# Public Works Department Government of Meghalaya

## Environmental and Social Impact Assessment (ESIA) Report of Umsning - Jagi Road

C.E.TESTINGCOMPANYPRIVATELIMITED

**Report No PI/CTKI21-19/R1**
**Revision No. A**

Table of Contents

**Table of Contents**

1 CHAPTER-I: INTRODUCTION ANDPROJECTBACKGROUND ..... 9
1.1 Approach for Environmental and Social Assessment ..... 10
2 CHAPTER-II: PROJECT DESCRIPTION. ..... 13
2.1 Need for the Project ..... 13
2.2 Project Location ..... 13
2.3 Existing Features of the Project ..... 14
2.4 Right of Way (ROW): ..... 15
2.5 Proposed Land Acquisition: ..... 15
2.6 Proposed Cross Section Details ..... 15
2.7 Footpath ..... 15
2.8 Paver Block ..... 15
2.9 Typical Cross Section: ..... 15
2.10 Current and Projected Daily Traffic ..... 22
2.11 Proposed Bridges and Culvert ..... 24
2.12 Proposed Roadside Drainage ..... 30
2.13 Proposed Pedestrian and Animal Crossing ..... 33
2.14 Wayside Amenities ..... 33
2.15 Construction Material Requirement ..... 35
2.16 Rates of Aggregate ..... 35
2.17 Sand ..... 36
2.18 Estimated Project Cost ..... 36
2.19 Implementation Schedule: ..... 39
2.20 Sub-project Benefits ..... 39
3 CHAPTER: IV- LEGAL FRAMEWORK ..... 40
3.1 Acts & Regulation ..... 40
3.2 Clearance Requirement ..... 47
3.3 MORTH & IRC Specifications ..... 48
3.4 Environmental Standards and Code of Practices ..... 48
3.5 Other Applicable Policies (Social Security & Labor Welfare) ..... 49
3.5.1 World Bank safeguard/ Operational policies ..... 50
3.5.2 Social Categorization: ..... 54
4 CHAPTER:V-DESCRIPTION OF ENVIRONMENT ..... 55

4.1 Meteorology: 57
4.1.1 Wind speed 59
4.1.2 Wind rose: 60
4.1.3 Mostly the wind blows towards East-North-East direction. 61
4.1.4 Relative Humidity: 61
4.2 Land Environment: 67
4.3 Water Environment: 68
4.4 Air Environment: 70
4.5 Monitoring Parameters and Standards 70
4.5.1 Ambient Air Quality Monitoring 70
4.6 Noise Environment: 75
Biological Environment: 77
4.6.1 Educational Institutions / Hospitals 79
4.7 Socio-Economic and Health Environment 79
4.8 Social Environment 80
4.8.1 The State Profile of Meghalaya 80
4.8.2 District Profile: 80
4.8.3 Demographic Profile 80
4.8.4 Schedule Castes and Schedule Tribes 81
4.8.5 Literacy Rate 81
4.8.6 Employment Pattern 82
4.8.7 Economic Development 82
4.8.8 Road Network 82
4.8.9 Railway 83
4.8.10 Aviation 83
4.8.11 Agriculture and Cropping Pattern 83
4.8.12 Animal Husbandry 83
4.8.13 Fishery 83
4.8.14 Hospitals 83
5 CHAPTER-V: ANALYSIS OF POTENTIAL ENVIRONMENTAL & SOCIAL IMPACTS & MITIGATION- MEASURES 84
5.1 Environmental Impacts and Mitigation Measures 84
5.1.1 Impacts during Design/ Pre-constructional Phase 84
5.1.2 Impacts during Construction Phase 85
5.1.3 Impacts during Operational Phase 108

5.2 Social Impact Assessment ..... 109
5.2.1 Projects Impacts ..... 109
5.2.2 Positive Impact ..... 109
5.2.3 Impact on Land ..... 110
5.2.4 Impact on Structures ..... 110
5.2.5 Impact on Community Structures ..... 111
5.2.6 Demography of Families ..... 111
5.2.7 Family Pattern ..... 111
5.2.8 Religious Stratification ..... 111
5.2.9 Social Stratification ..... 112
5.2.10 Educational Status of Sample Population ..... 112
5.2.11 Occupation ..... 113
5.2.12 Income and Expenditure Profile ..... 114
5.2.13 Holding of Agricultural Land (Immovable Assets) ..... 114
5.2.14 Possession of Vehicle (Movable Asset) ..... 115
5.2.15 Vulnerability ..... 115
5.2.16 Impact on Gender ..... 116
5.2.17 Migration ..... 116
5.2.18 Impact on Tribal People ..... 116
5.2.19 Impact on Socio Economic Profile of ST ..... 116
5.2.20 Impact on Community ..... 116
5.2.21 Impact on Gender ..... 117
5.2.22 Impact on Access to Services Amenities ..... 117
5.2.23 Transport facility ..... 117
5.2.24 Solid Waste Dumping Facilities ..... 117
5.2.25 Source of Drinking Water ..... 117
5.2.26 Distance of Medical Facilities ..... 118
5.2.27 Other Services ..... 118
5.3 Impacts on Road Safety and Human Health ..... 118
5.4 Mitigation Measures: ..... 118
6 CHAPTER-VI: CLIMATE CHANGE IMPACT & RISK ..... 121
6.1 Climate Change Mitigation ..... 121
6.2 Possible Climate Events, Risks and Adaptation Measures in Road Transport Infrastructure ..... 125
6.3 Environmental Monitoring Budget: ..... 126
7 CHAPTER-VII: STAKEHOLDER & PUBLIC CONSULTATION ..... 128

7.1 Introduction ..... 128
7.2 Objectives of the Public Consultation ..... 128
7.3 Identification of Stakeholders ..... 128
7.4 Project Stakeholders ..... 128
7.5 Methodology for Consultations ..... 129
7.6 Consultation with Local People and Beneficiaries ..... 131
7.7 Outcome of the Consultations ..... 134
7.8 Minutes of meeting ..... 138
8 CHAPTER VIII: TRIBAL PEOPLE'S DEVELOPMENT PLAN ..... 141
9 CHAPTER IX: GENDER ACTION PLAN AND ROAD SAFETY ..... 143
- Road Side Safety Measures ..... 143
- Recommendation for Gender Sensitization ..... 143
10 CHAPTER-X: RESETTLEMENT ACTION PLAN ..... 145
10.1 Some Common Definitions ..... 145
10.2 Process for RAP Preparation ..... 146
10.2.1 RPF for the Project Road ..... 146
10.3 Tribal People's Development Framework ..... 146
10.4 Gender Issues among Tribes ..... 147
11 CHAPTER XI: IMPLEMENTATION ARRANGEMENTS ..... 148
- Project Management Unit (PMU) ..... 148
- Capacity Building Strategy ..... 150
- Institutional Capacity to Manage Social Development Aspects ..... 150
- Grievance Redressal Committee (GRC) ..... 150
- Grievance Redress Mechanism ..... 150
- Grievance management through Electronic Mode ..... 151
- Grievance Redressal Mechanism ..... 151
- Disclosure of Project Information ..... 152
12 CHAPTER-XII: MONITORING & EVALUATION ..... 153
12.1 M&E of the ESMP application ..... 153
12.2 M&E of E&S Management Plans ..... 153
12.3 Concurrent Monitoring ..... 154
12.4 Periodic Evaluation ..... 154
12.5 Arrangements for Monitoring ..... 154
13 CHAPTER-XIII: ENVIRONMENT AND SOCIAL MANAGEMENT PLAN ..... 156

13.1 Objectives of EMP ..... 156
13.2 Pre-Construction Stage ..... 156
13.2.1 Pre-construction activities by PIU/Independent Consultant ..... 156
13.2.2 Pre-construction activities by Contractor ..... 156
13.3 Construction Stage ..... 156
13.3.1 Construction activities by the Contractor ..... 157
13.3.2 Construction activities by the PIU/ Authority Engineer / Independent Consultants ..... 157
13.4 Operation Stage ..... 157
13.5 Nonconformity to Environmental Management Plan (EMP) ..... 185
13.6 Social Management Plan (SMP) ..... 189
13.7 Budget for Implementation of Social Management Plan (SMP) ..... 190
14 CHAPTER-XIV: CONCLUSION AND RECOMMENDATIONS ..... 192

List of Table:

Table 1: Project Feature ....14
Table 2: Details of Footpath ....15
Table 3: Details of Paver Block ....15
Table 4: TCS Schedule....15
Table 5: ADT Umsning-Jagi Road (December 2021): ....22
Table 6:ADT Guwahati Nagaon section of NH-27 (December 2021)....24
Table 7:List of Minor Bridges to be retained with Rehabilitation ....25
Table 8:Summary of Improvement Proposals for Cross Drainage Works ....25
Table 9:Widening/ Retained Existing Culverts ....25
Table 10:Summary of Proposed Covered Drain ....31
Table 11:Summary of Proposed Hill side Drain- LHS ....31
Table 12:Summary of Proposed Hill side Drain- RHS....32
Table 13:Details of Proposed Bus Shelters ....33
Table 14:Summary of Pavement Condition....34
Table 15: Details of stone quarry: ....35
Table 16: Details of Aggregates ....35
Table 17:Details of Sand Quarry....36
Table 18:Abstract of Cost Estimate ....37
Table 19:Area of Influence (AOI) .... **Error! Bookmark not defined.**
Table 20:Applicable Acts & Regulations....40
Table 21:Applicable Acts & Regulations (Construction Phase)....47
Table 22: ApplicablePolicies....49
Table 23 :ApplicableWorldBankOperational policies ....50
Table 24 :ApplicableLegalFrameworkfortheentire Project....51
Table 25:Ground water Monitoring Locations ....69
Table 26:Ground Water quality result....70
Table 27:Techniques Used for Ambient Air Quality Monitoring ....72
Table 28:Techniques Used for Ambient Air Quality Monitoring ....72
Table 29:Air Quality Monitoring Locations by CPCB....72
Table 30: Ambient Air Quality Results....72
Table 31:Noise Monitoring locations ....76
Table 32:Day and Night Time Leq....77
Table 33:List of Fauna....78
Table 34:List of Flora....78
Table 35:Sensitive receptors along the project road....79
Table 36:Demographic Profile of RiBhoi District ....81
Table 37:DistributionofRural andUrban Population....81
Table 38:Summary of Gabion walls-LHS....86
Table 39:Summary of Gabion walls-RHS ....88
Table 40:Summary of Breast walls-LHS ....89
Table 41:Summary of Breast walls-RHS....90
Table 42:Summary of Toe walls-LHS ....91
Table 43:Summary of Toe walls-RHS....92
Table 44:Adverse impacts on air quality during construction stage ....94
Table 45:Impact on Air Environment and Mitigation Measures ....96

Table 46:Typical noise levels of principal construction equipment (Noise Level in dB (A) at 50 Feet .....97
Table 47:Anticipated Noise due to construction in the sensitive receptor .....100
Table 48:Species Recommended for Plantation.....106
Table 49:Temporary impact of StructureintheSub-Project .....111
Table 50:Loss of CPRs in theSub-Project .....111
Table 51:Family Pattern of Sample Surveyed Families.....111
Table 52:Religious Stratification of Sample Surveyed Families .....112
Table 53:OccupationalStatusofSample Surveyed Population (18-60 yrs) .....113
Table 54:AnnualIncome Profile of Sample Surveyed Families .....114
Table 55:Agricultura l /HomesteadLandHolding of Sample families.....115
Table 56:MovableAssetsHoldings of Sample families .....115
Table 57:VulnerabilityStatusoftheAffectedFamilies .....116
Table 58:SourceofDrinkingWater of Sample Surveyed Families .....118
Table 59:DistanceofMedicalFacilities from Sample Surveyed Families .....118
Table 60:Potentialimpactandmitigationmeasurealongtheproject road .....119
Table 61:Environment Monitoring Plan ..... **Error! Bookmark not defined.**
Table 62 :Environmental Monitoring Cost.....126
Table 63:BriefDescriptionofsomesamplePublicConsultation .....128
Table 64:PicturesofFirstStageConsultations .....133
Table 65:Summary of Consultation Outcome .....135
Table 66:Minutes of the meeting of ESIA and DPR consultant .....138
Table 67:Traffic Composition..... **Error! Bookmark not defined.**
Table 68:$CO_2$ Emission Factors ..... **Error! Bookmark not defined.**
Table 69:Mean rainfall (mm) and coefficient of variation (CV) of the state for the monsoon months, southwest monsoon season and annual..... **Error! Bookmark not defined.**
Table 70:Possible Climate Events, Risks, and Adaptation Measures..... **Error! Bookmark not defined.**
Table 71:DetailsofcontactforGrievances..... **Error! Bookmark not defined.**
Table 72 :Environment& Social Management Plan(ESMP) ..... **Error! Bookmark not defined.**
Table 73 :EnvironmentManagementPlanImplementationBudget .....186
Table 74:Environment Management Plan Implementation Budget .....186
Table 75:Summary of Environmental Management Budget .....188
Table 76:Summary of SMP Implementation Budget .....191

List of Figure

Figure 1:Location Mapofthe Umsning-JagiRoad.....10
Figure 2: Start Point of Project Road at Junctions of the NH-6/ AH road.....13
Figure 3 : End of the Project Road at Umsning-Mawhati Road .....14
Figure 4: Photographs of Existing Pavement.....35
Figure 5: Photographs of Quarry area and Aggregate.....36
Figure 6: Project alignment showing study area and corridor of impact ..... **Error! Bookmark not defined.**
Figure 7: Core zone of the project area.....55
Figure 8: Digital Elevation Map of Project Road.....56
Figure 9: Toposheet map showing the Project road stretches.....56
Figure 10: Soil map of Ri Bhoi.....57
Figure 11: Precipitation in Umsning .....58
Figure 12: Average Temperature in Umsning.....59

Figure 13: Average Wind Speed in Umsning .....60
Figure 14: Wind Rose Diagram For Umsning.....61
Figure 15:Average Humidity of previous 10 years.....62
Figure 16:Seismic zone map of India & Meghalaya.....63
Figure 17: Flood Prone Zones of Meghalaya .....64
Figure 18: Landslide Map of North-Eastern Himalayas .....65
Figure 19: Landslide prone zones of Meghalaya showing the project road.....66
Figure 20: Map of Wind and Cyclone Zone in Meghalaya.....67
Figure 21: Drainage map along the project road.....68
Figure 22: Groundwater monitoring locations .....69
Figure 23: Air Quality Monitoring locations .....73
Figure 24:NoiseMonitoringlocations near the project road.....77
Figure 25: Social CategoriesofSample SurveyedFamiliesalongtheProjectRoad .....112
Figure 26: EducationalStatus .....113
Figure 27: AnnualExpenditureProfile.....114
Figure 28: ProjectImplementationArrangement ..... **Error! Bookmark not defined.**

List of Annexures

**Annexure 1 Social Screening Format**.....193

# 1 CHAPTER-I: INTRODUCTION ANDPROJECTBACKGROUND

Meghalaya is one of the north eastern States of India with undulating terrain and sharing international boundaries with Bangladesh at south and west and state boundaries with Assam at 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 major backbone, 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 Meghalaya Integrated Transport Project (MITP). The Public Works Department (PWD) of Meghalaya is the executing agency with given responsibility for planning, designing and, implementing civil works that 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 (34.843km), Nongstoin in Town roads (20.752 km) and Williamnagar Town roads (13.451 km) as urban stretches and Nongstoin - Maweit Road (35km) and Umsning - Jagi Road (40km) as non-urban stretches. This Environmental and Social Impact Assessment (ESIA) report covers only Umsning - Jagi Road (40km).

**The Project Road (Umsning - Jagi Road) (SH-8):**

Umsning - Jagi Road corridor (SH-8) section is extended up to 40.00km length in the districts Ri-Bhoi of Meghalaya state. The project road starts from the junction with National Highway – 6 /Asian Highway. The NH-6 is a Jorabat to Shillong stretches and it also part of the Asian Highway. It is mainly connected between the cities Guwahati to Shillong. The project scope ends at Km 40.130 of SH-8 near Sonidan town. The project road traverses through hilly and rolling terrains, connecting various built-up areas such as Nongiri, Rilong, Sohpdok, Sohliya, Umtangngi, Mawdiengngan, Umlaiteng, Umlatar, Mawhati, Umsohlait, Sonidan, and Mawlaho, among others.


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

*Figure 1:Location Mapofthe Umsning-JagiRoad*

**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 (COL):** The project ROW on either side of the proposed road centreline is considered as the corridor of impact. This area is more vulnerable to the project's direct impacts.

## 1.1 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 social features 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 (GOL) and state (GOM) statutory requirements and World Bank policies were reviewed and referred 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 information was utilised 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.**

The study identified potential impacts resulting from the construction of project roads. These impacts encompass changes in the physical, biological, or socio – economic baseline environment. The impacts were also analysed with respect to pre-construction, construction and operation phases and were categorised 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. The entire bituminous surface has stripped away as a result of water accumulation for long periods. Existing road is not motorable as major part of the existing pavement is severely distressed with potholes and extensive cracking along the wheel path and thus '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 between Guwahati and Shillong is met.

## 2.2 Project Location

Umsning - Jagi Road corridor (SH-8) section has a length of 40.00km in the district Ri - Bhoi of Meghalaya state. The project road starts from the junction with National Highway - 6 /Asian Highway. It is mainly connected between the cities Guwahati to Shillong. The project scope ends at Km 40.00of SH-8 near Sonidan town. The Project road is situated in Eastern Part of India in the state 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.


*Figure 2: Start Point of Project Road at Junctions of the NH-6/ AH road*


*Figure 3 : End of the Project Road at Umsning - Mawhati Road*

## 2.3 Existing Features of the Project

The existing project features are given below:

*Table 1: Project Feature*

| Sl. | Project Component | Details |
|---|---|---|
| 1 | Location of Project | Umsning-Jagi (40.00Km) The Project Road is situated in Eastern Part of India in the state of Meghalaya |
| 2 | Administrative locations | Ri-Bhoi |
| 3 | State | Meghalaya |
| 4 | Length of the project section | 40Km |
| 5 | Terrain | The project road will pass through mostly hilly and rolling terrain |
| 6 | Major Settlement along the Project Stretch | This road passes through towns/ Villages viz. Rilong, Sohpdok, Tdohumsiang, Sohliya, Umtangngi, Mawdiengngan, Umlaiteng, Umlatar, Mowhati, Umsohlait, Sonidan and Mawlaho. |
| 7 | Land use | The adjoining land is generally hilly with vegetation. The project corridor has scattered built up area named as Umsning, Umtangngi, Umlaiteng, Mawhati, Umsonlait and Sonidan. |
| 8 | Forest area | No protected forest area along the project area |
| 9 | Bridge | There are total 7 Nos. of minor Bridges along the project road |
| 10 | Road Configuration | Existing project road is single lane |
| 11 | Pavement condition | Existing bituminous layer has stripped off due to water accumulation, either partially or completely and underlying granular material is visible, thus Poor in condition.Some part of the road is intact and is |

| Sl. | Project Component | Details |
|---|---|---|
| | | motorable, thus Good in condition |
| 12 | High embank road stretches | Nil |

## 2.4 Right of Way (ROW):

The carriageway width of the existing road varies from 3meter to 4meter. Width of earthen shoulder varies from 0.5 to 1.5 meter. The Proposed Right of Way is within the existing Right of way.

## 2.5 Proposed Land Acquisition:

As the Proposed Right of Way is well within the existing Right of Way, so No New Land acquisition is required at this stage.

## 2.6 Proposed Cross Section Details

The project envisages upgrading the existing single lane carriageway (3.5-5m) to intermediate lane for augmenting the capacity of the project road and significantly extending its service life.

## 2.7 Footpath

Drain cum footpath facility has been provided in urban areas for the safety of pedestrians.

*Table 2: Details of Footpath*

| Sl. | From | To | Length (m) | Remark |
|---|---|---|---|---|
| 1 | 0+000 | 0+250 | 250 | TCS 1 |
| 2 | 29+000 | 29+900 | 900 | TCS 2 |
| Total Length (LHS+RHS) | | | 2300 m | |

## 2.8 Paver Block

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

*Table 3: Details of Paver Block*

| Sl. | From | To | Length | TCS Type |
|---|---|---|---|---|
| 1 | 0+000 | 0+250 | 250 | TCS 1 |
| Total length **(LHS+RHS)** | | | 500 m | |

## 2.9 Typical Cross Section:

The Typical cross section for the complete project stretch is shown in the table below:

*Table 4: TCS Schedule*

| Sl. | From | To | Length | TCS Type |
|---|---|---|---|---|
| 1 | 0+000 | 0+250 | 250 | TCS 1 |
| 2 | 0+250 | 0+370 | 120 | TCS 3 |
| 3 | 0+370 | 0+430 | 60 | TCS 6 |
| 4 | 0+430 | 0+600 | 170 | TCS 3 |
| 5 | 0+600 | 0+630 | 30 | TCS 4 |
| 6 | 0+630 | 0+690 | 60 | TCS 6 |
| 7 | 0+690 | 0+790 | 100 | TCS 3 |
| 8 | 0+790 | 0+950 | 160 | TCS 6 |

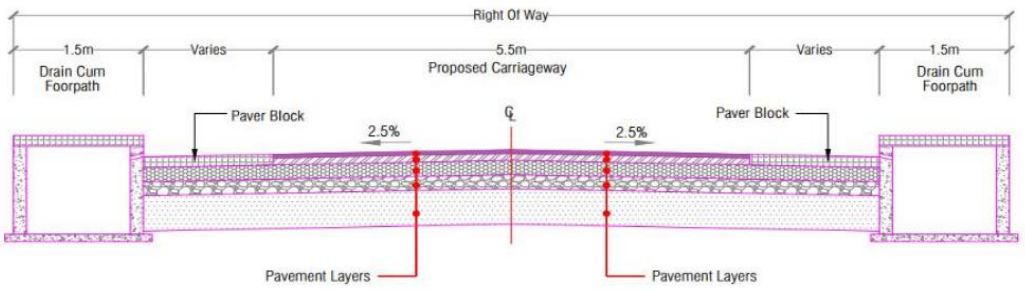
| Sl. | From | To | Length | TCS Type |
|---|---|---|---|---|
| 9 | 0+950 | 1+060 | 110 | TCS 3 |
| 10 | 1+060 | 1+100 | 40 | TCS 4 |
| 11 | 1+100 | 1+220 | 120 | TCS 3 |
| 12 | 1+220 | 1+290 | 70 | TCS 4 |
| 13 | 1+290 | 1+340 | 50 | TCS 6 |
| 14 | 1+340 | 1+620 | 280 | TCS 4 |
| 15 | 1+620 | 1+640 | 20 | TCS 4A |
| 16 | 1+640 | 1+750 | 110 | TCS 4 |
| 17 | 1+750 | 1+800 | 50 | TCS 4 |
| 18 | 1+800 | 1+830 | 30 | TCS 4A |
| 19 | 1+830 | 1+870 | 40 | TCS 3 |
| 20 | 1+870 | 1+920 | 50 | TCS 5 |
| 21 | 1+920 | 2+070 | 150 | TCS 3 |
| 22 | 2+070 | 2+180 | 110 | TCS 5 |
| 23 | 2+180 | 2+300 | 120 | TCS 6 |
| 24 | 2+300 | 2+370 | 70 | TCS 3 |
| 25 | 2+370 | 2+410 | 40 | TCS 5 |
| 26 | 2+410 | 2+970 | 560 | TCS 6 |
| 27 | 2+970 | 3+130 | 160 | TCS 4 |
| 28 | 3+130 | 3+230 | 100 | TCS 3 |
| 29 | 3+230 | 3+490 | 260 | TCS 4 |
| 30 | 3+490 | 3+530 | 40 | TCS 3 |
| 31 | 3+530 | 3+830 | 300 | TCS 4 |
| 32 | 3+830 | 3+880 | 50 | TCS 3 |
| 33 | 3+880 | 3+950 | 70 | TCS 4 |
| 34 | 3+950 | 4+200 | 250 | TCS 3 |
| 35 | 4+200 | 7+010 | 2810 | TCS 4 |
| 36 | 7+010 | 7+030 | 20 | TCS 4A |
| 37 | 7+030 | 8+010 | 980 | TCS 4 |
| 38 | 8+010 | 8+150 | 140 | TCS 3 |
| 39 | 8+150 | 8+370 | 220 | TCS 4 |
| 40 | 8+370 | 8+470 | 100 | TCS 3 |
| 41 | 8+470 | 8+710 | 240 | TCS 4 |
| 42 | 8+710 | 9+150 | 440 | TCS 3 |
| 43 | 9+150 | 9+220 | 70 | TCS 6 |
| 44 | 9+220 | 13+540 | 4320 | TCS 4 |
| 45 | 13+540 | 13+600 | 60 | TCS 3 |
| 46 | 13+600 | 14+380 | 780 | TCS 5 |
| 47 | 14+380 | 14+460 | 80 | TCS 6 |

| Sl. | From | To | Length | TCS Type |
|---|---|---|---|---|
| 48 | 14+460 | 15+580 | 1120 | TCS 5 |
| 49 | 15+580 | 15+800 | 220 | TCS 3 |
| 50 | 15+800 | 15+860 | 60 | TCS 5 |
| 51 | 15+860 | 15+900 | 40 | TCS 6 |
| 52 | 15+900 | 15+930 | 30 | TCS4B |
| 53 | 15+930 | 16+600 | 670 | TCS 4 |
| 54 | 16+600 | 16+730 | 130 | TCS 3 |
| 55 | 16+730 | 17+140 | 410 | TCS 4 |
| 56 | 17+140 | 17+190 | 50 | TCS 3 |
| 57 | 17+190 | 19+120 | 1930 | TCS 4 |
| 58 | 19+120 | 19+460 | 340 | TCS 6 |
| 59 | 19+460 | 20+840 | 1380 | TCS 4 |
| 60 | 20+840 | 21+000 | 160 | TCS 3 |
| 61 | 21+000 | 21+590 | 590 | TCS 5 |
| 62 | 21+590 | 21+660 | 70 | TCS 3 |
| 63 | 21+660 | 21+700 | 40 | TCS 6 |
| 64 | 21+700 | 21+860 | 160 | TCS 4 |
| 65 | 21+860 | 22+080 | 220 | TCS 3 |
| 66 | 22+080 | 22+170 | 90 | TCS 6 |
| 67 | 22+170 | 22+260 | 90 | TCS 3 |
| 68 | 22+260 | 22+470 | 210 | TCS 5 |
| 69 | 22+470 | 22+580 | 110 | TCS 6 |
| 70 | 22+580 | 23+260 | 680 | TCS 5 |
| 71 | 23+260 | 23+390 | 130 | TCS 3 |
| 72 | 23+390 | 23+550 | 160 | TCS 4 |
| 73 | 23+550 | 23+580 | 30 | TCS4B |
| 74 | 23+580 | 24+170 | 590 | TCS 4 |
| 75 | 24+170 | 24+260 | 90 | TCS 3 |
| 76 | 24+260 | 25+400 | 1140 | TCS 4 |
| 77 | 25+400 | 25+440 | 40 | TCS4B |
| 78 | 25+440 | 26+200 | 760 | TCS 4 |
| 79 | 26+200 | 26+220 | 20 | TCS 4A |
| 80 | 26+220 | 26+530 | 310 | TCS 4 |
| 81 | 26+530 | 26+580 | 50 | TCS 3 |
| 82 | 26+580 | 26+780 | 200 | TCS 5 |
| 83 | 26+780 | 26+930 | 150 | TCS 3 |
| 84 | 26+930 | 26+980 | 50 | TCS 6 |
| 85 | 26+980 | 27+070 | 90 | TCS 3 |
| 86 | 27+070 | 27+560 | 490 | TCS 5 |

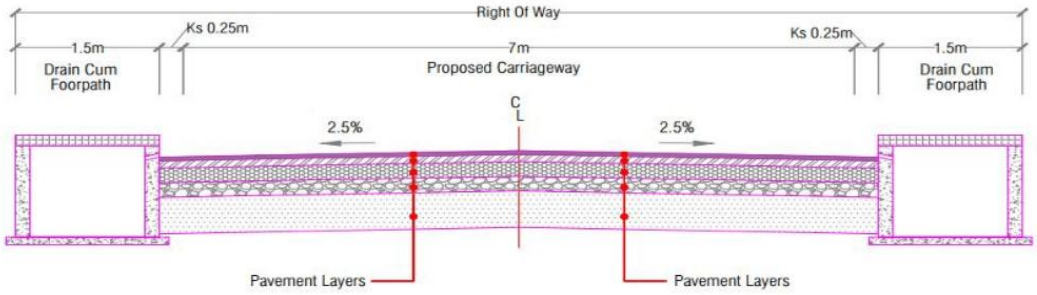
| Sl. | From | To | Length | TCS Type |
|---|---|---|---|---|
| 87 | 27+560 | 28+390 | 830 | TCS 5 |
| 88 | 28+390 | 28+440 | 50 | TCS 3 |
| 89 | 28+440 | 28+820 | 380 | TCS 3 |
| 90 | 28+820 | 29+000 | 180 | TCS 4 |
| 91 | 29+000 | 29+900 | 900 | TCS 2 |
| 92 | 29+900 | 30+440 | 540 | TCS 3 |
| 93 | 30+440 | 30+830 | 390 | TCS 5 |
| 94 | 30+830 | 30+860 | 30 | TCS 5A |
| 95 | 30+860 | 31+060 | 200 | TCS 5 |
| 96 | 31+060 | 31+080 | 20 | TCS 5A |
| 97 | 31+080 | 31+290 | 210 | TCS 5 |
| 98 | 31+290 | 31+310 | 20 | TCS 5A |
| 99 | 31+310 | 31+560 | 250 | TCS 5 |
| 100 | 31+560 | 32+460 | 900 | TCS 3 |
| 101 | 32+460 | 33+220 | 760 | TCS 5 |
| 102 | 33+220 | 33+270 | 50 | TCS 3 |
| 103 | 33+270 | 33+970 | 700 | TCS 5 |
| 104 | 33+970 | 34+670 | 700 | TCS 7 |
| 105 | 34+670 | 34+690 | 20 | TCS 7A |
| 106 | 34+690 | 34+720 | 30 | TCS 7 |
| 107 | 34+720 | 34+740 | 20 | TCS 7A |
| 108 | 34+740 | 34+870 | 130 | TCS 7 |
| 109 | 34+870 | 34+890 | 20 | TCS 7A |
| 110 | 34+890 | 34+940 | 50 | TCS 7 |
| 111 | 34+940 | 35+090 | 150 | TCS 5 |
| 112 | 35+090 | 35+220 | 130 | TCS 7 |
| 113 | 35+220 | 35+240 | 20 | TCS 7A |
| 114 | 35+240 | 35+560 | 320 | TCS 7 |
| 115 | 35+560 | 35+580 | 20 | TCS 7A |
| 116 | 35+580 | 35+900 | 320 | TCS 7 |
| 117 | 35+900 | 36+760 | 860 | TCS 5 |
| 118 | 36+760 | 36+800 | 40 | TCS 5B |
| 119 | 36+800 | 38+300 | 1500 | TCS 5 |
| 120 | 38+300 | 38+320 | 20 | TCS 5B |
| 121 | 38+320 | 38+340 | 20 | TCS 5 |
| 122 | 38+340 | 38+370 | 30 | TCS 5B |
| 123 | 38+370 | 38+860 | 490 | TCS 5 |
| 124 | 38+860 | 38+880 | 20 | TCS 5B |
| 125 | 38+880 | 38+920 | 40 | TCS 5 |

| Sl. | From | To | Length | TCS Type |
|---|---|---|---|---|
| 126 | 38+920 | 38+950 | 30 | TCS 5B |
| 127 | 38+950 | 39+270 | 320 | TCS 5 |
| 128 | 39+270 | 39+300 | 30 | TCS 5B |
| 129 | 39+300 | 39+910 | 610 | TCS 5 |
| 130 | 39+910 | 39+940 | 30 | TCS 5B |
| 131 | 39+940 | 40+130 | 190 | TCS 5 |
| Total Length | | | 40130 | |

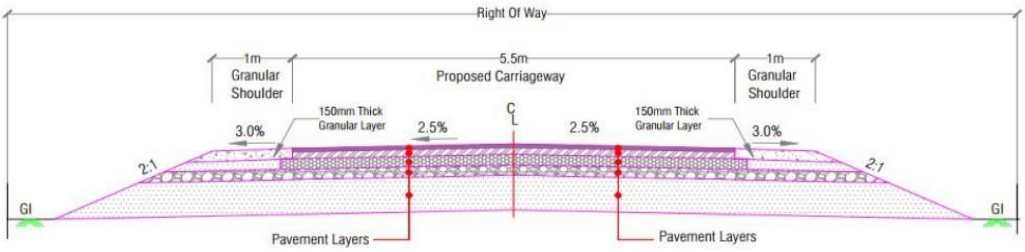
Typical cross sections (TCS) for various configurations proposed in built up area and open country area in rolling/hilly terrain are shown below:



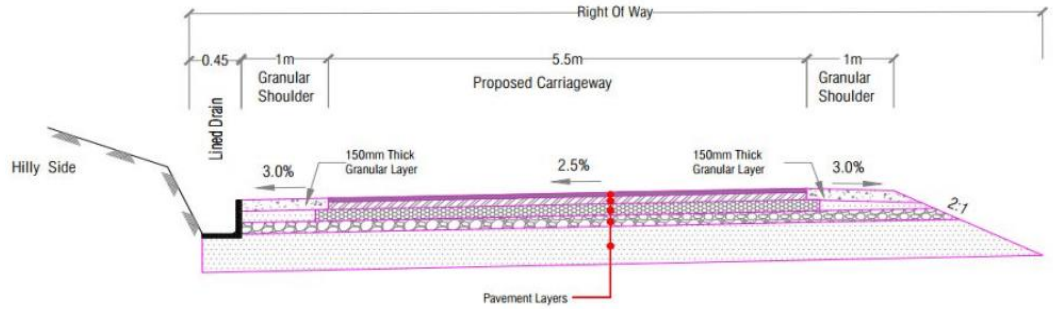

TCS : 1 - Typical Cross Section For Intermediate Lane Carriageway With Both Side Paver Block In Built-up Area



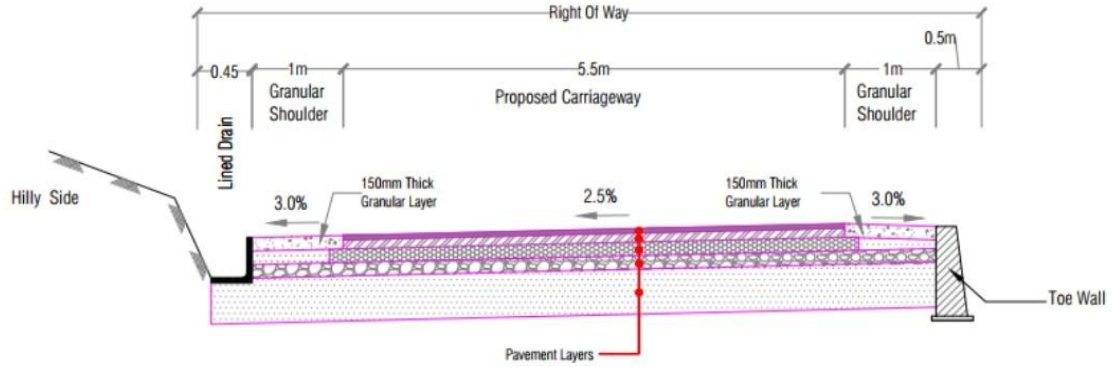

TCS : 2 - Typical Cross Section For Two Lane Carrigeway Without Paver Block In Built-up Area



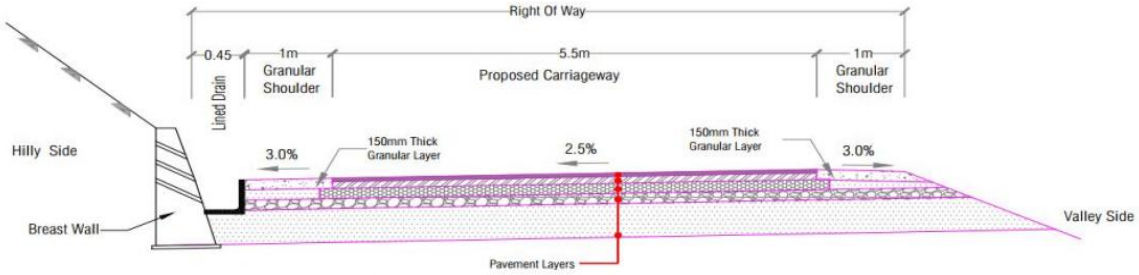

TCS : 3 - Typical Cross Section For Intermediate Lane Carriageway With Both Side Earthen Shoulder In Embankment Section



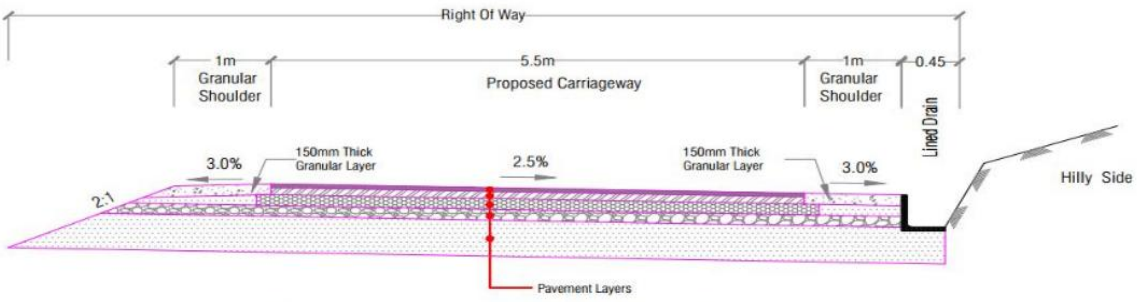

TCS : 4 - Typical Cross Section For Intermediate Lane Carriageway With Earthen Shoulder In Left Side Hill Cut Section




TCS : 4A - Typical Cross Section For Intermediate Lane Carriageway With Earthen Shoulder In Left Side Hill Cut Section

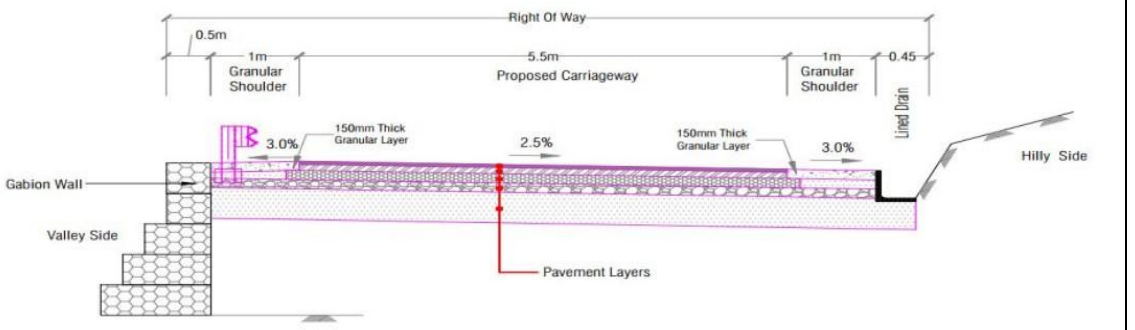



TCS : 4B- Typical Cross Section For Intermediate Lane Carriageway With Earthen Shoulder In Left Side Hill Cut Section

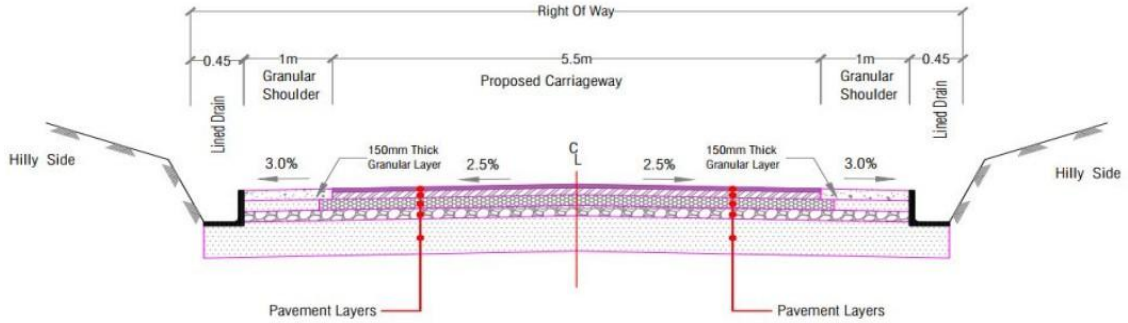



TCS : 5 - Typical Cross Section For Intermediate Lane Carriageway
With Earthen Shoulder In Right Side Hill Cut Section

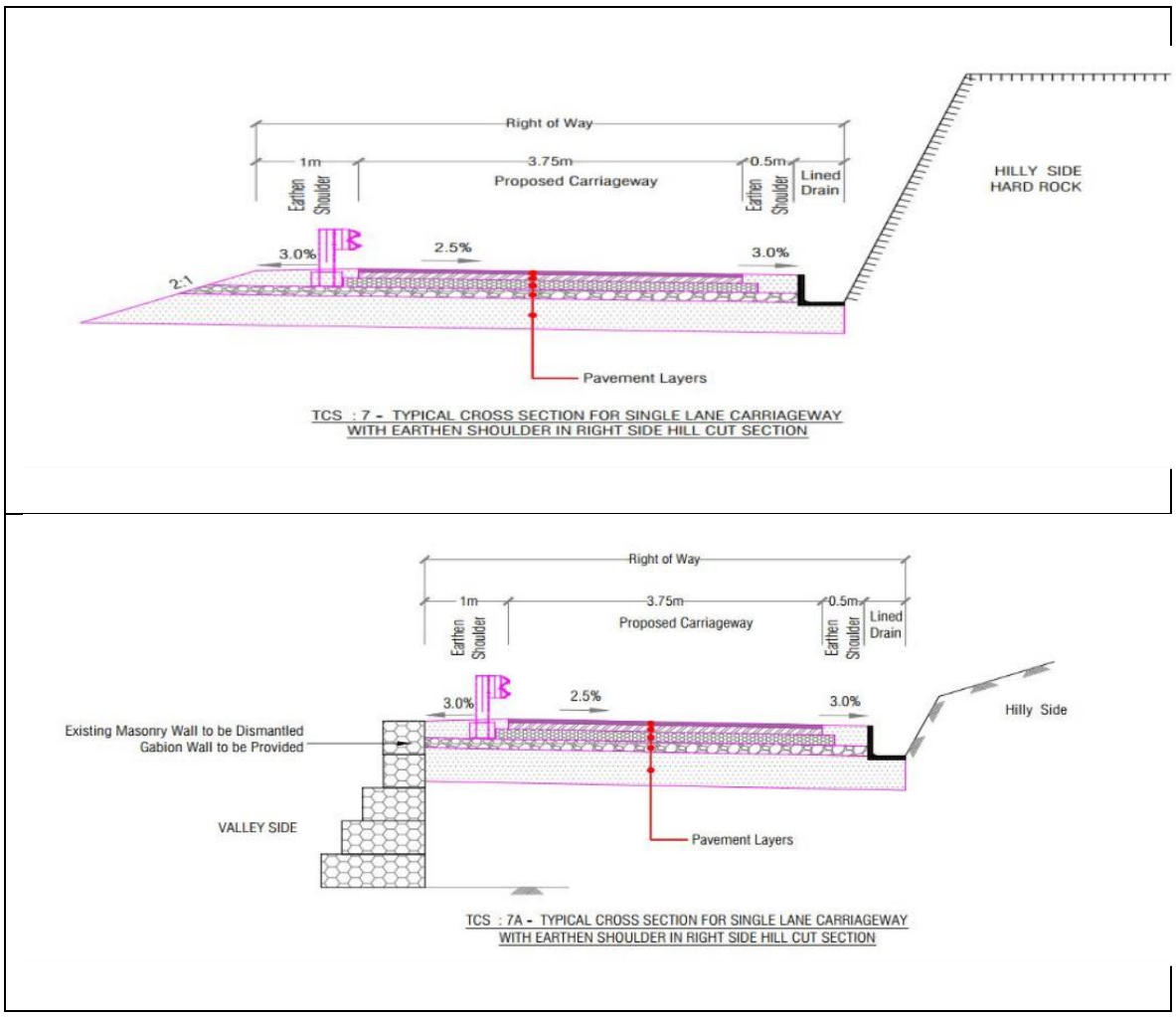

TCS : 5A - Typical Cross Section For Intermediate Lane Carriageway
With Earthen Shoulder In Right Side Hill Cut Section




TCS : 5B - Typical Cross Section For Intermediate Lane Carriageway
With Earthen Shoulder In Right Side Hill Cut Section




TCS 6 - Typical Cross Section For Intermediate Lane Carriageway
With Both Side Earthen Shoulder In Box Cut Section




## 2.10 Current and Projected Daily Traffic

Traffic Surveys were conducted from 14th to 17th, December 2021, at Sonidan and 13th to 20th December 2021, at NH-27.

**Average Daily Traffic**

The average value of Traffic Volume Count Data for 3 days & 7 days count has been calculated to determine the Average Daily Traffic (ADT). The Average Daily Traffic (ADT) in terms of Vehicles and PCU for both directions traffic is shown in given for Umsning - Jagi Road and NH-27 respectively:

*Table 5: ADT Umsning - Jagi Road (December 2021):*

| Categories | ADT (UP) | | ADT (DN) | | ADT (Both Direction) | |
|---|---|---|---|---|---|---|
| | Vehicles | PCU | Vehicles | PCU | Vehicles | PCU |
| 2 Wheeler | 30 | 15 | 41 | 21 | 71 | 36 |
| 3 Wheeler | 11 | 11 | 15 | 15 | 26 | 26 |
| Car | 94 | 94 | 150 | 150 | 244 | 244 |
| Mini LCV | 45 | 45 | 71 | 71 | 116 | 116 |
| Mini Bus | - | - | 1 | 2 | 1 | 2 |
| Standard Bus | 2 | 6 | 2 | 6 | 4 | 12 |
| LCV - 4 Tyre (Mini Truck) | 2 | 3 | 2 | 3 | 4 | 6 |

| Categories | ADT (UP) | | ADT (DN) | | ADT (Both Direction) | |
|---|---|---|---|---|---|---|
| | Vehicles | PCU | Vehicles | PCU | Vehicles | PCU |
| LCV - 6 Tyre | 1 | 2 | 2 | 3 | 3 | 5 |
| 2-Axle | 9 | 27 | 6 | 18 | 15 | 45 |
| 3-Axle | 2 | 6 | 2 | 6 | 4 | 12 |
| MAV (4 to 6) | - | - | - | - | - | - |
| OSV (7++ Axle) | - | - | - | - | - | - |
| HCM/EME | - | - | - | - | - | - |
| Tractors With Trailer | - | - | - | - | - | - |
| Tractors Without Trailer | - | - | - | - | - | - |
| Bi-Cycle | 13 | 7 | 18 | 9 | 31 | 16 |
| Cycle-Rickshaw | - | - | - | - | - | - |
| Animal-Drawn | - | - | - | - | - | - |
| Hand-Drawn | - | - | - | - | - | - |
| Exempted Vehicle | - | - | - | - | - | - |
| Total Slow Moving Vehicles | 13 | 7 | 18 | 9 | 31 | 16 |
| Total Fast Moving Vehicle | 196 | 209 | 292 | 295 | 488 | 504 |
| Total Commercial Traffic | 16 | 44 | 15 | 38 | 31 | 82 |
| Total Tollable Traffic | 155 | 183 | 236 | 259 | 391 | 442 |
| Total Traffic | 209 | 216 | 310 | 304 | 519 | 520 |

*Table 6:ADT Guwahati Nagaon section of NH-27 (December 2021)*

| Categories | ADT (UP) | | ADT (DN) | | ADT (Both Direction) | |
|---|---|---|---|---|---|---|
| | Vehicles | PCU | Vehicles | PCU | Vehicles | PCU |
| 2 Wheeler | 1611 | 806 | 1811 | 906 | 3422 | 1711 |
| 3 Wheeler | 326 | 326 | 311 | 311 | 637 | 637 |
| Car | 31 | 31 | 50 | 50 | 81 | 81 |
| Mini LCV | 3581 | 3581 | 3701 | 3701 | 7282 | 7282 |
| Mini Bus | 31 | 47 | 35 | 53 | 66 | 99 |
| Standard Bus | 340 | 1020 | 427 | 1281 | 767 | 2301 |
| LCV - 4 Tyre (Mini Truck) | 192 | 288 | 192 | 288 | 384 | 576 |
| LCV - 6 Tyre | 0 | 0 | 3 | 5 | 3 | 5 |
| 2-Axle | 105 | 315 | 142 | 426 | 247 | 741 |
| 3-Axle | 11 | 33 | 7 | 21 | 18 | 54 |
| MAV (4 to 6) | 624 | 2808 | 618 | 2781 | 1242 | 5589 |
| OSV (7++ Axle) | 136 | 612 | 116 | 522 | 252 | 1134 |
| HCM/EME | 230 | 1035 | 231 | 1040 | 461 | 2075 |
| Tractors With Trailer | 599 | 2696 | 526 | 2367 | 1125 | 5063 |
| Tractors Without Trailer | 335 | 503 | 399 | 599 | 734 | 1101 |
| Bi-Cycle | 551 | 276 | 623 | 312 | 1174 | 587 |
| Cycle-Rickshaw | 0 | 0 | 0 | 0 | 0 | 0 |
| Animal-Drawn | 4 | 24 | 4 | 24 | 8 | 48 |
| Hand-Drawn | 1 | 3 | 2 | 6 | 3 | 9 |
| Exempted Vehicle | 2 | 2 | 3 | 3 | 5 | 5 |
| Total Slow Moving Vehicles | 556 | 303 | 629 | 342 | 1,185 | 644 |
| Total Fast Moving Vehicle | 8154 | 14,103 | 8572 | 14,354 | 16,726 | 28,454 |
| Total Commercial Traffic | 1669 | 6,158 | 1771 | 6,417 | 3,440 | 12,574 |
| Total Tollable Traffic | 5281 | 9,770 | 5522 | 10,168 | 10,803 | 19,937 |
| Total Traffic | 8710 | 14,406 | 9201 | 14,696 | 17,911 | 29,098 |

## 2.11 Proposed Bridges and Culvert

There are 07 nos. of minor bridges on the project road all of which are in sound condition. These bridges are proposed to be retained with minor rehabilitation. List of existing bridges are given below:

*Table 7:List of Minor Bridges to be retained with Rehabilitation*

| Sl. | Design Chainage | Type of structure | Span Arrangement (m) | Proposal |
|---|---|---|---|---|
| 1 | 8+842 | Minor Bridge | 1x6.00 | Retained with Rehabilitation |
| 2 | 9+848 | Minor Bridge | 1x6.00 | Retained with Rehabilitation |
| 3 | 21+725 | Minor Bridge | 1x6.00 | Retained with Rehabilitation |
| 4 | 22+238 | Minor Bridge | 1x6.5 | Retained with Rehabilitation |
| 5 | 24+100 | Minor Bridge | 1x6.8 | Retained with Rehabilitation |
| 6 | 26+569 | Minor Bridge | 1x6.00 | Retained with Rehabilitation |
| 7 | 28+542 | Minor Bridge | 1x6.00 | Retained with Rehabilitation |

Out of the 239 nos. of existing culverts, 224 are Pipe Culvert & 15 are Slab culvert which are generally found structurally safe. Narrow Slab Culvert shall be widened to proposed TCS width with the same dimension & reinforcement as per the existing or as per the standard drawing by MoRTH which prevails. Narrow Pipe Culverts shall be widened to proposed TCS width with the same pipe diameter.

*Table 8:Summary of Improvement Proposals for Cross Drainage Works*

| Type of culverts | Pipe | Slab | Total |
|---|---|---|---|
| Existing | 224 | 15 | 239 |
| Widening with Rehabilitation of existing | 224 | 15 | 239 |

*Table 9:Widening/ Retained Existing Culverts*

| Sl. | Design Chainage | Existing Details | |
|---|---|---|---|
| | | Type | Span Arrangement |
| 1 | 0+069 | Pipe Culvert | 1x1 |
| 2 | 0+365 | Pipe Culvert | 1x1 |
| 3 | 0+453 | Pipe Culvert | 1x1 |
| 4 | 0+646 | Pipe Culvert | 1x1 |
| 5 | 0+752 | Pipe Culvert | 1x1 |
| 6 | 0+870 | Pipe Culvert | 1x1 |
| 7 | 1+057 | Pipe Culvert | 1x1 |
| 8 | 1+253 | Pipe Culvert | 1x1 |
| 9 | 1+343 | Pipe Culvert | 1x1 |
| 10 | 1+568 | Pipe Culvert | 1x1 |
| 11 | 1+680 | Pipe Culvert | 1x1 |
| 12 | 1+841 | Slab Culvert | 1x0.9 |
| 13 | 1+920 | Pipe Culvert | 1x1 |
| 14 | 2+043 | Pipe Culvert | 1x1 |
| 15 | 2+140 | Pipe Culvert | 1x1 |
| 16 | 2+427 | Pipe Culvert | 1x1 |
| 17 | 2+473 | Pipe Culvert | 1x1 |
| 18 | 2+533 | Pipe Culvert | 1x1 |
| 19 | 2+920 | Pipe Culvert | 1x1 |
| 20 | 3+070 | Pipe Culvert | 1x1 |
| 21 | 3+143 | Pipe Culvert | 1x1 |

| Sl. | Design Chainage | Existing Details | |
|---|---|---|---|
| | | Type | Span Arrangement |
| 22 | 3+219 | Pipe Culvert | 1x1 |
| 23 | 3+302 | Pipe Culvert | 1x1 |
| 24 | 3+468 | Pipe Culvert | 1x1 |
| 25 | 3+730 | Pipe Culvert | 1x1 |
| 26 | 4+152 | Pipe Culvert | 1x1 |
| 27 | 4+267 | Pipe Culvert | 1x1 |
| 28 | 4+404 | Pipe Culvert | 1x1 |
| 29 | 4+516 | Pipe Culvert | 1x1 |
| 30 | 4+756 | Pipe Culvert | 1x1 |
| 31 | 5+386 | Pipe Culvert | 1x1 |
| 32 | 5+474 | Pipe Culvert | 1x1 |
| 33 | 5+615 | Pipe Culvert | 1x1 |
| 34 | 5+750 | Pipe Culvert | 1x1 |
| 35 | 5+933 | Pipe Culvert | 1x1 |
| 36 | 6+003 | Pipe Culvert | 1x1 |
| 37 | 6+240 | Pipe Culvert | 1x1 |
| 38 | 6+545 | Pipe Culvert | 1x1 |
| 39 | 6+742 | Pipe Culvert | 1x1 |
| 40 | 6+854 | Pipe Culvert | 1x1 |
| 41 | 7+021 | Pipe Culvert | 1x1 |
| 42 | 7+130 | Pipe Culvert | 1x1 |
| 43 | 7+370 | Pipe Culvert | 1x1 |
| 44 | 7+908 | Pipe Culvert | 1x1 |
| 45 | 7+996 | Pipe Culvert | 1x1 |
| 46 | 8+201 | Pipe Culvert | 1x1 |
| 47 | 8+405 | Pipe Culvert | 1x1 |
| 48 | 8+590 | Pipe Culvert | 1x1 |
| 49 | 8+727 | Pipe Culvert | 1x1 |
| 50 | 8+862 | Pipe Culvert | 1x1 |
| 51 | 9+117 | Pipe Culvert | 1x1 |
| 52 | 9+398 | Pipe Culvert | 1x1 |
| 53 | 9+547 | Pipe Culvert | 1x1 |
| 54 | 9+728 | Pipe Culvert | 1x1 |
| 55 | 10+048 | Pipe Culvert | 1x1 |
| 56 | 10+377 | Pipe Culvert | 1x1 |
| 57 | 10+592 | Pipe Culvert | 1x1 |
| 58 | 10+802 | Pipe Culvert | 1x1 |
| 59 | 10+890 | Pipe Culvert | 1x1 |
| 60 | 11+009 | Pipe Culvert | 1x1 |
| 61 | 11+090 | Pipe Culvert | 1x1 |
| 62 | 11+380 | Pipe Culvert | 1x1 |
| 63 | 11+520 | Pipe Culvert | 1x1 |
| 64 | 11+663 | Pipe Culvert | 1x1 |
| 65 | 11+794 | Pipe Culvert | 1x1 |

| Sl. | Design Chainage | Existing Details | |
|---|---|---|---|
| | | Type | Span Arrangement |
| 66 | 12+028 | Pipe Culvert | 1x1 |
| 67 | 12+148 | Pipe Culvert | 1x1 |
| 68 | 12+277 | Pipe Culvert | 1x1 |
| 69 | 12+403 | Pipe Culvert | 1x1 |
| 70 | 12+700 | Pipe Culvert | 1x1 |
| 71 | 13+009 | Pipe Culvert | 1x1 |
| 72 | 13+190 | Pipe Culvert | 1x1 |
| 73 | 13+333 | Pipe Culvert | 1x1 |
| 74 | 13+719 | Pipe Culvert | 1x1 |
| 75 | 13+887 | Pipe Culvert | 1x1 |
| 76 | 13+900 | Pipe Culvert | 1x1 |
| 77 | 14+162 | Pipe Culvert | 1x1 |
| 78 | 14+290 | Pipe Culvert | 1x1 |
| 79 | 14+482 | Pipe Culvert | 1x1 |
| 80 | 14+652 | Pipe Culvert | 1x1 |
| 81 | 14+712 | Pipe Culvert | 1x1 |
| 82 | 14+911 | Pipe Culvert | 1x1 |
| 83 | 15+022 | Pipe Culvert | 1x1 |
| 84 | 15+320 | Pipe Culvert | 1x1 |
| 85 | 15+411 | Pipe Culvert | 1x1 |
| 86 | 15+522 | Pipe Culvert | 1x1 |
| 87 | 15+955 | Pipe Culvert | 1x1 |
| 88 | 16+025 | Pipe Culvert | 1x1 |
| 89 | 16+168 | Pipe Culvert | 1x1 |
| 90 | 16+552 | Pipe Culvert | 1x1 |
| 91 | 16+852 | Pipe Culvert | 1x1 |
| 92 | 17+010 | Pipe Culvert | 1x1 |
| 93 | 17+277 | Slab Culvert | 1x2 |
| 94 | 17+474 | Pipe Culvert | 1x1 |
| 95 | 17+655 | Pipe Culvert | 1x1 |
| 96 | 17+728 | Pipe Culvert | 1x1 |
| 97 | 17+874 | Pipe Culvert | 1x1 |
| 98 | 17+978 | Pipe Culvert | 1x1 |
| 99 | 18+047 | Pipe Culvert | 1x1 |
| 100 | 18+180 | Pipe Culvert | 1x1 |
| 101 | 18+734 | Pipe Culvert | 1x1 |
| 102 | 18+844 | Pipe Culvert | 1x1 |
| 103 | 19+088 | Pipe Culvert | 1x1 |
| 104 | 19+288 | Pipe Culvert | 1x1 |
| 105 | 19+351 | Pipe Culvert | 1x1 |
| 106 | 19+481 | Pipe Culvert | 1x1 |
| 107 | 19+542 | Pipe Culvert | 1x1 |
| 108 | 19+646 | Pipe Culvert | 1x1 |
| 109 | 19+749 | Pipe Culvert | 1x1 |

| Sl. | Design Chainage | Existing Details | |
|---|---|---|---|
| | | Type | Span Arrangement |
| 110 | 19+825 | Pipe Culvert | 1x1 |
| 111 | 19+910 | Pipe Culvert | 1x1 |
| 112 | 19+964 | Pipe Culvert | 1x1 |
| 113 | 20+150 | Pipe Culvert | 1x1 |
| 114 | 20+212 | Pipe Culvert | 1x1 |
| 115 | 20+268 | Pipe Culvert | 1x1 |
| 116 | 20+399 | Pipe Culvert | 1x1 |
| 117 | 21+168 | Pipe Culvert | 1x1 |
| 118 | 21+363 | Pipe Culvert | 1x1 |
| 119 | 21+627 | Slab Culvert | 1x4 |
| 120 | 21+806 | Pipe Culvert | 1x1 |
| 121 | 21+921 | Slab Culvert | 1x4.5 |
| 122 | 22+052 | Pipe Culvert | 1x1 |
| 123 | 22+372 | Pipe Culvert | 1x1 |
| 124 | 22+460 | Pipe Culvert | 1x1 |
| 125 | 22+942 | Slab Culvert | 1xNAcc |
| 126 | 23+058 | Pipe Culvert | 1x1 |
| 127 | 23+326 | Slab Culvert | 1x3.1 |
| 128 | 23+485 | Pipe Culvert | 1x1 |
| 129 | 23+649 | Pipe Culvert | 1x1 |
| 130 | 23+711 | Pipe Culvert | 1x1 |
| 131 | 23+873 | Pipe Culvert | 1x1 |
| 132 | 24+005 | Slab Culvert | 1x3.5 |
| 133 | 24+201 | Slab Culvert | 1x4.00 |
| 134 | 24+267 | Pipe Culvert | 1x1 |
| 135 | 24+390 | Pipe Culvert | 1x1 |
| 136 | 24+525 | Pipe Culvert | 1x1 |
| 137 | 24+583 | Pipe Culvert | 1x1 |
| 138 | 24+768 | Pipe Culvert | 1x1 |
| 139 | 24+926 | Pipe Culvert | 1x1 |
| 140 | 25+105 | Pipe Culvert | 1x1 |
| 141 | 25+163 | Pipe Culvert | 1x1 |
| 142 | 25+220 | Pipe Culvert | 1x1 |
| 143 | 25+477 | Pipe Culvert | 1x1 |
| 144 | 25+599 | Pipe Culvert | 1x1 |
| 145 | 25+661 | Pipe Culvert | 1x1 |
| 146 | 25+703 | Pipe Culvert | 1x1 |
| 147 | 25+853 | Pipe Culvert | 1x1 |
| 148 | 25+965 | Pipe Culvert | 1x1 |
| 149 | 26+134 | Pipe Culvert | 1x1 |
| 150 | 26+226 | Pipe Culvert | 1x1 |
| 151 | 26+633 | Pipe Culvert | 1x1 |
| 152 | 26+693 | Pipe Culvert | 1x1 |
| 153 | 27+022 | Slab Culvert | 1x0.7 |

| Sl. | Design Chainage | Existing Details | |
|---|---|---|---|
| | | Type | Span Arrangement |
| 154 | 27+130 | Pipe Culvert | 1x1 |
| 155 | 27+207 | Slab Culvert | 1x0.60 |
| 156 | 27+285 | Pipe Culvert | 1x1 |
| 157 | 27+410 | Pipe Culvert | 1x1 |
| 158 | 27+495 | Pipe Culvert | 1x1 |
| 159 | 27+634 | Pipe Culvert | 1x1 |
| 160 | 27+672 | Pipe Culvert | 1x1 |
| 161 | 27+725 | Pipe Culvert | 1x1 |
| 162 | 27+902 | Pipe Culvert | 1x1 |
| 163 | 27+986 | Pipe Culvert | 1x1 |
| 164 | 28+147 | Pipe Culvert | 1x1 |
| 165 | 28+211 | Pipe Culvert | 1x1 |
| 166 | 28+280 | Pipe Culvert | 1x1 |
| 167 | 28+354 | Pipe Culvert | 1x1 |
| 168 | 28+444 | Pipe Culvert | 1x1 |
| 169 | 28+848 | Pipe Culvert | 1x1 |
| 170 | 28+980 | Pipe Culvert | 1x1 |
| 171 | 29+189 | Pipe Culvert | 1x1 |
| 172 | 29+990 | Pipe Culvert | 1x1 |
| 173 | 30+252 | Pipe Culvert | 1x1 |
| 174 | 30+431 | Slab Culvert | 1x5 |
| 175 | 30+602 | Pipe Culvert | 1x1 |
| 176 | 30+644 | Pipe Culvert | 1x1 |
| 177 | 30+759 | Pipe Culvert | 1x1 |
| 178 | 30+820 | Pipe Culvert | 1x1 |
| 179 | 30+903 | Pipe Culvert | 1x1 |
| 180 | 30+955 | Pipe Culvert | 1x1 |
| 181 | 31+040 | Pipe Culvert | 1x1 |
| 182 | 31+128 | Pipe Culvert | 1x1 |
| 183 | 31+235 | Pipe Culvert | 1x1 |
| 184 | 31+339 | Pipe Culvert | 1x1 |
| 185 | 31+422 | Pipe Culvert | 1x1 |
| 186 | 31+482 | Pipe Culvert | 1x1 |
| 187 | 31+568 | Pipe Culvert | 1x1 |
| 188 | 31+639 | Slab Culvert | 1x0.9 |
| 189 | 31+757 | Pipe Culvert | 1x1 |
| 190 | 31+911 | Pipe Culvert | 1x1 |
| 191 | 32+620 | Pipe Culvert | 1x1 |
| 192 | 32+715 | Pipe Culvert | 1x1 |
| 193 | 33+030 | Pipe Culvert | 1x1 |
| 194 | 33+156 | Pipe Culvert | 1x1 |
| 195 | 33+486 | Pipe Culvert | 1x1 |
| 196 | 33+617 | Pipe Culvert | 1x1 |
| 197 | 33+850 | Pipe Culvert | 1x1 |

| Sl. | Design Chainage | Existing Details | |
|---|---|---|---|
| | | Type | Span Arrangement |
| 198 | 33+932 | Pipe Culvert | 1x1 |
| 199 | 34+074 | Pipe Culvert | 1x1 |
| 200 | 34+132 | Pipe Culvert | 1x1 |
| 201 | 34+212 | Pipe Culvert | 1x1 |
| 202 | 34+370 | Slab Culvert | 1x1.8 |
| 203 | 34+846 | Pipe Culvert | 1x1 |
| 204 | 35+058 | Pipe Culvert | 1x1 |
| 205 | 35+208 | Pipe Culvert | 1x1 |
| 206 | 35+259 | Pipe Culvert | 1x1 |
| 207 | 35+338 | Pipe Culvert | 1x1 |
| 208 | 35+753 | Pipe Culvert | 1x1 |
| 209 | 35+895 | Pipe Culvert | 1x1 |
| 210 | 35+998 | Pipe Culvert | 1x1 |
| 211 | 36+225 | Pipe Culvert | 1x1 |
| 212 | 36+358 | Pipe Culvert | 1x1 |
| 213 | 36+475 | Pipe Culvert | 1x1 |
| 214 | 36+558 | Pipe Culvert | 1x1 |
| 215 | 36+839 | Pipe Culvert | 1x1 |
| 216 | 36+965 | Pipe Culvert | 1x1 |
| 217 | 37+025 | Pipe Culvert | 1x1 |
| 218 | 37+152 | Slab Culvert | 1x4.00 |
| 219 | 37+270 | Pipe Culvert | 1x1 |
| 220 | 37+680 | Pipe Culvert | 1x1 |
| 221 | 37+790 | Pipe Culvert | 1x1 |
| 222 | 38+012 | Pipe Culvert | 1x1 |
| 223 | 38+232 | Pipe Culvert | 1x1 |
| 224 | 38+292 | Slab Culvert | 1x3.00 |
| 225 | 38+495 | Pipe Culvert | 1x1 |
| 226 | 38+528 | Pipe Culvert | 1x1 |
| 227 | 38+652 | Pipe Culvert | 1x1 |
| 228 | 38+698 | Pipe Culvert | 1x1 |
| 229 | 38+815 | Pipe Culvert | 1x1 |
| 230 | 38+886 | Pipe Culvert | 1x1 |
| 231 | 39+010 | Pipe Culvert | 1x1 |
| 232 | 39+177 | Pipe Culvert | 1x1 |
| 233 | 39+299 | Pipe Culvert | 1x1 |
| 234 | 39+553 | Pipe Culvert | 1x1 |
| 235 | 39+730 | Pipe Culvert | 1x1 |
| 236 | 39+859 | Pipe Culvert | 1x1 |
| 237 | 39+972 | Pipe Culvert | 1x1 |
| 238 | 40+018 | Pipe Culvert | 1x1 |
| 239 | 40+100 | Pipe Culvert | 1x1 |

## 2.12 Proposed Roadside Drainage

To ensure effective drainage of water from road side drainage system has been provided throughout the project stretch. The details of the roadside drainage is shown in typical cross section and drawing volume. Trapezoidal drains made of geo cell with PCC have been proposed at the hill. The details of roadside drainage is shown in the table below:

*Table 10:Summary of Proposed Covered Drain*

| Cover Drain Both Side | | | |
|---|---|---|---|
| **Sl.** | **From** | **To** | **Length** |
| 1 | 0+000 | 0+250 | 250 |
| 2 | 29+000 | 29+900 | 900 |
| Covered Drain (LHS+RHS) | | | 2300 |

*Table 11:Summary of Proposed Hill side Drain- LHS*

| Sl. | From | To | Length |
|---|---|---|---|
| 1 | 0+370 | 0+430 | 60 |
| 2 | 0+600 | 0+630 | 30 |
| 3 | 0+630 | 0+690 | 60 |
| 4 | 0+790 | 0+950 | 160 |
| 5 | 1+060 | 1+100 | 40 |
| 6 | 1+220 | 1+290 | 70 |
| 7 | 1+290 | 1+340 | 50 |
| 8 | 1+340 | 1+620 | 280 |
| 9 | 1+620 | 1+640 | 20 |
| 10 | 1+640 | 1+750 | 110 |
| 11 | 1+750 | 1+800 | 50 |
| 12 | 1+800 | 1+830 | 30 |
| 13 | 2+180 | 2+300 | 120 |
| 14 | 2+410 | 2+970 | 560 |
| 15 | 2+970 | 3+130 | 160 |
| 16 | 3+230 | 3+490 | 260 |
| 17 | 3+530 | 3+830 | 300 |
| 18 | 3+880 | 3+950 | 70 |
| 19 | 4+200 | 7+010 | 2810 |
| 20 | 7+010 | 7+030 | 20 |
| 21 | 7+030 | 8+010 | 980 |
| 22 | 8+150 | 8+370 | 220 |
| 23 | 8+470 | 8+710 | 240 |
| 24 | 9+150 | 9+220 | 70 |
| 25 | 9+220 | 13+540 | 4320 |
| 26 | 14+380 | 14+460 | 80 |
| 27 | 15+860 | 15+900 | 40 |
| 28 | 15+900 | 15+930 | 30 |
| 29 | 15+930 | 16+600 | 670 |
| 30 | 16+730 | 17+140 | 410 |
| 31 | 17+190 | 19+120 | 1930 |

| Sl. | From | To | Length |
|---|---|---|---|
| 32 | 19+120 | 19+460 | 340 |
| 33 | 19+460 | 20+840 | 1380 |
| 34 | 21+660 | 21+700 | 40 |
| 35 | 21+700 | 21+860 | 160 |
| 36 | 22+080 | 22+170 | 90 |
| 37 | 22+470 | 22+580 | 110 |
| 38 | 23+390 | 23+550 | 160 |
| 39 | 23+550 | 23+580 | 30 |
| 40 | 23+580 | 24+170 | 590 |
| 41 | 24+260 | 25+400 | 1140 |
| 42 | 25+400 | 25+440 | 40 |
| 43 | 25+440 | 26+200 | 760 |
| 44 | 26+200 | 26+220 | 20 |
| 45 | 26+220 | 26+530 | 310 |
| 46 | 26+930 | 26+980 | 50 |
| 47 | 28+820 | 29+000 | 180 |
| Total Length | | | 19650 |

*Table 12:Summary of Proposed Hill side Drain- RHS*

| Sl. | From | To | Length(m) | | S. No. | From | To | Length (m) |
|---|---|---|---|---|---|---|---|---|
| 1 | 0+370 | 0+430 | 60 | | 33 | 31+310 | 31+560 | 250 |
| 2 | 0+630 | 0+690 | 60 | | 34 | 32+460 | 33+220 | 760 |
| 3 | 0+790 | 0+950 | 160 | | 35 | 33+270 | 33+970 | 700 |
| 4 | 1+290 | 1+340 | 50 | | 36 | 33+970 | 34+670 | 700 |
| 5 | 1+870 | 1+920 | 50 | | 37 | 34+670 | 34+690 | 20 |
| 6 | 2+070 | 2+180 | 110 | | 38 | 34+690 | 34+720 | 30 |
| 7 | 2+180 | 2+300 | 120 | | 39 | 34+720 | 34+740 | 20 |
| 8 | 2+370 | 2+410 | 40 | | 40 | 34+740 | 34+870 | 130 |
| 9 | 2+410 | 2+970 | 560 | | 41 | 34+870 | 34+890 | 20 |
| 10 | 9+150 | 9+220 | 70 | | 42 | 34+890 | 34+940 | 50 |
| 11 | 13+600 | 14+380 | 780 | | 43 | 34+940 | 35+090 | 150 |
| 12 | 14+380 | 14+460 | 80 | | 44 | 35+090 | 35+220 | 130 |
| 13 | 14+460 | 15+580 | 1120 | | 45 | 35+220 | 35+240 | 20 |
| 14 | 15+800 | 15+860 | 60 | | 46 | 35+240 | 35+560 | 320 |
| 15 | 15+860 | 15+900 | 40 | | 47 | 35+560 | 35+580 | 20 |
| 16 | 19+120 | 19+460 | 340 | | 48 | 35+580 | 35+900 | 320 |
| 17 | 21+000 | 21+590 | 590 | | 49 | 35+900 | 36+760 | 860 |
| 18 | 21+660 | 21+700 | 40 | | 50 | 36+760 | 36+800 | 40 |
| 19 | 22+080 | 22+170 | 90 | | 51 | 36+800 | 38+300 | 1500 |
| 20 | 22+260 | 22+470 | 210 | | 52 | 38+300 | 38+320 | 20 |
| 21 | 22+470 | 22+580 | 110 | | 53 | 38+320 | 38+340 | 20 |
| 22 | 22+580 | 23+260 | 680 | | 54 | 38+340 | 38+370 | 30 |
| 23 | 26+580 | 26+780 | 200 | | 55 | 38+370 | 38+860 | 490 |

| Sl. | From | To | Length(m) | | S. No. | From | To | Length (m) |
|---|---|---|---|---|---|---|---|---|
| 24 | 26+930 | 26+980 | 50 | | 56 | 38+860 | 38+880 | 20 |
| 25 | 27+070 | 27+560 | 490 | | 57 | 38+880 | 38+920 | 40 |
| 26 | 27+560 | 28+390 | 830 | | 58 | 38+920 | 38+950 | 30 |
| 27 | 30+440 | 30+830 | 390 | | 59 | 38+950 | 39+270 | 320 |
| 28 | 30+830 | 30+860 | 30 | | 60 | 39+270 | 39+300 | 30 |
| 29 | 30+860 | 31+060 | 200 | | 61 | 39+300 | 39+910 | 610 |
| 30 | 31+060 | 31+080 | 20 | | 62 | 39+910 | 39+940 | 30 |
| 31 | 31+080 | 31+290 | 210 | | 63 | 39+940 | 40+130 | 190 |
| 32 | 31+290 | 31+310 | 20 | | | | | |
| TOTAL LENGTH= 15730 m | | | | | | | | |

## 2.13 Proposed Pedestrian and Animal Crossing

On the basis of interfering 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.

## 2.14 Wayside Amenities

**Bus Shelters**

Following Bus-shelters have also been proposed at the locations given in the following tables:

*Table 13:Details of Proposed Bus Shelters*

| Sl. | Chainage | Side |
|---|---|---|
| 1 | 0+070 | LHS |
| 2 | 0+070 | RHS |
| 3 | 3+290 | LHS |
| 4 | 3+350 | RHS |
| 5 | 4+180 | LHS |
| 6 | 4+910 | RHS |
| 7 | 8+985 | LHS |
| 8 | 9+100 | RHS |
| 9 | 13+550 | RHS |
| 10 | 13+620 | LHS |
| 11 | 14+960 | LHS |
| 12 | 15+080 | RHS |
| 13 | 15+650 | LHS |
| 14 | 15+720 | RHS |
| 15 | 16+370 | RHS |
| 16 | 16+500 | LHS |
| 17 | 21+025 | LHS |
| 18 | 21+425 | RHS |
| 19 | 22+160 | LHS |
| 20 | 23+330 | LHS |
| 21 | 27+690 | LHS |
| 22 | 28+110 | LHS |
| 23 | 29+275 | RHS |

| Sl. | Chainage | Side |
|---|---|---|
| 24 | 29+900 | LHS |
| 25 | 32+270 | RHS |
| 26 | 39+400 | LHS |
| 27 | 39+600 | RHS |

**Truck Lay Bye**

No Truck Lay Byes is proposed in the project road.

**Pavement Condition:**

The pavement is flexible type having earthen shoulders all along the project road. Major part of the existing pavement is severely distressed with potholes and extensive cracking has been observed along the wheel path.Kilometre-wise summary of the pavement condition is presented in the table below.

*Table 14:Summary of Pavement Condition*

| From km | To km | Length in km | Pavement Condition Good/Fair/Poor | From km | To km | Length in km | Pavement Condition Good/Fair/Poor |
|---|---|---|---|---|---|---|---|
| 0.000 | 3.000 | 3.000 | Fair | 22.600 | 22.800 | 0.200 | Poor |
| 3.000 | 4.600 | 1.600 | Poor | 22.800 | 23.200 | 0.400 | Good |
| 4.600 | 4.800 | 0.200 | Fair | 23.200 | 23.300 | 0.100 | Poor |
| 4.800 | 7.600 | 2.800 | Poor | 23.300 | 23.800 | 0.500 | Fair |
| 7.600 | 8.400 | 0.800 | Fair | 23.800 | 24.200 | 0.400 | Poor |
| 8.400 | 10.400 | 2.000 | Poor | 24.200 | 24.400 | 0.200 | Good |
| 10.400 | 10.800 | 0.400 | Good | 24.400 | 24.800 | 0.400 | Fair |
| 10.800 | 10.900 | 0.100 | Poor | 24.800 | 25.600 | 0.800 | Poor |
| 10.900 | 11.600 | 0.700 | Fair | 25.600 | 26.200 | 0.600 | Fair |
| 11.600 | 12.000 | 0.400 | Good | 26.200 | 27.200 | 1.000 | Poor |
| 12.000 | 15.800 | 3.800 | Poor | 27.200 | 27.600 | 0.400 | Fair |
| 15.800 | 16.000 | 0.200 | Fair | 27.600 | 30.400 | 2.800 | Poor |
| 16.000 | 16.800 | 0.800 | Poor | 30.400 | 30.600 | 0.200 | Fair |
| 16.800 | 17.900 | 1.100 | Good | 30.600 | 30.800 | 0.200 | Good |
| 17.900 | 18.200 | 0.300 | Fair | 30.800 | 36.200 | 5.400 | Poor |
| 18.200 | 18.800 | 0.600 | Poor | 36.200 | 36.600 | 0.400 | Good |
| 18.800 | 20.400 | 1.600 | Fair | 36.600 | 36.800 | 0.200 | Poor |
| 20.400 | 21.300 | 0.900 | Poor | 36.800 | 37.000 | 0.200 | Fair |
| 21.300 | 21.800 | 0.500 | Fair | 37.000 | 37.200 | 0.200 | Poor |
| 21.800 | 22.000 | 0.200 | Poor | 37.200 | 37.400 | 0.200 | Fair |
| 22.000 | 22.500 | 0.500 | Fair | 37.400 | 40.000 | 2.600 | Poor |
| 22.500 | 22.600 | 0.100 | Good | | | | |


Edge break


Potholes


Ravelling


Cracking

Figure 4: Photographs of Existing Pavement

## 2.15 Construction Material Requirement

Stone quarries and crusher locations are not near to each other. Information on both is provided separately.

***Table 15: Details of stone quarry:***

| Description | Location | Lead | Coordinates | |
|---|---|---|---|---|
| | | | N | E |
| Stone Quarry | | 6 km from km 0.000 LHS | 030698 | 2851253 |
| | Umbir stone quarry | 20 km from km 0.000 RHS | 0393812 | 2843299 |

## 2.16 Rates of Aggregate

Aggregate rates at the stone crushers are given below:

***Table 16: Details of Aggregates***

| Description | Location | Lead | Coordinates | |
|---|---|---|---|---|
| | | | N | E |
| Rates of aggregate | Mawarling | 40 km from km 0.000 RHS | 0389812 | 2825984 |
| | Umkhen | 40.000 km from km 0.000 RHS at Laitkor | 0388141 | 2823987 |
| | S. Wamkhar Crusher | 52.000 km from km 0.000 RHS at Laitkor | 0390713 | 2817907 |

## 2.17 Sand

*Table 17:Details of Sand Quarry*

| Description | Location | Lead | Coordinates | |
|---|---|---|---|---|
| | | | N | E |
| Sand | Kynsi river | 80.000 km from km 0.000 RHS at Kynsi, Khiri | 0352967 | 2823485 |
| | Untro river | 18.700 Km from 0.000 | | |

Umbir quarry at 20 km lead from km 0.000

Ritu crusher at 40 km lead from km 0.000 RHS


Sand quarry at 18.7 km lead from km 0.000

*Figure 5: Photographs of Quarry area and Aggregate*

## 2.18 Estimated Project Cost

Based on the detailed quantities worked as explained, the Abstract of Cost of the Project for all the options is worked out and summarized in table below:

*Table 18:Abstract of Cost Estimate*

| Sl. | Items | Unit | Quantity | Rate (cr) | Amount (cr) | Annexure | Remarks |
|---|---|---|---|---|---|---|---|
| A | ROAD WORKS | | Length | | | | |
| 1 | TCS 1 | Km | 0.25 | 1.47 | 0.37 | Annexure-I | Intermediate lane Carriageway (paver block) |
| 2 | TCS 2 | Km | 0.90 | 1.45 | 1.30 | Annexure-I | 2 lane Carriageway (without paver block) |
| 3 | TCS 3 | Km | 5.42 | 1.46 | 7.93 | Annexure-I | Intermediate lane Carriageway |
| 4 | TCS 4 | Km | 17.67 | 1.42 | 25.01 | Annexure-I | Intermediate lane Carriageway |
| 5 | TCS 4A | Km | 0.03 | 1.27 | 0.04 | Annexure-I | Intermediate lane Carriageway |
| 6 | TCS 4B | Km | 0.10 | 1.62 | 0.16 | Annexure-I | Intermediate lane Carriageway |
| 7 | TCS 5 | Km | 11.92 | 1.73 | 20.59 | Annexure-I | Intermediate lane Carriageway |
| 8 | TCS 5B | Km | 0.19 | 1.98 | 0.38 | Annexure-I | Intermediate lane Carriageway |
| 9 | TCS 6 | Km | 1.82 | 1.41 | 2.57 | Annexure-I | Intermediate lane Carriageway |
| 10 | TCS 7 | Km | 1.78 | 1.95 | 3.46 | Annexure-I | Single lane Carriageway |
| 11 | Minor Bridge | Km | 0.04 | | | | |
| | | | | | | | |
| Total Length | | Km | 40.13 | | | | |
| Sub Total (A) | | | | | 61.81 | | |
| B | BRIDGES AND STRUCTURES | | | | | | |
| 1 | MAJOR BRIDGES | Km | | | | | |
| | New Construction | Km | | | | | |
| 2 | MINOR BRIDGES (7 nos.) | | | | | | |
| a | New Construction | m | | | | | |

| Sl. | Items | Unit | Quantity | Rate (cr) | Amount (cr) | Annexure | Remarks |
|---|---|---|---|---|---|---|---|
| b | Re construction | m | | | | | |
| c | Repair & Rehabilitation | Km | 0.04 | 10.48 | 0.37 | | |
| | Total Length | | 40.13 | | | | |
| Sub Total(B) | | | | | 0.37 | | |
| | | | | | | | |
| C | CULVERTS (Pipe/Slab/Box) | | | | | | |
| 1 | Box/Slab/Arch | | | | | | |
| c) | Widening | No. | 13.00 | 0.10 | 1.26 | | |
| 2 | Pipe | | | | | | |
| c) | Widening | No. | 219.00 | 0.06 | 12.48 | | |
| Sub Total(C) | | | | | 13.75 | | |
| | | | | | | | |
| D | OTHER ROAD APPURTENENCE/MISCELLENEOUS ITEMS | | | | | | |
| 1 | BUS Shelter | No. | 20.00 | 0.04 | 0.80 | Annexure-II | |
| 2 | JUNCTIONS | | | | | | |
| a | MAJOR | No. | 1.00 | 0.20 | 0.20 | Annexure-III | |
| b | MINOR | No. | 42.00 | 0.08 | 3.46 | Annexure-IV | |
| 3 | Retaining wall, Breast Wall, Gabion wall | Rm. | 216.00 | 0.04 | 8.32 | Bill No. B | |
| 4 | TRAFFIC MANAGEMENT DURING CONSTRUCTION | Km. | 40.13 | 0.02 | 0.99 | Annexure-VIII | |
| 5 | OTHER MISCELLENEOUS ITEMS (Traffic signages, Fencing, Drains, safety appurantace, Road side Tree Transplantation, Maintenance during construction,convex mirror,Lighting , etc.,) | | | | 9.09 | Annexure-V, VI, and VII | |
| Sub Total(D) | | | | | 22.85 | | |
| E | Shifting of utilities | | | | 1.51 | | |
| F | TOTAL CONSTRUCTION COST (A+B+C+D+E) Without GST | | | | 100.28 | Cr. | |
| | | | | | | | |
| G | GST(12%) | | | | 12.03 | Cr. | |
| | | | | | | | |
| | Per km Civil cost | | | | 2.50 | 2.39 | |
| | TOTAL CONSTRUCTION COST (F+G) With GST including Utility | | | | 112.311 | | |
| | Contingencies @ 1 % of (F) above | | | | 1.00 | | |

| Sl. | Items | Unit | Quantity | Rate (cr) | Amount (cr) | Annexure | Remarks |
|---|---|---|---|---|---|---|---|
| | Agency charges @ 3% of (F) | | | | 3.01 | | As per circular 07.03.2019 for EPC projects. |
| | Supervision Charges @ 3% of (F) | | | | 3.01 | | As per circular 07.03.2019 for EPC projects. |
| | Maintenance Charges (2.5% of B) (First year - Nil, 2nd year -0.5%, 3 rd year -0.5%, 4th year -0.5 % & 5th year 1 %.) | | | | 2.51 | | |
| | Price Escalation @ 5% per annum for 3.5 years | | | | 17.55 | | |
| H | TOTAL PROJECT COST | | | | 139.39 | | |
| | Land Acquisition and Rehabilitation & Resettlement | | | | | | |
| | Forest, Environmental Impact and Mitigation, | | | | | | |
| I | Grand Total | | | | 139.39 | | |
| Total Cost per Km (Crore) | | | | | 3.47 | Cr. | |

## 2.19 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.

## 2.20 Sub-project Benefits

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

Improved road riding quality will lead to a reduction in Vehicle Operating Costs (VOC), including savings in fuel consumption and reduced wear and tear of tires. Additionally, there will be savings in travel time costs due to decreased congestion and increased travel speeds resulting from enhanced road capacity and riding quality. The overall effect will be a decrease in maintenance costs associated with better road conditions. 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 implementing agencies.

***Table 19: 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 &<br>Controlling emission of air pollutants as per the Prescribed standards. | This act is applicable for construction phase to control stack/fugitive emissions and to 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.<br>For establishment and operation of Hot Mix/ Stone crusher/ Batching Plants during construction, etc.<br>Batch Type Hot Mix –<br>PM (mg/ Nm3) – 150<br>SO2 (mg/ Nm3) – 250<br>NOX (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 | Contractor to:<br>a) obtained COE (consent to establish);<br>b) maintain pollution level below prescribed limit;<br>This will be taken by the contractor during construction period. |

| | | | | |
|---|---|---|---|---|
| | | | Board (SPCB) | |
| 2 | The Water (Prevention and Control of Pollution) Act, 1974 | To control water pollution by controlling discharge of liquid pollutants as per the prescribed standards. | Yes, For establishment and operation of Hot Mix/ Stone crusher/ WMM/ Batching Plants during construction, etc. (Construction Stage). This act is applicable for construction phase of the road to manage to liquid effluent discharges from worker camp concrete batch mix plant, etc. Consent to Establish (CTE) and Consent to Operate (CTO) for plants and workers camps, etc. Agency in Charge – State Pollution Control Board (SPCB) | Contractor to: a) obtained COE (consent to establish); b) maintain pollution level below prescribed limit; This will be taken by the contractor during construction period. |
| 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. These rules will be applicable to the contractors during construction phase, all vehicles used for construction will need to comply with the provisions of this act. 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 conversion of forested areas into non forested areas. | The project area does not pass through any forest area. 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 may be sought under the provisions of the | PIU |

| | | | | |
|---|---|---|---|---|
| | | | Meghalaya Tree (Prevention) Act, 1976 wherever applicable, and in areas outside purview of the said act, the permission shall be obtained as per Rule 6 of the Meghalaya Tree Felling (Non-Forest areas) Rules, 2006. The application along with the required documents shall be submitted to Divisional Forest Officer (Territorial Division) or Chief Forest Officer of the respective Autonomous District Council.<br>Agency in Charge - Forest Department GOI and Government of Meghalaya & MOEF & CC | |
| 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 is vital for sustenance of all life forms, human, animal and plant. | Applicable<br>Agency in Charge - Forest Department GOI and Government of Meghalaya | PIU |
| 6 | Wild Life (Protection) Act, 1972 and amendments thereof | Protection of Wildlife Sanctuaries and National Parks | No.<br>The proposed alignment is neither passing through nor falling within 10 km radius of any areas protected under Wildlife (Protection) Act, 1972.<br>Agency in Charge – National Board for Wildlife, State Board for Wildlife and MOEF & CC | - |

| | | | | |
|---|---|---|---|---|
| 7 | Environment Protection Act, 1986 | To protect and improve the overall environment | Yes.<br>It is umbrella legislation. Various notifications, rules and schedules are promulgated under this act.<br>Ensure applicable standards for ambient air quality. Ensure emission limit standards for new DG Sets,<br>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 designates areas within 100 meters<br>(m) of the “protected monument/area” as “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. Applicable for any “chance find” would be Notified / surrendered to the competent authority. Agency in Charge – Archaeological Survey of India (ASI). | - |
| 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 certain defined activities/projects, and this must be obtained before any construction work or land | Not Applicable as project activity does not attract provisions of EIA notification 2006 and its amendment till date. Because, neither is the alignment any new National highway nor is it any expansion of a National Highway greater than 30 km involving additional | - |

| | | | | |
|---|---|---|---|---|
| | | preparation (except land acquisition) may commence. | ROW greater than 20m involving land acquisition and passing through more than one State (Category A). Also, the alignment is not a state highway project or state highway expansion project in hilly terrain (above 1000 m AMSL) and or ecologically sensitive areas (Category B). It is a Major District Road Agency in Charge - Ministry of Environment, Forest & Climate Change (MoEF & CC) | |
| 1 | National Environmental Appellate Authority Act, 1997 | An Act to provide for the establishment of a National Environment Appellate Authority to hear appeals with respect to restriction of areas in which any industries, operations or processes or class of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards under the Environment (Protection) Act, 1986 and for matters connected therewith or incidental thereto. | No. The Act is not applicable because the said project does not involve any industries, operations or processes or class of industries, operations or processes. Agency in Charge - Ministry of Environment, Forest & Climate Change (MoEF & CC) | - |
| 1 | Solid Waste Management Rules 2016 | Responsibility of Solid Waste Generator (i) segregate and store the waste generated in three separate streams namely biodegradable, non-biodegradable and domestic hazardous wastes in suitable bins and handover | This rule is applicable to all forms/types of solid waste generated at construction activities, camp site, plant sites, etc. Agency in Charge - State Pollution Control Board | Contractor to follow all the rules during construction works. |

| | | | | |
|---|---|---|---|---|
| | | segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time. | | |
| 1 | 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 of structures 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. |
| 1 | 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 procedures and requirements for safe disposal of hazardous wastes.<br>Agency in Charge - State Pollution Control Board | Contractor to follow all the rules during construction works. |
| 1 | Notification for use 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 flyover 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 130 km (aerial distance) from the project site. The site is located at a distance of 225 km by road from the project site, but the improvement of project roads does not involve | PIU |

| | | | | |
|---|---|---|---|---|
| | | | widening or construction of large-scale embankments or flyovers, which can consume significant quantities of fly ash. Therefore, utilization of fly ash is not warranted for project road, despite the presence of coal based thermal power plants within 300kms. | |
| 1 | Noise Pollution (Regulation And Control) Act, 1990, 2010 and its subsequent amendments | The standards for noise for day and night have been promulgated by the MoEF & 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. 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 – 65dB(A); night time 55dB(A)<br>2. Residential area: day time – 55dB(A); night time – 45dB(A)<br>Agency in Charge - State Pollution Control Board | Contractor to follow all the rules during construction works. |
| 1 | The Explosives Act (& Rules) 1884 (1983) its subsequent amendments. The Explosive | Sets out the regulations as to regards the use of explosives and precautionary measures while | If contractor opens stone quarry and uses explosive for quarrying and storing of Diesel/ Petrol in the camp site Agency in Charge - | PIU |

| | | | | |
|---|---|---|---|---|
| | Rules, 2008 | blasting & quarrying | Petroleum & Explosives Safety Organization (PESO) | |
| 1 | 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. Agency in Charge – Central Ground Water Authority | PIU |
| 1 | Public Liability and Insurance Act, 1991 | Protection to the general public from accidents due to hazardous materials. | Yes. Hazardous materials like Bitumen shall be used for road construction 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 20:Applicable Acts & Regulations (Construction Phase)***

| Sl. | Clearance Required for | Statute under which clearance is required | Statutory Authority |
|---|---|---|---|
| 1 | Hotmix plants, Crushers, Batch Mix Plants & DG Sets. | Air(PreventionandControlofPollution)Act,1981andNoisePollution(Regulationand Control) Rules, 2000 | StatePollution 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) | EnvironmentProtectionAct,1986 | MoEF & CC |

| | | | |
|---|---|---|---|
| 5 | Permission for withdrawal of groundwater and for construction purpose. | EnvironmentProtectionAct,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 | CentralMotorandVehicleAct1988 | Department of Transport, State Government. |
| 8 | Storage of fuel oil, lubricants, explosives, diesel etc. at construction camp. | Manufacture, storage and Import of Hazardous Chemical Rules 1989 | State Pollution Control Board & PESO. |

## 3.3 MORTH & IRC Specifications

All road works in India are to be in accordance with the MoRTH specifications for Road and Bridge works and guidelines of Indian Roads Congress (IRC). The MoRTH specifications have special provisions towards protection of environment under Clause501, Annexure A and the contractor is to satisfy the 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. Provisions of clause 501 Annexure A, cover the environmental aspects as:

## 3.4 Environmental Standards and Code of Practices

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

- Guidelines for use of Fly Ashin Road Embankments(IRC:SP:58-2001)
- Guidelines on Preparation and Implementation of Environment Management Plan (IRC SP 108-2015)
- GuidelinesonLandscapingandTreePlantationIRC: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 Manual operation IRC: 10-1961
- RoadaccidentFormsIRC:53-1982
- Guidelines for Use of Construction and Demolition Waste in Road Sector(IRC121-

2017)

- ProceedingsofInternationalSeminaronsustainabledevelopmentin8.10.2001
- RoadTransportHighwaySafetyCodeIRC:SP:44-1996
- GuidelinesonSafetyinRoadConstructionZonesIRC:SP:55:2001
- Guidelines on Skill Development of Workmen in Road Sector(IRC127-2018)
- Guidelines of WB &A DB.

## 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 21: 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 Cine Workers Welfare Fund Act, 1981, The Building and Other Construction Workers Welfare CessAct,1996,UnorganisedWorkers'SocialSecurity Act2008. | Ministry of labour and Employment |
| The Occupational Safety, Health And Working Conditions Code, 2020 | It amalgamated - The Factories Act,1948,The Plantations Labour Act, 1951,The Mines Act, 1952,The Motor Transport Workers Act, 1961, The Beedi and Cigar Workers (Conditions of Employment) Act, 1966, The Contract Labour (Regulation and Abolition) Act, 1970, The Sales Promotion Employees (Condition of Service) Act, 1976,of Employment and The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. | Ministry of labour and 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 minimum and timely payment of wages for all workers in India. The Code repeals and replaces the Payment of Wages Act, 1936, theMinimumWagesAct,1948,thePaymentofBonus Act, 1965, and the Equal Remuneration Act, 1976. | Ministry of labour and Employment |

| Applicable Codes | Concerns | Remarks |
|---|---|---|
| Corporate Social Responsibility-Companies Act, 2013 | Section 135 of the Companies Act introduces mandatory Corporate social responsibility (CSR) contributions for large companies, making it the only mandatory CSR law in the world. According to the bill, all firms with net worth above 5billion rupees or ₹5billion (approx. $75million), turnover over 10billion rupees or ₹10billion (approx. $150million), or net profit over 50 million rupees or ₹50million (approx. $750,000) are required to spend at least 2% of their annual profits of the preceding year. The law requires that all businesses affected establish a CSR committee to Over see the spending. | Ministry of Corporate Affairs |

### 3.5.1 World Bank safeguard/ Operational policies

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

*Table 22 : 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 the protection, conservation, maintenance, and rehabilitation of natural habitats and their functions. This policy may be triggered to improvement 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 habitat of wild animals therefore this operational policy is not applicable in this project. |
| OP 4.36 Forestry | Aims to harness the potential of forests to reduce poverty in a sustainable manner integrate forests effectively for sustainable economic development and protect vital local and global environmental services and values of forests.<br>Initially 439 numbers of tree felling was anticipated based on primary survey, later it was decided the alignment will be limited to within the existing ROW only. Therefore, no tree felling will be done. Hence this |

| | |
|---|---|
| | operational policy is not applicable in this project. |
| 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 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.<br>This policy OP 4.12 is not applicable in this project as the project does 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 so that they receive culturally compatible social and economic benefits, and do not suffer adverse effects during the development process.<br>This OP 4.10 regarding Indigenous People is applicable only if any persons belonging to Indigenous community impacted by this project as Meghalaya are 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 23 : Applicable 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 is not applicable as there is no land acquisition. Thus, the rights of the forest dwelling schedule tribes & other traditional forest dwelling communities will not be impacted. | Tribal Affairs, 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 . |
| 4. | Workmen Compensation Act, 1923 | It provides for payment of compensation by Employers to their | Applicable | The Insurance Policy covers the compensation, hospitalization and | District Labour Commissioner |

| Sl. | Name of Act/ Rules | Purpose | Applicable/ Not Applicable | Description | Responsible Agency |
|---|---|---|---|---|---|
| | | Employees for injury by accident i.e., personal injury or occupational disease. | | transportation of workers /employees | |
| 5. | 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 or may not be from the neighboring state. Presently the construction workers are from within the state of Meghalaya. | District Labour Commissioner / Govt. Of Meghalaya |
| 6. | 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 involved in the project. | District Labour Commissioner |
| 7. | 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 |
| 8 | The Sexual Harassment of Women at Workplace (Prevention, Prohibition, and Redressal) Act, 2013 | Vishakha Guidelines are to be 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. | |
| 9 | The Equal Remuneration Rules, 1976 | Equal Remuneration for identical works | Applicable | Project should not discriminate between sex, race, caste or creed in payments to the employees | District Labour Commissioner |

| Sl. | Name of Act/ Rules | Purpose | Applicable/ Not Applicable | Description | Responsible Agency |
|---|---|---|---|---|---|
| 10 | The Trade Union Act, 1926 | Right to form Trade Union at the Workplace | Applicable | No trade union formed within the organization | District Labour Commissioner |
| 11 | Public Liability Insurance Act 1991 | Provides immediate relief to the persons affected by accidents, occurring while handling any hazardous substance | Applicable | Project has been adhering to all the relevant provisions made under the act | District Labour Commissioner |
| 12 | World Bank OP/BP 4.12 – Involuntary Resettlement | Avoid or minimize involuntary resettlement and, where this is not feasible, assist project 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 | Applicable | Many of them have been operating from the government land and would be affected temporarily during actual civil construction for few days. Thus, the non-title holders would be compensated as per the provision of the ESMF. | PIU/Implementing Agency |
| 13 | Indigenous Peoples OP/BP 4.10 | In the context of India Indigenous Peoples may be referred to "scheduled tribes". As per the 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 policy on Indigenous People was not be 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”. 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 |

| Sl. | Name of Act/ Rules | Purpose | Applicable/ Not Applicable | Description | Responsible Agency |
|---|---|---|---|---|---|
| 14 | Bank Policy – Access to Information | The policy governs the public accessibility of information in the Bank's possession. | Applicable | The Bank allows access to any information in its possession that is not on a list of exceptions. Documents such as ESIA were disclosed both by the borrower and Bank. | PIU/Implementing Agency |

### 3.5.2 Social Categorization:

All activities under these sub-projects are limited to the available ROW, thus no land acquisition and 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 collective attachment 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 reconstructed by 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 a mitigation measure 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.

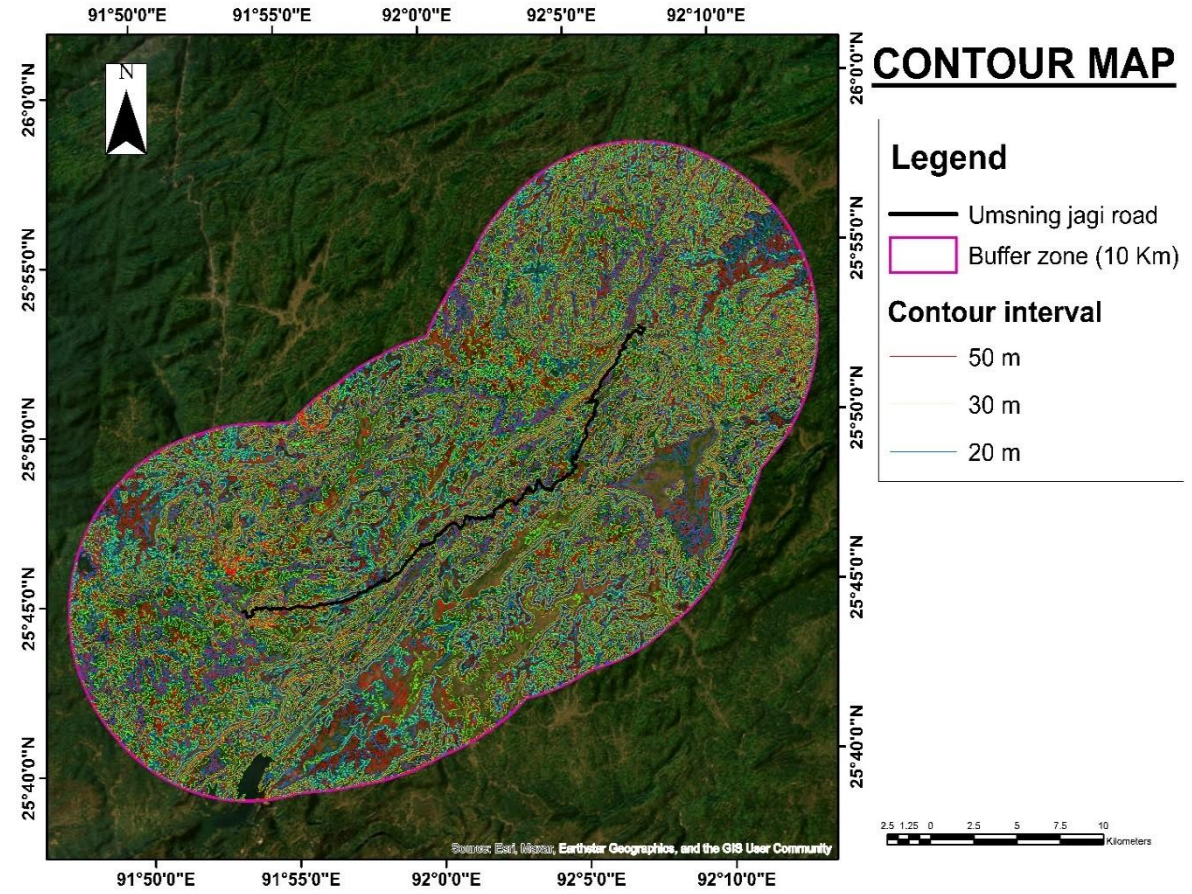



*Figure 6: Core zone of the project area*

## Topography:

The topography at Meghalaya comprises of landscapes that have a blend of mountain and plateau regions and this is why it is also known as Meghalaya plateaus. The plateaus have altitudes ranging from 150 meters to 1961 meters.

Ri - Bhoi district is a hilly one with intermontane valleys. The western and northern part of the district comprises of the denudational high hills with deep, narrow intermontane valleys covered with or without colluviums. The southern part of the district has highly dissected plateau with steep slopes and deep, narrow valleys. In the central and eastern parts, denudational high hills with deep valleys are found. Further in the southeastern part, denudational low hills are found to occur with narrow intermontane valleys.

The project road mostly passes through hilly and rolling terrain. The level of road stretches varies from 780-980 meter and few of them are within the range of 980-1,180 meter above sea level.

The Topo Sheet map and digital elevation map of the district is shown below.

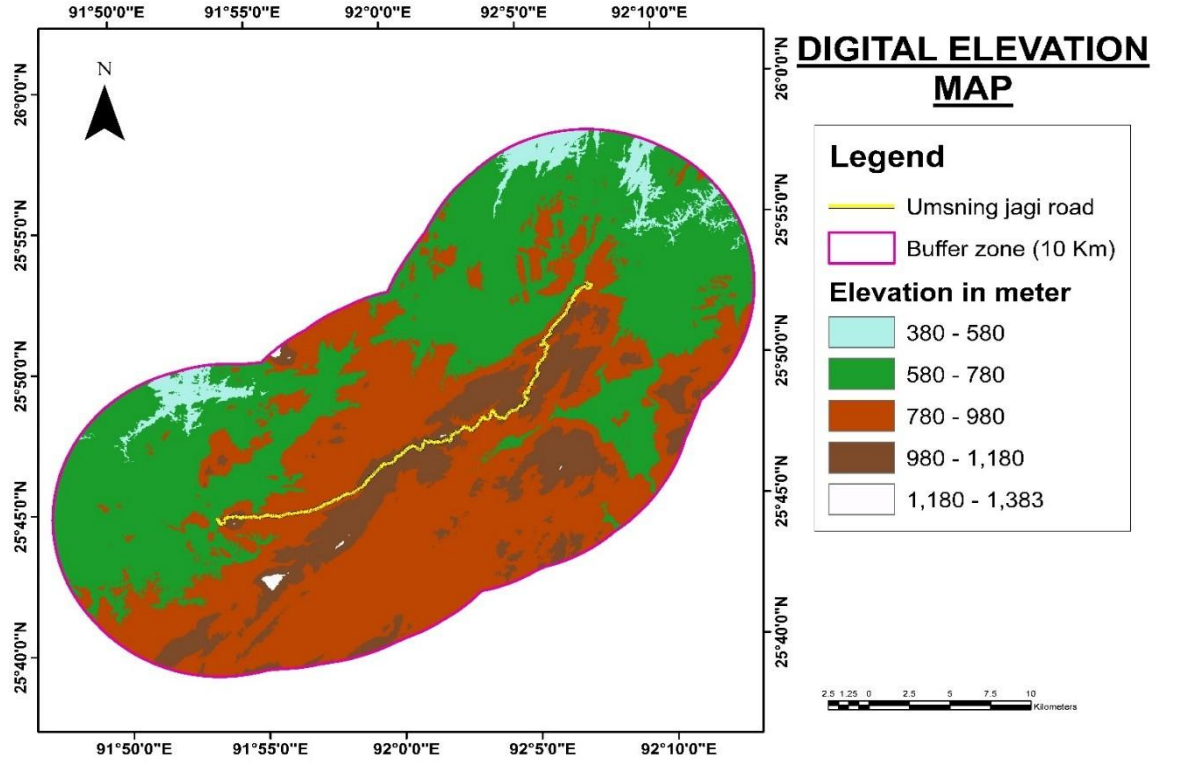



*Figure 7: Digital Elevation Map of Project Road*

The topo-sheet showing the project road is given below:

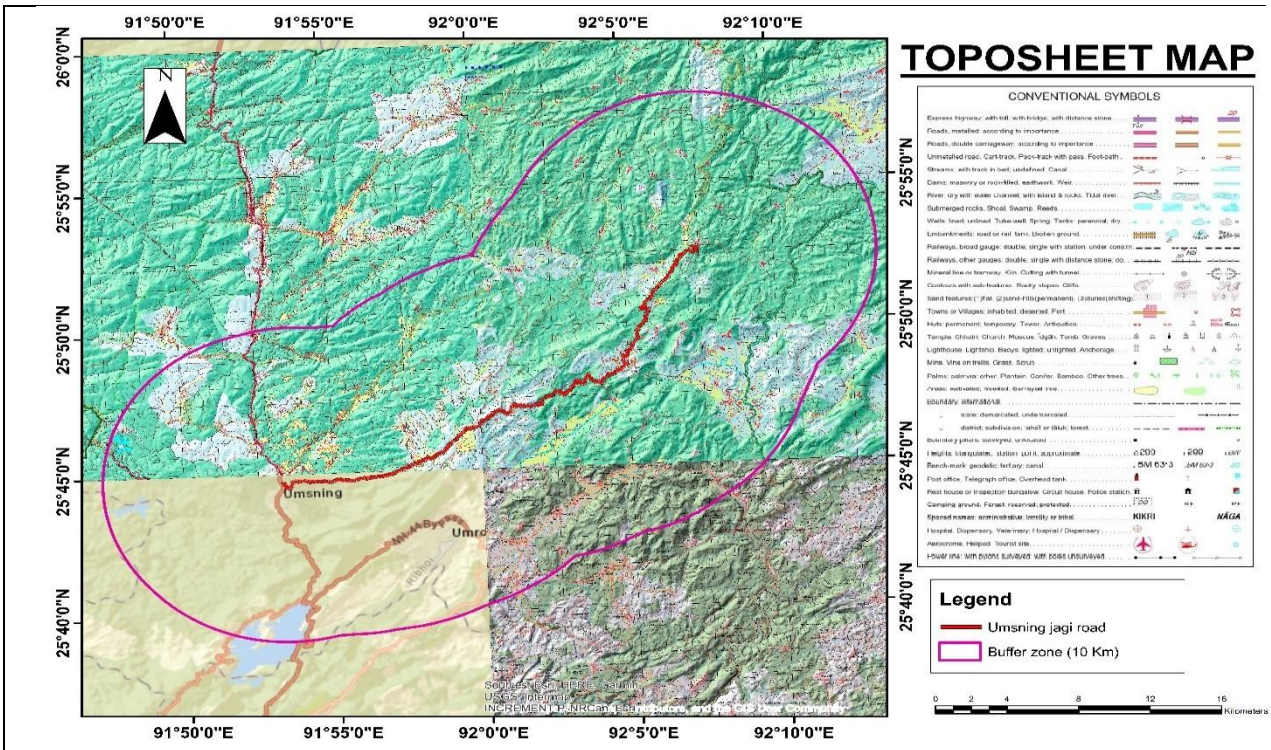



*Figure 8: Toposheet map showing the Project road stretches*
*Toposheet source: Survey of India*
*Toposheet No.: G46N13_78O13, G46O1_83C1, G46O2_83C2*

## Soil &Geology:

The Soils are in general deep to very deep with loamy to clay loam/clay in surface texture. Soils are acidic in nature. Soils are generally well drained except in low land where water table fluctuates. Owing to moderately undulating land form and absence of good vegetation cover, the area is exposed to erosion hazards.

## 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.

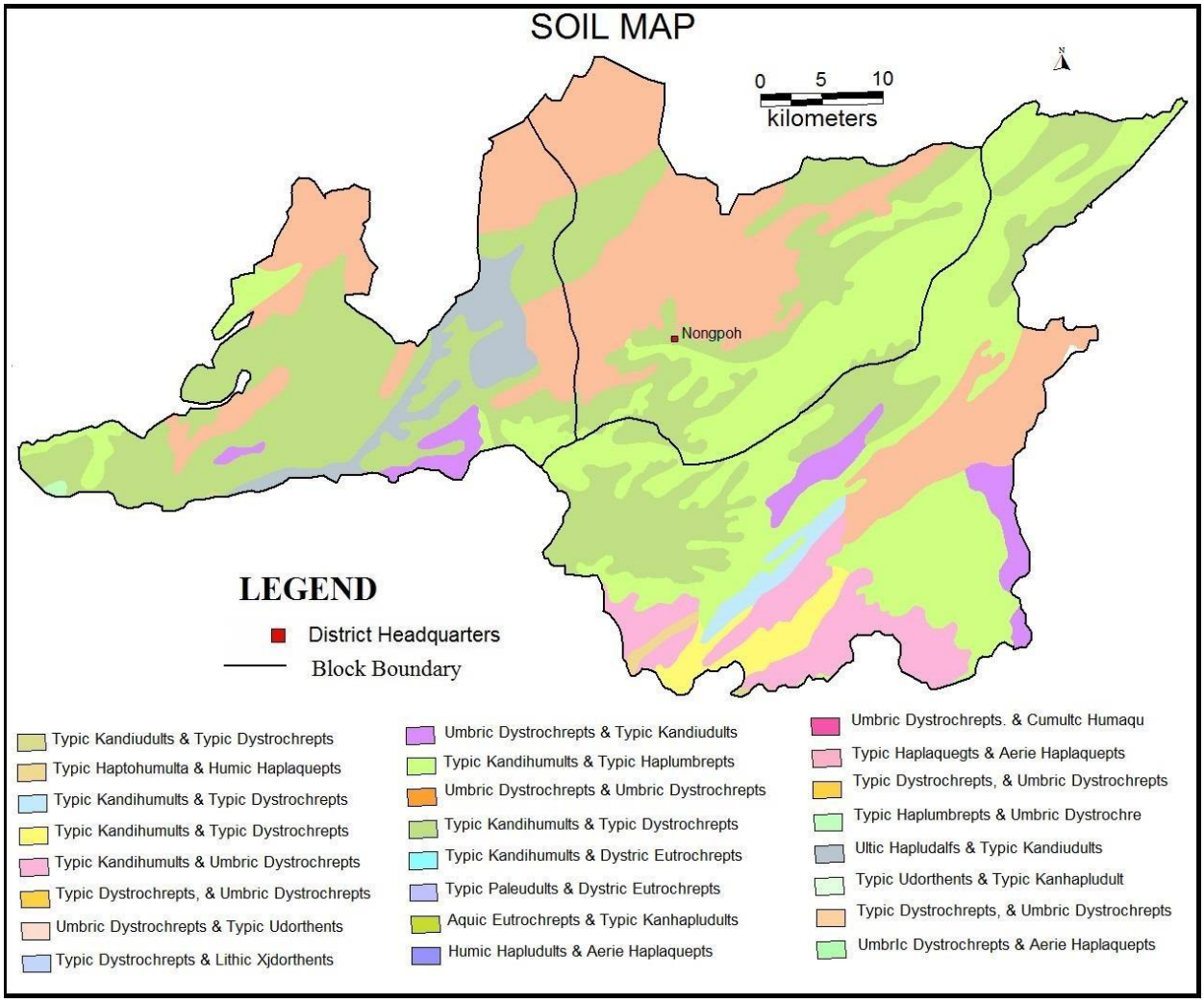



***Figure 9: Soil map of Ri - Bhoi***

(source: Regional Center of National Bureau of Soil Survey and Land Use Planning).

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

## 4.1 Meteorology:

The climate in this area is per humid subtropical, which is directly influence by the South West Monsoon. Originally from Bay of Bengal and Arabian Sea. The whole year can be divided into four seasons – summer, monsoon (rainy), autumn and winter. The summer season extend from the last part of March to Mid May, is characterized relatively high temperature, occasionally thunder storm and high wind velocity.

Rainfall:

The average annual rainfall in the district is 951 mm, most precipitation occurs in July. Heavy rainfall increase the chance of landslides in the project area.

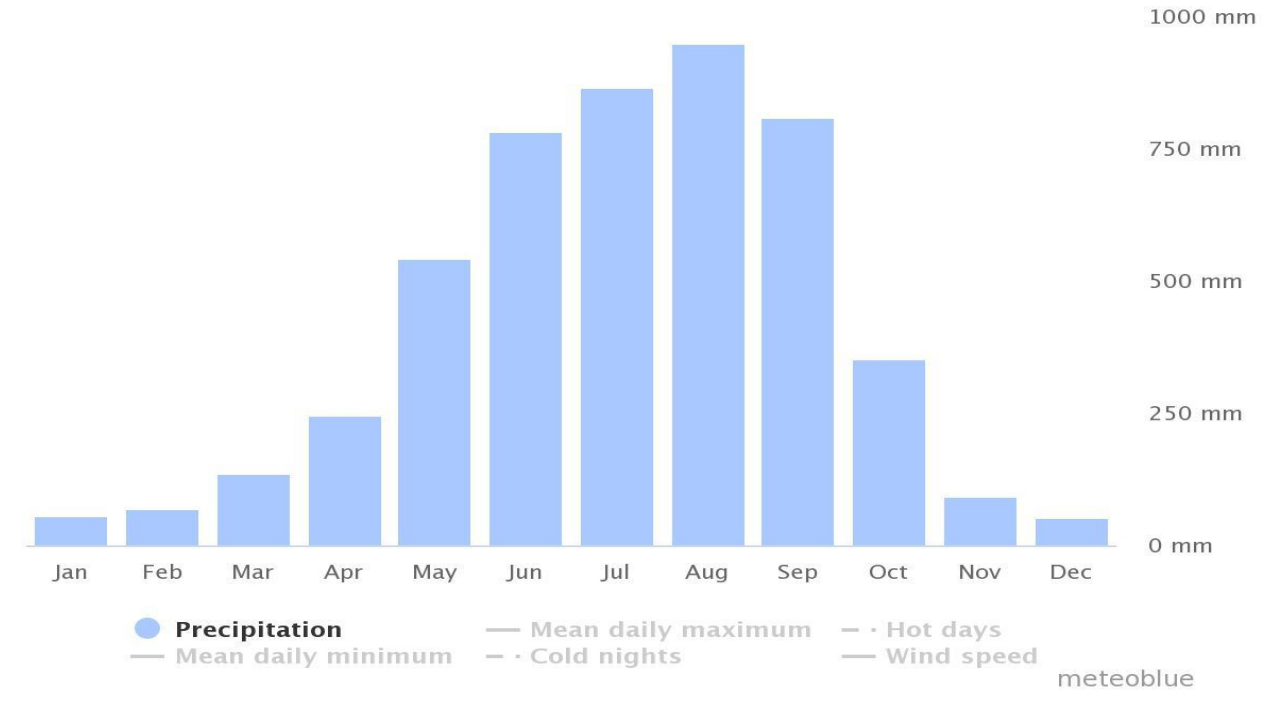



*Figure 10: Precipitation in Umsning*

***Source - Meteoblue***

Temperature:

The average annual temperature in Umsning is 19.3 °C. With an average of 27 °C, April is the warmest month. January has the lowest average temperature of the year. It is 14 °C.

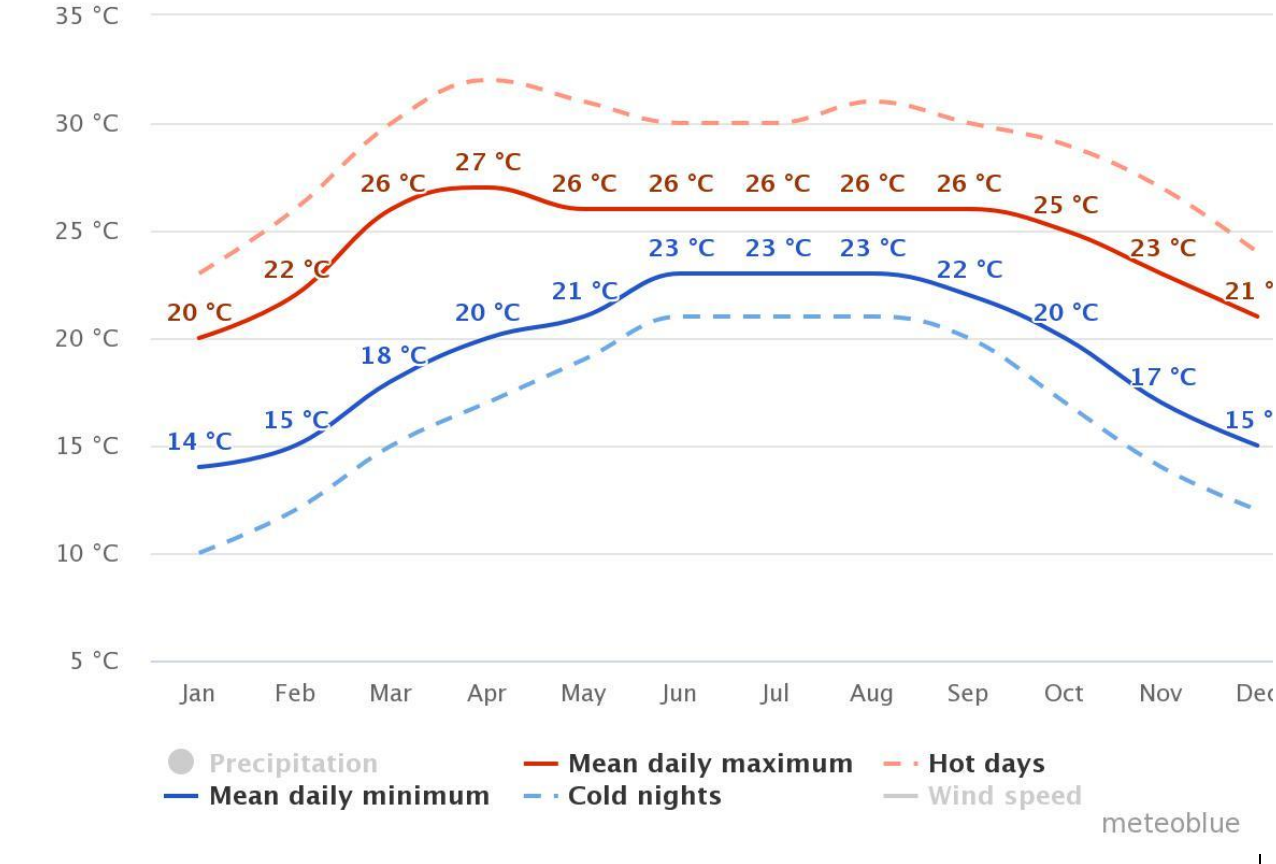



*Figure 11: Average Temperature in Umsning*

***Source: meteoblue***

### 4.1.1 Wind speed

Wind gusts are maximum faced in the months of March, April, May and June and 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 lead to the destruction of roads. Average Wind sped/direction data of 10 years of Umsning is shown below:

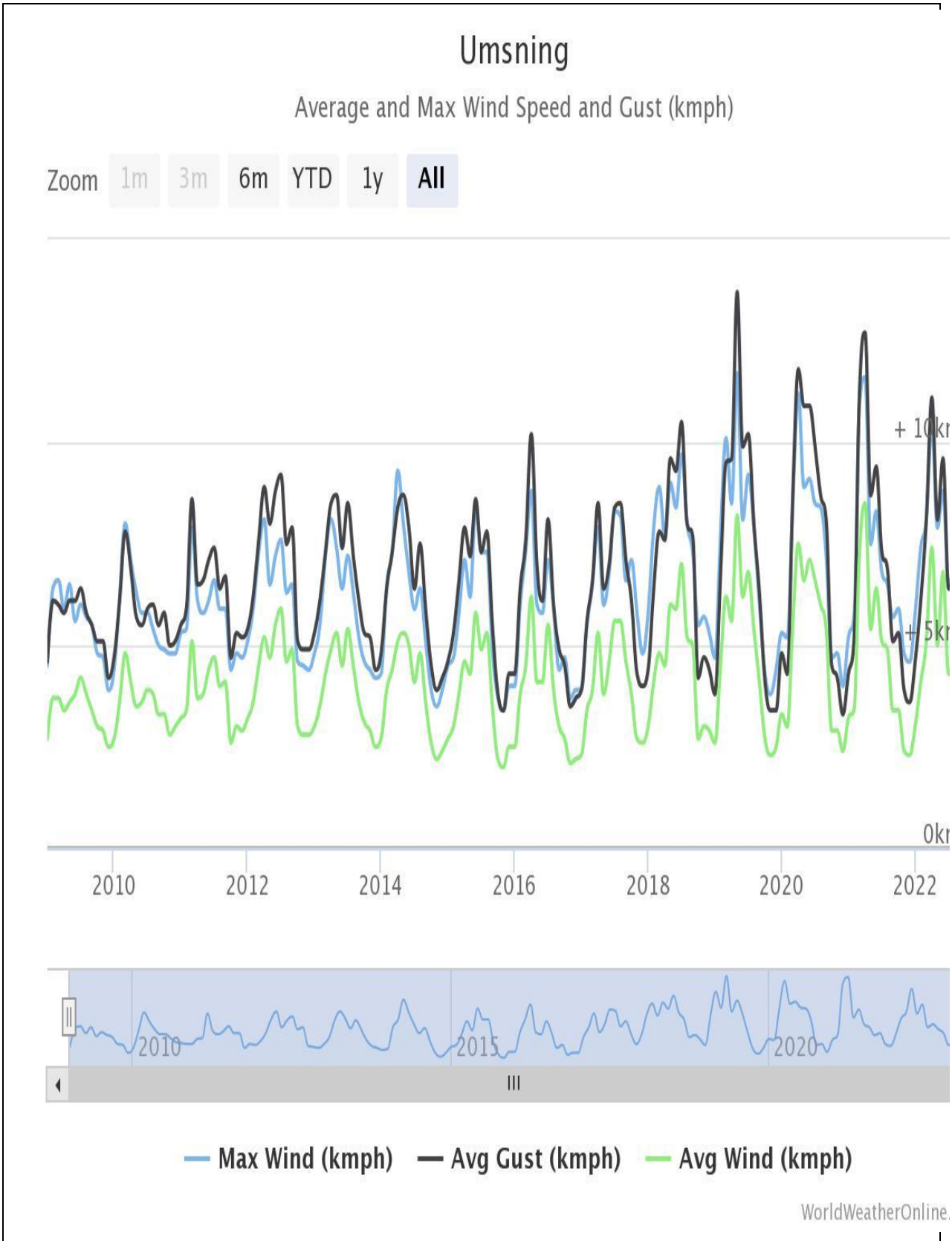



*Figure 12: Average Wind Speed in Umsning*

***Source: https://www.worldweatheronline.com/umsning-weather-averages/meghalaya/in.aspx***

### 4.1.2 Wind rose:

4.1.3 Mostly the wind blows towards East-North-East direction.

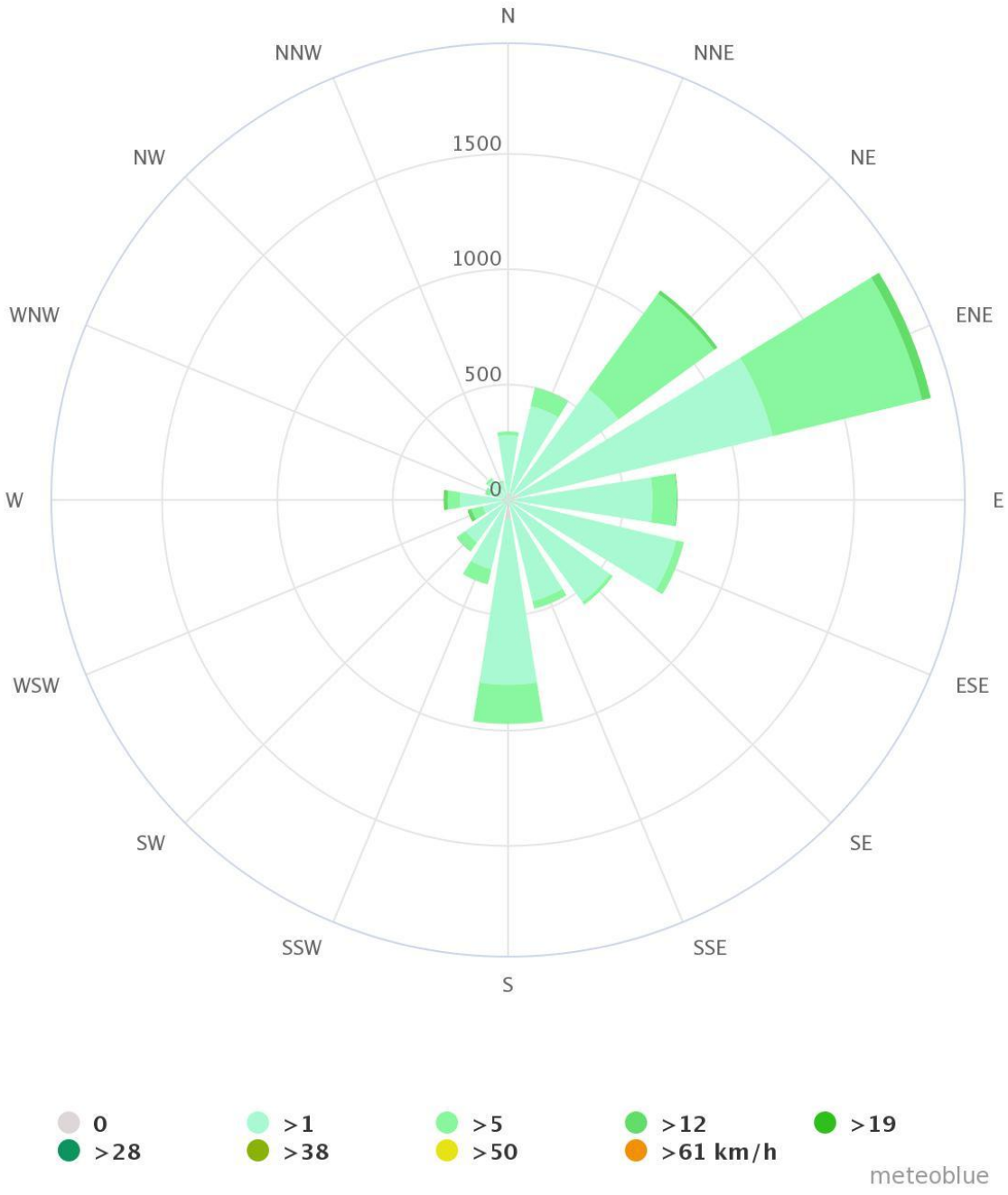



*Figure 13: Wind Rose Diagram For Umsning*

***Source: meteoblue***

### 4.1.4 Relative Humidity:

The month with the most relative humidity is September (88.34 %). The month with the least relative humidity is March (66.06 %).

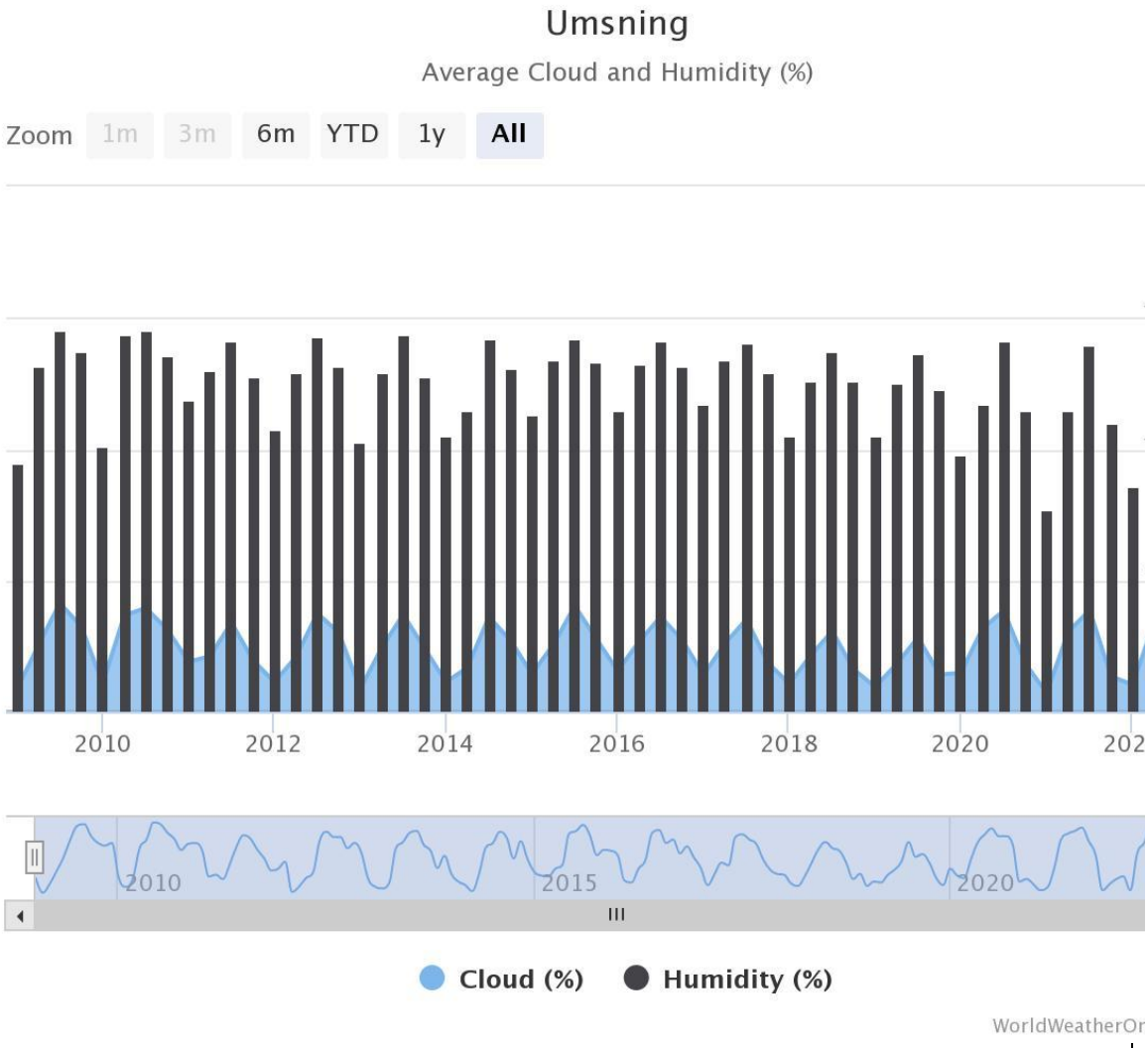



*Figure 14:Average Humidity of previous 10 years*

***Source: https://www.worldweatheronline.com/Umsning-weather-averages/meghalaya/in.aspx)***

**Natural Hazards:**

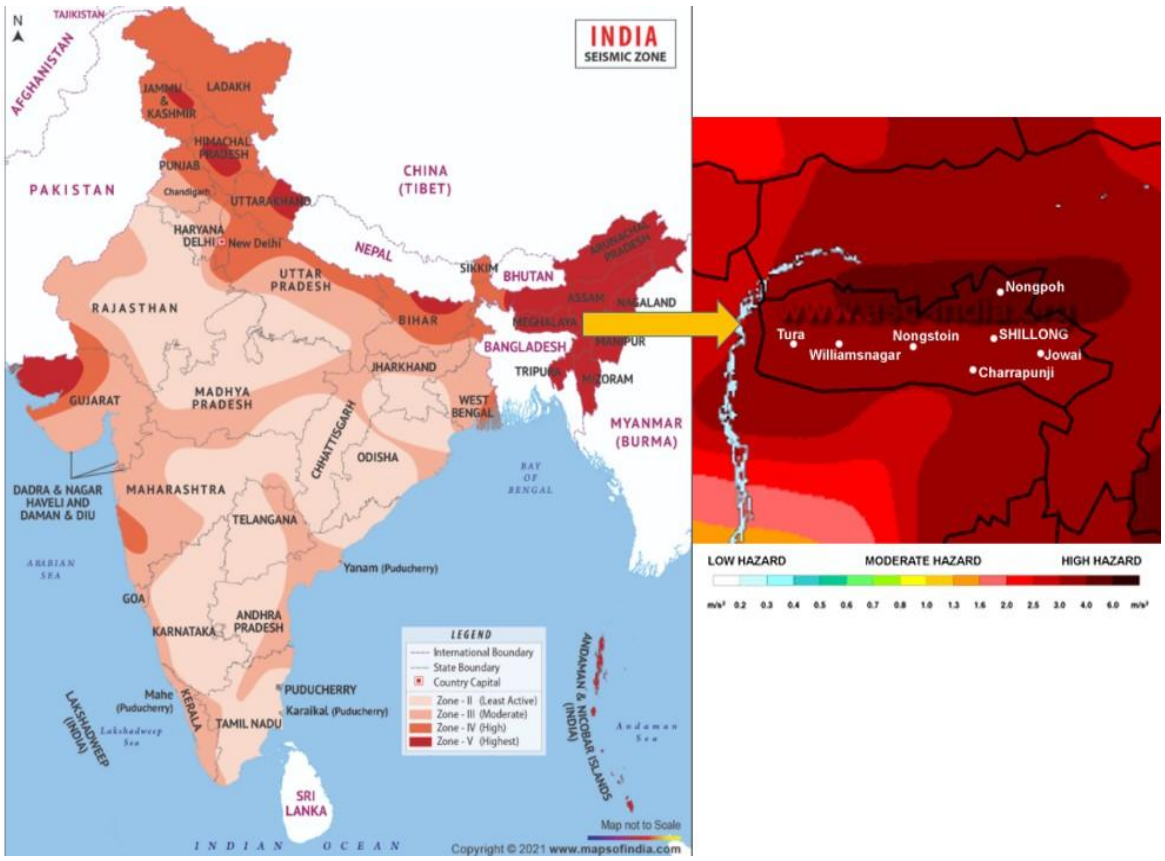
As the State lies in the seismically active zone, special emphasis should be given to reduce the impacts of earthquake. Moreover, it is also affected by hazards such as floods, flash floods, epidemics, fire, hailstorm, lightening, road accidents, etc.

The State of Meghalaya has witnessed seismic events of 8.7 magnitudes 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 earthquakes have 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. 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 Umsning Jagi road. The seismic map of Meghalaya indicating the location of project stretch is shown in Figure below:




| Seismic Zone Map of India | Seismic Zone Map of Meghalaya |
|---|---|

*Figure 15:Seismic zone map of India & Meghalaya*

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

**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.

. Flood prone area of Meghalaya is shown in the Figure below

The project area is not known to face significant impacts from monsoon floods.


*Figure 16: 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%2018th%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 the loss of lives 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, which are during the months of June to October, in Meghalaya. The project road passes through mostly hilly and rolling terrain which is prone to landslides. Proper mitigation measures are included in the design option. The landslide prone zone of Meghalaya is given below.

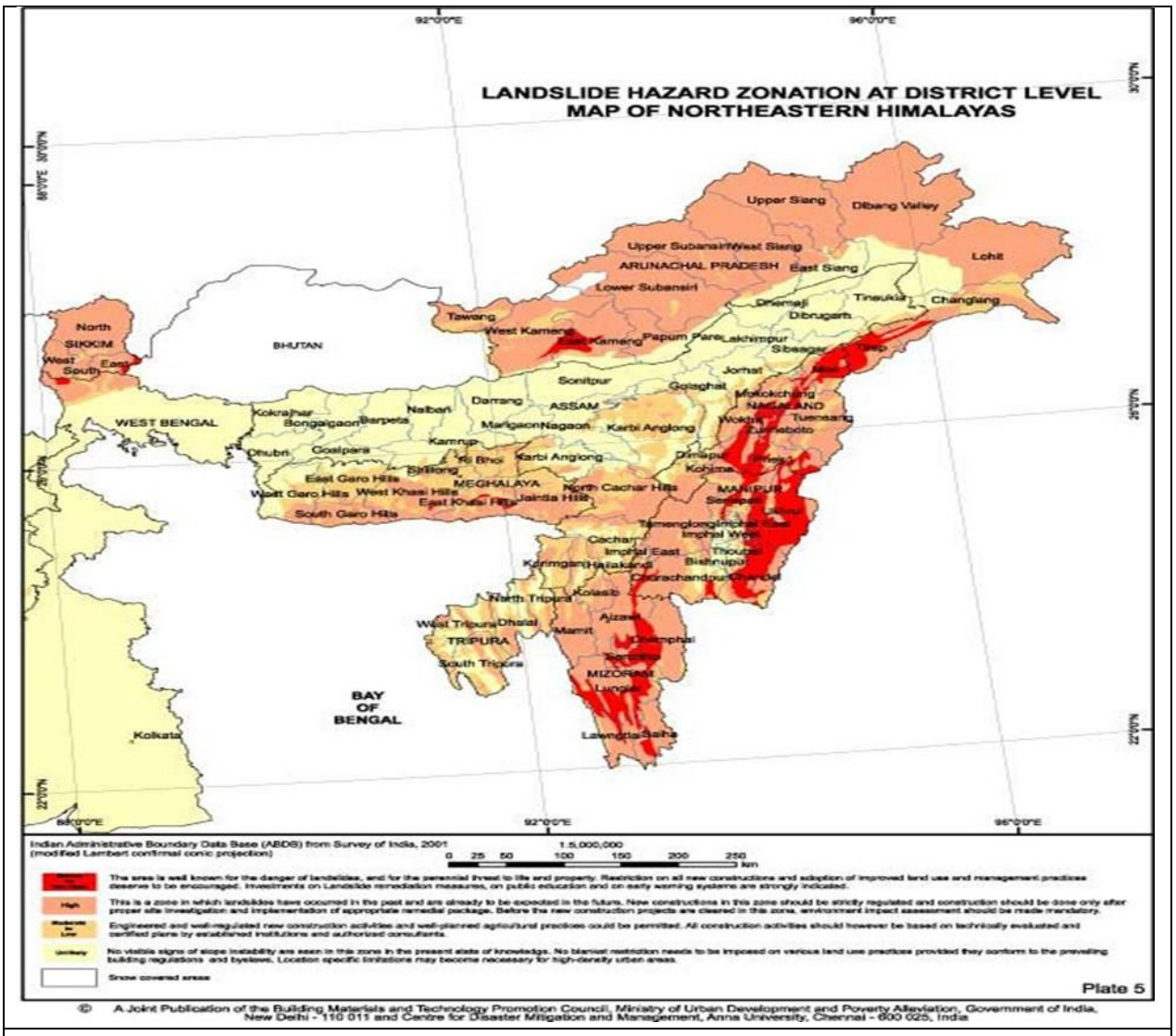



***Figure 17: Landslide Map of North-Eastern Himalayas***

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

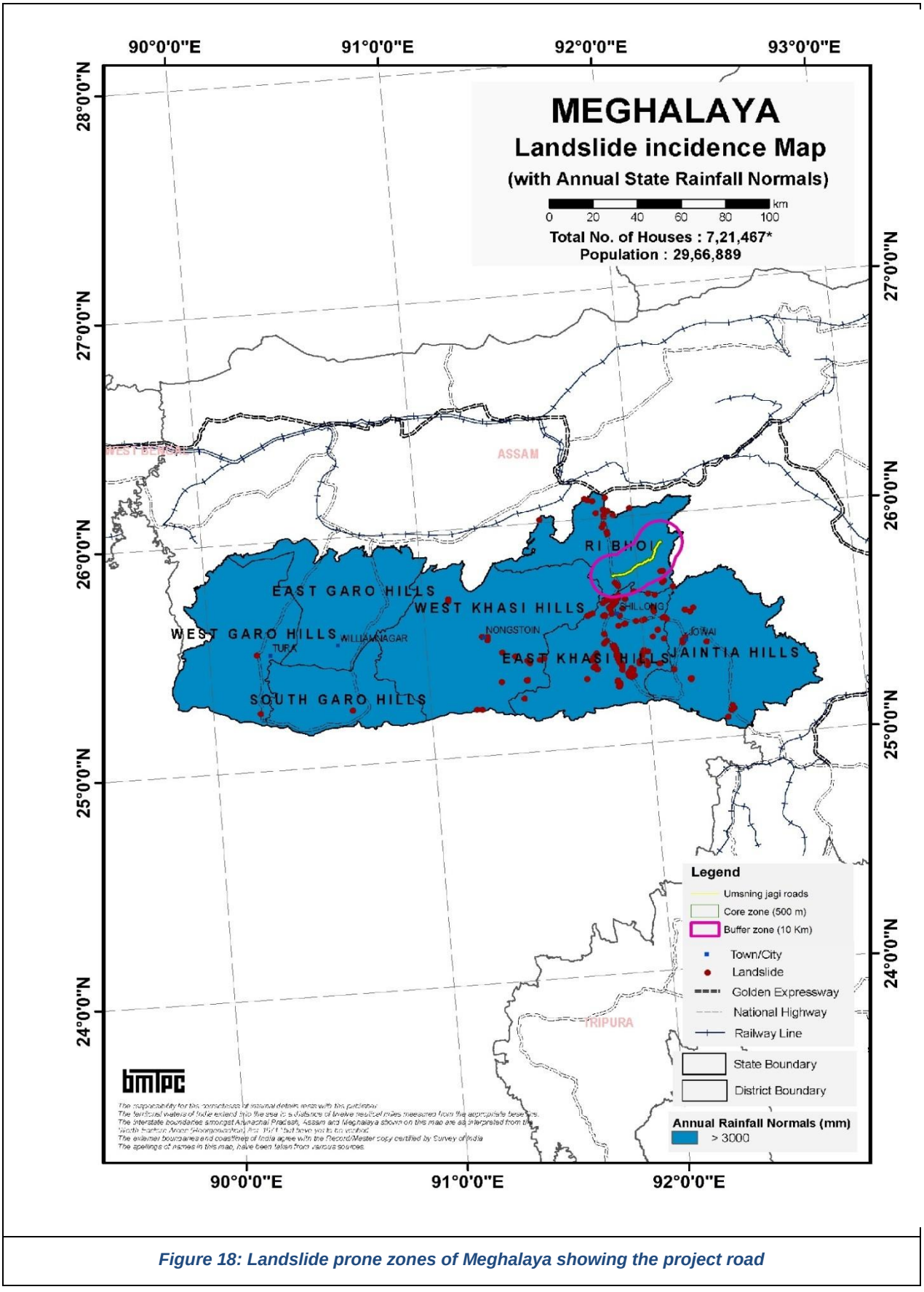



*Figure 18: Landslide prone zones of Meghalaya showing the project road*

**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. It has detrimental impacts on society and environment.

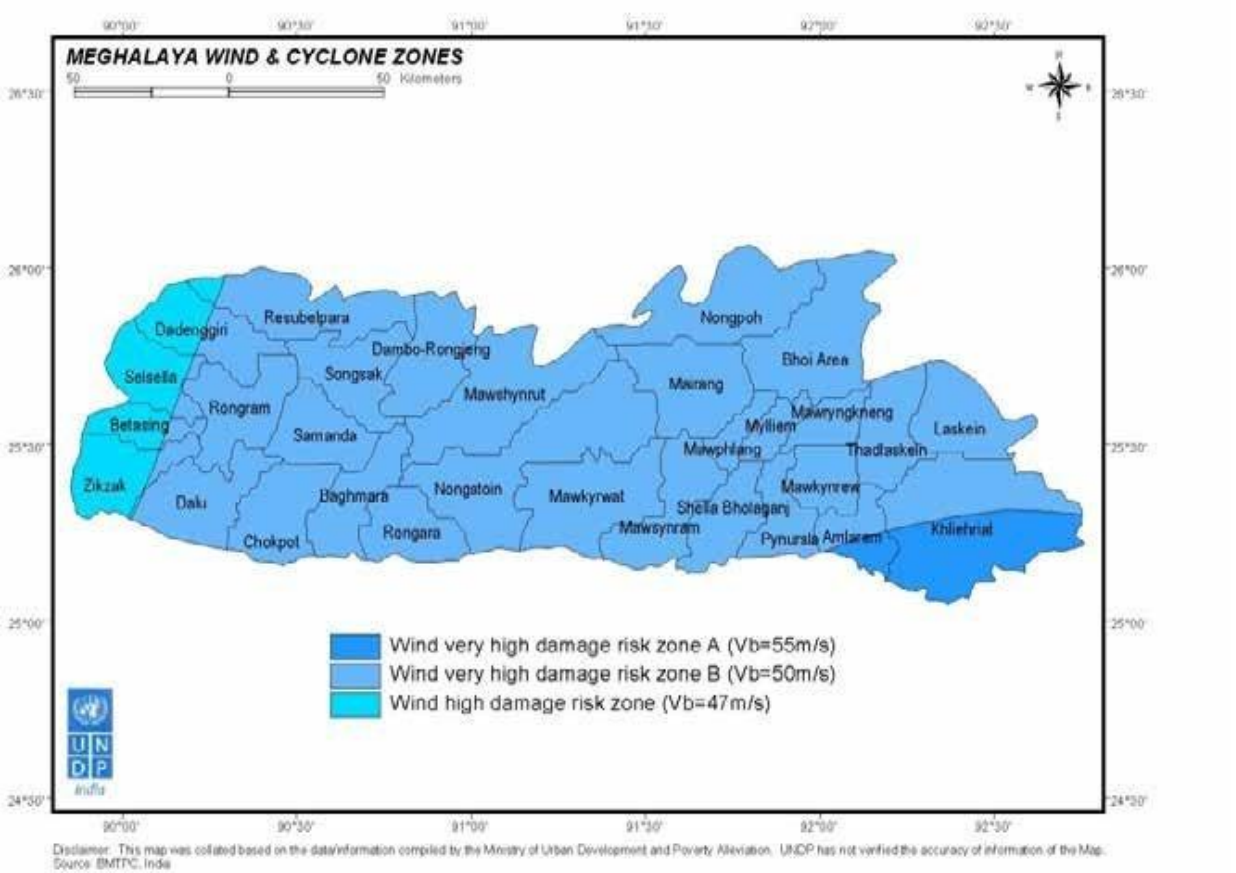
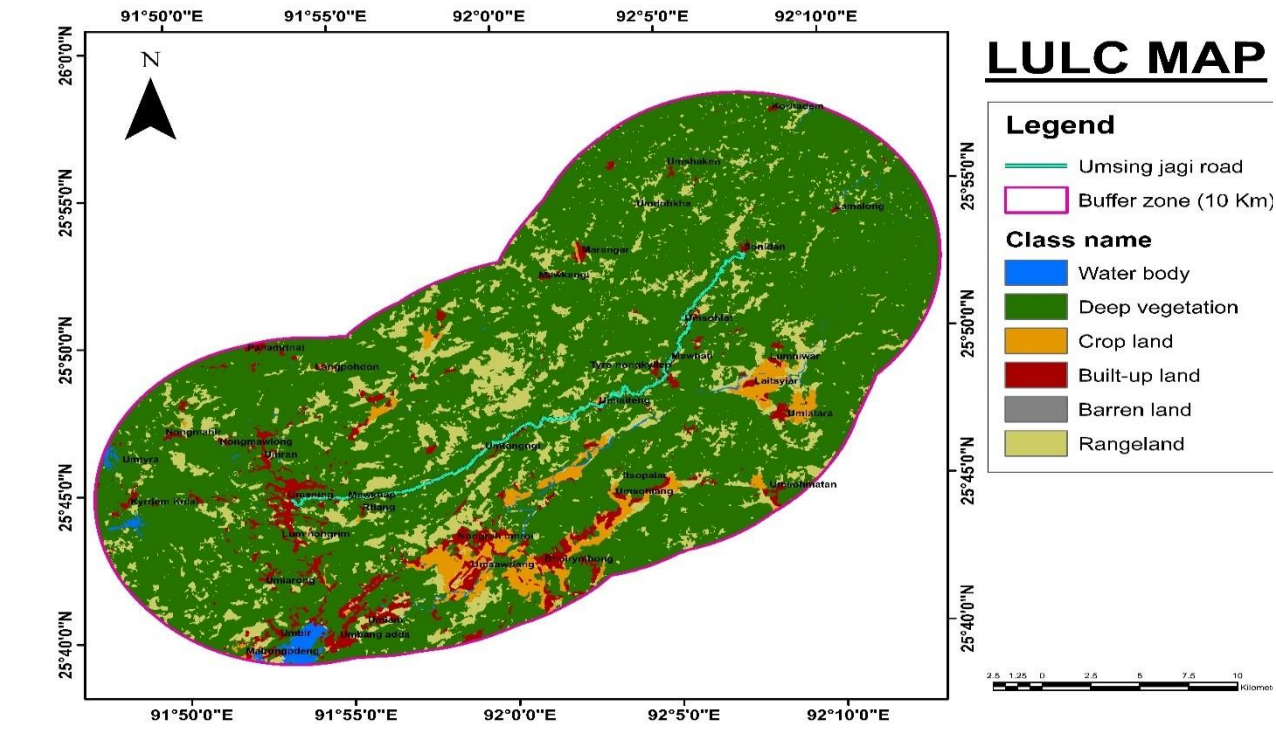



*Figure 19: Map of Wind and Cyclone Zone in Meghalaya*

***Source: Meghalaya state disaster management plan***

## 4.2 Land Environment:

Land utilization statistics provide detailed information of the land use pattern in the area. Based on the land utilization, the project road is divided into various types of landforms such as deep vegetation, build-up area; crop land and range land etc. Mostly deep vegetation growths are observed through the road stretch. The area of distribution of land utilization is given below:




## 4.3 Water Environment:

The Project area is not so rich in water sources. No major river/streams are there in the vicinity of the project corridor (refer Figure). Ground water resources are used for drinking purpose by open wells, bore wells, tube wells or installing hand pumps.

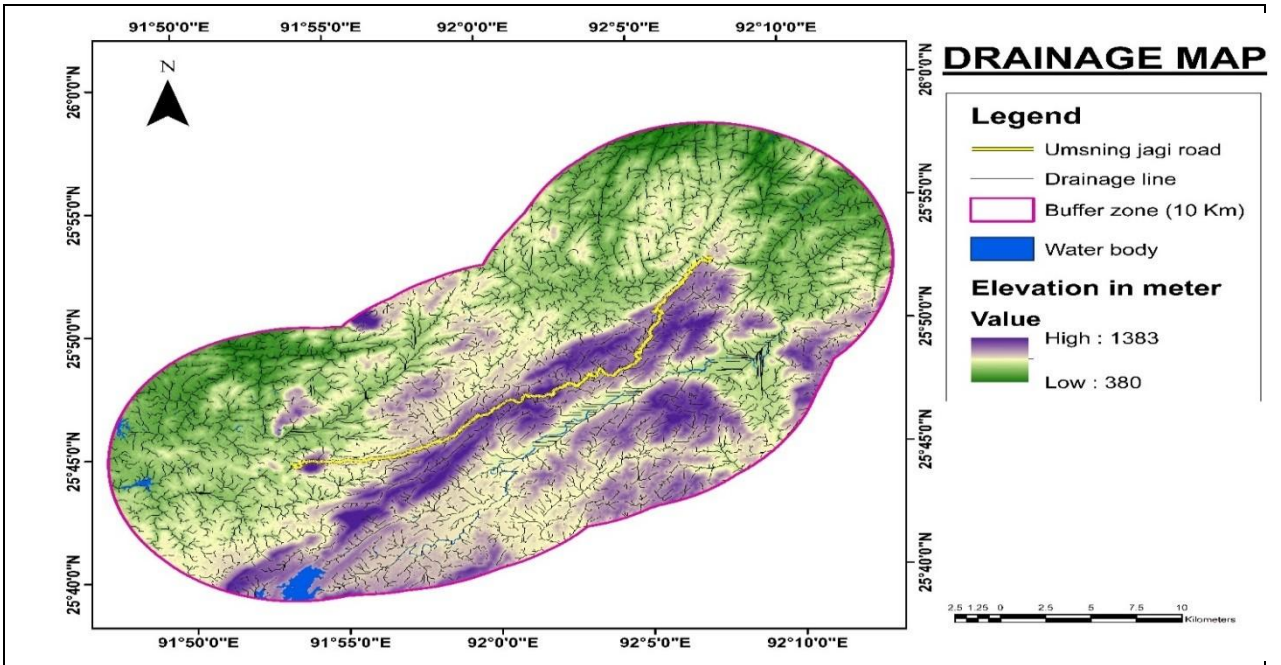



*Figure 20: Drainage map along the project road*

**Ground Water Quality Monitoring**

The objectives behind analyzing are to develop an overall picture of the ground and surface

water quality of the project district. Ground water monitoring data is collected from the of CPCB report of the year 2021(https://cpcb.nic.in/wqm/2021/NWMP_DATA_2021.pdf).

*Table 24:Ground water Monitoring Locations*

| Sampling Location | Name of place | Source | Distance(Km) | Coordinates | |
|---|---|---|---|---|---|
| | | | | Latitude | Longitude |
| 1 | GOOD SHAPHARD PARISH IN LADRYMBA | Borewell | 17.65 | 25°22'54.58"N | 92°19'37.81"E |
| 2 | FOREST COLONY, POLO, SHILLONG | Dug well | 17.62 | 25°35'8.73"N | 91°53'21.55"E |


*Figure 21: Groundwater monitoring locations*

*Table 25:Ground Water quality result*

| Sl. | Parameters | Unit | Limit (as per IS:10500-2012) | | Result | | WHO Drinking Water Standard (Fourth Edition 2011) |
|---|---|---|---|---|---|---|---|
| | | | Desirable Limit | Permissible Limit | GOOD SHAPHARD PARISH IN LADRYMBA | FOREST COLONY, POLO, SHILLONG | |
| 1 | pH | - | 6.5-8.5 | No Relaxation | 6.8 | 6.7 | 8.2-8.8 |
| 2 | Fluoride (as F) | mg/l | 1 | 1.5 | 0.2 | 0.2 | 1.5 |
| 3 | Nitrate (as $NO_3$) | mg/l | 45 | No Relaxation | 0.63 | 4.60 | 50 |
| 4 | TDS | mg/l | 500 | 2000 | 139 | 108 | - |
| 5 | Electrical Conductivity | Micromhos/cm | - | - | 202 | 155 | - |
| 6 | Total Coliform | mg/l | Nil | Nil | 2 | 140 | Absent |
| 7 | Fecal Coliform | mg/l | Nil | Nil | 2 | 22 | Absent |
| 8 | BOD | Mg/L | - | - | 1.6 | 1.8 | |
| 9 | Arsenic | Mg/L | - | - | 0.001 | 0.001 | |

It can be seen from

Table 25:Ground Water quality result that the pH of the drinking water varies from 6.7 to 6.8. Total dissolved solids vary from 108 to 139 mg/l. Other parameters analyzed like Arsenic, fluorides are found well within standards. 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 at all sampling locations. The chemical constituents present in the ground water of the district are within the desirable limit set for drinking and irrigation water standards.

## 4.4 Air Environment:

Air pollution is caused due to both natural and manmade processes. The main source of air pollution is human induced/manmade, which 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 the major source of 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.

## 4.5 Monitoring Parameters and Standards

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

### 4.5.1 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 ambient air quality monitoring was conducted during winter season in the month of January 2022.

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

Selection of Sampling Locations:

The baseline status of the ambient air quality has been assessed through a scientifically designed 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.

Frequency and Parameters for Sampling

High volume 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 on the basis of 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 -27below 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 table below

*Table 26:Techniques Used for Ambient Air Quality Monitoring*

| Sl. | 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$^3$) |

The ambient air quality of 2 locations taken from CPCB report (https://cpcb.nic.in/displaypdf.php?id=bWFudWFsLW1vbml0b3JpbmcvTG9jYXRpb25fZGF0YV8yMDIxLnBkZg==) as shown in table below near 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 table below:

*Table 27: Techniques Used for Ambient Air Quality Monitoring*

| Sl. | 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 |

*Table 28:Air Quality Monitoring Locations by CPCB*

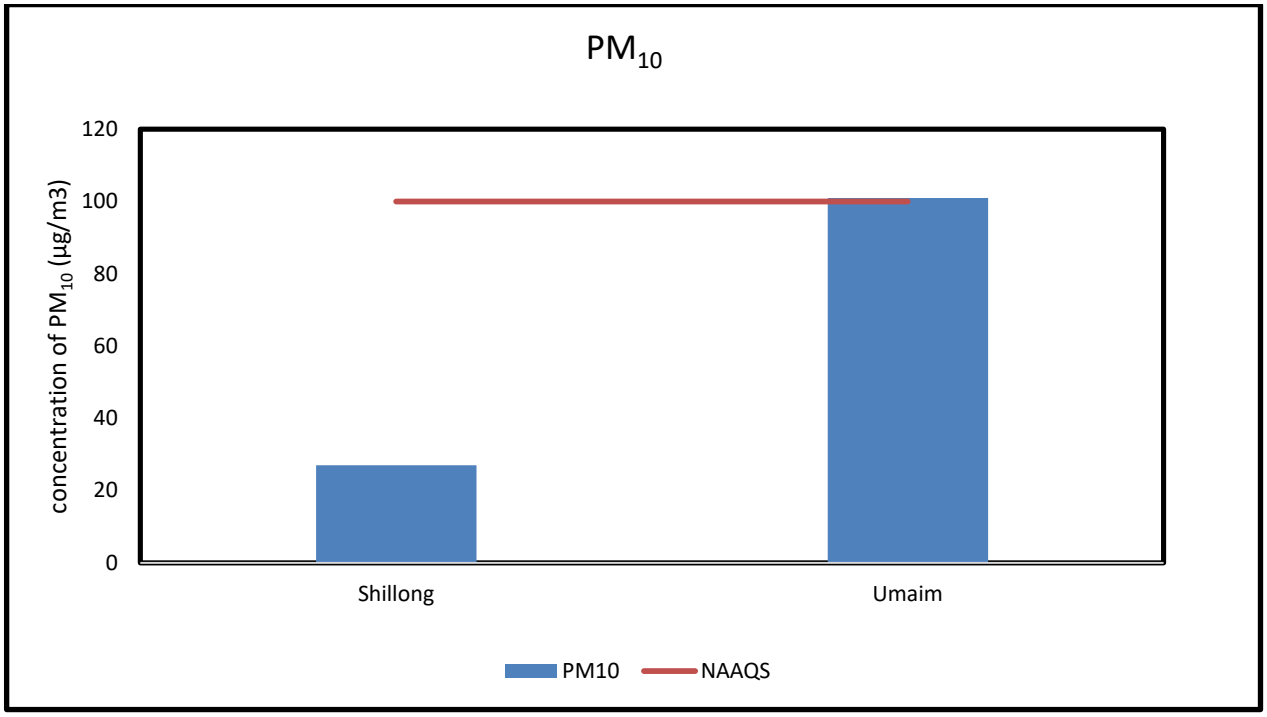
| Sl. | Name of place | Distance (Km) | Coordinates | |
|---|---|---|---|---|
| | | | Latitude | Longitude |
| 1 | Shillong | 18.32 | 25°34'43.11"N | 91°53'35.54"E |
| 2 | Umaim | 8.48 | 25°40'36.47"N | 91°55'37.25"E |

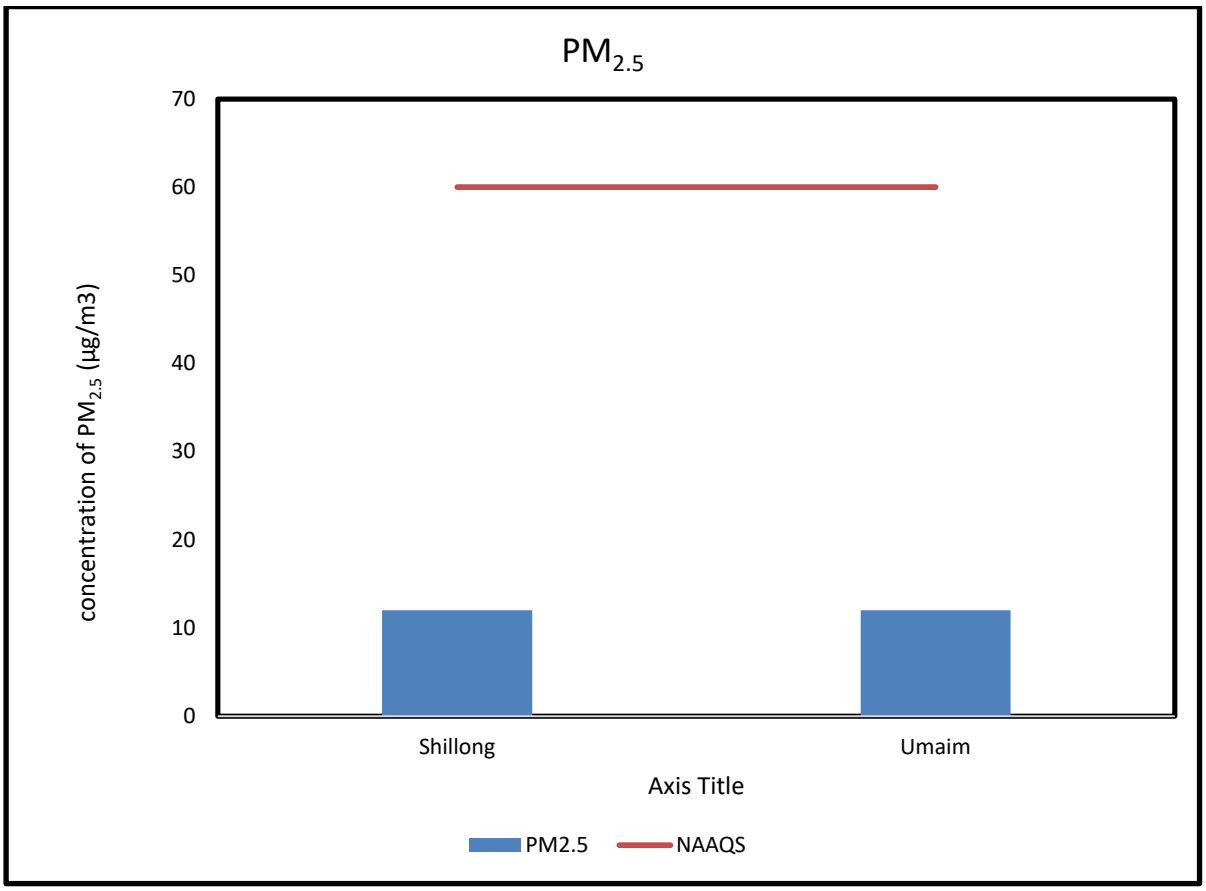
Ambient air quality data for $PM_{2.5}$, $PM_{10}$, $SO_2$, $NO_X$, and CO concentrations are given below. The values are compared with National Ambient Air Quality Standards prescribed by Central Pollution Control Board (CPCB).

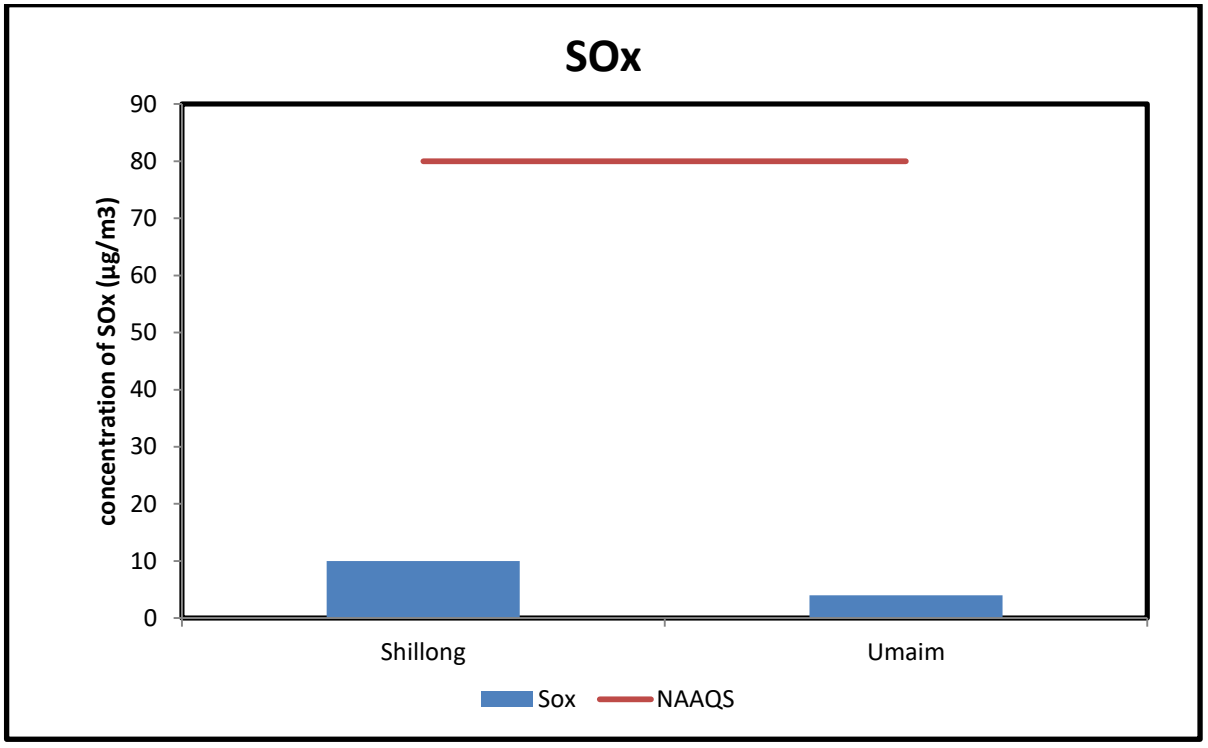
*Table 29: Ambient Air Quality Results*

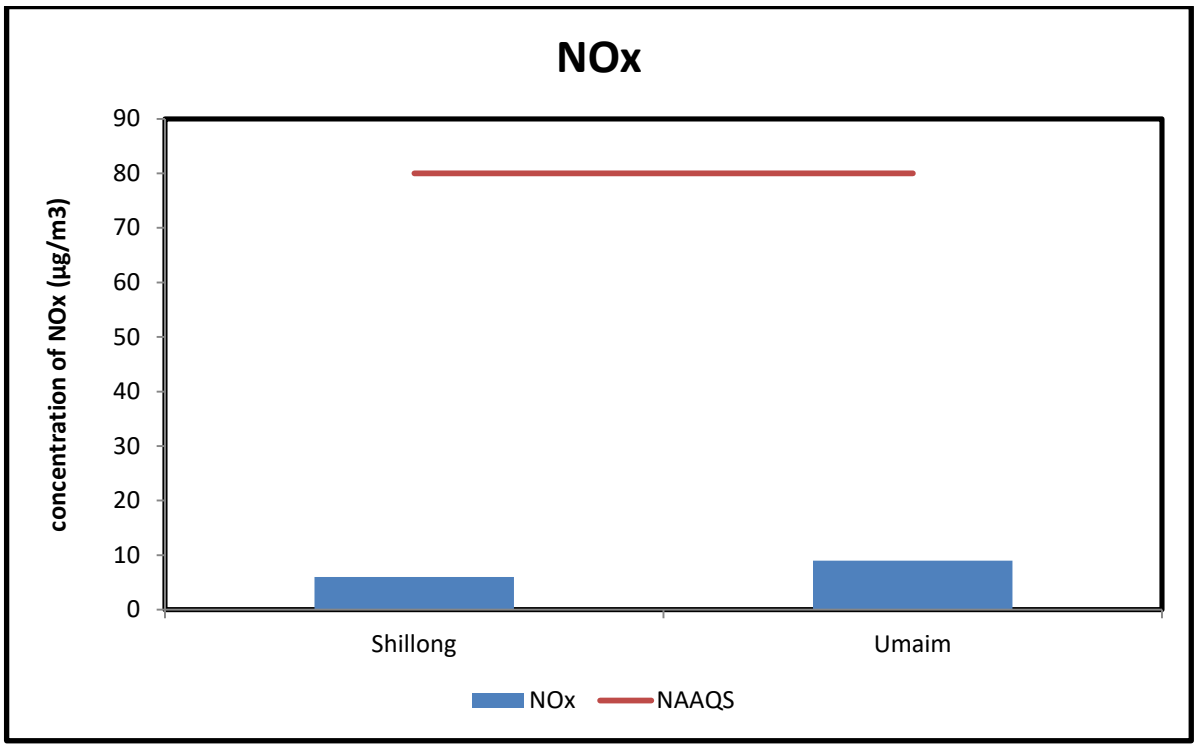
| Sl. | Location | Particulate Matter ($PM_{10}$) | Particulate Matter ($PM_{2.5}$) | Sulphur Dioxide | Nitrogen Dioxide |
|---|---|---|---|---|---|
| 1 | Shillong | 27 | 12 | 10 | 6 |
| 2 | Umaim | 101 | 12 | 4 | 9 |


*Figure 22: Air Quality Monitoring locations*




PM2.5
70
60
50
40
30
20
10
0
concentration of PM2.5 (µg/m3)
Shillong
Umaim
Axis Title
PM2.5
NAAQS


SOx
90
80
70
60
50
40
30
20
10
0
concentration of SOx (µg/m3)
Shillong
Umaim
Sox
NAAQS




Concentration of $PM_{10}$ varies from 27 to 101 µg/m3 and in Umiam its slightly exceeding the permissible limit at the location Umaim.

Concentration of $PM_{2.5}$ is 12 µg/m3 in both the locations and it is well within the permissible limit.

Concentrations of $SO_2$ and $NO_2$ are within the NAAQS permissible limit.

## 4.6 Noise Environment:

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 designed to 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;

Noise levels at night in residential areas are deemed unacceptable due to the potential for sleep disturbance. The acceptability of noise is also influenced by the location of the noise source concerning noise-sensitive land-use, as it determines both the loudness and duration 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 construction work 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 data collected from Nongpoh – Umden - Sonapur road. 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 seconds over 10 minutes per hour for 24 hr. The day noise level has been monitored from7 AM to 10 PM and night levels from 10 P.M. to 7 AM at 2 locations. The Details of the monitoring locations are given in Table 30:Noise Monitoring locations. Day and night-time Leq 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 baseline noise 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 30:Noise Monitoring locations***

| Sampling Location | Name of place | Date of Sampling | Distance | Coordinates | |
|---|---|---|---|---|---|
| | | | | Latitude | Longitude |
| 1 | Borgang | 03.02.2022-07.02.2022 | 1.60 | 25°53'27.67" | 91°55'8.30" |
| 2 | Jowe | 03.02.2022-07.02.2022 | 42.06 | 25°59'21.51" | 91°59'25.20" |

Source: Environmental Monitoring Report done for Nongpoh- Umden- Sonapur Road

| Sampling Location | Nameof place | Coordinates | |
|---|---|---|---|
| | | Latitude | Longitude |
| 1 | Near Start Point | 25°44'40.62"N | 91°53'16.41"E |
| 2 | Mawhati Pdeng Post Office | 25°49'7.31"N | 92° 5'6.08"E |
| 3 | Laphew Diengrian | 25°49'7.31"N | 92° 5'6.08"E |
| 4 | Near End Point | 25°49'7.31"N | 92° 5'6.08"E |
| Source: Mobile app data collected during site visit | | | |


Figure 23:Noise Monitoringlocations near the project road

*Table 31:Day and Night Time Leq*

| Sl. No | Location | Average Noise Level in dB | |
|---|---|---|---|
| | | DayTime | NightTime |
| 1 | Borgang | 49.9 | 38.3 |
| 2 | Jowe | 49.1 | 37.8 |
| 3 | Near Start Point | 64.3 | 56.8 |
| 4 | Mawhati Pdeng Post Office | 61.4 | 56.2 |
| 5 | Laphew Diengrian | 50.6 | 46.2 |
| 6 | Near End point | 75.1 | 68.7 |

It can be seen from Table 31 that at all the monitoring locations, the ambient noise levels are well within the permissible limits prescribed by CPCB except slightly higher value near start point, at post office and near the end point, as those location are commercial area or important junctions.

## Biological Environment:

Meghalaya falls under the Indo-Myanmar Biodiversity Hotspot zone.

This area is neither coming under any type of Protected Forest nor Reserve Forest. There is no Protected Area (National Park, Wildlife Sanctuary and Biosphere Reserve) located within 10 km radius of the project site. As per site inspection, the common species of flora and fauna available are provided below.

**Table 32:List of Fauna**

| MAMMALS | SCIENTIFICNAME |
|---|---|
| Asian Elephant | Elephasmaximus |
| Common Tree Shrew | Tupaiabelangeri |
| Bengal Slow Loris | Nyctcebusbengalensis |
| Assamese Macaque | Macacaassamensis |
| Capped Langur | Trachypithecuspileatus |
| Lesser Bandicoot Rat | Bandicotabengalensis |
| Indian Flying Fox | Pteropusgiganteus |
| AVI-FAUNA | |
| Grey Sibia | Heterophasiagracilis |
| Dark-rumped Swift | Apus acuticauda |
| Tawny-breasted Wren Babbler | Spelaeornislongicaudatus |
| White-naped Yuhina | Yuhinabakeri |
| Black-browed Leaf-Warbler | Phylloscopuscantator |

**Table 33:List of Flora**

| Common / Local Name | Scientific Name |
|---|---|
| Shorearobusta | Sal,Sakhu |
| Mesuaferrea | Diengngai,Nahar |
| Myricaesculenta | Boxmyrtle, Dieng Sohphi |
| Prunuscerasoides | Wild Himalayan Cherry |
| Betulaalnoides | Diengling |
| Tectonagrandis | Teak,Segun |
| Pinuskesiya | Khasipine |
| Lagerstroemiaspp | Ajhow,Jarul,Sida |
| Micheliaspp | Champ,Sopa,Titachap |
| Bombaxceiba | Semul |
| TerminaliaMyriocarpa | Hollock |
| Gmelinaarborea | Gamari(StateTree) |
| Xyliaxylocarpa | NA |
| AlbiziaSpp | Hiraru, Moroi, Mog ,Kako, Sundi, Saw, Harish |
| Toonaciliata | Poma |
| Terminaliaspp. | Bahera, Bhomda |
| Schimawallichii | Makrisal, Nagaplu |
| Cinnamomumspp. | |
| Castanopsisindica | Hingori |
| Syzigiumjambosa | jamoon |
| Artocarpus | Sam, Champ, Kathal |
| Quercusspp. | Oak |
| Chukrasiatabularis | Chuma, Dieng Dkharbti |

**Heritage Trees:**

There are a range of criteria that designate a tree as a heritage tree. These attributes—both material and non-material—makes 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 risk of being lost. The non-material criteria relate to cultural and aesthetic aspects. It could be that the tree has a historical or cultural association either with a person, 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 is being carried out with field officials from the local forest department to prepare the detailed inventory and marking of the trees to be cut. During the joint inspection, if any endangered and or protected species of flora are found within the formation width of the subproject road, necessary mitigation measures will be 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.

### 4.6.1 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 34**: Sensitive receptors along the project road. A total number of 11 educational institutions are located along the ROW. No health care centre was found within the project core zone which is 500m either side of the road.

*Table 34: Sensitive receptors along the project road*

| Name of the Component | Description | Distance from the road (m) |
|---|---|---|
| PO | Post Office | 6.93 |
| SCH | School | 4.96 |
| OFC | Office | 20.87 |
| CHC | Church | 5.85 |
| SCH | School | 2.99 |
| SCH | School | 3.91 |

## 4.7 Socio-Economic and Health Environment

The project road falls under Ri – Bhoi districts of Meghalaya state.

## 4.8 Social Environment

### 4.8.1 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 15,657sq.kmin theStateonly1,027.20 sq. km is under the control of State Forest Department, which constitutesonly4.58%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 ESIA Study Proposal of Roads lies under West Khasi, Ri - Bhoi, South West Khasi, Jaintia, East Garo Hills respectively.

### 4.8.2 District Profile:

Ri - Bhoi District came into existence and assumed the hierarchical status of the District on the 4th June 1992 by upgrading the former Civil Sub-Division. The District was carved out from the erstwhile East Khasi Hills District and lies between North Latitudes 25º15‟ and 26º15‟ and between East Longitudes 91º 45‟ and 92º 15‟. It geographically comprises parts of the Khasi kingdoms viz parts of Mylliem Syiemship, Khyrim Syiemship, Nongspung Syiemship, Nongkhlaw Syiemship, whole of Nongpoh Sirdarship (erstwhile Nongpoh Syiemship), MyrdonSirdarship and the erstwhile Nongwah Syiemship.

Presently, Nongwah Syiemship is one of the missing Khasi States that calls for restoration both administratively and territorially. Presently, the District is bounded on the North by the Kamrup, Morigoan and Nagoan Districts of Assam, on the East by the Karbi Anglong District of Assam, on the South by EastKhasi Hills & West Khasi Hills Districts and on the West by the West Khasi District. Nongpoh is the District headquarter and as well as that of Nongpoh Sirdarship. Ri Bhoi District encompasses an area of 2448.00 sq.km, excluding the geographical areas under the former Nongwah Syiemship and other locations categorized as "Areas of Differences" between Assam and Meghalaya. Nongpoh is near to the two major cities of Shillong and Guwahati and hence is an easy to reach place. It is located at 53 km away from the Shillong and 50 km from Guwahati.

### 4.8.3 Demographic Profile

Out of total population of Meghalaya, 54.75% people live in urban regions. The district occupies an area of 2378 km² and has a population of 258,840 (as of 2011). As of 2011 it is the second least populous district of Meghalaya.

*Table 35: Demographic Profile of Ri - Bhoi District*

| Description | 2011 | 2001 |
|---|---|---|
| Total Population | 258840 | 192790 |
| Male | 132531 | 99319 |
| Female | 126309 | 93471 |
| Population Growth | 0.3426 | 0.5143 |
| AreaSq.Km | 2448 | 2448 |
| Density / Km2 | 106 | 79 |
| Proportionto Meghalaya Population | 0.0872 | 0.0831 |
| Sex Ratio(Per1000) Males | 953 | 941 |
| Average Literacy | 75.67 | 65.73 |
| Male Literacy | 76.79 | 68.81 |
| Female Literacy | 74.49 | 62.43 |
| No. of Blocks | 4 | NA |
| No.of Villages | 579 | NA |

Source: 2011

As per 2011, 49.18% population of Ri - Bhoi district lives in rural areas of villages. The total Ri - Bhoi district population living in urban areas is 233587 of which males and females are 13826 and 11427 respectively. In rural areas of Ri - Bhoi district, sex ratio is 968 females per 1000 males.

*Table 36: Distribution of Rural and Urban Population*

| Description | Urban | Rural |
|---|---|---|
| Population(%) | 54.75% | 49.18% |
| Total Population | 25253 | 233587 |
| Male Population | 13826 | 118705 |
| Female Population | 11427 | 114882 |
| Sex Ratio | 826 | 968 |

Source: 2011 census.

### 4.8.4 Schedule Castes and Schedule Tribes

The social stratification of the project area shows a Schedule Tribe population with 88% households. The area's second social grouping stratum is the Schedule caste population, which is 0.25%.

### 4.8.5 Literacy Rate

The literacy rate in the district of Ri - Bhoi is 60.21%, whereas the literacy rate in the PIA is

around 67.37%. The respective male and female literacy rate is 61.10% and 59.28% in the district of Ri - Bhoi, whereas resembles 50.21% and 51.2% in the PIA.

### 4.8.6 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 linkages are 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 occupationalpatternoflabourforceandstatusofemploymenttoanalysethedevelopmentinthe state.

### 4.8.7 Economic Development

Meghalaya has predominantly an agrarian economy with a significant commercial forestry industry.Meghalaya'sgrossstate domestic product for 2012 was estimated at 16,173 crore (US$2.5billion) in current prices. The state is geologically rich in minerals. The state has about 1,170km of national highways. It is also a major logistical centre for trade with Bangladesh. Meghalaya has an ideal location advantage for South East Asia Market. The neighbouring countries of India viz Bhutan, Bangladesh, Myanmar has been involved with the state for business and commerce. It has a huge potential to reach other South Asian countries as well. Meghalaya is also geographically rich in minerals and has the potential for industrial setups based on these mineral resources. Above all the Meghalaya Industrial Policy is framed for the ease of doing business and increase trade and commerce. The added advantage being the climate in Meghalaya is good for the development of electronics chips.

Different types of Industry that can be ideally formed in the state are Mineral based Industry, Horticulture and Agro-Based Industry, Electronics and Information Technology, Export Oriented Units, Tourism and besides these the recent development in the state has seen many upcoming service sectors on customer service, real estate’s etc. The State Government also provides various types of Central and State Incentives for the established Industrial Setups which includes Transport Subsidy, Income Tax Exemption, Excise Exemption, Capital Investment Subsidy, Special Incentives for Food Processing, Subsidy on Comprehensive Insurance, Power Subsidy, Subsidy on Power Line (33 K.V. and above),Employment Subsidy, Refund of Central Sales Tax. Meghalaya is coming up with 150 LPM(Litres Per Minute)Oxygen Plant at Nongpoh Civil Hospital in RiBhoi district.

### 4.8.8 Road Network

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

### 4.8.9 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 connecting the north-east region with the rest of the country through a broad-gauge track network.

### 4.8.10 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 Turabecameoperationalin 2008. Other nearbyairports are in Assam, Borjhar,Guwahatiairport, about 124 kilometres (77 mi) from Shillong. Newly operational Rupsi Airport is also near to Tura.

### 4.8.11 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, only some horticultural crops, like pineapple, areca nut, banana, etc., are cultivated in the Watershed area.

Most forest species were extinct or not seen in the areas due to repeated jhumming. However, forest species like Shorea robusta, Artocarpus heterophyllus, Albizzia species, Bahaunia variegetta etc. are seen in the Watershed Area.

### 4.8.12 Animal Husbandry

Animal husbandry and Agriculture are related to the overall socio–economic conditions of the rural tribal people of Meghalaya. Animal husbandry plays a significant role in the comprehensive farming system of the state. The state's total livestock and poultry populations are 15.51 lakhs and 28.20 lakhs, respectively, 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 inferior due to stunted growth and low production of local breeds of livestock and poultry, a non-scientific approach to livestock and poultry farming

### 4.8.13 Fishery

The PIA has a 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 a maximum of 20% of the total area of pond/mini barrages of the state, followed by 10.2, 9.23 and 2.46% in reservoirs, rivers, and bells, lakes, respectively. Nevertheless, there is still no contribution to the state in terms of paddy cum fish culture from the district. However, its proven technology scope and the potential of ornamental fish (Puntius bartissp) could be more satisfactory.

### 4.8.14 Hospitals

The PIA has 1 hospital, 2 dispensaries, 8 primary health centres, 3 community health centres, 27 sub-centres, 1 leprosy control unit, 1 set-to centre, 1 ayurvedic dispensary and 3 homoeopathic 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.

## 5.1 Environmental Impacts and Mitigation Measures

The assessment of potential environmental impact consists of comparing the expected changes in the environment with or without the project. The analysis predicts the nature and significance of the expected impacts. The detail 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 on hill and rolling terrain the adjacent land to the project road is hilly with vegetation and few agricultural lands has been observed.. 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 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 SPCBLPG should be used in the labour camps for cooking purposes instead of wood.

#### *5.1.1.3 Felling of Trees*

From the primary survey, 439 no. of tree felling was initially anticipated due to widening of highway. Later, it was decided to limit the expansion within the existing ROW only. Therefore, no tree felling will be done. The project road is not passing through any reserved or protected forest. 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 is located in any Eco-sensitive zone. Further no movement of wild animals has been reported near 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 engineering designs and through the contract during construction practices.

The standard road construction works involve are 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 equipment's, 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 during construction 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 Silts with small amounts of Clay having low to medium plasticity. These soils are light textured and are thus prone to erosion by winds and during rain and consequent slides can occur due to hilly slopes of the area. 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 construction of 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. Erosion protection measures identified to be undertaken in specific road sections are specified below:

**Table 37: Summary of Gabion walls-LHS**

| Sl. | From | To | Length (m) | Height (m) |
|---|---|---|---|---|
| 1 | 22+220 | 22+230 | 10 | 2.00 |
| 2 | 30+800 | 30+810 | 10 | 6.00 |
| 3 | 30+930 | 30+940 | 10 | 2.50 |
| 4 | 31+030 | 31+040 | 10 | 2.50 |
| 5 | 31+110 | 31+120 | 10 | 3.00 |
| 6 | 31+310 | 31+320 | 10 | 3.00 |
| 7 | 31+500 | 31+510 | 10 | 2.00 |
| 8 | 31+510 | 31+520 | 10 | 3.50 |
| 9 | 31+520 | 31+530 | 10 | 2.00 |

| Sl. | From | To | Length (m) | Height (m) |
|---|---|---|---|---|
| 10 | 32+780 | 32+790 | 10 | 2.50 |
| 11 | 34+670 | 34+690 | 20 | 1 |
| 12 | 34+720 | 34+740 | 20 | 1.2 |
| 13 | 34+870 | 34+890 | 20 | 1.2 |
| 14 | 34+890 | 34+900 | 10 | 1 |
| 15 | 35+000 | 35+010 | 10 | 2.50 |
| 16 | 35+010 | 35+020 | 10 | 2.50 |
| 17 | 35+020 | 35+030 | 10 | 1 |
| 18 | 35+220 | 35+240 | 20 | 1 |
| 19 | 35+430 | 35+440 | 10 | 1 |
| 20 | 35+560 | 35+580 | 20 | 1.2 |
| 21 | 35+870 | 35+880 | 10 | 1 |
| 22 | 36+200 | 36+210 | 10 | 3.00 |
| 23 | 36+240 | 36+250 | 10 | 2.50 |
| 24 | 36+330 | 36+340 | 10 | 2.50 |
| 25 | 36+450 | 36+470 | 20 | 3.00 |
| 26 | 36+760 | 36+800 | 40 | 3.50 |
| 27 | 36+810 | 36+820 | 10 | 1.2 |
| 28 | 36+900 | 36+910 | 10 | 2.50 |
| 29 | 36+930 | 36+940 | 10 | 1.2 |
| 30 | 37+100 | 37+110 | 10 | 2.50 |
| 31 | 37+190 | 37+200 | 10 | 2.50 |
| 32 | 37+550 | 37+560 | 10 | 2.50 |
| 33 | 37+650 | 37+660 | 10 | 3.50 |
| 34 | 37+820 | 37+830 | 10 | 1.2 |
| 35 | 38+110 | 38+120 | 10 | 2.50 |
| 36 | 38+200 | 38+210 | 10 | 1 |
| 37 | 38+260 | 38+270 | 10 | 1.5 |
| 38 | 38+300 | 38+320 | 20 | 4.50 |

| Sl. | From | To | Length (m) | Height (m) |
|---|---|---|---|---|
| 39 | 38+340 | 38+370 | 30 | 5.00 |
| 40 | 38+540 | 38+550 | 10 | 1.5 |
| 41 | 38+620 | 38+630 | 10 | 1.5 |
| 42 | 38+720 | 38+730 | 10 | 4.00 |
| 43 | 38+780 | 38+790 | 10 | 2.50 |
| 44 | 38+860 | 38+880 | 20 | 2.50 |
| 45 | 38+920 | 38+950 | 30 | 3.50 |
| 46 | 39+270 | 39+300 | 30 | 2.50 |
| 47 | 39+140 | 39+150 | 10 | 1.2 |
| 48 | 39+910 | 39+940 | 30 | 2.50 |
| Total Length | | | 670 | |

**Table 38:Summary of Gabion walls-RHS**

| Sl. | From | To | Length (m) | Height (m) |
|---|---|---|---|---|
| 1 | 1+720 | 1+730 | 10 | 7.00 |
| 2 | 1+840 | 1+850 | 10 | 6.00 |
| 3 | 9+840 | 9+850 | 10 | 4.50 |
| 4 | 10+620 | 10+630 | 10 | 5.00 |
| 5 | 11+360 | 11+370 | 10 | 3.00 |
| 6 | 11+380 | 11+390 | 10 | 4.00 |
| 7 | 11+430 | 11+440 | 10 | 3.00 |
| 8 | 11+650 | 11+660 | 10 | 3.00 |
| 9 | 16+020 | 16+030 | 10 | 2.50 |
| 10 | 19+330 | 19+340 | 10 | 2.50 |
| 11 | 25+670 | 25+680 | 10 | 2.50 |
| 12 | 25+680 | 25+690 | 10 | 2.50 |
| 13 | 26+200 | 26+210 | 10 | 2.00 |
| 14 | 26+480 | 26+490 | 10 | 3.00 |
| Total Length | | | 140 | |

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

*Table 39: Summary of Breast walls-LHS*

| Sl. | Chainage | Length(m) | Height(m) |
|---|---|---|---|
| 1 | 0+390 | 10 | 2.5 |
| 2 | 1+800 | 10 | 1.8 |
| 3 | 1+810 | 10 | 1.7 |
| 4 | 4+760 | 10 | 2 |
| 5 | 8+650 | 10 | 2.5 |
| 6 | 10+350 | 10 | 1.8 |
| 7 | 10+360 | 10 | 2.5 |
| 8 | 10+780 | 10 | 1.8 |
| 9 | 10+950 | 10 | 2 |
| 10 | 11+030 | 10 | 1.5 |
| 11 | 11+040 | 10 | 1.5 |
| 12 | 15+910 | 10 | 2.5 |
| 13 | 15+920 | 10 | 2.5 |
| 14 | 15+930 | 10 | 1.7 |
| 15 | 15+980 | 10 | 2.5 |
| 16 | 15+990 | 10 | 2.5 |
| 17 | 16+420 | 10 | 1.8 |
| 18 | 18+070 | 10 | 2 |
| 19 | 18+310 | 10 | 1.5 |
| 20 | 18+800 | 10 | 2 |
| 21 | 18+900 | 10 | 1.8 |
| 22 | 19+840 | 10 | 3 |
| 23 | 20+220 | 10 | 3 |
| 24 | 20+530 | 10 | 2 |
| 25 | 22+540 | 10 | 2 |

| Sl. | Chainage | Length(m) | Height(m) |
|---|---|---|---|
| 26 | 23+560 | 10 | 1.6 |
| 27 | 23+570 | 10 | 1.5 |
| 28 | 23+580 | 10 | 1.5 |
| 29 | 23+750 | 10 | 2 |
| 30 | 24+880 | 10 | 3 |
| 31 | 25+400 | 10 | 2 |
| 32 | 25+410 | 10 | 1.7 |
| 33 | 25+420 | 10 | 1.8 |
| 34 | 25+440 | 10 | 3 |
| 35 | 25+580 | 10 | 1.5 |
| 36 | 26+280 | 10 | 3 |
| 37 | 26+470 | 10 | 3 |
| Total Length | | 370 | |

*Table 40:Summary of Breast walls-RHS*

| Sl. | Chainage | Length(m) | Height(m) |
|---|---|---|---|
| 1 | 14+190 | 10 | 2 |
| 2 | 15+080 | 10 | 2.5 |
| 3 | 21+460 | 10 | 1.9 |
| 4 | 22+540 | 10 | 2 |
| 5 | 30+600 | 10 | 3 |
| 6 | 30+840 | 10 | 2.5 |
| 7 | 30+850 | 10 | 2.5 |
| 8 | 30+860 | 10 | 2.8 |
| 9 | 31+060 | 10 | 2.5 |
| 10 | 31+070 | 10 | 2.8 |
| 11 | 31+290 | 10 | 3 |
| 12 | 31+300 | 10 | 3.5 |
| 13 | 33+520 | 10 | 2.1 |
| 14 | 33+530 | 10 | 3.5 |
| 15 | 35+130 | 10 | 3 |
| 16 | 36+250 | 10 | 2.5 |

| Sl. | Chainage | Length(m) | Height(m) |
|---|---|---|---|
| 17 | 36+310 | 10 | 3 |
| 18 | 36+890 | 10 | 2.5 |
| 19 | 37+220 | 10 | 2.5 |
| 20 | 39+040 | 10 | 3 |
| 21 | 39+760 | 10 | 2.5 |
| 22 | 39+770 | 10 | 2.5 |
| Total Length | | 220 | |

Toe wall is provided at edge of valley side of the project road where the existing slope does not allow construction of embankment and the average height is less than 1.0 m. The details of the Toe wall is given below

*Table 41: Summary of Toe walls-LHS*

| Sl. | Chainage | Length(m) |
|---|---|---|
| 1 | 1+950 | 10 |
| 2 | 1+960 | 10 |
| 3 | 2+130 | 10 |
| 4 | 2+910 | 10 |
| 5 | 9+850 | 10 |
| 6 | 13+710 | 10 |
| 7 | 13+980 | 10 |
| 8 | 14+160 | 10 |
| 9 | 14+280 | 10 |
| 10 | 15+210 | 10 |
| 11 | 22+230 | 10 |
| 12 | 27+890 | 10 |
| 13 | 27+910 | 10 |
| 14 | 27+970 | 10 |
| 15 | 28+770 | 10 |
| 16 | 30+640 | 10 |
| 17 | 30+930 | 10 |
| 18 | 31+210 | 10 |
| 19 | 31+220 | 10 |
| 20 | 31+290 | 10 |
| 21 | 33+810 | 10 |
| 22 | 33+820 | 10 |

| Sl. | Chainage | Length(m) |
|---|---|---|
| Total Length | | 220 |

*Table 42: Summary of Toe walls-RHS*

| Sl. | Chainage | Length(m) | | Sl.No | Chainage | Length(m) |
|---|---|---|---|---|---|---|
| 1 | 0+710 | 10 | | 25 | 11+090 | 10 |
| 2 | 0+750 | 10 | | 26 | 11+390 | 10 |
| 3 | 0+960 | 10 | | 27 | 11+440 | 10 |
| 4 | 1+060 | 10 | | 28 | 11+720 | 10 |
| 5 | 1+550 | 10 | | 29 | 11+790 | 10 |
| 6 | 1+620 | 10 | | 30 | 15+950 | 10 |
| 7 | 1+630 | 10 | | 31 | 18+830 | 10 |
| 8 | 1+700 | 10 | | 32 | 19+280 | 10 |
| 9 | 1+750 | 10 | | 33 | 19+530 | 10 |
| 10 | 1+800 | 10 | | 34 | 19+740 | 10 |
| 11 | 1+810 | 10 | | 35 | 19+900 | 10 |
| 12 | 1+830 | 10 | | 36 | 20+200 | 10 |
| 13 | 2+920 | 10 | | 37 | 20+390 | 10 |
| 14 | 3+320 | 10 | | 38 | 20+460 | 10 |
| 15 | 4+580 | 10 | | 39 | 23+990 | 10 |
| 16 | 5+390 | 10 | | 40 | 24+000 | 10 |
| 17 | 5+400 | 10 | | 41 | 24+730 | 10 |
| 18 | 6+300 | 10 | | 42 | 24+740 | 10 |
| 19 | 7+010 | 10 | | 43 | 25+700 | 10 |
| 20 | 7+020 | 10 | | 44 | 25+840 | 10 |
| 21 | 9+720 | 10 | | 45 | 26+200 | 10 |
| 22 | 10+370 | 10 | | 46 | 26+210 | 10 |
| 23 | 10+720 | 10 | | 47 | 26+500 | 10 |
| 24 | 11+010 | 10 | | 48 | 28+320 | 10 |
| Total Length | | | | 480m | | |

In addition to the above retaining structures, slope protection measures are provided in the form of Hydro seeding to protect the hill slope with soft and highly weathered rock and shotcrete has been proposed along the land slide areas in order to reduce the erosive forces and ensure long-term stability of slopes.

| | |
|---|---|
| Hydro Seeding | Shotcrete Crib wall with Vegetation |

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 (Chruch, community forest) which is traditionally used as conservation areas

Land Types Preferred:

– Waste lands.

– Owners view the Waste Lands as a source of income when used temporarily.

– 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*

A total number of 3 borrow areas have been identified around project road, two of them are at a distance of 1 Km and 5 of them are on road and one is at a distance of 2Km from the road. For meeting the required quantity of sand for construction, one sand quarry is available around the project area, which is located in Untro River and Kynsi River. Details of quarry is given in Section **Error! Reference source not found.**.

***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. Written clearance 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 borrowed.

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 is to be regulated so that the sides shall not be steeper than 25%. 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.

The adverse impacts on air quality during construction stage are classified and presented in the table below. There are two types of pollution i.e. dust pollution and pollution from harmful gases.

*Table 43: Adverse impacts on air quality during construction stage*

| Sl. | 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 latter is 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 paving equipment |
| | | The movement of heavy machinery, oil tankers etc. |
| | | Toxic gases released through the heating process during bitumen production |
| | | 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 water fogging 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 prescribed by 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 needs 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 per regulations (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 44: Impact on Air Environment and Mitigation Measures*

| Parameters | Potential Impact | Mitigation Measures Suggested |
|---|---|---|
| **Air Environment** | Generation of dust | Sprinkling of water<br>Earth handling site<br>Borrow area<br>Road construction site<br>Access road route<br>Air pollution control at crusher and Plants<br>PPE for Workers<br>Stone crushing units and Plants should be with environment compliance.<br>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. |

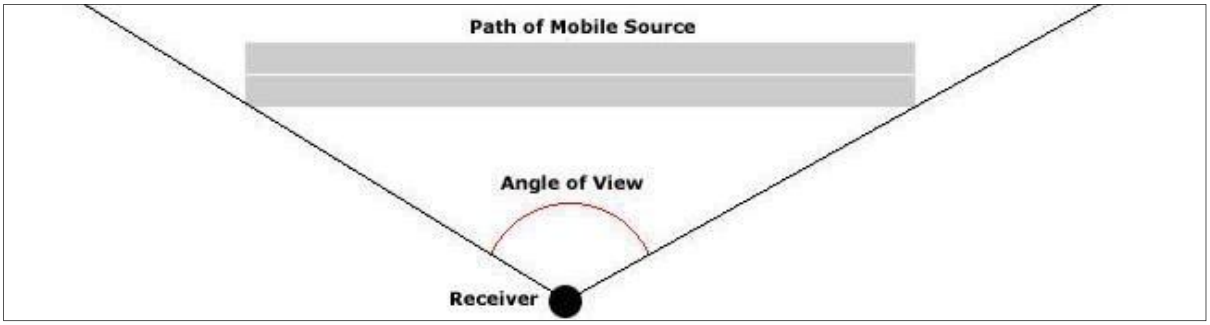
#### *5.1.2.5 Noise*

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). The tool 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 45:Typical noise levels of principal construction equipment (Noise Level in dB (A) at 50 Feet***

| ID | Type | Noise pressure (dB), 1m from the 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 excavator | 113 | | | | 20 | 90 | | | 76 |
| 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 |

| ID | Type | Noise pressure (dB), 1m from the 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 | | | | | | | | | | 79 |
| Tipping Fill | | | | | | | | | | |
| 1 | Dump Truck | 110 | 50 | None | None | 100 | 90 | 10 | 10 | 57 |
| Total noise from site at receiver | | | | | | | | | | 57 |
| 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 leveling | | | | | | | | | | |
| 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 |
| 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 |

| ID | Type | Noise pressure (dB), 1m from the source | Distance (m) | Barrier | Reflection | On Time (%) | Angle of View ($^0$) | Traffic Volume / hour | Speed (km/hr) | Total (dB(A)) |
|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 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 the source plant and the receiver – considered as 50m.

On Time (%): The percentage of time (of the overall time period in question) for which this plant is on.

Barrier: If there is a barrier between the source and the receiver (None - To reflect the 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 kilometers 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 are 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 of equipment, 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 transmitted along the ground. This may cause damage to kutcha structure located along the alignment. The extent 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 the population 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

***Table 46: Anticipated Noise due to construction in the sensitive receptor***

| Name of the Component | Description | Distance from the road (m) | Noise Level (dB) |
|---|---|---|---|
| PO | Post Office | 6.93 | 88.16 |
| SCH | School | 4.96 | 91.06 |
| OFC | Office | 20.87 | 78.58 |
| CHC | Church | 5.85 | 89.63 |
| SCH | School | 2.99 | 95.46 |
| SCH | School | 3.91 | 93.13 |

From the above study we have observed that the range of noise level at all the locations is exceeding the permissible limit. To avoid the impact, the mitigation measures are mentioned below.

Although all the construction related activities are not expected to occur simultaneously at a given location yet increase in noise due to construction activities (land clearing, site preparation, material/ equipment's /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 per distance requirements computed above 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. Construction activities 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.

***Mitigation Measures:***

In view of above, following mitigation measures are proposed:

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. No such water body has been observed along or near the project road. 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 from existing licensed quarries with all stipulated conditions of above mentioned authorities.

***Mitigation Measure:***

Construction works near waterways/water bodies will not be undertaken during the monsoon season

Retaining walls have been proposed to prevent erosion

Installation of temporary silt traps or sedimentation basins along the drainage leading to the water bodies;

No construction camp within 500m of any water body

All parking, repair, fuel, and hazardous material storage areas will be situated at a distance from any water bodies. Vehicle parking and maintenance areas will have waterproof floors from which drainage is collected and treated to legal standards.

Refueling of vehicles only in dedicated areas with waterproof floors from which drainage flows to an oil/water separator before discharge

Collection of all waste oil, store in sealed damage-proof containers and dispose it to recyclers.

All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual cleanup.

Installation of temporary retention ponds, interception drains, and silt traps to prevent silt laden water from entering adjacent water bodies/waterways;

To prevent the entry of contaminants, the slope of embankments leading to water bodies will be modified and rechanneled. 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 location of the cross-drainage structure. There is no existing Major Bridge on the Project road section only 7 nos. of minor Bridges exist, and No additional bridges are proposed to be constructed. Out of the 239 nos. of existing culverts, 224 nos. are Pipe Culvert, & 15 nos. are Slab culvert. All culverts present in the project road are either hydraulically inadequate or structurally unsafe & hence are proposed widening with rehabilitation.

***Mitigation Measure***

At all locations where the preliminary design has indicated a raise in the level of the embankment, the final design should review the feasibility of the same and if possible, reduce the embankment height.

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 also have 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 near 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-critical or 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 way that the water availability and supply to nearby communities remain unaffected.
- Water harvesting structures shall be proposed for groundwater augmentation in the project 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 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 has been considered in cost estimates. The Contractor will not dispose the excavated unsuitable material generated from hill section 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*

Flash floods are not a common occurrence in this area. Hence, no such mitigation measure is proposed.

#### *5.1.2.11 Disruption of Community Services*

Local services, including water supply lines, irrigation line, drainage, ditches, 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 arrange their own source to cater for their water requirement for construction and other activities and will not interfere with the local water supply 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/ user's 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 up gradation 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 the construction sites

Reduce speed through construction zones.

Construction of bridges/culverts will be carried out prior to construction of new carriageway at the first stage.

Strengthening/raising of existing two lanes will be done only after the completion of the first 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 are always risks 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 throughout the 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 to various 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 all the 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 are required 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 throughout the working period.

Proper utilization of scaffolding is essential and should be ensured.

Avoid entering an unprotected trench to ensure safety.

Avoiding 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-resistant soles

Hazard communication: Make information accessible to employees at all times in a language or formats

Checking of 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:

Most of the project road stretch passes through vegetation area and agricultural land, few built-areas has been observed without any National Parks, Wildlife Sanctuaries and other eco-sensitive areas nearby.

There is hardly presence of any Presence of Endangered/ Schedule - I species in the project area, confirmed by site visit 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 their habitat.

***Mitigation Measure***

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, for every 2 km, on alternate

sides is proposed.

The compensatory plantation shall act as the new habitat for the birds, animals and insects 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 public dependent on these water bodies.

#### *5.1.2.16 Impact on Flora and Mitigation measures:*

The project has no significant, direct and long-term impact on road side vegetation as the alignment will be limited to the existing ROW only. If any tree felling is required during the construction phase, prior permission will be obtained from the respective department only.

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 below tables. Local authority and populace may also be consulted for selection of species types.

All efforts shall be made for the survival of the planted trees. A Memorandum of Understanding should be signed with competent authority or agency to take up the plantation.

*Table 47: Species Recommended for Plantation*

| Scientific Name | Role |
|---|---|
| Azadirachta indica | Noise barrier, Pollution sink, Economic & Medicinal Value |
| Cassia fistula | Landscaping, Flowering plant, Pollution sink |
| Ficus bengalensis | Noise barrier, Pollution sink, Shade, Supports other species, Religious values |
| Ficus religiosa | Noise barrier, Pollution sink, Shade, Supports other species, Religious values |
| Magnifera indica | Noise barrier, Pollution sink, Shed, Economic & Medicinal Value |
| Syzygium cumini | Pollution sink, Economic Value (fruit bearing) |
| Terminalia arjuna | Noise barrier, Pollution sink |
| Terminalia chebula | Noise barrier, Pollution sink, Shed, Economic & Medicinal Value |
| *Alstonia scholaris* | Noise barrier, Pollution sink, Shade, Supports other species |
| Dillenia indica | Noise barrier, Pollution sink, Shed, Economic & Medicinal Value |
| Mimusops elengi | Noise barrier, Pollution sink, Shed, fruit |
| Lagerstroemia speciosa | Landscaping, Flowering plant, Pollution sink |
| Bombax ceiba | Landscaping, Flowering plant, Pollution sink |
| Mesua ferrea | Noise barrier, Pollution sink, Shed, Economic & Medicinal Value |
| Neolamarckia cadamba | Noise barrier, Pollution sink, Shed, Economic & Medicinal Value |

#### *5.1.2.17 Impact on Aquatic Ecology:*

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 labour camps into the surface water bodies. There is no significant impact on aquatic ecology during operation stage as there are no major rivers or water body in the ROW. No negative impacts are envisaged on the aquatic ecology during the operational phase.

***Mitigation measures***

Construction of road embankments shall be done adhering to specified norms as per slope ratio and turfing on the slopes will be done 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 point of time, the contractor shall immediately upon discovery thereof contact authorized wildlife rescuer or Forest Dept. for rescue of 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 procedure such as stopping the flow; removing ignition source; initiating emergency response; clean up and safe disposal will be followed.

Provision for silt traps will be made at regular intervals, especially at major cross drainage structures, to trap the silt before it reaches the water bodies along the subproject road.

#### *5.1.2.18 Management of Construction Debris/ Waste*

Construction debris/waste is generated due to demolition of existing structures, scarification of existing pavement and excavation at some section of the subproject road. 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 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 below the 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 utilized for backfilling embankments, filling pits, construction of cross roads, approach roads and landscaping before being disposed into disposal 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 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.

***Mitigation Measures for Bridge/Culvert Construction Sites***

There is proposal for construction few major and minor bridges along the ROW. None of these bridges are situated on any major river or its tributaries.7 numbers of minor bridges along the project road need to be widened with rehabilitation. All are either seasonal Nullah, Water logged area or Redundant part of old River channel. For rehabilitation of these bridges,

following steps has to be adopted:

Construction will be carried out during lean flow period as far as possible;
All slopes will be stone or brick pitched as per design recommendations;
Silt fencing will be provided at base of embankment of entire water body;
Siltation of soil into water bodies will be prevented;
All solid waste/ construction material will be properly disposed off from bridge sites;
Contractor will ensure that construction material/ solid wastes are not disposed off in water body;
No oil or lubricant will be discharged from construction yard or machinery into water body
The Construction materials will be stored at a minimum distance of 500m from the water body.
To maintain an efficient storm water flow, all drains will be regularly cleaned as part of regular maintenance.

### 5.1.3 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 rural area. 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. The project also provides the opportunities of the restoration of vegetation around the vicinity of the worksite and roads by implementing the compensatory plantation programme, which will not only enhance the aesthetic view but can also help in reclamation of soil. During operational phase this will be enhanced with the activities associated with the maintenance of landscape such as plantation programme, by providing roadside amenities, parks etc.

During the operational phase when the plantation works will be adequately implemented will enhance the aesthetic as well as hygienic environment thereby reducing the chances of diseases due to vehicular emission. 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:

#### *5.1.3.1 Impacts on Water Quality and Resources*

During the operation phase, the possibility of degradation of water quality is very remote. The impact on the surface water quality during operation can be expected due to accidental spillage. 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 monitoring of water quality will be done at selective location of proposed project.

#### *5.1.3.2 Impact on Air Quality*

Vehicular emissions are the principal source of pollution during the operation stage. The subproject road being mostly located in adjacent to open agricultural land, adequate dispersion of gaseous pollutants is expected.

Mitigation Measures:

Implementation of stricter emission norms for the vehicles is the only mitigation measure that will 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.

#### *5.1.3.3 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 newwallupto2m height

Planting creepers to provide aestatic 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.

#### *5.1.3.4 Accidents Involving Hazardous Materials*

Accidents involving hazardous chemicals will generally be catastrophic to the environment, though the probability of occurrence is low. Prevention of an accident involving hazardous material is a better way of minimising the impacts. The provisions mandated by 'The Hazardous Wastes (Management and Handling) rules, 1989' and “Manufacture Storage and import of Hazardous Chemicals Rules” 1989 under the Environmental (Protection) Act, 1986 will be complied with. Vehicles delivering hazardous substances will be printed with appropriate warning signs.

In case of spillage, the report to relevant departments will be made and instructions will be followed in taking up the contingency measures immediately.

## 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 is the inaccessibility during actual construction period. Socio Economic survey was done September, 2021. Due to the pandemic situation the SES / Survey Started from 10$^{th}$ November to 20$^{th}$ December, 2021.As there is no Project Affected Persons (PAPs), Socio - Economic Survey (SES) was conducted on the project beneficiaries or in other words positively impacted persons. The SES was done in September 2021 and also consultation was done from September to December 2021 which are completed for the present design phase. During the socio-economic survey, public consultations were also carried out.

### 5.2.2 Positive Impact

This sub-project aims to reduce traffic congestion within the Umsning-Jagi road. 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 corridor will reduce accident.

People residing at the Umsning - Jagi 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 the scope of land acquisition is insignificant in the project area because most of the proposed sub-projects are well within the available existing ROW. The proposed construction of parking areas is within the available Government land. Thus, there is no impact on the title and/or non-title holders.

### 5.2.4 Impact on Structures

During the survey the would-be impact were enumerated along the proposed developments. Based on the proposed alignment, there will be no impacts of any structures, private or CPRs. The detailed of the structures are depicted in below

*Table 48: Temporary impact of Structure in the Sub-Project*

| Sl. | Type of Ownership | No. of Structures |
|---|---|---|
| 1 | Title Holders | Nil |
| 2 | Non-Titleholders–Encroachers | Nil |
| 3 | Non-Titleholders–Squatters | Nil |
| 4 | BPL Families losing Commercial Properties | Nil |
| 5 | Total Tribal Families | Nil |
| 6 | Vendors affected | Nil |
| 7 | Petty shopkeepers & Kiosk affected | Nil |

Source: Survey, September 2021

### 5.2.5 Impact on Community Structures

There would be no impacts on community or Government (Common Properties Resource) structures in the project corridor.

*Table 49: Loss of CPRs in the Sub-Project*

| Sl. | Summary of CPRs | Numbers |
|---|---|---|
| 1 | Religious structure (specify) | Nil |
| 2 | Well | Nil |
| 3 | Schools/Educational/ Cultural Structures | Nil |
| 4 | Government/Community Structures | Nil |

Source:Survey,September2021

### 5.2.6 Demography of Families

Socioeconomic survey was carried out for 37 sample families with 174 number of total populations. The sample was selected from the positively impacted families at the primary PIA such that there is proportional representation of the socio-economic parameters of the PIA. The sample survey data reveals that average family size of the sample family is (4.7).

### 5.2.7 Family Pattern

Socio-economicsurveyrevealsthatonly14%oftheSurveyedSample Families are Joint in nature.

*Table 50: Family Pattern of Sample Surveyed Families*

| Sl. | Family pattern | Numbers | Percentage |
|---|---|---|---|
| 1 | Joint | 5 | 14% |
| 2 | Nuclear | 32 | 86% |
| **Total** | | **37** | **100%** |

Source: SES Survey, September 2021

### 5.2.8 Religious Stratification

Christianity is the predominant religion in the primary PIA followed by Other Religions. The detail presence of religion in the PIA is depicted in the Table 53.

*Table 51: Religious Stratification of Sample Surveyed Families*

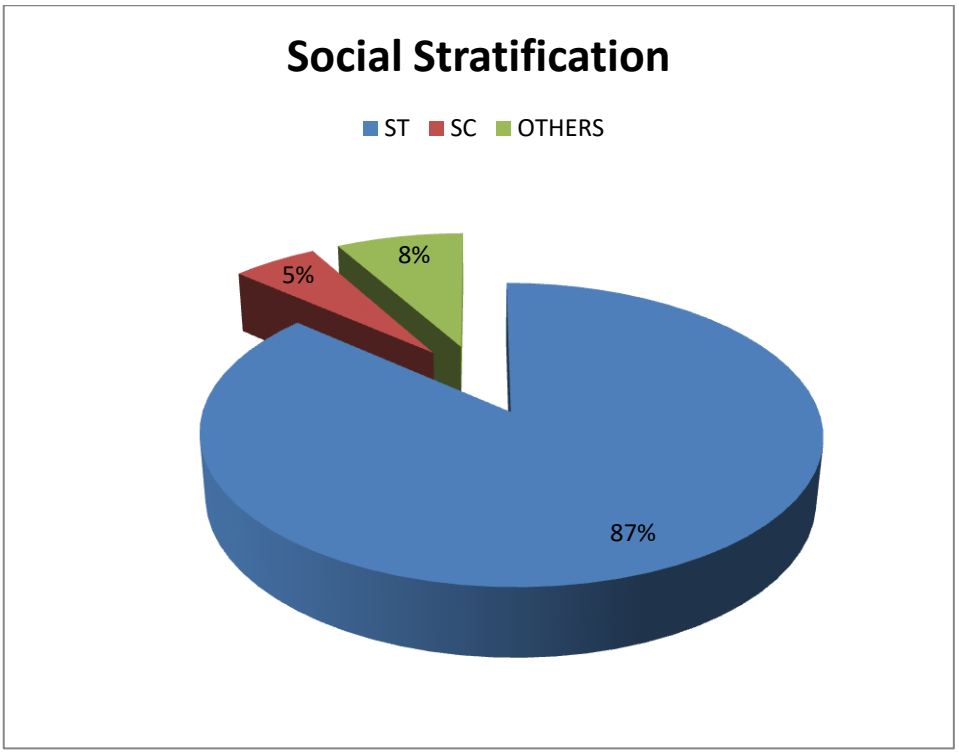
| Sl. | Category | Percentage |
|---|---|---|
| 1 | Christianity | 91.9% |
| 2 | Hindu | 2.7% |
| 3 | Muslims | 2.7% |
| 4 | Others | 2.7% |
| **Total** | | **100%** |

Source: SES Survey, September 2021

### 5.2.9 Social Stratification

The social stratification of the project area shows among sample household dominance of ST population with 87%families followed by other category8%. The third stratum of the social grouping in the PIA is of Schedule Caste comprising of 5%. The detail of social grouping in the project area is presented in the Figure below

*Figure 24: Social Categories of Sample Surveyed Families along the Project Road*

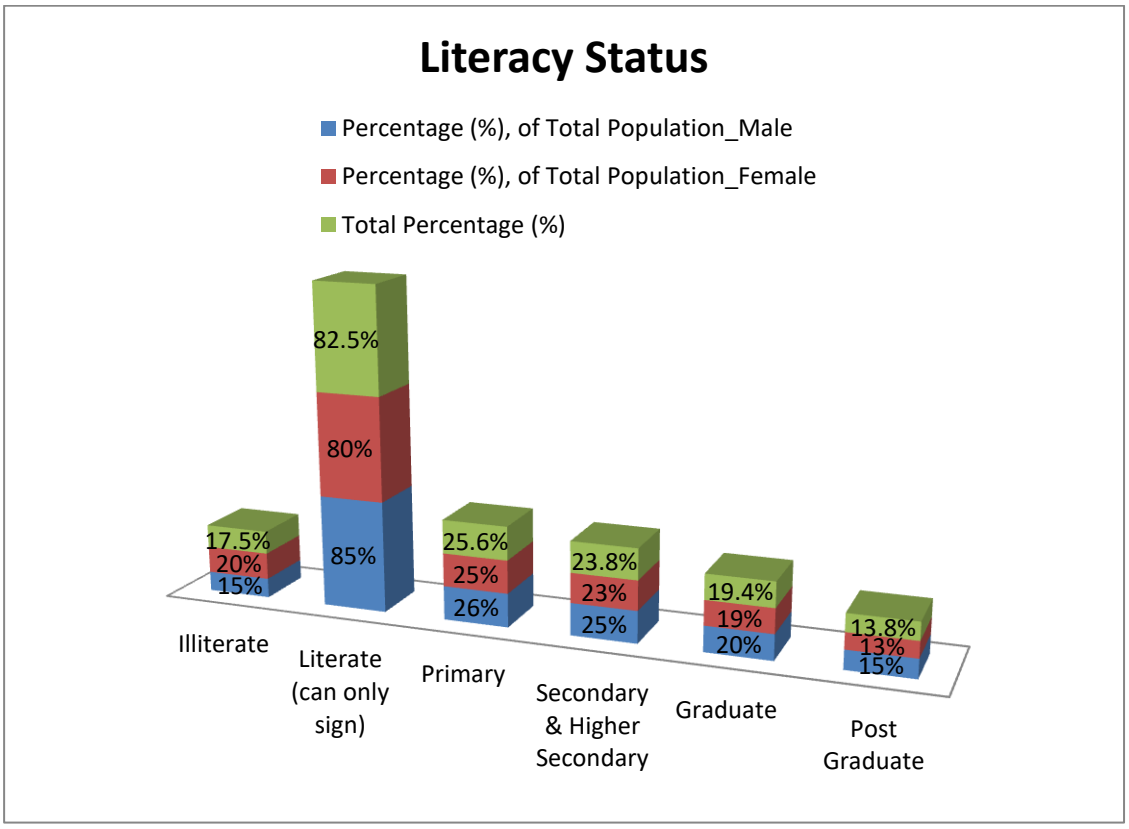



Source: SES Survey,September 2021

### 5.2.10 Educational Status of Sample Population

The educational status of the Sample population, above 6 years of age, reveals that overall scenario of literacy level is not very encouraging in the project area. Out of total 174 populations the number of child population (0-6yrs.) is 14whicharekeptasideforthis category.Only17.5% of the population is still illiterate and about 19.4% samples are graduates; while 13.8% have degree of master and above. The educational status is presented in the Figure below

*Figure 25: Educational Status*




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

### 5.2.11 Occupation

The occupational status of sample population reveals that 20% Population are depending on business and this includes the business they are carrying out along the road, mainly shops and kiosks. About 32% Population are having agriculture as their source of income and 4% are engaged in government jobs & private Jobs. The details of occupations by the sample survey are presented in the (Table below).

*Table 52: Occupational Status of Sample Surveyed Population (18-60 yrs)*

| Sl. No | Type of Occupation | Percentage |
|---|---|---|
| 1 | Agriculture & Allied Activities | 32% |
| 2 | Government & Private Services | 4% |
| 3 | Trade & Business | 20% |
| 4 | Self Employed | 4% |
| 5 | Casual Labour | 14% |
| 6 | Non-Remuneratively Engaged | 26% |
| Total | | 100% |

Source: SES Survey, September 2021

The total number of persons is 174 and the number of persons within the active age group of18 to 60 years is 116.

### 5.2.12 Income and Expenditure Profile

Surveyed sample families have an average annual income more than Rs. 30000/. About 24.3% Surveyed Families are having average annual income in the range of Rs. 30000-50000, while 51.4% of the families are earning between Rs. 50000-100000. It has been observed that about 23% Surveyed Families have annual income more than Rs. 1,00,000. The average income level of sample families in the project area is summarized in the (Table below).

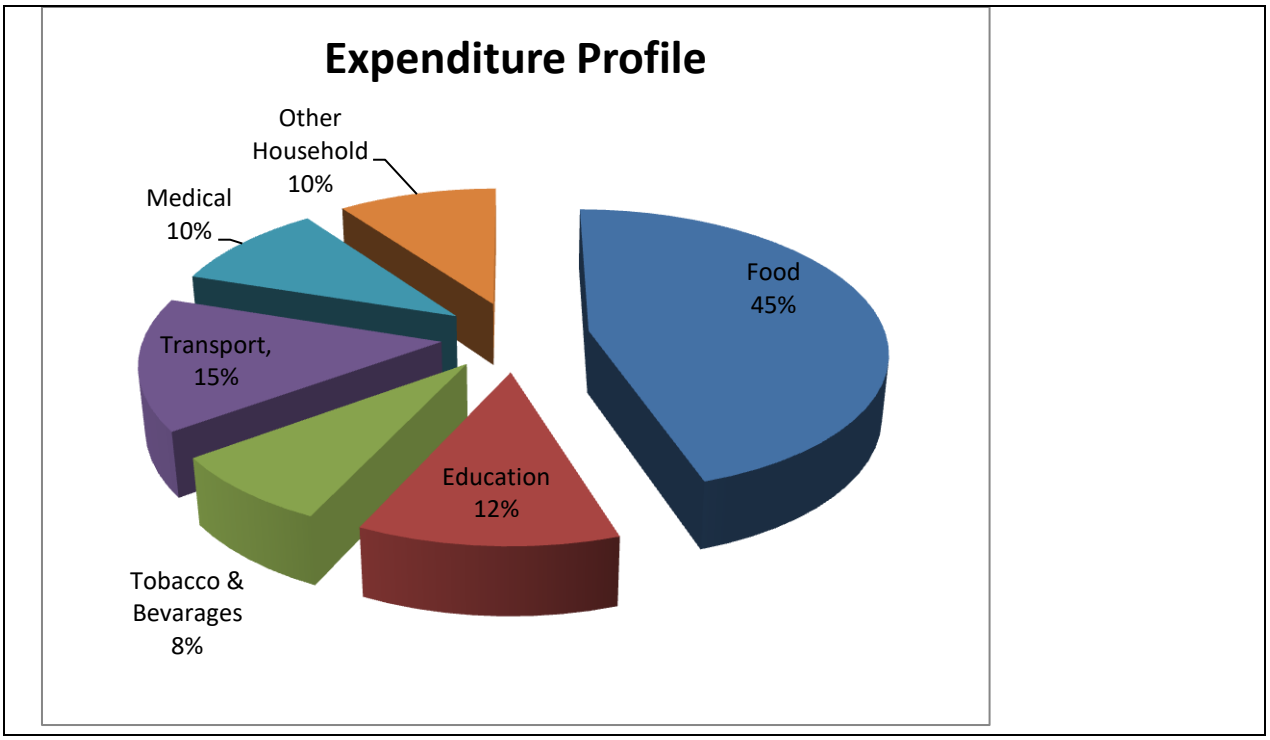
*Table 53: Annual Income Profile of Sample Surveyed Families*

| Sl. | Annual Income Categories in (Rs) | % Age |
|---|---|---|
| 1 | More than 30000 but less than or equal to 50000 | 24.3% |
| 2 | More than 50000 but less than or equal to 100000 | 51.4% |
| 3 | More than 100000 | 24.3% |
| **Total** | | **100.00%** |

Source: SES Survey, September 2021

The expenditure pattern of the sample families revealed that about 45% of the average expenditure incurred by the Surveyed Families is on the food items. The detail of the same is presented in graphical format in Figure below

*Figure 26: Annual Expenditure Profile*




Source: SES Survey, September 2021

### 5.2.13 Holding of Agricultural Land (Immovable Assets)

About 22% of the population do not own any land. Only 11% of the population owes more than 0.5 acre of land. The detail of the land holding is depicted in the Table 56.

*Table 54:Agricultura l /Homestead Landholding of Sample families*

| Sl. | Land owned (areain Acres) | Numbers | Percentage |
|---|---|---|---|
| 1 | Less than 0.25 | 23 | 62% |
| 2 | 0.25-0.5 | 2 | 5% |
| 3 | Morethan0.5 | 4 | 11% |
| 4 | No land | 8 | 22% |
| Total | | 37 | 100% |

Source: SES Survey, September 2021

### 5.2.14 Possession of Vehicle (Movable Asset)

Majority of the population (37.8%) have only four wheelers followed by two wheelers (32.4%) as mode of Family transport. The detail of the movable assets holding is depicted in the Table 57.

*Table 55: Movable Assets Holdings of Sample families*

| Sl. | Family assets | Numbers | Percentage |
|---|---|---|---|
| 1 | 2-wheeler | 12 | 32.4% |
| 2 | 3-wheeler | 2 | 5.4% |
| 3 | 4-wheeler | 14 | 37.8% |
| 4 | 2-wheeler & 4-wheeler | 6 | 16.2% |
| 5 | More than one 2-wheeler & 4-wheeler | 3 | 8.1% |
| 6 | No Assets | 0 | 0.0% |
| Total | | 37 | 100% |

Source: SES Survey, September 2021

### 5.2.15 Vulnerability

Vulnerable Families are defined as those who are

(i) below the poverty line (BPL),

(ii) (ii) in headed households (WHH), (iii) differently able households(DAH), or

(iii) (iv) elderly (60years and above) living alone; or

(iv) (v) scheduled tribes (ST); or

(v) (vi) scheduled caste (SC).

It shall be noted here that though multiple categories of vulnerability groups exist in the project road, we have taken a single impact of a single vulnerable category for authentication. For example, the number of BPL/DA/Aged Person / WHH mentioned in the table below does not include those who fall under the SC and ST categories to avoid the repetition of data and vice-versa. Vulnerability is defined by Survey data.

The survey finding reveals that 87% of the surveyed population along the roadside belongs to the ST community, 5% belong to the SC category & 3% of families are Women-headed households. About 5% of families, excluding ST and SC, belong to the BPL category. The total number of vulnerable families per the sample is nearly 100%.

*Table 56:VulnerabilityStatusoftheAffectedFamilies*

| Sl. | Category | %Age to total population |
|---|---|---|
| 1 | Schedule Tribe | 87% |
| 2 | Schedule Caste | 5% |
| 3 | Below Poverty Line (Excluding ST, SC) | 5% |
| 4 | Women Headed Households | 3% |
| 5 | Senior Citizen living alone | 0% |
| Total Vulnerable | | 100% |

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

### 5.2.16 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 51% and female accounts for 49%. The gender disparity is not so much visible in among surveyed persons i.e. 977 against state level statistic having 989 but as per Census data of India, 2011. The sex ratio of Ri-bhoi district is 976 females per 1000 males in 2011. The illiterate among the female is slightly higher than of the male counterparts. There is 1number Surveyed Families are Women Headed Households. From the SES survey the total Population is 174, of which 88 are males &86 are females.

### 5.2.17 Migration

The Decadal growth rate of the Ri - Bhoi district and town clearly indicates influx of migrates from the nearby districts and villages. The SES reveals that about 11% of the population has immigrated in the urban in the last 25 years.

### 5.2.18 Impact on Tribal People

Impact on Land & Structure of ST

As already discussed there neither any land acquisition nor any impact on the structures due to the proposed project.

### 5.2.19 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. The ST Surveyed Families have between Rs.50,000 to Rs. 1,00,000 annually.

### 5.2.20 Impact on Community

This sub – project has ensured that the designed and implementation will be in such away that it fosters full respect for ST identity, dignity, human rights, livelihood systems, and cultural uniqueness as they define them. 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 populations among the Surveyed Families along the road are living in the towns and in the due

course of time became the part of the mainstream population. Presently the ST population does not follow any customs that are attached to their land or natural habitat which will be impacted. Thus, there will be no cultural or social impact on the ST population.

### 5.2.21 Impact on Gender

It was identified that social and economic benefits for affected STs 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. The results of the focus group discussions included suggestions for noise barriers, dust reduction measures, and the employment of female members as unskilled laborers during construction. Continuous meaningful focus group discussions with the ST women and affected 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 imp acts or, when avoidance 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.

### 5.2.22 Impact on Access to Services Amenities

### 5.2.23 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. Umsning-Jagi road is well connected with the rest of the state. Railway Station is well connected with Guwahati Junction.

### 5.2.24 Solid Waste Dumping Facilities

The PIA is congested with structures and roads and as it is situated on the hill slope, solid waste 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.

### 5.2.25 Source of Drinking Water

The main source of drinking water in the PIA is river, streams and ponds (nearly68%).

*Table 57:SourceofDrinkingWater of Sample Surveyed Families*

| Sl. | Types of drinking Water Source | Numbers | Percentage |
|---|---|---|---|
| 1 | Tap Water by ULB | 12 | 42% |
| 2 | Groundwater/surface water | 25 | 68% |
| Total | | 37 | 100% |

Source: SES Survey, September 2021

### 5.2.26 Distance of Medical Facilities

Medical facilities like government hospital and urban health centers (UHC) are not easily available within 5km for68% of the population.

*Table 58: Distance of Medical Facilities from Sample Surveyed Families*

| Sl. | Distance of Medical Facilities | Numbers | Percentage |
|---|---|---|---|
| 1 | Within1km | 4 | 11% |
| 2 | Within2km | 7 | 19% |
| 3 | Within5km | 25 | 68% |
| 4 | Morethan5km | 1 | 3% |
| Total | | 37 | 100% |

Source: SES Survey, September 2021

### 5.2.27 Other Services

The proposed project will enhance the standard of living and/or quality of life of the residents of Ri-Bhoi. During the construction there might some temporary restrictions in access which have to be taken care in the Resettlement Plan.

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 is 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 up on 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.

*Table 59: 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 underpass, fly-over etc. | Proper provision of service roads, junctions, fly-over, underpasses to be provided at appropriate places. Truck parking places. 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. Preventive measures should be taken to check the spreading of STDs |

# 6 CHAPTER-VI: 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 and 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 emissions in the future and ease off the pressure of vehicles on the roads. 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.

## 6.1 Climate Change Mitigation

The Transport Emissions Evaluation Model for Projects (TEEMP) developed by Clean Air Asia was utilized to assess the $CO_2$ 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 (3.5/5.5 m) to two lanes with paved shoulder (7 m). 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 are:

- The road configuration will change from an intermediate lane to two lanes with a carriageway width of 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.

**Table 60: Traffic Composition**

| Vehicle Type | Traffic Composition |
|---|---|
| 2-Wheeler | 0.6% |
| 3-Wheeler | 0% |
| PassengerCar+Mini LCV +Exempted Vehicles | 6.1% |
| Mini Bus | 0.2% |
| Standard Bus | 0.2% |
| LCV | 4.7% |
| 2-Axle | 74.8% |
| 3-Axle | 12.4% |
| MAV | 0% |
| Tractors-With Trailer | 0.9% |
| Tractors-WithoutTrailer | 0% |
| **TotalMT (Motorized Traffic)Traffic** | **100.00%** |
| Bi-Cycle | 0% |
| Cycle-Rickshaw | 0% |

| Vehicle Type | Traffic Composition |
|---|---|
| Animal-Drawn | 0% |
| Hand-Drawn | 0% |
| **TotalNMTTraffic (Non-motorized Traffic)** | **0.00%** |

Road capacity of 3,496 PCU/lane/day for was adopted for this project based on projection at the end of design year (2043). 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 Health Relevant Emissions from in-Use Indian for three-wheelers rickshaw as shown intable below

**Table 61: $CO_2$ Emission Factors**

| VehicleType | 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 | |

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

For 45.000 km of road construction would result in emission of approximately 4635 tCO2eq. (Source: Greenhouse Gas Emissions Mitigation in Road Construction and Rehabilitation - 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 GHGemissions during around construction project involve the following major sources:

12. Transport emissions owing to transportation material
13. Material emissions owing to extraction/production of construction materials
14. Machines emissions owing to consumption of fuel by enginesusedin 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. is the main contributor.

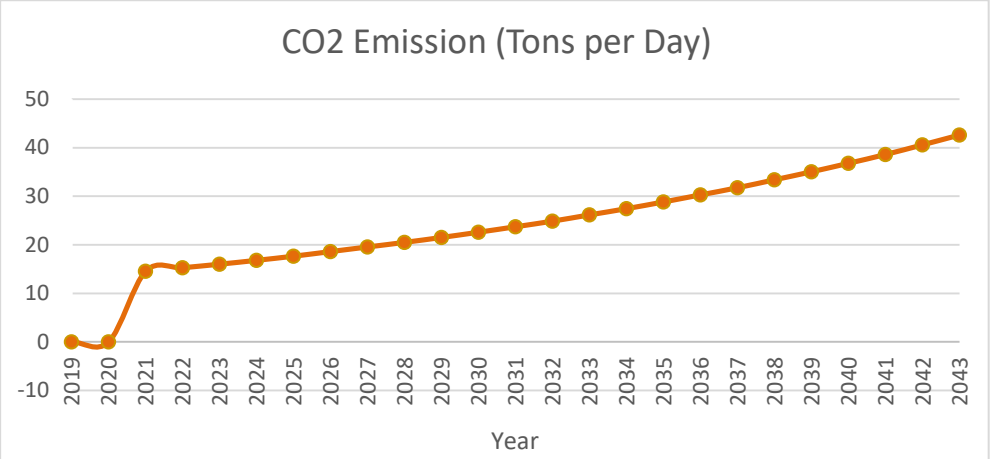
| Type ofRoad | Transport emissions | Materiale missions | Machines emissions | Total (t $C0_2$ eq.) |
|---|---|---|---|---|
| Rural Road—DBST | 26 | 62 | 14 | 103 |

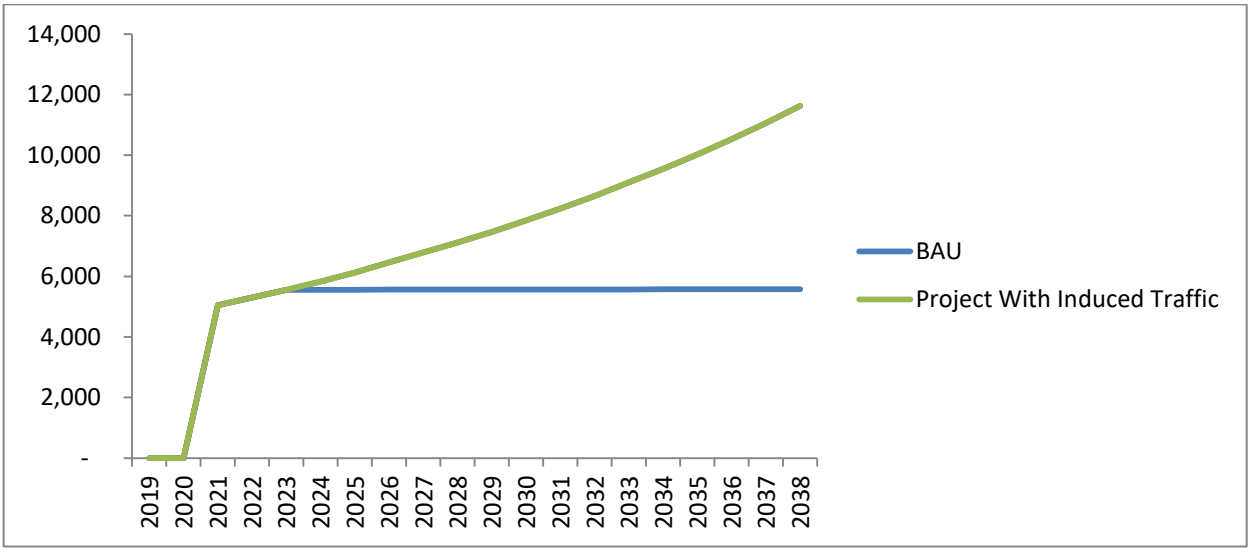
Source: Greenhouse Gas Emissions Mitigation in Road Construction and Rehabilitation-A Toolkit for Developing Countries

Therefore, for 34.801 km of road construction would result in emission of approximately 3584.50 tonCO2eq.

**Operation Phase**

The design life of the project road is 20 years. Total annual emission for each year starting from the base year -2019(i.e. without the project) till year 2043 is presented in the figure below.




(Both without and with induced traffic), there will be an increase in the $CO_2$ emission levels over the time due to the increase in the traffic volume, however, the emissions will be controlled by maintaining the road roughness below 3.0 m/km during the entire project life as well as the enhanced capacity of the road. This will result in annual $CO_2$ emissions of the project road much below the threshold limit of 100,000 tons/year.

**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:**

The temperature and precipitation pattern of the study area are given in **Error! Reference source not found.** and **Error! Reference source not found.** above in the baseline chapter. Increased temperature and precipitation will have the following impacts:

- **High Precipitation Impacting Roads /Bridge /Embankment**: Heavy rains can cause 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 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. Centered 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 10,650 sq km into the Barak Basin (Source: Central Water Commission). In less than 12 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 monsoon season. 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 is a 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.

## 6.2 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 in table below. It must be noted that all these events either simultaneously or in isolation can generate severe disastrous impacts on road infrastructure.

**Table 62: Possible Climate Events, Risks, and Adaptation Measures**

| Sl. | 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 flooding of 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 integrity were found to be compromised; the sub-grade strength specification meeting the recent-most IRC specifications has 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 guidelines has been adopted.<br>d. In terms of floodwater conveyance to prevent stagnation, closed concrete drains in settlement pockets have been provided. |
| 2 | Changes in seasonal and annual | i. Impact on soil moisture levels, affecting the structural | |

| Sl. | Climate Change Events | Risks to the Road Infrastructure | Adaptation Measures incorporated in Detailed Design of Project Roads |
|---|---|---|---|
| | average rainfall | integrity of roads, culverts, bridges standing water on the road base<br>ii. Risk of floods from runoff, landslides, slope failures and damage to roads if changes occur in the precipitation pattern | e. Improved cross-drainage capacities required for the quick conveyance of floodwater by replacing small 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 the road 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 traffic accidents | a. An adequate binding layer thickness has been proposed to offset the wear, surface fatigue, and rutting under 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 |

## 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 9, 00,000/- is estimated for the construction and Operation stages. The details have been presented below.

***Table 63 : Environmental Monitoring Cost***

| Cot of Environment / Migration Plan Description | Unit | Quantity | Unit Rate | Cost |
|---|---|---|---|---|
| Airqualitymonitoringat3locationsfor3 seasons for 2 consecutive years.( Construction Stage) | No. | 18 | 9000 | 162,000 |
| Airqualitymonitoringat3locationsfor3seasonsfor2consecutiveyears. | No. | 18 | 9000 | 162,000 |

| | | | | |
|---|---|---|---|---|
| (Operation Stage) | | | | |
| Waterquality monitoringat3locationsfor3 seasons for 2 consecutive years.( Construction Stage) | No. | 18 | 7000 | 126,000 |
| Waterqualitymonitoringat3locationsfor3seasonsfor2consecutiveyears. (Operation Stage) | No. | 18 | 7000 | 126,000 |
| Noise qualitymonitoringat3locationsfor3 seasons for 2 consecutive years.(Construction Stage) | No. | 18 | 3000 | 54,000 |
| Noisequalitymonitoringat3locationsfor3seasonsfor2consecutiveyears. (Operation Stage) | No. | 18 | 3000 | 54,000 |
| Soilqualitymonitoringat3locationsfor3seasonsfor2consecutiveyears. (Construction Stage) | No. | 18 | 6000 | 108000 |
| Soilqualitymonitoringat3locationsfor3seasonsfor2consecutiveyears. (Operation Stage) | No. | 18 | 6000 | 108000 |
| **Total** | | | | **900000** |

# 7 CHAPTER-VII: STAKEHOLDER & PUBLIC CONSULTATION

## 7.1 Introduction

Public consultations or community participation is an integral part and process of any project which involves resettlement or rehabilitation issues. It helps to incorporate valuable indigenous suggestions and perceptions of development. In the process, stakeholders get the opportunity to address issues, which are resolved after making appropriate changes in design and alternative finalization. The stakeholders become aware of the development schemes and at the same time influence and share the control over these initiatives, decisions and resources. Community consultations also help to avoid opposition to the project, which is otherwise likely to occur.

During the course of the social impact assessment, consultation meetings were held to inform the communities and population about the positive as well as negative impacts of the road improvement scheme. Public Consultations were held along the subproject with the temporarily impacted households, local persons who will be benefitted from the project and other stakeholders of the sub project. Focus group discussions were held with the youth's group, women's group, farmers, shopkeepers, tenants, interest groups and organisation. Key Informant Interview took place with the village head men, village council members, head of households and important personalities. There was special consultation with the individual women, vulnerable affected persons and tribal persons. These meetings were used to get wider public input from both the primary and secondary stakeholders.

## 7.2 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 project design
- Tounderstandspecificissuesrelatedtotribalpeopleandthoseofvulnerablesections
- Tofacilitatedevelopmentofappropriateandacceptableentitlementoptions
- To understand the priorities / concerns of the communities and the likely adverse and positive socio-economic impacts
- To create a sense of ownership of the project for its sustainability.

## 7.3 Identification of Stakeholders

The stakeholders are all the people getting affected by the project or are responsible for the project, whether directly or indirectly. Primary stakeholders included those affected negatively or positively by the project, like the project beneficiaries and project implementing agencies. Secondary stakeholders included other individuals and groups, with an interest in the project, viz., the town/urban road users, Government Stakeholders and the line departments.

## 7.4 Project Stakeholders

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

1. Primary stakeholders are those who are directly or indirectly affected by a project, such as the project beneficiaries and the people who are likely to be adversely affected by a project.
2. 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.
3. 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 on the impacts associated with each stage of planning, construction and post-construction. **Table 64**below provides a list of specific stakeholder's involvement and their level of impact and interest during project lifecycle.

**Table 64:Consultation Methods**

| Sl. | Categories of Stakeholders | Involvement of Stakeholders | | |
|---|---|---|---|---|
| | | Planning | Construction | Post Construction |
| 1 | Impacted Persons (NTH in this sub-project) | Frequent | Frequent | On required basis |
| 2 | Local Communities | Frequent | Occasional | On required basis |
| 3 | Village Headmen & Gram Panchayat members (local elected representatives) | Frequent | Occasional | On required basis |
| 4 | Women's belonging to various socio-economic groups | Frequent | Occasional | On required basis |
| 5 | Other vulnerable groups | Frequent | Occasional | On required basis |
| 6 | Local Elected Members | Occasional | On required basis | On required basis |
| 7 | Concerned Officials from Government | Frequent | Occasional | On required basis |
| 8 | NGOs and CBOs | Occasional | frequent | As and when required |

## 7.5 Methodology for Consultations

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 or the 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 in table below**.**

**Table 65:Consultation Methods**

| No. | Stakeholders | Dialogue Level | Issues for discussion | Frequency of Engagement | Form of Engagement |
|---|---|---|---|---|---|
| 1. | Women and Girls | Direct Contact and discussions | Issues related to GBV, safety, sanitation, and hygiene. Vocational training for women empowerment | Monthly | Open discussions with women and girls through the ANM and school authorities |
| 2. | Indigenous people (ST Community) | Contact through the Gram Pradhan | Common interest with that of the local community | Quarterly | Open Dialogue |
| 3. | Contractors and Sub-contractors | Regular Direct Contact | Issues of common Interest in the day-to-day functioning of the project. | weekly | Regular Direct Contact |
| 4. | 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. |
| 5. | Surrounding Community | Regular Direct Contact | Common Interest on social and environmental issues | Monthly | Community event and open dialogue |
| 6. | Gram Panchayat | Regular Direct Contact | Common Interest on employment, livelihood trainings, CSR activities, and social & environmental issues | Monthly | Information dissemination and suggestions and feedback. |
| 7. | Tehsil/District Officials | Occasional Direct Contact | Documentation of land deeds and local permits | As required | Formal meetings |
| 8. | Central and State Level authorities | Occasional Direct Contact | Permits and clearances | As required | Formal meetings |
| 9. | Local Political groups | Occasional Direct Contact | Common interest with that of the local community and administrative issues | As required | Information dissemination |
| 10 | NGOs and CBOs | Occasional Direct Contact | Common interest with that of the local community | As required | Information dissemination |

*Source: Socio-Economic Survey on 2021*

As the consultations were conducted in September 2021 during Covid-19 pandemic, as per the guidelines only five persons could be called for Consultation at Panchayat Office thus those are the Public Representatives, and the Public Consultation is rather Key Informant

Interview in Nature. Informal FGDs have been done at the villages, marketplace and other common places to gather and disseminate information about the proposed project.

## 7.6 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 Issues 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 labour involvement;
- Local disturbances due to project construction work;
- Need of tree felling etc. at project sites;
- Impact on water bodies, water-logging, and drainage problem if any;
- Environment and health;

*Table 66: Brief Description of some sample Public Consultation*

| Date/Place | No of Participants | Major Issues | Agreed upon | Mitigation Measures-Input to technical Design |
|---|---|---|---|---|
| Place: Umsning, 30/08/2021 | Total-3<br>Male-3<br>Female-0 | The existing alignment passes through the town area. It is one of the major town and many Goods vehicles passes through the town. There are both commercial and residential establishments along the alignment. It has been revealed from the Public consultations that the people on both side of the road, considering future potential in development, but afraid of road accident and menace like trafficking and HIV. Some of them also put the issue of construction of concrete drains for the development of the sewage system of the town. | Combined effort of the local authorities with the Government officials as well as the other stake holders would remove all the obstacles for development. | The local authorities also assured that they would help in development of roads project. Road safety awareness campaign should be made at schools |
| Place: Umlaiteng,30/08/2021 Female FGD | Total-7<br>Male-5<br>Female-2 | During discussion it has been observed that the benefits of the proposed project area are acknowledged by the local people but they want the Executing Agency to take care of the implementation of the project to bring about promised benefits and the traffic safety. Simultaneously | The female participants apprehend about the increase in the number of road accidents and would be dangerous to the children and students who | 1. It has been suggested to make traffic safety awareness campaign at the schools and localities.<br>2. It is also learnt that a NGO would be recruited for developing the |

| | | | | |
|---|---|---|---|---|
| | | a focus group discussion with all female participants was held in the same area. Discussed topics are mentioned below:<br>**1.** Most of the women are petty shopkeepers or customers; they want a proper market to be constructed by the Authority with the help of market association group in the starting point.<br>2. Need proper bus shelter.<br>3. The condition of the road is very bad during monsoon.<br>4. There is no proper Government transport facility available at this area. | usually not careful using the roads | awareness of the people of PIA regarding, trafficking, gender issues and other social stigmas.<br>3. The PWD assure to inform the Authority for construction of the Market as this is beyond the scope of this project.<br>4. Proper Bus Stop/Auto Stand is proposed in the design.<br>5. The proposed road will be all weather road and the condition would be much better.<br>6. It would be proposed to the Transport Department to provide transport facilities in this area. |

***Table 67: Pictures of First Stage Consultations***

| | |
|---|---|
|  | Focus Group Discussion with the distinguish personalities at the Panchayat Office at Ri-Bhoi District on dated 30/08/2021. The detail alignment of the proposed road was discussed and also the benefits of the proposed road were discussed at a length. The persons attend the meeting have put forward some suggestions which was conveyed to the local PWD. |
| Focus group discussion in the market area at Umlaiteng of Ri - Bhoi District on dated 30/08/2021 was held with the land owners and agricultural labourers (three persons, all male). The persons were aware of the project but anxious to know the benefits (compensation and assistance) the project would provide them. |  |
|  | Focus group discussion maintaining social distance was held with the shop owner and local people(two persons, all male) who would be affected by the project and the alignment were explained in detail. Detailed understandings regarding the affected peoples "perceived benefits and losses in relation to the project were developed and the affected peoples" views on the project were recorded. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development at a village in Umsning of Ri-Bhoi district on dated 30/08/2021. |

| | |
|---|---|
| Focus Group Discussion with about four persons (all male) was held maintaining social distancing. The Panchayat Member of the village, in presence of the Survey Coordinator, explains the local people about the detail of the project. All the queries of the villagers were answered. Detailed understandings regarding the affected peoples‟ perceived benefits and losses in relation to the project were recorded<br>Place: Local club at Umsning of Ri-Bhoi District Dated 30/08/2021. |  |
| | |
|  | Interaction with children of the affected area. It was done basically to make them aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. Place: Umsning of Ri-Bhoi District Date:30/08/2021<br>About ten children were interacted. |
| | |
| FGD with the female members (three members all female) of the PAHs at Ri-Bhoi on dated 30/08/2021 is being carried on the proposed project road. The Affected persons were also explained in detail about the projects and their entitlements. People are made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. The conception and myths regarding the developmental works were also noted. |  |
| | |

## 7.7 Outcome of the Consultations

People were aware about the improvements proposed for the project road but were not aware about specific details of the PRoW, shift in centre line and the method of valuation for land and building, payment of compensation and other rehabilitation and resettlement measures. A detailed public consultation was organized with the potential project is placed persons, people's representatives, shopkeepers, businessmen, and others regarding the project benefits and vis- à-vis estimated loss. The main points of discussions were minor realignments to save certain structures, compensation and assistance, road safety etc. It has been observed that the benefits of the proposed project area acknowledged by the local people but they want the Executing

Agency, to take care of the implementation of the project to bring about promised benefits with proper safety measures.

The information and recommendations gathered from the various stakeholder consultations has been incorporated into the design of the project to ensure that the investments align with local priorities and development plans, and that they will deliver equitable socio-economic benefits to the intended project beneficiaries. The salient points of the consultations are summarized in the following Table below

***Table 68:Summary of Consultation Outcome***

| IssuesDiscussed | Outcome |
|---|---|
| Relocation Options Compensations/Assistance | Duringconsultationtheywereconvincedthattherewillbenopermanentimpact but might be temporary impact during the active construction period. |
| What are all the facilities provided through this project and to whom should we approach? | Facilities like bus shelters, restrooms, pavements, drains etc would be provided. Officers such as PWRD Engineers, LARR Authority 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 but might be temporary impact during the active construction period. |
| Could you inform us the time when our assets be removed? | Would be informed well in advance and compensation will be paid before vacating assets, if required. |
| Relocation of school buildings Relocation of Bus shelter/CPR | The sites for relocation of the position of the Waiting sheds were identified in consultation with the villagers and the village Headman was carried out. However, there were differences in opinions among the villagers in demolishing / shifting the Bus shelter. |
| 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 taken for the shifting of the utilities. |
| Employment during construction | People were of demand if the local people are given preference for 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 measurements of structures. |
| What about the loss of livelihood during active | The active phase of construction is planned in such a way that there will be minimum loss of access and / or livelihood. If there is any loss or |

| IssuesDiscussed | Outcome |
|---|---|
| phase of construction? | damage of structures or any immovable assets the Civil Contractor will compensate the same in discussion with the affected party. |

## Leaflet

## Up gradation and Reconstruction- Umsning-Jagi Road (Meghalaya)

The Government of Meghalaya has stepped up investments in the development of transport infrastructure using financial assistance (loan) from the World Bank (IBRD) under its Meghalaya Integrated Transport Project (MITP) for the enhancement of the transport Infrastructure in the State. The state Government has assigned the work of improvement/rehabilitation of roads and construction of bridges (under the World Bank funded MITP) to Public Works Department (PWD) of the Government of Meghalaya. This department designs plans for rehabilitation / up gradation of existing roads and construction of missing links / bypasses / Bridges in the stretches from Nongstoin-Maweit (35km), Umsning- Jagi Road (40.130km), Borsora (6.50Km), Cherragoan (6.80 Km), Bagli (4.00 Km), Nongpoh-Umden-Sonapur (25.0km), Shillong town roads (12.591km), Jowai Town roads (34.843km), Nongsto in Town roads (20.752 km) and Williamnagar Town roads (13.989 km). Umsning-Jagi Road (SH-8) section has a length of 40.130 km in the district Ri-Bhoi of Meghalaya state. The project road starts from the junction with National Highway - 6 /Asian Highway (Jorabat to Shillong stretch). The project road ends at Km 40.130 of SH-8 near Sonidan town. It connects built up areas like Nongiri, Rilong, Sohpdok, Sohliya, Umtangngi, Mawdiengngan, Umlaiteng, Umlatar, Mawhati, Umsohlait, Sonidan and Mawlaho etc. The project road passes through hilly and rolling terrains.

As for this project the cut off date for the non title holders was **20th December, 2021**. The Resettlement Plan (RP) has been prepared in accordance with Meghalaya RFCTLARR Rules, 2015, National Highway, Act 1956 and RTFCLARR Act, 2013 and in accordance with the policy and guidelines of World Bank. The Executing Agency of the proposed road is PWD of Meghalaya. And will be funded by **World Bank.**

There are about 37 non-title holder are expected to be temporarily affected due to the development of the project road during actual period of construction. No private land acquisition has envisaged. Five number of (5) waiting shed will be relocated due to the project.

### Compensation

**1. Private Agricultural Land:** The replacement cost of land compensation will be calculated over and above the updated circle land rate, as registration cost plus solatium.

**2. Residential/ Commercial and other structures:** The average estimated rate for affected permanent structures ,semi-permanent structures, temporary structures and boundary walls is based on the Basic Schedule Rates (BSR) of PWD Meghalaya. Solatium will be awarded only to the title holder.

### Assistance

**Shifting allowance**: Shifting allowance will be provided to all the affected households.

**Rental Assistance**: Rental assistance to be provided to all affected owner of structures and tenants.

**Rehabilitation Assistance to DPs Losing Business Establishment**: All commercial structure, who losing their business establishment due to displacement will be provided with a lump sum transitional allowance.

**Training Assistance to Agricultural Titleholders**: Training Assistance will be provided for income generating vocational training and skill up-gradation options as per those households losing their primary source of income.

**Rehabilitation Assistance to Employees in Structure**: Wage earning employees indirectly affected due to displacement of commercial structure will be provided assistance as per the prevailing local wage rate for 3 months.

**Agricultural Labourers/ Sharecroppers** will be provided with assistance as per the prevailing local wage rate for 100 days.

**One time special lump sum assistance** will be paid to each vulnerable households. This will be paid above and over the other assistance(s).

**Compensation for Community and Government Property:** Any religious or community structure (School, Collage, government Structure, Temple, Mosque etc.) requires full or partly relocation will be compensated in replacement rate.

**Contract Details Information**

**PWD ,Meghalaya** Telephone:: 0364-2224561

e-mail cenhwbmitp@gmail.com

**Propagated by PWD Meghalaya in the public interest.**

## 7.8 Minutes of meeting

A meeting via video conference was held between ESIA Consultant and the DPR Consultant for discussion on Environmental and Social Impact Assessment on Umsning to Jagi Road.

| **Location:** | **Office of CETEST Pvt. Ltd, Kolkata and CEG Tower, Jaipur vide Video Conference Mode** |
|---|---|
| Date: | 23.12.2021 |
| Time: | 4.30 pm |
| Attendees: | Mr. Sukesh Gupta, Team Leader, CEG Ltd.<br>My. Shyam Sundar Khandelway, Asso. Director, CEG Ltd.<br>Mr. Anirban Nayak, Road Safety Specialist,CETesting<br>Mr. Supriya Deb, Highway Expert, CETesting<br>Mr. Swarnava Bandhopadhyay, Environmental Specialist, CETesting<br>Mr. Suman Sarkar, Social Specialist, CETesting |

The proposals mentioned in Draft Project Report for Umsning Jagi Road and their possible Environmental and social effects were discussed along with probable remedies. Following points were discussed in detail.

*Table 69: Minutes of the meeting of ESIA and DPR consultant*

| Sl. | Topic | Details of Discussion | Decision |
|---|---|---|---|
| 1 | Land Acquisition | The ESIA consultants requested for the 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 know the 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 damaged and 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 turning points, sharp corners of the | The DPR consultants clarified that all the required safety measures including Rumble |

| Sl. | Topic | Details of Discussion | Decision |
|---|---|---|---|
| | | roads at a suitable height as they allow seeing invisible but oncoming vehicles. Hence reducing the probability of road accidents. Proper signage and road furniture are to be integral part of the design. | 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 absolutely necessary 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 results in 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 Furniture and Road Signage are to be introduced at all proper and 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. At congested 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 are expected to to use public 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 given prime consideration in the proposal. |

| Sl. | Topic | Details of Discussion | Decision |
|---|---|---|---|
| 8 | Utility Corridor | There should be utility corridor at underground near the congested place | Utility corridor will be provided as per actual requirement. |
| 9 | Public Transport | There are very few public transports in the total alignment. The frequency of public transport should increase. | The matter belongs to Govt. of Meghalaya and ESAI consultants can recommend increasing public transport for betterment of people. |
| 10 | Bridges | Are there any new bridges proposed 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 which are in distressed condition will be replaced |
| 11 | Trees | Are there any trees proposed in the alignment? | No trees will be cut |

# 8 CHAPTER VIII: TRIBAL PEOPLE'S DEVELOPMENT PLAN

The Tribal People in India are categorized as indigenous community who often become vulnerable indevelopmentprojectsbecauseoftheirculturalautonomy,economicstatus,andenduringspecific disadvantages in terms of social indicators of quality of life, thus usually as subject of social exclusion. Because tribal communities live within varying and changing historical, cultural, political and economic contexts, no precise and coherent term has been found to define them. Under OP 4.10, the determination as to whether a group is to be defined as indigenous peoples is made by reference to the presence (in varying degrees) of four identifyingcharacteristics:

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 13ST population among the Surveyed Families inthe PIA are living in the towns and intheduecourseoftimebecamethepartofthemainstreampopulation.Presentlythe temporarilyimpactedSTpopulationdoesnotfollowanycustomsthatareattachedtotheirlandornaturalhabitatwhichwillbeimpacted. Thus,therewillbenoculturalorsocialimpactontheSTpopulation.

**Cultural Profile**

Culture of West Khasi Hills District as well as the project area is also heavily influenced by the activities, beliefs, religion, festivals, lifestyle and festivals of the tribal people. Khasi tribe mainly inhabits West Khasi Hills District and thus the culture of this region is basically tribal.Culture of West Khasi Hills District is principally tribal in character as this district is inhabited by Khasi Tribe. Khasi society has greatly been transformed by many factors in the recent times. Adoption of the western style of life, especially among the literate and educated, has been quite rapid although the matrilineal laws of inheritance and succession and the other cultural traits are still retained in a Khasi tribe.

The social and cultural events of West Khasi Hills District are similar to that of East Khasi Hills District. The dances of significance with a distinctive style of West Khasi Hills District are the 'Lyngngam dance' where men in dhoti and turban and women in sarong type of clothing dance to the beat of different drums (Ksing) and flute (Besli), the Shad Kiewling, Shad Mastieh and the Shad Suk Mynsiem. Traditional as well as modern dresses are worn by the Khasi people. A head cover (Tapmohkhlieh) is used by the women. However, most males still use the wrapper (RyndiaTlem) over their coats, during the cold season.

Traditional sports, arts, crafts, festivals and their religious beliefs form an integral part of the culture of West Khasi Hills District. Archery is the most popular traditional sport in rural parts of the district while among modern games; football, basketball and badminton have gained popularity with majority of the young people. Hunting and fishing are the seasonal sports which are considered as recreational activities, and community hunting by using tracking dogs is still being practiced in the region. Another recreation activity is bull fight which is being organized occasionally for gambling and betting.

Music occupies a central position in the cultural life of the people of West Khasi Hills District, especially the youth. Indigenous instruments such as the 'duitara' (4-stringed instrument), 'besli' (flute), 'nakra' and 'bom' (percussions) are still in use. The district boasts of a number of composers, radio and stage artistes. Another significant social factor of West Khasi Hills District is

an '8 days-a-week' market system, which is still being adopted by the people. The distinct characteristic of these markets, commonly known as 'Iew', is that they serve not only as places for trading activites but also as a place for socialization, business transaction and otherfestivities like holding of fairs, sports and games, etc. These markets are held after eight days in different places of the district. Thus, it is clear that culture of West Khasi Hills District reflects the traditions and beliefs of the Khasi tribe.

**Impact on Structures**

There are 13 nos. of ST families who are impacted by the project & the structures which will be impacted shall be constructed without any delay after completion of construction activities at that site. The cost for reconstruction has been included as Bill Of Quantities (BOQ) item as civil cost. The minor repairing shall be done by contractors as an incidental cost to them. All safety precautions shall be taken. The contractor will provide temporary access to the structure losing staircases till the structures are reconstructed by the Contractor. Most of structures are some extended portions of stair, Boundary of some residential or commercial structure. As there is no full impact on main structure like shop or any residential structure. Thus, there will be no cultural or social impact on the ST population.

# 9 CHAPTER IX: GENDER ACTION PLAN AND ROAD SAFETY

The tribal women in Meghalaya play an important role in the community and family development. Women normally constitutehalf 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 whosesocieties are organized on matrifocal principleshave obtained much greater gender equality than the societies (e.g. Hindu and Muslim) that are organized on the patriarchal principles. answered, "Securing equal treatment for men and women in the workplace." Following measures are proposed as part of Gender Action Plan:

- **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.

- 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 other complaints.
- 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.

# 10 CHAPTER-X: RESETTLEMENT ACTION PLAN

The Resettlement Policy Framework (RPF) provides a guide the preparation of the Resettlement and Rehabilitation Action Plan (R&R Action Plan) depending upon the scale and severity of impacts that may arise, temporary or permanent land acquisition or resettlement and rehabilitation is inevitable. Thus, the objective of the RPF is to ensure that the persons get compensation for their loss, are offered resettlement measures, and are supported in improving or at least restoring their levels of living and income after the project impact to pre-project levels. The RPF is intended to safeguard the interests of the population impacted by the project, especially the poor and vulnerable. The RPF is based on applicable Policies of GoI, State government (herein Govt. of Meghalaya) and the World Bank.

As there is no scope of land acquisition and/or permanently removal of any encroachments/ hindrances. As per the guidelines of World Bank there will be an ESIA document to be prepared at this stage. However, if at any stage ARAP or RAP is required a discussion of the same is made in the subsequent paragraphs.

The project is likely to have broadly two type of impacts that require mitigation measures. These are:

- Loss of immovable assets viz., land, house, commercial establishments, wells, ponds etc.
- Loss of livelihood or income opportunities commercial establishments etc.
- Impact on the community in terms of loss of common property sources.

None of the categories have been identified due to the proposed development. If any of the three impact category occur during actual implementation of the project then suitable mitigation and support mechanism will be collectively oriented, and the monitoring will focus on impact on such groups.

There is no Tribal PAFs will be required to be re-settled. For tribal the following provisions will be adhered to:

The Tribal would be eligible for the ESMP benefits and in addition would be also eligible for one-time special Vulnerable Allowance, if required.

## 10.1 Some Common Definitions

The following definitions are used in the documents:

**Cut-off Date:** In the cases of land acquisition affecting legal title holders or non-title holders, the cut- off date would be the date of issuing the publication of preliminary notification/s11 (I) of RFCTLAR Act, 2013.

**Project Affected Person:** Person who is affected in respect of his/her land including homestead land and structure thereon, trade and occupation due to construction of the project.

**Project Displaced Person(PDP):**Adisplacedpersonisapersonwhoiscompelledtochangehis/her place of residence and/or work place or place of business, due to the project.

**Project Affected Family(PAF):** Family includes a person, his or her spouse, minor children, minor brothers and minor sister's dependent on him. Provided that widows, divorcees and women deserted by families shall be considered separate families. Additionally, an adult of either gender with or without spouse or children or dependents shall be considered as a separate family

for the purpose of this Act.

**Land Owner:** Land owner includes any person - whose name is recorded as the owner of the land or building or part thereof,in there cords of the authority concerned; or Any personwhoisgrantedforest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 or under any other law for the time being in force; or who is entitled to be granted Patta rights on the land under any law of the State including assigned lands; or any person who has been declared as such by an order of the court or Authority.

**Marginal Farmer:** Marginal farmer means a cultivator with an un-irrigated land holding up to one hectare or irrigated land holding up to one half hectare, or as may be defined by the concerned state government.

**Small Farmer**: Small farmer means a cultivator with an un-irrigated landholding up to two hectares or irrigated land holding up to one hectare, but more than the holding of a marginal farmer, or as may be defined by the concerned state government.

**Encroacher:** A person who has trespassed Government/ private/community Land, adjacent to his or her land or asset to which he/she is not entitled and who derives his/her livelihood and housing there from prior to the cut-off date.

**Squatter:** A squatter is a person who has settled on publicly owned land for housing or livelihood without permission or who has been occupying publicly owned building without authority prior to the cut-off date.

**Landless/Agriculture Labour**: A person who does not hold any agriculture land and has been derivinghismainincomebyworkingonthelandsofothersassub-tenantorasanagriculturelabour prior to the cut-off date.

**Below Poverty Line (BPL):** A household, whose annual income from all sources is less than the designed sum as fixed by the planning commission of India, will be considered to be below poverty line (BPL).

**Vulnerable Person**: Those people falling under BPL line category/ vulnerable community as defined by the central government. The Vulnerable group may include but not be limited to the following:

Member of Scheduled caste / tribe community / other backward community.

Women Headed households.

Senior citizen-person above the age of 60 years.

Landless

Village artisan

## 10.2 Process for RAP Preparation

The project roads include rural roads, major district roads and state highways. Different measures will be followed for different categories of road as explained below:

### 10.2.1 RPF for the Project Road

For rural roads, the existing PMGSY guidelines will be followed. The project will ensure that there is no relocation due to rural roads. The alignment finalized in consultation with the community

## 10.3 Tribal People's Development Framework

The Tribal People in India are categorized as indigenous community who often become

vulnerable 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 of social exclusion. Because tribal communities live within varying and changing historical, cultural, political and economic contexts, no precise and coherent term has been found to define them. Under OP 4.10, the determination as to whether a group is to be defined as indigenous peoples is made by reference to the presence (in varying degrees) of four identifying characteristics.

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 20 ST populations 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. Presently the surveyed ST population does not follow any customs that are attached to their land or natural habitat which will be impacted. Thus, there will be no cultural or social impact on the ST population.

## 10.4 Gender Issues among Tribes

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. Therefore, there is no specific requirement to establish an institutional framework for making 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.

# 11 CHAPTER XI: 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).

The Project Directors (PDs) will operate under the overarching guidance and oversight of a Project Advisory Committee. This committee is headed by the Secretary of the respective departments.

Meghalaya Infrastructure Finance Development Corporation (MIFDC) set up under the Planning Department will be responsible for overall planning, coordination, implementation and monitoring of the project along with various departments. It will also be responsible for mobilizing private sector finance for the development works. It will ensure that ESIA is conducted and ESMPs 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.

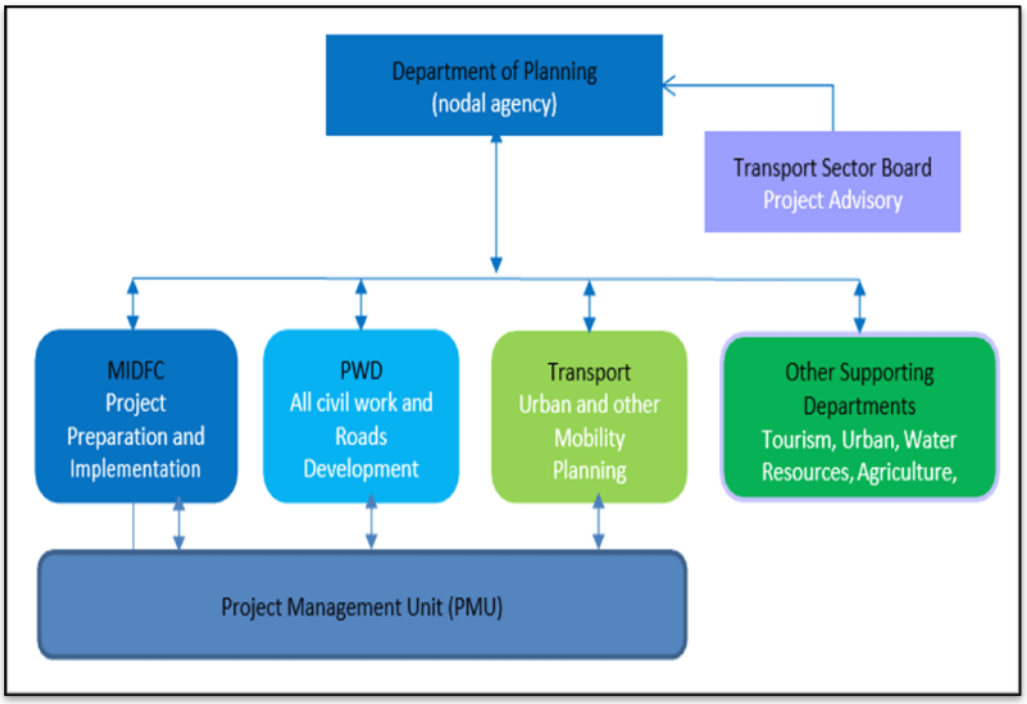



*Figure 27: Project Implementation Arrangement*

- **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 safe guards 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 of project activities;
- Discussion with different stakeholders, including implementing agencies on safeguard measures and their expected role;
- Preparing / finalizing assessment framework in line with the Environment and Social indicators;
- 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:*

#### *11.1.1.5 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.

#### *11.1.1.6 Environmental Expert*

Theenvironmentexpertwilllookafterenvironmentalaspects.She/hewillguidetheprojectteam onenvironmentalaspectsandsupportinbuildingenvironmentalparameterstobebuiltinthebids. She / he will also guide the contracts and monitor their works from time to time. In case of requirement, she/he will prepare a detail environment management plan for different activities to be executed by

the project. The expert will be guided by the MIDFC Project Director and reporting to the Project Director directly.

- **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.

- **Institutional Capacity to Manage Social Development Aspects**

#### *11.1.1.7 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'traditionalpracticeandtoactasaconduitbetweentheformalstategovernmentandthe informal grassroots tribal institutions.

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

#### 11.1.1.8 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 level's elected members to govern the village.

- **Grievance Redressal Committee (GRC)**

- **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 andmitigationofenvironmentalandsocialissueofaparticularproject.Thisconsistsofdefiningthe process for recording/receiving complaints and their redressal in respect of environmental and socialmatters.

An integrated system will be established with Grievance Redressal Cell (GRCs), with necessary officers, 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.

Thegrievanceredressmechanismshouldbeinplaceatthetimeofinitiatingtheimplementationof ESMFandcivilconstructionactivitiesintheprojectarea.Aplatformforgrievanceredressalshould 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. Theproject,apartfromweb-basedmechanism,willhavethree-tiregrievanceredressalmechanism, i.e., (1) at the project site level, (2) State level (PMU level) and (3) Judiciarylevel.

**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/communicatingwiththeconcerneddivisionsforresolutionofthesame.Thepersonin-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 ProjectDirector.

**Tier I**: Under this project, the local VECs and community level organizations will serve as the first-tiermechanismtohandlecomplaintsandgrievances.ThelocalHeadmanwillbethefocalpointwho will receive, address, and keep record of the complaints and feedbacks. The grievance focal point willfirstreviewthegrievancessubmitted.IfgrievancesordisputescannotbesolvedattheVEC's level within 30 days of the submission of the grievances, the issue will be 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 ChairmanshipofSecretary,DepartmentofPlanning.TheothermemberswillincludeChiefEngineer; Project Director and Social Expert of the Project. The second level of grievance cell will provide its view within 30 days of receiving thegrievance.

**TierIII**:TheaggrievedpersonifnotsatisfiedwiththeverdictgivenbyStatelevelgrievancecell,will have the right to approach the Judiciary. Project will help the aggrieved person in all respect if 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.

- **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 Helpline number will also be established to make the mechanism widely accessible and gender friendly.

- **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 people living near to the road alignment 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 70: 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 |

| Description | Contact details |
|---|---|
| Fax: | - |

- **Disclosure of Project Information**

In order to make the ESIA implementation process transparent, salient features of ESIA shall be translated in Khasi and disclosed on the Project Authority's website. The documents available in the public domain will include ESIA (summary in Khasi). 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 such as R&R, TPP, and GAP. 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 each project activity.

## 12.1 M&E of the ESMP application

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 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 all applicable activities?
- Has the scoping for further assessment been done comprehensively for all applicable activities?

**Monitoring of E&S aspects in project activities:**

- Arethecontractorsandimplementingagenciesundertakingperiodicandregularmonitoring 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 projects and 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 duly incorporated. 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:

## 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. It would 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 during the tenure.

## 12.5 Arrangements for Monitoring

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

- disbursement of compensation and assistance to PAPs, if any
- establishment of grievance redressal mechanism (including processes and timeline for redressal of grievances),
- consultation meetings with PAPs and communities regarding resettlement and rehabilitation issues,
- MIDFC website will include a link where 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.
- income restoration of persons,
- training of the interested PAPs
- 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.

# 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 EMP

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 the project 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;
- 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 mix plants, 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 the agencies 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 issues that 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 and assisting the contractor during this phase. Their work shall include but not limited to:

- Monitoring and guiding the contractor on adopting good environmental and engineering practices;
- Arrangement of plantation through the Forest Department;
- Arranging training to the contractor and other stakeholders according to the needs arising; 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/enhancement measures carried out.

*Table 71: Environment and Social Management Plan (ESMP)*

| Sl. | Environmental and Social 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<br>Collaborating Agencies | - |
| P2 | Land Acquisition | 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 land acquisition for this project not required.<br>PIU has to ascertain that any additional environmental impacts resulting from acquisition of land | Throughout Corridor | PIU,<br>Revenue Dept.<br>NGOs<br>Collaborating Agencies | |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | are addressed and integrated into the EMP and other relevant documents. | | | |
| P3 | Preservation of Trees | All efforts will be made to preserve trees including evaluation of minor design adjustments/ alternatives to save trees. Specific attention will be given for protecting giant trees, and locally important trees (religiously important etc.).<br>The amount of tree within toe line due to widening of highway is 166 trees. These trees will betransplanted along the project stretch to restore the green cover<br>In the event of design changes, additional assessments including the possibility to save trees shall be made.<br>Stacking, transport and storage of the wood will be done as per the relevant norms. | Throughout Corridor | PIU<br>Forest Department<br>Contractor | |
| P4 | Relocation of Utilities and Common Property Resources (CPR) | All utilities and CPRs i.e., water supply lines, religious structures, 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 kept in mind while relocating all utilities and CPRs.<br>The boundary wall of one school will be impacted which will be reconstructed. There were differences in opinions among the villagers in demolishing/ shifting the Bus shelter. It was agreed that bus shelter has been proposed in the DPR.<br>There are 12 educational institute and 6 religious structures are found in this project road which are away (minimum 10 m) from project road and not impacted by the project | Throughout Corridor | PIU<br>Concerned Agencies<br>Contractor | |
| P5 | Orientation of Implementing | The PIU shall organize orientation sessions and regular training sessions during all stages of the | Throughout Corridor | PIU<br>Concerned | |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | Agency and Contractors | project. This shall include on-site training (general as well as in the specific context of the sub-project). 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. | | 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. The verification exercise should assess the need for additional protection measures or changes in design/ scale/ nature of protection measures including the efficacy of enhancement measures suggested in the EMP. Proper documentation and justifications/reasons shall be maintained in all such cases where deviation from the original EMP is proposed. | 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 will assess 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 of work. | Throughout out Corridor | Contractor Environmental Expert of AE | PIU |
| P8 | Crushers, Hot-mix plants and Batching Plants Location | Hot mix plants and batching plants will be sited sufficiently away from settlements and agricultural operations or any commercial establishments. Such plants will be located at least 1 Km away from the nearest village/ settlement preferably in the downwind direction. The Contractor shall submit a detailed layout plan for all such sites and approval of Environmental Expert of AE/PMC shall be necessary prior to their establishment. Arrangements to control dust | Throughout out Corridor | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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 and submitted. The engineer will ensure that the regulatory and legal requirements are being complied with. | | | |
| 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 standards promulgated under the Environment Protection Act, 1986 will be strictly adhered to.<br>Noise limits for construction equipment to be procured such as compactors, rollers, front loaders concrete mixers, cranes (moveable), vibrators and saws will not exceed 75 dB (A), measured at one meter from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986.<br>The Contractor shall maintain a record of PUC for all vehicles and machinery used during the contract period, which shall be produced for NH verification whenever required.<br>Mobile equipment shall be placed at least 100 m away from the nearest dwelling. | Throughout out Corridor | Contractor | Environmental Expert of AE and PIU |
| P10 | Borrow Areas | Finalizing borrow areas for borrowing earth and all logistic arrangements as well as compliance to environmental requirements, as applicable, will be | Along the Project Influence Area | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | the sole responsibility of the contractor.<br>The Contractor will not start borrowing earth from selected borrow areas until the formal agreement is signed between landowner and contractor and a copy is submitted to the PIU/Environmental Expert of AE through the Engineer.<br>Locations finalized by the contractor shall be reported to the Environmental Expert of AE and who will in turn report to PIU.<br>Planning of haul roads for accessing borrow materials will be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas as far as possible (in case such a land is disturbed, the Contractor will rehabilitate it as per Borrow Area Rehabilitation Guidelines) and will use the existing village roads wherever available.<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. | | | |
| P11 | Quarry | Authorized Quarries that meet environmental and social standards and the necessary technical specifications will be identified by PIU in the project area<br>Quarries must adhere to World Bank Environmental Health and Safety Guidelines<br>In case of new Quarries, they must have permission from the Department of Mining and Geology and have the necessary clearances from Pollution Control Board and Forest Department and a valid Environmental Clearance | Along the Project Influence Area | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | from the State Environmental Impact Assessment Authority (SEIAA);<br>Quarry should not be operating in any sites of valuable critical or natural habitat<br>Quarry should not be operating in landslide or erosion prone zones<br>Quarry should not disrupt drainage pattern or cause water pollution<br>Quarry should not be operating on the road where operations can disrupt traffic or pose safety risks<br>Quarry workers must have access to Personal Protective Equipment during operations<br>Contractor will finalize the quarry for procurement of construction materials after assessment of the availability of sufficient materials and other logistic arrangements In case the contractor decides to use quarries other than recommended by DPR consultant, then will be selected based on the suitability of the materials.<br>The contractor will procure necessary permission for procurement of materials from Mining Department, District Administration and State 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 will extract 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 by community.<br>The contractor will need to comply | Along the Project Road | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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 PIU prior to initiation of any construction work. | | | |
| 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 will be 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 1000 m from watercourses.<br>The waste disposal and sewage system 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 Expert of AE. The Environmental Expert will be required to ensure that the clearing up of the site prior to handing over to the owner (after construction or completion of the activity) is included in the contract. | Along the Project Road | Contractor | Environmental Expert of AE and PIU |
| P16 | Implementation -Information Meetings | The contractor will organize at least 2 implementation information meetings in the 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, | Along the Project Road | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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 along the 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 of posters 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 disclosure shall be approved by PIU prior to the meetings. | | | |
| P17 | Disaster Management and Emergency Response Plan | The Contractor will develop and maintain emergency response systemin order to address any accidents or other emergency situation or disaster at site such as fall of workers from height, collapse of pier,flood, earthquake, accident, etc. | For entire project stretch including bridge locations, camp site and platsite | Contractor | Environmental Expert of AE and PIU |
| P18 | Chance Finds Procedure | As unknown features/objects could be encountered during works, earthworks, a “chance finds procedure” shall be in place to stop | Along the Project Road | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | works and require investigation by an archaeologist in case of such findings and involvement of relevant state entities | | | |
| 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 is minimum.<br>Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed 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 30 cm 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, temporary traffic diversions, haulage routes etc. | Along the work in progress | Contractor | Environmental Expert of AE and PIU |
| C2 | Disposal of debris from dismantling structures and road surface | The contractor shall identify disposal sites. The identified locations will be reported to the Environmental Expert of AE. These locations will be checked on site and accordingly approved by Environmental Expert of AE prior | Along the work in progress | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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 puddles in the area. | | | |
| 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 in consultation 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 spoils of material unsuitable for embankment fill will not be disposed off near any water course, agricultural land, and natural habitat like grass lands or pastures. Such spoils from excavation can be used to reclaim borrow pits and low-lying 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 | Along the Road | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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 disposal or any non-compliance that may arise on account of lack of action on his part. | | | |
| 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 will be kept to a minimum to ensure that 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 or when 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, | Along the Road | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | filling up of tree pits, in the median and in the agricultural fields of farmers, acquired temporarily. | | | |
| | Impact on structures | 13 structures are being impacted due to the construction activities. The type of structures are ramps, staircases, boundary wall and chimney. The contractor will reconstruct all these affected structures within 15 days of completion of work at these sites. | Along the Road | Contractor | Social cum Gender Expert, PIU |
| 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 are accessible 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 for transportation of hazardous | Along the Road | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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><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 Borrow Areas 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 carried out 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 areas or 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 during their 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 | Borrow Areas | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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 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 to PIU 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.<br>Sand, Stone and Aggregate will be from authorized sources that adhere to state regulations as well as World Bank Environmental Health and Safety Guidelines and Safeguard standards as outlined in Annexure 7. | Quarry Areas | Contractor | Environmental Expert of 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, | All Roads Used | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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. | | | |
| C10 | Construction Water | Contractor will arrange adequate supply and storage of water for the whole construction period at his own costs. The Contractor will submit a list of source/s from where water will be used for the project to 'PIU' through the Engineer.<br>The contractor will source the 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 precaution to minimize the wastage of water in the construction process/ operation. | Along the Project | Contractor | Environmental Expert of AE and PIU |
| 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 Irrigation Department 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 and Flood Control | Contractor will ensure that no construction materials like earth, stone, ash or appendage is disposed off in a manner that blocks the flow of water of any | Drainage line along the road | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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>Contractor will take all necessary measures to prevent the blockage of water flow. In addition to the design requirements, the contractor will take all required measures as directed by the Environmental Expert of the PIU 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>Drainage line will be constructed all along the project road.<br>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.<br>Although, effective drainage of water from road side drainage system has been provided throughout the project stretch | | | |
| 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 borrowing earth for embankment construction.<br>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 | All Surface Water Bodies Along the Road | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | the embankment slopes, on the particular sub-section of the road. The contractor will also put-up sedimentation cum grease 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, However the item has been kept in case need arises during construction. However, all the water bodies are minimum 2.18 m away from the project road(Refer to Table 24)<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. | | | |
| 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 and sedimentation.<br>Slope protection shall be provided on embankments abutting water bodies by providing stone pitching for slopes b/w 1:4 (V:H) to 1:2 (V:H). Retaining walls shall be provided at high embankments.<br>All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earth work or other items of work and as such as no separate payment will be made for them.<br>Contractor will ensure the following aspects:<br>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>Turfing works will be taken up as soon as possible provided the | Along the Roads | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | season is 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>In borrow pits, the depth shall be so regulated that the sides of the excavation will have a slope not steeper than 1 vertical to 2 horizontals, from the edge of the final section of the bank.<br>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 into streams, 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.<br>The Environmental Expert of the PIU will certify that all liquid wastes disposed off from the sites meet the discharge standards. | 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 such sites will be submitted by the Contractor prior to their establishment and will be approved by the Environmental Expert of AE and PIU.<br>Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refueling will be carried out in such | Along the Roads | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | a fashion that 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 fueling locations, to prevent contamination of water.<br>'Oil interceptors' shall be provided in wash down areas and re-fueling 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, 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 and state PCB guidelines.<br>Environmental Expert of AE and Resident Engineer' will certify that all arrangements comply with the guidelines of PCB/ MoEF&CC or any other relevant laws. | | | |
| C17 | Dust Pollution | The contractor will take every precaution 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 of screen/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 control legislation.<br>The suspended particulate matter value at a distance of 40m from a unit located in a cluster should be less than 500 g/m3. The pollution | Along the Roads, Construction Site/ Camps | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | monitoring is to be conducted as per the monitoring plan.<br>Alternatively, only crushers licensed by the 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. | | | |
| 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 project. Monitoring results will also be submitted to 'PIU' through the 'Engineer'. | Along the Roads, all vehicles used/ Camps | Contractor | Environmental Expert of AE and PIU |
| C19 | Noise Pollution: Noise from Vehicles, Plants and Equipment | 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 | Along the Roads, all vehicles used/Camps | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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 be permitted around educational institutes/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'.<br>Contractor will provide noise barriers to the suggested locations of select schools (at km 2+900, 3+050, 34+050, 34+100&34+150) because in these locations during the construction noise level will be very high.<br>No noisy construction activities will be permitted around educational institutes/health centers (silence zones) up to a distance of 100 m from the sensitive receptors i.e., school, health centers and hospitals between 9.00 am to 5.00 pm | | | |
| 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 to workers who are engaged in welding works<br>Protective goggles and clothing to | Along the Roads, all vehicles used/Camps | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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 concrete mixing 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 for use 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 | | | |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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 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' | Along the Roads, all vehicles used/Camps | Contractor | Environmental Expert of AE and 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. | Along the Roads, construction Camps | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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. | | | |
| 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 in every work zone<br>availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital<br>Equipment and trained nursing staff at construction camp. | Along the Roads, construction Camps | Contractor | Environmental Expert of AE and PIU |
| 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 Expert of 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. The contractor 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 | Along the Roads | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | time, the contractor will immediately upon discovery thereof acquaint the Environmental 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 stage should be made to minimize the tree felling requirement<br>Compensatory plantation should be started during construction phase parallel to the construction activities. | | | |
| C28 | Chance Found Archaeological Property | All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation.<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. | Along the Roads, construction sites/Camps | Contractor | Environmental Expert of AE and PIU |
| C29 | Labour Accommodation | Contractor will follow all relevant provisions of the Factories Act, 1948 and the building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance | Along the Roads, construction Camps/site | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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 only upon 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 camps will be properly designed and built so that no water pollution takes place in adjacent canals | | | |
| 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 Workers (Regulation of Employment and Conditions of Service) Act, 1996.<br>Testing of water will be done as per parameters prescribed in IS 10500:1991. | Along the Roads, construction Camps/construction site | Contractor | Environmental Expert of AE and PIU |
| 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 Expert of 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 | Along the Roads, construction Camps | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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 for disposal 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. | | | |
| C33 | Consultation | The Environmental Expert of AE will contact the responsible people with the enhancement drawing of the site for which enhancement has been proposed and take their consent before the start of work.<br>Accesses to Different Schools along the road will be developed to the satisfaction of 'PIU'. | Along the Roads | Contractor | Environmental Expert of 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 filled in and effectively sealed off. Residual topsoil, if any will be distributed in pre identified approved areas or in places suggested by the Environmental Expert of AE areas in a layer of thickness of 75 mm-l50 mm. All construction zones including river-beds, culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, at the contractor's expense, to the entire satisfaction to the Environmental Expert of AE and | Along the Roads, construction Camps | Contractor | Environmental Expert of AE and PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | 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 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 of rainwater and avoid flooding.<br>PIU will ensure that all the sediment and 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, etc.<br>Regular maintenance of the road will be done to ensure good surface condition | Along the Road | PIU through Pollution Monitoring Agency | PIU |
| 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 | Along the Road | PIU through Pollution Monitoring Agency | PIU |

| Sl. | Environmental and Social Issue | Management Measures | Location | Responsibility | |
|---|---|---|---|---|---|
| | | | | Planning and Execution | Supervision/ Monitoring |
| | | Signs for sensitive zones (health centers / educational institutions etc.) will be put up where horn should not be blown or traffic speed need to be regulated<br>Pressure Horn must be banned in the project road | | | |
| O6 | Water Pollution | Water Quality will be monitored as per monitoring plan | 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 borrow 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 be developed, especially along congested locations and near sensitive locations<br>Traffic control measures including speed limits will be enforced strictly.<br>Engagement with local community / Awareness Training | Along the Road | PIU | PIU |

## 13.5 Nonconformity 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 time period 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 lapse from the date of issuing the second reminder.
- If a major lapse is not rectified upon receiving the notice PIU shall invoke reduction, in the 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 72 : Environment Management Plan Implementation Budget*

| Sl. | Cot of Environment / MigrationPlan Description | Unit | Quantity | Unit Rate (Rs.) | Amount (Rs.) |
|---|---|---|---|---|---|
| | Obtaining necessary clearances, permission, consent from the concerned departments. | Contractors' responsibility | | | |
| | Water Sprinkling for dust suppression at site(3 trips/ day) | | | | |
| | Labour welfare as per norms. | | | | |
| | Environmental Monitoring (Air, Water, Noise & Soil). | -- | -- | -- | 900000/- |
| | Conducting Swachh at a Pakhwada, EHS awareness program and Training etc | Lump sum | -- | 200000 | 200000/- |
| | Traffic Safety (Signboards, Delineators, Barricades, Cautionary tape etc.) | Lump sum | -- | 500000 | 500000/- |
| | Fire Safety, Workers Safety(PPEs),Electrical Safety, Health Safety (First Aid Facility) etc | Lump sum | -- | 500000 | 500000/- |
| | Miscellaneous/CER | Lump Sum | | 200000 | 200000/- |
| | Total cost | | | | 2300000/- |

*Table 73: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 transporting construction material | 40. 130 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. | | | | |

| Sl. no | Environmental Components | Particulars | | Unit | Rate In (Rs.) | Approx. Quantity | Total Cost In (Rs.) |
|---|---|---|---|---|---|---|---|
| | | Oil trap at parking/servicing of construction vehicles (at three location every 14km)- | | No. | Ref: Project Cost Estimate | | |
| **2.3** | Environmental Enhancements | 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. | | |
| **2.4** | Flora | No tree felling as the project road is within the existing ROW. | | Nos. | If required, the cost of trees transplantation will be 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 Civil Cost. | | |

| Sl. no | Environmental Components | Particulars | | Unit | Rate In (Rs.) | Approx. Quantity | Total Cost In (Rs.) |
|---|---|---|---|---|---|---|---|
| **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 center | | | Cost of relocation is included in Total Civil Cost. | | |
| | | 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 to traffic and accidents | Clearing of spills at accident site | | | | 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 74: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 | 450000 |
| Total Cost in Construction phase | | **1232000** |
| **2** | **Operation Phase** | |
| **2.1** | Total Mitigation / Enhancement Cost | 700000 |
| **2.2** | Environmental Monitoring Cost | 450000 |
| Total Cost in Operation Phase | | **1150000** |

| Sl. No. | Environmental Components | Cost (Rs.) |
|---|---|---|
| | | |
| 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)** | | **29,02,000** |

An environmental management budget at of INR**29,02,000** has been estimated for implementation of the environmental management plan. This budget includes cost of environmental monitoring and associated trainings.

## 13.6 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 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 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.

**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 sensitize to take more proactive role to apprehend any remote chance of human trafficking, particularly of women 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.

**Recommendation of the Vulnerable groups**

- Provision for institutional credit to the roadside vendors and traders.
- Skill development training to the members of the PAFs.
- Linkages of the locals with the available schemes sponsored by the State and the Central Government.

**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 toilets/washrooms 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 other complaints.
- 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.

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

The cost related to temporary impacts will be borne by the EA. EA will ensure allocation of funds 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 persons. The implementing agency will be involved in facilitating the disbursement process and rehabilitation program. The SMP implementation budget is given in Table 79

***Table 75:Summary of SMP Implementation Budget***

| | | | |
|---|---|---|---|
| **I. Implementation of SMP** | | | |
| Support for implementation of RAP (lump sum) | 420,000 | 1 | 420,000.00 |
| M & E consultant (lump sum) | 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-XIV: 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 people about 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).

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: Social Screening Format**

## Urban Roads (Town roads) and Non-urban roads under MITP (World Bank) initiative. Public Works Department (Roads), Government of Meghalaya

**General Information:**

Name of Project: **Umsning- Jagi Road** Urban/ Rural Area: **Rural**

Tehsil: **Ribhoi** District: **Ribhoi**

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

**6. Residential structures/buildings (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 |
| 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 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 to proposed 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 | To be updated |

**10. 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** 200 persons (all impacts combined together – land, structure, other assets, livelihood, etc) or there is only temporary impact during construction | Abbreviated Resettlement Action Plan (ARAP) 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 | Resettlement Action Plan (RAP) required | Not Applicable |

| Output | Outcome | Triggered for the Project |
|---|---|---|
| assets, livelihood, etc) | | |
| 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 | Applicable |

**11. 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 |