw | 0 |
| Bicycle | 10 |

- Internal link road within Williamnagar Town

| Vehicle Type | No. of Vehicles |
|---|---|
| Bus | 20 |
| Mini Bus | 24 |
| Truck | 50 |
| Tractor | 25 |
| Car/Jeep | 35 |
| Three-Wheeler | 50 |
| LCV | 200 |
| Two-Wheeler | 214 |
| Rickshaw | 10 |
| Bicycle | 62 |

- Junction27- Junction15- Junction14- Junction13- Junction12- Junction11- Junction20- Junction21- Junction28 within Williamnagar Town

| Vehicle Type | No. of Vehicles |
|---|---|
| Bus | 21 |
| Mini Bus | 25 |
| Truck | 55 |
| Tractor | 28 |
| Car/Jeep | 45 |
| Three-Wheeler | 60 |
| LCV | 210 |
| Two-Wheeler | 214 |
| Rickshaw | 0 |
| Bicycle | 20 |

- 13th Km from RSN Road to Terrace Gittim via Dawa Kosi and Dawa nengjata within Williamnagar Town

| Vehicle Type | No. of Vehicles |
|---|---|
| Bus | 6 |
| Mini Bus | 8 |
| Truck | 30 |
| Tractor | 6 |
| Car/Jeep | 25 |
| Three-Wheeler | 10 |
| LCV | 8 |
| Two-Wheeler | 56 |
| Rickshaw | 6 |
| Bicycle | 21 |

## 2.8 Proposed Bridges and Culvert

The details of culverts observed along the project stretch are as follows:

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sl. No. | Chainage | Type | Span Arrangement | | | Width (m) | Condition | Remark |
| | | | No. of Pipe/Span | Diameter/Span | | | | |
| 1 | 175 | Slab | 1 | x | 6.00 | 9.40 | good | Overall con the culvert i |
| 2 | 698 | Pipe | 1 | x | 1.00 | 10.50 | good | Overall con the culvert i |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| 3 | 526 | Pipe | 1 | x 1.00 | 10.05 | good | Overall condition of the culvert is good. |  |
| 4 | 800 | Pipe | 1 | x 1.00 | 10.62 | Fully choked, and head wall is in distressed condition. | Culvert is in choked condition needs cleaning. |  |
| 5 | 1200 | Pipe | 1 | x 1.00 | 9.80 | Almost Chocked condition. | Culvert is in choked condition needs cleaning. |  |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| 6 | 1090 | Pipe | 1 | x 1.00 | 9.20 | good | Overall condition of the culvert is good. |  |
| **RSN Road 7th to 8th Km** | | | | | | | | |
| 1 | 0+015 | Pipe | 1 | x 1.00 | 11.00 | good | Overall condition of the culvert is good. |  |
| 2 | 0+850 | Pipe | 1 | x 1.00 | 10.00 | good | Overall condition of the culvert is good. |  |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| 3 | 0+175 | Pipe | 1 | x 1.00 | 8.10 | Fully Choked | Cleaning is required. |  |
| 4 | 0+425 | Pipe | 1 | x 1.00 | 9.80 | good | Overall condition of the culvert is good. |  |
| **Williamnagar Soil Bazar to Nama Bazar Junction** | | | | | | | | |
| 1 | 0+675 | Pipe | 1 | x 1.00 | 10.00 | good | Overall condition of the culvert is good. |  |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| 2 | 0+640 | Pipe | 1 | x 1.00 | 10.00 | good | Overall condition of the culvert is good. |  |
| 3 | 0+432 | Pipe | 1 | x 1.00 | 9.85 | good | Overall condition of the culvert is good. |  |
| 4 | 0+313 | Pipe | 1 | x 1.00 | 10.00 | good | Overall condition of the culvert is good. |  |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| 5 | 0+910 | Pipe | 1 | x 1.00 | 9.70 | Choked | Needs cleaning ofthe culvert. |  |
| 6 | 1+280 | Pipe | 1 | x 1.00 | 10.00 | good | Overall condition of the culvert is good. |  |
| 7 | 1+650 | Pipe | 1 | x 1.00 | 10.00 | good | Overall condition of the culvert is good. |  |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| 8 | 2+005 | Pipe | 1 | x 1.00 | 10.10 | good | Overall condition of the culvert is good. |  |
| 9 | 2+095 | Pipe | 1 | x 5.00 | 7.50 | good | Overall condition of the culvert is good. |  |
| 10 | 2+135 | Pipe | 1 | x 1.00 | 9.90 | good | Overall condition of the culvert is good. |  |
| **Agriculture Colony to Fishery Colony** | | | | | | | | |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| 1 | 0+430 | Pipe | 1 | x 1.00 | 8.90 | good | Overall condition of the culvert is good. |  |
| 2 | 0+657 | Pipe | 1 | x 1.00 | 9.75 | good | Overall condition of the culvert is good. |  |
| 3 | 0+725 | Pipe | 1 | x 1.00 | 14.30 | good | Overall condition of the culvert is good. |  |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| 4 | 0+900 | Pipe | 1 | x 1.00 | 9.20 | Chocked | Needs cleaning ofthe culvert. |  |
| **All India Radio Station to Fishery Colony** | | | | | | | | |
| 1 | 0+025 | Pipe | 1 | x 1.00 | 7.00 | good | Overall condition of the culvert is good. |  |
| 2 | 0+092 | Pipe | 1 | x 1.00 | 7.00 | good | Overall condition of the culvert is good. |  |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| 3 | 0+250 | Pipe | 1 | x 1.00 | 7.00 | good | Overall condition of the culvert is good. |  |
| **Approach Road to Circuit House** | | | | | | | | |
| 1 | 0+010 | Pipe | 1 | x 1.00 | 12.00 | Poor condition | Overall condition of the culvert is Poor. Replacement Required. |  |
| 2 | 0+120 | Pipe | 1 | x 1.00 | 6.00 | good | Overall condition of the culvert is good. |  |
| **Fishery Colony to Williamnagar Main Bazar** | | | | | | | | |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| 1 | 0+100 | Pipe | 1 | x 1.00 | 9.00 | good | Overall condition of the culvert is good. |  |
| 2 | 0+157 | Pipe | 1 | x 1.00 | 9.60 | good | Overall condition of the culvert is good. |  |
| 3 | 0+235 | Pipe | 1 | x 1.00 | 10.00 | good | Overall condition of the culvert is good. |  |
| 4 | 0+380 | Pipe | 1 | x 1.00 | 9.90 | good | Overall condition of |  |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| **14th km RSN Road to Terrracegittim via Dawa Koksi and Dawa Nengjata** | | | | | | | | |
| 1 | 0+268 | Pipe | 1 | x 0.50 | 5.40 | good | Overall condition of the culvert is good. |  |
| 2 | 0+580 | Pipe | 1 | x 1.00 | 6.30 | good | Overall condition of the culvert is good. |  |
| **14th Km. Of Rsn Road To Loyola College Williamnagar** | | | | | | | | |
| 1 | 0+125 | Pipe | 1 | x 1.00 | 4.50 | Chocked | Cleaning is required. |  |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| **Warimagre to Fire Service Station** | | | | | | | | |
| 1 | 0+120 | Pipe | 1 | x 1.00 | 6.00 | good | Overall condition of the culvert is good. |  |
| 2 | 0+262 | Pipe | 1 | x 1.00 | 5.20 | good | Overall condition of the culvert is good. |  |
| **Internal Link Road at Kusimkolgre in Williamnagar** | | | | | | | | |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| 1 | 0+810 | Pipe | 1 | x 1.00 | 5.00 | good | Overall condition of the culvert is good. |  |
| 2 | 0+730 | Pipe | 1 | x 1.00 | 5.10 | good | Overall condition of the culvert is good. |  |
| 3 | 0+090 | Pipe | 1 | x 1.00 | 5.10 | good | Overall condition of the culvert is good. |  |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| 4 | 0+125 | Pipe | 1 | x 1.00 | 5.00 | good | Overall condition of the culvert is good. |  |
| **Internal Link Road at Nokgil Awe (Phase II) (8th km of RSN Road to Sacred Heart School Via Nokgil Awe)** | | | | | | | | |
| 1 | 0+035 | Pipe | 1 | x 1.00 | 5.20 | good | Overall condition of the culvert is good. |  |
| 2 | 0+100 | Pipe | 1 | x 1.00 | 5.10 | good | Overall condition of the culvert is good. |  |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| 3 | 0+125 | Pipe | 1 | x 1.00 | 5.30 | good | Overall condition of the culvert is good. |  |
| 4 | 0+660 | Pipe | 1 | x 1.00 | 5.30 | good | Overall condition of the culvert is good. |  |
| 5 | 0+680 | Pipe | 1 | x 1.00 | 5.00 | good | Overall condition of the culvert is good. |  |

| ABDK Mission Compound to 9th Km of RSN Road | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Chainage** | **Type** | **Span Arrangement** | | **Width (m)** | **Condition** | **Remark** | **Picture** |
| | | | **No. of Pipe/Span** | **Diameter/Span** | | | | |
| 6 | 0+720 | Pipe | 1 | x 1.00 | 5.00 | good | Overall condition of the culvert is good. |  |
| 7 | 0+975 | Pipe | 1 | x 1.00 | 4.90 | Chocked | Overall condition of the culvert is Poor. |  |
| 8 | 1+060 | Pipe | 1 | x 1.00 | 5.00 | good | Overall condition of the culvert is good. |  |

ThedetailsofMinorBridgesobservedalongtheprojectstretchareasfollows:

| Sl. No. | GPS Coordinate | | Chainge (km) | Type of Structure | Span arrangement | | Width of MNBR (m) | Condition | Remark | Picture |
|---|---|---|---|---|---|---|---|---|---|---|
| | Latitude | Longitude | | | No. of pipe/ Span | Span length (m) | | MNBR | | |
| **ABDK Mission Compound to 9th Km of RSN Road** | | | | | | | | | | |
| a | 25.515907 | 90.603445 | 0+625 | MNBR | 1 | 12.0 | 8.0 | Good | The Overall bridge Condition is good. The bridge is to be retained. |  |
| b | 25.511221 | 90.607531 | 1+285 | MNBR | 1 | 6.5 | 9.5 | Good | The Overall bridge Condition is good. The bridge is to be retained. |  |
| **Williamnagar Soil Bazar to Nama Bazar Junction** | | | | | | | | | | |
| a | 25.514655 | 90.602721 | 0+150 | MNBR | 1 | 12.0 | 10.7 | Good | The Overall bridge Condition is good. The bridge is to be retained |  |

| Sl. No. | GPS Coordinate | | Chainge (km) | Type of Structure | Span arrangement | | Width of MNBR (m) | Condition | Remark | Picture |
|---|---|---|---|---|---|---|---|---|---|---|
| | Latitude | Longitude | | | No. of pipe/ Span | Span length (m) | | MNBR | | |
| **Agriculture Colony to Fishery Colony** | | | | | | | | | | |
| a | 25.514655 | 90.602721 | 0+150 | MNBR | 1 | 13.4 | 5.15 | Poor | Constructed on1982.The Bridge is single Lane requires replacement By two lane new bridge. |  |
| **Internal Link Road at NokgilAwe (PhaseII) (8th km of RSN Road to Sacred Heart School Via Nokgil Awe)** | | | | | | | | | | |
| a | 25.506847 | 90.597405 | 1+230 | MNBR | 1 | 12.0 | 8 | Satisfactory | The superstructure of the bridge requires repairement. The bridge can be retained. |  |

## 2.9 Proposed Roadside Drainage

To ensure effective drainage of water, roadside drainage system has been provided throughout the project stretch. The details of the roadside drainage are shown in typical cross section and drawing volume.
Roadside drains should generally be of uniform section throughout, irrespective of the location of road on the hill slope. Road on ridge alignment may not require the same section of drains due to lesser quantity of flow of water. For the convenience of construction, however, it may be necessary to have uniform section of a drain, but the frequency of culverts could be regulatedto the catchment area that it has to cater to. Roadside drains are constructed as parabolic (Saucer shape), trapezoidal, triangular, V-Shape, kerb and channel or U-Shaped cross- sections. The parabolic section is hydraulically the best and most erosion resistant. The trapezoidal sections are easier to construct and hence more generally used. Kerb and channel drain gives extra width, in case of emergencies, for vehicles to use. U-Shaped drains are generally deep drains and are provided where higher discharge has to be catered to and adequate road width is available.
Drawings of Structures of different shapes of roadside drains are given below in Figure 2.

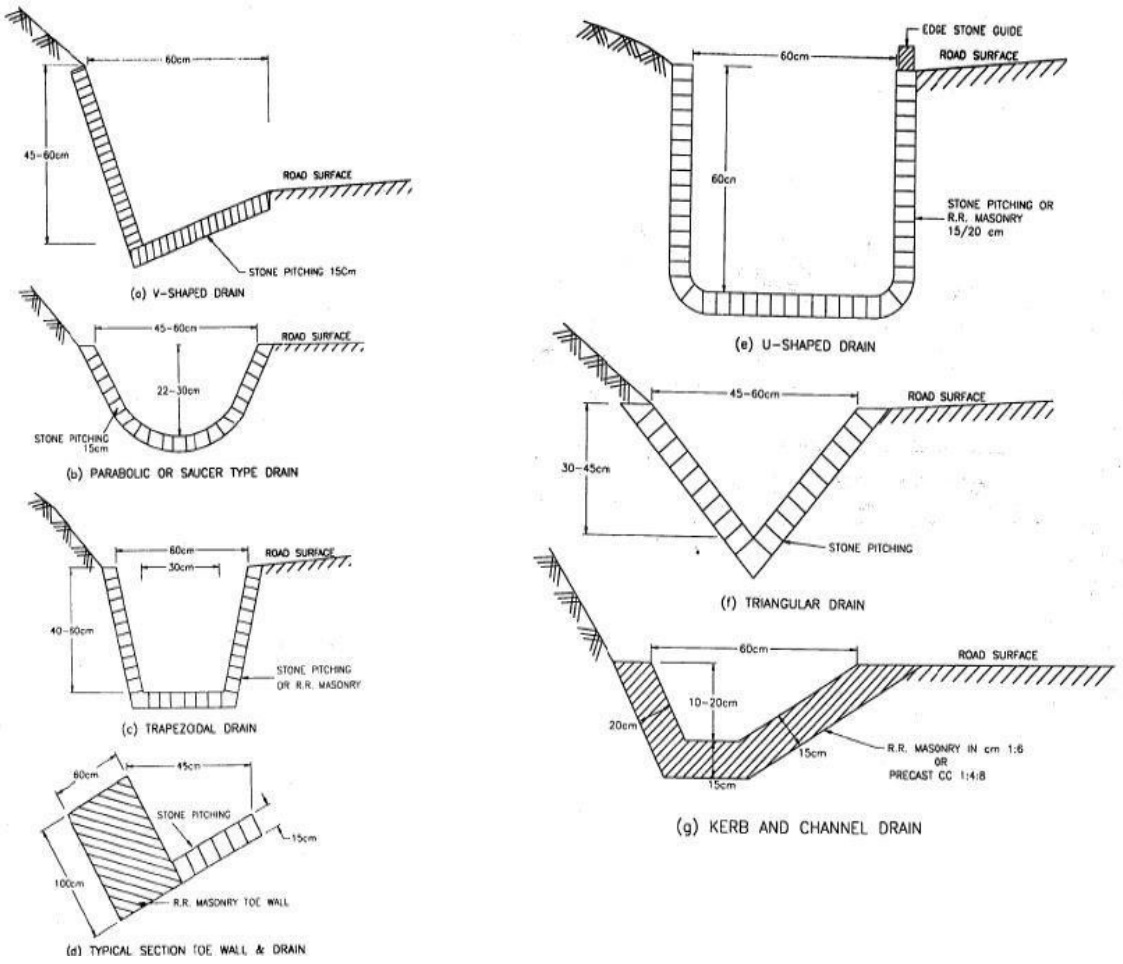



*Figure 2: Structure of Roadside Drains*

## 2.10 Proposed Pedestrian and Animal Crossing

On the basis of site visit data and traffic data, no pedestrian underpass is proposed. There is no animal movement corridor along or across the project road. Therefore, no animal underpass is needed.

## 2.11 Wayside Amenities

- **Bus Shelters**
  Passenger shelters have been proposed at 20 nos. of locations near built up areas (bothside). The details are given in Table 1

Table 1:Details of Proposed Bus Shelters

| Sl. | Chainage (km) | Side |
|---|---|---|
| 1 | 0+370 | Both |
| 2 | 0+990 | Both |
| 3 | 1+850 | Both |
| 4 | 2+575 | Both |
| 5 | 3+460 | Both |
| 6 | 4+430 | Both |
| 7 | 5+400 | Both |
| 8 | 7+930 | Both |
| 9 | 9+220 | Both |
| 10 | 11+000 | Both |
| 11 | 14+220 | Both |
| 12 | 17+690 | Both |
| 13 | 19+750 | Both |
| 14 | 22+310 | Both |
| 15 | 24+225 | Both |
| 16 | 25+620 | Both |
| 17 | 30+235 | Both |
| 18 | 32+800 | Both |
| 19 | 33+915 | Both |
| 20 | 34+475 | Both |

- **Truck Lay Bye**
  No Truck Lay Byes are proposed along the project road.
- **Footpath**
  Drain cum footpath facility has been provided in urban areas for the safety ofpedestrians. The details are provided in Table 2 below

Table 2: Details of Footpath

| Chainage(m) | | Side | Length(m) | Length of CD(m) | Net Length(m) |
|---|---|---|---|---|---|
| From | To | | | | |
| 0 | 330 | Both | 330 | 2 | 656.0 |
| 1775 | 2200 | Both | 425 | 4 | 842.0 |
| 2620 | 3300 | Both | 680 | 6 | 1348.0 |
| 3700 | 4410 | Both | 710 | 4 | 1412.0 |
| 33630 | 34340 | Both | 710 | 2 | 1416.0 |
| **Total Length (m)** | | | | | **5674.0** |

- **Paver Block**

  Paver blocks have been provided in urban areas as per below table.

Table 3: Details of Paver Block

| Chainage(m) | | Side | Length(m) | Length of CD(m) | Net Length(m) |
|---|---|---|---|---|---|
| From | To | | | | |
| 0 | 330 | Both | 330 | 2 | 656.0 |
| 1775 | 2200 | Both | 425 | 4 | 842.0 |
| 2620 | 3300 | Both | 680 | 6 | 1348.0 |
| 3700 | 4410 | Both | 710 | 4 | 1412.0 |
| 33630 | 34340 | Both | 710 | 2 | 1416.0 |
| **Total Length (m)** | | | | | **5674.0** |

## 2.12 Pavement Condition

The project stretch has bitumen surface throughout. Most of the existing road stretches are poor in condition. But some of the roads are intact and motorable and in good or fair condition. The summary of the visual pavement condition(survey carried out in October, 2021) of the project roads are given below:

Table 4: Summary of Pavement Condition

| Williamnagar Town Road | | | | |
|---|---|---|---|---|
| Sl. | From (Km) | To (Km) | Length (Km) | Pavement Condition (Good/Fair/Poor) |
| 1 | 0.000 | 0.060 | 0.060 | Good |
| 2 | 0.060 | 2.780 | 2.720 | Fair |
| 3 | 2.780 | 2.843 | 0.063 | Good |
| 4 | 2.843 | 4.175 | 1.332 | Fair |
| 5 | 4.175 | 35.312 | 31.137 | Poor |

## 2.13 Construction Material Requirement

Locations of quarry site are not yet identified by DPR consultant and will be finalized during the construction period by contractor. However, the nearest licensed quarry site will be selected for this purpose.

## 2.14 Estimated Project Cost

The amount of each item is evaluated on the basis of relevant unit rates analyzed from Standard Data Book of Ministry of Road Transport and Highways (MoRTH). Summary of the Preliminary Cost Estimate for all the improvement works is presented in the table below

Table 5: Summary of Project Cost

| SlNo. | Details of Road | Length Of the Road(km) | Cost (INR) | Cost (Cr.) |
|---|---|---|---|---|
| 1 | ABDKMissionCompoundto9thKmofRSNRoad | 1.724 | 35,835,876.78 | 3.58 |
| 2 | RSNRoad7thto8thKm | 2.835 | 22,979,801.02 | 2.30 |
| 3 | Williamnagar Soil Bazar to Nama Bazar Junction | 2.270 | 84,173,857.91 | 8.42 |
| 4 | Agriculture Colony to Fishery Colony | 0.941 | 49,967,450.39 | 5.00 |
| 5 | All India Radio Station to Fishery Colony | 0.334 | 11,429,605.39 | 1.14 |
| 6 | Approach Road to Circuit House in Williamnagar | 0.246 | 1,125,302.94 | 0.11 |
| 7 | Fishery Colony to Williamnagar Main Bazar | 0.442 | 12,409,072.65 | 1.24 |
| 8 | 14thkm RSN Road to Terrrace gittim via Dawa Koksi and Dawa Nengjata | 1.668 | 16,954,308.59 | 1.70 |
| 9 | 14th Km. of Rsn Road to Loyola College Williamnagar | 0.488 | 5,128,529.12 | 0.51 |
| 10 | Warimagre to Fire Service Station | 0.593 | 7,954,483.05 | 0.80 |
| 11 | Williamnagar Soil Bazar to Poultry Farm Colony | 0.181 | 6,164,288.85 | 0.62 |
| 12 | Internal Link Road at Kusimkolgrein Williamnagar | 0.856 | 1,849,385.18 | 0.18 |
| 13 | Internal Link Road at Nokgil Awe (Phase II) (8th km of RSN) Road to Sacred Heart School Via Nokgil Awe) | 1.411 | 3,033,397.20 | 0.30 |
| | **Total Cost** | | **259,005,359.08** | **25.90** |

## 2.15 Implementation Schedule:

Since as a widening proposal, intermediate lane has been proposed, a construction period of 730 days (2022-23, 2023-24) has been envisaged with a phasing of 60% & 40%respectively.

## 2.16 Sub-project Benefits

The Project Benefits comprises the cost savings in operation of vehicles and maintenance of the road between Without Project and With Project options. The Project Benefits results in the form of-:

- Savings in Vehicle Operating Costs (VOC) - Vehicle Operating Cost (VOC) will be reduced when riding quality of road is improved.
- Savings in travel time costs due to reduction in congestion and higher travel speeds asa result of improved roads - both in terms of capacity as well as riding quality.
- Savings in maintenance costs- Maintenance and Operation cost such as fuelconsumption, wear and tear of tyres, will be sufficiently reduced. The vehicle operating cost shall be further reduced by improving the geometrics and design. The benefits perceived by the road user are in the form of lower expenditure.
- The proposed project will also contribute to economic development by encouraging attraction of businesses to sites equipped with good access and by improving the travel efficiencies of existing businesses and to start a new avenue.
- Reductions in adverse environmental impacts of transportations i.e. reduced traffic emissions, decrease in respirable suspended particulate matter and suspended particulate matter, reduced Noise and other impacts are also the direct benefits of proposed upgradation of the project road.

# 3 CHAPTER: III- LEGAL FRAMEWORK

The following chapter summarizes the legislative framework in which the present project will be addressed with respect to the environmental and social issues.

## 3.1 Acts & Regulation

The Government of India has laid down various policy guidelines, regulations, acts and legislations pertaining to sustenance of environment. The following table shows the relevant environmental legislations and the implementing agencies.

Table 6: Applicable Acts & Regulations

| Sl. | Act/Regulations | Main Objective | Applicability to this Project | Implementation Agency |
|---|---|---|---|---|
| 1. | Air (Prevention and Control of Pollution) Act,1981 | To control air pollution & Controlling emission of air pollutants asper the Prescribed standards. | This act is applicable forconstruction phase to control stack/fugitive emissions andto manage ambient air quality at project site and ancillary activities like crusher plant, hot mix plant, concrete batch mix plant, WMM Plants, DG Set etc., for the road The NAAQ standards (CPCB) for Ambient Air Quality have been promulgated by the MoEF & CC for various land uses. For establishment and operation of Hot Mix/ Stone crusher/ Batching Plantsduring construction, etc.<br>Batch Type Hot Mix –PM (mg/ Nm3) – 150 SO2 (mg/ Nm3) – 250NOX (mg/ Nm3) – 200<br>Consent to Establish (CTE) and Consent to Operate (CTO) for hot mix plant, batching plant and WMM Plants, DG sets, etc.<br>Agency in Charge — State Pollution Control Board(SPCB) | Contractor to:<br>a) obtained COE (consent to establish);<br>b) maintain pollution level below prescribedlimit;<br>This will be takenby the contractorduring construction period. |
| 2. | The Water (Prevention and Control of Pollution) Act, | To control water pollution by controlling discharge<br>Of liquid pollutants asper | Yes, For establishment andoperation of Hot Mix/ Stone crusher/ WMM/ Batching<br>Plants during construction, | Contractor to:<br>a) obtained COE (consent to establish); |

| Sl. | Act/Regulations | Main Objective | Applicability to this Project | Implementation Agency |
|---|---|---|---|---|
| | 1974 | The prescribed standards. | etc. (Construction Stage). This act is applicable forconstruction phase of the road to manage to liquid effluent discharges fromworker camp concrete batchmix plant, etc.<br>Consent to Establish (CTE) and Consent to Operate (CTO) for plants and workerscamps, etc.<br>Agency in Charge — State Pollution Control Board(SPCB) | b) maintain pollution level below prescribedlimit;<br>This will be takenby the contractor during construction period. |
| 3. | Motor Vehicles Act, 1988 and its subsequent amendments | Empowers StateTransport Authority toenforce standards for vehicular pollution. From August 1997 the "Pollution Under Control Certificate" is issued to reduce vehicular emissions | Yes.<br>These rules will be applicable to the contractors during construction phase, allvehicles used for construction will need to comply with the provisions of this act.<br>Agency in Charge - Motor Vehicles Department, Govt. of Meghalaya. | This will be taken by the contractor during construction period. |
| 4. | The Forest Conservation Act, 1980 and The Forest Conservation Rules, 2003 | To check deforestation by restricting conversionof forested areas into non forested areas. | The project area does notpass through any forest area.<br>166 no. of tree felling is required as per primary survey and site visit report. Permission for felling of trees from non-forest areas or in homesteads and farms maybe sought under the provisions of the MeghalayaTree (Prevention) Act, 1976wherever applicable, and inareas outside purview of thesaid act, the permission shallbe obtained as per Rule 6 ofthe Meghalaya Tree Felling (Non-Forest areas) Rules,2006. The application alongwith the required documents shall be submitted to Divisional Forest Officer (Territorial Division) or ChiefForest Officer of the respective Autonomous District Council. | PIU |
| | 1974 | The prescribed standards. | etc. (Construction Stage). This act is applicable forconstruction phase of the road to manage to liquid effluent discharges fromworker camp concrete batchmix plant, etc.<br>Consent to Establish (CTE) and Consent to Operate (CTO) for plants and workerscamps, etc.<br>Agency in Charge — State Pollution Control Board(SPCB) | b) maintain pollution level below prescribedlimit;<br>This will be takenby the contractorduring construction period. |

| Sl. | Act/Regulations | Main Objective | Applicability to this Project | Implementation Agency |
|---|---|---|---|---|
| 3. | Motor Vehicles Act, 1988 and its subsequent amendments | Empowers State Transport Authority to enforce standards for vehicular pollution. From August 1997 the "Pollution Under Control Certificate" is issued to reduce vehicular emissions | Yes.<br>These rules will be applicable to the contractors during construction phase, allvehicles used for construction will need to comply with the provisions of this act.<br>Agency in Charge - Motor Vehicles Department, Govt. of Meghalaya. | This will be takenby the contractorduring construction period. |
| 4. | The Forest Conservation Act, 1980 and The Forest Conservation Rules, 2003 | To check deforestation by restricting conversion of forested areas into non forested areas. | The project area does not pass through any forest area.<br>166 no. of tree felling isrequired as per primary survey and site visit report. Permission for felling of trees from non-forest areas or in homesteads and farms maybe sought under the provisions of the MeghalayaTree (Prevention) Act, 1976 wherever applicable, and in areas outside purview of the said act, the permission shall be obtained as per Rule 6 ofthe Meghalaya Tree Felling (Non-Forest areas) Rules, 2006. The application alongwith the required documents shall be submitted to Divisional Forest Officer (Territorial Division) or ChiefForest Officer of the respective Autonomous District Council.<br>Agency in Charge - Forest Department GOI and Government of Meghalaya & MoEF & CC | PIU |
| 5. | National Forest Policy, 1988 | The principal aim of National Forest Policy, 1988 is to ensure environmental stability and maintenance of ecological balance including atmospheric equilibrium which are vital for sustenance of all life forms, human, animal and plant. | Applicable<br>Agency in Charge - Forest Department GOI and Government of Meghalaya | PIU |

| Sl. | Act/Regulations | Main Objective | Applicability to this Project | Implementation Agency |
|---|---|---|---|---|
| 6. | Wild Life (Protection) Act,1972 and amendments there of | Protection of Wildlife Sanctuaries and NationalParks | No.<br>The proposed alignment is neither passing through norfalling within 10 km radius of any areas protected under Wildlife (Protection) Act,1972.<br>Agency in Charge – NationalBoard for Wildlife, State Board for Wildlife and MoEF& CC | - |
| 7. | Environment Protection Act, 1986 | To protect and improvethe overall environment | Yes.<br>It is umbrella legislation. Various notifications, rules and schedules are promulgated under this act. Ensure applicable standards for ambient air quality. Ensure emission limit standards for new DG Sets, Ensure stack height standards requirement for DG Sets.<br>Agency in Charge - Dept. of Environment and Forest, Meghalaya. | PIU |
| 8. | Ancient Monuments and Archaeological Sites and Remains Act,1958 | The Act designatesareas within 100 meters (m) of the protected monument/ areas, prohibited area and beyond that up to 200 m as regulated area respectively. No construction is permitted in the prohibited area and any construction activity in the regulated area‖ requires prior permission of the Archaeological Survey of India (ASI). | Not applicable as no such monuments within the project corridors.<br>Applicable for any chance find would be Notified / surrendered to the competent authority.<br>Agency in Charge – Archaeological Survey of India (ASI). | - |

| Sl. | Act/Regulations | Main Objective | Applicability to this Project | Implementation Agency |
|---|---|---|---|---|
| 9. | EIA Notification, September 14, 2006 | The EIA Notification of 2006 set out the requirement for environmental assessment in India. Environmental Clearance is required for certaindefined activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. | Not Applicable as project activity does not attract provisions of EIA notification 2006 and its amendment till date.<br>Because, neither is the alignment any new National highway nor is it any expansion of a National Highway greater than 30 km involving additional RoWgreater than 20m involvingland acquisition and passingthrough more than one State(Category A). Also, the alignment is not a statehighway project or statehighway expansion project in hilly terrain (above 1000 mAMSL) and or ecologically sensitive areas (Category B). It is a Major District Road<br>Agency in Charge - Ministry of Environment, Forest & Climate Change (MoEF & CC) | - |
| 10. | National Environmental Appellate Authority Act, 1997 | An Act to provide for the establishment of a National EnvironmentAppellate Authority tohear appeals with respect to restriction of areas in which any industries, operations or processes or class of industries, operations orprocesses shall not be carried out or shall be carried out subject to certain safeguards underthe Environment (Protection) Act, 1986 and for matters connected therewith or incidental thereto. | No.<br>The Act is not applicablebecause the said project does not involve any industries, operations orprocesses or class of industries, operations or processes.<br>Agency in Charge - Ministry of Environment, Forest & Climate Change (MoEF& CC) | - |

| | | | | |
|---|---|---|---|---|
| 11. | Solid Waste Management Rules 2016 | Responsibility of Solid Waste Generator<br>(i) segregate and storethe waste generated inthree separate streamsnamely biodegradable, non-biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time. | This rule is applicable to all forms/types of solid waste generated at construction activities, camp site, plant sites, etc.<br>Agency in Charge - StatePollution Control Board | Contractor to follow all the rules during construction works. |
| 12. | Construction and Demolition Waste Management Rules 2016 | Safe disposal and management of construction and demolition wastes | This rule shall be applicable to generation of wastes resulting from demolition ofstructures and scarifying of surface of existing road and from road construction activities.<br>Agency in Charge - State Pollution Control Board | Contractor to follow all the rules during construction works. |
| 13. | Hazardous and Other Wastes (Management, And Transboundary Movement) Rules, 2016 and amendments thereof | Protection to the general public against improper handling and disposal of hazardous wastes | The rules will be applicable to used oil generated from construction equipment/ machinery during construction works. The rule includes storage, handling,transportation proceduresand requirements for safe disposal of hazardous wastes.<br>Agency in Charge - State Pollution Control Board | Contractor to follow all the rules during construction works. |
| 14. | Notification foruse of Fly ash, 3rd November 2009 and its amendment on 25th January 2016 | As per the notification of MoEF & CC, it is mandatory to use fly-ash in the construction of road or fly over embankments within a radius of 300 km of a thermal power plant. | Yes.<br>The NTPC Thermal Power Project in Dolaigaon, Assam, Bongaigaon Thermal Power Project lies at a distance of 106 km (aerial distance) from the project site. The site islocated at a distance of 184 km by road from the project site. | PIU |

| | | | | |
|---|---|---|---|---|
| 15. | Noise Pollution (Regulation And Control) Act, 1990, 2010 and its subsequent amendments | The standards for noise for day and night have been promulgated by theMoEF & CC for various land uses. | This act will be applicable for all construction equipment/ plant and machinery including vehicles deployed for construction of the proposed road to regulate ambient noise levels. This act will be applicable to regulate noise nuisance during construction phase.<br>Since the project is located in residential cum commercial area the Ambient Air Quality Standards in respect of Noise are:<br>**1.** Commercial area: day time – 65 dB (A); night time 55 dB (A)<br>**2.** Residential area: day time – 55 dB (A); night time – 45 dB (A)<br>Agency in Charge - State Pollution Control Board | Contractor to follow all the rules during construction works. |
| 16. | The Explosives Act (& Rules)1884 (1983) its subsequent amendments. The Explosive Rules, 2008 | Sets out the regulations as to regards the use of explosives and precautionary measures while blasting & quarrying | If contractor opens stone quarry and uses explosive for quarrying and storing ofDiesel/ Petrol in the camp site<br>Agency in Charge - Petroleum & Explosives Safety Organization (PESO) | PIU |
| 17. | Guidelines to regulate and control ground water extraction in India, 2020 | Regulate and control ground water extraction for various purpose. | Yes, NOC for establishing bore wells for abstraction of ground water for use of construction as well as domestic use.<br>Agency in Charge – Central Ground Water Authority | PIU |
| 18. | Public Liability and Insurance Act, 1991 | Protection to the general public from accidents due to hazardous materials. | Yes.<br>Hazardous materials like Bitumen shall be used for road construction<br>Agency in Charge - Labour Commissioner / District Magistrate | PIU |

### 3.2 Clearance Requirement

During the construction stage, some of the key statutory requirements that need to be obtained by the Contractor as part of mobilization have been listed in the table given below:

Table 7: Applicable Acts & Regulations (Construction Phase)

| S. No. | Clearance Required for | Statute under which clearance is required | Statutory Authority |
|---|---|---|---|
| 1 | Hot mix plants, Crushers, Batch Mix Plants & DG Sets. | Air (Prevention and Control of Pollution) Act, 1981 and Noise Pollution (Regulation and Control) Rules, 2000 | State Pollution Control Board |
| 2 | Storage, handling and transport of hazardous materials. | Hazardous Waste (Management and Handling) Rules, 1989 and Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989. | State Pollution Control Board |
| 3 | Location/ layout of workers camp, equipment and storage yards | Environment Protection Act, 1986 and Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989 | State Pollution Control Board |
| 4 | Quarries (Aggregates, Sand & Earth) | Environment Protection Act, 1986 | MoEF & CC |
| 5 | Permission for withdrawalof groundwater and for construction purpose. | Environment Protection Act, 1986 | CGWB |
| 6 | Disposal of bituminous wastes | Hazardous Waste (Management and Handling) Rules, 1989 | As per state norm/ Local Civic Body |
| 7 | Pollution Under Control Certificate | Central Motor and Vehicle Act 1988 | Department of Transport, State Government. |
| 8 | Storage of fuel oil, lubricants, explosives, diesel etc. at construction camp. | Manufacture, storage and Import of Hazardous Chemical Rules1989 | State Pollution Control Board & PESO. |

### 3.3 MoRTH & IRC Specifications

All road works in India are to be in accordance with the Ministry of Road Transport and Highway (MoRTH) specifications for Road and Bridge works and the guidelines of Indian Roads Congress (IRC). The MoRTH specifications have special provisions towards the protection of environment under Clause 501, Annexure A and the contractor has to satisfy these provisions. Apart from the Annexure A to clause 501, there are provisions for control of erosion, drainage, dust suppression, borrow area and haul road management under relevant sections.

### 3.4 Environmental Standards and Code of Practices

All the construction work will be carried out as per the Environment standards and guidelines of MoEF & CC, CPCB & code of practices of IRC. Some of the codes used during the construction phase are listed below.

- Guidelines for use of Fly Ash in Road Embankments (IRC: SP: 58-2001)
- Guidelines on Preparation and Implementation of Environment Management Plan (IRC SP108-2015)
- Guidelines on Landscaping and Tree Plantation (IRC: SP-21-2009)
- Report containing recommendations of the IRC regional workshops on Highway Safety (IRC:SP: 27-1984)
- Recommended practice for Borrow pits for Road Embankments constructed by Manualoperation (IRC: 10-1961)
- Road accident Forms (IRC: 53-1982)
- Guidelines for Use of Construction and Demolition Waste in Road Sector (IRC 121-2017)
- Proceedings of International Seminar on sustainable development in 8.10.2001
- Road Transport Highway Safety Code (IRC: SP: 44-1996)
- Guidelines on Safety in Road Construction Zones (IRC: SP: 55:2001)
- Guidelines on Skill Development of Workmen in Road Sector (IRC 127-2018)
- Guidelines of WB.

### 3.5 Other Applicable Policies (Social Security & Labor Welfare)

Environmental and labour welfare issues during the construction stage generally involve equity,safety and public health issues. The different applicable policies are:

Table 8: Applicable Policies

| Applicable Codes | Concerns | | Remarks |
|---|---|---|---|
| The Code on Social Security, 2020 | It consolidated The Employees‘ Compensation Act, 1923, The Employees‘ State Insurance Act, 1948, The Employees‘ Provident Funds and Miscellaneous Provisions Act, 1952, The Employment Exchanges (Compulsory Notification of Vacancies) Act, 1959, The Maternity Benefit Act,1961, The Payment of Gratuity Act, 1972, The CineWorkers Welfare Fund Act, 1981, The Building andOther Construction Workers Welfare Cess Act, 1996, Unorganised Workers' Social Security Act 2008,The Constitution (Eighty-Ninth Amendment) Act, 2003, Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, PESA, Vishaka Guidelines, Equal Remuneration Act, 1976, The Child and Adolescent Labour (Prohibition and Regulation) Act, 1986, The Immoral Traffic (Prevention) Act,1956, Sexual Harassment of Women at Workplace (prevention, Prohibition and Redressal) Act, 2013 and POSCO Act,2013 | | Ministry of Labour and Employment |

| Applicable Codes | Concerns | Remarks |
|---|---|---|
| The Occupational Safety, Health and Working Conditions Code, 2020 | It amalgamated The Factories Act, 1948, ThePlantations Labour Act, 1951, The Mines Act, 1952, The Working Journalists and other Newspaper Employees (Conditions of Service and Miscellaneous Provisions) Act, 1955, The Working Journalists (Fixation of Rates of Wages) Act, 1958, The Motor Transport Workers Act, 1961, The Beediand Cigar Workers (Conditions of Employment) Act, 1966, The Contract Labour (Regulation and Abolition) Act, 1970, The Sales PromotionEmployees (Condition of Service) Act, 1976, The Inter-State Migrant workmen (Regulation of Employment and Conditions of Service) Act, 1979, The Cine Workers and Cinema Theatre Workers Act, 1981, The Dock Workers (Safety, Health and Welfare) Act, 1986 and The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. | Ministry of Labourand Employment |
| The Code on Wages, 2019 | It consolidated the provisions of four labour laws concerning wage and bonus payments and makes universal the provisions for minimumwages and timely payment of wages for all workersin India. The Code repeals and replaces the Payment of Wages Act, 1936, the Minimum WagesAct, 1948, the Payment of Bonus Act, 1965, and the Equal Remuneration Act, 1976. | Ministry of Labourand Employment |

### 3.5.1 World Bank safeguard/ Operational policies

The World Bank policies and directives on environmental and social safeguards have been adhered to for the project roads. The applicability of the relevant policies to the project roads that are undergoing up-gradation (strengthening and widening) are summarized in the following **Table 9:**

Table 9: Applicable World Bank Operational policies

| | |
|---|---|
| OP 4.01 Environmental Assessment | The objective of this policy is to ensure that Bank financed projects are environmentally sound and sustainable. Help to ensure the environmental and social soundness and sustainability of investment projects. Support integration of environmental and social aspects of projects in the decision-making process. **OP 4.01 is applicable in this project**.<br><br>MITP Project is a ―Category A‖ project as the sub-project sites are located in the hilly areas with fragile ecosystem, abutting forest and eco-sensitive zones as well as Wildlife Sanctuaries**. Thus, by default the sub-project "Category is A".** |
| OP 4.04 Natural Habitats | The policy recognizes that the conservation of natural habitats is essential for long-term sustainable development. Promote environmentally sustainable development by supporting theprotection, conservation, maintenance, and rehabilitation of natural habitats and their functions. This policy may be triggered toimprovement activity of road requiring forest/ wildlife lands, locating close to the natural habitats with the potential to cause significant adverse impact or degradation of natural habitats whether directly (through construction) or indirectly (through human activities induced by the project).<br>The project does not pass through reserved forest or natural habitatof wild animals therefore this operational policy is not applicable in this project. |

| | |
|---|---|
| OP 4.36 Forestry | There is no felling of trees as the project road is within the existing RoW. |
| OP 4.09 Pest Management | The objective of this policy is to promote the use of biological or environmental control methods and to reduce reliance on chemical pesticides. This policy is not applicable in this project. |
| OP 4.12 Involuntary Resettlement | Avoid or minimize involuntary resettlement and, where this is notfeasible, assist project displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relativeto pre-displacement levels or to levels prevailing before the beginningof project implementation, whichever is higher.<br>This policy OP 4.12 is not applicable in this project as the projectdoes not involve any land acquisition. The existing RoW is encumbrance free. |
| OP 4.10 Indigenous People | Design and implement projects in a way that fosters full respect for indigenous peoples dignity, human rights, and cultural uniqueness sothat they i. Receive culturally compatible social and economic benefits, and ii. Do not suffer adverse effects during the development process.<br><br>i. This OP 4.10 regarding Indigenous People is applicable only if any persons belonging to Indigenous community impacted by this project as Meghalaya is largely tribal state with more than 86% ST population. Hence, this policy will be triggered. |
| Physical Cultural Resources (PCR) | OP 4.11 Assist in preserving PCR and in avoiding their destruction or damage. PCR includes resources of archaeological, paleontological, historical, architectural, religious (including graveyards and burial sites), aesthetic, or other cultural significance.<br>There are no PCR impacted under this project. Therefore OP.411 is not triggered. |

Table 10: Applicable Social Legal Framework for the entire Project

| Sl. | Name of Act/ Rules | Purpose | Applicable /Not Applicable | Description | Responsible Agency |
|---|---|---|---|---|---|
| 1. | The Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act | Grants Legal recognition to the rights of traditional forest dwelling communities. | Not Applicable | This Act will be Applicable if in future there is any land required to be acquired during implementation. | Ministry of Tribal Affairs, GoI and Department of Tribal Welfare of State Government |
| 2. | The Minimum Wage Act,1948 | Payment of minimum rate of wages as fixed and periodically revised by the State Government | Applicable | Construction/daily wageworkers who are involved in the project | District Labour Commissioner |
| 3. | Workmen Compensation Act, 1923 | It provides for payment of compensation by Employers to their Employees for injury by accident i.e., personal injury or occupational disease. | Applicable | The InsurancePolicy covers the compensation, hospitalization and transportation of workers /employees | District Labour commissioner |
| 4. | Inter-state Migrant Workers Act, 1979 | It protects workers whose services are requisitioned outside their native states in India. Contractor who employs or who employed five or more Inter- State migrant workmen need to obtain registration under this act | Applicable | Construction workers involved in the project may ormay not be from the neighboring state. Presently the construction workers are from within the state of Meghalaya. | District Labour commissioner/ Govt. of Meghalaya |

| Sl. | Name of Act/ Rules | Purpose | Applicable /Not Applicable | Description | Responsible Agency |
|---|---|---|---|---|---|
| 5. | The Child Labour (Prohibition & Regulation) Amendment Act, 2016 | It prohibits employment of children in certain specified hazardous occupations and processes and regulates the working conditions in others. | Applicable | No Child worker should be involvedin the project. | District Labour commissioner |
| 6. | Building and Other Construction Workers Welfare Cess Act, 1996 | An Act to provide for the levy and collection of a Cess on the cost of construction incurred by employers. | Applicable | Project involves employment of construction workers | District Labour commissioner |
| 7. | The Sexual Harassment of Women at Workplace (Prevention, Prohibition, and Redressal) Act, 2013 | Vishakha Guidelines are tobe followed | Applicable | This act specially protects the rights of the women workers against any kinds of sexual harassment at the project, both at office and sites. | |
| 8. | The Equal Remuneration Rules, 1976 | Equal Remuneration for identical works | Applicable | Project should not discriminate between sex, race,caste or creed in paymentsto the employees | District Labour Commissioner |
| 9. | The Trade Union Act, 1926 | Right to form Trade Unionat the Workplace | Applicable | No trade union formed within the organization | District Labour Commissione r |
| 10 | Public Liability Insurance Act 1991 | Applicable | Applicable | Project has been adhering to all the relevant provisions made under the act | District Labour Commissione r |

| Sl. | Name of Act/ Rules | Purpose | Applicable /Not Applicable | Description | Responsible Agency |
|---|---|---|---|---|---|
| 11 | World Bank OP/BP 4.12 — Involuntary Re settlement | Avoid or minimize involuntary resettlement and, where this is not feasible, assist displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing before the beginning of project implementation, whichever is higher | Not Applicable | The project does not envisage land acquisitionand the RoW is free from any encroachments or encumbrances as there is a very low scale widening, realignments, junction improvements etc. | Project Implementing Unit (PIU)/ Implementing Agency |
| **12** | Indigenous Peoples OP/BP 4.10 | In the context of India Indigenous Peoples may be referred to "scheduled tribes". As per the Census of India, 2011 about 86% of the Meghalaya state belongs the Schedule Tribe. The population is distributed across 11 districts of Meghalaya. | Not Applicable | The majority of the population of the state is tribal however, largely impacted ST population mostly live in the urban areas and become the mainstream population. Indigenous People is not triggered as the presence of tribal groups with close attachment to land in the project area is not established. Further, this policy is not triggered in terms of "collective attachment to geographically distinct habitats" and "institutions". Thus the policy on institutions. The project is mostly within the town limits and tribal population living in the towns have become the part of the mainstream population | PIU/ Implementing Agency |
| 13 | Bank Policy – Access to Information | The policy governs the public accessibility of information in the Bank's possession. | Applicable | Documents such as RPF, all ESIAs was disclosed both by the borrower and Bank and uploaded in the website. | PIU/Implementing Agency |

### 3.5.2 Social Categorization:

All activities under the sub-projects are limited to the available RoW, thus no land acquisition and resettlement and rehabilitation are envisioned for these activities. The activities in this project will impact the tribal population as Meghalaya is largely tribal state with over 86% of the population belonging to the Schedule Tribes (ST) communities. The project will have positive impact on the tribal population Further the tribal community in Meghalaya have collectiveattachment to the land and if project have any impact on them would have trigger the Operational Policy OP 4.10 of the World Bank. Anticipated impact on livelihood of vendors is not there; however, there would be minor impacts on some structures which will be reconstructedby the Contractor upon completion of work. Thus, a separate Abbreviated Resettlement Action Plan (ARAP) will not be required for this sub-project. Apart from this, there would be some access restrictions to the structures along the road for 2-5 days and mitigation measures to address the access restriction issues has been suggested in ESMP.

# 4 CHAPTER: IV- DESCRIPTION OF ENVIRONMENT

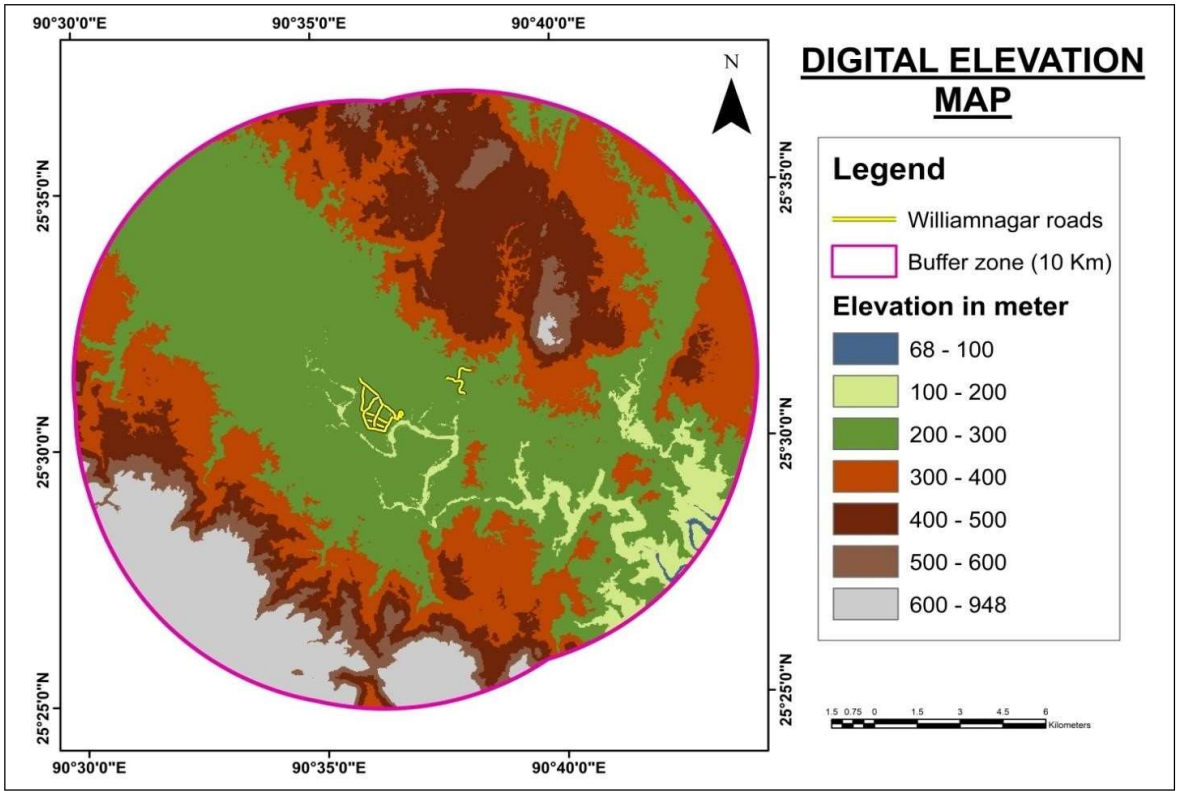
The present chapter describes the baseline environmental and social conditions within the project influence area of 10 Kms of the project road. The baseline information on biophysical (air quality, water quality, noise, soil, ecology & biodiversity), social and economic aspects along the project roads has been collected applying primary surveys and referring to secondary sources. Topography:

The dominant part of the state is located in Meghalaya plateau. The highest point in the state is the Shillong Peak with an altitude of 1961 meters. The state can, broadly, be divided into three physiographic zones, namely:

- Central Plateau Region comprising the Khasi Hills and has the highest elevationsbetween 900-2000m
- Sub-montane region in continuation with the Central Plateau below 900m whichgradually merges with the plains in the West and North, namely the Jaintia Hills, and
- Border region which stretches south-wards abruptly from the Central Plateau to theplains in Bangladesh, mainly the Garo Hills region, and is nearly plain.

**East Garo Hills:**

East Garo Hills is mainly lies in hilly terrain. The hills are highly dissected and one major formation is the Arbella Range, which cuts through the south-central part of the district. The range consists of peaks with an average height of 700 metres above sea level. Another important physiographic feature is the Simsang Valley which runs through the southern part of the district. The River Simsang is the longest river in Garo Hills, which originates in West Garo Hills and flows through East Garo Hills and thence to South Garo Hills. The topography of the rest of the district is of undulating low hills, with altitude ranging from 150 to 600 metres above sea level. The digital elevation map and toposheet of the study area are given below:



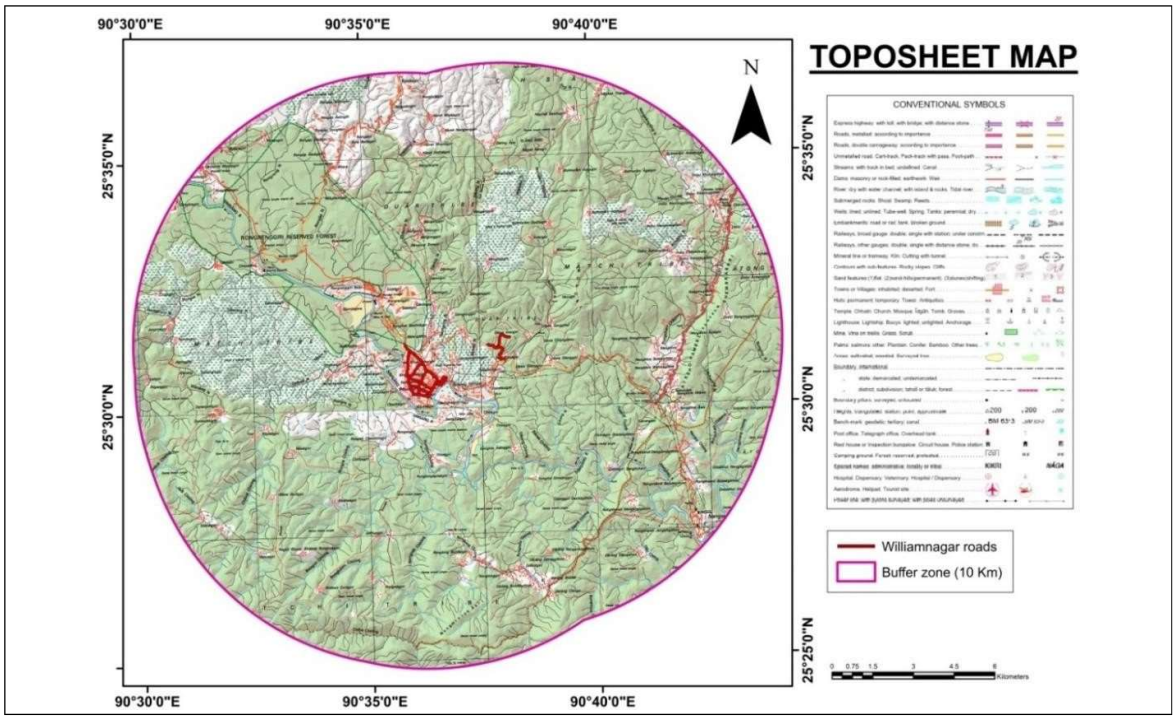




Figure 4: Toposheet map showing the Project road stretches

Figure 3: Digital Elevation Map of Proposed Project Road

**Toposheet source: Survey of India**
**Toposheet No.: G46M6_78K6, G46M7_78K7, G46M10_78K10, G46M11_78K11**

## 4.1 Topography

Most of the project road stretches lies in plain terrain but two of them lies in hilly terrain. Theroad stretches are situated 200-300 meter above sea level

## 4.2 Soil & Geology:

Three major soils can be found in this district viz.,

i) Lateritic soil: It is found in the northern parts of the district. They are characterized by reddish brown colour and are rich in iron. It occurs in areas around Rongmil, Karkutta, Resulbelpara, Wagensi, etc.,

ii) Red - Loamy soil, and

iii) Red and Yellow soil: These soils are the most prevalent one, covering the middle and southern part of the district. In the parts of Rongjeng and Songsak read-loamy soil can be found. And Red and Yellow soil is found in Samanda and Williamnagar areas of the district. These soils are acidic in character with pH ranging from 4.9 to 5.6.

Soil profile of the **study area** is **shown** below:

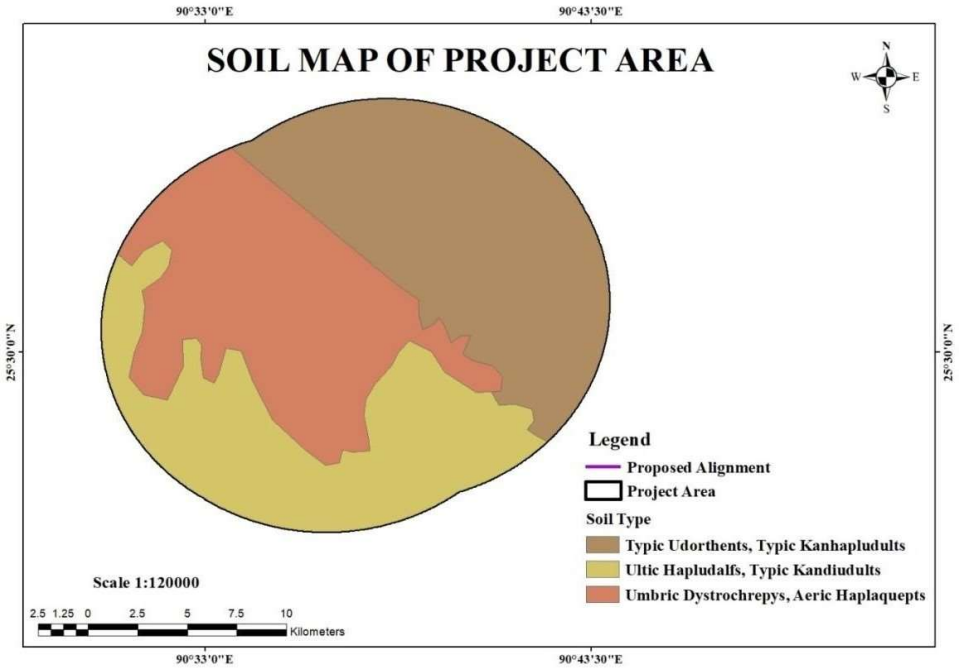



Figure 5: Soil Map of Project Area

The improvement work of project road may have some temporary effect upon soilquality; therefore, soil quality monitoring was not conducted for the project stretches.

### 4.3 Soil Quality Monitoring

Soil is an important non-renewable resource to human life and terrestrial ecosystems. The key aim of soil monitoring is to understand the condition of soil in the project roads. The sampling was taken by a NABL Accredited Laboratory in the month of January. The concerned parameters are Nitrogen, Phosphorus, Potassium, pH, Nitrate etc. The sample collection, preservation, storage, transportation, and analysis were carried out as per the standard methods.

### 4.4 Climate:

The Climate of the district varies in latitudinal and longitudinal directions and is influenced mainly by physiography. There are four seasons in the district namely summer, monsoon or rainy, autumn and winter. The summer season starts from the end of March and continues till mid-May, which is characterized by relatively higher temperatures. Rainy season starts with the onset of southwest monsoon in April and lasts up to October. Then this is followed by short autumn season which starts from mid-October and continues till November. This season is characterized by clear and sunny sky. Winter season starts from December and continues tillthe end of March. This time of the year is characterized by sharp decline in the temperature.

- Rainfall:

In terms of precipitation received, June and July are the rainiest month. During the month of June**,** the district gets 257mm rainfall while **in** December **it** gets the lowest amount of rainfall i.e. 5mm. Rainfall profile remains high during the south-west monsoon. The study area is surrounded by hills and is subjected to a wet weather. The area experiences a lot of rainfall every year.

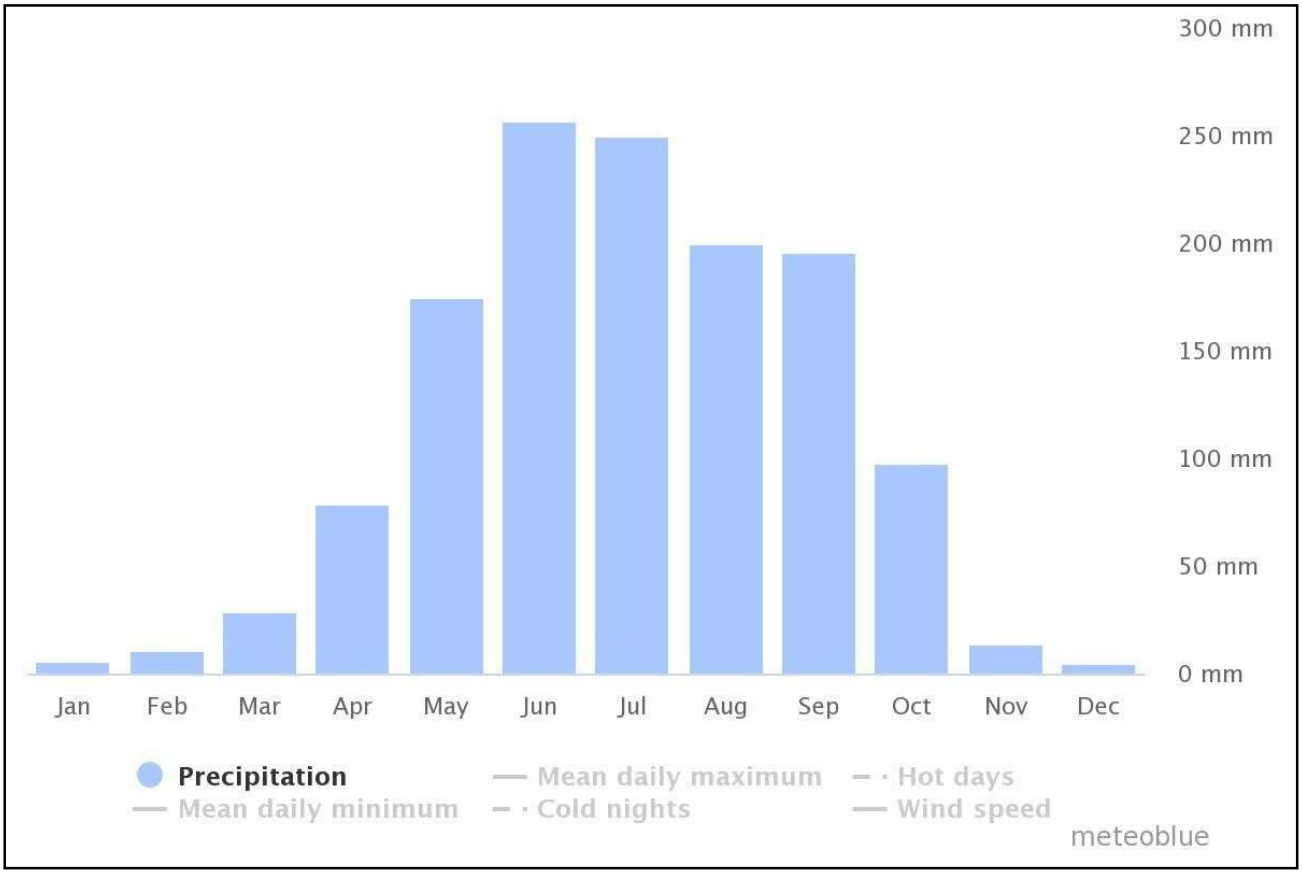



Figure 6: Precipitation in Williamnagar (Source - meteoblue)

- **Temperature:**

  From March to October, temperature ranges between 30 ºC to 32 ºC. The hottest month of the year is April, with an average of 32°C. From December to February, the temperature ranges between 13 ºC to 15 ºC. The coldest month of the year in Williamnagar is January, with an average of 13 ºC.

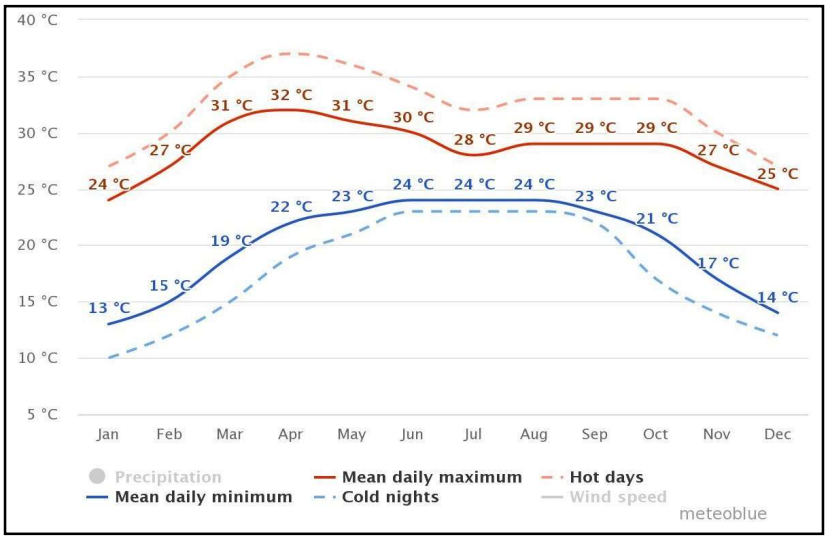



Figure 7: Mean Temperature

- **Wind Speed/Direction:**

  The average hourly wind speed varies significantly with seasonal variation over the course of the year. The windiest month in Williamnagar is May with the wind speed of16.8 Km/hand so in these months there is a chance of soil erosion in this area. Potholes can also be created due to continuous soil erosion and water may get logged into the potholes during heavy rainfall which can ultimately led to the destruction of roads. While January is the month when the wind speed is very low i.e. 2.9 Km/h. The calmer time of year is suitable for construction.

  Depending on the dominant wind flow direction the location of hot mix plant will be decided so that the construction of roads should not affect the air quality of residential areas in the down wind direction.

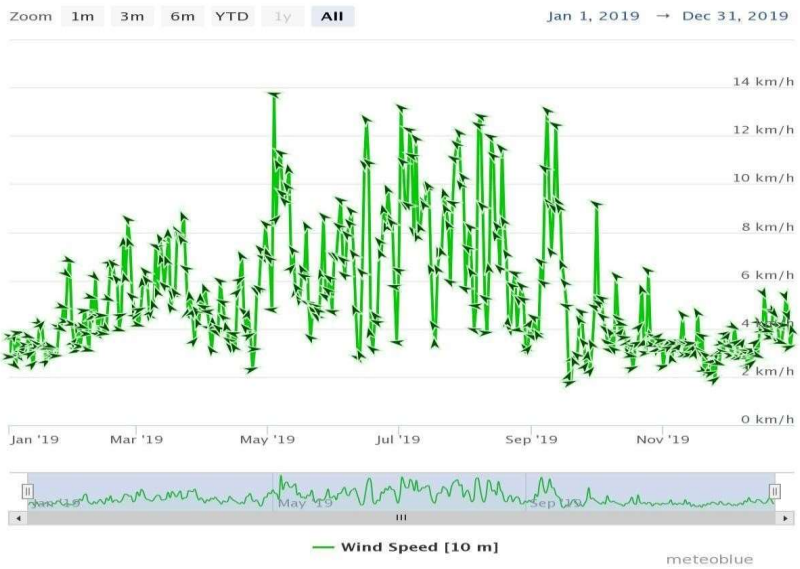



Figure 8: Average Wind Speed in Williamnagar (Source: Meteoblue)


Figure 9: Wind Rose Diagram for Williamnagar
(Source: Meteoblue)

- **Relative Humidity:**

The air is generally humid in this region during the monsoon season when the maximumrelative humidity was observed to be 99.6% in the month of July. Similarly, the minimum relative humidity was observed to be 53.6% in the month of March.

The Relative Humidity is often associated with the working capacity of the labour force and shares an inversely proportional relationship. The higher the humidity, the less isthe working capacity as the body gets tired and fatigued easily. Hence, construction work will be done more comfortably during the months when the humidity is lower.


Figure 10: Average Humidity of previous 10 years (Source: Meteoblue*)*

## 4.5 Natural Hazards:

As the State lies in the seismically active zone, special emphasis should be given to reduce the impacts of earthquake. Moreover, it is also affected by hazards such as floods, flash floods, epidemics, fire, hailstorm, lightening, road accidents, etc.

The State of Meghalaya has witnessed seismic events of ≧8.7 magnitude in 1897‘. This region has been identified as a potential site of a future catastrophic earthquake. With the growth of population and infrastructure seismic vulnerability has increased and previous earthquake provided a glimpse of the devastating potential of seismic tremors

- **Seismicity:**

Earthquake is a natural disaster so necessary safety measures may be adopted considering the vulnerability to avoid enhanced risk. As per the 2002 Bureau of Indian Standards (BIS) map, the state of Meghalaya falls in a region of high to very high seismic hazard. All districts of the state of Meghalaya lie in Zone V. This state also falls in Zone V

Seismically, East Garo Hills district lies in Zone V. Nearly all of the state of Meghalaya, lies on the "Shillong Massif". This is a block-like structure that has not undergone much folding or faulting as compared to the surrounding areas. The main threats to the state

come from faults bounding the massif with the surrounding areas. The northern part of the massif has several faults, among the newly identified Oldham Fault that is believed responsible for the 1897 earthquake. The southern boundary is marked by the east- west trending Dawki Fault, along the Bangladesh border. Moderate earthquakes have occurred in this state but the most significant of all was the Great Assam earthquake of 1897. Centred across the state border in Assam, much of Meghalaya was severely jolted. Considering high hazard seismic zone of the project road section area, design standards for structures stipulated in the clause under IRC: 6-2014 has been taken into account.

Both the project district and project area lie over high damage risk zone V. The project area falls in a high earthquake prone zone but no such earthquake was recorded in Williamnagar.
The seismic map of Meghalaya indicating the location of project stretch is shown in Figure 11

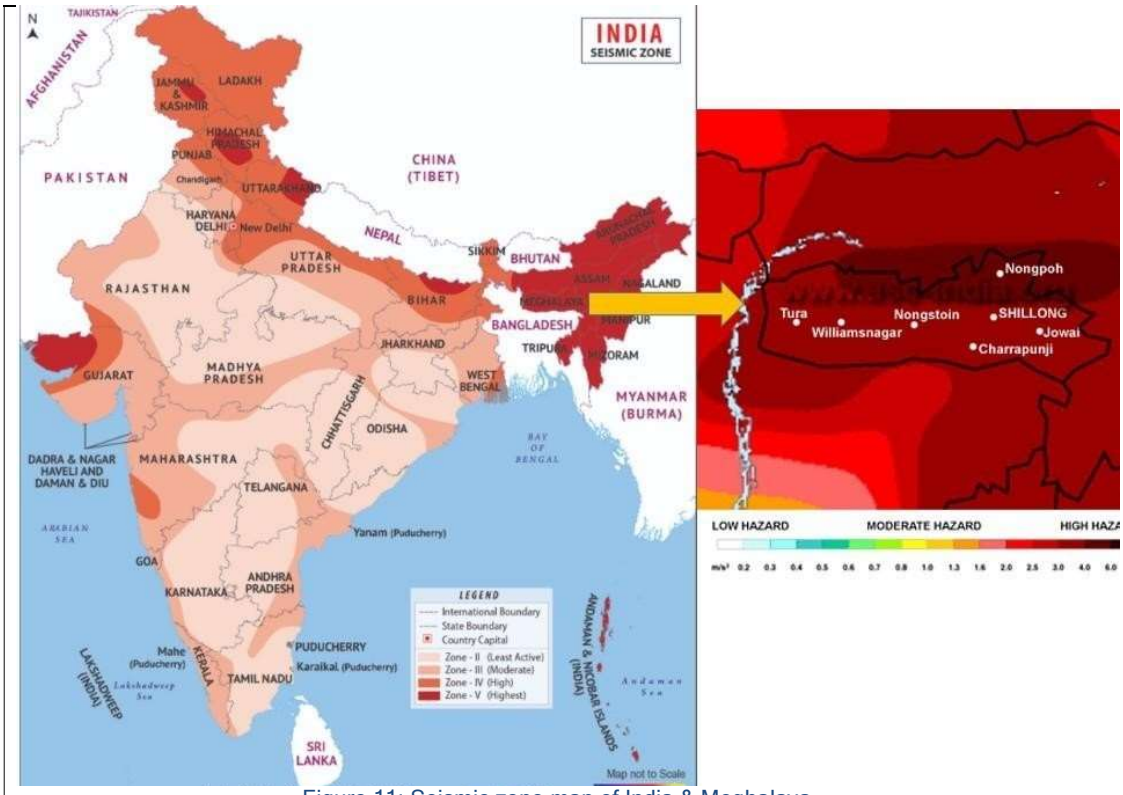



Figure 11: Seismic zone map of India & Meghalaya

Source: http://asc-india.org/seismi/seis-meghalaya.htm

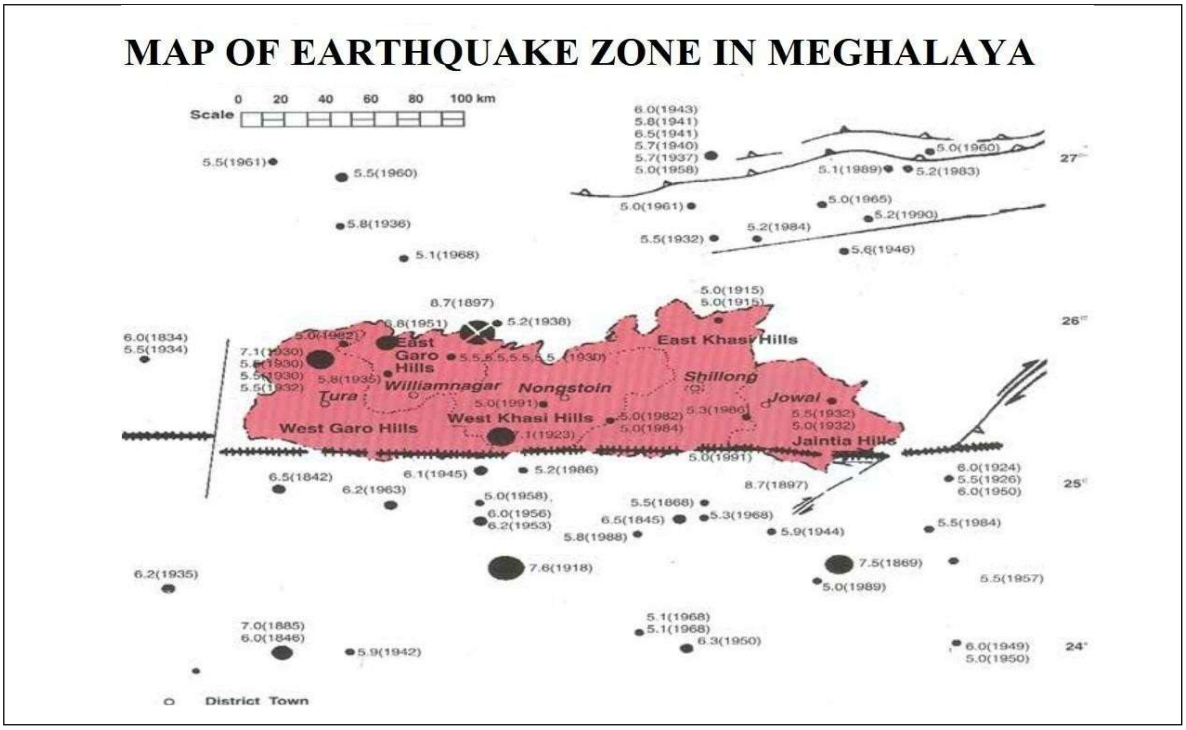



Figure 12: Earthquake Zones Map of Meghalaya

- **Flood Hazard:**

  In Meghalaya, floods occur in river valleys when the flow exceeds the capacity of the river channel, particularly at bends or meanders. The plain areas of Meghalaya adjoining Assam are affected by flood due to the back flow of water from the River Brahmaputra during the flood season between June and October. The tributaries like Krishnai, Jinari, Jingjiram, Rongai, Dudhnoi, Ringgi, Gohai, Dilni etc. cause flood in the plain areas of the State.

  The Flood Prone Areas of Meghalaya:

  Western part of Meghalaya like Tikrikilla, Phulbari, Rajabala, Garobadha, Hallidaygunj,Bhaitbari, Fersakandi, Magurmari, Silkata, Mahendraganj etc.

  Plain areas near Bangladesh like Baghmara, Balat, Shella, Dawki etc.Urban

  Flooding in localized areas of Shillong, Williamnagar, Tura etc.

  Localised areas of West Khasi Hills, South West Khasi Hills, East Khasi Hills Jaintia Hills and in Ri-Bhoi Districts.

  Project district also fall under flood prone area. Flood prone area of Meghalaya is shownin the Figure below

  The project area is not known to face significant impacts from monsoon floods.However, it does witness flash floods in certain low-lying areas.

- Flood prone areas of Meghalaya is shown in Figure 13.

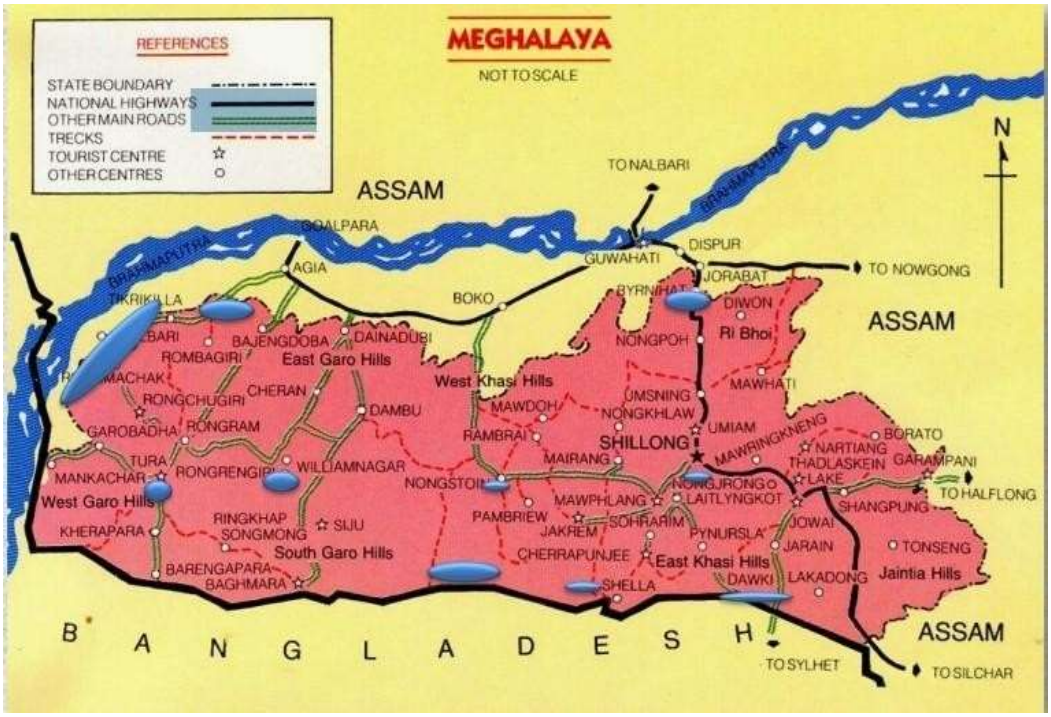



Figure 13: Flood Prone Zones of Meghalaya

Source: http://www.mati.gov.in/docs/Academic%20Module%20-%202/PDF%20(3rd%20November%202021)/vulnerability%20profile%20of%20meghalaya%20 18th%20October,2013-SDMA.pdf

- **Landslide Hazard:**

Meghalaya being a hilly terrain is prone to landslides. Every year a number of landslides have been reported from various localities. These cause a lot of miseries to public, resulting in loss oflives and properties, disruption of communication network, besides causing economic burden on the society. Landslide is primarily attributed to high slope, immature geology, neo-tectonic activity, heavy rainfall, unplanned and improper land use practice in the State. Landslides generally occur during heavy rains that is during the months of June to October in Meghalaya. The existing road section comes under high landslide zones.

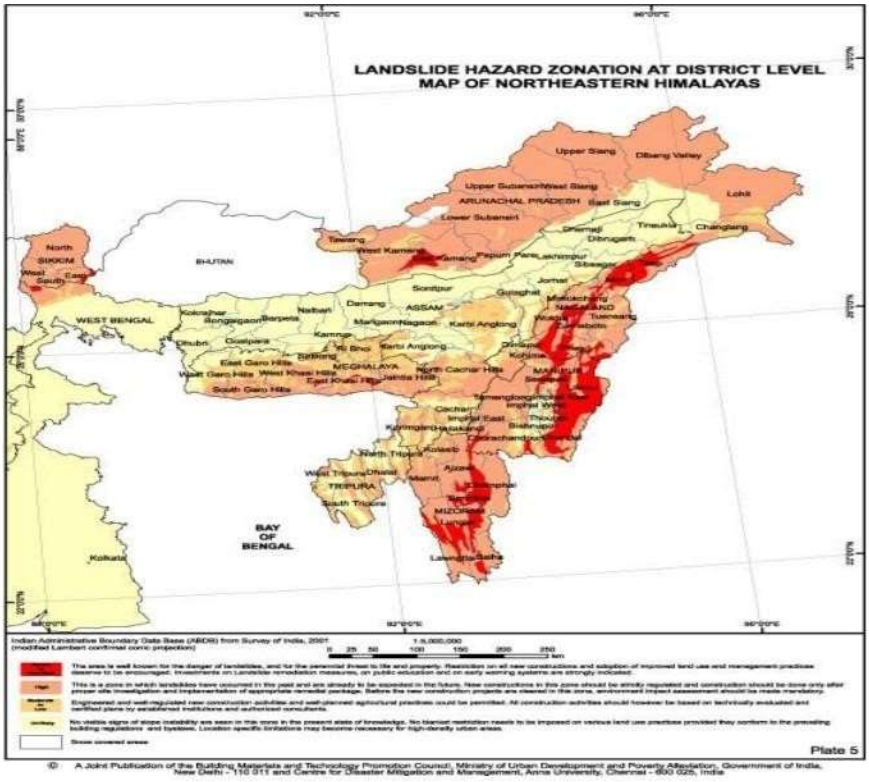



Figure 14: Landslide Map of North-Eastern Himalayas

Source:https://megrevenuedm.gov.in/reports/Meghalaya_State_Disaster_Management_Plan_Volume1. pdf

Most of the project stretches lies in plain terrain but two of them lies in hilly terrain. The road stretches do not fall under landslide prone zone. Refer Figure 15 given below:

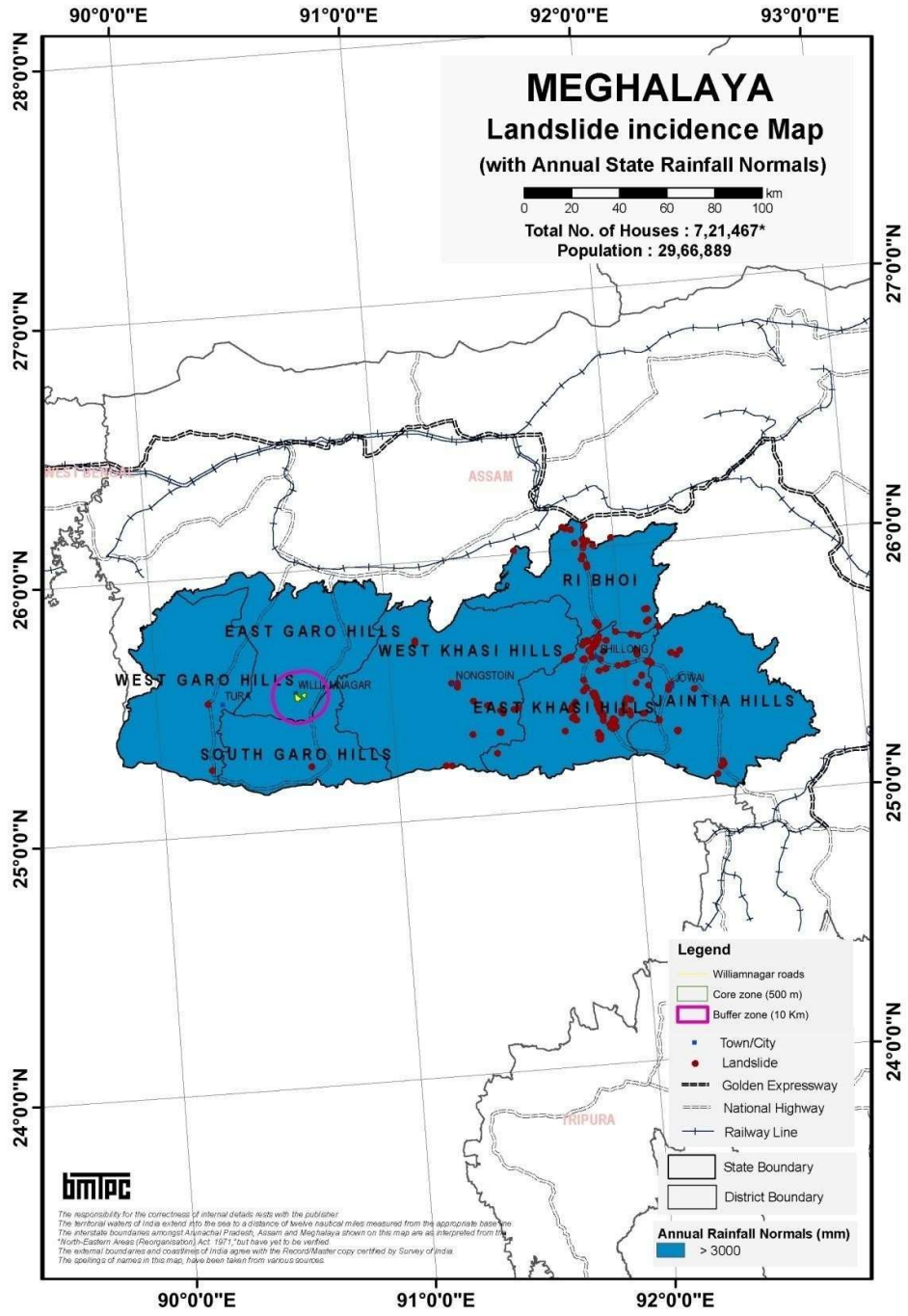



Figure 15: Landslide prone zones of Meghalaya

- **Cyclone**

Meghalaya is situated in the north eastern direction of Bangladesh which is highly prone to cyclone. Yearly, approx. 60% percent of the state is affected by cyclone in Bangladesh. The Districts close to Bangladesh like South West Garo Hills, South Garo Hills, South West Khasi Hills, West Khasi Hills, fall in very high cyclonic zone due to close proximity to Bay of Bengal which is a cyclone basin). During April – May,

various parts of Meghalaya observe cyclone. Ithas detrimental impacts on society and environment.[2] East Garo Hills district and project area road section also comes under high cyclonic zone.

### 4.6 Land Environment:

The project area is passing through mainly built-up area. The land use pattern alongside the project roads is predominantly built-up. 80% of the project area is passing through built-up area.The land use map of the project area is shown in Figure 16

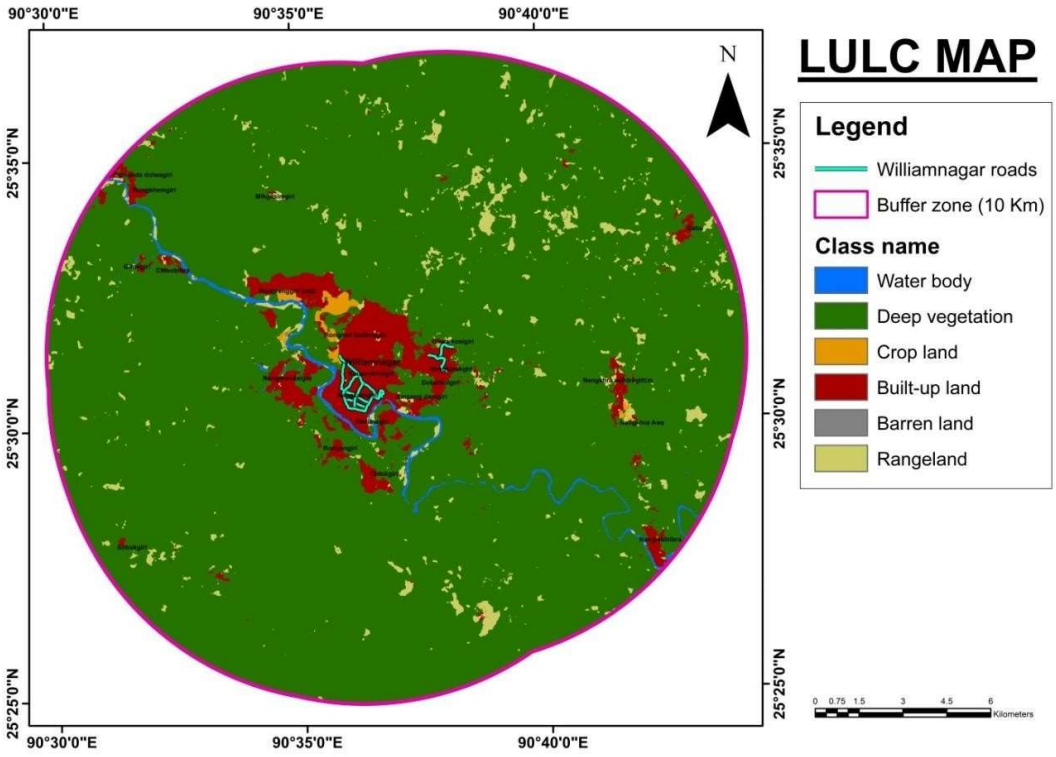



Figure 16: Land Use Map of the Project Area

### 4.7 Drainage

The drainage system of the district is controlled by topography. The East West trending hills ranges passing through the area of Dilmagiri, Rongdolgiri, Narringiri, Wethesa ranging in elevation between 688 to 784 m above mean sea level serves as water divide and dissect the area into two drainage basins viz the Brahmaputra and the Meghna. The northern basin drains the water into the mighty river Brahmaputra, Assam whereas the southern ones into Meghna, Bangladesh. The southern basin is drained by the river Simsang which is the major perennial river in the southern part of the district. The northern basin is drained by the tributaries viz Manda (Dudhnoi), Damring (Krishnoi) etc. into the Brahmaputra.

[2] Meghalaya State Disaster Management Plan River Simsang is passing near the project road stretches. Drainage map of the study area is shown below.

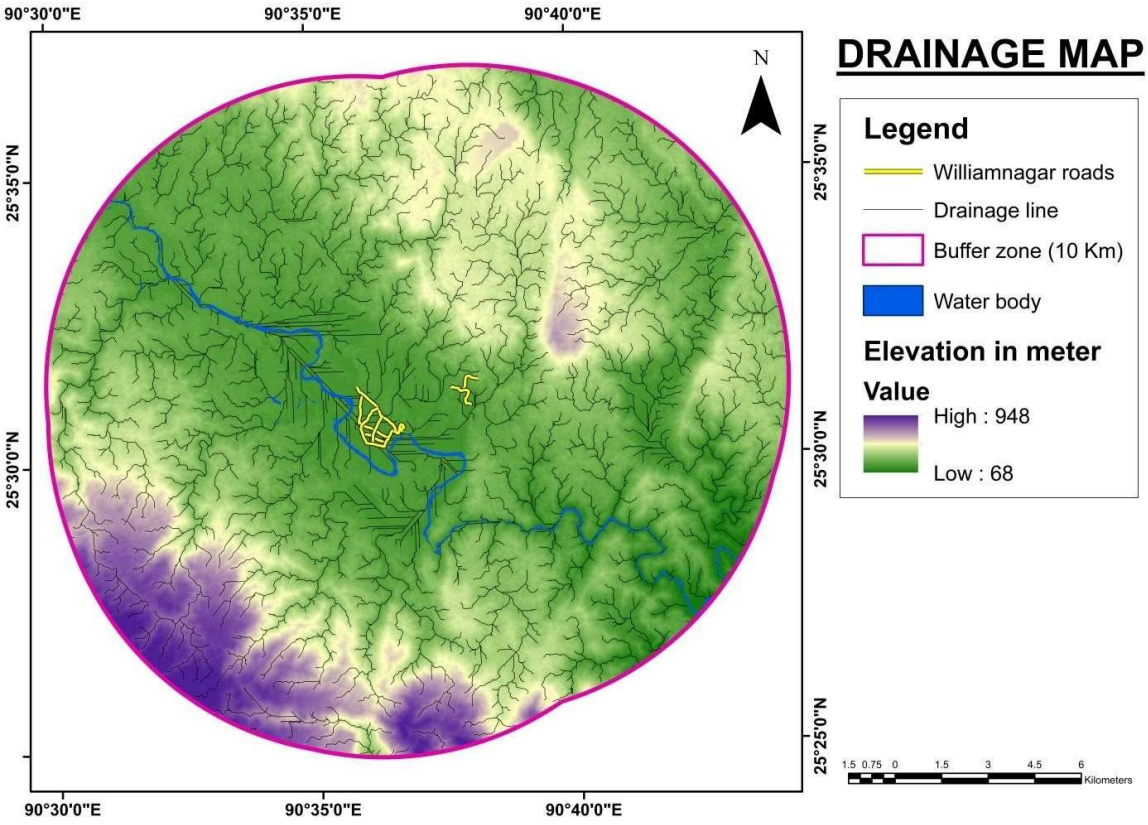



Figure 17: Drainage Map of Project Area

**Hydrogeology**

The hydrogeological framework of the district is essentially controlled by geological setting, distribution of rainfall and movement of ground water through inter-connect weak planes due to joints, fissures and faults, primary and secondary porosities of the Geological formation. Hydrogeologically, the district can be divided into three units, namely consolidated, semi consolidated and unconsolidated formations.

Development of ground water in the district is practically negligible. As the district is characterized by undulating terrain, the scope for development of ground water lies in low lying depressions and the valley fills, which hold good prospects for ground water development. Moreover, in the district all the minor irrigation scheme are executed by the surface water only and as per Ground water resources estimation, the stage of ground water development is only 0.005% which leaves a greater scope for ground water development. Ground water development is being done through dug wells and bore wells in the intermontane valleys and linear ridges. The development of springs is seen mainly along the foothills. The ground water

is mainly used for domestic purposes such as washing and drinking. Therefore, there is amplescope for future development of ground water in the area. (Source: http://cgwb.gov.in/)

### 4.8 Water Environment:

Surface water:

There are few ponds found near to the project road given below.

Table 11: Nearby Water Bodies Along the Project Road

| ***Sl.No*** | ***Water Body*** | ***Road*** | ***Distance from the road (m)*** |
|---|---|---|---|
| 1. | *Pond* | *Junction to junction 22 start point* | *3.53* |
| *2.* | *Pond* | *Junction to junction 21 start point* | *5.82* |
| *3.* | *Pond* | *Junction to Junction* Kusimkolgre near Simsang River | *15.91* |


Figure 18: Photographs of few Surface Water Bodies along the Project Road

### 4.8.1 Water Quality Monitoring

During the environmental screening, no major impact is identified on nearby surface and ground water quality due to the project activities as the project involve upgradation of existing urban road within RoW. Therefore, secondary information has been collected from Meghalaya State.

Pollution Control Board and a published environmental assessment report of Rongram - Rongrenggre - Darugre Road (https://megpwd.gov.in/pdf/EIAs/Environmental-Impact- Assessment-for-Rongram-Rongrenggre-Darugre-Road.pdf).

Table 12: Ground water sampling locations near Williamnagar

| Location No. | Name of place | Distance from Williamnagar (Km) | Coordinates | |
|---|---|---|---|---|
| | | | Latitude | Longitude |
| 1 | Chinabat | 21.18 | 25°43'2.39"N | 90°32'49.50"E |
| 2 | Asanang | 32.85 | 25°36'1.46"N | 90°16'25.46"E |


Figure 19: Groundwater sampling locations near Williamnagar

Table 13: Ground Water quality result

| Sl No. | Parameter | Asanang | Chinabat | Permissible Limit | Unit |
|---|---|---|---|---|---|
| 1 | pH | 6.9 | 6.8 | 6.5-8.5 | |
| 2 | EC | 0.22 | 0.24 | - | mmhos /c |
| 3 | Nitrate | 0.31 | 0.29 | 45 | mg/l |
| 4 | Total Hardness | 91 | 93 | 200 | mg/l |
| 5 | Chloride | 6.7 | 5.9 | 250 | mg/l |
| 6 | Sulphate | 5.24 | 7.26 | 200 | mg/l |
| 7 | Fluoride | 0.53 | 0.54 | 1.0 | mg/l |
| 8 | TSS | 182 | 175 | - | mg/l |
| 9 | Dissolved solids | 141 | 134 | 500 | mg/l |
| 10 | Iron | 0.7 | 0.8 | 0.3 | mg/l |
| 11 | Potassium | 3.8 | 3.4 | | mg/l |
| 12 | Magnesium | 7.1 | 8.2 | 30 | mg/l |
| 13 | Calcium | 23.2 | 21 | 75 | mg/l |
| 14 | Lead | BDL | BDL | 0.01 | mg/l |
| 15 | Cadmium | BDL | BDL | 0.01 | mg/l |
| 16 | Copper | 0.01 | 0.02 | 0.04 | mg/l |
| 17 | Chromium | BDL | BDL | 0.01 | mg/l |
| 18 | Zinc | 0.19 | 0.23 | 5 | mg/l |
| 19 | Nickel | BDL | BDL | - | mg/l |

*Source: Environmental Baseline Monitoring*

It can be seen from that; the pH of the drinking water varies from 6.8 to 6.9. Total hardness as $CaCO_3$ varies from 91 to 93 mg/l. It can be seen from the results that the ground water quality meets the standards of IS:10500-2012 standards for drinking water and CPCB standards for ground water, except for the high level of Iron content at all sampling locations. As per a surface water quality study conducted by Meghalaya SPCB, the surface water quality data of Simsang river in Williamnagar is presented below:

| Location | pH 6.5 -8.5 | DO >4.0 mg/l | BOD <3.0mg/l | FC <2500MPN/ 100ml | TC <5000MPN /100ml | Fs <500/100 ml | Water Quality Status |
|---|---|---|---|---|---|---|---|
| Simsang at Williamnagar | 7.1 | 7.5 | 1.6 | 84 | 330 | ---------- | Satisfactory |

(Source: https://megspcb.gov.in/)

### 4.9 Air Environment:

Air pollution is caused due to both natural and manmade processes. The main source of manmade air pollution includes industrialization and its by products, burning of timber, heat and

light, rapid urbanization, vehicular pollution, plastics, burning of polymers and processing of various materials emitting obnoxious gasses, generation of smoke, dust and fine respirable particles due to construction activity and rapid burning etc. Vehicular emission is major sourceof air pollution now-a-day. Presently some patches of the study area are in the locality of heavy traffic movement particularly at congested places i.e at major market areas, which may impact the ambient air quality of the area. During construction stage of the project, temporary air pollution arises due to movement of construction vehicles, operation of plants & machineries, dust emission due to excavation and demolition etc.

Based on historical data analysis, the state of Meghalaya is considered to be in the same airshed. Therefore, secondary information collected from SPCB has been compared with a single available data of Williamnagar (Meghalaya_Annual%20Report%202019- 2020_Ready%20for%20print.pdf) to understand the baseline condition.

## 4.10 Monitoring Parameters and Standards

The Environmental monitoring of the parameters involved and the threshold limits specified are discussed below: -

### 4.10.1 Ambient Air Quality Monitoring

The air quality parameters viz. Sulphur di-oxide ($SO_2$), Oxides of Nitrogen ($NO_X$), Carbon Monoxide (CO) and Particulate Matter ($PM_{2.5}$& $PM_{10}$) shall be regularly monitored at identified locations from the start of the construction activity. The air quality parameters shall be monitored in accordance with the National Ambient Air Quality Standards.

The ambient air quality with respect to the study area forms the baseline information. The prime objective of the baseline air quality study was to assess the existing air quality of the area. This will also be useful for assessing the conformity to standards of the ambient air quality during the construction and operation phase.

This section describes the selection of sampling locations, methodology adopted for sampling, analytical techniques and frequency of sampling. The secondary data is taken from an environmental assessment report of Rongram- Rongrenggre- Darugre Road(https://megpwd.gov.in/pdf/EIAs/Environmental-Impact-Assessment-for-Rongram-
Rongrenggre-Darugre-Road.pdf).

#### *4.10.1.1 Methodology Adopted for Air Quality Survey*

**Selection of Sampling Locations:**

The baseline status of the ambient air quality has been assessed through a scientificallydesigned ambient air quality monitoring network. Selection of Air quality monitoring station was done as per MoEF guidelines for conducting EIA study. The design of monitoring network in the air quality surveillance program has been based on the following considerations:

- Meteorological conditions on synoptic scale;
- Topography of the study area;
- Representatives of regional background air quality for obtaining baseline status;
- Representatives of likely impact areas.

#### *4.10.1.2 Frequency and Parameters for Sampling*

Ambient air quality monitoring was carried out for 24hrs representing winter season. Highvolume samplers were used to collect/measure the air pollutant concentration data at 24 hours averaging periods for all stations. The baseline data of air environment was monitored for parameters mentioned below:

- Particulate Matter (PM2.5);
- Particulate Matter (PM10);
- Sulphur dioxide ($SO_2$);
- Oxides of Nitrogen ($NO_x$);
- Carbon Monoxide (CO)

The AAQ sampling is carried out as per the present revised standards mentioned in the latest Gazette notification of the Central Pollution Control Board (CPCB) (November, 2009).

The baseline status of the ambient air quality has been checked through ambient air quality monitoring at selected points along the project road. The ambient air quality has been monitored at 2 locations as shown in Table 16: Ambient Air Quality Monitoring locations along the project road

along the project road for particulate matter ($PM_{2.5}$ and $PM_{10}$), Sulphur dioxide ($SO_2$), oxides of nitrogen ($NO_X$); and carbon monoxides (CO) using standard analysis technique is shown in the table below.

Table 14: Techniques Used for Ambient Air Quality Monitoring

| Sl. No. | Parameter | Technique | Minimum Detectable Limit (µg/m$^3$) |
|---|---|---|---|
| 1. | Particulate Matter ($PM_{2.5}$) | Gravimetric Method | 10.0 |
| 2. | Particulate Matter ($PM_{10}$) | Gravimetric Method | 25.0 |
| 3. | Sulphur dioxide | Modified West and Gaeke | 5.0 |
| 4. | Nitrogen Oxide | Modified Jacob & Hochheiser | 5.0 |
| 5. | Carbon Monoxide | Non-Dispersive Infrared Spectroscopy (NDIR) | 1(in mg/m$^3$) |

To study the baseline ambient air quality scenario within the project corridor the ambientair quality, air sampling was carried out in the winter season. To generate post-monsoon air quality of the project area, samples of ambient air was collected from four (4) locations for twice a week for two weeks.

Table 15: Ambient Air Quality Monitoring locations along the project road

| Sl. no | Name of place | Distance (km) | Coordinates | |
|---|---|---|---|---|
| | | | Latitude | Longitude |
| 1 | **Chinabat** | 21.18 | 25°43'2.39"N | 90°32'49.50"E |
| 2 | **Asanang** | 32.85 | 25°36'1.46"N | 90°16'25.46"E |
| 3 | **Office Premises of E.E, PHED, Nongstoin** | 67.96 | 25°30'19.04"N | 90°11'40.76"E |

| Sl. no | Name of place | Distance (km) | Coordinates | |
|---|---|---|---|---|
| | | | Latitude | Longitude |
| 4 | **PHED, Araimille, Tura** | 39.96 | 25°31'17.49"N | 91°15'45.78"E |

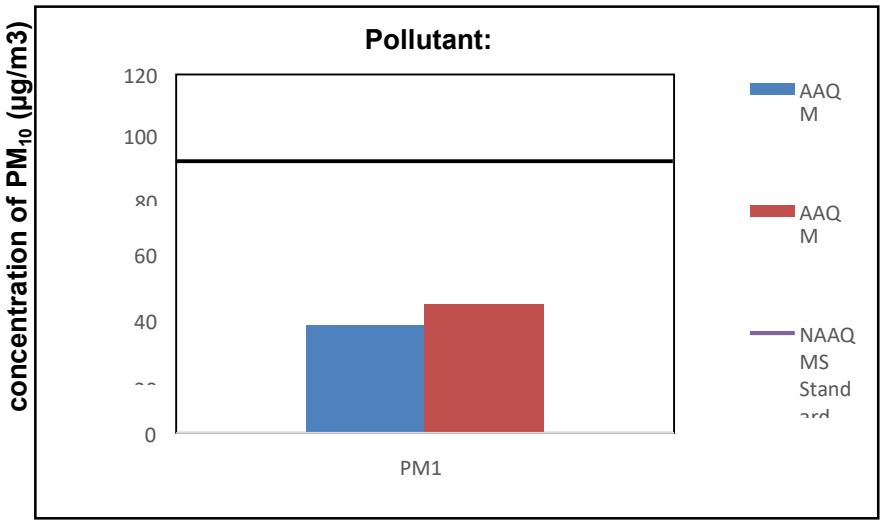
*Source: environmental assessment report of Rongram-Rongrenggre-Darugre Road.*

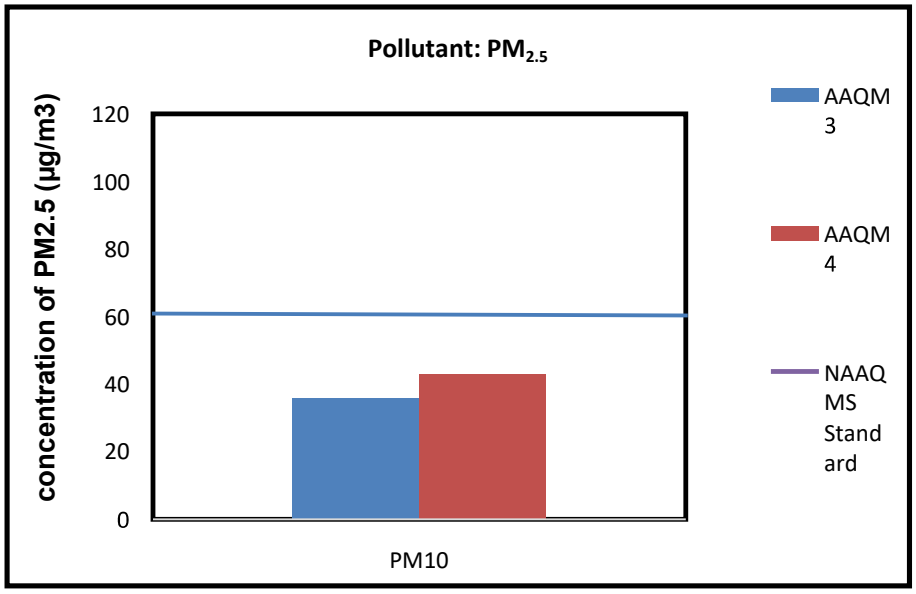

Figure 20: Air Quality Monitoring locations near Williamnagar

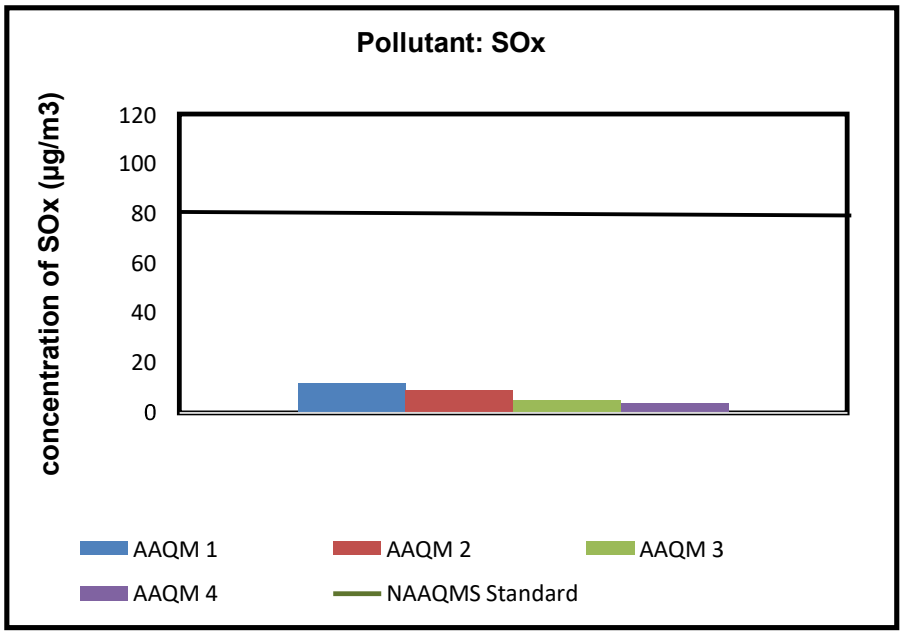
Ambient air quality monitoring results for $PM_{2.5}$, $PM_{10}$, $SO_2$, $NO_X$, and CO concentrations are summarized below. The monitored values are compared with National Ambient Air Quality Standards prescribed by Central Pollution Control Board (CPCB) and WHO Ambient Air Quality Guidelines (IFC EHS) for residential, rural, and other areas.

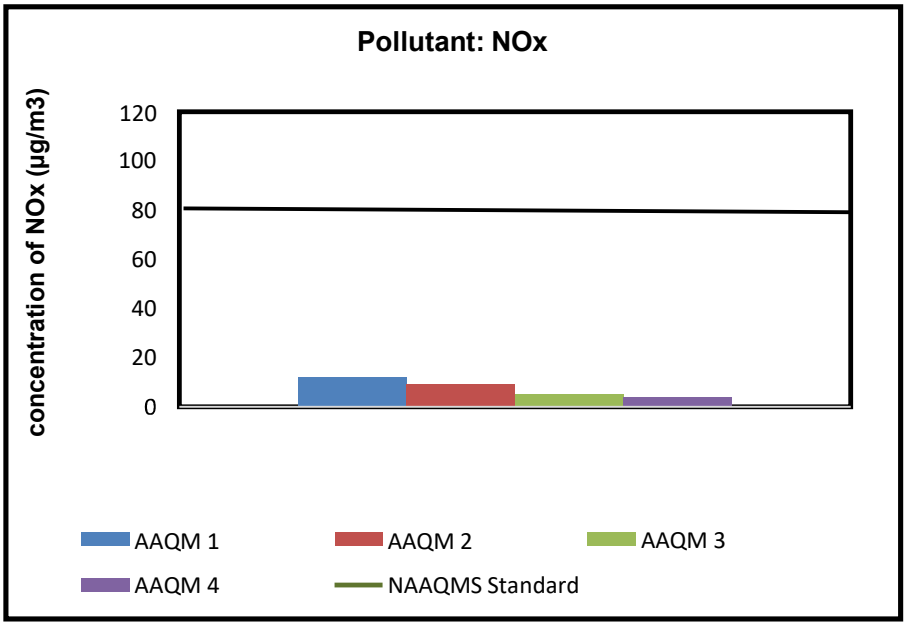
Table 16: Ambient Air Quality Data

| | S. N. | Particulate Matter ($PM_{10}$) | Particulate Matter ($PM_{2.5}$) | Sulphur Dioxide | Nitrogen Dioxide |
|---|---|---|---|---|---|
| National Ambient Air Quality Standard (CPCB) - Permissible limit | | 100 | 60 | 80 | 80 |
| **Chinabat** | 1 | | | 12 | 24 |
| **Asanang** | 2 | | | 9 | 22 |
| **Office Premises of E.E, PHED, Nongstoin** | 3 | 36 | 24 | 5 | 15 |
| **PHED, Araimille, Tura** | 4 | 43 | 14 | 4 | 14 |






Ambient air quality levels meet the National air quality standards for the rural, residential areaall along the project road. Concentrations of all the parameters at four locations are within the National Ambient Air Quality Standard (CPCB) - Permissible limit.

- $PM_{2.5}$: The mean $PM_{2.5}$ concentrations at ambient air quality monitoring locations varies from 14 µg/m$^3$ to 24 µg/m$^3$. The values are within the permissible limit atall the stations.
- $PM_{10}$: The mean $PM_{10}$ concentration at ambient air quality monitoring locations varies from 36 to 43 µg/m$^3$. The values are within the permissible limit at all the stations as per the NAAQS.

- $SO_2$: The mean concentrations of $SO_2$ at all ambient air quality monitoring locations vary from 4 µg/m$^3$ to 12 µg/m$^3$. The values are within the permissible limit at all the stations.
- $NO_X$: The mean concentrations of $NO_X$ at all AAQM locations range from 14 to24 µg/m$^3$. The values are within the permissible limit at all the stations.
- The data obtained from dumping site at Williamnagar was much low as the monitoring was conducted in June.

## 4.11 Noise Environment:

Noise can be defined as any sound that is undesirable because it interferes with speech and hearing, and is intense enough to damage hearing or is otherwise annoying. Noise impacts can be of concern during construction and operational phases of the project.

Noise quality is an issue particularly at congested locations due to heavy traffic jams, horns and slow-moving traffic. The educational institutions, health care facilities, Court etc. along the project corridor comprise sensitive receptors with respect to noise pollution.

The Ambient Noise Quality Standards with respect to noise have been stipulated by Govt. of India vide Gazette Notification dt.14.02.2000.

Table 17: Ambient Noise Standards

| Area Code | Category of Area | Limits in dB (A), Leq | |
|---|---|---|---|
| | | Day time | Night time |
| A | Industrial Area | 75 | 70 |
| B | Commercial Area | 65 | 55 |
| C | Residential Area | 55 | 45 |
| D | Silence Zone* | 50 | 40 |

* Silence zone is defined as an area up to 100 meters around such premises as hospitals, educational institutions and courts. The silence zones are to be declared by the competent authority;

A separate Environment Management and Monitoring Plan for the safeguard of noise environment has been prepared to mitigate the different impacts caused due to construction activities, which is provided in the subsequent chapters.

### 4.11.1 Noise Quality Monitoring

Noise in general is sound which is composed of many frequency components of various types of loudness distributed over the audible frequency range. Various noise scales have been introduced to describe, in a single number, the response of an average human to complex sound made up of various frequencies at different loudness levels. The noise is measured as dB (A).

This is more suitable for audible range of 20 to 20,000 Hz. The scale has been designedto weigh various components of noise according to the response of a human ear. The impact of noise sources on surrounding community depends on:

- Characteristics of noise sources (instantaneous, intermittent or continuous in nature). It can be observed that steady noise is not as annoying as one which is continuously varying in loudness;

- The time of day at which noise occurs, for example high noise levels at night in residential areas are not acceptable because of sleep disturbance; and
- The location of the noise source, with respect to noise sensitive land-use, which determines the loudness and period of exposure.

The main objective of noise monitoring in the study area is to establish the baseline noise levels, and assess the impact of the total noise generated by the constructionwork and movement of vehicles during operations phase.

**Identification of Sampling Locations**

A preliminary reconnaissance survey was done to identify the major noise generating sources along the proposed alignment. Onsite recording of noise level has been done using mobile app. The same has been compared with the secondary information collected from EIA report (https://megpwd.gov.in/pdf/EIAs/Environmental-Impact-Assessment-for-Rongram-Rongrenggre-Darugre-Road.pdf). The noise at different noise generating sources has been identified based on industrial, commercial, and residential activities, traffic, and noise at sensitive areas. Sound Pressure Level (SPL) measurements were undertaken at all locations, with an interval of about 5 secondsover 10 minutes per hour for 24 hr. The day noise level has been monitored from7 AMto 10 PM and night levels from 10 P.M. to 7 AM at 2 locations. The Details of the monitoring locations are given below. Day and night-time noise monitoring have been calculated from hourly Leq values and compared with the stipulated standards.

The monitored values are compared with CPCB Ambient Air Quality Standards in respect of Noise and Guidelines for Community Noise, World Health Organization for residential areas. The monitored levels meet the National as well as WHO standards for the residential area all along the project road.

The main objective of noise monitoring in the study area is to establish the baselinenoise levels, which was used to assess the impact of total noise generated by the proposed project activities. Noise level monitoring was carried out continuously for 24 — hours with one-hour interval at each location using Sound level meter capable of measuring the Sound Pressure Level (SPL) in Db (A). Hourly Leq values were computed by the noise integrating sound level meter and statistical analysis was done for measured noise levels in the study area.

Table 18: Noise Quality Monitoring Data

| Sampling Location | Location Name | Distance | Coordinates | |
|---|---|---|---|---|
| | | | Latitude | Longitude |
| 1 | Chinabat | 21.18 | 25°43'2.39"N | 90°32'49.50"E |
| 2 | Asanang | 32.85 | 25°36'1.46"N | 90°16'25.46"E |

*Source:*https://megpwd.gov.in/pdf/EIAs/Environmental-Impact-Assessment-for-Rongram-Rongrenggre-Darugre-Road.pdf

| Sampling Location | Location Name | Coordinates | |
|---|---|---|---|
| | | Latitude | Longitude |
| 1 | RSN Rd to Terrace Gittim | 25°31'2.41"N | 90°37'55.66"E |
| 2 | To junction Kusimkolgre | 25°30'30.34"N | 90°36'13.21"E |

| Sampling Location | Location Name | Coordinates | |
|---|---|---|---|
| | | Latitude | Longitude |
| 3 | Kusimkolgre internal link road | 25°30'57.96"N | 90°35'54.66"E |
| 4 | To junction Rd. 23 | 25°30'45.69"N | 90°36'19.18"E |

Source: Mobile app data collected during site visit

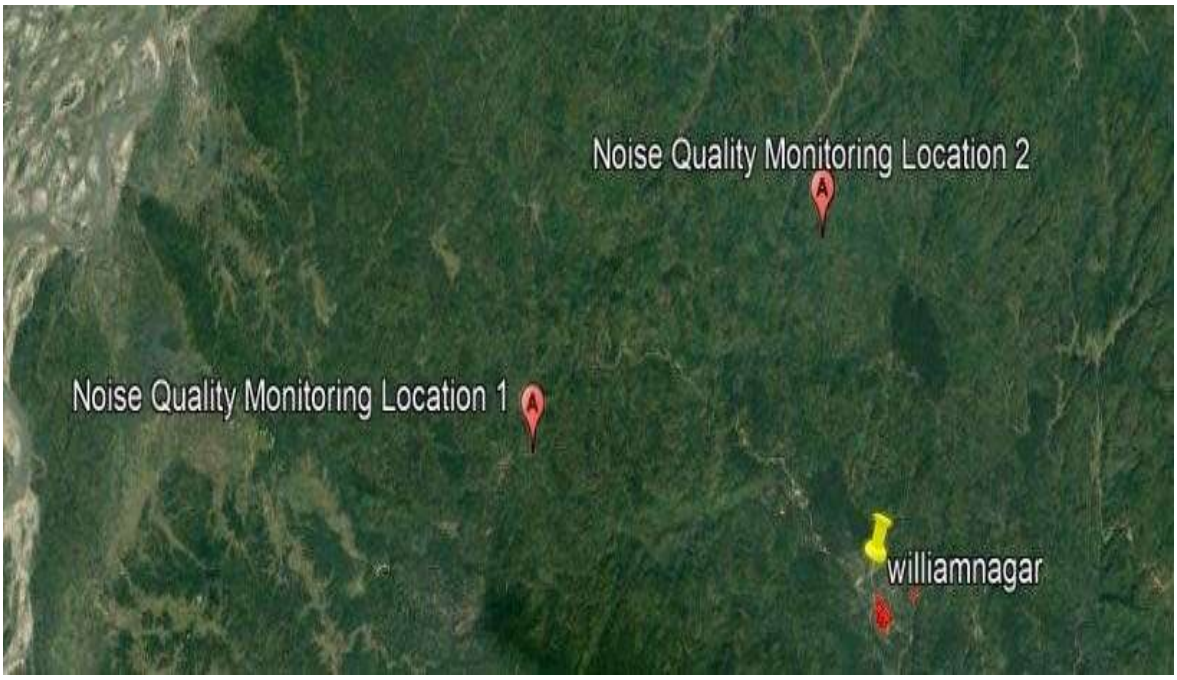



Figure 21: Noise monitoring locations along the project road Day and Night Time Noise monitoring data

Table 19: Average Noise Level in dB

| Sl. No | Location | Average Noise Level in dB | |
|---|---|---|---|
| | | Day Time | Night Time |
| 1 | Asanang | 44 | 33 |
| 2 | Chinabat | 36 | 30 |
| 3 | RSN Rd to Terrace Gittim | 46.2 | 41.5 |
| 4 | To junction Kusimkolgre | 62.7 | 54.1 |
| 5 | Kusimkolgre internal link road | 52.8 | 49.3 |
| 6 | To junction Rd. 23 | 78.3 | 64.5 |

It has been seen from Table 19 that at all the monitoring locations, the ambient noise levels are well within the permissible limits as prescribed by CPCB and also by World Bank EHS standards except at few road junctions at Williamnagar.

### 4.12 Biological Environment:

Ecological resources are among the most important resources impacted by the road/infrastructure projects. The detailed baseline study of the ecological resources is essential to estimate the magnitude of potential impacts and to avoid or mitigate any loss caused by the proposed project. The baseline details of the flora and fauna around the project road are described below.

Meghalaya falls under the Indo-Myanmar Bio-diversity Hotspot zone. Meghalaya is one of the biodiversity rich states of India in terms of diversity of both flora and fauna due to its unique geographical position at the meeting point of Indo-Malayan and Eastern Himalayan bio- geographical regions. Thus, it shares biodiversity elements including flora and fauna from both the regions. Meghalaya also shares rich species diversity containing species from Indo-China and rest of India. The diverse landscape of the state also supports a large array of forest types and species. The flora of Meghalaya comprises about 3,128 species of flowering plants of which a large number of species are endemic. Meghalaya harbours a rich diversity of orchids (Family: Orchidaceae), of which nearly 110 genera and 439 taxa are reported from the state. Meghalaya is also considered as center of origin for a number of crop plants like rice, andCitrus based on the large number of wild relatives found in the state.

The faunal diversity of Meghalaya constitutes a total of 5538 species recorded so far, of a total 89,451 species known from India. Nearly 35 % of Indian Mammals and 50 % of the birds are represented in the state (. Invertebrates are represented by 2114 genera and 4580 species, of which 3624 species are insects. Among invertebrates, the porifera is the smallest group represented by only one genus and one species. Meghalaya has 139 species of Mammals, 659 species of Birds, 107 species of Reptiles, 55 species of Amphibia and 152 species of Fishes. Of these, 35 species of Mammals are endangered, vulnerable or insufficiently known. Similarly, 10 species of birds and 9 species of reptiles are either endangered or vulnerable. Along withthe species diversity, the State has a significant percentage of endemic elements.

Table 20: Faunal Diversity of Meghalaya

| | **No. of Genera** | **No. of Species** |
|---|---|---|
| Vertebrates | | |
| Mammalia | 83 | 139 |
| Aves | 232 | 659 |
| Reptilia | 51 | 107 |
| Amphibia | 11 | 55 |
| Pisces | 74 | 152 |
| Invertebrates | 2114 | 4580 |
| Bryozoa | 3 | 5 |
| Arthropoda | 1825 | 3901 |
| Annelida | 25 | 49 |
| Mollusca | 67 | 223 |
| Nematoda | 49 | 77 |
| Rotifera | 30 | 111 |
| Platyhelminthes | 56 | 83 |
| Medusae | 2 | 2 |
| Porifera | 1 | 1 |
| Protozoa | 56 | 128 |

**Protected Areas of Meghalaya:**

The protected area network in Meghalaya occupies 1133.9 Sq. Km area which constitutes about 5.06 % of the State's Geographical Area. The Protected Area Network includes 2 national Parks, 4 wildlife Sanctuaries and 1 Biosphere Reserve playing an important role in in- situ conservation of Biodiversity. There are 24 Reserved Forests (RFs) in the state with area varying from 0.44 $km^2$ to 150 $km^2$ covering a total of 712.74 $km^2$ area. Being located in the urban area there is no protected forest area within project AoI. The nearest RF is the Rongrenggiri, which is about 6 km from the nearest project site and as the project site which is already degraded in nature due to encroachment and wood extraction.

| District | Name of Reserved Forests | Area (in sq. km.) | Distance from Project Road |
|---|---|---|---|
| East Garo Hills District | Darugiri R.F. | 10.36 | 25.03 km |
| | Rongrenggiri R.F. | 36.26 | 5.71 km |
| | Dambu R.F. | 18.13 | 36.26 |
| | Songsak R.F. | 23.31 | 14.36 km |

The nearest Protected area is Nokrek National Park, which is about 12 km away from theproject site and falls outside of both Direct and Indirect impact zone. The Protected Area Network of Meghalaya is given in Figure 22 and the distance of the Project site from the Nokrek National Park is given in Figure 23. The distance of the Project Site from the Rongrenggiri RF is shown in Figure 24.

**Table 22: Protected Areas in Meghalaya:**

| Sl No | Protected Area | Area (sq kms) | District |
|---|---|---|---|
| 1 | Balpakram National Park | 352.00 | South Garo Hills |
| 2 | Nokrek National Park | 47.48 | East Garo Hills |
| 3 | Nongkhyllem Wildlife Sanctuary | 29.00 | Ri-Bhoi District |
| 4 | Siju Wildlife Sanctuary | 5.18 | South Garo Hills |
| 5 | Baghmara Pitcher Plant Sanctuary | 0.02 | South Garo Hills |
| 6 | Narpuh Wildlife Sanctuary | 59.9 | East Jaintia |
| 7 | Nokrek Biosphere Reserve | 820 | East, West and South Garo Hills |

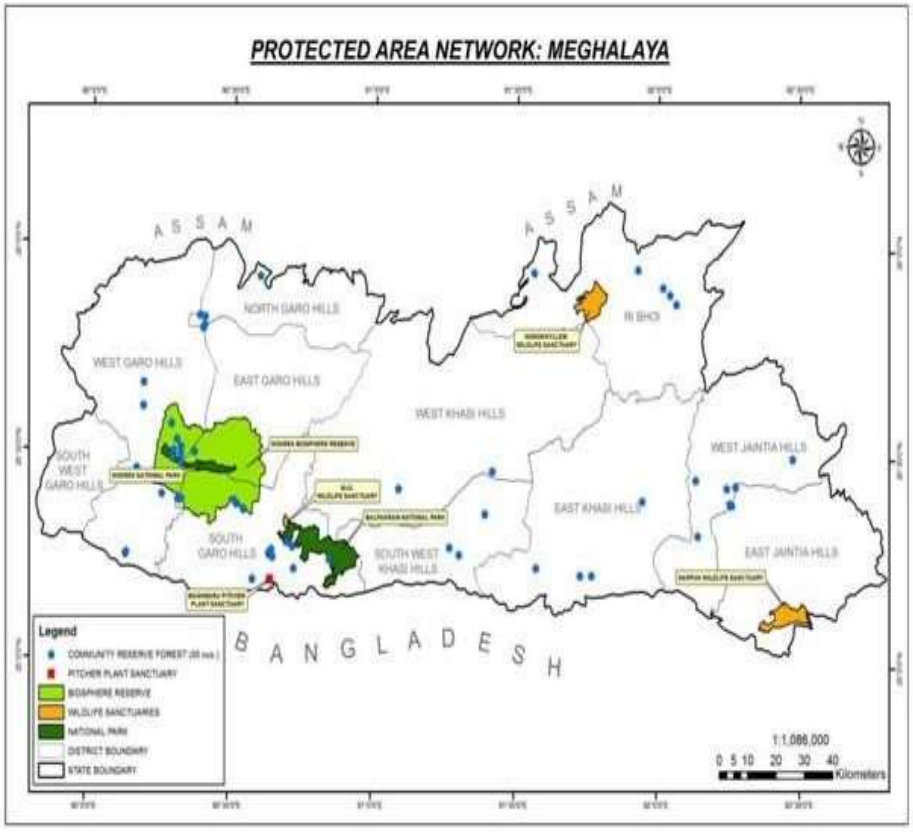



Figure 22: Protected Area Network: Meghalaya

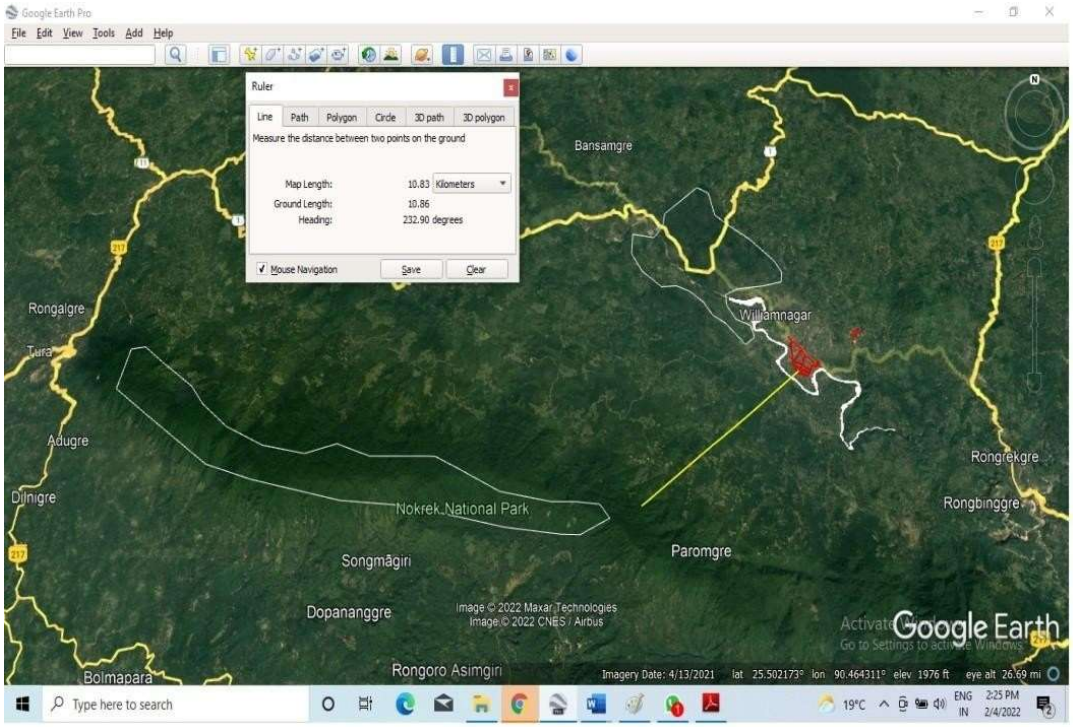



Figure 23: Distance of Nokrek National Park from the project stretch

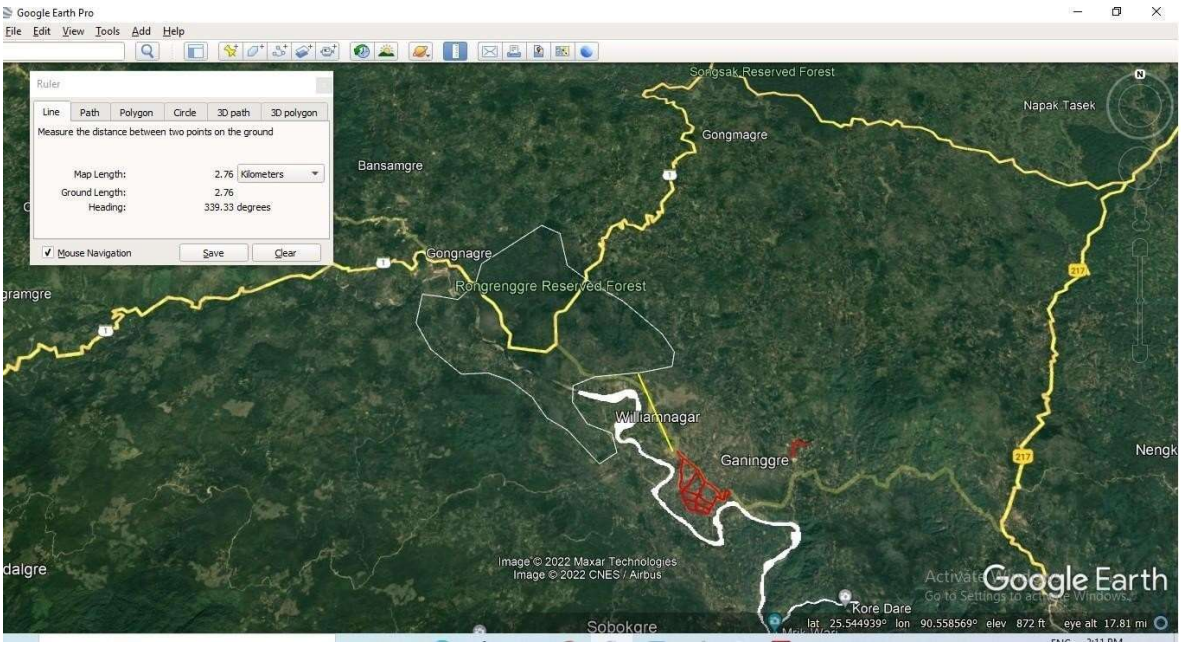



Figure 24: The distance of the Project Site from the Rongrenggiri RF

**Community Reserves:**

Community Reserves or Conservation Reserves are special category of protected areas and it recognizes the fact that local communities can participate in protection of threatened species and natural resources. Meghalaya has a large number of Community Reserves, the largest for any Indian state. The Govt. of Meghalaya has declared 73 private and community lands/forests into Community Reserves, to increase the area under protected networks for protecting flora, fauna and traditional or cultural conservation values and practices. All Community Reserves situated in East Garo Hill District are away from the project sites.

| District | Name of Community Reserve | Area (Ha) | Distance from Project Site |
|---|---|---|---|
| East Garo Hills | Mandalgre | 50 | 18.69 km |
| | Daribokgre | 173 | 27.43 km |
| | Dura Kalakgre | 60 | 31.23 km |
| | Aruakgre | 10 | 38.21 km |

**Elephant Reserve and Corridor:**

The state has a substantial population of Asian elephant and due to this high density ofelephants in the state; the state has developed various policies for their conservation. For protection and conservation of elephants in Garo Hills area, Meghalaya government has notified (vide- No.132/2000/97 dated 31st October 2001) a 3500 $km^2$ area as Garo Hills Elephant Reserve under Project Elephant, MoEFCC, Govt of India. Nokrek and Balpakram National Park forms the core area (400 $Km^2$) of the Elephant Reserve and majority of the part ofthe Elephant Reserve is situated in East Garo and South Garo Hill Districts. According to ‗Right of Passage: Elephant Corridors of India (2017), five active elephant corridors have been identified in the State of Meghalaya. No elephant Corridor is present in the close vicinity of the RoW. During public consultation and discussion with Forest Official, no presence of wild elephants from the close vicinity of the RoW has been reported. The Elephant Corridors in Meghalaya is shown in Figure 25

Table 21: List of Elephant Corridors*:*

| Corridor name | Connectivity | Corridor Use |
|---|---|---|
| Ranggira – Nokrek | West Garo Hills with Nokrek National Park | Rare |
| Nokrek – Imangre | Imangre Reserve Forest and Nokrek National Park | Regular |
| Rewak – Imangre | Imangre Reserve Forest with Rewak Reserve Forest | Regular |
| Siju – Rewak | Siju Wildlife Sanctuary with Rewak Reserve Forest | Regular |
| Baghmara – Balpakram | Balpakram National Park with Baghmara Reserve Forest | Regular |

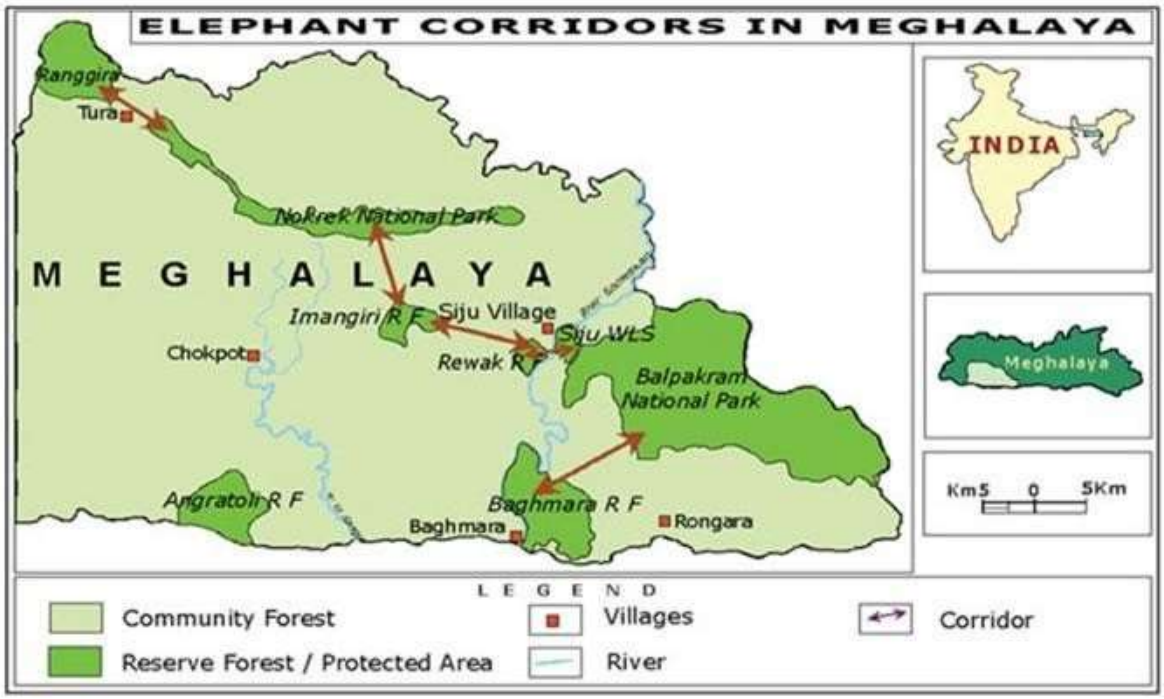



Figure 25: the Elephant Corridors in Meghalaya

**Sacred groves:**

Sacred groves are forest patches, which are protected by communities based on religious beliefs, and have a significant religious connotation for the protecting community. These groves are considered as one of the most species-rich areas for plants, birds and mammals. Most of the groves are in the catchment areas of major rivers. The information on floristic richness ofthe sacred groves of Meghalaya revealed that at least 514 species representing 340 genera and 131 families are present in these sacred forests. Many endemics, rare, endangered and threatened species of the state are found in the sacred groves. The sacred grove biodiversity compares favorably with that of the core area of some of the biosphere reserves in this region, which are being managed by the state forest department.

Even though Meghalaya has as many as 105 recorded sacred groves, the more famous ones are the Mawphlang and Mawsmai sacred groves. No sacred grove is located within the Project site i.e., William Nagar Town.

Table 22: Sacred Grove in East Garo Hills District

| Sl. No. | Sacred Grove Name | Sacred Grove Location | Area (Hectares) | Distance from Project site |
|---|---|---|---|---|
| **District - East Garo Hills** | | | | |
| 1 | BoraMiapara | BoraMiapara | 1 | 44.91 km |
| 2 | GannaRamRock | Megapgiri | 30 | 28.92 km |
| 3 | Jongola | Jongola | 1 | |
| 4 | KimpraHills | Risubakrapara | 20 | 41.39 km |
| 5 | KonkalHills | Risubakrapara | 10 | 41.39 km |

| | | | | |
|---|---|---|---|---|
| 6 | MiaparaRongadom | Miapara | 1 | 47.54 km |
| 7 | Rautagiri | Rautagiri | 37 | |
| 8 | WalchiRuramHills | Risubakrapara | 25 | 41.39 km |

**Biodiversity of East Garo Hills District at a Glance:**

East Garo Hills supports an incredibly rich biodiversity and some parts of the Nokrek Biosphere Reserve fall under the district. Bamboos are tall arborescent grasses belonging to the family Graminaceae. They have an extremely wide range of distribution and are found as an understorey in many types of forests occurring in the state. They form rich belts of vegetation in well-drained parts of tropical and subtropical habitats and rise up-to the highest point in Meghalaya. In East Garo Hills the forests under the control of District Council have been badly mauled by the practice of shifting cultivation. The tree species in these areas have been replaced by pure bamboo crop, over vast areas. In abandoned Jhum areas, pure crops of *Dendrocalamushamiltonii* (Hamilton's Bamboo), *Melocannabambusoides* (Muli Bamboo) and *Gigantochloanigrociliata* have sprung up.

Meghalaya, and Garo Hills in particular is home to several rare animal species. Among them is the Western Hoolock Gibbon, popularly known as the Huro among Garos. It is the only ape species found in India. There are about 2,000 elephants in Garo Hills. The favourite habitat of the elephants is tall forest areas and undulating grounds. They can live in steamy humid junglesas well as in cool elevated forests. Thick bamboo forests are liked by them for food. During the rains, they come out into open valleys and often enter into cultivations.

**Biodiversity Profile of the Study area:**

Being located in the urban area the biodiversity of the project site is very low. During the survey, the team has also given emphasis to the presence of different species within the 10 km Buffer area of the project site through interview, field visit and literature review. The tree species common to the project site includes — *Shorea robusta* (Sal), *Schima walichii* (Needle wood Tree), *Terminalia bellerica* (Bahera), *Emblica officinalis* (Amla), *Bahunia variegate* (Kanchan),*Duabanga* spp. and *Ficus* spp. However, due to encroachment, wood cutting and urbanization, the forest cover of the area has reduced considerably.

Table 23: Agro-biodiversity in the Study Area

| Scientific Name | Family | Crop Type | Local/English Name |
|---|---|---|---|
| *Allium cepa* | Amaryllidaceae | Vegetable | Piyaj |
| *Allium sativum* | Amaryllidaceae | Spice | Lahsun |
| *Amaranthus sp.* | Amaranthaceae | Vegetable | Lalsag |
| *Anacardium occidentalis* | Anacardiaceae | Plantation Crop | Kaju |
| *Ananas comosus* | Bromeliaceae | Fruit | Pineapple |
| *Areca catechu* | Arecaceae | Plantation Crop | Tambul |
| *Artocarpus heterophyllus* | Moraceae | Vegetable | Kathal |
| *Brassica spp.* | Brassicaceae | Oilseed | Sarson |
| *Capsicum annuum* | Solanaceae | Vegetable | Mirch |
| *Carica papaya* | Caricaceae | Fruit | Papita |
| *Cicer arietinum* | Fabaceae | Pulse | Chana |
| *Citrus medica* | Rutaceae | Fruit | Nimbu |
| *Cocos nucifera* | Arecaceae | Fruit | Narikol |
| *Colocasia esculenta* | Aracea | Vegetable | Kachchu |

| | | | |
|---|---|---|---|
| *Corchorus capsularis* | Malvaceae | Fibre | Jute |
| *Coriandrum sativum* | Apiaceae | Condiment & Spice | Dhania |
| *Cucumis sativa* | Cucurbitaceae | Fruit | Kheera |
| *Cucurbita pepo* | Cucurbitaceae | Vegetable | Kaddu |
| *Daucus carota* | Apiaceae | Vegetable | Gajar |
| *Hevia brasiliensis* | Euphorbiaceae | Plantation Crop | Rubber |
| *Lens esculenta* | Fabaceae | Pulse | Masur |
| *Luffa spp.* | Cucurbitaceae | Vegetable | Lauki |
| *Lycopersicon esculentum* | Solanaceae | Vegetable | Tamatar |
| *Momordica charantia* | Cucurbitaceae | Vegetable | Karela |
| *Musa indica* | Musaceae | Fruit | Kela |
| *Oryza sativa* | Poaceae | Cereal | Dhan |
| *Phaseolus mungo* | Fabaceae | Pulse | Urad |
| *Psidium guajava* | Myrtaceae | Fruit | Amrud |
| *Raphanus sativa* | Brassicaceae | Vegetable | Muli |
| *Sesamum indicum* | Pedaliaceae | Oilseed | Til |
| *Solanum melongena* | Solanaceae | Vegetable | Began |
| *Solanum tuberosum* | Solanaceae | Vegetable | Aalu |
| *Spinach oleracea* | Amaranthaceae | Vegetable | Palak |
| *Trigonella foenum-graecum* | Fabaceae | Vegetable | Methi |
| *Triticum aestivum* | Poaceae | Cereal | Gehu |
| *Zea mays* | Poaceae | Cereal | Makka |
| *Zingiber officinalis* | Zingiberaceae | Rhizome | Adrakh |

The list presented below tabulates the Angiosperms (a large group that comprises those that have flowers and produce seeds enclosed within a carpel, including herbaceous plants, shrubs, grasses, and most trees) and the Ferns and Fern Allies that are found in the area.

Table 24: Angiosperms and the Ferns found in the project district

| **Common Name** | **Scientific Name** | **Family** | **Local Availability** | **IUCN Status** |
|---|---|---|---|---|
| **Angiosperms** | | | | |
| Climbing wattle (Climbing Shrub) | *Acacia pennata* | Mimosaceae | Common | LC |
| Billy-Goat weed (Herb) | *Ageratum conyzoides* | Asteraceae | Very Common | NA |
| White Siris (Tree) | *Albizia procera* | Mimosaceae | Rare | NA |
| Kadam (Tree) | *Anthocephalus chinensis* | Rubiaceae | Common | NA |
| Kanthal (Tree) | *Artocarpus integrifolia* | Moraceae | Common | NA |
| (Grass) | *Arundinellanepalensis* | Poaceae | Common | NA |
| **Common Name** | **Scientific Name** | **Family** | **Local Availability** | **IUCN Status** |
| Giant reed (Grass) | *Arundo donax* | Poaceae | Common | LC |
| Shatavari (Woody Climber) | *Asparagus racemosus* | Liliaceae | Rare | NA |
| White Orchid Tree (Shrub) | *Bauhinia acuminata* | Caesalpiniaceae | Common | LC |
| Silk Cotton Tree (Tree) | *Bombax ceiba* | Bambacaceae | Very Common | NA |
| Narrow leafed Bittercress | *Cardamine impatiens* | Brassicaceae | Common | NA |

| | | | | |
|---|---|---|---|---|
| (Herb) | | | | |
| Golden Shower Tree (Tree) | *Cassia fistula* | Caesalpiniaceae | Common | NA |
| Chakunda (Shrub) | *Cassia tora* | Caesalpiniaceae | Common | NA |
| Guria Grass (Herb) | *Chrysopogon fulvus* | Poaceae | Common | NA |
| Velvet Leaf (Herb) | *Cissampelospariera* | Manispermaceae | Rare | NANIC |
| Wandering Jew (Herb) | *Commelinabenghalensis* | Commelinaceae | Very Common | NANIC |
| Purple Nut Sedge (Herb) | *Cyperus rotundus* | Cyperaceae | Abundant | NANIC |
| Hamilton's Bamboo (Herb) | *Dendrocalamus hamiltonii* | Poaceae | Common | NA |
| Air yam (Climber) | *Dioscorea bulbifera* | Dioscoreaceae | Common | NA |
| Indian Coral tree (Tree) | *Erythrina variegata* | Papilionaceae | Rare | NA |
| Forest Red Gum (Tree) | *Eucalyptus tereticornis* | Myrtaceae | Rare | NA |
| Bristly Spurge (Herb) | *Euphorbia emodi* | Euphorbiaceae | Common | LC |
| Asthma Weed (Herb) | *E. hirta* | Euphorbiaceae | Common | NA |
| Hairy fig (Small tree) | *Ficus hispida* | Moraceae | Common | NA |
| | *Galium sp.* | Rubiaceae | Common | NA |
| Gamhar (Tree) | *Gmelina arborea* | Verbenaceae | Common | NA |
| Cogon Grass (Herb) | *Imperata cylindrica* | Poaceae | Common | LC |
| Kalmi Saag (Herb) | *Ipomoea aquatica* | Convolvulaceae | Common | NA |
| Railway Creeper (Herb) | *I. cairica* | Convolvulaceae | Very common | NA |
| Vasak (Herb) | *Justicia adhatoda* | Acanthaceae | Common | NA |
| (Tree) | *Lagerstroemia sp* | Lytharaceae | Rare | NA |
| Yellow pea (Creeper) | *Lathyrus aphaca* | Fabaceae | Common | NA |
| Duckweed (Aquatic Herb) | *Lemna minor* | Lemnaceae | Common | LC |
| Virginia Papergrass (Herb) | *Lepidium virginicum* | Brassicaceae | Common | NA |
| Indian Laurel (Tree) | *Litseaglutinosa* | Lauraceae | Rare | NA |
| Kumkum Tree (Tree) | *Mallotusphilippensis* | Euphorbiaceae | Common | NA |
| Touch-me-not (Creeper) | *Mimosa pudica* | Mimosaceae | Rare | NA |
| **Common Name** | **Scientific Name** | **Family** | **Local Availability** | **IUCN Status** |
| Tall reed (Herb) | *Phragmites karka* | Poaceae | Common | LC |
| Amla (Tree) | *Phyllanthus emblica* | Euphorbiaceae | Common | NA |
| Annual Meadowgrass (Herb) | *Poa annua* | Poaceae | Common | LC |
| Fennel-leaved Pondweed (Herb) | *Potamogetonpectinatus* | Potomogetonaceae | Common | LC |
| (Herb) | *Pycrius spp.* | Cyperaceae | Abundant | NA |
| Corn Buttercup (Herb) | *Ranunculus arvensis* | Ranunculaceae | Common | NA |
| Kans grass (Herb) | *Saccharum spontaneum* | Poaceae | Abundant | LC |

| | | | | |
|---|---|---|---|---|
| | *Sapiumbaccatum* | Euphorbiaceae | Common | NA |
| | *Scripus spp.* | Cyperaceae | Common | NA |
| Sal (Tree) | *Shorea robusta* | Dipterocarpaceae | Rare | NA |
| Kumarika (Climber) | *Smilax zeylanica* | Smilaceae | Rare | LR |
| Ban tamakhu (Small tree) | *Solanum erianthum* | Solanaceae | Common | NANIC |
| | *Sonchus spp.* | Asteraceae | Common | NA |
| Common chickweed (Herb) | *Stellaria media* | Caryophylaceae | Common | NA |
| Jamun (Tree) | *Syzygiumcumini* | Myrtaceae | Common | NA |
| Teak (Tree) | *Tectona grandis* | Verbenaceae | Common | NA |
| Broom Grass (Herb) | *Thysanolaena maxima* | Poaceae | Common | NA |
| Giloy (Climber shrub) | *Tinospora cordifolia* | Manispermaceae | Rare | NA |
| Red Cedar (Tree) | *Toona ciliata* | Meliaceae | Common | NA |
| False white teak (Tree) | *Trewianudiflora* | Euphorbiaceae | Rare | LR |
| (Tree) | *Vitex peduncularis* | Verbenaceae | Rare | NA |
| Ber (Tree) | *Zizyphusmauritiana* | Rhamnaceae | Abundant | NANIC |
| **Ferns And Fern Allies** | | | | |
| Tailed maidenhair (Herb) | *Adiantum caudatum* | Adiantaceae | Common | NA |
| Himalayan horsetail (Herb) | *Equisetum diffusum* | Equisetaceae | Common | NA |
| Water Clover (Herb) | *Marseliaminuta* | Marseliaceae | Common | NANIC |
| Thinleaf Brake (Herb) | *Pteris biaurita* | Pterideae | Rare | NA |
| Spikemoss (Herb) | *Seleginellahelferi* | Selaginellaceae | Common | NANIC |

Abbreviations: VU=Vulnerable, NA=Not assessed but present in the catalogue of Life, NANIC = Not assessed and not present in the catalogue of Life, LC =Least concern, LR =Low risk

**Endemic and Threatened Medicinal Plant Species:**

There are many medicinal plants, which have been classified as endemic and/or threatened in the state depending on their distribution pattern and population size. Eight medicinal plant species such as *Camellia caduca* C.B.Cl.ex Brandis, *Citrus latipes* Tanaka (Khasi papeda), *Nepenthes khasiana* Hk. F (Indian Pitcher plant), *Osbeckia capitata* Benth are reported to be endemic to Meghalaya only. Thirty-seven medicinal plants, like *Schima khasiana* Dyer, *Boehmeria macrophylla* D.Don, Citrus *medica* L, Il ex *khasiana* Purk, *Piper griffithii* C.DC, *Acanthus leucostachys* Roxb. etc. which has been classified as endemic to Eastern Himalayas, Western Ghats, Indo-Burma region and Peninsular India, are also found in Meghalaya. Seventeen medicinal plant species found in Meghalaya have been classified under

threatened category some of these are *Taxus wallichiana var. baccata*, *Dendrobium nobile*, *Panax pseudo-ginseng, Nepenthes khasiana* etc.

But, presently, harvesting of medicinal plants has drastically reduced due to increased dependency on modern medicine and lack of traditional knowledge. The project site is entirely within William Nagar and it is already a built-up and developed area and there are no reports of medicinal plants within the project site.

**Fauna in Study Area:**

Being located in the urban area, there is no wildlife observed in the project area. Primary field surveys were conducted through random observation in the study area and information was collected from elderly persons of the area, forest officials.

***Mammals present in the study area:***

Though the state of Meghalaya records the presence of about 139 different species of mammals, but mammalian diversity is not high in the project site as the area doesn't have any dense forest cover. The table given below tabulates the list of mammals found in the project district.

Table 25: Mammals found in the project district

| ***Order*** | ***Common Name*** | ***Scientific Name*** | ***Local Availability*** | ***IUCN Status*** | ***WPA Status*** |
|---|---|---|---|---|---|
| Primates | Monkey | *Macaca mulatta* | Common | LC | II |
| Artiodactyla | Wild Boar | *Sus scrofa* | Rare | LC | III |
| Artiodactyla | Barking Deer | *Muntiacus muntjak* | Rare | LC | II |
| Carnivora | Jackal | *Canis aureus* | Rare | LC | II |
| Carnivora | Jungle Cat | *Felis chaus* | Rare | LC | II |
| Carnivora | Common Palm Civet | *Paradoxurus hermaphroditus* | Common | LC | II |
| Carnivora | Indian Grey mongoose | *Herpestesedwarsdii* | Common | LC | IV |
| Eulipotyphla | The Asian House Shrew | *Suncus murinus* | Common | LC | V |
| Rodentia | Hoary-Bellied Squirrel | *Callosciuruspygeryt hrus* | Common | LC | V |
| Rodentia | The House Mouse | *Mus musculus* | Common | LC | V |
| Rodentia | Bandicoot Rat | *Bandicota bengalensis* | Common | LC | IV |

***Herpetofauna of the study area:***

Herpetofauna includes reptiles and amphibians of a particular area. Major reptiles include snakes, lizards etc. Snakes, lizards are common in the project site as the area is a predominantly agriculture zone. Being an urban area, the herpetofauna diversity is very low in the project site. The table presented below lists the reptiles and the amphibians found in the area.

Table 26: Snakes and lizards found in the project district

| **Order** | **Common Name** | **Scientific Name** | **Local availability** | **IUCN Status** | **WPA Status** |
|---|---|---|---|---|---|
| Agamidae | Garden Lizard | *Calotes versicolor* | Common | LC | IV |
| Gekkonidae | Indian House Gecko | *Hemidactylus sp* | Common | LC | IV |
| Scincidae | Common Skink | *Eutropiscarinata* | Common | LC | IV |
| Varanidae | Common Indian Monitor | *Varanus bengalensis* | Common | LC | I |
| Pythonidae | Burmese Python | *Python bivittatus* | Common | VU | I |
| Typhlopidae | Brahminy blind snake | *Indotyphlopsbraminus* | Common | LC | IV |
| Colubridae | Common Wolf Snake | *Lycodonaulicus* | Common | LC | IV |
| Colubridae | Indian Rat Snake | *Ptyas mucosa* | Common | LC | IV |
| Colubridae | Checkered Keelback | *Fowlea piscator* | Common | LC | IV |
| Colubridae | Mountain Pit Viper | *Ovophismonticola* | Rare | LC | II |
| Colubridae | Red Necked Keelback Snake | *Rhabdophissubminiatus* | Rare | LC | IV |
| **Amphibians** | | | | | |
| Bufonidae | Common Asian Toad | *Duttaphrynusmelanostictus* | Common | LC | ~ |
| Rhacophoridae | Terai Tree Frog | *Polypedatesteraiensis* | Common | LC | ~ |
| Rhacophoridae | Common Tree Frog | *Polypedatesleucomystax* | Common | LC | ~ |
| Rhacophoridae | Assam Tree Frog | *Polypedatesassamensis* | Common | LC | ~ |
| Dicroglossidae | Indian Bull Frog | *Hoplobatrachustigerinus* | Common | LC | IV |
| Dicroglossidae | Garo Hill Bush Frog | *Philautusgaro* | Very Rare | VU | IV |
| *LC= Least Concern, EN= Endangered, NT= Near Threatened, VU= Vulnerable* | | | | | |

***Common Fishes of study area:***

Fish diversity of the West Garo hills is quite high due to presence of numerous water bodies, small streams etc. As commercial fishery is an important livelihood option in West Garo hills, many different species of fishes are farmed in the region. The River Simsang is situated in very close proximity to the Project Site, but due to over fishing resulting from the close proximity to the town limit, the fish diversity is very low and production is also very low.

The table given below lists the fishes found in the project district.

Table 27: Common fishes found in the project district

| *Order* | *Scientific Name* | *Common Name* | *Local Name* | *IUCN Status* |
|---|---|---|---|---|
| Cypriniformes | *Gudusiachapra* | Indian river shad | Na Patchi/Puti | LC |
| Cypriniformes | *Danio sp* | Zebra Fish | Na bat | LC |
| Cypriniformes | *Puntius chola* | Barb | Na Patchi/Puti | LC |
| Cypriniformes | *Puntius conchonius* | Rosy Barb | Na Patchi/Puti | LC |
| Cypriniformes | *Puntius sophore* | Pool Barb | Na Patchi/Puti | LC |
| Cypriniformes | *Amblypharyngodon mola* | Mola Carplet | Kha Muka | LC |
| Cypriniformes | *Botia rostrata* | Gangetic Loach | Kah Syiem(khasi) | VU |
| Cypriniformes | *Garrasp* | | | LC |
| Cypriniformes | *Neolissocheilushexagonolepis* | Copper Mahsheer | Na rong | NT |
| Cypriniformes | *Tor putitora* | Golden Mahsheer | Na gitchak | EN |
| Cypriniformes | *Labeopangusia* | | Na wak | NT |
| Cypriniformes | *Labeorohita* | Rohu | khabaw | LC |
| Cypriniformes | *Catlacatla* | catla | | LC |
| Cypriniformes | *Labeogonius* | kuria | Kha ski | LC |
| Cypriniformes | *Cyprinus carpio* | Common carp | | VU |
| Cypriniformes | *Chaguniuschagunio* | Lal punti | | LC |
| Cypriniformes | *Esomusdanricus* | Indian flying barb | shalynnai | LC |
| Cypriniformes | *Raiamas bola* | The trout barb | | LC |
| Perciformes | *Channa stewartii* | Snakehead | Na Chi | LC |
| Perciformes | *Channa gachua* | Snakehead | Na Chi | LC |

***Common Birds of study area:***

As the proposed road mostly runs along human habitation, tea gardens and agricultural field, avian diversity is low. The project site also does not lie close to the vicinity of any Important BirdArea. But due to presence of water-logged low-lying areas, there are reports of some winter migratory birds. The common birds of the area are-

Table 28: Common Birds found in the project district

| Common Name | Scientific Name | IUCN Status | WPA1972 Schedule |
|---|---|---|---|
| Black drongo | *Dicrurus macrocercus* | Least concern | Schedule IV |
| Blue throated barbet | *Psilopogon Asiaticus* | Least concern | Schedule IV |
| Common myna | *Acridotheristristis* | Least concern | Schedule IV |
| Common tailorbird | *Orthothomussutorius* | Least concern | Schedule IV |
| Emerald Dove | *Chalcophaps indica* | Least concern | Schedule IV |
| Great barbet | *Psilopogon virens* | Least concern | Schedule IV |
| House sparrow | *Passer domesticus* | Least concern | Schedule IV |
| Indian pond heron | *Ardeolagrayii* | Least concern | Schedule IV |
| Jungle myna | *Acridothersfuscus* | Least concern | Schedule IV |
| Red vented bulbul | *Pycnonotuscafer* | Least concern | Schedule IV |
| Shikra | *Accipiter badius* | Least concern | Schedule IV |
| spotted dove | *Spilopelia chinensis* | Least concern | Schedule IV |
| white throated kingfisher | *Halcyon smyrnensis* | Least concern | Schedule IV |
| Oriental white eye | *Zosteropspalpebrosus* | Least concern | Schedule IV |
| Asian Koel | *Eudynamysscolopeceus* | Least concern | Schedule IV |
| Common Hoopoe | *Upupa epos* | Least concern | Schedule IV |
| Rufous woodpecker | *Micropternusbrachyurus* | Least concern | Schedule IV |
| Common Iora | *Aegithina tiphia* | Least concern | Schedule IV |
| Scarlet minivet | *Pericrocotusflammeus* | Least concern | Schedule IV |
| Bronzed Drongo | *Dicrurus aeneus* | Least concern | Schedule IV |
| Black Hooded Oriole | *Oriolusxanthornus* | Least concern | Schedule IV |
| Rufous treepie | *Dendrocittavagabunda* | Least concern | Schedule IV |
| Barn Swallow | *Hirundo rustica* | Least concern | Schedule IV |
| Asian pied Starling | *Gracupica contra* | Least concern | Schedule IV |
| Paddy field pipit | *Anthus rufulus* | Least concern | Schedule IV |
| Oriental turtle dove | *Streptopeliaorientalis* | Least concern | Schedule IV |
| Red collared dove | *Streptopeliatranquebarica* | Least concern | Schedule IV |
| Green bee eater | *Meropsorientalis* | Least concern | Schedule IV |
| White wagtail | *Motacilla alba* | Least concern | Schedule IV |
| Grey wagtail | *Motacilla cinerea* | Least concern | Schedule IV |
| Citrine wagtail | *Motacillacitreola* | Least concern | Schedule IV |
| Common stonechat | *Saxicola torquatus* | Least concern | Schedule IV |
| Crimson sunbird | *Aethopyga siparaja* | Least concern | Schedule IV |
| Purple sunbird | *Cinnyris asiaticus* | Least concern | Schedule IV |
| Jungle owlet | *Glaucidium radiatum* | Least concern | Schedule IV |
| Jungle babbler | *Turdoides striata* | Least concern | Schedule IV |

| | | | |
|---|---|---|---|
| Greater necklaced laughing thrush | *Garrulax pectoralis* | Least concern | Schedule IV |
| Black throated sunbird | *Aethopyga saturata* | Least concern | Schedule IV |
| Green tailed sunbird | *Aethopyga nipalensis* | Least concern | Schedule IV |
| Purple rumped sunbird | *Leptocomazeylonica* | Least concern | Schedule IV |
| Ruby cheeked sunbird | *Chalcopariasingalensis* | Least concern | Schedule IV |
| Scarlet backed flowerpecker | *Dicaeumcruentatum* | Least concern | Schedule IV |
| Plain prinia | *Priniainornata* | Least concern | Schedule IV |

**Plankton Diversity:**

Plankton are the microscopic organisms that drift on the water currents. Phytoplankton forms the sole base of food chain in aquatic system as they act as energy transducers and convertthe solar energy into chemical energy of food. Zooplankton passes this food energy to the higher trophic levels and thus provides a link between energy producers and the consumers. These organisms are important biological indicator of water quality and trophic status of aquatic ecosystem as they respond quickly to the environmental changes. A rapid survey of the different water bodies was carried out to determine the species diversity in project site. Given below is the list of phytoplanktons and zooplanktons found in the study area.

Table 29: Phytoplanktons found in the project area

| **Class: Bacillariophyceae** | **Class: Chlorophyceae** |
|---|---|
| *Frustulia sp.* | *Staurastrum rotundum* |
| *Gyrosigma sp.* | *Staurastrumleptocladium* |
| *Navicula sp.* | *Cosmariumdecoratum* |
| *Tabellaria sp.* | *Cosmariumreniforne* |
| *Gomphonema sp.* | *Cosmariumleibleinii* |
| *Fragilaria sp.* | *Draparnaldiopsis sp.* |
| *Diatomasp* | *Hyalotheca sp.* |
| *Synedra sp.* | *Spirogyra sp.* |
| *Pinnularia sp.* | *Gonatozygon sp.* |
| **Class: Cyaenophyceae** | *Ulothrix sp.* |
| *Anabaena sp.* | *Eudorina sp.* |
| *Oscillatoria sp.* | **Class: Desmidiacae** |
| *Microcystis aeruginosa* | *Closterium* sp. |

| | |
|---|---|
| *Spirulina sp.* | **Class: Chrysophyceae** |
| *Nostoc sp.* | *Dinobryonsociale* |
| **Class: Dinophyceae** | |
| *Ceratium sp.* | |
| *Glenodinium sp.* | |
| *Ceratiumhirudinella* | |

Table 30: Zooplankton found in the Project area

| | |
|---|---|
| **Kingdom: Animalia;**<br>**Phylum: CRUSTACEA** | **Order: Rotifera** |
| *Nauplii sp. larvea* | *Anuraeopsisfissa* |
| **Order: Copepoda** | *Pleosomahudsoni* |
| *Cyclops sp.* | *Polyarthra vulgaris* |
| *Diaptomus sp.* | *Ascomorphasp* |
| *Mesocyclops sp.* | *Conochilusunicornis* |
| *Tropocyclops sp.* | *Trichocercasp* |
| **Order: Cladocera** | *Pompholyx sulcata* |
| *Moina sp.* | *Asplanchnapriodonta* |
| *Bosminopsisdeitersi* | *Monostyla sp.* |
| *Diaphanosoma* | *Brachionus sp.* |
| *Chydorussphaericus* | *Keratella sp.* |
| *Bosmina sp.* | *Lepadella sp.* |
| *Ceriodaphnia sp.* | *Nauplius sp.* |
| *Daphnia sp.* | *Euchlanis sp.* |
| **Class: Rhizopoda** | **Kingdom: PROTISTA** |
| *Difflugialebes* | *Paramoecium sp.* |
| *Arcella vulgaris* | *Euglena sp.* |
| *Acanthocystischaetophora* | |
| *Polymyxa sp.* | |

**Heritage Trees:**

There are a range of criteria that designate a tree as a heritage tree. These attributes—both material and non-material—make the tree stand out. The material attributes could be age or size of the tree. It could also be the result of the form or shape of the tree. Further, it could be that the tree is a rare species or a tree at a risk of being lost. The non-material criteria relate to the cultural and aesthetic aspects. It could be that the tree has a historical or cultural association either with a person, or an event or a place. It could also be a tree associated with myth or folklore.

In order to identify Heritage trees in the study area a detailed field study was conducted. As per the study conducted, no such Heritage trees of cultural significance have been identified along the road.

**Sericulture**

No Sericulture activities were identified in the project region.

**Rare or Endangered Species**

The local forest department was consulted to know the presence of any endangered and protected species of flora and fauna within the formation width. It is confirmed by the forest department officials that there are no endangered species that are likely to be affected by the current project.

Joint inspection was carried out with field officials from the local forest department to preparethe detailed inventory and marking of the trees to be cut. During the joint inspection, if any endangered and or protected species of flora were to be found within the formation width of the subproject road, necessary mitigation measures would have been adapted to protect such species. Also based on the joint inspection, a suitable compensatory afforestation plan will be prepared to mitigate the loss of vegetative cover due to the subproject activities.

**Rice Cultivation**

No large-scale rice cultivation has been found during the field visit along the project site

**Tea Estates**

No tea Plantation is present along the Project Site.

### 4.12.1 Educational Institutions / Hospitals

The educational institutions and hospital/health centres constitute the sensitive environmental receptors. The list of such features along the RoW along the project roads is presented in Table 31. Sensitive receptors along the project road. A total number of 3 educational institutions are locatede located along the project stretches. No health care centre was found within the project core zone which is 500m either side of the road.

Table 31: Sensitive receptors along the project road

| Sl. No. | Receptor | Road Name | Side | Approx distance from the edge of the road (m) |
|---|---|---|---|---|
| **1** | School | RSN road to Terrace Gittim-Dawa Nengjata | LHS | 194.47 |
| **2** | School | RSN road to Terrace Gittim-Dawa Nengjata | RHS | 2.92 |
| **3** | School | Williamnagar City Roads: junction to junction Kusimkolgre | RHS | 5.28 |
| **4** | Church | RSN Road to Terrace Gittim opposite Loyola College William Nagar | RHS | 1.78 |
| **5** | Hospital | Junction to Junction 23 Start point | RHS | 0.39 |
| **6** | District & Session Court | Junction to Junction 24 Circular Road | RHS | 8.81 |


Loyola Secondary School


Loyola Higher Secondary School

Church


Higher Secondary School


Figure 26: District Session Court - Photographs of some sensitive receptors along the road stretch

## 4.13 Social Environment

### 4.13.1 The State Profile of Meghalaya

The State of Meghalaya was carved out of Assam as an autonomous State in April 1970 and was declared a full-fledged State in January 1972. Meghalaya, situated in the north eastern region of India is a narrow stretch of land, running between Bangladesh on the South and West and Assam on the North and East, Meghalaya lies between 24□ 58‘N to 26□ 07‘N latitudes and 89□ 48‘E to 92□ 51‘E longitudes. It covers an area of 22,429 sq. km. The State has most of its land covered by hills interspersed with gorges and small valleys. Endowed with dense forests and rivers cascading down undulating terrain, this region is one of the most scenic of the North Eastern States.

Thus, out of the total forest area of 15,657 sq. km in the State only 1,027.20 sq. km is under the control of State Forest Department, which constitutes only 4.58 % of the total geographical area of the State and 6.56 % of the total forest area of the State. Rest of the area is either private or clan /community owned and is under the indirect control and management of the Autonomous District Councils.

The population of Meghalaya is predominantly tribal, the main tribes are the Khasis, the Jaintias and the Garos besides other plain tribes such as Koch, Rabhas and Bodos etc. The Khasis and the Jaintias predominantly inhabiting the districts towards eastern part of Meghalaya, belong to the Proto Austroloid Monkhmer race. The proposed project lies at Williamnagar, the head quarter of East Garo Hills.

### 4.13.2 District Profile:

East Garo Hills District was upgraded from a sub-division to a full-fledged district in 1976, after the erstwhile Garo Hills District was reorganised with a view to bring the administration closer tothe people. In 2012 East Garo Hills District was further reorganised to form a new district, the North Garo Hills District, out of the erstwhile Resubelpara Civil Sub-Division. The District is bounded by South Garo Hills on the south, West Garo Hills on the west, West Khasi Hills on theEast and North Garo Hills on the north.

The new headquarter-complex is a neatly planned township. It has been christened as Williamnagar after Captain Williamson A. Sangma, the first Chief Minister of the State of Meghalaya. Williamnagar now has all the amenities of a modern town and is the largest growth centres in Garo Hills, next to Tura.

### 4.13.3 Demographic Profile

Out of total population of Meghalaya, 13.9% people live in urban regions. The district occupies:

Table 32: Demographic Profile of West Khasi Hills District

| Description | Census 2011 | Census 2001 |
|---|---|---|
| Total Population | 317,917 | 250,582 |
| Male | 161,223 | 127,474 |

| Description | Census 2011 | Census 2001 |
|---|---|---|
| Female | 156,694 | 123,108 |
| Population GRoWth | 26.87% | 32.45% |
| Area Sq.Km | 2,603 | 2,603 |
| Density /Km2 | 122 | 96 |
| Proportion to Meghalaya Population | 10.72% | 10.81% |
| Sex Ratio (Per 1000) Males | 972 | 966 |
| Average Literacy | 73.95 | 60.59 |
| Male Literacy | 77.72 | 66.12 |
| Female Literacy | 70.05 | 54.84 |
| No. of Blocks | 6 | NA |
| No. of Villages | 492 | NA |

**Source: Census 2011**

As per 2011 census, 86.1% population of East Garo Hills district lives in rural areas of villages. The total East Garo Hills district population living in urban areas is 44192 of which males and females are 22,460 and 21732 respectively. In rural areas of East Garo Hills district, sex ratio is 968 females per 1000 males.

Table 33: Distribution of Rural and Urban Population

| Description | Urban | Rural |
|---|---|---|
| Population (%) | 86.10 % | 13.90 % |
| Total Population | 273,725 | 44,192 |
| Male Population | 138,763 | 22,460 |
| Female Population | 134,962 | 21,732 |
| Sex Ratio | 973 | 968 |

**Source: Census 2011**

### 4.13.4 Schedule Castes and Schedule Tribes

The population of East Garo Hills district consists of two major groups - tribal & non-tribal. The tribal population of the district amounts to 96.54 % of the total population. The majority of the tribal population are the Garos, while the other indigenous inhabitants are the Hajongs, Rabhas, Koches, Rajbansis, Kacharis and Dalus. The small non-tribal population, including the Scheduled Castes is mostly concentrated in the urban settlements of Williamnagar and semi- urban habitations like Rongjeng, Songsak & Rongsak.

### 4.13.5 Literacy Rate

Average literacy rate of East Garo Hills in 2011 were 73.95 compared to 60.59 of 2001. If thingsare looked out at gender wise, male and female literacy were 77.72 and 70.05 respectively. For 2001 census, same figures stood at 66.12 and 54.84 in East Garo Hills District. Total literate in East Garo Hills District were 192,147 of which male and female were 102,513 and 89,634 respectively. In 2001, East Garo Hills District had 120,874 in its district.

### 4.13.6 Employment Pattern

Economic backwardness is the leading problem of the state as majority of the population is below the poverty line. Although the state is rich in mineral resources, the industrial linkagesare virtually absent and government is the major source of employment in the organized sector. Activities like animal husbandry, fishery, poultry and horticulture have not been targeted as a major source of employment. Therefore, agriculture forms the only option for the people to seek gainful employment. This too is influenced by impediments such as shifting agriculture, poor productivity, land tenure system and

traditional methods of cultivation. All these factors have resulted in poor land and labour productivity. As unemployment and poverty are correlated, it becomes necessary to understand the occupational pattern of labour force and status of employment to analyse the development in the state.

**East Garo Hills:**

More than 80% of the total population in East Garo Hills is agrarian as their main backbone of livelihood is basically agriculture. Rice, Maize, potato and ginger are the main crops grown in East Garo Hills. Agriculture and allied activities provide income and employment for the people in West Khasi Hills. Mono cropping in low land areas and mixed cropping in upland areas arethe features of agriculture in the district.

### 4.13.7 Economic Development

Since independence, various schemes have been adopted by the central and local governments for economic development. The district council was created under the sixth schedule of the Constitution of India to preserve the traditional way of life of the people, to protect them from exploitation by others, and to make them leaders of their own progress. The tribal development blocks came into existence to ensure speedy development. Incentives provided for cash crops and efforts made to popularize terrace cultivation have yielded some results. The communication bottle-neck, soil erosion and loss of fertility are, however, among the problems retarding prosperous economic growth.
The occupational mobility is a noticeable phenomenon. The literacy rate is on increase and the educated gentry is involved in professions other than traditional agriculture. Many are employedoutside Garo Hills. Some are wealthy farmers, taking advantage of the official schemes. The multi-tier democratic political system has converted many into whole-timers in politics. The contractors constitute the wealthy class. The growth of population and markets inspired many to set themselves in business. Poultry and dairy farming and bee-keeping are also practiced.

### 4.13.8 Road Network

Meghalaya has a road network of around 7,633km, out of which 3,691km is black-topped and the remaining 3942km is gravelled. The state has couple of national highways running throughit viz NH 40, NH 44, NH 51 and NH 62.

The project road stretches are of great importance, as the road will carry not only the normal city traffic, but also the freight traffic that will connect the export points to the National Highway. The road network of the East Garo Hills district is given below:

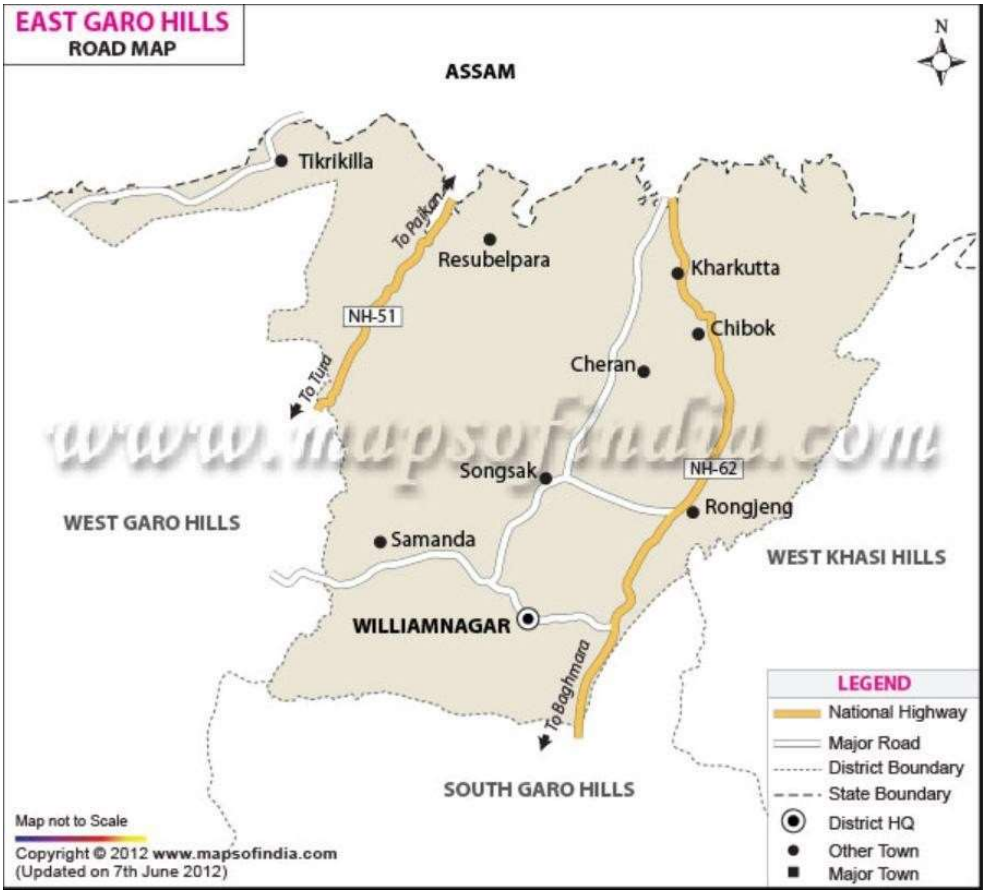



Figure 27: Road Network of East Garo Hills

### 4.13.9 Railway

Meghalaya has a railhead at Mendipathar and regular train service connecting Mendipathar in Meghalaya and Guwahati in Assam. Guwahati is the nearest major railway station connectingthe north-east region with the rest of the country through a broad-gauge track network.

### 4.13.10 Aviation

The state has an airport at Umroi which is at a distance of 30 kilometres from Shillong. There is also a helicopter service connecting Shillong to Guwahati and Tura. Baljek Airport near Tura became operational in 2008. Other nearby airports are in Assam, Borjhar, Guwahati airport,about 124 kilometres (77 mi) from Shillong. Newly operational Rupsi Airport is also near to Tura.

### 4.13.11 Agriculture and Cropping Pattern

Agriculture is the main occupation of the people of the watershed areas. The principal agricultural crops are paddy, ginger, yam, chillies, turmeric etc. However, few horticultural cropslike pineapple, are cashew nut, banana etc. are cultivated in the Watershed area.

Most of the forest species were extinct or not seen in the areas due to repeated jhumming. However, some forest species like Shorearobusta, Artocarpus heterophyllus, Albizzia species, Bahauniavariegetta etc. are seen in the Watershed Area.

**East Garo Hills:**

Agriculture is the mainstay of livelihood of the people in the district, covering about 80% of the total population. The people are dependent on traditional jhum cultivation and forests for their livelihood. Efforts to improve food production through agriculture are impeded by the limitedarea available for cultivation, hilly terrain, low land holdings, landlessness, and low availabilityof technical support.

### 4.13.12 Animal Husbandry

Animal husbandry and Agriculture are related with the overall socio — economic conditions of rural tribal people of Meghalaya. Animal husbandry plays a significant role in overall farming system of the state. The total livestock and poultry population of the state are 15.51 lakhs and
28.20 lakhs respectively out of which Ri Bhoi district possesses 1.12 lakhs and 3.52 lacks respectively (Sample survey 2005- 06). The livestock availability in the district ranges from pig, cattle, buffalo, poultry, goat, rabbit and sheep. Although the district possesses a good number of livestock and poultry, the productivity of livestock and poultry is very poor due to stunted growth and low production of local breeds of livestock and poultry, non-scientific approach of livestock and poultry farming.

### 4.13.13 Fishery

The PIA has unique topographical condition. Consequently, the PIA is blessed with vast and varied water resources in the forms of rivers, reservoirs, beels, lakes, swamp, pond, mini barrages and low-lying paddy. The district shared maximum 20% in total area of pond/mini barrages of the state followed by 10.2, 9.23 and 2.46% in case of reservoirs, rivers, and beels, lakes etc. respectively, but no contribution in state in terms of paddy cum fish culture in the district, although it is a proven technology scope and potential of ornamental fish (Puntius bartissp) is not so much satisfactory.
The Government of Meghalaya has identified fisheries as a key sector and launched theMeghalaya State Aquaculture Mission (MSAM) in 2012. Under this mission, a large water area in the state has been brought for fish culture.

In West Khasi Hills District, the total water area assisted under MSAM is 99.5 ha which includes970 nos. of individual ponds and 5 nos. of community ponds. There are 5 nos. of fish ponds under convergence of MSAM with other Departments covering an area of 3.5 ha which will be implemented shortly. The area covered under the 1000 ponds scheme of the Fisheries Department is 67.45 ha. There are 2 nos. of Govt. fish farm in the district. There are also 3 nos. of fish sanctuaries which aims at conserving the indigenous and endemic fish species. According to the Fisheries Department, fish production (2014-15) in the district is 386 MT.

### 4.13.14 Hospitals

The PIA has 1 hospital, 1 dispensary, 7 primary health centres, 1 community health centres, 1 leprosy control unit, 1 set centre, 1 ayurvedic dispensary and 3 homeopathic dispensaries. Paramedical personnel registered during the year for the service of the people of the district.

# 5 CHAPTER-V: ANALYSIS OF POTENTIAL ENVIRONMENTAL& SOCIAL IMPACTS &MITIGATION- MEASURES

The potential environmental and social impacts due to project activities are discussed in this section. For the impact assessment, environmental parameters were assessed both within area of impact of 50 meter either side of the alignment and project's area of influence up to 10 km. A Corridor of Impact of 100 m along the road alignment has been considered for the social parameters. Environmental parameters are broadly classified into three groups.

a) **Physical Environment includes:** Water Resources, Water Quality, Air Quality,Noise and Land environment etc.
b) **Biological Environment includes:** Terrestrial and aquatic biodiversity andRoadside Plantation etc.
c) **Social Environment includes**: Demography, Employment, Agriculture, Housing,Culture etc.

## 5.1 Environmental Impacts and Mitigation Measures

The assessment of potential environmental impact consists of comparing the expected changesin the environment with or without the project. The analysis predicts the nature and significance of the expected impacts. The details of potential impacts & mitigation measures are mentioned in the below table.

### 5.1.1 Impacts during Design/ Pre-constructional Phase

The project envisages upgrading the existing single lane carriageway to intermediate lane for augmenting the capacity of the project road and significantly extending its service life. However,at few locations small parcel of land will be required to accommodate the proposed improvement/widening. The impacts during Design and Preconstruction stage have been discussed in the following sections:

#### *5.1.1.1 Impacts on Physiography*

The project section is an already existing road and located within city limits. The same alignment will be followed for improvement from existing single lane with earthen shoulder to standard single lane configuration with paved shoulder and geometric correction at few locations. The existing ground profile will be followed with minor profile corrections at few locations without significant alteration of existing vertical profile, except for improvement of geometrics and road safety. The rehabilitation and widening will be generally restricted within the existing RoW, except for few locations where small land parcel would be required beyond existing RoW. The entire project lies over flat land. The project will not have any impact on the topography/ Physiography within the project influence area and hence does not require any mitigation measures.

#### *5.1.1.2 Ambient Air Quality*

Impact to air environment during pre-construction stage will be limited to activities such as setting of construction camp, unloading of materials, and exhaust from Diesel Generators, etc.

Mitigation Measure:

- Consent to Establish for emission/continuation of emission under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981 should be obtained for Diesel Generator Set (s) of > 15 KVA for Non-Industrial use from SPCB
- LPG should be used in the labour camps for cooking purposes instead of wood.

#### *5.1.1.3 Felling of Trees*

There is no felling of trees as the project road is within the existing RoW. Hence does not require any mitigation measure.

#### *5.1.1.4 Impacts on Fauna*

There is no wildlife habitat located along the project area nor any migratory route/ animal crossings in the project area. So any risk or impact on wild animals or incidence of habitat fragmentation or disturbances to the wildlife migration route due to project is not anticipated in any of the project sections.

#### *5.1.1.5 Impacts on Ecologically Protected Area*

The project road does not pass through any ecologically protected areas such as Wildlife Sanctuary, National Park, Tiger Reserve or any notified ecologically sensitive area not islocated in any Eco-sensitive zone. Further no movement of wild animals has been reportednear the project alignment. So, any impact on such feature due to the project is not envisaged.

### 5.1.2 Impacts during Construction Phase

Most of the adverse environmental impacts are related to construction works which are inevitable but are manageable through certain environmental friendly practices. The negative environmental effects can be taken care of at an early stage through proper engineeringdesigns and through the contract during construction practices.

The standard road construction works involve site clearance, excavation, filling of earth materials and sub grade materials, laying of bituminous mixtures, handling of hazardous materials like bitumen, diesel, etc., dumping of unusable debris materials, transportation of materials from production site to construction site, and other constructional activities and associated works like mobilization of constructional equipments, setting up of different construction plants, setting up of workforce camps, quarrying, material storage etc. These activities have certain impacts of various magnitudes on different components of environment. No significant natural habitat conversion is envisaged to take place as a direct consequence of this project. Since the road improvements would follow the existing alignment of the road and all improvements will be undertaken within the formation width of the road, there will no direct impacts on land use conversion. The anticipated impacts due to all these activities have been described below:

#### *5.1.2.1 Compaction and Contamination of Soil*

Contamination of soil during construction stage may happen primarily due to construction and allied activities. The sites where construction vehicles are parked and serviced are likely to be contaminated because of leakage or spillage of fuel and lubricants. Contamination of soil duringconstruction might be a major long-term residual negative impact. Unwarranted disposal of construction spoil and debris will add to soil contamination. This contamination is likely to be carried over to water bodies in case of dumping near water bodies.

Mitigation Measures:

- Construction equipment/vehicles should be routinely maintained to prevent leakage of fuels/ lubricants;
- Construction equipment/vehicles should be parked and maintained in designated areas on hard stand having perimeter drains to collect spilled liquids;
- Fuels and other liquid chemicals should be stored in designated storage areas with drip trays to collect leaked materials, if any.
- The Contractors shall ensure the use of a relatively new, well maintained hot mix plant (batch type) and maintenance of hot mix plants and batching plants should be regular and periodic to prevent any kind of oil leakage on soil surface.

#### *5.1.2.2 Increased erosion and loss of top soil*

Loss of topsoil: The topsoil on the land parcels, which is either used for short term (e.g., borrow areas, construction camps etc.) or permanent use (expansion of the road alignment), would be lost unless the same is preserved. The alignment passes through areas which have sandy loam or sandy clayey loam. These soils are light textured and are thus prone to erosionby winds and during rain, gravity erosion. Further, the movement of vehicle over land next to existing road and to access the construction site would also cause compactions of soil and affect soil fertility.

Waste from off-spec hot-mix as wells as from the regular operations of the machinery e.g. layers and bitumen sprayers during the surfacing of the roads. The concrete wastes from the batching plant and transit mixer wash water would also be generated.

The labour camps that would be setup for construction would generate municipal solid waste and hazardous waste (waste oil from the maintenance and operation of machinery). These wastes have potential to contaminate the soil around the site if it is not properly stored, handled and disposed. If these excess excavated material, construction and demolition wastes are disposed on agricultural land it may result in loss of productivity of land.

**Mitigation Measures:**

- The existing vegetation on slopes outside the immediate area of construction must remain undisturbed during construction and/or upgrading.
- Engineering and bioengineering techniques to be used to prevent barren slopes and to stop soil erosion and protect erosion prone areas from excessive grazing by animals;
- Slope failures should be monitored and remedial actions initiated at the earliest possible time
- Logging immediately above road should be restricted to reduce erosion/landslide potential;
- Retaining structures like gabion wall, breast wall and retaining wall, slope protection measures are provided to ensure stability of hill slope during and after the constructionof project road. Gabions are made up of Galvanized iron wire netting of 4 mm diameter having 10 cm square or hexagonal openings and filling the sausages with hammer dressed stones and wrapping the wire net at top.
- Slope protection measures are to be provided along the project stretch in the form of erosion blanket with shrub plantation, Hydro seeding, interlink chain mesh with grass strips, shotcrete crib wall with vegetation and hedge brush layer
- Where practicable, excavated areas should be backfilled at the end of the working day.
- Guidance for establishment of construction camps, material storage or staging of plant and machinery.

  Sites /land types to be avoided:

  – Lands close to habitations

  – Irrigated agricultural lands

– Lands belonging to small farmers
– Lands under village forests
– Lands within 100m of community water bodies and water sources as rivers to avoid contamination.
Lands supporting dense vegetation and Forest with/without conservations status
– Low lying lands within 100m of watercourses
– Grazing lands and lands with or without tenure rights
– Lands where there is no willingness of the landowner to permit its use
– 2km from towns 500m from any villages
– Community land (Church, community forest) which is traditionally used asconservation areas

Land Types Preferred:

– Waste lands.
– Waste Lands belonging to owners who look upon the temporary use as a source ofincome.
– Community lands or government land not used for beneficial purposes.
– Private non-irrigated lands where the owner is willing.
– Lands with an existing access road.

#### *5.1.2.3 Borrow Areas and Quarries*

Need for opening borrow areas is anticipated. It may cause some adverse impacts ifleft un-rehabilitated. It may pose risk to people, particularly children and animals of accidentally falling into it as well as become potential breeding ground for mosquitoes and vector born disease. Illegal quarrying may lead to unstable soil condition; destroy the landscape of the terrain, air and noise pollution. Quarry material will be sourced from existing licensed quarries. The dredging and use of dredged material, if involved, may have its impact in terms of localized sedimentation level increase and dispersion of pollutants present in the dredged material in the river water.

Mitigation Measures

- Borrow areas if required, shall not be located near forest areas. The edges of borrow sites shall be no closer than 3 meters from any fence line or boundary. Adequate clearance shall be provided for the construction of catch drains.
- Borrow sites shall have adequate drainage outlets unless the relevant landowner has agreed that the borrow area is to create a permanent tank or dam. Cut batter slopes shall not be steeper than 3 to 1 and shall be left by the Contractor in a tidy and safe condition to the satisfaction of the Engineer. Writtenclearance from the land owner/village head shall be obtained before leaving a site
- Borrow pits shall be selected from barren land/wasteland to the extent possible. Borrow areas should not be located on cultivable lands except in the situations where land owners' desires to level the land. The top soil shall be preserved and depth shall be restricted to the desired level.
- Borrow areas should be excavated as per the intended end use by the owner. The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and amount that can be borrow107d.
- The dredged material from the nearby water body shall be tested for presence of heavy metals and other pollutants before its reuse.
- The depths in borrow pits to be regulated so that the sides shall not be steeper than 25% and, to the extent possible, borrow areas shall be sited away from populated areas. Borrow areas shall be leveled with salvaged material or other filling materials which do not pose contamination of soil.

#### *5.1.2.4 Ambient Air Quality*

Construction stage impacts will have adverse impacts on the workers as well as the settlements adjacent to the road, especially those in the down wind direction. Bituminous concrete which is used for pavement rehabilitation can affect the air quality by producing toxic gases. If the hot mix plant is installed nearby project road it will emit number of pollutants that can affect construction workers as well as habitation along the project stretches.

if the bituminous concrete cannot be sourced from outside, and install near project stretches, then there will be adverse impacts on air quality during construction stage. They are classified and presented in the table below. There are two types of pollution i.e. dust pollution and pollution from harmful gases.

Table 34: Adverse impacts on air quality during construction stage

| Sl. No. | Impact | Source |
|---|---|---|
| 1 | Generation of dust | Transportation and tipping of cut material - while the former will occur over the entire stretch between the cutting location and disposal site, the latteris more location specific and more intense; |
| | | Transportation of raw materials from quarries and borrow sites |
| | | Stone crushing, handling and storage of aggregates in asphalt plants |
| | | Site levelling, clearing of trees, laying of asphalt |
| | | Concrete batching plants; |
| | | Asphalt mix plants – due to the mixing of aggregates with bitumen; |
| | | Construction of structures and allied activities |
| 2 | Generation of polluting gases including $SO_2$, $NO_x$ and HC | Hot mix plants |
| | | Large construction equipment, trucks and asphalt producing and pavingequipment |
| | | The movement of heavy machinery, oil tankers etc. |
| | | Toxic gases released through the heating process during bitumenproduction |
| | | Inadequate vehicle maintenance and the use of adulterated fuel in vehicles. |

The impacts are expected to be temporary (limited to construction period) and confined within construction areas.

Mitigation Measures:

- Vehicles delivering loose and fine materials shall be covered
- Limiting unnecessary idling of heavy machineries and other vehicles significantly reduce emission of polluting gases.
- Loading and unloading of construction materials in covered area or provisions of waterfogging around these locations.
- Storage areas should be located downwind of the habitation area.
- Periodic water sprinkling needs to be done, wherever required.
- Regular maintenance of machinery and equipment needs to be done. Vehicular pollution check shall be made mandatory and renewed as per requirement.
- Hot mix plants and other plants should be located at least 1.5 km from the nearest habitation, school, hospital, archaeological site, forest, rivers, streams and lakes, 500 m from ponds, and national highway, 250 m from state highway, unless otherwise required by statutory requirements after securing a No-Objection Certificate (NOC) from the

SPCB. Hot mix plant shall be fitted with stack of adequate height as may be prescribedby SPCB to ensure enough dispersion of exit gases.

- Bitumen emulsion and bitumen heaters should be used to extent feasible.
- CTE & CTO for HMP, BMP, crushers & DG sets need to be obtained.
- LPG should be used as fuel source in construction/labour camps instead of firewood.
- Mask and other PPE shall be provided to all the staffs/workers at construction site.
- Diesel Generating (DG) sets shall be fitted with stack/chimney of adequate height as perregulations (Height of stack = height of the building + 0.2 KVA). Low sulphur diesel shall be used in DG sets as well as machineries.
- Contractor should submit a site-specific air pollution management plan.
- Avenue plantation may improve the air quality during operation stage.
- Regular air monitoring will be done to check the ambient air quality of the area.

Table 35: Impact on Air Environment and Mitigation Measures

| Parameters | Potential Impact | Mitigation Measures Suggested |
|---|---|---|
| **Air Environment** | • Generation of dust | • Sprinkling of water<br>a. Earth handling site<br>b. Borrow area<br>c. Road construction site<br>d. Access road route<br>• Air pollution control at crusher and Plants<br>a. PPE for Workers<br>b. Stone crushing units and Plants shouldbe with environment compliance.<br>c. Necessary clearance needs to be obtained prior to operation of the borrow area.<br>• Regulations of construction timings near sensitive receptors and settlements |
| | • Gaseous Pollution | • Vehicles and machineries will be regularly maintained to conform to the emission standards.<br>• Asphalt mixing sites and Crusher should be placed 1 km away from residential area and outside forest area.<br>• Asphalt plant will be equipped with pollution control equipment<br>• Use of PPE by workers engaged in construction and application of asphalt mix on road surface. |

#### *5.1.2.5 Noise*

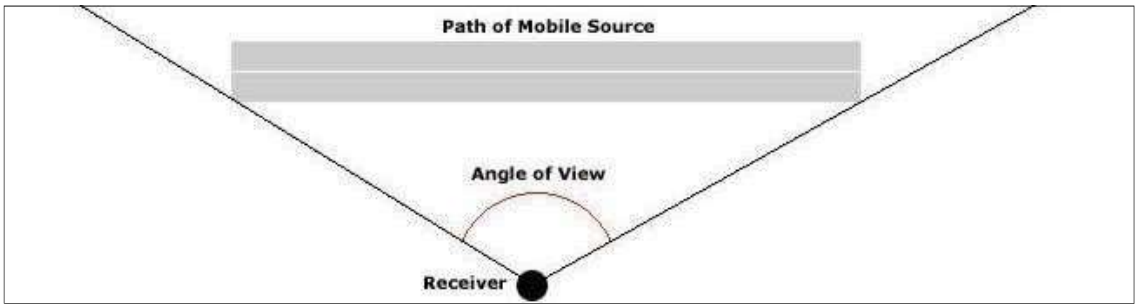
The scale of the construction necessary to upgrade the road and the corresponding slight increase in traffic is not expected to generate adverse impacts. Ambient noise level may increase temporarily in the close vicinity of various construction activities, maintenance workshops, and vehicles and earthmoving equipment. These construction activities are expected to generate noise levels in the range of 80 — 95 dB(A) at a distance of about 5 m from the source.

At the outset, it should be noted that unavailability of exact information on the construction methodology, hours of work, no. of equipment and their ratings / fuel consumption, construction

schedule, etc. are the limiting factors while estimate the construction noise for this subject project; however, to represent the possible worst-case scenario, an effort has been made based on our knowledge on the construction of similar project using QUESTOR Construction Noise Tool.

The QUESTOR Construction Noise Tool is a simple application capable of calculating noise levels for construction sites. It is based on the construction site noise calculation model documented in PR70 "How much noise do you make? A guide to assessing and managing noise on construction sites" by Dr Alan Wills (KVÆRNER) and David Churcher (CIRIA). Thetool itself works on a relationship of one receiver to many sources.

QUESTOR Construction Noise Tool provides a library of sample plants and the activities they are performing from the BS 5228 standard: The British Standard on Noise. The total noise level calculated by the application is the noise level at the receiver.




As depicted in the above picture, it is considered that for particular construction zone, the source is located at a distance of 50m with 900angle of view. Accordingly, the sound pressure levels are predicted at the receptor location during different activities.

*Inference*

Based on the calculations, presented below it is anticipated that whenever the construction will happen in any zone other than industrial, the ambient noise level will exceed the statutory level at a distance of 50m away from the construction zone, if no barrier is put.

Table 36:Typical noise levels of principal construction equipment (Noise Level in dB (A) at 50 Feet

| ID | Type | Noise pressure (dB), 1m fromthe source | Distance (m) | Barrier | Reflection | On Time (%) | Angle of View ($^0$) | Traffic Volume / hour | Speed (km/hr) | Total (dB(A)) |
|---|---|---|---|---|---|---|---|---|---|---|
| Site Clearing | | | | | | | | | | |
| 1 | Dozer | 116 | 50 | None | None | 20 | 90 | 10 | 10 | 46 |
| 2 | Tracked | 113 | | | | 20 | 90 | | | 76 |

| ID | Type | Noise pressure (dB), 1m fromthe source | Distance (m) | Barrier | Reflection | On Time (%) | Angle of View ($^0$) | Traffic Volume / hour | Speed (km/hr) | Total (dB(A)) |
|---|---|---|---|---|---|---|---|---|---|---|
| | excavator | | | | | | | | | |
| 3 | Tracked loader | 113 | | | | 20 | 90 | | | 76 |
| 4 | Wheeled loader | 108 | | | | 20 | 90 | | | 71 |
| | | | | | | | | | Total noise from site at receiver | 80 |
| Ground Excavation | | | | | | | | | | |
| 1 | Dozer | 114 | 50 | None | None | 20 | 90 | 10 | 10 | 44 |
| 2 | Tracked excavator idling | 96 | | | | 20 | 90 | | | 59 |
| 3 | Tracked excavator | 113 | | | | 20 | 90 | | | 76 |
| 4 | Wheeled loader | 104 | | | | 20 | 90 | | | 67 |
| 5 | Tracked loader | 112 | | | | 20 | 90 | | | 75 |
| | | | | | | | | | Total noise from site at receiver | 79 |
| Tipping Fill | | | | | | | | | | |
| 1 | Dump Truck | 110 | 50 | None | None | 100 | 90 | 10 | 10 | 57 |
| | | | | | | | | | Total noise from site at receiver | 57 |

| ID | Type | Noise pressure (dB), 1m fromthe source | Distance (m) | Barrier | Reflection | On Time (%) | Angle of View ($^0$) | Traffic Volume / hour | Speed (km/hr) | Total (dB(A)) |
|---|---|---|---|---|---|---|---|---|---|---|
| Spreading Fill | | | | | | | | | | |
| 1 | Wheeled excavator / loader | 104 | 50 | None | None | 50 | 90 | 10 | 10 | 81 |
| 2 | Dozer | 117 | | | | 50 | 90 | 10 | 10 | 61 |
| | | | | | | | | Total noise from site at receiver | | 81 |
| Spreading Fill | | | | | | | | | | |
| 1 | Wheeled excavator / loader | 104 | 50 | None | None | 50 | 90 | 10 | 10 | 81 |
| 2 | Dozer | 117 | | | | 50 | 90 | 10 | 10 | 61 |
| | | | | | | | | Total noise from site at receiver | | 81 |
| Ground levelling | | | | | | | | | | |
| 1 | Dozer | 114 | 50 | None | None | 50 | 90 | 10 | 10 | 58 |
| 2 | Grader | 111 | | | | 50 | 90 | 10 | 10 | 55 |
| | | | | | | | | Total noise from site at receiver | | 60 |
| Unloading | | | | | | | | | | |
| 1 | Tipper lorry | 113 | 50 | None | None | 50 | 90 | 10 | 10 | 57 |
| 2 | Tracked loader | 112 | | | | 50 | 90 | 10 | 10 | 89 |

| ID | Type | Noise pressure (dB), 1m fromthe source | Distance (m) | Barrier | Reflection | On Time (%) | Angle of View ($^0$) | Traffic Volume / hour | Speed (km/hr) | Total (dB(A)) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Total noise from site at receiver | | | 89 |
| Rolling gravel / bricks | | | | | | | | | | |
| 1 | Road roller | 108 | 50 | None | None | 100 | 90 | 10 | 10 | 55 |
| | | | | | | | Total noise from site at receiver | | | 85 |
| Compacting fill | | | | | | | | | | |
| 1 | Vibratory roller | 106 | 50 | None | None | 50 | 90 | 20 | 15 | 84 |
| 2 | Compactor rammer | 108 | 50 | None | None | 50 | 90 | 20 | 15 | 86 |
| | | | | | | | Total noise from site at receiver | | | 88 |
| Compacting sub-base | | | | | | | | | | |
| 1 | Compactor rammer | 108 | 50 | None | None | 100 | 90 | 20 | 15 | 89 |
| | | | | | | | Total noise from site at receiver | | | 89 |
| Compacting earth | | | | | | | | | | |
| 1 | Compactor rammer | 108 | 50 | None | None | 100 | 90 | 20 | 15 | 89 |
| | | | | | | | Total noise from site at receiver | | | 89 |
| Road surfacing | | | | | | | | | | |
| 1 | Asphalt melter (Stationary) | 103 | 50 | None | None | 70 | NA | NA | NA | 59 |

| ID | Type | Noise pressure (dB), 1m fromthe source | Distance (m) | Barrier | Reflection | On Time (%) | Angle of View ($^0$) | Traffic Volume / hour | Speed (km/hr) | Total (dB(A)) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | Asphalt spreader | 110 | 50 | None | None | 70 | 90 | 10 | 10 | 88 |
| 3 | Road roller and lorry | 96 | 50 | None | None | 80 | 90 | 10 | 10 | 42 |
| | | | | | | | | | Total noise from site at receiver | 88 |
| Installation of traffic light controls | | | | | | | | | | |
| 1 | Groove cutter | 115 | 50 | None | None | 100 | NA | NA | NA | 73 |
| | | | | | | | | | Total noise from site at receiver | 71 |

- Receiver Distance: The minimum distance in meters between thesource plant and the receiver – considered as 50m.
- On Time (%): The percentage of time (of the overall time period in question) forwhich this plant is on.
- Barrier: If there is a barrier between the source and the receiver (None - To reflectthe worst-case scenario)
- Reflection: If the receiver is within 1m of a wall then select this option
- Angle of view: 900
- Traffic Volume (veh/hour): Total number of return journeys that is made by the mobile plant in an hour
- Speed: Average speed of the plant in kilometres per hour

Although this level of noise is higher than the permissible limit for ambient noise level for residential/commercial levels but will occur only intermittently and temporarily. This noise level will attenuate with an increase in distance from the noise source, decreasing by 10dB at a distance of about 55m and 20 dB at 180 meters. Impact due to noise during construction activities will be minimal near communities as construction camps are located at least 50 meters away from community areas.

Along the project road, noise-sensitive places have been located which includes schools,hospitals, and religious places. Noise impacts during project construction will be significant on these but temporary.

The principal source of noise during construction of highway would be from operation ofequipment, machinery and vehicles. Earth moving machineries e.g. excavators, graders and vibratory rollers has potential to generate high noise levels. These machineries produce noise level of more than 70 dB (A). This can cause disturbance to the settlement, adjacent to the carriageway or at 500 m from the worksite. The vibration produced by rollers can be transmittedalong the ground. This may cause damage to kutcha structure located along the alignment. Theextent of damage would be dependent on the type of soil, the age and construction of the structure. The noise generated during the construction would cause inconvenience to thepopulation adjoining the road especially within 500 m of the alignment after which it would be attenuated to acceptable levels Since, the settlement along the road alignment is sparse the severity of the noise in sensitive receptor are given below.

- Further, using the Inverse Square Law of noise propagation, anticipated noise at the sensitive receptor due to construction was also calculated. This is given below.

*Table 37: Anticipated Noise due to construction in the sensitive receptor*

| Name of the Component | Description | side of the road (L/R) | Distance from the road (m) | Noise Level (dB) |
|---|---|---|---|---|
| SCH | School | LHS | 194.47 | 59.20 |
| SCH | School | RHS | 2.92 | 95.67 |
| SCH | School | RHS | 5.28 | 90.52 |
| CHC | Church | RHS | 1.78 | 99.97 |
| HSP | Hospital | RHS | 0.39 | 113.15 |
| CRT | District Session Court | RHS | 8.81 | 86.07 |

From the above study we have observed that the range of noise level of maximum locations is exceeding the permissible limit for both Sensitive and Non-sensitive receptors. To avoid impacts, the mitigation measures are proposed below.

Although all the construction related activities are not expected to occur simultaneously at a given location yet increases in noise due to construction activities (land clearing, site preparation, material/ equipments /machinery movement, establishment of camps/site offices) are expected.

Control Measures adopted during Construction Phase for Noise Environment

- Site Controls: Stationary equipment will be placed along un-inhabited stretches, as far as practicable, to minimize objectionable noise impacts. These locations should be away from known bird nesting areas.
- Scheduling of Project Activities: Construction activities will be scheduled to coincide with period when people would least likely to be affected. Constructionactivities will be strictly prohibited between 10 P.M. and 6 A.M. Near sensitive areas like schools, construction activities should be prohibited at the schooling hours. Noisy operation near known nesting areas should be avoided during winter, typical breeding period of migratory birds.
- Protection devices (ear plugs or ear muffs) will be provided to the workers operating in the vicinity of high noise generating machines.
- Construction equipment and machinery should be fitted with silencers and maintained properly.

- Noise measurements should be carried out along the road to ensure the effectiveness of mitigation measures
- All construction equipment used for an 8-hour shift shall conform to a standard of less than 90 dB(A). If required, machinery producing high noise as concrete mixers, generators etc., must be provided with noise shields;
- At construction sites within 500m of human settlements, noisy construction activities shall be stopped between 9.00PM and 6.00AM and near sensitive locations such as schools construction activities should not be done during the schooling hours.
- Vehicles and construction machinery shall be monitored regularly with particular attention to silencers and mufflers to maintain noise levels to minimum;
- Workers in the vicinity of high noise levels must wear ear plugs and should be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 85 dB(A)per 8-hour shift.

#### *5.1.2.6 Surface Water Quality and Siltation*

Construction activities may increase turbidity level increasing the sediment load. Sometimes contamination of surface water may take place due to accidental spills of construction materials, oil, grease, fuel, and paint. 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. During construction phase, care would be exercised to control silt so that the water available in the ponds and wells especially those located very near to the RoW may not be contaminated.

Extraction of sand from the river bed will increase turbidity and affect propagation of fishes and other aquatic life mainly benthic organisms. The macro-benthic life which remains attached to the river bed material may get dislodged and carried away downstream by turbulent flow. Mining and dredging activities, poorly planned stockpiling and uncontrolled dumping of overburden, and chemical/fuel spills from equipment's and machinery involved in dredging may cause deterioration of water quality for downstream users, and poisoning of aquatic life. However, the river bed sand quarries identified for the project have no density and diversity of benthic fauna. Fishing is practiced in the water bodies intersecting the project road. There are several ponds adjacent to the proposed project road. Moreover, any extraction of river bed material is regulated by different authorities like State Environmental Impact Assessment Authority, State Pollution Control Board and State Mining Department with an objective to conserve top soil, avoid impact on aquatic biodiversity, hydrological regime etc. by haphazard and unscientific mining of minor minerals. The project will utilize river bed materials fromexisting licensed quarries with all stipulated conditions of above-mentioned authorities.

Mitigation Measure**:**

- Construction works near waterways/water bodies will not be undertaken during themonsoon season
- Retaining walls have been proposed to prevent erosion
- Installation of temporary silt traps or sedimentation basins along the drainage leading tothe water bodies;
- No construction camp within 500m of any water body

- Locating all parking, repair and fuel and hazardous material storage area away from anywater body. Vehicle parking and maintenance areas will have waterproof floors from which drainage is collected and treated to legal standards.
- Refueling vehicles only in dedicated areas with waterproof floors from which drainage flows to an oil/water separator before discharge
- Collecting all waste oil, store in sealed damage-proof containers and disposing it to recyclers.
- All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up.
- Installation of temporary retention ponds, interception drains, and silt traps to prevent siltladen water from entering adjacent water bodies/waterways;
- Modification and rechanelling of the slopes of embankments leading to water bodies to prevent entry of contaminants.
- Compliance with requirements of the clearance issued by the relevant state authority for mining in rivers
- No construction related activities of bridges during breeding season of fish and other aquatic species.

#### *5.1.2.7 Impacts on natural drainage and watershed management (flooding)*

Along the rivers and streams crossed by the road, there is a need for bank protection measures to avoid accelerated sedimentation that can affect drainage pattern as well as riverine habitats. The alignment follows the existing topography except for the locationof the cross-drainage structure. There is no existing Major Bridge on the Project Road section only 5 nos. of minor RCC Bridge exist, and No additional bridges are proposedto be constructed. Out of the 51 nos. of existing culverts, overall condition found good, cleaning may require for few cases.

**Proposed Mitigation Measure**

A slope protection measure that has been successful in Meghalaya has been the use of Vertiver as a Bio engineering measure. The basis of this technique is plantation of Vetiver plants of approved variety specifically designed as per the soil and site conditions. For controlling the underwater erosion, a flexible mattress is proposed to be used. This mattress made of waste/recycled items like empty cement bags which will remain intact for long periods under water has been found effective in controlling underwater erosion elsewhere in Meghalaya. The stretches along the river bank will alsohave a reed bed which will absorb the flow energy before the water current hits the bank.

#### *5.1.2.8 Ground Water Quality*

Water for construction purpose will be sourced mainly through major streams along the project road. Suitable arrangement for drinking water in the campsite will be managed by contractor without affecting availability to local community. The area is not classified as critical semi-criticalor overexploited by CGWB. However, uncontrolled drinking water abstraction can deteriorate the situation. Contamination of groundwater is not envisaged since all construction camps will have septic tanks or mobile toilets depending on the number of workers in each camp.

Mitigation Measures:

- Provision for adequate numbers of septic tank to avoid contamination of ground water
- Requisite permission will be obtained for abstraction of groundwater.

- The contractor will make arrangements for water required for construction in such a waythat the water availability and supply to nearby communities remain unaffected.
- Water harvesting structures shall be proposed for groundwater augmentation in theproject area.
- No change in groundwater regime is envisaged, hence no mitigation is proposed.

#### *5.1.2.9 Construction and Demolition Waste*

Construction and Demolition waste shall be generated during the project construction phase. A certain amount of waste will be generated. Those wastes shall be utilized by the Contractor depending upon suitability. However, Contractor shall dispose unused C&D waste at designated disposal site as per the Construction and Demolition Waste Management Rules, 2016.

Mitigation measures:

Contractor will use the excavated road side material for construction of road. The rest unsuitable material will be disposed suitably. The lead and lift have been considered in cost estimates. The Contractor will not dispose the excavated unsuitable material generated from hillsection to other side (valley side) of the project road. Proper disposal plan will be prepared by the Contractor to dispose the unsuitable material generated from hill cutting/ road excavation.

#### *5.1.2.10 Natural Disaster*

Flood and flash flood is common during the monsoon in the vicinity of the proposed projectroad. During public consultation it was revealed by the local people that flash flood occurs in several villages in the project area during the months of monsoon season. Hence All CD structures have been proposed to be designed with anticipated risk of flood. Embankment height along potential flood affected areas shall increase. Lined and unlined side drains have been included in the design to avoid water-logging.

Relevant IS codes have been adopted in designing the structures to sustain the highest magnitude of earthquake.

#### *5.1.2.11 Disruption of Community Services*

Local services, including water supply lines, irrigation line, drainage, ditch, and streets are commonly cut during road earthworks. These activities are required by the local people for crop production, drinking water supply and access, and have the potential to damage road work too. These services are often either inadequately reconnected or not reinstated at all.

Mitigation Measures

- The Contractor will make arrangements for their own source to cater to their water requirement for construction and other activities and will not interfere with the local watersupply system
- All irrigation canals, water supply lines and stand pipes, drainage and streets will be maintained during construction or if necessary, temporary services shall be arranged of the owner/ users permission for temporary cessation will be gained.
- All the Services will be progressively reinstalled as soon as road excavation has been completed.

#### *5.1.2.12 Diversion of Traffic*

Since the road upgradation works will be on the existing road only, therefore there will be direct interface with the road traffic. The Short-term impacts associated with the project will be traffic diversion and management during construction phase. Construction activities will cause hindrance to the existing traffic flow. There is possibility of accident hazards during construction phase of the widening project. There will be requirement for diversion of existing traffic at various construction sites during construction phase. It needs to be mentioned that though there are no direct impacts on the natural environment due to disruption/diversion of such services, but diversion can also lead to adverse impacts if not planned properly. Rapid restoration of diverted services can help in minimizing the severity of impacts arising out due to diversions of existing services.

Mitigation Measures

- Proper preventive measures will be taken during the construction activities at theconstruction sites
- Reduce speed through construction zones.
- Construction of bridges/culverts will be carried out prior to construction of newcarriageway at the first stage.
- Strengthening/raising of existing two lanes will be done only after the completion of thefirst stage.
- Proper warning signs will be displayed at construction sites.

#### *5.1.2.13 Impacts on Occupational Health & Safety*

The Construction workers are continuously exposed to dust and gaseous emission during construction activities. The construction industry falls in hazardous category and there is alwaysa risk of accidents to the labours. However, this type of risks of Occupational hazards can be managed with implementation of proper safety at site.

Mitigation Measures:

- The Contractor will comply with the requirements of the Environmental, Health, and Safety (EHS), Guidelines of the World Bank, April, 2007 and all national, state and local core labor laws on working conditions and safety during construction.
- The Contractor will Develop and implement site-specific Health and Safety (H&S) Plan including SoP for preventing spread of COVID-19 epidemic which will include measures such as: (a) excluding public from the site;

(b) ensuring all workers are provided with and use Personal Protective Equipment;

(c) H&S training for all site personnel;

(d) documented procedures to be followed for all site activities; and,

(e) documentation of work-related accidents

- The Contractor will provide adequate good quality Personal Protective Equipment (PPE)to all the workers working at construction zones and Plant sites and will ensure that these PPEs are used by workers at all time during works.

- Safe access to the work site and safe working conditions to be maintained throughoutthe working

period.

- Adequate drainage, sanitation and waste disposal will be provided at workplaces.
- Proper drainage will be maintained around sites to avoid water logging leading tovarious diseases.
- Adequate sanitation and waste disposal facilities will be provided at construction camps by means of septic tanks, soakage pits etc.
- A health care system will be maintained at construction camp for routine check-up of workers and avoidance of spread of any communicable disease.
- Readily available First Aid kit bearing all necessary first aid items will be proved at allthe work sites and should be regularly maintained.
- The Contractor will organize awareness program on occupational health and safety aspects as well as on HIV/AIDS and sexually transmitted diseases (STDs) and COVID- 19 on periodic basis through authorized agency.
- Preventive measures require to be followed to avoid or minimize transmission of communicable diseases that may be associated with the influx of temporary or permanent project labour for workers on periodic basis.

#### *5.1.2.14 Work Site Safety*

Construction site safety is one of the most overlooked things during a construction project. In most workplaces accidents are common due to lack of work site safety. Accidents have the potential to be life-threatening and can be avoided through proper Work site Safety.

Mitigation Measures:

- Safe access to the work site and safe working conditions to be maintained throughoutthe working period
- Scaffolding to be used properly.
- Avoid enter a trench that is unprotected.
- Avoid ladders with metallic components near electrical work and power lines
- Head Protection, use helmet or body harnesses
- Construction workers should wear work boots with slip-resistant and puncture-resistantsoles
- Hazard communication: Make information accessible to employees at all times in a language or formats
- Check all electrical tools and equipment regularly for defect
- The Contractor will comply with the requirements of the Environmental, Health, and Safety (EHS), Guidelines of the World Bank, April, 2007 and the statutory norms on safety during construction.

#### *5.1.2.15 Anticipated Impact on Biological Environment:*

**Impact on Faunal and Terrestrial Ecology:**

The entire project site is within the William Nagar Town and there are no National Parks, Wildlife Sanctuaries and other eco-sensitive areas nearby.

There is hardly the presence of any Endangered/ Schedule - I species in the project area, as confirmed by site visits as well as consultation with community and Forest/Wildlife department. Majority of the important species are reported from outside of the RoW.

The traffic — animal conflicts during the operation stage shall be resolved by implementing speed calming mitigation measures such as road humps, rumble strips, speed limits, sign boards etc.

It is essential to make provisions for the transportation of agricultural equipment and animal crossing wherever necessary by providing service roads, speed breakers (road humps, rumble strips, signboards, etc.). Although situation does not warrant for the provision of exclusive underpasses, all possible efforts shall be made to avoid animal- traffic conflict arising out of proposed improvement of project roads.

There is a scope of slight impact to local domestic animals, which graze in the area especially after the road is constructed. Increased vehicle movement in the area might lead to accidents involving animals. Apart from this, micro-ecosystems developed on the roadside, with the birds, animals and insects using the plantation over the years would be lost due to loss of theirhabitat.

**Mitigation**

- The Contractor shall 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.
- Mandatory / Regulatory sign for entire section of project road, at every 2 km, on alternate sides is proposed.
- The compensatory plantation shall act as the new habitat for the birds, animals and insect species
- If any animal is found near the construction site at any point of time, the contractor shall immediately upon discovery thereof contact authorized wildlife rescuer or Forest Dept. for rescue of snakes or other distressed wildlife.
- Special care of ponds shall be taken since the wildlife and the public are dependent on these water bodies.

**Impact on Flora and Mitigation measures:**

No tree felling is anticipated as proposed construction is within existing RoW. Following mitigation measures are proposed as preventive mitigation measures.

- Trees if required to be fell due to the project activity shall only be cut after requisite permission from State Forest Department is obtained.
- Trees impacted by the project shall be compensated by planting of endemic tree species which are highly tolerable to vehicular emissions and dust as per IRC: SP 21.
- All necessary measures such as siting of construction establishments away from human habitations; increase of stack height; regular maintenance of construction equipments and vehicles; etc. shall be taken up to reduce the dust and gaseous emissions duringconstruction activities.

- The compensatory plantation shall act as the new habitat for avifauna, lesser mammals, herpetofauna & insects. List of species recommended for taking up compensatory afforestation has been presented in the table below. Local authority and populace may also be consulted for selection of species types.

**Impact on Aquatic Ecology:**

The Simsang River is situated within close proximity to the Project Site. The major impacts on the aquatic ecology during construction include increase in the silt inflow to the surface water bodies and disposal of liquid wastes and untreated sewage from construction camps and labourcamps into the surface water bodies causing water pollution. No negative impacts are envisaged on the aquatic ecology during the operational phase.

***Mitigation measures***

- Construction of road embankments shall be done based on specified norms as perslope ratio and turfing on the slopes to reduce the embankment erosion. Construction of cross drainage structures will be taken up during lean flow period to avoid the silt inflow to the surface water bodies.
- If any aquatic animals, such as turtles, are found near the construction site at any pointof time, the contractor shall immediately upon discovery thereof contact authorized wildlife rescuer or Forest Dept. for rescue of the said animals.
- No fishing should be allowed by construction workers
- Liquid wastes and sewage from the construction establishments will be treated to meet the CPCB standards before disposing it into water bodies.
- Accidental chemical spills shall be handled by emergency spill procedures such as stopping the flow; removing ignition source; initiating emergency response; cleanup and safe disposal.
- Provision for silt traps has been made at regular intervals, especially at major cross drainage structures to trap the silt before it reaches the water bodies along the subproject road.

**Management of Construction Debris/Waste**

Construction debris/waste is generated due to demolition of existing structures, scarification of existing pavement and excavation on some sections of the subproject road etc. Improper disposal of scarified bitumen causes decrease in soil fertility and water pollution. Careless disposal of debris can obstruct waterways causing siltation of reservoirs and reduce capacity. Unleaded demolition wastes will cause traffic blockage and dust, thus causing inconvenience and health risks.

***Mitigation measures***

- During the site clearance and disposal of debris, the contractor shall take full care to ensure that public or private properties are not affected; there are no dwellings belowthe dumpsite and the traffic is not interrupted.
- The Contractor shall at all times ensure that the entire existing canal and drains within and adjacent to the site are kept safe and free from any debris.
- Construction waste debris shall be utilised for backfilling embankments, filling pits,construction of cross roads, approach roads and landscaping before being disposed intodisposal pits.
- Debris disposal sites shall be sited away from sensitive locations like settlements, water body, forest areas and any other sensitive locations.
- The debris dumpsites have to be suitably rehabilitated by planting local species of shrubs and other plants so that the landscape is coherent with the local environment.
- Care should always be taken to maintain the hydrological flow in the area and that the dumping sites do not contaminate the water sources such as rivers and ponds.
- Public perception about the location of debris disposal site has to be obtained before finalizing the location. Permission from the Village/local community is to be obtained for the Disposal site selected.

**Impacts during Operational Phase**

During operation stage, the main sources of environmental impacts are the increased traffic volume and speeds. The increase in traffic volume and speed may enhance the safety risk especially in the congested areas. No sudden change in the traffic volume is expected due to this road as the road is already existing one and opened for public traffic. During operational phase this will be enhanced with the activities associated with the maintenance of landscape such as plantation programme etc. Widening will ensure smooth plying of the vehicles and also will help in reducing the congested zone and thus will reduce the emission rate of vehicles. Various impacts during operation phase are discussed below:

***Impacts on Water Quality and Resources***

During the operation phase, the possibility of degradation of water quality can be expected due to accidental spillage only. However, the probability of such accidents are minimal since enhancement of road safety measures such as improvement of curves and widening of the roads and other pedestrian facilities are taken care of in the design stage. Periodic monitoringof water quality will be done at selective location of proposed project.

***Impact on Air Quality***

Vehicular emissions are the principal source of pollution during the operation stage. The subproject road being mostly located in built-up areas; dispersion of gaseous pollutants is less.

***<u>Mitigation Measures:</u>***

Implementation of stricter emission norms for the vehicles is the only mitigation measure thatwill have significant influence on the ambient air quality. In the year 2040, if 50% of the total vehicle turns into electric vehicle then the impact will be less. However, implementation of such norms for vehicles plying on the project road is beyond the control of the proponent.

#### *5.1.2.16 Impact on Noise Quality*

Impact due to increased noise level and vibration is anticipated due to heavy vehicular movement upon improvement of existing road condition.

***Mitigation Measure***

To reduce noise and vibrations, noise barriers in the form of compound wall is proposed.In case of space crunch, the use of concrete screens is also suggested. The noise barrier wall shall be constructed by excavation of foundation, laying of brick masonry wall up to a height of 2m aboveground, plastering and coping as per the direction of the engineer and as laid in the specification. Creepers and paints shall be used in consultation with the affected community to give an aesthetic look. Shade and flowering trees shall be planted within the boundary of the sensitive receptor, between the building line and the compound wall, wherever space shall be available, 5m centre to centre.

The measures adopted for noise attenuation is given below

- Plantation within the premises if space available for plantation
- Raising of existing boundary wall/ construction of newwallupto2mheight
- Planting creepers to provide aesthetic view

In urban areas the boundary wall can be painted with posters to provide aesthetic views. The option of posters or creepers shall be agreed by the school / hospital administrator.

## 5.2 Social Impact Assessment

### 5.2.1 Projects Impacts

The urban infrastructures project is associated with some adverse impacts as well as some benefits. The major impacts of the project include temporary loss of livelihood during the actual construction period due to inaccessibility to the commercial enterprise all along the project corridor and in Parking Areas. Socio Economic survey for the non-title holders who are temporarily affected during actual civil construction work started from September, 2021. Due to the pandemic situation the Survey started from 10$^{th}$ November and continued till 20$^{th}$ December, 2021 and will be updated in the final DPR. The SES was done in November 2021 and also consultation was done from November to December 2021 which are completed for the present design phase.

### 5.2.2 Positive Impact

This sub-project aims to reduce traffic congestion within the Williamnagar Town. The storm water drain improves the existing system of rain water flow as most of the drain chokes due to silting. The new design will make easy cleaning/desilting of the storm water drain and thus prevent the overflow of water on the black top. The footpath over the drain and utility corridorwill reduce accident.

- People residing at the Williamnagar town area road can easily travel within the area. It will give a major fillip to the quest for all weather good roads for the PIA.
- Lower accident and provide quick accessibility to services like hospital, market, office etc.

### 5.2.3 Impact on Land

As discussed earlier also there is no scope of land acquisition and the RoW is free from all encroachments and encumbrances in the project area. The proposed construction of parking areas is within the available Government land. Thus, there is no permanent impact on the titleand/or non-title holders.

### 5.2.4 Impact on Structures

During the census survey the structures were also enumerated along the sub-project road. Based on the updated DPR design, there would be no impact on any structures belong to private individuals both title and non-title holders or Community Displaced Families

### 5.2.5 Impacts on Affected Families

As there is no land acquisition and the RoW is free from any encroachments or encumbrances there will be no permanent impact to any families.

### 5.2.6 Impact on Gender

In Indian context, irrespective caste, creed, religion and social status, the overall status of women in lower than male and therefore a male child is preferred over a female child. According to 2001 Census in Meghalaya, the sex ratio was 972 females per 1000 male in 2001 but it has increased in 2011 with 989 females per 1000 male which is an indication of social development.

The gender composition of surveyed persons shows that the male accounts for 53% and female accounts for 47%. The gender disparity is visible in among surveyed persons i.e. 902 against state level statistic having 989 but as per census data of India, 2011. The sex ratio of West Khasi Hills district is 974 females per 1000 males in 2011. The illiterate among the female is slightly higher than of the male counterparts.

### 5.2.7 Migration

The Decadal growth rate of the East Garo Hills district and town clearly indicates influx of migrates from the nearby districts and villages. The SES reveals that about 2.38% of the population or One Family has immigrated in the urban in the last 25 years.

### 5.2.8 Impact on Tribal People

**a) Impact on Land & Structure of ST**

As there is no Land Acquisition and the RoW is free from all encumbrances there will be no impact of the land, structures and livelihood of the ST population.

**b) Impact on Socio Economic Profile of ST**

The proposed sub-project can be viewed as boosting economic growth and poverty reduction, which will bring substantial social and economic development in the region.

**c) Impact on Community**

d) There is no cultural heritage site of the ST which comes in the way of the road alignment. There was no impact on cultural or social impact on the ST population was found.

**e) Impact on Gender**

The tribes of Meghalaya whose societies are organized on matrifocal principles have obtained much greater gender equality than the societies (e.g. Hindu and Muslim) that are organized on the patriarchal principles. However, it was identified that social and economic benefits for affected which are culturally appropriate and gender and inter-generationally inclusive and develop measures to avoid, minimize, and/or mitigate adverse impacts on STs mainly the Gender. Suggestion of noise barrier, reduction of dust, providing employment of the female members as unskilled labourers during construction were the results of the focus group discussions.

Continuous meaningful focus group discussions with the ST women and STs communities and concerned STs organizations were carried out and will be carried on to solicit their participation

(i) in designing, implementing, and monitoring measures to avoid adverse impacts or, when avoid acne is not possible, to minimize, mitigate, or compensate for such effects; and (ii) in tailoring project benefits for affected ST communities in a culturally appropriate manner. To enhance STs' active participation, projects affecting them will provide appropriate and gender inclusive capacity development. Establish a culturally appropriate and gender inclusive grievance mechanism to receive and facilitate resolution of the ST concerns.

### 5.2.9 Impact on Access to Services Amenities

- **Transport facility**

Transport facility is considered as the most basic of all civic amenities as this is the life line to access any kind of social services. Most of the clusters in the PIA have adequate road transport facility but it fails to cater its benefit due to bad condition of the road during winter and rainy season. Williamnagar town road is of great importance, as the road will carry not only the normal city traffic, but also the freight traffic that will connect the export points to the National Highway.

- **Solid Waste Dumping Facilities**

The PIA is congested with structures and roads and as it is situated on the hill slope, solidwaste dumping is a very sensitive issue in the area. As per the SES it is revealed that more than 95% of the people dispose solid waste by the method of door to door collection by local Authority in the urban area.

- **Source of Drinking Water**

The main source of drinking water in the PIA is river, streams and ponds (nearly 68%).

Table 38: Source of Drinking Water of Sample Families

| Sl. | Types of drinking Water Source | Numbers | Percentage |
|---|---|---|---|
| 1 | Tap Water by ULB | 16 | 94% |
| 2 | Groundwater/surface water | 1 | 6% |
| Total | | 17 | 100% |

**Source: Census& SES Survey, September 2021**

- **Distance of Medical Facilities**

Medical facilities like government hospital and urban health centres (UHC) are not easilyavailable within 5km for 18% of the population.

Table 39: Distance of Medical Facilities of Sample Families

| Sl. | Distance of Medical Facilities | Numbers | Percentage |
|---|---|---|---|
| 1 | Within 1km | 8 | 47% |
| 2 | Within 2km | 6 | 35% |
| 3 | Within 5km | 3 | 18% |
| 4 | More than 5km | - | - |
| Total | | 17 | 100% |

***Source: Census& SES Survey, September 2021***

- **Other Services**

The proposed project will enhance the standard of living and/or quality of life of the residents of West Khasi Hills. During the construction there might some temporary restrictions in access which have to be taken care in the ESIA.

There is no permanent impact regarding the limited access to services or amenities are envisaged in the process of development of the proposed project.

## 5.3 Impacts on Road Safety and Human Health

The planning and designing of the project road are in accordance with the improved safety measures and better health conditions.

The chances of accidents could be minimized by (1) strengthening the pavements, (2) improving upon the curves in road geometrics, (3) grade separators (4) proposing the service lanes in market places and near schools, etc (5) providing proper median, (6) improving upon road crossings (7) putting right signals and signboards, (8) new under passes.

## 5.4 Mitigation Measures:

The project is likely to bring some negative impacts on the environment and socio-economic structure of the region. While deciding the alignment from environment point of view, some negative potential impacts are unavoidable. In such cases, adoption of mitigation measures is the only solution. Mitigation should be focused on achieving goals within clear timeframes. Use of SMART approach is recommended to evaluate the likely effectiveness of alternative mitigation strategies or measures. The SMART refers to measures that are Specific, Measurable, Achievable,Realistic and Timely. GBV is rare in Meghalaya Societies and the influx of labour from nearby districts is very low as the volume of work is not huge.

Table 40: Potential impact and mitigation measure along the project road

| Potential Impacts | Mitigation |
|---|---|
| Accidental spots can be reduced by providing proper signs and warnings, improvement of junctions, new under pass, fly-over etc. | • Proper provision of service roads, junctions, fly-over, under passes tobe provided at appropriate places<br>• Truck parking places<br>• Medical facility to be provided (an ambulance fitted with all medical equipments and a doctor) |
| Sexually transmission diseases (STDs) | • Detected diseased person to be carried to the nearest city hospital<br>• Preventive measures should be taken to check the spreading of STDs |

# 6 CHAPTER-VI: ENVIRONMENTAL MONITORING PROGRAM

The purpose of the monitoring program is to ensure that the envisaged purpose of the projectis achieved and results in desired benefits to the target population. To ensure the effective implementation of the Environmental Management Plan (EMP), it is essential that an effective monitoring program should be designed and carried out. The environmental monitoring program provides such information based on which management decision may be taken duringconstruction and operational phases. It provides basis for evaluating the efficiency of mitigation and enhancement measures and suggest further actions that need to be taken to achieve the desired effect.

**Objective of Monitoring Program**

The Objectives of environmental monitoring program are-

- Evaluation of the efficiency of mitigation and enhancement measures;
- Updating of the actions and impacts of baseline data;
- Adoption of additional mitigation measures if the present measures are insufficient;and
- Generating the data, which may be incorporated in environmental management planin future projects.

## 6.1 Environmental Monitoring

Environmental monitoring describes the processes and activities that need to take place to characterize and monitor the quality of the environment. Environmental monitoring is used in the preparation of environmental impact assessments, as well as in many circumstances in which human activities carry a risk of harmful effects on the natural environment. All monitoring strategies and program have reasons and justifications which are often designed to establish the current status of an environment or to establish trends in environmental parameters. In all cases the results of monitoring will be reviewed, analyzed statistically and published. Thedesign of a monitoring program must therefore have regard to the final use of the data before monitoring starts.

## 6.2 Monitoring Plans for Environment Condition

For each of the environmental components, the monitoring plan specifies the parameters to be monitored; location of the monitoring sites; frequency and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities. The monitoring plan for the various environmental condition indicators of the project in construction and operation stages is presented below**.**

Monitoring plan does not include the requirement of arising out of Regulation Provision such as obtaining NOC/ consent for plant site operation.

Table 41: Environment Monitoring Plan

| Environmental Component | Project Stage | Monitoring | | | | | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|---|
| | | Parameters | Special Guidance | Standards | Location | Frequency | Implementation | Supervision |
| Air Quality | Construction Stage | PM10, PM 2.5, $SO_x$, NOx, CO | Respirable Dust Sampler to be located 50 m from the plant inthe downwind direction.<br><br>Use method specified by CPCB for analysis | Air (P&CP) Act,1981 and its amendment | Hot mix Plant / Batching Plant. Stretch of the road where construction is in progress at the site.<br><br>(Total 02 locations) | Three times in a year for two years<br><br>(Excluding Rainy season) | Contract or through NABL approved monitoring agency | Environment Expert-AE/IE/PIU |
| | Operational Stage | PM10, PM 2.5, $SO_x$, NOx, CO | Respirable Dust Sampler tobe located 50m from the plant in the downwind direction. Use method specified by CPCB for analysis | Air (P&CP) Act,1981 and its amendment | As directed by the PIU<br><br>(02 Project locations) | Three times ina year for two years<br><br>(Excluding Rainy season) | P I U<br><br>through NABL approved monitorng agency | P I U |
| Water Quality | Construction Stage | Parameters as per IS: 10500 and standards of surface water | Grab sample collected from source and analyze as per Standard Methods for Examination of Water quality | Water quality standards by CPCB | 01 drinking water sample-Labour Camp and 01 surface water samples in project | Three times ina year for two years<br><br>(Excluding Rainy season) | Contract or through NABL approved monitoring agency | Environment Expert-AE/IE/PIU |

| Environmental Component | Project Stage | Monitoring | | | | | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|---|
| | | Parameters | Special Guidance | Standards | Location | Frequency | Implementation | Supervision |
| | | | | | stretch. | | | |
| **Water Quality** | **Operation Stage** | Parameters as per IS: 10500 and standards of surface water | Grab sample collected from source and analyze as per Standard Methods for Examination of Water quality | Water quality standards by CPCB | As directedby the PIU<br>(01 Project locations) | Three times ina year for two years<br>(Excluding Rainy season) | P I U through NABL approved monitoring agency | P I U |
| **Noise Levels** | **Construction Stage** | Noise levels on dB (A) scale | As per CPCB | Noise standard s by CPCB | Hot mix Plant / Batching Plant. Stretch of the road where construction is in progress at the site.<br>(Total 03 locations) | Three times ina year for two years. | Contract or through NABL approved monitoring agency | Environment Expert-AE/IE/PIU |
| | **Operation Stage** | Noise levels on dB (A) scale | As per CPCB | Noise standard s by CPCB | As directedby the PIU<br>(Total 03 locations) | Three times ina year for two years. | PIU through NABL approved monitoring agency | PIU |
| **Soil Erosi** | **Const** | Turbidity in Storm | ---- | As per Standard | 01 location construction camp and | Three times in a year | Contract or through | Environment Expert- |

| Environmental Component | Project Stage | Monitoring | | | | | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|---|
| | | Parameters | Special Guidance | Standards | Location | Frequency | Implementation | Supervision |
| | | Water<br><br>Silt load in ponds, water courses | | (ICAR) | 01 major construction locations. (Total 02 locations) | for two years | NABL approved monitoring agency | AE/IE/PIU |
| | Operational Stage | Turbidity in Storm Water<br><br>Silt load in ponds, water courses | ---- | As per Standard (ICAR) | As directedby the PIU<br><br>(Total 02 locations) | Three times ina year for two years. | PIU through NABL approved monitoring agency | PIU |

### 6.3 Environmental Monitoring Budget:

The environmental monitoring cost is estimated on the basis of the length and existing environmental scenario of the proposed project. Environmental monitoring cost of 6, 18,000/- is estimated for the construction and Operation stages. The details have been presented in Table 42: Environmental Monitoring Cost

*Table 42: Environmental Monitoring Cost*

| Cot of Environment / Migration Plan Description | Unit | Quantity | Unit Rate | Cost |
|---|---|---|---|---|
| Air quality monitoring at 2 locations for 3 seasons for 2 consecutive years. (Construction Stage) | No. | 12 | 9000 | 108,000 |
| Air quality monitoring at 2 locations for 3 seasons for 2 consecutive years. (Operation Stage) | No. | 12 | 9000 | 108,000 |
| Water quality monitoring at 2 locations for 3 seasons for 2 consecutive years. (Construction Stage) | No. | 12 | 7000 | 84,000 |
| Water quality monitoring at 2 locations for 3 seasons for 2 consecutive years. | No. | 12 | 7000 | 84,000 |

| Cot of Environment / Migration Plan Description | Unit | Quantity | Unit Rate | Cost |
|---|---|---|---|---|
| (Operation Stage) | | | | |
| Noise quality monitoring at 2 locations for 3 seasons for 2 consecutive years. (Construction Stage) | No. | 12 | 3000 | 36,000 |
| Noise quality monitoring at 3 locations for 3 seasons for 2 consecutive years. (Operation Stage) | No. | 18 | 3000 | 54,000 |
| Soil quality monitoring at 2 locations for 3 seasons for 2 consecutive years. (Construction Stage) | No. | 12 | 6000 | 72,000 |
| Soil quality monitoring at 2 locations for 3 seasons for 2 consecutive years. (Operation Stage) | No. | 12 | 6000 | 72,000 |
| **Total** | | | | **6,18,000** |

# 7 CHAPTER-VII: CLIMATE CHANGE IMPACT & RISK

A rapid increase in the number of motor vehicles on road in Meghalaya has been observed over the past decade. Due to the lack of adequate public transport systems where buses comprise only 1% of the total population of vehicles on road, and due to the availability of easy loans, most of the people are aspiring to buy their vehicles. As a result, two-wheelers are 57% of the total vehicle mix in the State, and cars follow suit with a 21% share in 2013-14. The road transport sector is a direct consumer of fossil fuel, emits GHG into the atmosphere. With an increase in population and per capita rise in the number of personal vehicles, GHG emissions are likely to rise. The use of the public transport system needs to control future emissions in thefuture and to ease off the pressure of vehicles on the roads, hence. This would require policy changes in the way lending is done by banks, enabling fuel mix with biofuels, and behavioural changes of the population whereby they use more and more non- motorized transport at short distances and public transport for long distances.

## 7.1 Climate Change Mitigation

The Transport Emissions Evaluation Model for Projects (TEEMP) developed by Clean Air Asia was utilized to assess the CO2 gross emissions with and without the project improvements.The main improvement from the project that was considered for the model are better surface roughness with initially 6 m/km which may deteriorate over a period but not less than 2 m/km and widening of roads from the single/intermediate lane to two lanes with paved shoulder (7m). These were translated into impacts on traffic speed and hence fuel consumption. The model also allows for the inclusion of impacts related to traffic congestion with and without project through provisions for inserting data on the traffic numbers, lane width, number of lanes, and volume/capacity saturation limit.

Information that was fed into the model for projecting the $CO_2$ emissions were:

- The road configuration will change from an intermediate lane to two lanes with a carriageway width of varies from 2.4 to 7 m with 1.5 m hard shoulder on both sides. The road will have an asphalt concrete surface.
- The surface road roughness is mostly 6 m/km and will be improved to 2.0 m/km, which may further reach up to 3.5 m/km during 5 years of road operations. Resurfacing of the road would be required after 5 years.
- The design life of the road is 20 years.
- Other improvements include the repair or reconstruction and improvement of culverts, longitudinal and cross drains, and removal of irregularities on the existing vertical profile and road safety appurtenances.

Emission factors were mostly taken from the CPCB/MOEF (2007) Draft Report on Emission Factor Development for Indian Vehicles, the Automotive Research Association of India, and C. Reynolds et.al (2011) Climate and Health, Relevant Emissions from in-Use Indian for three- wheelers rickshaw as presented in Table below. Emission factors were taken from the CPCB/MOEF&CC (2007) Draft Report on Emission Factor Development for Indian Vehicles,the Automotive Research Association of India, and C. Reynolds et.al (2011) Climate and HealthRelevant Emissions from in-Use Indian for three-wheelers rickshaw as shown below**.**

Table 43: CO2 Emission Factors

| *Vehicle Type* | *Petrol* | *Diesel* | *LPG/CNG* |
|---|---|---|---|
| *2-Wheel* | *1.37kg/l* | | |
| *3-Wheel* | *2.12kg/l* | *2.58kg/l* | *3kg/l* |
| *Cars/bus* | *2.24kg/l* | *2.58kg/l* | |

1. *All 2-wheel vehicles are run on petrol; average fuel conomy:50km/litres*
2. *All3-wheelvehicles are run on diesel; average fuel conomy:30km/litres*
3. *50%of the cars/bus are run on petrol while the remaining are run by diesel; average fuel economy:15km/litres*

For 13.989 km of road construction would result in emission of approximately 1431.5 tCO2eq. (Source: Greenhouse Gas Emissions Mitigation in Road Construction andRehabilitation - A Toolkit for Developing). This value if based on estimation of materials required to upgrade /construct of rural road which include cement, steel, gasoline,diesel, and bitumen etc.

**Estimated carbon emissions:**

Construction Phase The GHG emissions during a road construction project involve the following major sources:

- Transport emissions owing to transportation of man and material
- Material emissions owing to extraction/production of construction materials
- Machines emissions owing to consumption of fuel by engines used in construction

A detailed study conducted for the World Bank titled ―Greenhouse Gas Emissions Mitigation in Road Construction and Rehabilitation- A Toolkit for Developing Countries‖ established the typical GHG emission rate in terms of ton $CO_2$eq per km of road construction. According to this study, for Rural Road-DBST, GHG emissions due to material production is based on estimation of materials required to upgrade /construct of rural road which include cement, steel, gasoline, diesel, and bitumen etc. are the main contributor.

| Type of Road | Transport emissions | Material emissions | Machines emissions | Total (t $C0_2$ eq.) |
|---|---|---|---|---|
| Rural Road—DBST | 26 | 62 | 14 | 103 |

Source: Greenhouse Gas Emissions Mitigation in Road Construction andRehabilitation-A Toolkit for Developing Countries

Therefore, for 13.989 km of road construction would result in emission of approximately 1431.5tonCO2eq.

Operation Phase

The design life of the project road is 20 years. Due very less traffic density and introduce of e-vehicle major CO2 emission increase not anticipated.

**Climate Change Impacts & Risks**

In today's world, climate change is considered the most serious global challenge. Changes in the atmosphere have been detected that could drastically alter the climate system and the balance of ecosystems. Atmospheric changes are linked to an increase in greenhouse gases (GHGs), chiefly on account of anthropogenic releases attributed to fossil fuel consumption, land-use changes, deforestation, etc. Research has established that carbon dioxide ($CO_2$) levels in the atmosphere have risen by 35% since the pre-industrial era. Rising $CO_2$ concentrations increase the energy retention of Earth's atmosphere, leading to a gradual rise in average temperatures and global warming. Sector-specific climate risk screening has been done based on secondary sources to analyze the impact on road components due to likely change in climatic variables, mainly temperature and precipitation.

**Temperature & Precipitation:**

Meghalaya is one of the important states located at north east of India. Usually, four seasons are observed in this beautiful hilly state. As per the rainfall data from 1989 to 202183, highest rain fall (31% of south west monsoon rainfall) is observed in month of July. Similarly, state experienced 30% of the south west monsoon rainfall in June month. Also, in August and September, 23% and 17% of south west monsoon rainfall were observed in the State. Highest annual rainfall is 5440.8 mm in the year of 1995. Details rainfall variation table is given below:

*Table 44: Mean rainfall (mm) and coefficient of variation (CV) of the state for the monsoon months, southwest monsoon season and annual*

| | June | July | August | September | June-September (JJAS) rainfall | Annual |
|---|---|---|---|---|---|---|
| Mean | 801.5 | 825.1 | 612.6 | 463.2 | 2702.4 | 3784.3 |
| C V | 33.0 | 40.2 | 40.4 | 46.2 | 24.9 | 21.5 |

Comparing[4] to Eastern part, Western part of this state, especially West Garo Hills and East Garo Hills, small increase of minimum temperature is observed and also, high increase around 1.2 degree centigrade in maximum temperature is noticed in Central part and West Khasi hills, South Garo hills and East Kahli hills region. Maximum temperatures during summer and winter seasons are 25°C & 16°C, respectively. [5] Minimum temperatures during summer and winter seasons are 15°C & 4°C.

Increased temperature and precipitation will have the following impacts:

- **High Precipitation Impacting Roads /Bridge /Embankment**: Heavy rains cancause disruption of the road networks, decreased accessibility, erosion of roads and embankments, surface water drainage problems, slope failures, landslides,among others. Increased river flow resulting from precipitation and storminess may result in damages to bridges, pavements, and other road structures. Bridge/culvert capacities are reduced or exceeded, causing upstream flooding

[3]https://imdpune.gov.in/hydrology/rainfall%20variability%20page/meghalaya_final.pdf
[4]https://meghalaya.pscnotes.com/meghalaya-geography/climate-of-meghalaya/
[5]https://www.mapsofindia.com/meghalaya/geography.html

to occur.

- **High Temperature Impacting Road Stability**: Extreme heat, combined with traffic loading, speed, and density can soften asphalt roads, leading to increased wear and tear. There would likely be concerns regarding pavement integrity such as softening, traffic-related rutting, embrittlement, migration of liquid asphalt. Additionally, thermal expansion in bridge expansion joints and paved surfaces may be experienced.
- **Earthquake**: All districts of the state of Meghalaya lie in Zone V. Centred across the state border in Assam, much of Meghalaya was severely jolted especially Shillong.
- **Drought**: The Average Annual Rainfall in Meghalaya is 2818 MM (source: rainwaterharvesting.org), whereas, Sohra or Cherrapunjee and Mawsynram in Meghalaya receive the highest rainfall in the world i.e. about 11000 mm annually, but this huge rainfall is concentrated only in monsoon months. 11, 667 sq km of the State drains into the Brahmaputra basin and the rest 10,650sq km into the Barak Basin (Source: Central Water Commission). In less than12 hours all the rainfall runoff water reaches the plains of Bangladesh and Assam taking along with-it top soil, boulders and logs besides creating flood- havoc in Bangladesh. In contrast during non-monsoon months, most of the rain-fed surface sources and spring sources get dried up, leading to water scarcity, which is a major problem as the people living in these areas with highly variable rainfall, experience droughts like situation and floods and often have insecure livelihoods. In many dire cases people do not even have regular access to water for drinking purposes.
- **Cyclone** Meghalaya is situated in the north eastern direction of Bangladesh which is highly prone to cyclone/ winds. Every year about 60% of the area is affected by cyclone in Bangladesh. The Districts of West Jaintia Hills and East Jaintia Hills may experience a wind speed of up to 55m/s. Occasional cyclones do occur in western Meghalaya their severity being more during monsoonseason. The districts close to Bangladesh like South West Garo Hills, South Garo Hills, South West Khasi Hills, West Khasi Hills, fall in very high cyclonic zone due to close proximity to Bay of Bengal (which is a cyclone basin). In this zone wind speed can reach up-to 50 m/s, which can cause large scale damages. The Bay of Bengal accounts for seven percent of the annual tropical cyclone activity worldwide; the recorded frequency of cyclones per year along the Bay of Bengal is four and inevitably one of the four transforms into a severe cyclone causing human and property losses
- **Flood**:

  The plain areas of Meghalaya adjoining Assam are affected by flood due to the back flow of water from the River Brahmaputra during the flood season between June and October. The tributaries like Krishnai, Jinari, Jingjiram, Rongai, Dudhnoi, Ringgi, Gohai, Dilni etc. cause flood in the plain areas of the State.

Key engineering measures taken to address flood risks in the design are:

- Increase in embankment height,
- Construction of new side and lead away drains,
- Construction of new culverts and widening of existing ones and iv)widening of bridges.

Cross drainage structures, embankment, and Roadside drains would have been considered anyway in the conventional design as the issue of flooding isa threat to the sustainability of the road. However, these measures also contribute to the adaptation of the roads for future increases in precipitation. This risk screening and risk identification exercise have helped to ensure that the project road with climate risks have adequate risk mitigation or adaptation measures. Provisions have also been made in the bidding documents for the Contractor to prepare contract package-specific EMP's based on the final detailed design to address a range of issues including climate-related risks and vulnerabilities.

## 7.2 Possible Climate Events, Risks and Adaptation Measures in Road Transport Infrastructure

The design objective included ensuring that current infrastructure assets are protected from the long term and acute effects of climate change, and wherever necessary upgrading to new infrastructure systems fit for changing climate conditions have been taken into serious consideration. Those adaptive measures to counter possible risks and their likely effects on project road infrastructure as incorporated in the DPRs are summarized below**.** It must be notedthat all these events either simultaneously or in isolation can generate severe disastrous impacts on road infrastructure.

*Table 45: Possible Climate Events, Risks, and Adaptation Measures*

| Sr. No. | Climate Change Events | Risks to the Road Infrastructure | Adaptation Measures incorporated in Detailed Design of Project Roads |
|---|---|---|---|
| 1 | Extreme rainfall events | i. Overtopping and wash away<br>ii. Increase of seepage and infiltration pass<br>iii. Increase of hydrodynamic pressure of roads<br>iv. Decreased cohesion of soil compaction<br>v. Traffic hindrance and safety | a. Certain critical sections affected by overland floodingof the road raised (vertical alignment, embankment improvement) to be free from the onslaught of flooding events under intense precipitation.<br>b. Road asset survey has considered certain critical road sections where the sub-grade strength and integritywere found to be compromised; the sub-grade strength specification meeting the recent-most IRC specificationshas been adopted.<br>c. The highest assessment of design discharge for sizing culverts and bridges from among the several discharge methods as outlined in recent IRC guidelineshas been adopted.<br>d. In terms of floodwater conveyance to prevent stagnation, closed concrete drains in settlement pocketshave been provided.<br>e. Improved cross-drainage capacities required for the quick conveyance of floodwater by replacing small |
| 2 | Changes in seasonal and annual average rainfall | i. Impact on soil moisture levels, affecting the structural integrity of roads, culverts, bridges standing water on the road base<br>ii. Risk of floods from | |

| Sr. No. | Climate Change Events | Risks to the Road Infrastructure | Adaptation Measures incorporated in Detailed Design of Project Roads |
|---|---|---|---|
| | | runoff, landslides, slope failures and damage to roads if changes occur in the precipitation pattern | diameter pipes with box culverts with higher discharge openings has been considered.<br>f. The bottom of the sub-grade has been kept 0.6m above HFL, to avoid over topping, water-logging of theroad surface. |
| 3 | Increased maximum temperature and a higher number of consecutive hot days (heat waves) | i. Concerns regarding pavement integrity, e.g., softening, traffic-related rutting, cracking, fracture, etc.<br>ii. Thermal expansion in bridge expansion joints and paved surfaces Temperature break soil cohesion and increase dust volume which caused health and trafficaccidents | a. An adequate binding layer thickness has been proposed to offset the wear, surface fatigue, and ruttingunder climate stresses.<br>b. In terms of pavement integrity, the choice of viscosity grade VG30 has been maintained. |
| 4 | Extreme wind speed under cyclonic conditions | i. The threat to the stability of bridge decks<br>ii. Damage to signs, lighting fixtures and supports | Business As Usual |

# 8 CHAPTER-VIII: PUBLIC CONSULTATIONS

## 8.1 Public Consultation

Public consultation has been taken up as an integral part of environmental impact assessment process of the Project. Public consultation has been viewed as a continuous two-way process, involving promotion of public understanding of the processes and mechanisms through which developmental problems and needs are investigated and solved. Consultation was used as a tool to inform and educate stakeholders about the proposed action both before and after the development decisions were made. It assisted in identification of the problems associated with the project as well as the needs of the population likely to be impacted.

This participatory process helped in reducing the public resistance to change and enabled the participation of the local people in the decision-making process. The involvement of likely affected people and other stakeholders have been ensured in this project with the objectives of minimizing probable adverse impacts of the project through alternate design solutions (alignment and cross-sectional) and to achieve speedy implementation of the project through bringing in awareness among the community on the benefits of the project.

Different categories of Consultations planned in this project are a) Village Consultations, b) Focus Group Discussions (FGD), c) Consultation with Women, d) Consultation with Vulnerable groups and e) Consultations with Traders etc.

## 8.2 Objectives of the Public Consultation

Stakeholder Engagement Plan (SEP) is an integral part of the project planning and design. The consultations are carried out to develop community /stakeholder's ownership and support for the project; integrate and address their concerns through suitable measures in the project design and implementation. The objectives of undertaking public consultations are listed below.

- Dissemination of information to build awareness among them
- To incorporate community concerns in the project designs for minimizing potential conflicts and resultant delays in implementation
- To document road safety related issues for developing possible mitigation measures
- To appraise gender issues and accordingly incorporate views of women into the projectdesign
- Tounderstandspecificissuesrelatedtotribalpeopleandthoseofvulnerablesections
- To facilitate development of appropriate and acceptable entitlement options
- To understand the priorities / concerns of the communities and the likely adverse andpositive socio-economic impacts
- To create a sense of ownership of the project for its sustainability.

## 8.3 Methodology for Consultations

Both formal and informal modes of consultation were used in the public consultation process forthe project. Consultation with the stakeholders, beneficiaries, and community leaders were carried out using standard structured questionnaires as well as unstructured questionnaires. In addition, focused ground discussions (FGDs) and personal discussions with officials, on-site discussion with temporarily affected stakeholders, and reconnaissance visits have also been made to the project area. The attempts were made to encourage participation in the consultation process of the government officials from different departments that have relevance to the project. Same way, local people from different socio-economic backgrounds in the villages as well as urban areas along the road alignment and at detours, women, residents near the existing road, local commuters, and other concerned were also consulted.

**Identification of Stakeholders**

Stakeholders were identified to ensure as wide coverage as possible of the projectarea as follows

1. Households in the project area including Women groups,
2. Local, regional and international voluntary organizations /non-government organizations (NGOs), Government agencies, and Community leaders.

Questionnaire survey/ discussions were designed to obtain background information and details of general environmental issues that concern people in the project area. In addition, environmental issues were discussed with relevant organizations, government officials, beneficiaries, community leaders, women group sand experts.

## 8.4 Stakeholder Consultations

**Project Stakeholders**

Stakeholder analysis typically classifies stakeholders or all those who have an interest in the project, into three categories:

i. Primary stakeholders are those who are directly or indirectly affected by a project, such asthe project beneficiaries
ii. Secondary stakeholders are those who are involved in the delivery of the project outputs, such as the government, the implementing agency, the executing agency (e.g., contractors, consultants), if any and NGOs, etc.
iii. External stakeholders are those who are the ambit of the project activities, but who can influence the outcome of the project, such as the media, politicians, religious leaders and other opinion leaders.

Stakeholders and their level of interest may change as the project progresses, depending onthe impacts associated with each stage of planning, construction and post-construction. Table 57: Consultation Methods below provides a list of specific stakeholder's involvement and their level of impact and interest during project lifecycle.

Table 46: Consultation Methods

| Sl. | Categories of Stakeholders | Involvement of Stakeholders | | | Pre-Construction | |
|---|---|---|---|---|---|---|
| | | Planning | Construction | Postconstruction | Level of Impact | Level of Interest |
| 1 | | | | | | |
| 1 | Local Communities | Frequent | Occasional | On required basis | High | Low |
| 2 | Village Headmen & Gram Panchayat members (local elected representatives) | Frequent | Occasional | On required basis | High | Low |
| 3 | Women's belonging to various socio-economic groups | Frequent | Occasional | On required basis | High | Low |
| 4 | Other vulnerable groups | Frequent | Occasional | On required basis | High | Low |
| 5 | Local Elected | Occasional | On required | On required basis | Low | High |

| Sl. | Categories of Stakeholders | Involvement of Stakeholders | | | Pre-Construction | |
|---|---|---|---|---|---|---|
| | | Planning | Construction | Postconstruction | Level of Impact | Level of Interest |
| | Members | | basis | | | |
| 6 | Concerned Officials from Government | Frequent | Occasional | On required basis | Low | High |
| 7 | NGOs and CBOs | Occasional | frequent | As and when required | Low | High |

The different methods/tools that will be employed for stakeholder engagement to consult with each of the identified key stakeholder groups under the primary and secondary categories will be either one of the tools listed below or a combination of some of these depending on the category of stakeholders and the requirement of the project. The methods that will be used for obtaining the feedback of the different stakeholders are:

- Face to face discussions with individual stakeholders
- Public meetings/open house community forums like Gram Sabha, local health centres orthe schools
- Formal closed-door meetings with the elected representatives or government functionaries
- Public notices through print in the form of flyers, posters, banners and public announcements.
- Formal correspondence through telephone or email

Engaging in an appropriate way and communicating adequately is fundamental for a good relationship. Engagement methods have been tailored according to the needs and influence of the two categories of stakeholders. A summary of the proposed level of engagement with stakeholders has been presented below.

Table 47: Consultation Methods

| No. | Stakeholders | Dialogue Level | Issues for discussion | Frequency of Engagement | Form of Engagement |
|---|---|---|---|---|---|
| 1 | Landowner households | Proactive Information | payment of lease rent, temporary employment opportunities etc. | Monthly | Open Dialogue with the affected households |
| 2 | Agricultural laborers | Proactive Information | Issues related to livelihood and livelihood and training opportunities in the project andthrough other programs under CSR | Monthly | Open Dialogue with the affected persons |
| 3 | Women and Girls | Direct Contact and discussions | Issues related to GBV, safety, sanitation, and hygiene. Vocational training for women empowerment | Monthly | Open discussions withwomen and girlsthrough the ANM and school authorities |
| 4 | Indigenous people (ST | Contact through the | Common interest with that of the local community | Quarterly | Open Dialogue |

| No. | Stakeholders | Dialogue Level | Issues for discussion | Frequencyof Engagement | Form of Engagement |
|---|---|---|---|---|---|
| | Community) | Gram Pradhan | | | |
| 5 | Contractors and Sub-contractors | Regular Direct Contact | Issues of common Interest in the day-to-day functioning of theproject. | weekly | Regular Direct Contact |
| 6 | Unskilled and semi-skilled local labour | Regular contact through the labour supplier | Issues related to employment opportunities and payments | monthly | Information dissemination and redressal of payments related complaints raised by the labourers. |
| 7 | Surrounding Community | Regular Direct Contact | Common Interest on social and environmental issues | Monthly | Community event and open dialogue |
| 8 | Gram Panchayat | Regular Direct Contact | Common Interest on employment, livelihood trainings, CSR activities, and social & environmental issues | Monthly | Information dissemination and suggestionsand feedback. |
| 9 | Tehsil/District Officials | Occasional Direct Contact | Documentation of land deeds and local permits | As required | Formal meetings |
| 10 | Central and State Level authorities | Occasional Direct Contact | Permits and clearances | As required | Formal meetings |
| 11 | Local Political groups | Occasional Direct Contact | Common interest with that of the local community and administrative issues | As required | Information dissemination |
| 12 | NGOs and CBOs | Occasional Direct Contact | Common interest with that of the local community | As required | Information dissemination |

*Source: Socio-Economic Survey on 2021*

### 8.5 Consultation with Local People and Beneficiaries

The informal consultation was generally started with explaining the project, followed by an explanation of potential impacts. Participant ‘s views were gathered with regard to all aspects of the environment which may have a direct or indirect impact on local people. Key Issuesd discussed are:

- Awareness and extent of the project and development components;
- Benefits of the project for the economic and social upliftment of community;
- Labour availability in the project area or requirement of outside labourinvolvement;
- Local disturbances due to project construction work;
- The necessity of tree felling etc. at project sites;

- Impact on water bodies, water-logging, and drainage problem if any;
- Environment and health
- Flora and fauna of the project area
- Socio-economic standing of the local people.

Table 48: Brief Description of some sample Public Consultation

| Date / Place | No of Participants | Major Issues | Agreed upon | Mitigation Measures - Input to technical Design |
|---|---|---|---|---|
| Place: Williamnagar Bazar, Date: 04/09/2021 | Total-3 Male-3 Female-0 | The town is basically a trading hub. The cultivators as well as the traders are concern of selling their agricultural and industrial output at proper price Though the town lacks in many infrastructural facilities, but they think that with better communication there would be economic development that would addto their prosperity. As this proposed road is the only communication to the outer world, they want the road to be completed within schedule time. | The road after constructed would have major impact on both the economic and social life of the locals of the area. | The road is expected to be completed by two years. |
| Place: Rongongre, Date: 04/09/2021 | Total-5 Male-3 Female-2 | Existing condition of the present road which needs immediate upgradation/restoration not only to allow smooth flow of traffic but also to minimize the count of road accident. Moreover, the affected stretches of road turn into nightmare during monsoon. | The proposed road project is the only feasible option for development. | The people agreedto cooperate and help in all possibleways for the successful of the project. The PWD assure early completion of road development. |

| Date / Place | No of Participants | Major Issues | Agreed upon | Mitigation Measures - Input to technical Design |
|---|---|---|---|---|
| Place: Dawa-Nengkatok, Date: 04/09/2021 | Total-5 Male-4 Female-1 | Upgradation of this earthen portion of the project road is proposed by the local people as this is their only motorable way throughout the year. Moreover, proper signboards/display should be given at U-turns to avoid accidents. | Combined effort of the local authorities with the Government officials as well as the other stake holders would remove all the obstaclesfor development. Road Safety will be look after. | The local authorities also assured that they would help in development of road project. Road safety awareness campaign should be made at schools. There would ample signage and other road furniture to reduce the accident. |
| Place: Tura Williamnagar Road. Date: 04/09/2021 | Total-5 Male-3 Female-2 | A detailed public consultation was organized with the temporarily affectedpersons people's representatives, shopkeepers, businessmen,and others regarding the project benefits | The local people had agreed in the view of the proposed road project which will bring some hope to the movement of the heavy vehicles and development ofthe area but against any damages to the market structures. | The PWD officials had agreed to take special care for traffic movement and road safety. It was assured that there would be no damages of any structures at the market place |
| In addition to the above specific public consultations and FGDs the peoples were also consulted. In the villages the impact of social and economic are more. In all the villages the access to the market would increase and based on this the valuation of land and properties would also increase. | | | | |

Table 49: Pictures of First Stage Consultations

| | | |
|---|---|---|
|  | | Special attention is needed on the road crossings/intersections to avoid traffic snarlsand accidents. Proper traffic signals and signboards should be present at strategic points not only for the sake of motorists but also for the pedestrians.<br>Place: Jail Samgong Road<br>Dated: 04/09/2021<br>. |
| | | |
| | | |
|  | | Existing condition of the present road which needs immediate upgradation/restoration not only to allow smooth flow of traffic but also to minimize the count of road accident. Moreover,the affected stretches of road turn into nightmare during monsoon.<br>Place: Rongongre<br>Dated: 04/09/2021 |
| | | |

| | | |
|---|---|---|
| Upgradation of this earthen portion of the project road is proposed by the local people asthis is their only motorable way throughout the year. Moreover, proper signboards/display should be given at U-turns to avoid accidents. Place: Dawa-Nengkatok Road<br>Dated: 04/09/2021. | |  |
| | | |
| | | |
| Improper/illegal parking not only causes hindrance to the smooth flow of traffic but alsoincreases the probability of road accident.<br>Therefore, the local people demanded for a separate parking bay especially in congested areas.<br>Place: Williamnagar Bazar<br>Dated: 04/09/2021. | |  |
| | | |

## 8.1 Outcome of the Consultation

Following are the key issues emerged during public consultations during field Study:

- The proposed project should have adequate road safety measures includingservice roads, traffic signal etc. to minimize increasing road accidents.
- Adequate provision of drainage should be made for catering runoff fromsurrounding areas as well.
- Tree cutting should be minimized.

- ☞ Traffic noise is particularly disturbing for schools, residential complex, hospitals located near to project and appropriate mitigation measures are required.
- ☞ Appropriate pollution control measures are required during construction phase.
- ☞ Provision of noise barriers for sensitive noise receptors like school and colleges.
- ☞ Provision of bus stops with kiosk facilities and landscaping.

Provision for adequate tree plantation should be made to compensate tree cutting

Table 50: Summary of Consultation Outcome

| Issues Discussed | Outcome |
|---|---|
| What are all the facilities provided through this project and to whom should we approach? | Facilities like bus shelters, rest rooms, pavements, drains etcwould be provided. Officers such as PWRD Engineers, Town Council could be approached for grievances. |
| Safety due to alignment | People expressed their views on the risk if the road is widened at the dense settlement area affecting structures on both sides.During consultation they were convinced that there will be no permanent Impact with updated DPR but temporary impact during the active construction period. |
| Cross Drainage for alignment | People have shown their concern for the proposed drainage pattern for the alignment of a portion of the project road. In this regard the lined rectangular drains with proper outfall shall be planned as a part of the project design of the main carriageway.Adequate cross drainage structures are planned after study of hydrology of the Survey area. |
| Utilities and basic infrastructures | People showed their concern about what will happen with the utility lines if the road is widened. Adequate care shall be takenfor the shifting of the utilities. |
| Employment during construction | People were of demand if the local people are given preferencefor employment during the construction phase of the project. Such options shall be explored to the extent possible and mostly the unskilled worked can be hired from nearby locality. |
| Why structures at places along the road were not measured? | If and only the structure to be impacted, measurements are required. Otherwise, there is no requirements of measurementsof structures. |

| Issues Discussed | Outcome |
|---|---|
| What about the loss of livelihood during active phase of construction? | The active phase of construction is planned in such a way that there will be minimum (temporary) loss of access and/or livelihood. If there is any loss or damage of structures or any immovable assets the Civil Contractor will compensate the same in discussion with the affected party. Civil Contractor will minimize the impact of accessibility of the residential structures and the temporary loss of livelihood of the Commercial structures will be minimized by speeding up the civil work and doing the work on one side of the road at a time and providing accessibility to the customers. |

# 9 CHAPTER-IX: TRIBAL PEOPLE'S DEVELOPMENT PLAN

The Tribal People in India are categorized as indigenous community who often becomevulnerable in development projects because of their cultural autonomy, economic status, and enduring specific disadvantages in terms of social indicators of quality of life, thus usually as subject ofsocial exclusion. Because tribal communities live within varying and changing historical,cultural, political and economic contexts, no precise and coherent term has been found todefine them. Under OP 4.10, the determination as to whether a group is to be defined asindigenous peoples is made by reference to the presence (in varying degrees) of four identifying characteristics:

- Self-identification as members of a distinct indigenous cultural group and recognition ofthis identity by others;
- Collective attachment to geographically distinct habitats or ancestral territories in theproject area and to the natural resources in these habitats and territories
- Customary cultural, economic, social,or political institutions that are separate from those of the dominant society and culture; and
- An indigenous language, often different from the official language of the countryor region.

There is no impact on the community structure or community land of cultural or religious sentiment of the ST Population in the Primary PIA. The proposed project will ensure that STs receive culturally appropriate social and economic benefits, do not suffer adverse impacts as a result of projects, and can participate actively in projects that affect them. There is no cultural heritage site of the ST which comes in the way of the road alignment. The ST population among the Surveyed Families in the PIA are living in the towns and in the due course of time became the part of the main stream population. Thus, there will be no cultural or social impact on the ST population.

# 10 CHAPTER-X: GENDER ACTION PLAN AND ROAD SAFETY

The tribal women in Meghalaya play an important role in the community and family development. Women normally constitute half of the total population. These women mostly work as agricultural labourers and share equal burden with men. Meghalaya being the state with matriarchal society, women are empowered but not necessarily well educated about human and tribal rights. Thus, there no specific requirement to create an institutional framework to make gender sensitive decisions. Women consulted within project associated villages and together identify awareness programs on ―women's role in development and maintenance of public assets‖.

The tribes of Meghalaya whose societies are organized on matrifocal principles have obtained much greater gender equality than the societies (e.g. Hindu and Muslim) that are organized on the patriarchal principles. "Securing equal treatment for men and women in the workplace" is already prevailing in the project area. Thus, Gender Action Plan is not required.

## 10.1 Road Side Safety Measures

Indian Road Congress (IRC) codes will be followed in proposing and designing road safety features. Pavement markings will be done for traffic lane line, edge lines and hatching. The marking will be with hot applied thermoplastics materials. The pavement markings will be reinforced with raised RR pavement markers and will be provided for median and shoulder edge longitudinal lines and hatch markings. Highway lightings including high masts will be provided at intersections in order to improve the night time visibility. All the urban locations as well grade separated structure locations will be provided lighting arrangements.

# 11 CHAPTER-XI: IMPLEMENTATION

## 11.1 Implementation Arrangements

The project activities will be implemented by many agencies: Public Works Department (PWD)and Community and Rural Development Department. Each of the mentioned departments, will depute a Project Director (PD) preferably at the level of a Chief Engineer/Superintending Engineer along with the required supporting staff with the overall responsibility for project implementation with the involvement of the various field divisions and other units at the head-quarters (HQ — Shillong). PDs will work under the overall guidance and oversight of a Project Advisory Committee headed by theSecretary of the respective departments.

Meghalaya Infrastructure Finance Development Corporation (MIFDC) set up under the Planning Department will be responsible for overallplanning, coordination, implementation and monitoring of the project along with various departments. It will also be responsible for mobilizing private sector finance for the developmentworks. The State Planning Department will be the nodal department for the Project. MIDFC will be responsible for overall planning and implementation of the entire project. It will ensure that ESIA is conducted and ESMP are prepared and that the ESMF is followed during project implementation. Additionally, a project management unit (PMU) will be mobilized under MIDFC to support the implementing agencies during project preparation and subsequent implementation. The overall institutional arrangement for the implementation of the project is outlined in the following diagram.

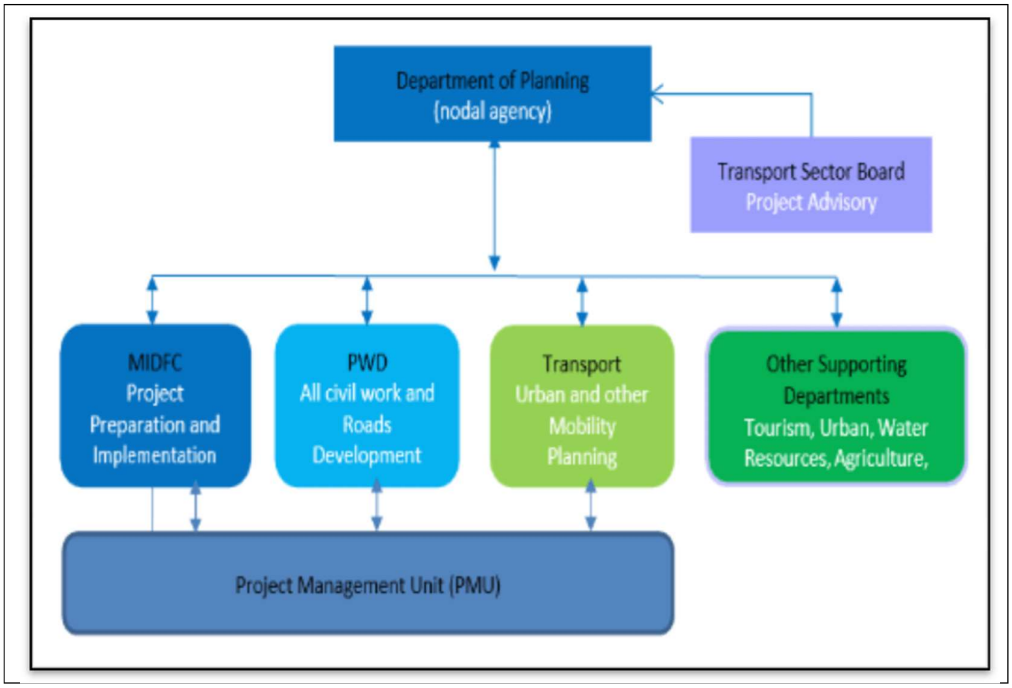



Figure 28: Project Implementation Arrangement

### 11.1.1 Project Management Unit (PMU)

The Project Management Unit (PMU) will engage a consulting firm, as Project Management Consultant (PMC) for providing technical support to the project and facilitate implementation of project framed activities. The experts of the PMC will assist MIDFC in preparing and updating ESIA (including E&SMPs). The PMC will also assist MIDFC in preparing semi-annual safeguards monitoring reports. Specific roles of the PMC with regard to ESMF implementation would include the followings.

#### *11.1.1.1 Preparatory Stage:*

- Initial field visit to project sites and assessment of environmental and social aspects ofproject activities;
- Discussion with different stakeholders, including implementing agencies on safeguardmeasures and their expected role;
- Preparing / finalizing assessment framework in line with the Environment and Socialindicators;
- Finalizing TOR of the contractors incorporating safeguard measures to be taken;
- Facilitate / organize training / workshops on safeguard measures for the stakeholders;
- Designing study / assessment tools for periodic assessment, its piloting and finalization.

#### *11.1.1.2 Implementation Stage:*

- Conductingperiodicsitevisitsandobservethemeasurestakenasperthesafeguardnorms;
- On the spot guidance to contractor/s / implementing agencies on safeguards;
- Preparation of site-specific reports and sharing with MIDFC;
- Documentation of learning cases for sharing and dissemination;
- Visual documentation of site-specific safeguard measures;

- Tracking activity specific environmental and social monitoring indicators;
- Organizing / facilitating refresher training courses for stakeholders;
- Monthly and quarterly progress report preparation and submission to MIDFC.

#### *11.1.1.3 Post-Implementation Stage:*

- Consolidation of periodic monitoring reports;
- Support in conducting environment and social audit;
- Consolidation of good practice documents and its submission to MIDFC;
- Final sharing workshop on environment and social safeguard practices and its outcome.

#### *11.1.1.4 The PMU shall have following experts for implementation of ESMF and E&SMPs: Social cum Gender Expert*

The Social cum Gender Expert at the PMU level will guide the overall process related to social and gender aspects. The district/sub-district level implementing agencies will execute and monitor the social / gender components in consultation with the said Expert. She / he will be associated in the screening process of such activities that require acquisition of land and/or involvement of women and/or need special focus on tribal involvement. She/he will monitor the social processes followed in execution of the planned activities and realisation of the social / gender inclusion parameters. She / he will be looking after social / gender aspects of the project, including monitoring of social / gender indicators and coordinating with different agencies / institutions. The expert will be guided by the Project Director from MIDFC and reporting to the Project Director directly.

#### *11.1.1.5 Environmental Expert*

The environment expert will look after environmental aspects. She/he will guide the project team on environmental aspects and support in building environmental parameters to be built in the bids. She /he will also guide the contracts and monitor their works from time to time. In case ofrequirement, she/he will prepare a detail environment management plan for different activitiesto be executed by the project. The expert will be guided by the MIDFC Project Director andreporting to the Project Director directly.

### 11.1.2 Capacity Building Strategy

The concerned officials within the project implementation agencies will be oriented on different social and environment aspects by which they will be equipped well to manage the related issues effectively and efficiently.

### 11.1.3 Institutional Capacity to Manage Social Development Aspects

#### *11.1.3.1 Autonomous District Councils*

As mentioned earlier, ADCs were established under the Sixth Schedule of the Constitution of India (Articles 244(2) and 275(1)) with a view to preserve and protect tribal institutions. It is a system of local administration to give greater autonomy to tribal societies, to preserve and safeguard tribal groups' traditional practice and to act as a conduit between the formal state government and the informal grassroots tribal institutions.

The Project lies within the Khasi Hills Autonomous District Councils. The ADC with the village councils or looks after the administration of the Council areas.

#### *11.1.3.2 Grassroots Institutions*

The third centre of authority is the grassroots tribal institutions and practices. In the Khasi and Jaintia Hills, these are powers that rest at the village levels' elected members to govern the village.

## 11.2 Grievance Redressal Committee (GRC)

### 11.2.1 Grievance Redress Mechanism

Effective grievance redressal mechanism gives an opportunity to the organization to implement a set of specific measures to ensure good governance accountability and transparency in managing and mitigation of environmental and social issue of a particular project. This consists of defining the process for recording/receiving complaints and their redressal in respect of environmental and social matters.

An integrated system will be established with Grievance Redressal Cell (GRCs), with necessaryofficers, officials and systems at MIDFC. Grievances, if any, may be submitted through various mediums, including in person, in written form to a noted address, e-mail, or through direct calls to concerned official/s. The Social and Environmental Expert within PMU shall be responsible for coordination of grievance/complaints received.

A platform for grievance redressal should be organized and its regular meetings may be conducted so as to allow people to put forth their grievances. It will help the appropriate authority to find solutions and amicably address the issues. The project, apart from web-based mechanism, will have three-tire grievance redressal mechanism, i.e., (1) at the project site level, (2) State level (PMU level) and (3) Judiciary level.

**Web based grievance mechanism**[11]: In case of grievances received through toll free number or web-based system, a person should be made in-charge of screening and resolution of the same/communicating with the concerned divisions for resolution of the same. The person in- charge based on nature of complaint, should forward the same to the concerned official. A ticket or a unique number will be generated for all such complaints. The complainant should follow up based on that unique number. All calls and messages should be responded within 15 days. If response is not received within 15 days, the complaint should be escalated to the Project Director.

**Tier I**: Under this project, the local VECs and community level organizations will serve as the first- tier mechanism to handle complaints and grievances. The local Headman will be the focal point who will receive, address, and keep record of the complaints and feedbacks. The grievance focal point will first review the grievances submitted. If grievances or disputes cannot be solved at the VEC's level within 30 days of the submission of the grievances, the issue willbe brought to PMU level for mediation. PMU is expected to inform aggrieved persons or parties to disputes of the resolution in 30 days.

**Tier II**: If the aggrieved person is not satisfied with the verdict of site level grievance cell, he or she can escalate the grievance to state level grievance cell. The tier II cell will be under the Chairmanship of Secretary, Department of Planning. The other members will include Chief Engineer; Project Director and Social Expert of the Project. The second level of grievance cell will provide its view within 30 days of receiving the grievance.

**TierIII**: The aggrieved person if not satisfied with the verdict given by State level grievance cell, will have the right to approach the Judiciary. Project will help the aggrieved person in all respectif person wants to approach the judiciary. This would include the District Commissioner and

Legal courts. If the issue cannot be addressed or is outside the purview of the GRC, then it may be taken by the Office of the District Commissioner or a Legal Court.

### 11.2.2 Grievance management through Electronic Mode

A simplified mobile based technology feedback system can be used at community level to capture and feed data into the Management Information System of the PMU. A toll-free Helplinenumber will also be established to make the mechanism widely accessible and gender friendly.

### 11.2.3 Grievance Redressal Mechanism

There Grievance Redressal Committee (GRC) at the PMU level is in process of formation. Consultation for the formation of GRC for this project at city/ward level is currently being undertaken. Before the start of civil contractor appointment, the GRC at project level will be formed with consultation with the temporarily affected persons and Beneficiaries so that the grievances are resolved at the project site only. There should be a Women Cell at the PMU.The contractor and the other stakeholder's office will display the Vishaka Guidelines at their Notice board. The Women helpline Number should be displayed in the Bus Stand, Ticket Counter, all commercial vehicles and any other place as required.

Table 51: Details of contact for Grievances

| Description | Contact details |
|---|---|
| Company: | PWD, Meghalaya |
| To: | Chief Engineer-cum-Project Director |
| Address: | HV9P+GFJ, Lachumiere, Shillong, Meghalaya 793001 |
| E-mail: | cenhpwd@gmail.com |
| Website: | http://megpwd.gov.in/contacts.html |
| Telephone: | Tel: 0364-2224561 |
| Fax: | - |

### 11.2.4 Disclosure of Project Information

In order to make the ESIA implementation process transparent, salient features of ESIA shallbe translated in Khasi and disclosed on the Project Authority's website. The documents available in the public domain will include ESIA (summary in Garo). Copy of all documents will be kept in PMU for ready reference. As per Access to Information Policy of the World Bank, all safeguard documents will also be disclosed and available at the World Bank's Portal.

# 12 CHAPTER-XII: MONITORING & EVALUATION

The M&E framework of ESMF is designed to assess the progress and achievements against the said management plans — both Environment and Social as well as other plans. By providing a feedback loop, the M&E plans enable decision makers to take up mid-course corrections if required. The M&E framework is designed to measure the impacts that have taken place, ensure compliance with the legal obligations, evaluate the performance of the mitigation measures applied, and suggest improvements in management plans, if so required.
The M&E is to be undertaken at two levels:

- Monitoring and Evaluation of the ESMF application: i.e. the application and effectiveness of ESMF elements including screening, assessment, formulation and implementation of the ESMPs, monitoring, capacity building and institutional arrangements; and
- Monitoring and Evaluation of E&S management plans at each project site: i.e. to monitor the effectiveness of implementation of the identified mitigation measures, the environmental quality parameters and social management plans relevant to eachproject activity.

## 12.1 M&E of the ESMF application

The PMU's Social cum Gender Expert and Environment Expert will undertake ongoingmonitoring of the ESMF implementation in order to identify issues, good practices and requiredactions. Reports based on the monitoring will be prepared by the PMU at least every quarterand submitted to the Project Director. The reports will be shared with the other implementingagencies. The monitoring of the ESMF implementation will cover the following aspects: Screening of project activities:

- Has the categorization of the project activities been done accurately and or changed (A to B)?
- Has the Environmental and Social Screening Checklist been used in allapplicable activities?
- Has the scoping for further assessment been done comprehensively for allapplicable activities?

Monitoring of E&S aspects in project activities:

- Are the contractors and implementing agencies undertaking periodic and regular monitoring of the E&S implementation in the project activities?

Capacity building arrangements for management of E&S aspects:

- What training programs on E&S aspects have been organized for the staff of implement agencies?
- What training programs on E&S aspects have been organized for the contractors?

## 12.2 M&E of E&S Management Plans

Monitoring and evaluation of the project is significant for achieving the project development objective (PDO) within the stipulated time period. The key environmental and social aspects, those that have been highlighted in each E&SMPs at site level are to be monitored periodically. The approved E&SMPs will give the direction and indicate the milestones achieved as per the

national / state benchmarks / norms. The following specific environmental and social parameters should be quantitatively and qualitatively measured and compared over a period of time to understand the impacts. The PMU through the respective district level offices of PWD will monitor all projects roads to ensure conformity to the requirements of the ESMF. The monitoring will cover all stages of planning and implementation. The monitoring will be carried out through the safeguard compliance reports that will form a part of Quarterly Progress Reports (QPR) for all sub projectsand regular visits by the Social cum Gender and Environmental specialists of the PMU.

### 12.3 Concurrent Monitoring

The PMU's Social cum Gender Expert and Environment Expert will undertake ongoing monitoring of the ESMF implementation in order to identify issues, good practices and required actions. Reports based on the monitoring will be prepared by the PMU at least every quarter and submitted to the Project Director. The reports will be shared with the other implementing agencies.

The PMU will review these reports and identify technical, managerial, policy or regulatory issues with regards to the ESMF compliance. The identified technical issues will be dulyincorporated. Policy and regulatory issues will be debated internally by PMU and the need for appropriate interventions will be determined. These interventions could include appropriate revision of ESMF in consultation with the Bank or suitable analytical studies to influence policy or programs of the state, if found necessary / warranted. The table below provides the milestones and process to be followed for monitoring at different stages of project:

Table 52: Monitoring Protocol

| Milestones | Objectives | Process | Responsibility | Decision/Target/ Deliverable |
|---|---|---|---|---|
| **Environment** | | | | |
| **Social** | | | | |
| **Sub- Project Screening** | To approve categorization of proposed sub-projects | Discussions with implementing agencies to assess eligibility of project based on project's priorities and identify scope of project report<br>Consultants to submit report along with proposed impact categorization | PMU and PIU | Decision to proceed or not Identification of impact category |
| **Sub- Project Appraisal** | To ensure satisfactory compliance with SMP | Detailed appraisal, including site visits/ investigations, if necessary, assess suitability of site, adequacy of safeguard measures, risk analysis and regulatory clearances).<br>DPR to be submitted for Approval | PMU | Review report and decide to accept with modifications – reject and instruct to resubmit |
| **Approval** | Approvals from PMU | PIU to recommend to PMU<br>PMU to review and | PIU and PMU | Approval of ESMP |

| Milestones | Objectives | Process | Responsibility | Decision/Target/ Deliverable |
|---|---|---|---|---|
| | | approve | | |
| **Monitoring and Review** | Ensure Implementation of agreed SMP | Prepare quarterly progress reports<br>Schedule field visits as required<br>Midterm and end term evaluation | PIU, PMU, NGO | Quarterly Progress Report |

Project monitoring will be the responsibility of the PMU who will submit Quarterly Progress Reports. The reports will compare the progress of the project to targets set up at the commencement of the project. The list of impact performance indicators will be used to monitor project objectives. The socio-economic survey conducted will provide the benchmarks for comparison.

### 12.4 Periodic Evaluation

An external evaluation of the safeguard implementation prepared for sub projects will also be undertaken twice during the implementation of the project — midterm and at the end of the implementation. During implementation, meetings will be organized by PMU inviting all PIUs for providing information on the progress of the project work.

**Mid-term Assessment Study –** this would be undertaken mid-way through the project to ascertain the progress achieved and any mid-course corrections which need to be introduced. Itwould include indicators to measure progress towards log frame goals and objectives.
**End-Term Assessment Study** — this will be undertaken at the end of the project period (around the time of project completion) and will assess the achievement of the project duringthe tenure.

### 12.5 Arrangements for Monitoring

Monitoring is an integral part of successful implementation of the SMP activities. Internal monitoring will be carried out by the Social Development Expert, PMU and/or the ULB underthe supervision of Project Director/Chairman of ULB. Data collected for monitoring activitiesshall be suitably analysed for project management's learning and experience. Key progress indicators (indicative) for monitoring SMP implementation are as given below:

- establishment of grievance redressal mechanism (including processes and timeline forredressal of grievances),
- MIDFC website will include a link where affected person(s) can register their complaints online. A telephone number will also be on the website of MIDFC and the project sites, so that the general public can register their complaint with the PMU office.

- grievance handling mechanism

Project monitoring will be the responsibility of the PMU who will submit Quarterly Progress Reports. The reports will compare the progress of the project to targets set up at the commencement of the project. The list of impact performance indicators will be used to monitor project objectives. The socio-economic survey conducted will provide the benchmarks for comparison.

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**End-Term Assessment Study** — this will be undertaken at the end of the project period (around the time of project completion) and will assess the achievement of the project during the tenure.

# 13 CHAPTER-XIII: ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

The environmental and social management measures shall be implemented during the various stages of the project viz: Pre-construction Stage, Construction Stage and Operational Stage. The environmental and social management plan for the project is described below.

## 13.1 Objectives of ESMP

The Environmental Management Plan (EMP) consists of a set of mitigation, monitoring and institutional measures to be taken during the design, construction and operational phases of theproject to eliminate adverse environmental impacts, to offset them, or to reduce them to acceptable levels. The main aim of the Environmental Management Plan is to ensure that the various adverse impacts are mitigated and the positive impacts are enhanced. A description of the various management measures against each activity suggested for construction stage is provided in this chapter.

## 13.2 Pre-Construction Stage

### 13.2.1 Pre-construction activities by PIU/Independent Consultant

Prior to the contractor mobilization, the PIU will ensure that a hindrance free corridor is handed over to enable the start of construction work. Clearance involves for the following activities:

- Felling and removal of trees, which should be minimal with due permission.
- Relocation of common property resources and community assets like temples, telephone poles, electric poles and hand pumps etc. if required;
- Modification (if any), of the contract documents by the Engineer of the Independent Engineer.

### 13.2.2 Pre-construction activities by Contractor

- Pre-construction stage involves mobilisation of the contractor and the activities undertaken by the contractor pertaining to the planning of logistics and site preparation necessary for commencing construction activities. The activities include:
- Joint field verification of EMP by the Environment Expert of the Independent Engineer/Authority Engineer and Contractor.
- Identification and selection of material sources (quarry and borrow material, water,sand etc.).
- Procurement of construction equipment / machinery such as crushers, hot mixplants, batching plants and other construction equipment and machinery.
- Selection, design and layout of construction areas, hot mix and batching plants,labour camps etc.
- Apply for and obtain all the necessary clearances/ NOC's/ consents from theagencies concerned.
- Planning traffic diversions and detours including arrangements for temporary land acquisition (if required).

## 13.3 Construction Stage

### 13.3.1 Construction activities by the Contractor

Construction stage is the most crucial stage in terms of activities that require careful management to avoid environmental impacts. There are several other environmental issuesthat have been addressed as part of good engineering practices, the costs for which have been accounted for in the Engineering Costs.

### 13.3.2 Construction activities by the PIU/ Authority Engineer / Independent Consultants

The PIU/Independent Engineer shall be involved in the smooth execution of the project andassisting the contractor during this phase. Their work shall include but not limited to:

- Monitoring and guiding the contractor on adopting good environmental andengineering practices;
- Arrangement of plantation through the Forest Department;
- Arranging training to the contractor and other stakeholders according to the needsarising; and
- Implementation of Environment Management and Monitoring Plan.
- Making changes in the design if need so arises.

## 13.4 Operation Stage

The operational stage involves the following activities by PIU:

- Monitoring of environmental conditions through approved monitoring agency; and
- Monitoring of operational performance of the various mitigation/enhancementmeasures carried out.

Table 53: Environment Management Plan (EMP)

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| **PRE-CONSTRUCTION STAGE** | | | | | |
| **P1** | Alignment, | • The alignment as finalized by shifting / adjusting the centerline of the road, adopting of suitable cross-sections and adjustment of the median width to minimize land acquisition, loss of settlements and to avoid environmentally sensitive features compatible with project activities. | Throughout Corridor | PIU, Revenue Dept. NGOs Collaborating Agencies | - |
| **P2** | Land Acquisition | • No Land Acquisition is envisaged<br>• PIU has to ascertain that any additional environmental impacts resulting from acquisition of land are addressed and integrated into the EMP and other relevant documents. | Throughout Corridor | PIU, Revenue Dept. NGOs Collaborating Agencies | - |
| **P3** | Preservation of | • There is no tree felling as the project | Throughout | PIU | |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | Trees | road is within the existing RoW. | Corridor | Forest Department Contractor | |
| **P4** | Relocation of Utilities and Common Property Resources (CPR) | • All utilities i.e., water supply line, hand pumps will be relocated before the construction starts.<br>• The PIU will relocate these properties in consultation and written agreement with the agency/ owner/community.<br>• Environmental considerations with suitable/required actions including health and hygiene aspects will be keptin mind while relocating all utilities and CPRs. | Throughout Corridor | PIU Concerned Agencies Contractor | |
| **P5** | Orientation of Implementing Agency and Contractors | • The PIU shall organize orientation sessions and regular training sessions during all stages of the project. Thisshall include on-site training (general as well as in the specific context of the sub-project).<br>• These sessions shall involve all staff of Authority Engineer, field level implementation staff of PIU and Contractor. The contractor will ensure that his staff including engineers, supervisors and operators attend the training sessions. | Throughout Corridor | PIU Concerned Agencies Contractor | |
| **P6** | Joint Field Verification | • The Environmental Expert of AE and the Contractor will carry out joint field verification to ascertain any additional possibility to saving trees, environmental and community resources.<br>• The verification exercise should assessthe need for additional protection measures or changes in design/ scale/ nature of protection measuresincluding the efficacy of enhancement measures suggested in the EMP.<br>• Proper documentation and justifications/reasons shall bemaintained in all such cases where deviation from the original EMP is proposed. | Throughout out Corridor | Contractor and Environmental Expert of AE | **PIU** |
| **P7** | Assessment of Impacts due to Changes/ Revisions/ Additions in the Project Work | • The Environmental Expert of AE willassess impacts and revise/ modify the EMP and other required sections of the project documents in the event of changes/ revisions (including addition or deletion) in the project's scope ofwork. | Throughout out Corridor | Contractor Environmental Expert of AE | **PIU** |
| **P8** | Crushers, Hot-mix plants and | • Hot mix plants and batching plants willbe sited sufficiently away from | Throughout out | Contractor | **Environmental Expert of** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | Batching Plants Location | settlements and agricultural operations or any commercial establishments. Such plants will be located at least 1 Km away from the nearest village/ settlement preferably in the downwind direction.<br>• The Contractor shall submit a detailed layout plan for all such sites andapproval of Environmental Expert of AE/PMC shall be necessary prior to their establishment.<br>• Arrangements to control dust pollution through provision of windscreens, sprinklers, and dust encapsulation will have to be provided at all such sites.<br>• 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 —PIU through Environmental Expert of AE/PMC.<br>• The Contractor shall not initiate plant/s operation till the required legal clearances are obtained andsubmitted. The engineer will ensure<br>that the regulatory and legal requirements are being complied with. | Corridor | | **AE and PIU** |
| **P9** | Other Construction Vehicles, Equipment and Machinery | • All vehicles, equipment and machinery to be procured for construction will confirm to the relevant Indian Standard (IS) norms. The discharge standardspromulgated under the Environment Protection Act, 1986 will be strictly adhered to.<br>• Noise limits for construction equipments 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 fromthe edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986.<br>• The Contractor shall maintain a record of PUC for all vehicles and machinery used during the contract period, which<br>shall be produced for NH verification whenever required.<br>• Mobile equipment shall be placed atleast 100 m away from the nearest dwelling. | Throughout out Corridor | Contractor | **Environmental Expert of AE and PIU** |
| **P10** | Borrow | • Finalizing borrow areas for | Along the | Contractor | **Environmental** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | Areas | borrowing earth and all logistic arrangements as well as compliance to environmental requirements, as applicable, will be the sole responsibility of the contractor.<br>• The Contractor will not start borrowing earth fromselected borrow areas until the formal agreement is signed between landowner and contractor and a copy is submitted to the PIU/Environmental Expert of AEthrough the Engineer.<br>• Locations finalized by the contractor shall be reported to the Environmental Expert of AE and who will in turn reportto PIU.<br>• Planning of haul roads for accessingborrow 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 existingvillage roads wherever available.<br>• In addition to testing for the quality of borrow materials by the AE, the environmental personnel of the AE will be required to inspect every borrow area location prior to approval<br>• The AE will make sure that each such site is in line with IRC and other project guidelines.<br>• Necessary clearances need to be obtained prior to operation of borrow areas. | Project Influence Area | | **Expert ofAE and PIU** |
| **P11** | Quarry | • Contractor will finalize the quarry for procurement of construction materials after assessment of the availability of sufficient materials, quality and other logistic arrangements.<br>• In case the contractor decides to use quarries other than recommended byDPR consultants, then it will be selected based on the suitability of the materials and as per established law.<br>• The contractor will procure necessary permission for procurement of materials from Mining Department, District Administration and State | Along the Project Influence Area | Contractor | **Environmental Expert of AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | Pollution Control Board and shall submit a copy of the approval and the rehabilitation plan to the PIU through Engineer.<br>• Contractor will also work out haul road network and report to Environmental Expert of AE and will inspect and in turn report to PIU before approval. | | | |
| **P12** | Arrangement for Construction Water | • To avoid disruption/disturbance to other water users, the contractor willextract water from fixed locations and consult the Environmental Expert of AE before finalizing the locations.<br>• The contractor will not be allowed to pump from any irrigation canal and surface water bodies used bycommunity.<br>• 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 AE and PIUprior to initiation of any construction work. | Along the Project Road | Contractor | **Environmental Expert of AE and PIU** |
| **P13** | Labor Requirements | • The contractor preferably will use unskilled labor from local communities to give the maximum benefit to the local community. | Along the Project Area | Contractor | **Environmental Expert of AE and PIU** |
| **P14** | Construction Camp Locations — Selection, Design and Lay-out | • Sitting of the construction camps willbe selected by the contractor as per the guidelines.<br>• Construction camps will not be proposed within 500 m from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community.<br>• Location for stockyards for construction materials will be identified at least 1000m from watercourses.<br>• The waste disposal and sewagesystem for the camp will be designed, built and operated such that no odor is generated. | Along the Project Road | Contractor | **Environmental Expert of AE and PIU** |
| **P15** | 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.<br>• The Contractor will submit a copy of agreement to the Environmental Expertof AE. The Environmental Expert will be required to ensure that the clearing up of the site prior to handing over to | Along the Project Road | Contractor | **Environmental Expert of AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | the owner (after construction or completion of the activity) is included inthe contract. | | | |
| **P16** | Implementation - Information Meetings | • The contractor will organize at least 2 implementation information meetings inthe vicinity of Project Site (minimum one in each section) for general public to consult and inform people about his plans covering overall construction schedule, safety, use of local resources (such as earth, water), traffic safety and management plans of debris disposal, drainage protection during construction, pollution abetment and other plans, measures to minimize disruption, damage and in convenience to roadside users and people alongthe road.<br>• The first Implementation information meeting be conducted within four weeks of mobilization. The people should be informed about the date, time and venue at least 7 days prior to meetings. Public shall be informed about the meeting through display ofposters at prominent public places (panchayat offices, offices of Market committees, notice board of religious places etc.) and distribution of pamphlets along roadside communities or in any manner deemed fit.<br>• The contractor will maintain a channel of communication with the communities through his designated Environment and Safety Officer to address any concern or grievances.<br>• Periodic meetings will also be conducted during the construction period to take feedback from communities or their representatives to ensure minimum disturbance. The mechanism and contents for disclosureshall be approved by PIU prior to the meetings. | Along the Project Road | Contractor | **Environmental Expert of AE and PIU** |
| **CONSTRUCTION STAGE** | | | | | |
| **C1** | 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 isminimum.<br>• Only ground cover/shrubs that impinge directly on the permanent works or | Along the work in progress | Contractor | **Environmental Expertof AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | necessary temporary works will beremoved with prior approval from the Environmental Expert of AE.<br>• The Contractor under any circumstances will not cut trees other than those identified for cutting and for which he has written instructions from the PIU. The PIU will issue these instructions only after receiving all stages of clearances from the Forest Department/ MoEF& CC.<br>• Vegetation only with girth of over 30cm will be considered as trees and shall be compensated, in the event of PIU's instruction to undertake tree cutting.<br>• The sub grade of the existing pavement shall be used as embankment fill material.<br>• The existing base and sub-base material shall be recycled as sub-base of the haul road or access roads.<br>• The existing bitumen surface may be utilized for the paving of cross roads, access roads and paving works in construction sites and campus,<br>temporary traffic diversions, haulage routes etc. | | | |
| **C2** | Disposal of debris from dismantling structures androad surface | • The contractor shall identify disposalsites. The identified locations will bereported to the Environmental Expertof AE. These locations will be checked on site and accordingly approved by Environmental Expert of AE prior to any disposal of waste materials.<br>• 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 approved and directed by the Environmental Expert of AE.<br>• The pre-designed disposal locations will be a part of Comprehensive Solid Waste Management Plan to be prepared by Contractor in consultation and with approval of Environmental Expert of AE.<br>• Debris generated from pile driving or other construction activities shall be disposed such that it does not flow into the surface water bodies or form mud<br>puddles in the area. | Along the work in progress | Contractor | **Environmental Expertof AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| **C3** | Other Construction Waste Disposal | • The pre-identified disposal locations will be a part of Comprehensive Waste Disposal Management Plan to be prepared by the Contractor inconsultation and with approval of Environmental Expert of AE. Location of disposal sites will be finalized prior to initiation of works on any particular section of the road.<br>• The Environmental Expert of AE will approve these disposal sites after conducting a joint inspection on the site with the Contractor.<br>• Contractor will ensure that any spoilsof material unsuitable for embankment fill will not be disposed off near anywater 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 areas located in barren lands along the project corridors (if so desired by the owner/community and approved by the Environmental Expert of AE).<br>• All waste materials will be completely disposed and the site will be fully cleaned and certified by Environmental Expert of AE before handing over.<br>• The contractor at its cost shall resolve any claim, arising out of waste disposalor any non-compliance that may arise on account of lack of action on his part. | Along the Road | Contractor | **Environmental Expertof AE and PIU** |
| **C4** | Stripping, stocking and preservation of top soil | • The topsoil from all areas of cutting 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 AE. The following precautionary measures will be taken to preserve them till they are used:<br>• 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.<br>• Stockpiles will not be surcharged or otherwise loaded and multiple handling | Along the Road | Contractor | **Environmental Expertof AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | will be kept to a minimum to ensurethat no compaction will occur. The stockpiles shall be covered with gunny bags or vegetation.<br>• It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping orwhen in stockpiles.<br>• Such stockpiled topsoil will be utilized for -<br>• covering all disturbed areas including borrow areas only in case where these are to be rehabilitated as farm lands (not those in barren areas)<br>• top dressing of the road embankment and fill slopes,<br>• filling up of tree pits, in the median and in the agricultural fields of farmers, acquired temporarily. | | | |
| **C5** | Accessibility | • The contractor will provide safe and convenient passage for vehicles, pedestrians and livestock to and from roadsides and property accesses connecting the project road, providing temporary connecting road.<br>• The contractor will take care that schools and religious places areaccessible to Public. The contractor will also ensure that the work on / at existing accesses will not be undertaken without providing adequate provisions and to the prior satisfaction of Environmental Expert of AE.<br>• The contractor will take care that the cross roads are constructed in such a sequence that construction work over the adjacent cross roads are taken up one after one so that traffic movement in any given area not get affected much. | Along the Road | Contractor | **Environmental Expert of AE and PIU** |
| **C6** | Planning for Traffic Diversions and Detours | • Temporary diversions will be constructed with the approval of the Resident Engineer and Environmental Expert of AE for which contractor will seek prior approval for such plans.<br>• Detailed Traffic Control Plans will be prepared and submitted to the Resident Engineer for approval, seven days prior to commencement of works on any section of road. The traffic control plans shall contain details diversions; traffic safety arrangement during construction; safety measures for night – time traffic and precautions | Along the Road | Contractor | **Environmetal Expertof AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | for transportation of hazardous materials. Traffic control plans shall be prepared in line with requirements of IRC's SP- 55 document and The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.<br>• The contractor will also inform local community of changes to traffic routes, conditions and pedestrian access arrangements with assistance from AE and PIU. The temporary traffic detours will be kept free of dust by sprinkling of water three times a day and as required under specific conditions (depending on weather conditions, construction in the settlement areas and volume of traffic). | | | |
| **C7** | Earth from borrowAreas for Construction | • No borrow area will be opened without permission of the Environmental Expert of AE. The location, shape and size of the designated borrow areas will be as approved by the Environmental Expert of AE and in accordance to the IRC recommended practice for borrow pits for road embankments (IRC 10: 1961). The borrowing operations will be carriedout as specified in the guidelines for sitting and operation of borrow areas.<br>• The unpaved surfaces used for the haulage of borrow materials, if passing through the settlement areasor habitations; will be maintained dust free by the contractor. Sprinkling of water will be carried out twice a day to control dust along such roads duringtheir period of use.<br>• During dry seasons (winter and summer) frequency of water sprinkling will be increased in the settlement areas and Environmental Expert of AE will decide the numbers of sprinkling depending on the local requirements.<br>• Contractor will rehabilitate the borrow areas as soon as borrowing is over from a particular borrow area in accordance with the guidelines for Redevelopment of borrow Areas or as suggested by Environmental Expert of | Borrow Areas | Contractor | **Environmental Expertof AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | AE.<br>• The final rehabilitation plans will be approved by the Environmental Expert of AE. | | | |
| **C8** | Quarry Operations | • The contractor shall obtain materials from quarries only after the consent of the Department of Mining / SPCB (both the states) / District Administration or will use existing approved sources of such materials. Copies of consent/approval/ rehabilitation plan for opening a new quarry or use of an existing quarry source will be submitted to Environmental Expert of AE and the Resident Engineer.<br>• The contractor will develop a Comprehensive Quarry Redevelopment plan, as per the Mining Rules of the state and submit a copy toPIU and AE prior to opening of the quarry site.<br>• The quarry operations will be undertaken within the rules and regulations in force in the state. | Quarry Areas | Contractor | **Environmental Expertof AE and PIU** |
| **C9** | Transporting Construction Materials and Haul Road Management | • Contractor will maintain all roads (existing or built for the project), which are used for transporting construction materials, equipment and machineries as précised. All vehicles delivering fine materials to the site will be covered to avoid spillage of materials.<br>• 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.<br>• 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.<br>• The unloading of materials at construction sites/close to settlements will be restricted to daytime only. | All Roads Used | Contractor | **Environmental Expertof AE and PIU** |
| **C10** | Construction Water | • Contractor will arrange adequate supply and storage of water for the whole construction period at his owncosts. The Contractor will submit a list of source/s from where water will be used for the project to ‗PIU' through the Engineer.<br>• The contractor will source the | Along the Project | Contractor | **Environmental Expert of AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | requirement of water preferentially from ground water but with prior permission from the Central Ground Water Board. A copy of the permission will be submitted to 'PIU' through the Engineer prior to initiation of construction.<br>• The contractor will take all precautionto minimize the wastage of water in the construction process/ operation. | | | |
| **C11** | 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.<br>• Construction over and close to the perennial streams shall not be undertaken in any season.<br>• The contractor will take prior approval of the River Authority or IrrigationDepartment for any such activity. The PIU and the Engineer will ensure that contractor has served the notice to the downstream users of water well in advance. | All Water Bodies Used | Contractor | **Environmental Expert of AE and PIU** |
| **C12** | Drainage | • Contractor will ensure that noconstruction materials like earth, stone,ash or appendage is disposed off in a manner that blocks the flow of water of any water course and cross drainage channels. Contractor will take all-necessary measures to prevent any blockage to water flow. In addition to the design requirements, the contractor will take all required measures as directed by the Environmental Expert of AE and the 'Resident Engineer' to prevent temporary or permanent flooding of the site or any adjacent area.<br>• To maintain the surface water flow/drainage, proper mitigation measures will be taken along the road, like:<br>i. Drainage line will be constructed all along the project road.<br>ii. Good engineering and construction practice should be followed<br>Use of sediment traps, silt fencing, oil and grease turfing etc. to minimize of the soil movement. | Drainage line along the road | Contractor | **Environmental Expert of AE and PIU** |
| **C13** | Siltation of Water Bodies and Degradation of Water Quality | • The Contractor will not excavate beds of any stream/canals/ any other water body for 179 borrow 179 ng earth for embankment construction. | All Surface Water Bodies Along the | Contractor | **Environmental Expert of AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | • Contractor will construct silt fencing at the base of the embankment construction for the entire perimeter of water bodies (including wells) adjacent to the RoW and around the stockpiles at the construction sites close to water bodies.<br>• The fencing will be provided prior to commencement of earthwork and continue till the stabilization of the embankment slopes, on the particular sub-section of the road. The contractor will also put-up sedimentation cumgrease traps at the outer mouth of the drains located in truck lay byes and bus bays which are ultimately entering into any surface water bodies / water channels with a fall exceeding 1.5 m. in present case three Sedimentation Cum Grease Trap are proposed, Howeverthe item has been kept in case need arises during construction.<br>• Contractor will ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water does not drain into nearby watercourse. | Road | | |
| **C14** | Slope Protection and Control of Soil Erosion | • The contractor will take slope protection measures as per design, or as directed by the Environmental Expert of AE to control soil erosion andsedimentation.<br>• All temporary sedimentation, pollution control works and maintenance thereofwill be deemed as incidental to the earth work or other items of work and as such as no separate payment willbe made for them.<br>• Contractor will ensure the following aspects:<br>1. During construction activities on road embankment, the side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications.<br>2. Turfing works will be taken up assoon as possible provided the seasonis favorable 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.<br>3. In 180orrow pits, the depth shall be | Along the Roads | Contractor | **Environmental Expert of AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | so regulated that the sides of the excavation will have a slope not steeper than 1 vertical to 2 horizontals, from the edge of the final section of thebank.<br>4. Along sections abutting water bodies, stone pitching as per design specification will protect slopes. | | | |
| **C15** | Water Pollution from Construction Wastes | • The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering intostreams, water bodies or the irrigation system. Contractor will avoid construction works close to the streams or water bodies.<br>• All waste arising from the project is to be disposed off in the manner that is acceptable and as per norms of the State Pollution Control Board. | Along the road | Contractor | **Environmental Expert of AE and PIU** |
| **C16** | Water Pollution from Fuel and Lubricants | • The contractor will ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance and refueling sites will be located at least 500 m from rivers and irrigation canal/ponds.<br>• All location and layout plans of suchsites will be submitted by the Contractor prior to their establishment and will be approved by theEnvironmental Expert of AE and PIU.<br>• Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refuelingwill be carried out in such a fashionthat spillage of fuels and lubricants does not contaminate the ground. Oil interceptors will be provided for vehicle parking, wash down and refueling areas as per the design provided.<br>• Oil and grease traps will be provided at fuelling locations, to prevent contamination of water.<br>• Oil interceptors' shall be provided in wash down areas and re-fuelling areas<br>• In all, fuel storage and refueling areas, if located on agricultural land or areas supporting vegetation, the top soil will be stripped, stockpiled and returned after cessation of such storage.<br>• Contractor will arrange for collection, | Along the Roads | Contractor | **Environmental Expert of AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | storing and disposal of oily wastes to the pre-identified disposal sites (list to be submitted to AE and PIU) and approved by the Environmental Expert of AE. All spills and collected petroleum products will be disposed off in accordance with MoEF & CC andstate PCB guidelines.<br>• Environmental Expert of AE and Resident Engineer will certify that all arrangements comply with theguidelines of PCB/ MoEF & CC or any other relevant laws. | | | |
| **C17** | Dust Pollution | • The contractor will take everyprecaution to reduce the level of dust from crushers/hot mix plants, construction sites involving earthwork by sprinkling of water, encapsulation of dust source and by erection ofscreen/barriers.<br>• All the plants will be sited at least 1 km in the downwind direction from the nearest human settlement.<br>• The contractor will provide necessary certificates to confirm that all crushers used in construction conform to relevant dust emission controllegislation.<br>• The suspended particulate mattervalue at a distance of 40m from a unit located in a cluster should be less than 500 g/m3. The pollution monitoring isto be conducted as per the monitoring plan.<br>• Alternatively, only crushers licensed bythe SPCB shall be used. Required certificates and consents shall be submitted by the Contractor in such a case to the Environmental Expert of AE through the Engineer.<br>• Dust screening vegetation will be planted on the edge of the RoW for all existing roadside crushers. Hot mix plant will be fitted with dust extraction units. | Along the Roads, Construction Site/ Camps | Contractor | **Environmental Expertof AE and PIU** |
| **C18** | 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 SPCB.<br>• The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the | Along the Roads, all vehicles used/ Camps | Contractor | **Environmental Expertof AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | project. Monitoring results will also be submitted to PIU through the Engineer | | | |
| **C19** | Noise Pollution: Noise from Vehicles, Plants and Equipments | • The Contractor will confirm the following:<br>• All plants and equipment used in construction shall strictly conform to the MoEF& CC/CPCB noise standards.<br>• All vehicles and equipment used in construction will be fitted with exhaust silencers.<br>• 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.<br>• Limits 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.<br>• Maintenance of vehicles, equipment and machinery shall be regular to keep noise levels at the minimum.<br>• At the construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing, batching will be stopped during the night time between 10.00 pm to 6.00 am.<br>• No construction activities will bepermitted around educationalinstitutes/health centers (silence zones) up to a distance of 100 m from the sensitive receptors i.e., school, health centers and hospitals between 10.00 pm to 6.00 am.<br>• Monitoring shall be carried out at the construction sites as per the monitoring schedule and results will be submitted to Environmental Expert of AE through the Engineer. | Along the Roads, all vehicles used/Camps | Contractor | **Environmental Expertof AE and PIU** |
| **C20** | Personal Safety Measures for Labour | • Contractor will provide:<br>• Protective footwear and protective goggles to all workers employed on mixing asphalt materials, cement, lime mortars, concrete etc.<br>• Welder's protective eye-shields toworkers who are engaged in welding | Along the Roads, all vehicles used/Camps | Contractor | **Environmental Expertof AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | works<br>• Protective goggles and clothing to workers engaged in stone breaking activities and workers will be seated at sufficiently safe intervals<br>• Earplugs to workers exposed to loud noise, and workers working in crushing, compaction, or concretemixing operation.<br>• Adequate safety measures for workers during handling of materials.<br>• The contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.<br>• The contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labor Organization (ILO) Convention No. 62 as far as those are applicable to this contract.<br>• The contractor will make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to.<br>• 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.<br>• The contractor will also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint.<br>• Contractor will provide facemasks foruse to the workers when paint is applied in the form of spray or a surface having lead paint dry is rubbed and scrapped.<br>• The Contractor will mark ‗hard hat' and ‗no smoking' and other ‗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 AE and PIU. | | | |
| **C21** | Traffic and Safety | • The contractor will take all necessary measures for the safety of traffic during construction and provide, erect and | Along the Roads, all vehicles | Contractor | **Environmental Expert of AE and** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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 of AE and Resident Engineer for the information and protection of traffic approaching or passing through the section of any existing cross roads.<br>• The contractor will ensure that all signs, barricades, pavement markings are provided as per the MOSRT&H specifications. Before taking up of construction on any section of the existing lanes of the highway, a Traffic Control Plan will be devised and implemented to the satisfaction of Environmental Expert of AE and Resident Engineer | used/Camps | | **PIU** |
| **C22** | Risk from Electrical Equipment(s) | • The Contractor will take all required precautions to prevent danger from electrical equipment and ensure that:<br>• No material will be so stacked or placed as to cause danger or inconvenience to any person or the public.<br>• All necessary fencing and lights will be provided to protect the public in construction zones.<br>• All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provision and to the satisfaction of the Resident Engineer. | Along the Roads | Contractor | **Environmental Expert of AE and PIU** |
| **C23** | 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.<br>• The contractor will make required arrangements so that in case of any mishap all necessary steps can be taken for prompt first aid treatment. Construction Safety Plan prepared by the Contractor will identify necessary actions in the event of an emergency. | Along the Roads, construction Camps | Contractor | **Environmental Expert of AE an PIU** |
| **C24** | First Aid | • The contractor will arrange for –<br>• a readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules | Along the Roads, construction Camps | Contractor | **Environmental Expert of AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | in every work zone<br>• availability of suitable transport at alltimes to take injured or sick person(s) to the nearest hospital<br>• Equipment and trained nursing staff at construction camp. | | | |
| **C25** | 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 and MoRT&H specifications. | Along the Roads, construction Camps | Contractor | **Environmental Expertof AE and PIU** |
| **C26** | Road side Plantation Strategy | • The contractor will do the plantation at median and/or turfing at embankment slopes as per the tree plantation strategy prepared for the project.<br>• Minimum 90 percent survival rate of the saplings will be acceptable otherwise the contractor will replace dead plants at his own cost. Thecontractor will maintain the plantation till they handover the project site to NHAI.<br>• Environmental Expert of AE will inspect regularly the survival rate of the plants and compliance of tree plantation guidelines. | Along the Roads | Contractor | **Environmental Expert of AE and PIU** |
| **C27** | Flora and 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.<br>• If any wild animal is found near the construction site at any point of time, the contractor will immediately upon discovery thereof acquaint theEnvironmental Expert of AE and carry out the AE instructions for dealing with the same.<br>• Environmental Expert of AE 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.<br>• All efforts during the design stageshould be made to minimize the tree felling requirement<br>• Compensatory plantation should bestarted during construction phase parallel to the construction activities. | Along the Roads | Contractor | **Environmental Expert of AE and PIU** |
| **C28** | Chance Found | • All fossils, coins, articles of value of | Along the | Contractor | **Environmental** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | Archaeological Property | antiquity, structures and other remains or things of geological or archaeological interest discovered onthe site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation.<br>• 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 AE of such discovery and carry out the AE instructions for dealing with the same, waiting which all work shall be stopped.<br>• The AE will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site. | Roads, construction sites/ Camps | | **Expertof AE and PIU** |
| **C29** | Labour Accommodation | • Contractor will follow all relevant provisions of the Factories Act, 1948and the building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labor camp.<br>• The location, layout and basic facility provision of each labor camp will be submitted to AE and ‗PIU' prior to their construction.<br>• The construction will commence onlyupon the written approval of the Environmental Expert of AE.<br>• The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the AE.<br>• The sewage system for such campswill be properly designed and built so that no water pollution takes place in adjacent canals | Along the Roads, construction Camps/site | Contractor | **Environmental Expertof AE and PIU** |
| **C30** | 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.<br>• 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 | Along the Roads, construction Camps/ construction site | Contractor | **Environmental Expertof AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | Workers (Regulation of Employmentand Conditions of Service) Act, 1996.<br>• Testing of water will be done as per parameters prescribed in IS 10500:1991. | | | |
| **C31** | Sanitation and Sewage System | • The contractor will ensure that –<br>• 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<br>• separate toilets/bathrooms, wherever required, screened from those from men (marked in vernacular) are to be provided for women<br>• Adequate water supply is to be provided in all toilets and urinals | Along the Roads, construction Camps/ Construction Sites | Contractor | **Environmental Expertof AE and PIU** |
| **C32** | Waste Disposal | • The contractor will provide 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 of AE.<br>• Unless otherwise arranged by local sanitary authority, arrangements fordisposal of night soils (human excreta) suitably approved by the local medical health or municipal authorities or as directed by Environmental Expert of AE will have to be provided by the contractor. | Along the Roads, construction Camps | Contractor | **Environmental Expertof AE and PIU** |
| **C33** | Consultation | • The Environmental Expert of AE will contact the responsible people with the enhancement drawing of the site for which enhancement has beenproposed and take their consent beforethe start of work.<br>• Accesses to Different Schools along the road will be developed to the satisfaction of PIU. | Along the Roads | Contractor | **Environmental Expertof AE and PIU** |
| **C34** | Clean-up Operations, Restoration and Rehabilitation | • Contractor will prepare site restoration plans, which will be approved by the Environmental Expert of AE. 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 AE.<br>• All disposal pits or trenches will be | Along the Roads, construction Camps | Contractor | **Environmental Expertof AE and PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | filled in and effectively sealed off.Residual topsoil, if any will be distributed in pre identified approved areas or in places suggested by theEnvironmental Expert of AE areas in a layer of thickness of 75 mm-l50 mm. Allconstruction 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 of AE and PIU will certify in this regard. | | | |
| **OPERATION STAGE** | | | | | |
| | | **Activities to be carried Out by PIU** | | | |
| **O1** | Monitoring Operation Performance | • The PIU will monitor the operational performance of the various mitigation/ enhancement measures carried out as a part of the project.<br>• The indicators selected for monitoring include the survival rate of trees; utility of enhancement provision, status of rehabilitation of 189 borrow areas and disposal sites, | Along the Road | PIU | **PIU** |
| **O2** | Maintenance of Drainage | • PIU will ensure that all drains (side drains, median drain and all cross drainages) are periodically cleared especially before monsoon season to facilitate the quick passage ofrainwater and avoid flooding.<br>• PIU will ensure that all the sedimentand oil and grease traps set up at the water bodies are cleared once in every three months. | Along the Road | PIU | **PIU** |
| **O3** | Pollution Monitoring | • The periodic monitoring of the ambient air quality, noise level, water quality, soil pollution/contamination in the selected locations as suggested in pollution monitoring plan.<br>• PIU will either appoint PCB or its approved pollution-monitoring agency for the purpose | Along the Road | PIU through Pollution Monitoring Agency | **PIU** |
| **O4** | Air Pollution | • Ambient air concentrations of various pollutants shall be monitored as envisaged in the pollution-monitoring plan.<br>• Bottlenecks should be avoided for smooth flow of traffic.<br>• Plantation of pollutant adsorbing trees, such as Spider Plant, Bamboo Palm, | Along the Road | PIU through Pollution Monitoring Agency | **PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | etc.<br>• Regular maintenance of the road willbe done to ensure good surface condition | | | |
| **O5** | Noise Pollution | • Noise pollution will be monitored as per monitoring plan at sensitive locations. Noise control programs are to be enforced strictly.<br>• According to monitoring results, use of sound barriers / trees will be considered where warranted<br>• Signs for sensitive zones (health centers / educational institutions etc.) will be put up where horn should not beblown or traffic speed need to be regulated<br>• Pressure Horn must be banned in the project road | Along the Road | PIU through Pollution Monitoring Agency | **PIU** |
| **O6** | Water Pollution | • Water Quality will be monitored as per monitoring plan | Along the Road | PIU through Pollution Monitoring Agency | **PIU** |
| **O7** | Plantation (Flora and Fauna) | • Monitoring of survival of trees should be done at regular interval and suitable mitigation measures should be taken to protect the trees.<br>• Efforts will be made for proper maintenance of planted trees, shrubs and grasses to maintain greenery and aesthetics<br>• Planted tree should be covered with fence or net | Along the Road | PIU through Pollution Monitoring Agency | **PIU** |
| **O8** | Soil Erosion and Monitoring of Borrow Areas | • Visual monitoring and inspection of soil erosion at 190orrow areas, quarries (if closed and rehabilitated), embankment > 2m. and other places expected to be affected, will be carried out once in every three months as suggested in monitoring plan. In case soils erosion is found, suitable measures should be taken to control the soil erosion. | Along the Road | PIU | **PIU** |
| **O9** | **Road Safety and Traffic** | • Road Safety will be monitored during operation especially at location where traffic-calming measures have been proposed.<br>• The spills at the accident sites will be cleared immediately and disposed off properly in accordance with Emergency Response Plan<br>• Traffic management plan will bedeveloped, especially along congested locations and near sensitive locations<br>• Traffic control measures including | Along the Road | PIU | **PIU** |

| Sl. No. | Environmental Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | speed limits will be enforced strictly.<br>• Engagement with local community / Awareness Training | | | |

### 13.5 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.

Project Monitoring Cell will be set up in the PIU, which will act as the Contract ManagementUnit (CMU) and will be responsible for execution of the Project. Project Execution Units will be set up under the supervision of the Contract Management Unit for the Contract Package.

### 13.6 Technical set up

It is proposed that an Environmental Management Implementation Unit (EMIU) will be set up within PIU. The EMIU will have an Environmental Expert who will be responsible for monitoring the implementation of the EMP with the assistance of the Environmental Expert/Specialist of the AE/IE and the Contractor. The Environmental Expert will be assisted by two Environmental Engineers. The EMIU of PIU will assist the CMU and the Project Director and will interact with State Pollution Control Board (SPCB), State Forest Dept., NGO & various Committees for addressable of environmental issues. In the PIU, there will be an Environmental Officer within the Project Management Information System Unit who will assist the Project Director on the environmental matters and also interact with the CMU, PIUs and its EMIUs.

### 13.7 Non-conformity To Environmental Management Plan (EMP)

The Contractor will implement necessary mitigation measures for which responsibility is assigned to him as stipulated in the EMP. Any lapse in implementing the same will attract the damage clause as detailed below:

- Any complaints of public, within the scope of the Contractor, formally registered with the PIU and communicated to the Contractor, which is not properly addressed within the timeperiod intimated by the PIU shall be treated as a major lapse.
- Non-conformity to any of the mitigation measures like unsafe conditions, non-collection of excavated material (during laying of drainage pipes) regularly and other unattended Environment, Health & Safety (EHS) issues, as stipulated in the EMP Report (other than stated above) shall be considered as a minor lapse.
- On observing any lapses, PIU 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 ten days from the original notice date and first reminder date respectively. Any minor lapse, which is not rectified, shall be treated as a major lapsefrom the date of issuing the second reminder.

- If a major lapse is not rectified upon receiving the notice PIU shall invoke reduction, inthe subsequent interim payment certificate.
- For major lapses, 10% of the interim payment certificate will be withheld, subject to a maximum limit of about 0.5% of the contract value.
- If the lapse is not rectified within one month after withholding the payment, the amount withheld shall be forfeited immediately.

Table 54:Environment Management Plan Implementation Budget

| Sl. No | Environmental Components | Particulars | Unit | Rate In (Rs.) | Approx Quantity | Total Cost In (Rs.) |
|---|---|---|---|---|---|---|
| | | Mitigation / Enhancement Cost | | | | |
| **2** | | Construction Stage | | | | |
| **2.1** | Air | Dust Management with sprinkling of water, covers for vehicles transportin gconstruction material | 13.989 Km | Cost included in Total Civil Cost | | |
| **2.2** | Water | Provision of Taps | No. | Included in utility shifting and replacement cost. | | |
| | Water Bodies | Enhancement of Road side Ponds | No. | Retaining wall has been proposedto protect this water bodies. Cost of retaining wall is included in total Civil Cost. | | |
| | | Oil trap at parking/servicing of construction vehicles (at three location every 14km)- | No. | Ref: Project Cost Estimate | | |
| **2.3** | Environmental Enhancement s | Enhancement of traffic sign outside of most sensitive locations mentioned in EMP, by planting of traffic sign and planting of 1 RoW of trees at a distance of 3m c/c and as per directions of the Engineer | No. | At this location proper traffic sign has been proposed. The cost of traffic sign is included in total civil cost. | | |

| Sl. No | Environmental Components | Particulars | Unit | Rate In (Rs.) | Approx. Quantity | Total Cost In (Rs.) |
|---|---|---|---|---|---|---|
| **2.4** | Flora | There is no tree felling as the project road is within theexisting RoW. | Nos. | The cost of trees transplantation is included in total civil cost. | | |
| | Provision of Mobile Toilets at Work Site | Supply and commissioning of mobile toilets on wheel (5 units each Toilet and Bathroom) with proper water supply and drainage system, electric supply and safe access at work site locations | Nos. | 1 | 250000 | 250000 |
| | | Maintenance: Daily cleaning twice a day by engaging one permanent helper | Monthly | 24 | 18000 | 432000 |
| | | Painting at every six months | Six Monthly | 4 | 25000 | 100000 |
| | Noise barrier | Provide the Noise barrier at sensitive areas like schools and hospitals. The noise barriers of hollow brick wall/reinforced concrete panels with height of 3.5m. The design of the noise barrier shall be approved by the engineer in charge**.** | | Cost of noise barrier is included in Total Civil Cost. | | |
| **2.5** | Silt Runoff Control | Slope stabilization, turfing, silt fencing etc. | | For slope stabilization turfing has been proposed on high embankment. Cost of slope stabilization is included in Total CivilCost. | | |
| **2.6** | Slope/ embankment protection measures | Stone pitching, Gabion, retaining wall, Turfing at toe line, etc. | | For Slope/ embankment protection Retaining wall, Turfing has been proposed. Cost of Slope/ embankment is included in Total Civil Cost. | | |
| **2.7** | Relocation of sensitive receptor | Relocation of religious structure, educational properties and health care | | Cost of relocation is included in Total Civil Cost. | | |

| Sl. No | Environmental Components | Particulars | Unit | Rate In (Rs.) | Approx. Quantity | Total Cost In (Rs.) |
|---|---|---|---|---|---|---|
| | | center | | | | |
| | | Total Mitigation / Enhancement Cost | | | | 782000 |
| **3** | | **Operation Stage** | | | | |
| **3.1** | Soil erosion | Mitigation measure for soil erosion | | included in Total Civil Cost | | |
| **3.2** | Contamination from spills due totraffic and accidents | Clearing of spills at accidentsite | | | Average cost | 700,000 |
| **3.3** | Flora | Maintenance of planted trees | Already included in construction phase | | | |
| **3.4** | Safety | Traffic management and Traffic control | Part of project construction cost. | | | |
| | | Total Mitigation / Enhancement Cost | | | | 700,000 |

Table 55:Summary of Environmental Management Budget

| Sl. No. | Environmental Components | Cost (Rs.) |
|---|---|---|
| **1** | **Construction Phase** | |
| 1.1 | Total Mitigation / Enhancement Cost | 782000 |
| 1.2 | Environmental Monitoring Cost | 309000 |
| Total Cost in Construction phase | | **1091000** |
| **2** | **Operation Phase** | |
| **2.1** | Total Mitigation / Enhancement Cost | 700000 |

| | | |
|---|---|---|
| **2.2** | Environmental Monitoring Cost | 309000 |
| Total Cost in Operation Phase | | **1009000** |
| 3 | **Miscellaneous Cost** | |
| 3.1 | Environmental Awareness and Training | 1,20,000 |
| 3.2 | Administrative Charges including logistics | 4,00,000 |
| Total Cost in Miscellaneous | | **520000** |
| **TOTAL BUDGETED COST (1+2+3)** | | **2620000** |

An environmental management budget at of INR **2620000** has been estimated for implementation of the environmental management plan. This budget includes cost of environmental monitoring and associated trainings.

## 13.8 Social Management Plan (SMP)

The aim of this Social Management Plan (SMP) is to mitigate all such unavoidable negative impacts cause due to the project. This (SMP) Plan will be prepared on the basis of project survey findings and consultation with various stakeholders. The plan complies with PWRD, Meghalaya State Laws, the Municipal Act and Regulations.

Socio-economic mitigation measures will consist of policies and actions taken before the implementation of the project with the intention of minimizing the extent of impact. The first step of such mitigation will be to avoid unnecessary acquisition and then decide about the mitigation for the damage which is unavoidable. Mitigation is a long-term effort for reduction of socio- economic impacts on the affected population. The outcome of SIA will be guided by the Resettlement Framework of the project to prepare Social Management Plan (SMP).

In order to conduct socio-economic mitigation, it is necessary to acknowledge the grievance/ dis-satisfaction among the affected persons, identify the genuine grievances, finding the facts behind the grievances, and finally finding out ways to address those grievances.

The main responsibilities of the GRC at both the levels will be to i) provide support to local on problems arising from the proposed work; (ii)record the grievances, categorize, and prioritize grievances and resolve them; (iii)immediately inform the EA of serious cases; and (iv) report to locals on developments regarding their grievances and decisions of the GRC.

## 13.9 Recommendation of SIA to be Implemented

Some key informants and representatives of various organizations have presented some recommendations for implementation of SIA so that the project's adverse impact will be minimized. These are noted below.

- There should be proper awareness campaign at the project sites regarding health and hygiene, awareness about HIV/AIDS, drug and human trafficking with details of the mode of operation, kind of people at high risk and method of mitigation. IEC materials in local language & in picture to be displayed and distributed in the sites, major settlements, Block and ULBs.
- Police administration, health department and block officials should be sensitized to take more proactive role to apprehend any remote chance of human trafficking, particularly ofwomen and girls, drug peddling and risk of HIV/AIDS.
- . Civil Contractor will minimize the impact of accessibility of the residential structures and the loss of livelihood of the Commercial structures will be minimized by speeding up the civil work and doing the work on one side of the road at a time.

## 13.10 Recommendation of the Vulnerable groups

- Linkages of the locals with the available schemes sponsored by the State and theCentral Government.

## 13.11 Recommendation for Gender Sensitization

- Implementation of the Vishakha Guidelines as amended as The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 in case of sexual harassment against women should be displayed at the project sites and other important location.
- Earmarked parts of parking bays for women two-wheeler drivers and women car drivers to ensure their security.
- Making Sulabh toilets for women workers, with fittings for pregnant and disabled women at the project site.
- Better maintenance of street lighting and roads, especially near education institutions and workplaces of informal sector workers.
- Provision of quality drinking water and sanitation services, including menstrual hygiene facilities for women workers at the project office and other site offices.
- Safer vending and market places at project sites and by the road side.
- Conduct regular trainings of drivers, conductors, auto-drivers and traffic police on sexual harassment in public spaces and what support systems can be accessed.
- Develop protocols and response systems to address sexual harassment in transport facilities and display police and women's helpline numbers prominently in all project offices, public places and important junctions
- Ensure regular patrolling by PCR vans in highly vulnerable areas.

- Ensure presence of visible security, including CCTV at all important and vulnerable locations. Build trust and confidence among female citizens.
- Ensure effective operation of the women's helpline and registering FIRs and othercomplaints.
- Ensure effective functioning of Sexual Harassment Committees in all institutions and Local Complaint Committees at local, district level that can be accessed by women workers in the informal sector.

### 13.11.1 Budget for Implementation of Social Management Plan (SMP)

The cost related to temporary impacts will be borne by the EA. EA will ensure allocation offunds and availability of resources for smooth implementation of the project SMP activities. In the case of assistance and other rehabilitation measures, the EA will directly pay the money or any other assistance as stated in the RPF to temporarily affected persons. The construction will be planned in such a way that there is minimum temporary impact during actual civil construction. The implementing agency will be involved in facilitating the disbursement process and rehabilitation program. The SMP implementation budget is given below

Table 56: Summary of SMP Implementation Budget

| **I. Implementation of SMP** | | | |
|---|---|---|---|
| Support for implementation of SMP (lumpsum) | 420,000 | 1 | 420,000.00 |
| M & E consultant (lumpsum) | 80,000 | 1 | 80,000.00 |
| | | **Total** | **500,000.00** |

An estimated budget of Rs. **500,000.00**or INR 0.50 million will be required for implementation of SMP.

# 14 CHAPTER-XVI: CONCLUSION AND RECOMMENDATIONS

The environmental and the social impact assessment have been conducted as per the approach/ methodology for conducting ESIA study for all the seven project corridors. All the potential impacts were identified in relation to pre-construction, construction, and operation phases. Social impact assessment study has done within the proposed corridor. The proposed project interventions shall not attract Environmental Clearance (EC) from the SEIAA.

Focus Group Discussions (FGD's) were conducted to assess the perception of the peopleabout the proposed project. The stakeholders selected included shop keepers, residents along the road, owners/ workers of local commercial establishments etc. The outcome of the consultations depicts the requirement for the road safety measures; road furniture's (including street lights, additional bus bays, signage's, speed breaker etc.,).Project may allure labourers from the neighbouring states which may bring menace to the society. The project is not huge and civil construction is very limited. Thus, there is minimum chance of influx of labour forcefrom neighbouring states. However, there will be labour coming from the neighbouring districts of Meghalaya and accustomed with the culture and tradition of the society.

In view of the environmental Impact assessment, there will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on the project corridors (traffic, dust, safety etc.,), mining of construction material, occupation health and safety aspects, disturbance to the residents, businesses, safety risk to workers, public and nearby buildings due to road excavation works, access impediment to houses and business, disposal of large quantities of construction waste, etc. These are all general impacts that are likely to arise during the road construction works in the settlement areas, and there are well developed methods of mitigation that are suggested in the ESMP. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off- site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported by the contractor to the CSC/PIU.

The prepared ESMP will assist the Contractor, CSC, and the PIU in mitigating the environmental and social impacts, and guide them in the environmentally sound execution of the proposed project. A copy of the updated ESMP shall be kept on-site during the construction period at all times. The ESMP shall be included in the bidding document along with appropriate contractual clauses for safeguarding the environment during the project construction and operation (maintenance period). As per the World Bank policy requirements, the prepared safeguard documents shall be disclosed in the World Bank website.

# Annexure 1: Environmental Screening Checklist

| | |
|---|---|
| Name of the sub-project | WILLIAMNAGAR TOWN ROAD |
| Size of the project (approx. area in sq. mt/hac or length in mt/km, as relevant) | 13.989 KM |
| Location of the proposed sub-project | Meghalaya, India |
| Name of the of the district, block | East Garo Hills district |
| Name of the settlement/ area, where the bridge is located | This road moves through the Williamnagar town which is a headquarterof East Garo Hills district in the state of Meghalaya in India. |
| Latitude and longitude | Lat: 25.5134268$^0$ Long: 90.6436182$^0$ |
| New construction/ repair/ rehabilitation/ expansion (if there is an existing bridge, please share picture of old bridge. Also, the approach roads.) | Rehabilitation of the project road |
| If expansion, then is there any need of new land | NA |
| If yes, please share detail:<br>- Total requirement<br>- Private land<br>- Govt. land<br>- Forest land | NA |
| What is the High Flood Level in the sub-projectarea? | Flood prone Area |

| S. No. | Environmental & Social Features | Presence within 500 mts from activity sites (Yes/No) If yes, mention distance in km) | Type of Impact (+ or -) | Significance of Impact (High (H), Medium (M), Low (L)) | Likelihood of Impact (Likely, Unlikely) | Description of Impact |
|---|---|---|---|---|---|---|
| **Physical Environment** | | | | | | |
| | Springs | No | | | | |
| | Standing water bodies (ponds, lakes, etc.) | Yes | _ | Low (L) | unlikely | |
| | Flowing water bodies (rivers, rivulets, streams, canals, etc.) | Yes | _ | Low (L) | Likely | Increase in turbidity |
| | Ground water sources (open wells, bore wells, etc.) | Yes | | Low (L) | Unlikely | Extraction of groundwater |
| | Meandering River | No | | | | |
| | Erosion prone stretches[6] | Yes | _ | Medium (M) | Likely | Because of unscientific agricultural practices and |

[6]https://slusi.dacnet.nic.in/srm/srmabstracts/SRM_129_East_Garo_Hills.pdf

| S. No. | Environmental & Social Features | Presence within 500 mts from activity sites (Yes/No) If yes, mention distance in km) | Type of Impact (+ or -) | Significance of Impact (High (H), Medium (M), Low (L)) | Likelihood of Impact (Likely, Unlikely) | Description of Impact |
|---|---|---|---|---|---|---|
| | | | | | | poor drainage facilities, soil erosion takes places in some locations. |
| | Areas with high slope (higher than 15 percent) | Yes | _ | Medium (M) | Likely | High slope will cause soil erosion problem. |
| | Landforms (hills, valleys) | Yes | _ | Medium (M) | Likely | Project road is mostly going through the Plain areas and for this, hill cutting may be required. |
| | Coal Mine | | | | | |
| **Biological Environment** | | | | | | |
| | National Park / Wildlife Sanctuary | Consider both end of the bridges and within 10km radius as perlaw | | | | No National Park / Wildlife Sanctuary are located along the project road |
| | Reserved Forests | Consider both end of the bridges and within 10km radius as per law | | | | No reserved forest are located along the project road |
| | Community Forest/ Fisheries | Local consultation Fish breeding Around the area — unique amphibian species (relevant dept.) | | | | No |
| | Large Trees / Woodland | Visual checks — if found, please click photograph | _ | Medium (M) | Likely | Tree cutting causes soil erosion |
| | Sacred Groves | No | | | | |
| | Presence of endangered species / habitat | Consider both end of the bridges and | | | | |

| S. No. | Environmental & Social Features | Presence within 500 mts from activity sites (Yes/No) If yes, mention distance in km) | Type of Impact (+ or -) | Significance of Impact (High (H), Medium (M), Low (L)) | Likelihood of Impact (Likely, Unlikely) | Description of Impact |
|---|---|---|---|---|---|---|
| | areas | within 10km radius as per law | | | | |
| | Migratory routes | Please refer to ESMF and check if any intercepts with the project Area | | | | No |
| | Ecologically sensitive areas | Consider both end of the bridges and within 10km radius as perlaw | | | | No |
| **Human Environment** | | | | | | |
| | Settlements/Habitations | Yes | + | Medium (M) | Likely | improve the connectivity |
| | Sensitive Receptors (schools, hospitals, markets etc.) | Yes | _ | Low | Likely | Increase of noise and air pollution. |
| | Drinking water sources | Yes | _ | Low | Unlikely | |
| | Underground utility lines like electricity lines, pipelines for gas, etc | Yes | _ | Low | Likely | Utility trench may come in the project road and may need to shift |
| | Physical cultural resources<br><br>—Protected monuments, historical/ heritage sites etc. | No | | | | |
| | Physical cultural resources<br>—<br>Religious structures, other sites significant to community | Yes | _ | Low | Likely | Increase of noise and air pollution. |
| | Agricultural land/ Other activities | No | | | | |
| | Defence Installations / Airports | No | | | | |

| S. No. | Environmental & Social Features | Presence within 500 mts from activity sites (Yes/No) If yes, mention distance in km) | Type of Impact (+ or -) | Significance of Impact (High (H), Medium (M), Low (L)) | Likelihood of Impact (Likely, Unlikely) | Description of Impact |
|---|---|---|---|---|---|---|
| | Heavy polluting Industry | No | | | | |
| | Water or Waste water Treatment Plant | No | | | | |
| **Social Safeguard Issues** | | | | | | |
| | Any loss / reduction of access to traditional dependent communities (to areas where theyearn for their primary or substantial livelihood). | No | | | | |
| | Adverse impacts to women, gender issues including economic and safety concerns | Community consultation | | | | |
| | Presence of Indigenous / vulnerable communities | Community consultation | | | | |
| | Land acquisition of private land leadingto loss of shelter and livelihood | No | | | | |
| | Whether land acquired / donated is more than 10%of the total holding | No | | | | |
| | Land acquisition resulting to loss of income; livelihood; sources of livelihood; loss of access to common property resources and / or private residential and/or property resources. | No | No | | | |
| | Possible conflicts with and/or | No | | Low | Unlikely | |

| S. No. | Environmental & Social Features | Presence within 500 mts from activity sites (Yes/No) If yes, mention distance in km) | Type of Impact (+ or -) | Significance of Impact (High (H), Medium (M), Low (L)) | Likelihood of Impact (Likely, Unlikely) | Description of Impact |
|---|---|---|---|---|---|---|
| | disruption to local community | | | | | |
| | Significant issues raised by the stakeholders during consultation | MoM of the community consultation | | | | |

# Annexure 2: Social Screening Checklist

Urban Roads (Town roads) and Non-urban roads under MITP (World Bank) initiative.

Public Works Department (Roads), Government of Meghalaya

**Social Screening Format**

**General Information:**

Name of: Town: **Williamnagar** Urban/ Rural Area: **Urban**

Tehsil: **Williamnagar** District: **East Garo Hills**

1. Does the project activity require additional land area? **No**

2. If response in above question is yes, then fill information against sl. no. 3, 4 & 5 (as applicable), otherwise skip to sl. no. 6

| Details | Unit | Quantity |
|---|---|---|
| **3. Private land required** | Acres | Nil |
| a. No. of land owners affected | Number | Nil |
| b. Persons whose livelihood is primarily dependent on land likely to be acquired/required | Number | Nil |
| c. BPL Families (among a+b) | Number | Nil |
| d. Total Vulnerable Families (including BPL) (among a+b) | Number | Nil |
| **4. Government Land** | Acres | Nil |
| a. Non-Titleholders – Encroachers Families | Number | Nil |
| b. Non-Titleholders – Squatters Families | Number | Nil |
| c. Various other users of this Govt. Land; Families | Number | Nil |
| d. People losing livelihoods/ access due toloss of Govt. Lands project; Families | Number | Nil |
| **5. Tribal Families affected** | Number | Nil |

**6. Residential structures/buildings (permanently) affected due to project activities:**

| Details | Unit | Quantity |
|---|---|---|
| a. Total Affected Families | Number | Nil |

| Details | Unit | Quantity |
|---|---|---|
| b. Title Holders | Number | Nil |
| c. Non-Titleholders – Encroachers | Number | Nil |
| d. Non-Titleholders – Squatters | Number | Nil |
| e. BPL Families losing Dwellings | Number | Nil |
| f. Total vulnerable families (including BPL) | Number | Nil |
| g. Total Tribal Families | Number | Nil |

**7. Commercial units (permanently) affected due to project activities:**

| Details | Unit | Quantity |
|---|---|---|
| a. Total Affected Families | Number | Nil |
| b. Title Holders | Number | Nil |
| c. Non-Titleholders – Encroachers | Number | Nil |
| d. Non-Titleholders – Squatters | Number | Nil |
| f. BPL Families losing Commercial Properties | Number | Nil |
| g. Total vulnerable families (including BPL) | Number | Nil |
| h. Total Tribal Families | Number | Nil |
| i. Vendors affected | Number | Nil |
| j. Petty shop keepers & Kiosk affected | Number | Nil |

**8. Common Property Resources (permanently) Affected: (Please give each type by number)**

| Description | Unit | Quantity |
|---|---|---|
| Religious structure (specify) | Number | Nil |
| Well | Number | Nil |
| Waiting Shed/Rain Shelter | Number | Nil |
| Schools/Educational/ Cultural Structures | Number | Nil |
| Government/ Community Structures | Number | Nil |

**9. Summary:**

| S No | Items | Results |
|---|---|---|
| 1 | Total no of Families (permanently) affected due to proposed project activity (Single or multiple impacts) | Nil |
| 2 | Total no of BPL Families (permanently) affected due toproposed project activity (Single or multiple impacts) | Nil |
| 3 | Total no of vulnerable Families (permanently) affected (including BPL) due to proposed project activity (Single or multiple impacts) | Nil |
| 4 | Total no of Tribal Families (permanently) affected (including BPL) due to proposed project activity (Single or multiple impacts) | Nil |
| 5 | Total number of Community Property Resources affected | **Nil** |
| 6. | Total Number of Families temporarily affected during construction | Nil |

**8. Result/ Outcome of Social Screening Exercise**

| Output | Outcome | Triggered for the Project |
|---|---|---|
| If the number of affected due to scheme/ sub- project implementation is **less than equal to** 200persons (all impacts combined together — land, structure, other assets, livelihood, etc.) or there isonly temporary impact during construction | Abbreviated Resettlement Action Plan (ARAP)not required | **Not Applicable** |
| If the number of affected due to scheme/ sub- project implementation is **more than 200 persons**(all impacts combined together – land, structure, other assets, livelihood, etc.) | Resettlement Action Plan (RAP) not required | Not Applicable |
| If only govt. land, forest land, other department land is impacted and the number of affected persons is nil (all impacts combined together – land, structure, other assets, livelihood, etc.) | ARAP/RAP not required | Not Applicable |

**9. Additional information to be collected about the site:**

| Sl. No. | Previous usage of site | Response |
|---|---|---|
| 1 | Whether the present site or part of present site ever used for any of the following purposes? Response column whichever is applicable | |
| | Worshipping sacred trees/ sacred grooves | No |
| | Burial place | No |
| | Grazing cattle/ goats | No |
| | Other small shrines | No |
| | Other prayers, rituals, annual or seasonal festivals/ rituals | No |
| | Habitation place of community Gods/ ancestors/ or any other good or bad supernatural forces | No |
| | Place of offering (animal sacrifice) | No |
| | Other purposes (e.g. sports, cattle racing, etc.) | No |
| | Sensitive social/ cultural/ historical folk tales or oral history of the site (which may later on influence the project) | No |
| | Open defecation | No |
| 2 | No specific usage/ plain ground/ agricultural | No |

# Annexure 3: Minutes of meeting with the DPR consultant

A meeting via video conference was held between ESIA Consultant and the DPR Consultantfor discussion on Environmental and Social Impact Assessment on Williamnagar Town Roads.

Location: Office of CETEST Pvt. Ltd, Kolkata vide Video Conference Mode

Date: 23.12.2021

Time: 4.30 pm

Attendees: Team Leader, DPR with Mr. Swarnava Bandhopadhyay, Environmental Specialist, Mr. Suman Sarkar, Social Specialist and team members of DPR and ESIA Consultant.

The proposals mentioned in Draft Project Report for Williamnagar town roads and their possible Environmental and social effects were discussed along with probable remedies. Followingpoints were discussed in detail.

Table 57: Minutes of the meeting of ESIA and DPR consultant

| Sl. | Topic | Details of Discussion | Decision |
|---|---|---|---|
| 1 | **Land Acquisition** | The ESIA consultants requested forthe details of Land Acquisition being done on the project stretch. DPR Consultant informed that, no land is being acquired for this project stretch and the road is being designed to fit within available RoW as advised by the Client. All proposed structures are well within the existing RoW and thus no LA is required for this project. | DPR Consultant has assured that there is no proposal for Land Acquisition. |
| 2 | **Demand for all weather road** | ESIA consultants wanted to knowthe condition of existing road and improvements planned in the design. DPR Consultant deliberated that the existing pavement condition along the road is poor. In some portions of the stretch, the existing pavement is damaged with cracks, raveling, rutting edge breaking and potholes and in some stretches it is observed that the existing bituminous layer is fully damagedand exposed. The overall pavement condition needs to be improvised. | DPR Consultants clarified that pavement is being designed in compliance with IRC codal provisions along with climate resilient technology. |
| 3 | **Road safety** | ESIA Consultants asked about the convex mirror to be installed at | The DPR consultants clarified that all the required safety |

| Sl. | Topic | Details of Discussion | Decision |
|---|---|---|---|
| | | turning points, sharp corners of the roads at a suitable height as they allow to see invisible but oncoming vehicles. Hence reducing the probability of road accidents.<br>Proper signage and road furniture are to be integral part of the design. | measures including Rumble strips, Sign boards, Chevron boards, Road studs, Convex mirrors etc. are being provided as per codal provisions so as to make the road safe to drive. |
| 4 | **Road safety at Night** | ESIA Consultants recommended for street lighting. Provision of street lighting is absolutelynecessary as it not only act as a prevention of accidents but also an important source of public security intended to reduce crime. Studies have shown that darkness resultsin a large number of crashes and fatalities, especially those involving pedestrians; pedestrian fatalities are 3 to 6.75 times more likely in the dark than in daylight. Several decades ago, when automobile crashes were far more common, street lighting was found to reduce pedestrian crashes by approximately 50%. Road Furnitureand Road Signage are to be introduced at all proper and<br>suitable places. | DPR Consultants clarified that street lightings are proposed at built — up areas and other safety measures viz. Chevron sign boards, Road studs are proposed as safety measures at night. |
| 5 | **Storm Water Drain** | The Local People demanded storm water drain as much as possible throughout the alignment. Atcongested area it should also have cover and use as footpath. | DPR Consultants clarified that storm water drains are provided at all required locations. Trapezoidal drains are proposed at hill side locations. At built up areas cover drain cum footpath are already proposed considering the requirement of pedestrians. |
| 6 | **Bus Shelter and/or Rain Shed** | Bus Shelter and/or Rain Shed should be proposed at regular intervals. | Bus shelters are proposed in the DPR at all built up locations where people areexpected to use public<br>transport. |
| 7 | **Other facilities** | There should be speed breakers in front of school, church and market place | Boundary wall are proposed to completely segregate the school from traffic. Road humps/Rumble strips are proposed at cross roads of all junction. Hence safety is givenprime consideration in the proposal. |
| 8 | **Utility** | There should be utility corridor at | Utility corridor will be provided |

| Sl. | Topic | Details of Discussion | Decision |
|---|---|---|---|
| | **Corridor** | underground near the congestedplace | as per actual requirement. |
| 9 | **Public Transport** | There are very few public transports in the total alignment. The frequency of public transportshould increase. | The matter belongs to Govt. of Meghalaya and ESIA consultants can recommend toincrease public transport for betterment of people. |
| 10 | **Bridges** | Are there any new bridgesproposed in the alignment for not to disturb the natural flow of water? | Two minor bridges have been proposed for reconstruction. All natural streams have been provided with cross drainage structures viz. minor bridges and culverts. All culverts whichare in distressed condition will be replaced |
| 11 | **Trees** | Are there any trees proposed in the alignment? | No trees will be cut |

The project has immense acceptability among the local people. They perceive that in additionto providing all-weather connectivity, the subproject road will bring positive socioeconomicchanges in the area. Local people mainly discussed the issues related to flooding, rehabilitation, resettlement, and road safety issues.