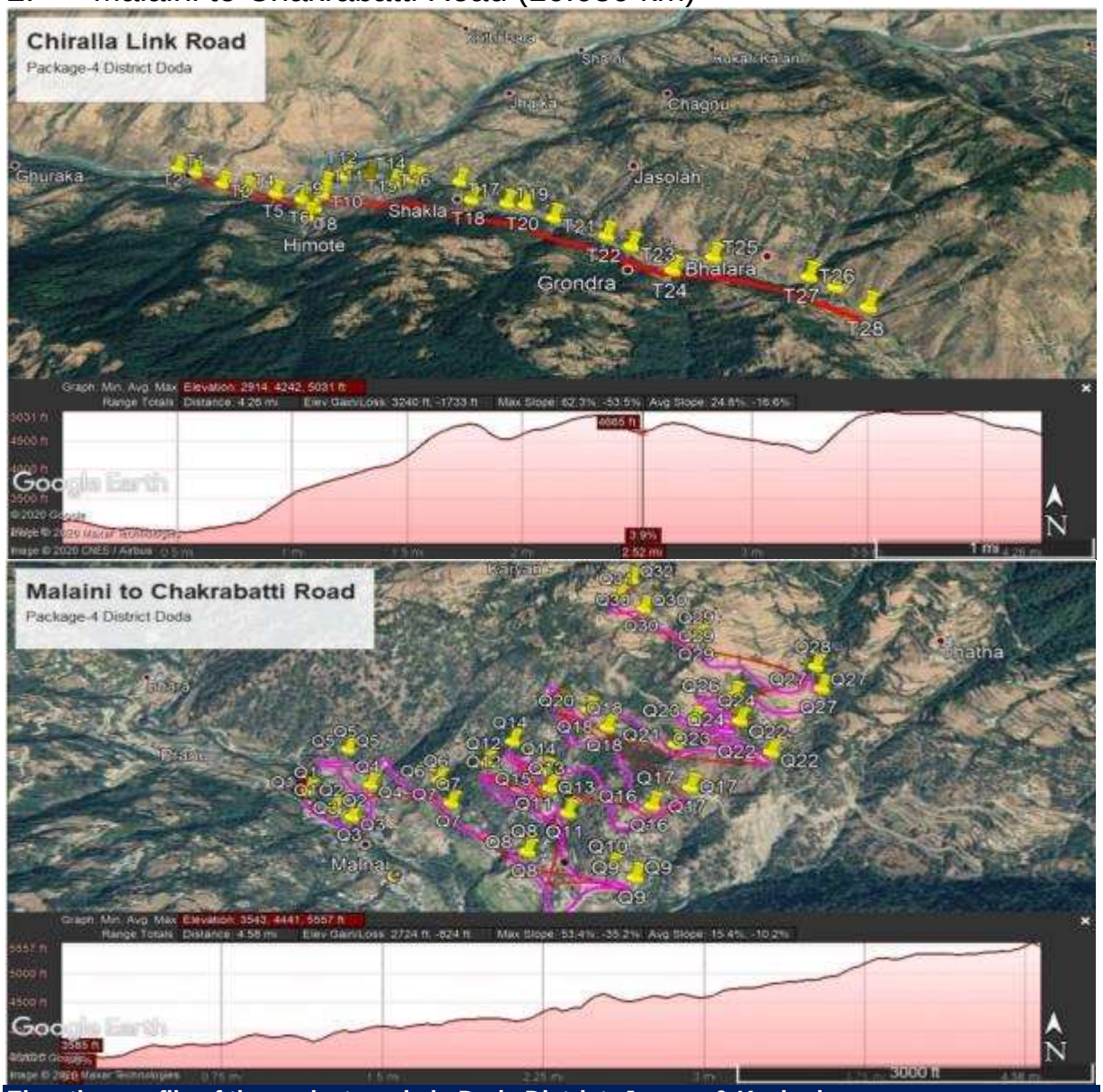
ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

Improvement & Up-gradation of:

1. Chiralla Link Road (10.139 km)
2. Malaini to Chakrabatti Road (10.059 km)



Elevation profile of the project roads in Doda District- Jammu & Kashmir

Jhelum Tawi Flood Recovery Project- The World Bank Financed Project

Environmental Impact Assessment Report

November 2020

Jhelum Tawi Flood Recovery- World Bank Financed Project

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Acronyms & Abbreviations

AAQ	:	Ambient Air Quality
ASI	:	Archaeological Survey of India
BIS	:	Bureau of Indian Standards
CPCB	:	Central Pollution Control Board
CPR	:	Common Property Resources
DPR	:	Detailed Project Report
DO	:	Dissolved Oxygen
EA	:	Environmental Assessment
EIA	:	Environmental impact Assessment
EMP	:	Environmental Management Plan
ERA	:	Economic Reconstruction Agency
GC	:	General Conditions
GoI	:	Government of India
ILO	:	International Labour Organization
IS	:	Indian Standards
J&K	:	Jammu and Kashmir
JTFRP	:	Jhelum Tawi Flood Recovery Project
MoEF&CC	:	Ministry of Environment, Forest and Climate Change
NAAQS	:	National Ambient Air Quality Standards
NOC	:	No Objection Certificate
OP	:	Operational Policy
PAP	:	Project Affected Persons
PIU	:	Project Implementation unit
PIA	:	Project Influence Area
PMU	:	Project Management Unit
PPE	:	Personal Protective Equipment
PUC	:	Pollution Under Control
PWD	:	Public Works Department
RoW	:	Right of Way
SPCB	:	State Pollution Control Board
TAQAC	:	Technical Assistance and Quality Audit Consultants
WB	:	The World Bank

EXECUTIVE SUMMARY

A catastrophic deluge of September 2014 shows negative impact on economic aspects of the State (now Union Territory) and massive infrastructure damages in which capital city Srinagar was most affected and a trail of siltation in most of the water bodies as environmental degradation which is always synonymous with major floods. In connection to the catastrophic flood, a mission of the World Bank visited the State during February 1-6, 2015 on request of Government of India to review and assess the damages to produce a rapid multi-sectoral assessment report of the damages and needs. The Rapid Damage and Needs Analysis (RDNA) estimates the total damages and loss caused by floods at about INR 211,975 million (US$ 3,550.45), most of it to housing, livelihoods, and roads and bridges, which combined represent more than 70% of the damages in terms of value. Public service infrastructure and equipment of hospitals and education centres were also severely damaged and are still not fully operational. Based on the RDNA results, restoration works underway, and discussions with the GoJ&K, "Jhelum and Tawi Flood Disaster Recovery Project (JTFRP)" will focus on restoring critical infrastructure using international best practice on resilient infrastructure.

The objective of this component is to restore and improve the connectivity disrupted due to the disaster through the reconstruction of damaged roads and bridges. The infrastructure will be designed to withstand earthquake and flood forces as per the latest official design guidelines. The affected areas will benefit from the restored access to the markets thereby increasing the economic growth in these areas and timely access to health and education services. Restoration of roads will also serve as supply/rescue lines in the event of a disaster.

Under Road Package-4, two subprojects have been identified in District Doda and DPR has been prepared namely for 1) Chiralla Link Road with a total length of 10.139 Km and 2) Malaini to Chakrabatti Road with a total length of 10.059 Km. The roads are having a hilly terrain.

The environmental assessment scope includes screening and scoping, environmental assessment and environmental management plan for the individual road subprojects under Jhelum Tawi Flood Recovery Project. The objective of Environment and social screening is to identify the potentially significant environmental/ social issues of the sub-projects at an early stage for Environmental Assessment.

As per the EIA notification 2006 and subsequent amendment, environmental clearance for the widening/ strengthening/ up-gradation and improvement works on the existing road is not required. The subproject shall require to obtain Consent to Establish and Consent to Operate under Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981 and authorization under Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016 from J&KSPCB for establishing and operation of Crusher Plant, Hot Mix Plant, and WMM Plant for the subproject.

The World Bank safeguard policies are designed to prevent and mitigate undue harm to people and their environment in the development process. The layout requirements that

must be complied with for all Bank-funded projects (refer to World Bank's Website on Safeguard Policies). Environmental and Social Policies – OP/BP 4.01 Environmental Assessment and OP/BP 4.11 Physical Cultural Resources are triggered in the project.

Project Location

The Sub-project of Chiralla Link Road is located in District Doda in Jammu region, having geo-coordinates of 33°7'33.57"N (Latitude) & 75°37'39.14"E (Longitude) at Chiralla (starting point) to 33°6'19.94"N (Latitude) & 75°41'39.28"E (Longitude) at Puneja (endpoint) of the road. Malaini to Chakrabatti Road is having geo-coordinates of 33°5'31.95"N (Latitude) & 75°35'16.95"E (Longitude) at Malaini (starting point) to 32°57'42.45"N (Latitude) & 75°36'4.38"E (Longitude) at Chakrabatti (endpoint) of the road.

The proposed subprojects "Improvement & Up-gradation of the Roads under Package-4" are a rural roads passing through the hilly terrain. of Chiralla and Malaini-Chakrabatti Road passes through villages where residents are primarily associated with agriculture The improvement of these roads will help in socio-economic development in the region besides give a major boost for creation of additional livelihood opportunities for local people It will also provide the people of the region with better access to education and health.

Screening and Environmental Assessment (EA)

Sub-projects under "Jhelum and Tawi Flood Recovery Project" commonly known as JTFRP have a prior requirement of screening which is based on three categories; viz., nature of the project, size of the project and location of the project that is sensitive area criteria. The objective of the Environment screening is to identify the potentially significant environmental issues of the sub-project at an early stage for detailed Environmental impacts. The EA for selected subproject includes establishing an environmental baseline in the study area, identify the range of environmental impacts, specify the measures to avoid, minimize, and mitigate negative impacts and maximize positive impacts and integrate possible environmental enhancement measures. The proposed measures will be formulated in the form of an environmental management plan with the necessary budget and institutional roles for effective implementation. The EMP developed shall form the part of the construction contract document.

Policy and Legal Regulatory Instruments

National and State Laws

- EIA Notification, 14th Sept 2006 and Subsequent amendments
- Jammu and Kashmir Forest (Conservation) Act, 1997
- Jammu and Kashmir Wildlife (Protection) Act, 1978
- Air (Prevention and Control of Pollution) Act,1981
- Water (Prevention and Control of Pollution) Act,1974
- Noise Pollution (Regulation and Control Act),2000
- Construction & Demolition Waste Management Rules, 2016
- e-waste (Management) Rules, 2015
- Public Liability and Insurance Act 1991

- Central Motor Vehicle Act 1988 and the Central Motor Vehicle Rules 2019
- Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996/ Jammu and Kashmir Building and Other Construction Workers (Regulation of Employment and Condition of Services) Rules, 2006
- Jammu and Kashmir Electricity Act, 2010 and amendments thereof and BIS 1255;1983 and amendments thereof
- Hazardous Waste (Management, Handling and Trans-boundary Movement) Rules,2008 and amendments thereof
- Solid Waste Management Rules, 2016
- The Jammu and Kashmir Preservation of Specified Trees Act, 1969

World Bank Operational Policies

- OP/BP 4.01 Environmental Assessment
- OP/BP 4.36 Forests
- OP/BP 4.11 Physical Cultural Resources
- OP/BP 4.12 Involuntary Resettlement

Project Description

The proposed Improvement and Up-gradation of the road under Package-4 in District Doda comprise the construction of identified project Roads of "Chiralla Link Road and Malaini to Chakrabatti Road" by way of Improvement & Up-gradation of existing roads, drains, protective works, road profile, hillside stabilization and enhancement measures etc., as per the best engineering practices, in compliance to the World Bank policies and in synchronization with project environmental management strategies.

Scope of the Work

The scope of works for the proposed project will include but not limited to the component which will finance the reconstruction of damaged roads, bridges and associated drainage and slope stabilization works and environmental enhancement measures, retaining walls, breast walls and other structures/ activities to increase resilience.

Public Consultation

One of the important components of this study is the dissemination of project information by way of "Consultation with stakeholders and the general public". A public consultation was done at Thalella, Bhella locations and Malaini, Berarrre locations of the project corridor of Chiralla Link Road and Malaini to Chakrabatti Road respectively with local people as part of the environment and social screening study. During the consultation process, people have expressed keen interest in the proposed sub-project. Local people were made aware of the upcoming work and World Bank funding and guidelines. People, in general, were very enthusiastic about the benefits of the subproject as the project will connect with the famous tourist and piligrimage destinations and will give connectivity to the villages adjoining to Chiralla Link Road in District Doda.

Some of the positive response with suggestions received from the residents and stakeholders during the consultation is summarized as, i) road safety measures to

be applied at all curves especially at critical sharp points and executed with better-designed features for the hilly road terrain, better riding surface, higher life period, both cross and longitudinal drainage provision etc. ii) ensured full cooperation and support for the successful execution of the project; ii) residents who are related to the construction industry may be engaged with the proposed road works; iii) Road section at the sensitive area with a history of landslip/ erosion to be provided with best engineering protective measures, beautification process enhancement measures, iv) built-up shall be provided with the provision of an effective drainage system and designed in a manner to effectively manage stormwater episodes.

Assessment of Impacts

The environmental assessment study carried out for the Road Project under Package-4 namely; Chiralla Link Road and Malaini to Chakrabatti Road in District Doda in terms of the potential environmental impacts that may occur as a result of the implementation of the project. The anticipated environment impacts identified for the construction phase which comprise of transitory/ insignificant increase in air and noise pollution, soil erosion, a slight change in water quality near the construction area and these impacts are temporary and site/time-specific in nature. The major impacts of the project are expected to be during the construction phase leading to air and noise quality deterioration, addressing slope stabilization issues, occupational, health and safety impacts to the works and local communities, utility shifting, generation of construction debris and disposal of waste material respectively. The project roads are hilly roads with rugged terrain features. The proposed road projects will have significant positive impacts and to address the problem of bad road condition through improved design and geometrics, hill/ valley side protective measures and environmental enhancement measures.

The project mitigation measures have been developed for evading, reducing and regulating the adverse impacts on the environment impacts induced by the project proposed with emphasis on slope stabilization/ protective measures. The policy, legal and institutional framework under the ambit of which the EIA was undertaken, is also detailed out in environmental assessment report. The Environmental Management Plan (EMP) for the Improvement and Up-gradation of project road in District Doda has been developed, which elaborates on the mitigation measures, means of implementation for the proposed measures, monitoring strategy and the budgets about the implementation of the proposed mitigation measures.

1. INTRODUCTION

1.1. Project Background

The state, owing to its geographical and geo-climatic setting, is a multi-hazard prone region that has experienced natural disasters like earthquakes, floods, landslides, avalanches, high-velocity winds, and snowstorms. Most parts of the Kashmir Valley fall in Seismic Zone V. The rest of the State falls in the Seismic Zone IV. The proposed roads under Package-4 in Doda District also falls in Seismic Zone-IV. Floods and flash floods are also frequent in Jammu& Kashmir. Floods generally occur in the summer when heavy rains are followed by snowmelt. Flooding of the river Jhelum is the main cause of floods in the Kashmir valley. Floods also occur occasionally in the Jammu Province.

In September 2014, Jammu & Kashmir experienced torrential monsoon rains in the region causing major flooding and landslides. The continuous spell of rains from September 2 to 6, 2014, caused Jhelum and Chenab Rivers as well as many other streams/tributaries to flow above the danger mark. The Jhelum River also breached its banks flooding many low-lying areas in Kashmir, including the capital. In many districts, the rainfall exceeded the normal by over 600%. The Indian Meteorological Department (IMD) records precipitation above 244.4 mm as extremely heavy rainfall, and J&K received 558mm of rain in the June- September period, as against the normal 477.4 mm. The district of Qazigund recorded over 550 mm of rainfall in 6 days as against a historic normal of 6.2 mm over the same period.

Due to the unprecedented heavy rainfall, the catchment areas, particularly the low lying areas, were flooded for more than two weeks and south Kashmir was badly affected by 2014 floods. Some areas stayed flooded for more than 1 month. Water levels were as high as 27 feet in many areas. The areas from the main tributaries of river Jhelum vis-à-vis Brengi nallah, Vishav nallah, Lider nallah and Sandran nallah started overflowing due to the heavy rainfall causing water levels in Jhelum river to rise. Subsequently, the discharge of the river Suran was 200 thousand cusecs as against an average of 50 thousand cusecs. With the excessive discharge of water, the river Suran affected the basin areas and also took a different course at various locations causing damages to the surrounding villages in the catchment area. Water levels also increased in the rivers of Chenab and Tawi, both of which were flowing above normal levels. Due to the rivers overflowing nearly 20 districts of the State were impacted.

Based on the **Rapid Damage Needs Assessment (RDNA)** results, restoration works underway, and discussions with the GoJ&K, the project will focus on restoring critical infrastructure using international best practices on resilient infrastructure. Given the state's vulnerability to both floods and earthquakes, the infrastructure will be designed with upgraded resilient features and will include contingency planning for future disaster events. Therefore, the project aims at both restoring essential services disrupted by the floods and improving the design standard and practices in the state to increase resilience.

The Project Development Objective (PDO) is to support the recovery and increase disaster resilience in targeted areas of the State and increase the capacity of the State entities to respond promptly and effectively to an eligible crisis or emergency.

The project comprises of the following seven components:

1. Reconstruction and strengthening of critical infrastructure (US$60 million)
2. **Reconstruction of roads and bridges (US$80 million)**
3. *Restoration of urban flood management infrastructure (US$50 million)*
4. Strengthening and restoration of livelihoods (US$15 million)
5. Strengthening disaster risk management capacity (US$25 million)
6. Contingent Emergency Response (US$0 million)
7. Implementation Support (US$20 million)

Under Jhelum Tawi Flood Recovery Project (JTFRP), component-2 aims at Improvement, up-gradation of more than 300 km of roads in J&K that would be developed under different packages covering a total of 19 roads. These roads were badly damaged during the 2014 floods and are mostly in poor condition concerning riding quality, geometry, pavement strength, absence of longitudinal drainage, and road safety standards. The sub-projects were selected based on flood damages incurred during September 2014 and findings of environment and social screening exercise. The improvement and up-gradation of the proposed roads will improve the efficiency and safety of transport on these roads. List of the roads to be taken under Component-2 is provided in Table 1.1 below;

Table 1.1: List of the Road Projects (Package Wise) under Component-2 of JTFRP in Jammu & Kashmir

S. No.	Package Name	Subprojects	Length of the Road (in Km)	District
Kashmir Region				
Improvement & Upgradation of:				
1.	Package-1	Pampore-Pulwama Road	30.256	Pulwama
2.		Rambagh-Lasjan-Kadalbal Road	12.978	Srinagar
3.	Package-2	Hamray-Sultanpora-Nowgam Road to Sumbal Bridge.	12.688	Baramulla/ Bandipora
4.		Shadipora-Khanpeth-Sumbal Road	6.0	Bandipora
5.		Shadipora-Khanpeth-Sumbal Road	6.0	Bandipora
6.	Package-3	Rigid Pavement of IG Road from Rambagh to Civil Secretariat	1.907	Srinagar
7.		Rigid Pavement of IG Road from Peerbagh to Humhama Chowk	1.491	Srinagar
8.		Rigid Pavement of Eastern Foreshore Road (Brari Nambal)	3.600	Srinagar
9.		Parimpora-Soibugh Road	7.927	Srinagar/Budgam
10.	Package-4	Sangam Khudwani Road	4.793	Anantnag
11.		Bijbehara-Waghama Road via Kitriteng Road	8.396	Anantnag
12.	Package-5	Kawhar Bala Payeen Road (On Hold)	5.240	Baramulla
Jammu Region				
13.	Package-1	Sidra-Surinser Road	18.290	Jammu

14.		Tutain Di Khui to Khadamadana Road	11.0	Jammu
15.	Package-2	Anji-Panasa Road	4.256	Reasi
16.		Deva Mai to Ohli Mandir Road	4.999	Reasi
17.	Package-3	Gulhati to Shahdra Sharief Via Ghambir Gali	27.280	Rajouri
18.	Package-4	Chiralla Link Road	10.139	Doda
19.		Malaini to Chakrabatti Road	10.059	Doda

This report pertains to environmental assessment and environmental management plan for a road project under Package-4 covering Improvement & Up-gradation of Chiralla Link Road(10.139 km) and Malaini to Chakrabatti Road(10.059 km) in District Doda (J&K)

1.2. Description of the Project

The Chiralla Link Road is proposed to be improved and upgraded with a total design length of 10.139 km. Project Road takes off from Km 61 of Batote-Kishtwar National Highway (NH-244) and ends at 10th Km of this alignment near village Puneja. The existing road is single lane and has 2.65m to 3.0m wide carriageway with an average shoulder width of 0.50 m and is proposed to be upgraded as 3.75m . The terrain features are characteristic hilly with open, mixed land use with sections of built-up and agricultural land. The Road traverses through hilly area settlements of Chiralla, Kandosu, Himote, Sakia, Grondra, and Bhalara. Through this alignment people of several villages namely Chhatra, Misratah, Sengoi, Jasolah, Deyoki, Kundi, changnu, Manawa etc. will get connected with district town Doda & Jammu. From Commercial Traffic point of view it has high importance as this road passing through agricultural hub of Doda District. The existing surface of the carriageway is Flexible Broken BT for a length of 5.5 Km and rest stretches are either Gravel or Earthen which is in poor condition and eroded in most of the stretches. The existing formation width is 3.65m to 4m with a ROW of 6m. Sliding continued from Km 2.000 to Km 2.400, Km 5.400 to Km 6.500 and Km 7.100 to Km 7.700. Protection work is required at the particular land slide zones to protect slope with inclusion of CC drain. Cleanliness of existing CC drains mandatory to avoid damages of BT surface during rain. The proposed new flexible pavement thickness is OGPC-25 mm; BM -50 mm, WBM - 225 mm; GSB-150 mm. 1 major junction exists in the proposed road and cross drainage structures include proposed reconstruction of culverts of 14 no's which include Hume pipe culverts of 11 no's and 2 no's are Box culverts.

The proposed road of Malaini to Chakrabatti Road has a total length of 10.059 km and transverses through hilly area settlements of Malaini, Jahnana, Sundra. Project Road takes off from Km 7th of Pul-doda-Bhaderwah and ends at village Sundra. From connectivity point of view, this particular road has high importance as through this alignment people of several villages namely Jahnana, Dranga, Pendku, Mehrada etc will get connected with district town. The existing surface of the carriageway is the pavement with mostly Earthen. Some stretches are Flexible BT surface which is in poor condition and eroded in most of the stretches. . The existing road is single lane and has 2.50m to 3.0m wide carriageway with an average shoulder width of 0.50 m and is proposed to be upgraded as 3.75m. The existing formation width varies between 3.50 to 3.00 m with a ROW of 6m. Protection work is required at some particular land slide zone to protect slope with inclusion of CC drain. Overlay also proposes at different stretches. Cleanliness of existing CC drains mandatory to avoid damages of BT surface during rain. The proposed new flexible pavement thickness is OGPC-25 mm; BM -50

mm, WBM - 225 mm; GSB-175 mm. 1 Major junction exist in the proposed road and cross drainage structures include proposed HP Culverts of 9 no's Slab Culverts 5 no's.

1.3. Scope of Environmental Assessment

An environmental assessment study of the project roads, comprise of identification and evaluation of impacts on the environment due to the various stages of the project implementation and provide inputs to project road design team to incorporate necessary measures in design to minimise such impacts through suitable engineering interventions. The combined length of both roads is 20.198 Km under selected sub-projects under Road Package-4 for its restoration of damage occurred during the floods and heavy precipitation in September 2014. Hence, an Environmental Management Framework has been designed for baseline environmental study, identifying impacts, mitigation measures to avoid, minimize and mitigate anticipated negative impacts within the project impact zone and project influence area. Accordingly, to minimize negative impacts during the entire project cycle environmental management plan has been developed with roles and responsibility for sound construction management during the project implementation. Furthermore, the report covers major finding of existing environmental, legal and administrative framework, monitoring programme, the cost for environmental management and evaluation of potential environmental impacts due to the proposed Road Sub-projects of Chiralla Link Road(10.139 Km) and Malaini to Chakrabatti Road(10.059 Km) under Package-4 in District Doda in region of J&K.

In general, the broad scope of the Environmental Assessment study includes following but not limited to:

- collect additional data relevant to the study area;
- undertake environmental monitoring so as to establish the baseline environmental status of the study area;
- assess the impacts on environmental attributes due to the construction and operation on of the proposed improvement work;
- prepare an Environmental Management Plan (EMP) outlining the measures for improving the environmental quality and budgetary cost estimation for implementation;
- identify critical environmental attributes required to be monitored subsequent to the implementation of the proposed subproject

1.4. Need and Benefits of The Project Road

The prerequisite objective of this component is to restore and improve the connectivity disrupted due to the disaster through the reconstruction of damaged roads. The infrastructure will be designed to withstand earthquake and flood forces as per the latest official design guidelines. The affected areas will benefit from the restored access to markets thereby increasing the economic growth in these areas and timely access to health and education services. Restoration of roads will also serve as supply/rescue lines in the event of a disaster. The component will finance the reconstruction of damaged roads, bridges and associated drainage and slope stabilization works, retaining walls, breast walls and other structures to increase resilience.

By improving and upgrading the existing roads which are in highly dilapidated condition will facilitate better riding surface and the access to the education/ religious places, markets, connecting villages and by inter-district connectivity which is the perceivable benefits.

1.5. The need for Environmental Assessment

The environmental impact assessment for the road Package-4 includes establishing the environmental baseline conditions in the study area, identify the range of anticipated environmental impacts during design, pre-construction, operation and maintenance phases of the project, specifying the measures to avoid, minimize, and mitigate negative impacts and maximize positive impacts and integrate possible mitigation measures, environmental management plan and environmental enhancement measures.

The proposed mitigation measures will be formulated in the form of an environmental management plan with necessary budget and institutional roles for effective implementation of EMP for the “Improvement and Up-gradation of road Package-4 (Doda District) under Jhelum and Tawi Flood Recovery Project (JTFRP) and integration of the same in project implementation agreements, including construction contract documents.

1.6. Environmental Screening and Scoping

Environmental screening exercise of the proposed subproject projects was undertaken to facilitate inputs on environmental, social and economic considerations for current and future prospects. Further, this report also provides scoping inputs in determining the major environmental issues and defines the scope of work for conducting an environmental assessment. As per the findings and recommendations of the Environmental Screening report, Environmental Assessment has been carried out for the subproject. The scoping exercise defines geographical boundaries for the subproject for impact assessment as well as defining the project influence area to assess the impacts due to project activities.

1.7. Environmental Assessment (EA)

The EA for selected subproject includes establishing an environmental baseline in the study area, identify the anticipated environmental impacts, specify the measures to avoid, minimize, and mitigate negative impacts and maximize positive impacts and integrate necessary mitigation measures, environmental management plan and environmental enhancement measures as required. The proposed measures will be formulated in the form of an environmental management plan with necessary budget provisions and institutional roles for effective implementation during various stages of the project. The EMP developed shall form the part of the construction contract document.

1.8. Environmental Management Plan (EMP)

An Environmental Management Plan designed for the implementation of the subproject shall consist of an overall framework which will be a guidance document providing environmental planning and design criteria for the current subproject, generic environmental management measures, institutional mechanism for implementation, capacity building and training process, and resource materials to function adequately to mainstream the environmental management and implementation of environmental management and monitoring plan.

1.9. Study Approach

To accomplish the above objectives, studies were organised in line with the guidelines stipulated by the World Bank and ESMF of JTFRP for environmental assessment.

a) Field Reconnaissance Survey

The approach to the entire study was formulated based on a detailed field reconnaissance survey and a thorough understanding of the proposed project. The reconnaissance survey was carried out for the project road to understand the salient environmental features of the project area, sensitive areas with regards to the proposed project activities, and a general understanding of the proposed subproject.

Based on the above an environmental profile of the project area, primary and secondary data requirements for carrying out further activities of the study, environmental surveys necessary for assessing the project impacts, and the project influence area were identified.

b) Review and Assessment of Applicable Environmental Regulations

Discussions with different stakeholders and review of the various regulations and guidelines for environmental assessment were conducted to assess the sampling and analysis requirements for the project and the procedural requirements for conducting an Environment Assessment. This primarily comprised of reviewing all relevant documents available for the project area.

c) Delineation of Study Area for Assessment

The above tasks identified the survey and analysis requirements for baseline data collection required for assessing the anticipated impacts of the proposed subproject activities. Based on which, the study area that is critical for assessing the project impacts was identified and delineated. The project influence area also considered those areas that are directly or indirectly influenced by the project activities during pre-construction, construction or operation of the proposed road improvement works.

d) Base Line Environmental Conditions

This activity comprised of field surveys for assessing the baseline environmental conditions and collecting primary and secondary information regarding physical, biological and socio-economic conditions of the study area. Besides, existing environmental quality of the study area was assessed based on the field of environmental monitoring. For monitoring the air, noise, and water quality, monitoring was carried and samples were collected and analyzed for relevant parameters.

e) Prediction/Assessment of Potential Impacts

The activity identified the likely impacts through changes in the physical, biological or socio-economic environment based on the analysis of the baseline environmental data collected. The assessment considered both positive and negative impacts due to the subproject activities and also due to the construction, and operation of the project corridor.

f) Environment Management Plan

The major components of the environment management plan comprised preparation of mitigation plan for all the negative impacts identified during study and to avoid, minimize or compensate the impacts, and the post-project monitoring plan for the measures suggested in the management plan to ensure that the impacts of the project are within the regulatory standards.

1.10. Structure of Environmental Assessment Report

The structure of the EA report has been categorized in the following Chapters:

Executive Summary

1. Introduction
2. Approach & Methodology
3. Project Description
4. Policy, Legal and Administrative Framework
5. Baseline Environmental Condition
6. Potential Environmental Impacts
7. Analysis of Alternatives
8. Public Consultation & Disclosure
9. Environmental Management Plan

Annexures

2. APPROACH & METHODOLOGY

2.1. Reconnaissance Survey

A detailed reconnaissance survey was conducted in the project domain area of Chiralla Link Road and Malaini to Chakrabatti Road in Jammu district. Detailed features such as land use, habitation, intersecting roads, utilities etc. This enabled the Consultants to visualize the possible problems to be encountered while selecting the realignments, as applicable. The detailed ground reconnaissance of project influence area was utilized for planning and programming the detailed surveys and investigations. All fieldworks involving topographic surveys and engineering investigations are primarily based on the information obtained from the reconnaissance survey.

2.2. Project Impact and Project Influence Area

In perspective of the environmental assessment study of above roads under Package-4, it is important to define the area for environmental impacts are being considered. The project will support infrastructure and the proposed improvement and up-gradation of roads under Package-4 which are confined within the existing roads of the area. These roads are free from any land acquisitions as no widening is involved.

The project impact area has been considered Right of Way (RoW) of the project corridor and project influence area has been considered as 500 meter which is the hilly road from the centre line of the road surface on both sides (LHS/RHS).

2.3. Screening Methodology

The screening exercise was done through reconnaissance survey. Public consultation meetings were arranged with the local community and conducted in Thalella and Bhella areas of Chiralla Link Road and Malaini and Berarre areas of Malaini to Chakrabatti Road respectively. Field survey and data collection were carried out as per the screening checklist provided in the Environmental & Social Management Framework (ESMF-2015) of the project. The information has been collected through primary as well as secondary sources, with the support of PMU/PIU team members. The objective behind the environmental screening was to delineate affected environmental features and issues like eroding of road surface/ de-stabilization of erosion-prone/ landslip areas due to the flash floods during high precipitation episodes, sensitive receptors- schools/ religious places and residential areas, scheduled trees protection, human settlements, water, natural resources etc. in the project area in order to define impacts and to minimize the adverse environmental impacts by suggesting best engineering solutions/options at optimal costs. The positive actions not only to avoid adverse impacts but to capitalize on opportunities to correct environmental degradation or improve environmental conditions were determined.

2.4. Detailed Baseline Environmental Surveys

A comprehensive survey was conducted for environmental impact and screening studies. For this purpose, a data-sheet was devised to collect quantitative and qualitative social and environmental data together with local subproject specific consultations. This will be the basis for further investigations for future studies. Information collection, literature survey and

analysis of data published and other recorded data *e.g.* on wildlife, forest flora, climate, pollution along with socio-economic, demographic, land-use pattern, land ownership details etc., about the subproject were also studied and reviewed. National and state environmental guidelines were also reviewed before carrying out baseline studies. A detailed survey has been carried out by the environmental and social experts who are responsible for the documentation of the environmental and social investigations and issues, to evaluate the existing environmental and social setting and conditions of the proposed project area. Potential significant impacts were identified based on an analytical review of project activities, baseline data, land use, environmental factors, socioeconomic conditions and review of the assessment of potential impacts identified in previous similar kind of projects. A participatory process was adopted while performing social screening of the sub-project. The information has been gathered through primary as well as secondary sources of information, with the support of PMU and PIU team members.

2.5. Collection of Data

Keeping in line with the proposed Improvement and Up-gradation of the existing roads in Doda district under Package-4, various activities like specific literature reviews and surveys were carried out referring publication & using the internet and useful information about the project impact and influence area was collected. This includes both published and unpublished environmental data. Literature searches were undertaken and relevant agencies were contacted and apprised of the proposed subproject. The following data were collected for the road projects during environmental screening/ assessment study: `

- Geo reference maps.
- Socio-economic data from the Planning Department and Census records.
- Geological data from the Geological Survey of India.
- Meteorological data from India Meteorology Department, Govt. of India.
- District Profile from District Statistics Department.
- Forestry and Wildlife Data from the Forest Department.
- Flora and fauna from various sources, including the State Forests Department and Wildlife Department.

Readily available data were reviewed with the initial reconnaissance investigations, and the need for primary data collection in some instances was determined.

2.6. Environmental Monitoring Data

Environmental monitoring (Air, Noise and Water quality) of the proposed roads under Package-4 will be carried during pre-construction stage to generate the latest baseline data so that it can be correlated for the comparative analysis with the monitoring during the construction/ operation stages of the project

2.7. Assessment of Alternatives

Analysis of alternatives is an analytical comparison of the operational effectiveness, costs and environmental and social risks of proposed development options. This helps to analyze the options critically about its impacts on all physical, social and biological environments.

The 'no action option' is to be considered among various options available. The process will ultimately help to determine which option is comparatively better than the other various options. For this project, alternative analysis has been made for three considerations, *i.e.* strategic, planning and technology consideration. Since the project is improvement and up-gradation of the existing road of Package-4 which was affected due to the incessant high-intensity rains during the catastrophic floods of September 2014. The high-intensity precipitation has damaged the road, drainage and stabilization issues of the hillside of the project road. The road is completely passing through the hilly terrain and protection works /stabilization measures and hill road safety aspects have been considered. Based on this assessment the present option of improvement and up-gradation is the best applicable solution and socio-economically viable option since does not involve any land acquisition/ displacement/ rehabilitation.

2.8. Stakeholder consultation and participation

Stakeholder's view and perception were assessed through informal and formal public consultation meetings. The different stakeholder's *viz.* government officials, local people (both male & female) were contacted and consulted during the study. Stakeholders were informed about the subproject components and likely environmental impacts before seeking their views. In each consultation, all efforts were made to have adequate participation from women as well. Consultations have been carried out for the project in two stages. First stage consultation was undertaken during the impact assessment process to identify the concerns of people, which were duly addressed through appropriate mitigation measures. Second stage consultation was undertaken as part of the preparation of the EIA report to assess the adequacy and acceptability of the proposed mitigation measures and management plan. Public consultations ensured the involvement of the public, experts in the project's pre-planning stage itself and redressal of their concerns and expectations from the subproject. The community members, government officials members opined that the proposed subproject would contribute to the social and economic development of the area. The proposed project would contribute to increased employment opportunities for the local people during and after subproject implementation. The communities welcomed the subproject and all were in favour of the project. Issues raised by stakeholders were analysed for practical and scientific basis, and for developing an appropriate mitigation, management and monitoring plan, depending on its importance and practicality.

Environmental Assessment report for Improvement and Up-gradation of road Package-4 (Chiralla Link Road and Malaini to Chakrabatti Road) and its executive summary shall be disclosed at JTFRP/PMU website as per provisions of World Bank disclosure policies.

3. PROJECT DESCRIPTION

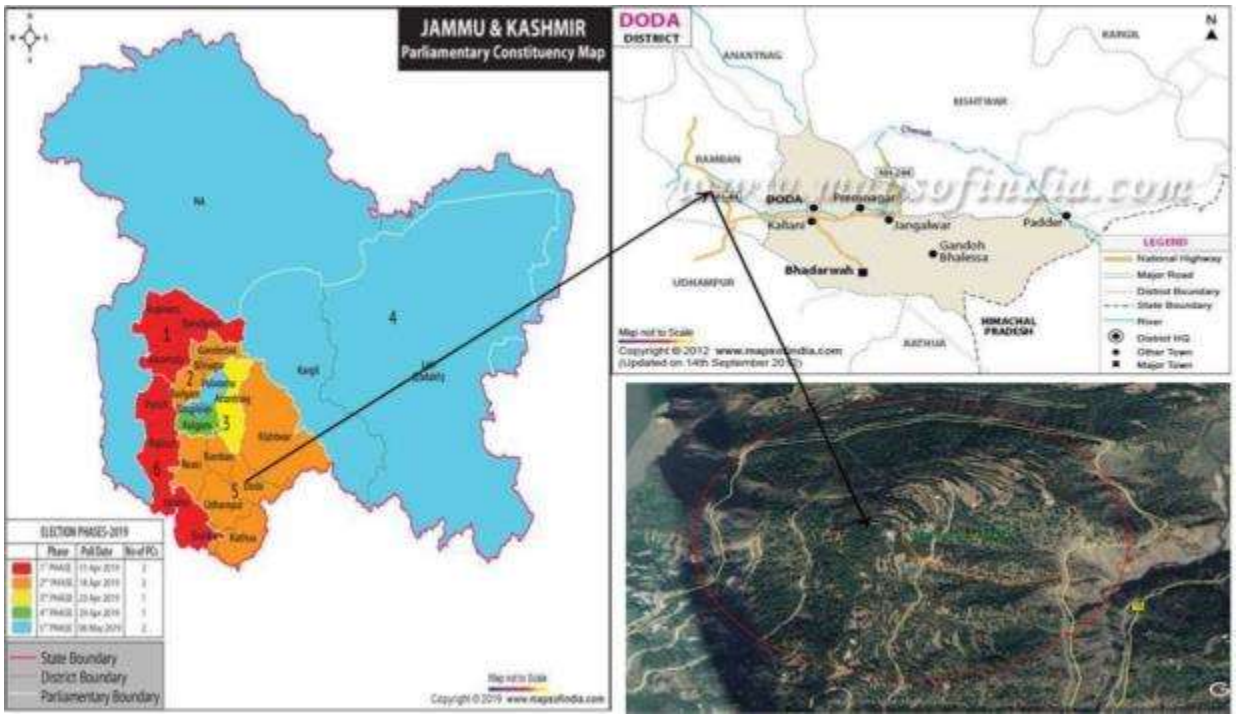


Fig 3.1: Location of the Doda District, J&K

3.1. Project Area

3.1.1. Component A of Package-4: Chiralla Link Road

The proposed Chiralla Link Road starts from Chiralla and terminates at Puneja of Doda District. It is a village road, the existing road is single lane and has 2.65m to 3.0m wide carriageway. This particular road has high importance and gives connectivity to Chhatra, Misratah, Sengoi, Jasolah, Deyoki, Kundi, changnu, Manawa etc. During September 2014 high intensity and prolonged rains like seasonal torrential rains resulted in damage / eroding of the pavement surface. Due to non-existence of CC drain, the existing road is badly damaged and slope eroded at several locations. Necessary protection works required at several stretches with the provision of CC drain.

3.1.2. Component B of Package-4: Malaini to Chakrabatti Road

Project Road Malaini to chakrabatti Road takes off from Km 7th of Pul-Doda-Bhaderwah and ends at village Sundra. From connectivity point of view, this particular road has high importance as through this alignment people of several villages namely Jahnana, Dranga, Pendku, Mehrada etc will get connected with district town. The existing surface of the carriageway is the pavement with mostly Earthen. Some stretches are Flexible BT surface which is in poor condition and eroded in most of the stretches. The existing road is single lane and has 2.50m to 3.0m wide carriageway with an average shoulder width of 0.50 m and is proposed to be upgraded as 3.75m. Due to non existence of throughout CC drain, pavement badly damaged and slope eroded at several locations. Necessary protection work

require at several stretches with provision of CC drain. After development of this road, significant traffic flows through the routes which will enhance the economy of that area as well.

3.2. Project Location and Outline

3.2.1. Component A of Package-4: Chiralla Link Road

The proposed subproject of Chiralla Link Road is having geo-coordinates of 33°7'33.57"N (Latitude) & 75°37'39.14"E (Longitude) at Chiralla (starting point) to 33°6'19.94"N (Latitude) & 75°41'39.28"E (Longitude) at Puneja (endpoint) of the road. This road has importance from pilgrim, tourist as well as traffic point of view. The total length of the Road is 10.139 Km. It traverses through the settlements of Chiralla, Bhela, Bhalara, and Gosti.

3.2.2. Component B of Package-4: Malaini to Chakrabatti Road

The Malaini to Chakrabatti Road is having geo-coordinates of 33°5'31.95"N (Latitude) & 75°35'16.95"E (Longitude) at Malaini (starting point) to 33°5'56.10"N (Latitude) & 75°36'4.38"E (Longitude) at Chakrabatti (endpoint) of the road. Project Road takes off from Km 7th of Pul-Doda-Bhaderwah and ends at village Sundra. From connectivity point of view, this particular road has high importance as through this alignment people of several villages namely Jahnana, Dranga, Pendku, Mehrada etc will get connected with district town. The proposed Sub-project has the total length of 10.059 Km.

Component A: Chiralla Link Road (10.139 Km)

Component B: Malaini to Chakrabatti Road (10.059 Km)

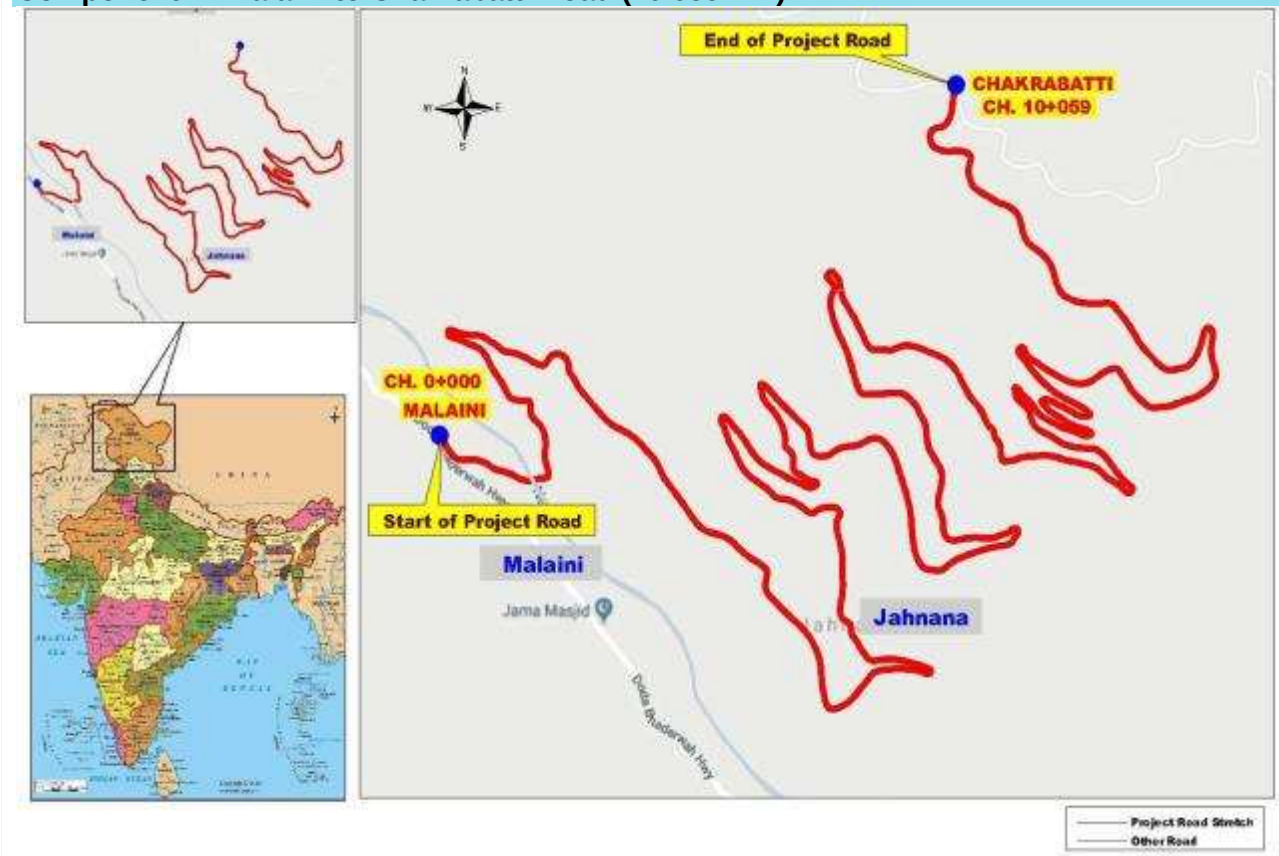


Figure 3.2: Index Map of the Subproject Roads under Package-4 (Component A & B)

3.3. Technical Description of the Package-4 (Component A & B)

Table 3.1: Component A **(**Improvement & Up-gradation of Chiralla Link Road)

S. No.	Description of item	Details	
1	Road length	Existing 10.185	Design 10.139
2	Road Configuration	Existing:- 2.65 m to 3.0 m wide carriageway	Propose:- 3.75 m wide carriageway
3	Terrain	Hilly	
4	Land use pattern	Mixed land use between Open, Built Up, and Agricultural	
5	Existing Surface of the carriageway	Flexible Broken BT surface exists for a length of 5.5 Km and rest stretches are either Gravel or Earthen.	
7	Existing Formation Width	Varies from 3.65 m to 4.00 m	
8	Right of Way (ROW)	6.0m	
9	Pavement Condition	Poor	
10	New Flexible Pavement thickness	OGPC-25 mm; BM -50 mm, WBM - 225 mm; GSB-150 mm	
11	Design CBR	8.1 % (Av CBR)	
12	Junctions	Major- 01	
13	Traffic	T9 (15 ESAL to 20 EASL) – IRC SP 72 -2015	
14	Cross drainage structures	Existing Culvert- 23 (HP Culvert - 17 Nos. Slab Culvert - 5 Nos Causeway – 1 no)	Proposed Culvert- 14 (Reconstruction HP Culvert - 11 Nos Box Culvert – 2 no)
15	Settlement	Chiralla, Gosti, Rukali via Ponchai, Bhella, Bhalara	

Table 3.2: Component B **(**Improvement & Up-gradation of Malaini to Chakrabatti Road)

S.No.	Description of item	Details	
1	Road length	Existing 10.056 Km	Design 10.059 Km
2	Road Configuration	Existing:- 2.50 m to 3.0 m wide carriageway	Proposed:- 3.75 m wide carriageway
3	Terrain	Hilly	
4	Land use pattern	Mixed land use between open	
5	Existing Surface of the carriageway	The pavement is mostly Earthen and some stretches are Flexible BT surface	
7	Existing Formation Width	Varies from 3.50 m to 4.00 m	
8	Right of Way (ROW)	6.0 m	
9	Pavement Condition	Poor	
10	New Flexible Pavement thickness	OGPC-25 mm; BM -50 mm, WBM - 225 mm; GSB-175 mm	
11	Design CBR	7.40 % (Avg. CBR)	
12	Junctions	Major- 01	
13	Traffic	T9 (15 ESAL to 20 EASL) – IRC SP 72 -2015	
14	Cross drainage structures	Existing Culvert- 19 HP Culvert - 10 Nos. Slab Culvert - 8 Nos Bridge – 1 no	Proposed Culvert- 14 (HP Culvert - 9 Nos Reconstruction & Slab Culvert 5 Nos Reconstruction
15	Settlement	Malaini, Jahnana, Dranga, Pendku, Mehrada	

3.4. Project Features and Design Aspects

3.4.1 Existing Cross Drainage Structures

In Chiralla Link Road, there are 23 nos. of cross drainage structures. There are 17 no's hume pipe culverts, 05 no's slab culverts, and 1 no's of Causeway. Out of these 17 no's hume pipe culverts 12 are having lesser dia than 900 mm and are chocked by siltation and poor condition; needs to be replace by 1200 mm dia hume pipe culverts and causeways converted into Box culverts of suitable size. The details are given in the **Table 3.3** below;

There are 19 no's. of cross drainage structures in the Malaini to Chakrabatti Road project, out of which 10 no's are HP Culverts, 8 no's are Slab culvert and 1 no. Major Bridge (60m Span). Out of these 10 no's of HP Culverts 9 are chocked by siltation; need to replace by 1.2 m dia HP Culverts. The details are given in the **Table 3.4** below;

Table 3.3: Component A (Chiralla Link Road): List of Existing Cross Drainage Structures

S No.	Structures		
	Chainage	Types	Dia/Span(m)
1	1+210	HP Culvert	1 x 0.90
2	1+410	HP Culvert	1 x 1.20
3	1+490	Slab Culvert	1 x 3.01
4	1+630	HP Culvert	1 x 0.90
5	1+800	HP Culvert	1 x 0.90
6	1+930	HP Culvert	1 x 0.90
7	2+120	HP Culvert	1 x 1.20
8	2+160	Causeway	1 x 8.61
9	3+090	HP Culvert	1 x 1.20
10	3+680	Slab Culvert	1 x 3.01
11	5+080	HP Culvert	-
12	5+250	HP Culvert	-
13	5+425	HP Culvert	-
14	6+300	HP Culvert	-
15	6+490	HP Culvert	-
16	6+980	HP Culvert	-
17	7+710	HP Culvert	-
18	8+490	HP Culvert	1 x 1.2
19	8+830	HP Culvert	1 x 0.6
20	9+120	HP Culvert	1 x 1.2
21	9+270	Slab Culvert	1 x 2.0
22	9+750	Slab Culvert	1 x 2.0
23	9+890	Slab Culvert	1 x 2.0

Table 3.4: Component B (Malaini to Chakrabatti Road): List of Existing Cross Drainage Structures

S No.	Structures		
	Chainage	Types	Dia/Span(m)
1	0+084	HP Culvert	1 x 0.9
2	0+172	HP Culvert	1 x 1.2
3	0+320	Bridge	60.0
4	0+525	Slab Culvert	1 x 2.8
5	0+710	Slab Culvert	1 x 2.4
6	0+915	Slab Culvert	1 x 1.5

S No.	Structures		
	Chainage	Types	Dia/Span(m)
7	1+125	Slab Culvert	1 x 3.2
8	1+380	Slab Culvert	1 x 3.2
9	1+870	Slab Culvert	1 x 2.7
10	3+050	Slab Culvert	1 x 2.8
11	4+450	Slab Culvert	1 x 2.7
12	5+570	HP Culvert	1 x 0.9
13	6+360	HP Culvert	-
14	6+915	HP Culvert	1 x 0.9
15	7+180	HP Culvert	1 x 0.9
16	8+460	HP Culvert	1 x 0.9
17	9+225	HP Culvert	1 x 0.9
18	9+600	HP Culvert	1 x 0.9
19	9+780	HP Culvert	1 x 0.9

3.4.1. Improvement of Cross Drainage Structures

There are 23 nos. of CD structure in the Chiralla Link Road project. Out of which 17 no's of HP Culverts, 05 no's of Slab culverts, and 1 no. of Causeway exists on the project stretch. Out of these 17 no's of HP Culverts, 12 no's are having lesser dia than 900 mm and are choked due to siltation and are in very poor condition so needs to be replaced by HP of 1200 mm dia. In addition to that, 1 causeway is proposed to be replaced and reconstructed by Box culvert. The details are given in the **Table 3.5** below;

Table 3.5: Component A (Chiralla Link Road): Details of Proposed Culverts

S No.	Existing Structure					Proposed Structure		
	Chainage	Type of Structure	Span / Dia (mm)	Total Width (m)	Condition	Type of Structure	Span/ Dia	Proposed Structure
1	1+210	HP Culvert	1 x 0.90	1.250	C & P	HP Culvert	1 x 1.2	R & NC
2	1+410	HP Culvert	1 x 1.20	1.450	Good	-	-	Retained
3	1+490	Slab Culvert	1 x 3.01	3.250	Good	-	-	Retained
4	1+630	HP Culvert	1 x 0.90	1.110	C & P	HP Culvert	1 x 1.2	R & NC
5	1+800	HP Culvert	1 x 0.90	1.150	C & P	HP Culvert	1 x 1.2	R & NC
6	1+930	HP Culvert	1 x 0.90	1.110	C & P	HP Culvert	1 x 1.2	R & NC
7	2+120	HP Culvert	1 x 1.20	1.400	Good	-	-	Retained
8	2+160	Causeway	1 x 8.61	9.000	-	Box Culvert	2 x 2	R & NC
9	3+090	HP Culvert	1 x 1.20	1.400	Good	-	-	Retained
10	3+680	Slab Culvert	1X3.01	3.250	Good	-	-	Retained
11	5+080	HP Culvert	-	-	C & P	Box Culvert	2 x 2	R & NC
12	5+250	HP Culvert	-	-	C & P	HP Culvert	1 x 1.2	R & NC

S No.	Existing Structure					Proposed Structure		
	Chainage	Type of Structure	Span / Dia (mm)	Total Width (m)	Condition	Type of Structure	Span/ Dia	Proposed Structure
13	5+425	HP Culvert	-	-	C & P	HP Culvert	1 x 1.2	R & NC
14	6+300	HP Culvert	-	-	C & P	HP Culvert	1 x 1.2	R & NC
15	6+490	HP Culvert	-	-	C & P	HP Culvert	1 x 1.2	R & NC
16	6+980	HP Culvert	-	-	C & P	HP Culvert	1 x 1.2	R & NC
17	7+710	HP Culvert	-	-	C & P	HP Culvert	1 x 1.2	R & NC
18	8+490	HP Culvert	1 x 1.2	1.450	Good	-	-	Retained
19	8+830	HP Culvert	1 x 0.6	1.005	C & P	HP Culvert	1 x 1.2	R & NC
20	9+120	HP Culvert	1 x 1.2	1.400	Good	-	-	Retained
21	9+270	Slab Culvert	1 x 2.0	2.350	Good	-	-	Retained

Annotations: R&NC – Replaced and New Construction

There are 19 no's of CD structure in the Malaini to Chakrabatti Road project, out of which 10 no's of HP Culverts, 8 nos Slab culverts and 1 Major Bridge exist on the project stretch. Out of these 10 nos HP culverts 9 nos are replaced by 1200 mm dia HP as all the existing are choked due to siltation and in poor condition. In addition to that, 5 nos of Slab Culverts also proposed to replaced and reconstructed by Box culvert. The details are mentioned in **Table 3.6** below;

Table 3.6: Component B (Malaini to Chakrabatti Road): Details of Proposed Culverts

S No.	Existing Structure					Proposed Structure		
	Chainage	Type of Structure	Span / Dia (m)	Total Width (m)	Condition	Type of Structure	Span/Dia	Proposed Structure
1	0+084	Pipe Culvert	1 x 1.0	1089.812	8.865	HP Culvert	1 x 1.2	Replaced
2	0+172	Pipe Culvert	1 x 1.2	1086.107	8.537			Retained
3	0+320	Bridge	60.0	1076.264	4.71			-
4	0+525	Slab Culvert	1 x 2.8	1087.055	5.591	Box Culvert	3 x 3	Replaced
5	0+710	Slab Culvert	1 x 2.4	1099.664	6.357			Retained
6	0+915	Slab Culvert	1 x 1.5	1111.863	6.402			Retained
7	1+125	Slab Culvert	1 x 3.2	1121.564	5.627	Box Culvert	3 x 3	Replaced
8	1+380	Slab Culvert	1 x 3.2	1130.124	6.846			Retained
9	1+870	Slab Culvert	1 x 2.7	1146.858	5.484	Box Culvert	3 x 3	Replaced
10	3+050	Slab Culvert	1 x 32.8	1221.22	5.291	Box Culvert	3 x 3	Replaced

S No.	Existing Structure					Proposed Structure		
	Chainage	Type of Structure	Span / Dia (m)	Total Width (m)	Condition	Type of Structure	Span/Dia	Proposed Structure
11	4+450	Slab Culvert	1 x 2.7	1309.804	5.35	Box Culvert	3 x 3	Replaced
12	5+570	Pipe Culvert	1 x 1.0	1375.752	7.482	HP Culvert	1 x 1.2	Replaced
13	6+360	Pipe Culvert	-	-	5.868	HP Culvert	1 x 1.2	Replaced
14	6+915	Pipe Culvert	1 x 0.9	1482.617	9.437	HP Culvert	1 x 1.2	Replaced
15	7+180	Pipe Culvert	1 x 0.9	1499.887	8.742	HP Culvert	1 x 1.2	Replaced
16	8+460	Pipe Culvert	1 x 0.9	1568.273	11.327	HP Culvert	1 x 1.2	Replaced
17	9+225	Pipe Culvert	1 x 0.9	1614.732	11.868	HP Culvert	1 x 1.2	Replaced
18	9+600	Pipe Culvert	1 x 1.0	1634.03	9.883	HP Culvert	1 x 1.2	Replaced
19	9+780	Pipe Culvert	1 x 1.0	1647.708	9.687	HP Culvert	1 x 1.2	Replaced

3.4.2. Existing Road Drains

In the Chiralla Link Road, from Ch 0.00 Km to Ch 10.139 Km, there are 352.34 m Earthen (unlined) drains existing at different stretches. In addition to that, 2555 m length drain is required at different stretches. Existing Drains are in good condition but filled with siltation, clearance of drain is very much required. Details are shown in **Table 3.7** below;

In the Malaini Chakrabatti Road project road from Ch 0.00 Km to Ch 10.059 Km, there are 3237.75 m Earthen (unlined) drains existing at different stretches. Existing Drains are in good condition but filled with siltation, clearance of drain is very much required. Details are shown in **Table 3.8** below;

Table 3.7: Component A (Chiralla Link Road): List of Existing Drains

S.No.	Existing Stretches (Starting)	Existing Stretches (Ending)	Length (m)	Existing Side	Type of Structure
1	7+115	7+171	55.575	RHS	Unlined
2	8+490	8+539	49.322	RHS	Unlined
3	8+575	8+626	51.093	RHS	Unlined
4	8+830	8+961	131.052	RHS	Unlined
5	9+270	9+335	65.298	RHS	Unlined
		Total	**352.34**		

Table 3.8: Component B (Malaini to Chakrabatti Road): List of Existing Drains

S.No.	Existing Stretches (Starting)	Existing Stretches (Ending)	Length (m)	Existing Side	Type of Structure
1	0+108	0+150	41.766	RHS	Unlined
2	0+350	0+480	130.155	RHS	Unlined

S.No.	Existing Stretches (Starting)	Existing Stretches (Ending)	Length (m)	Existing Side	Type of Structure
3	0+564	0+744	180.322	RHS	Unlined
4	0+766	0+798	32.056	RHS	Unlined
5	0+815	1+089	293.409	LHS	Unlined
6	1+100	1+117	17.245	RHS	Unlined
7	1+139	1+425	286.06	LHS	Unlined
8	1+471	1+534	62.857	LHS	Unlined
9	1+780	1+817	37.883	LHS	Unlined
10	1+862	2+258	395.528	LHS	Unlined
11	4+481	4+762	280.572	LHS	Unlined
12	5+343	5+428	84.555	RHS	Unlined
13	5+568	5+882	314.56	RHS	Unlined
14	6+368	6+717	349.131	LHS	Unlined
15	6+966	7+010	44.829	LHS	Unlined
16	7+682	7+799	117.245	RHS	Unlined
17	7+835	7+933	97.951	LHS	Unlined
18	7+974	8+064	90.620	RHS	Unlined
19	8+479	8+678	198.926	LHS	Unlined
20	9+771	9+934	163.293	RHS	Unlined
21	10+037	10+056	18.783	RHS	Unlined
		Total	**3237.75**		

3.4.3. Proposed Drains at Different Road Stretches

In Malaini to Chakrabatti Road from Ch 0.000 Km to Ch 10.059 Km, there are 3237.75 m existing Earthen (unlined) drains at different stretches. In addition to that, 885 m length drain is required at different stretches. Existing Drains are in good condition but filled with siltation, clearance of drain is very much required. Details are shown in **Table 3.9** below;

Table 3.9: List of the Proposed Drains of Malaini to Chakrabatti Road

Sl	Starting Chainage	Ending Chainage	Length (m)	Side
1	1+000	2+500	1500	LHS
2	3+450	3+750	300	LHS
3	3+750	4+050	300	LHS
4	4+250	5+000	750	LHS
5	6+200	7+040	840	LHS
6	7+400	7+650	250	LHS
7	7+800	7+950	150	LHS
8	8+150	8+900	750	LHS

Sl	Starting Chainage	Ending Chainage	Length (m)	Side
9	0+050	0+250	200	RHS
10	0+450	0+800	350	RHS
11	2+600	3+250	650	RHS
12	3+450	3+750	300	RHS
13	3+750	4+050	300	RHS
14	5+000	5+500	500	RHS
15	7+050	7+400	350	RHS
16	7+650	7+800	150	RHS
17	7+950	8+150	200	RHS
18	9+900	10+060	160	RHS
		Total	**8000**	

3.4.4. Existing Protection Walls (Breast Wall and Retaining Wall)

The proposed Chiralla Link Road under Package-4, have existing 644.99 m of Retaining Wall in the form of stone masonry at different stretches. Existing Breast Wall are fully collapsed and requires reconstruction.

In the Malaini to Chakrabatti Road project from Ch 0.00 Km to Ch 10.059 Km, there are 901.100 m of existing Breast Wall in the form of stone masonry at different stretches. Length of existing Retaining Wall is 1142.36 m and are in god condition. Details of the existing protection works of these roads are shown in **Table 3.10 & Table 3.11 below;**

Table 3.10: Component A (Chiralla Link Road): List of Existing Protection Works

S.No.	Existing Stretches (Starting)	Existing Stretches (Endng)	Length (m)	Side	Type of Protection Work
1	5+075	5+081	5.575	LHS	Retaining Wall
2	5+085	5+095	9.907	LHS	Retaining Wall
3	6+133	6+151	18.016	LHS	Retaining Wall
4	7+265	7+280	14.771	LHS	Retaining Wall
5	7+510	7+532	21.622	LHS	Retaining Wall
6	8+485	8+495	9.553	LHS	Retaining Wall
7	8+883	8+918	34.567	RHS	Retaining Wall
8	8+975	9+109	133.711	RHS	Retaining Wall
9	9+010	9+020	9.879	LHS	Retaining Wall
10	9+115	9+124	8.772	LHS	Retaining Wall
11	9+250	9+264	13.578	RHS	Retaining Wall

S.No.	Existing Stretches (Starting)	Existing Stretches (Endng)	Length (m)	Side	Type of Protection Work
12	9+265	9+299	33.866	LHS	Retaining Wall
13	9+275	9+329	53.560	RHS	Retaining Wall
14	9+375	9+523	147.535	LHS	Retaining Wall
15	9+540	9+565	24.626	LHS	Retaining Wall
16	9+575	9+603	27.838	RHS	Retaining Wall
17	9+890	9+909	19.479	LHS	Retaining Wall
18	9+910	9+952	41.871	LHS	Retaining Wall
19	9+960	9+976	16.271	LHS	Retaining Wall
		Total	**644.99**		

Table 3.11: Component B (Malaini to Chakrabatti Road): List of Existing Breast Wall

S.No.	Existing Stretches (Starting)	Existing Stretches (Endng)	Length (m)	Side	Type of Protection Work
A.	**Breast Wall**				
1	0+000	0+077	76.983	LHS	Stone Masonry
2	0+100	0+121	20.886	LHS	Stone Masonry
3	0+130	0+167	37.394	LHS	Stone Masonry
4	0+190	0+225	34.614	LHS	Stone Masonry
5	0+255	0+279	24.387	LHS	Stone Masonry
6	0+261	0+279	18.174	RHS	Stone Masonry
7	0+345	0+352	6.9195/12.305	LHS/RHS	Stone Masonry
8	0+360	0+390	30.106	LHS	Stone Masonry
9	0+418	0+443	25.418	LHS	Stone Masonry
10	0+451	0+477	25.382	LHS	Stone Masonry
11	0+484	0+511	27.108	LHS	Stone Masonry
12	0+518	0+525	7.119/8.480	LHS/RHS	Stone Masonry
13	0+534	0+552	18.039/3.035	LHS/RHS	Stone Masonry
14	0+630	0+656	25.988	LHS	Stone Masonry
15	0+700	0+707	6.906/2.618	LHS/RHS	Stone Masonry
16	0+768	0+804	36.271	LHS	Stone Masonry
17	0+905	0+912	6.644	RHS	Stone Masonry
18	1+029	1+048	18.799	RHS	Stone Masonry
19	1+140	1+154	8.715/14.240	LHS/RHS	Stone Masonry
20	1+490	1+545	55.382	RHS	Stone Masonry
21	2+073	2+090	16.653	RHS	Stone Masonry
22	2+164	2+185	20.814	RHS	Stone Masonry
23	2+225	2+230	5.351	RHS	Stone Masonry
24	2+266	2+371	105.000	RHS	Stone Masonry

S.No.	Existing Stretches (Starting)	Existing Stretches (Endng)	Length (m)	Side	Type of Protection Work
25	2+674	2+718	43.970	LHS	Stone Masonry
26	2+779	2+821	42.305	LHS	Stone Masonry
27	3+900	3+911	11.103	LHS	Stone Masonry
28	5+191	5+200	9.431	LHS	Stone Masonry
29	5+914	5+929	15.397	LHS	Stone Masonry
30	5+986	6+000	14.363	LHS	Stone Masonry
31	6+900	6+911	11.425	RHS	Stone Masonry
32	7+160	7+171	11.248	LHS	Stone Masonry
33	8+450	8+469	19.215	RHS	Stone Masonry
34	9+218	9+224	6.052	LHS	Stone Masonry
35	9+588	9+592	4.077	LHS	Stone Masonry
36	9+785	9+798	12.789	LHS	Stone Masonry
		Total	**901.10**		
B.	**Retaining Wall**				
1	0+100	0+142	42.122	RHS	Stone Masonry
2	0+635	0+711	76.354	RHS	Stone Masonry
3	0+725	0+795	69.718	RHS	Stone Masonry
4	0+820	0+962	141.719	LHS	Stone Masonry
5	1+021	1+060	39.018	LHS	Stone Masonry
6	1+382	1+410	28.444	LHS	Stone Masonry
7	1+450	1+529	78.964	LHS	Stone Masonry
8	1+671	1+700	28.813	LHS	Stone Masonry
9	2+074	2+216	142.451	LHS	Stone Masonry
10	2+289	2+304	15.181	LHS	Stone Masonry
11	2+795	2+853	57.791	RHS	Stone Masonry
12	3+573	3+640	67.162	LHS	Stone Masonry
13	3+790	3+825	35.499	RHS	Stone Masonry
14	3+854	3+906	52.192	RHS	Stone Masonry
15	5+565	5+666	101.105	RHS	Stone Masonry
16	6+210	6+309	99.312	LHS	Stone Masonry
17	9+350	9+384	34.35	RHS	Stone Masonry
18	9+630	9+662	32.163	RHS	Stone Masonry
		Total	**1142.36**		

3.4.5. Proposed Protective Works

As the River Chenab flows parallel with the project Chiralla Link Road upto Ch 1+500, henceforth Retaining walls are required at several location at valley side. In addition to that, Breast Wall will also provided at some stretches. Total length required for Retaining and Breast Wall are 518 m & 3280 m respectively.

Chainage-wise details of Proposed Protective works are shown in **Table 3.12** below;.

Table 3.12: List of Proposed Protective Work Stretches (Chiralla Link Road)

A	Breast Wall Details (Hill Side)				
S.No	Chainage (From)	Chainage (To)	Length (m)	Height (m)	Type
1	3975	4670	695	1.5	Breast Wall
2	5175	5625	450	1.5	Breast Wall
3	5775	6025	250	1.5	Breast Wall
4	6595	6970	375	1.5	Breast Wall
5	7275	8135	860	1.5	Breast Wall
6	9875	9925	50	1.5	Breast Wall
7	9839	10039	600	1.5	Breast Wall
Total Length			3280		
B.	Retaining Wall Details (Valley Side)				
1	2658	2668	10.00	3	Retaining Wall
2	3803	3817	14.00	2	Retaining Wall
3	3913	3927	14.00	2	Retaining Wall
4	3950	3960	10.00	2	Retaining Wall
5	4074	4084	10.00	2	Retaining Wall
6	4142	4154	12.00	2	Retaining Wall
7	4218	4234	16.00	2	Retaining Wall
8	4272	4288	16.00	2	Retaining Wall
9	4519	4531	12.00	2	Retaining Wall
10	4909	4919	10.00	2	Retaining Wall
11	4966	4986	20.00	2	Retaining Wall
12	5115	5125	10.00	2	Retaining Wall
13	5265	5275	10.00	2	Retaining Wall
14	5305	5310	5.00	2	Retaining Wall
15	5344	5356	12.00	2	Retaining Wall
16	5414	5424	10.00	2	Retaining Wall
17	5269	5287	18.00	2	Retaining Wall
18	5748	5758	10.00	2	Retaining Wall
19	5909	5921	12.00	2	Retaining Wall
20	5952	5966	14.00	2	Retaining Wall
21	6009	6021	12.00	2	Retaining Wall
22	6109	6121	12.00	2	Retaining Wall
23	6272	6282	10.00	2	Retaining Wall
24	6289	6301	12.00	2	Retaining Wall
25	6646	6658	12.00	2	Retaining Wall
26	6902	6914	12.00	2	Retaining Wall
27	6962	6974	12.00	2	Retaining Wall
28	7017	7029	12.00	2	Retaining Wall
29	7059	7072	13.00	2	Retaining Wall

30	7146	7163	17.00	2	Retaining Wall
31	7273	7283	10.00	2	Retaining Wall
32	7823	7835	12.00	2	Retaining Wall
33	8201	8215	14.00	2	Retaining Wall
34	8350	8360	10.00	2	Retaining Wall
35	8550	8560	10.00	2	Retaining Wall
36	8687	8697	10.00	2	Retaining Wall
37	8815	8831	16.00	2	Retaining Wall
38	9725	9742	17.00	2	Retaining Wall
39	9817	9837	20.00	2	Retaining Wall
40	9858	9878	20.00	2	Retaining Wall
41	10130	10140	10.00	2	Retaining Wall
Total Length			**518**		

As the alignment is totally collapsed from Km 2.450 to Km 4.990, New construction concept has been adopted for the entire stretch of Malaini to Chakrabatti Road project. From Km 0.000 to Km 2.450, existing protective structures which are in good condition is retained. Apart from that, additional protective structures are proposed at different stretches as per site condition. PCC Breast Walls are required about 1944 m length, (Proposed 1344m for 1.5m height and 600m for 2.0m height). PCC Retaining Wall required about length 919m of height 2.0m and 160m length of 3.0m height. Detail of protective works is shown in **Table 3.13**

Table 3.13: List of Proposed Protective Works Breast Wall & Retaing Wall (Malaini to Chakrabatti Road)

Sl. No.	Starting Km	Ending Km	Length (m)	Side	Type of Structure	Height of Structure (m)
A.	**Breast Wall**					
1	1+650	1+900	250	LHS		1.500
2	2+400	2+600	200	LHS		1.500
3	3+000	3+150	150	LHS		1.500
4	4+000	4+100	100	LHS		1.500
5	4+200	4+350	150	LHS		1.500
6	4+450	4+550	100	LHS		1.500
7	4+650	4+850	200	RHS		1.500
8	5+300	5+400	100	RHS		1.500
9	7+390	7+450	60	LHS		1.500
10	7+620	7+660	40	LHS		1.500
11	7+760	7+840	80	LHS		1.500
12	7+920	7+990	70	LHS		
13	8+050	8+200	150	LHS		
Total Length			1650			
B.	Retaining Wall					
Retaining walls are proposed about 1120m length along the project road.						

3.4.6. Improvement of Geometrics

Component A (Chiralla Link Road)

Carriageway width

In general, the proposed cross-section comprises of 3.75 m wide carriageway with 1.0 m wide granular hard shoulder on either side of the c/w. The camber on either side of the carriageway and hard shoulder is 2.5 % & on shoulder it is 3.0 %. The proposed cross-sections are presented in TCS"s in **Fig 3.3 and Fig 3.4.**

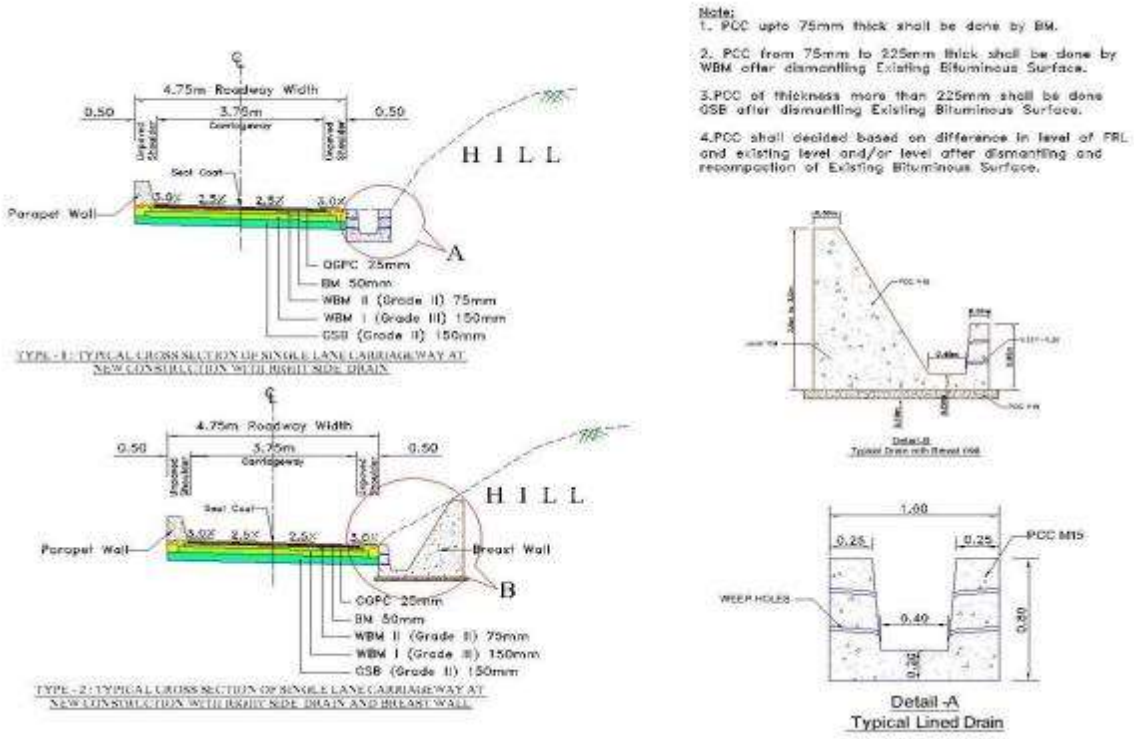


Figure 3.3: Typical Cross-Section of Single Lane carriageway at New Construction with Right side Drain and Breast Wall.

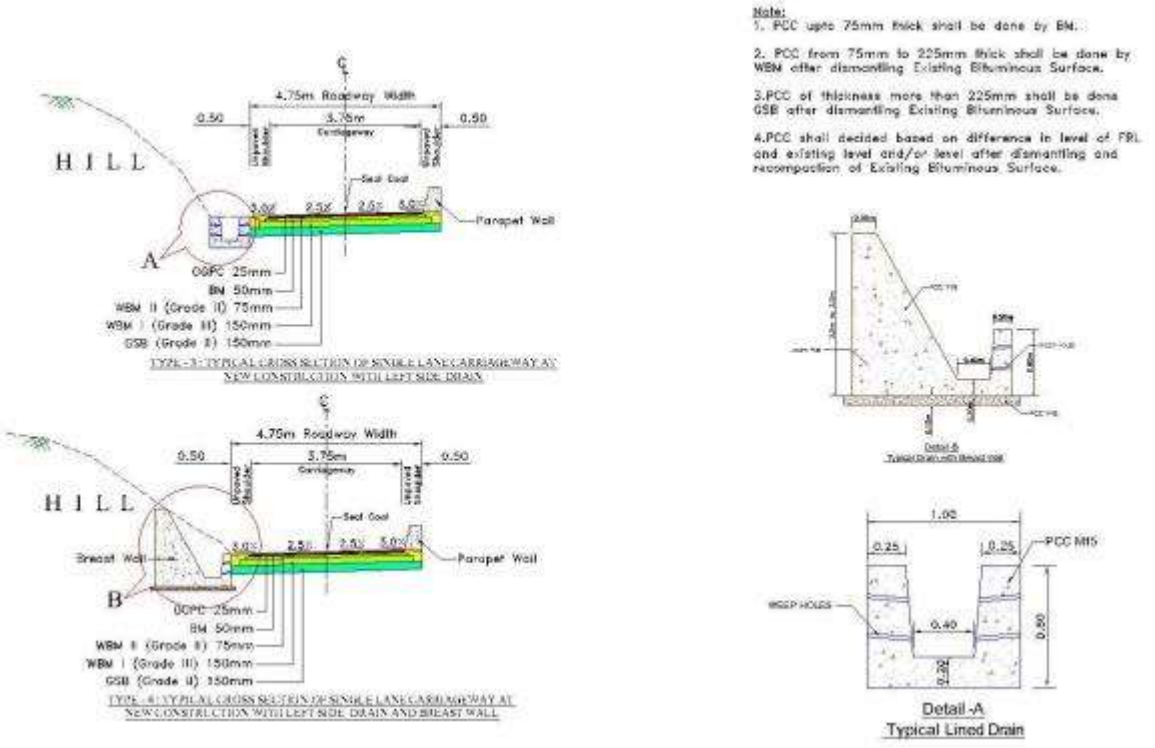


Figure 3.4: Typical Cross-Section of Single Lane carriageway at New Construction with Left side Drain and Breast Wall.

Horizontal & Vertical Alignment

Existing alignment is followed to upgrade and strengthening of the existing road and it is found that mostly the required ruling design speed of 40 km/hour is maintained. The existing carriageway will be provided with required grade after making the provision of profile corrective course with proper cambers over the existing carriageway surface. Due to land constraint, most of the curve radius is less than 60, henceforth 0.6 m to 0.9 m extra widening provide at that location as per IRC norms.

Improvement of Sight Distance

Improvement of sight distance on the proposed alignment has been taken care while designing the alignment. However, necessary road sign has to be provided where speed is restricted wherever required.

Component-B (Malaini to Chakrabatti Road)

In general, the proposed cross-section comprises of 3.75 m wide carriageway with 1.000 m wide granular hard shoulder on either side of the c/w. The camber on either side of the carriageway and hard shoulder is 2.5 % & on shoulder it is 3.0 %.

The proposed cross-sections are presented in TCS-1 & TCS - 2 having 3.75 m CW in **Fig 3.5** to **3.7** below;

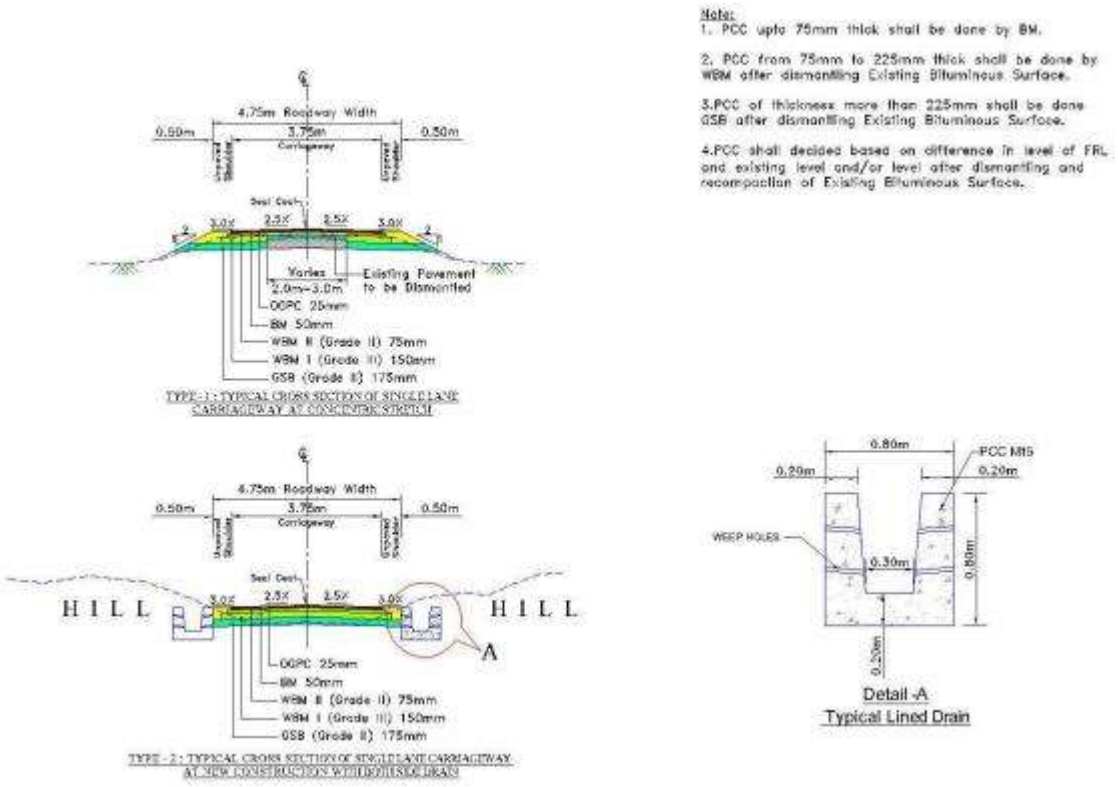


Figure 3.5 Typical Cross-Section of Single Lane carriageway at New Construction With Both Side Drain

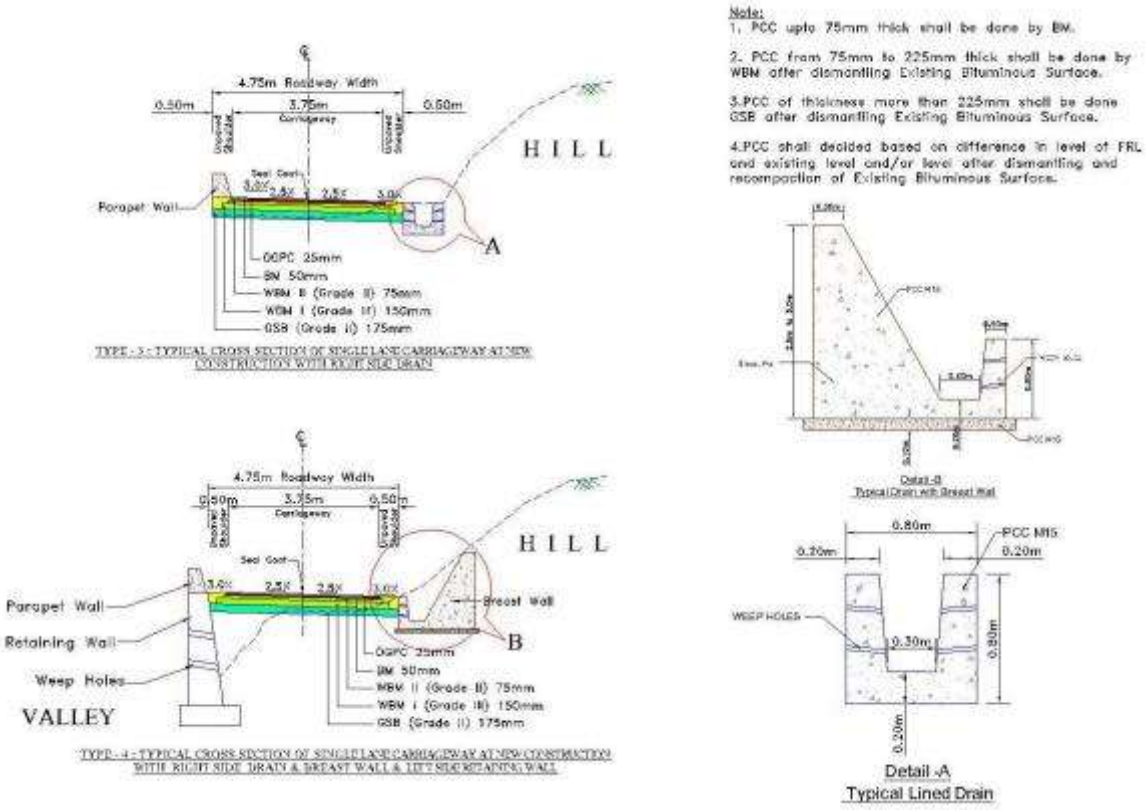


Figure 3.6: Typical Cross-Section of Single Lane Carriageway at New Construction with Right Side Drain and Breast wall and Left Side Retaining Wall.

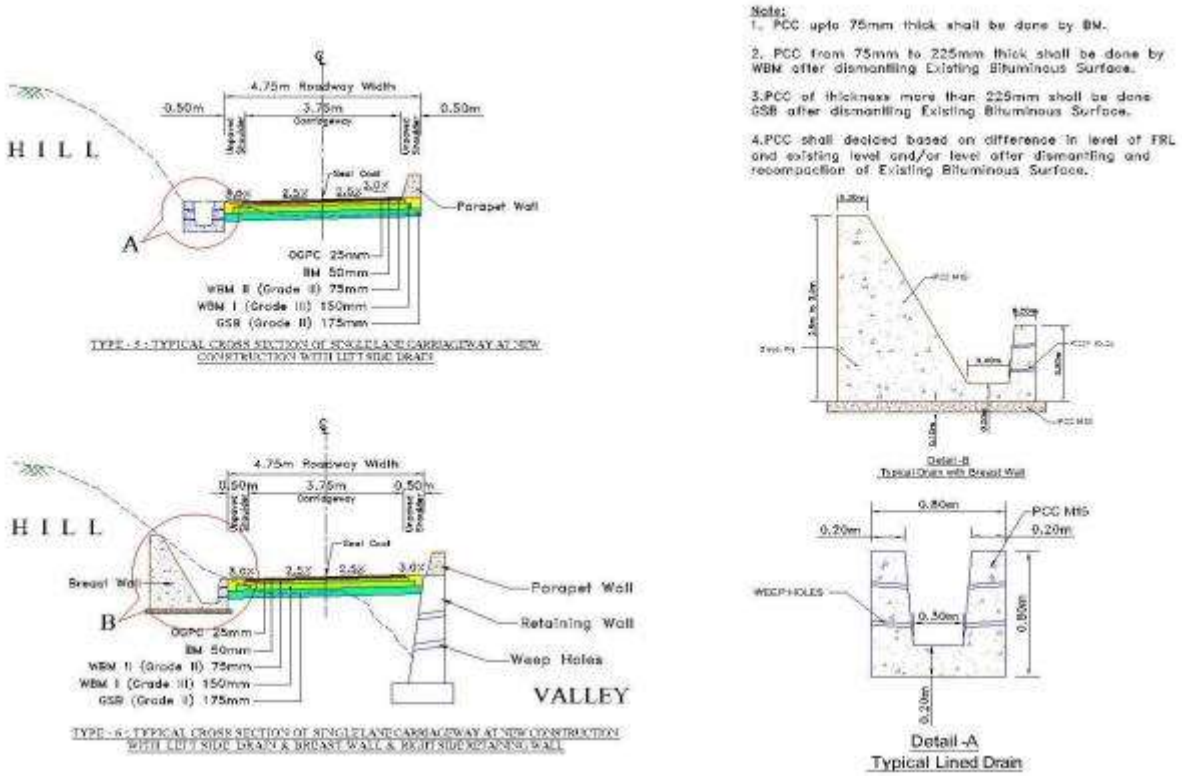


Figure 3.7 : Typical Cross-Section of Single Lane Carriageway at New construction with Left Side Drain & Breast wall and Right Side Retaining Wall

Horizontal & Vertical Alignment

Existing alignment is followed for the purpose of widening and strengthening of the existing road and it is found that mostly the required ruling design speed of 40 kmph is maintained. The existing carriageway will be provided with required grade after making the provision of profile corrective course with proper cambers over the existing carriageway surface. Due to land constraint, most of the curve radius is less than 60, henceforth 0.6 m to 0.9 m extra widening provides at those location as per IRC norms.

Improvement of Sight Distance

Improvement of sight distance on the proposed alignment has been taken care while designing the alignment. However, necessary road sign has to be provided where speed is restricted wherever required.

3.5. Traffic Safety and Other Appurtenances

Following road furniture and miscellaneous items have been designed keeping the safety aspect on top priority for the proposed roads of Chiralla Link Road and Malaini to Chakrabatti Road.

Road Markings

Road Markings on the carriageway and the objects within and adjacent to the roadway are used as a means of guiding. They promote road safety and ensure smooth flow of traffic in the required paths of travel.

The location and type of marking lines, material and colour are followed using IRC: 35-2015 – "Code of Practice for Road Markings". The road markings were carefully planned on carriageways, intersections and bridge locations.

Road Signs

Road signs were planned to supply information, to regulate traffic by imparting messages to the drivers. The type, locations, sizes were planned using IRC: 67-2012 "Code of Practice for Road Sign".

Delineators

The role of delineators is to provide visual assistance to the driver about the alignment of the road ahead, especially at night. Reflectors are used on the delineators for better night visibility. IRC: 79-1981 "Recommended Practice for Road Delineators" was followed to plan locations details. Two types of road delineators were planned i.e. hazard markers and object markers. Hazard markers are to define obstructions like guardrails, and abutments adjacent to the carriageway, for instance at culverts and bridges. Object markers are used to indicate hazards and obstructions within the vehicle flow path, at channelling islands close to intersections.

Crash Barrier

W Type Metal crash barriers are proposed/ provided for the safety of the traffic on the stretches on approaches of bridges. It is also proposed on the curves for the safety of traffic irrespective of embankment height as per NHAI Circular (NHAI/PH-II/NHDP/ADB/GM (NS)-I dated May 19, 2004).

Parapet Wall

Parapet walls are provided along the edge of the shoulders at the valley side throughout the project stretch excluding the settlement areas. These are provided to prevent the vehicles toppling over.

Convex Mirror

Roadside Convex Safety Mirrors are widely used by both commercial and private properties to help eliminate blind spots on approach roads, junctions and entrances. Convex mirrors are ideal for use in road safety applications because the domed effect of the mirror will give a wider angle view and allows the driver to see down the road from a wider range of parked positions.

Typically a 600mm diameter convex mirror is useful when viewed no more than 6 Metres or 20 feet away. Above this distance, you need to use a bigger mirror. Convex mirror required along the project road at the following chainages of the respective Road projects as given shown **Table 3.14 and 3.15** below;.

Table 3.14: Chainage details of proposed convex mirrors for Chiralla Link Road

S.No.	Location	S.No.	Location	S.No.	Location
1	0+100	13	4+100	25	9+000

S.No.	Location	S.No.	Location	S.No.	Location
2	0+300	14	4+500	26	9+500
3	1+000	15	4+800	27	9+700
4	1+100	16	5+080		
5	1+480	17	5+850		
6	1+800	18	5+900		
7	2+160	19	6+000		
8	2+500	20	6+400		
9	2+580	21	6+700		
10	3+090	22	7+350		
11	3+600	23	8+600		
12	3+900	24	8+700		

Table 3.15: Chainage details of proposed convex mirrors for Malaini to Chakrabatti Road

S.No.	Location	S.No.	Location	S.No.	Location	S.No.	Location
1	0+250	7	5+000	13	0+750	19	7+400
2	2+200	8	7+900	14	3+350	20	9+800
3	4+450	9	0+525	15	7+000	21	1+870
4	7+800	10	3+050	16	8+900	22	4+150
5	0+350	11	6+000	17	1+125	23	7+600
6	2+500	12	8+200	18	3+700		

4. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This chapter presents the national and state-level environmental legislation and regulations; and World Bank Policies relevant to the "Improvement and Up-Gradation of Chiralla Link Road and Malaini to Chakrabatti Road District Doda, in J&K. The various regulation applicable and regulatory clearances required for the road improvement and up-gradation are also been incorporated in this section.

4.1. Legal Framework

The Government of India has laid out various policy guidelines, acts and regulations about the environment. The Environment (Protection) Act, 1986 provides umbrella legislation for the protection of the environment. As per this Act, the responsibility to administer, the legislation has been jointly entrusted to the Ministry of Environment, Forests and Climate Change (MoEF & CC) at National level, whereas Jammu & Kashmir Pollution Control Board (J&KPCB) at State level in the present context to "Improvement and Up-gradation of Chiralla Link Road and Malaini to Chakrabatti Road in District Doda under Package-4.

4.2. Applicable National and State Regulations

The key environmental and other regulations relevant to Improvement and Up-gradation of subproject road under Package-4 in District Doda in Jammu division in J&K is presented in **Table 4.1** below;

Table 4.1: Environmental Regulations Relevant to Up-gradation of subproject roads under

S. No.	Environmental and Other Regulations	Relevance to Improvement & Up-gradation of Subproject Road (Package-4), Jammu	Regulatory Clearances Required, if any	Authority
1.	EIA Notification, 14th Sept 2006 and subsequent amendments	The subproject is not covered in the ambit of the EIA Notification 2006 as this is not covered under Category of the notification. As a result, the categorization, and the subsequent environmental assessment and clearance requirements, either from the state or the Government is not triggered.	The project road is not covered under the preview of EIA Notification 2006 and subsequent amendments. However, for the opening of new borrow areas and stone quarry, prior environmental clearance will be required from SEIAA/DEIAA, which is to be obtained by the contractor.	MoEF & CC, GoI and SEIAA/DEIAA, GoJ&K
2.	Jammu and Kashmir Forest (Conservation) Act, 1997	This Act is NOT applicable as the proposed roads of Package-4 in Doda District does not require diversion of forest land.	NONE The improvement & up-gradation of the roads under Package-4 are in existing roads and are not located in protected/ reserved forest area.	Principal Chief Conservator of Forests, J&K Forest Department, Government of J&K

3.	Jammu and Kashmir Wildlife (Protection) Act, 1978 as amended, J&K Wildlife (Protection) Act 1978, as amended provide for protection & management of Protected Areas	This act is NOT applicable as the proposed roads of Package-4 in Doda District are not passing through any National Parks and Wild Sanctuary.	NONE	Chief Wildlife Warden, Government of J&K
4.	Air (Prevention and Control of Pollution) Act, 1981	This act is applicable for the construction phase to manage ambient air quality at the project site and ancillary sites like camp, crusher plant, hot mix plant, concrete batch mix plant, DG Set etc, for the roads under Package-4 in Doda District The NAAQ standards (CPCB) for Ambient Air Quality have been promulgated by the MoEF&CC for various land uses.	YES Consent to Establish (CTE) and Consent to Operation (CTO) from the JKSPCB for setting up of hot mix plant, wet mix plant, stone crusher and diesel generators. To be obtained by the Contractor, before construction works.	J&KSPCB, Government of J&K
5.	Water Prevention and Control of Pollution) Act,1974	This act is applicable for the construction phase of the roads under Package-4 in Doda District to manage liquid waste discharges from a work camp, concrete batch mix plant, etc. This act will be applicable for control of water pollution from project activity. during the construction phase	YES Consent to Establish (CTE) and Consent to Operation (CTO) from the JKSPCB for setting up of hot mix plant, wet mix plant and stone crusher. To be obtained by the Contractor, before construction works.	J&KSPCB, Government of J&K
6.	Noise Pollution (Regulation and Control Act),2000	This act will be applicable for all construction equipment/ plant and machinery including vehicles deployed for implementation of the proposed roads under Package-4 in Doda District to regulate ambient noise levels The standards for noise for day & night have been promulgated by the	Noise levels are to be controlled during construction works for the proposed road Package-4 in conformity with permissible standards	J&KSPCB, Government of J&K

		MoEF&CC for various land uses. This act will be applicable to regulate noise nuisance during the construction phase		
7.	Construction & Demolition Waste Management Rules, 2016	This rule shall apply to the generation of wastes resulting from the demolition of bridge and culvert structures and scarifying of the surface of the existing road and from road construction activities. This will be mitigated within the ambit of this rule.	Construction and Demolition Waste Management Plan shall be prepared and implemented by the contractor, before the commencement of works	Municipal Corporation
8	Wetland (Conservation and Management) Rules, 2017	This rule prohibits a range of activities in wetlands like settling up and expansion of industries, waste dumping, effluent discharge.	There is no wetland in the project road.	State Wetland Authority
9.	Public Liability and Insurance Act of 1991	To protect damage to the public life and/or property as a result of negligence/accidents during the construction of proposed roads under Package-4 in Doda District.	Project operations are to be insured by the contractor to cover damage to public life and/or property due to accidents/ negligence during the construction of the proposed road.	State Labour Department
10.	Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules 2019	This act will be applicable for all construction equipment/plant and machinery including vehicles deployed during construction of roads under Package-4 in Doda District	Vehicular emissions are to be regulated by project proponent in conformity with permissible levels/ emissions PUC to be obtained by the contractor.	J&K Motor Vehicles Department
11.	Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996/ Jammu and Kashmir Building and Other Construction Workers (Regulation of Employment and Condition of Services) Rules, 2006	To ensure safety and welfare measures for the workers employed at construction sites. Compliance to provisions of health and safety measures for the construction workers in conformity with BOCW rule concerning safety and health in construction. These regulations to be complied with during the construction of proposed road works of Package-4.	Safety and welfare measures for workforce employed at construction sites are to be regulated by the contractor in conformity with the Jammu and Kashmir Building and Other Construction Workers (Regulation of Employment and Condition of Services) Rules, 2006	Labour and Employment Department, Govt. of J&K

12.	Hazardous and Other Waste (Management, and Transboundary Movement) Rules,2016	The rules will apply 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.	Hazardous Waste Authorisation with CTE and CTO by the contractor.	J&KSPCB
13.	Solid Waste Management Rules, 2016	This rule applies to all forms/types of solid waste generated at construction activities, campsite, plant sites, etc.	Solid Waste Management Plan shall be prepared and implemented by the contractor, before the commencement of works	Municipal Corporation
14	The Jammu and Kashmir Preservation of Specified Trees Act, 1969	The act preserves specified trees and for cutting of such trees, permission will be required from Forest Department.	NONE For cutting off any specified trees permission will be obtained from the Forest Department.	J&K Forest Department
15	The Ancient Monuments and Archaeological Sites and Remains Act, 1958, and the rules, 1959	This act provides guidelines for carrying out activities, including conservation, construction and reuse in and around the protected monuments.	No ASI site located within the project influence area. .	ASI Archaeological Survey of India

4.3. World Bank Safeguard Policies

World Bank safeguard policies are designed to prevent and mitigate undue harm to people and their environment in the development process. The layout requirements that must be complied with for all Bank-funded projects (refer to World Bank's Website on Safeguard Policies). The safeguard policies of the World Bank relevant to the "Improvement and Up-gradation of the Chiralla Link road and Malaini Chakrabatti Road" are given in **Table 4.2**.

Table 4.2: Relevant and Applicability of WB Safeguard Policies for Improvement & Up-gradation of Chiralla Link Road and Malaini to Chakrabatti Road under Package-4 in District Doda, J&K

S. No.	World Bank Safeguard Policy	Key Features	Policy Applicability to Sub Project	Policy Triggered Or Not
1.	OP/BP 4.01 Environmental Assessment	An overall governing policy intended to ensure Bank-financed projects are environmentally sound and sustainable	All potential impacts due to the construction of roads under Package-4 by way of improvement and up-gradation of the existing roads are to be assessed and necessary mitigation measures are to be incorporated accordingly.	Triggered
2.	OP/BP 4.04 Natural Habitats	The policy is intended to prohibit Bank financing of projects that degrade or convert critical habitats and supports projects that affect non-	The construction of roads under Package-4 by way of improvement and up-gradation of the existing roads and the project sites are not located in any	Not Triggered

		critical habitats only if no alternatives are available and if acceptable mitigation measures are in place.	protected area/ national park or wild sanctuary.	
3.	OP/BP 4.36 Forests	The policy is intended to support sustainable and conservation-oriented forest management, harness potential of forests to reduce poverty sustainably, integrate forests into sustainable economic development and protect vital local and global environmental services and values of forests.	The improvement & up-gradation of the roads under Package-4 are in existing roads and are not located in any protected/ reserved forest area.	Not Triggered
5.	OP/BP 4.11 Physical Cultural Resources	The policy is intended to ensure that projects identify and inventory cultural resources that are potentially affected by the project. Projects should include mitigation measures when there are adverse impacts on physical cultural resources.	Construction of road will be on existing road corridor and will avoid cultural property resources (CPR) and therefore does NOT warrant shifting or affect CPRs. However, there may be a direct or indirect impact on nearby cultural properties along the road.	Triggered

4.4. MoRTH & IRC Specifications

Table 4.3: Specifications of MoRTH and IRC

Section 111	Precautions for safeguarding the environment
Clause 201.2	Preservation of Property/Amenities during clearing and grubbing
Clause 202	Dismantling of Culverts
Clause 301.3.2	Stripping and storing of topsoil for reuse during excavation for roadway and drains
Clause 302.4	Restriction on timings for blasting operations
Clause 304.3.6	Public safety near towns/villages where excavation is carried out
Clause 305.2.2.2	Locations of borrowing and relevant regulations
Clause 305.3.3	Stripping and storing of topsoil at borrow locations
Section 306	Soil erosion and sedimentation control
Clause 407.4.2	Provisions for turfing on median and islands
Clause 701.2.1	Use of geotextiles (Jute or Coir) for control of soil erosion
Section 810	Use of Metal beam crash barriers for safety, relevant regulations and specifications

4.5. Applicability of International Conventions

Ramsar Convention on Wetlands of International Importance, 1971 – not Applicable

The Ramsar Convention is an international treaty for the conservation and sustainable utilization of wetlands i.e. to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific and recreational value.

According to the Ramsar List of Wetlands of International Importance, there are 25 designated wetlands in the country which are required to be protected. Activities undertaken in the proximity of these wetlands should follow the guidelines of the convention. The proposed project roads under Package-4 are hill roads and does not have any wetland in the project influence area. Hence, Ramsar convention is not applicable for the Chiralla Link Road and Malaini- Chakrabatti Road

International Union for Conservation of Nature (IUCN) - not Applicable

The International Union for Conservation of Nature (IUCN) is a membership Union uniquely composed of both government and civil society organizations. IUCN has evolved into the world's largest and most diverse environmental network. IUCN is the global authority on the status of the natural world and the measures needed to safeguard it.

IUCN produces the IUCN Red List of Threatened Species and the IUCN Red List of Ecosystems. The IUCN Red List of Ecosystems is applicable at local, national, regional and global levels. IUCN' stated goal is to expand the global network of national parks and other protected areas and promote good management of such areas. In particular, it focuses on greater protection of the oceans and marine habitats.

4.6. Indian Road Congress (IRC) Code of Practices applicable for the Project Road

Key Indian Road Congress (IRC) Code of Practices applicable for the project road for the environment are given in Table 4.4 below:

Table 4.4: Indian Road Congress Code of Practices for Project Road

S. No.	IRC Code Theme	Year	Purpose	Applicability
1.	Recommendations for Road Construction in Areas Affected by Water Logging, Flooding and/or Salts Infestation	IRC:34-2011	Construction in waterlogged areas	Yes
2.	Recommended Practice for Construction of Earth Embankments and Sub-Grade for Road Works	IRC:36-2010	Issues relating to Borrow pits	Yes
3.	Guidelines for Pedestrian Facilities	IRC: 103 - 1988	Safety of pedestrians	Yes
4.	Guidelines for Use of Construction and Demolition Waste in Road Sector	IRC:121-2017	Use of Construction and Demolition Waste in Road Sector	Yes
5.	Guidelines on Landscaping and Tree Plantation	IRC:SP:21-2009	Landscaping and Tree Plantation along the road	Yes
6.	Guidelines on Road Drainage	IRC: SP: 42-1994	Drainage	Yes
7.	Highway Safety Code	IRC: SP: 44-1994	Highways safety	Yes
8.	Guidelines for Use of Geotextiles in Road Pavements and Associated Works	IRC:SP:59-2002	Use of Geotextiles in Road Pavements and Associated Works	Yes
9.	Guidelines for Soil and Granular Material Stabilization Using Cement Lime and Fly	IRC:SP-89-2010	Soil and Granular Material Stabilization Using Cement Lime	Yes

S. No.	IRC Code Theme	Year	Purpose	Applicability
	Ash		and Fly Ash	
10.	Guidelines on Requirements for Environmental Clearance for Road Projects	IRC:SP-93-2017	Requirements for Environmental Clearance for Road Projects	Yes
11.	Use of Cold Mix Technology in Construction and Maintenance of Roads Using Bitumen Emulsion	IRC:SP-100-2014	Use of Cold Mix Technology in Construction and Maintenance of Roads Using Bitumen Emulsion	To be considered
12.	Guidelines on Preparation and Implementation of Environment Management Plan	IRC:SP-108-2015	Preparation and Implementation of Environment Management Plan	Yes

4.7. Environmental Standards

Various environmental standards like National Ambient Air Quality Standards, Ambient Noise Standards and Drinking Water Standards are applicable to the proposed “Improvement and Up-gradation of the existing roads of Chiralla Link Road and Malaini to Chakrabatti Road are reflected in Environmental Monitoring section of this report.

Environmental standards applicable to this subproject are given below:

- National Ambient Air Quality Standards, 2009
- Ambient Noise Standards
- Drinking-Water Quality Standards-IS:10500:2012
- CPCB Standards for Surface Water Use
- Stack Gas Discharge Standards for Hot Mix Plant

5. ENVIRONMENTAL BASELINE CONDITION

5.1. General

District Doda lies in the outer Himalayan range in Jammu Division in the Indian union territory of Jammu and Kashmir spread between 32°-53′ and 34°-21′ North Latitude and 75°-1′ and 76°-47′ East Longitude at an Average elevation of 1107 m. It lies in eastern part of state and is located about 175 Km from Jammu and about 200 Km from Srinagar. The District is bounded by Anantnag district in North, Kishtwar in North-East, Kathua and Udhampur in South and South-West, Ramban in West. Chamba area of Himachal Pradesh falls in the South. The geographical area of the district is 8912 sq.km, where the rural part of the district is spread over an area of 8892.25 sq.km and the urban sector has area of 19.75 sq.km. The district encircles within the lofty mountains with diverse vegetation and huge variety of medicinal plants. The district has highest forest cover among all the districts of the state and exhibits altitudinal extremes from 1,600 to 5,200 m. Land cover mainly comprises of lush green forests, denuded steep slopes and alpine meadows. The district is known for its rich mineral deposits like lead, mica, gypsum, manganese, marble, graphite copper etc. The distict is pre-dominantly rural and has agricultural and pastoral economy.

Population of the district is 409,936 (2011 Census) and having a population density of 46. About 92.03% of the population resides in rural areas and their economy mainly sustains on agriculture. The Doda District as per census 2011 consists of 406 census villages, out of which four are un-inhabited. The villages have been grouped into 17 Tehsils, 17 CD Blocks, and 237 Gram Panchayats. The average literacy rate stands at 64.68 per cent as per Census 2011. The decadal growth rate in population during 2001–11 was 28 %. It is predominately a hilly district and the climate in the district ranges from sub-tropical to semi-temperate. Summers are generally warm and winters cold with snowfall on the high ridges. The average annual rainfall ranges from 900 to 1000 mm. The district is predominantly hilly and the area of 3967 sq.km is under forest cover which is about 33.93 % of the total geographical area of the district**.**

The district has good potential for tourism including pilgrimage and adventure. Monuments of archaeological importance in the distt. include a fort at Bhadarwah. Kashmiri, Dogri, Bhadarwahi, Siraji, Punjabi etc. are the languages being spoken here in different areas. The District has its own history and cultural matrix comprising people from different ethnic, religious, cultural, linguistic and social groups.

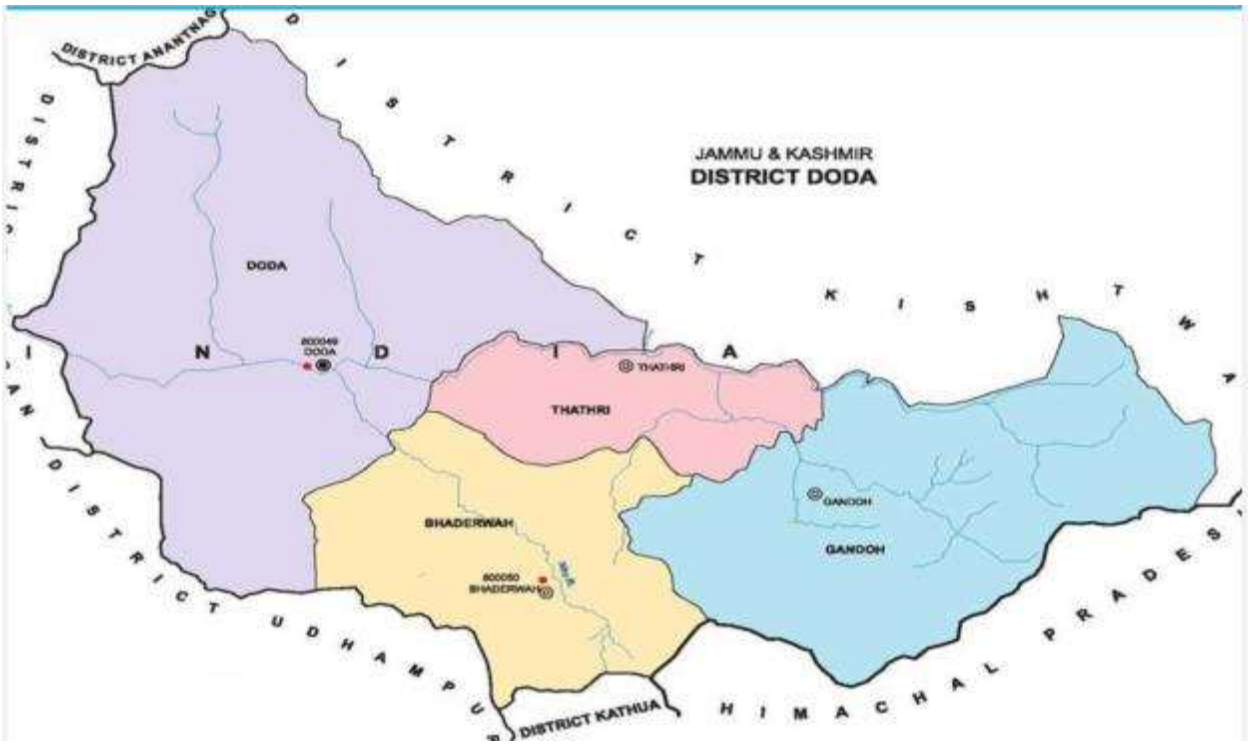


Figure 5.1: District Map of Doda

5.2. Study Area (Project Location and Outline)

Component A of Package-4: Chiralla Link Road

The Chiralla Link Road is located in District Doda in Jammu region, having geo-coordinates of 33°7'33.57"N (Latitude) & 75°37'39.14"E (Longitude) at Chiralla (starting point) to 33°6'19.94"N (Latitude) & 75°41'39.28"E (Longitude) at Puneja (endpoint) of the road. The proposed subproject is a rural road passing through the hilly terrain**.** It is a village road, the existing road is single lane and has 2.65m to 3.0m wide carriageway with an average shoulder width of 0.50 m and is proposed to be upgraded as 3.75m. The Road traverses through hilly area settlements of Chiralla, Kandosu, Himote, Sakia, Grondra, and Bhalara. Through this alignment people of several villages namely Chhatra, Misratah, Sengoi, Jasolah, Deyoki, Kundi, changnu, Manawa etc. will get connected with district town Doda & Jammu. The proposed subproject has a total length of 10.139 km. During September 2014 high intensity and prolonged rains like seasonal torrential rain resulted in damage/eroding of the pavement surface. Due to non-existence of CC drain, the existing road is badly damaged and slope eroded at several locations. Necessary protection works required at several stretches with the provision of CC drain.

Component B of Package-4: Malaini to Chakrabatti Road

The Malaini to Chakrabatti Road is located in District Doda. Project Road takes off from Km 7th of Pul-Doda-Bhaderwah and ends at village Sundra. It is having geo-coordinates of 33°5'31.95"N (Latitude) & 75°35'16.95"E (Longitude) at Malaini (starting point) to 33°5'56.10"N (Latitude) & 75°36'4.38"E (Longitude) at Chakrabatti (endpoint) of the road. The proposed subproject has a total length of 10.059 km. From connectivity point of view, this particular road has high importance as through this alignment people of

several villages namely Jahnana, Dranga, Pendku, Mehrada etc will get connected with district town. This Road needs necessary protection work at several stretches with provision of CC drain and few culverts. After upgradation of this Road, significant traffic can flow through the routes which will help to enhance the economy of that area.

5.3. Topography and Physiography

The Chiralla Link Road and Malaini to Chakrabatti Road lies in the District Doda of Jammu region in J&K. The Subprojects falls in characteristic hilly terrain topography. The project influence area on both sides of the Chiralla Link Road and Malaini to Chakrabatti Road is mostly open. District Doda is predominantly a mountainous district. Doda district lies in the outer Himalayan range in Eastern part of Jammu & Kashmir. The general topography of the area is rugged and mountainous. Doda area can also be called as a land of lofty mountains, deep gorges, valleys and meadows, showing great variation in elevation. The district includes Greater Himalaya, Lesser Himalaya and Pir Panjal ranges which are interwoven by numerous small forested hills leaving a limited space for cultivation. There are most famous peaks in district Doda like Marble Pass, Nunkun on the suru border which rise to a height of 2300ft above the sea level. Two other mountain peaks are Brahma & Moon sikie. The district includes a few plain and low level areas with a minimum height of 740 meters. But there is hardly any mountain peak dotted in the district which is less than 5,637 meters in height. The Chenab is the principal river of Doda district. It rises from the glaciated Dhauladhar range (the eastern part of Pir Panjal range) and flows in a regional direction of west or north-west draining in the entire Doda district. The district is predominantly hilly and the area of 3967 sq.km is under forest cover which is about 33.93 % of the total geographical area of the district**.**

5.4. Geomorphology and Soil of the Area

The geomorphic forms recognized in the area are structural hills, erosional hills, plateaus, river terraces and hill slopes. Structural hills cover about 90% of the area and they belong to mainly Salkhalas, Dogra slates and Murees. The erosional hills have developed over Dul Quartzite and Gneissic outcrops. The plateau surface (Kishtwar plateau) forms a conspicuous geomorphic feature in the area. The plateau appears to be tectonic depression which, in the later phases of evolution supported a lacustrine domain over it. Sediments of the Chenab formation are, in general, fine to coarse textured and exhibit moderate to wide depression, presence of pollen and spores in Kishtwar formation indicate a temperate dry climate phases in the part.

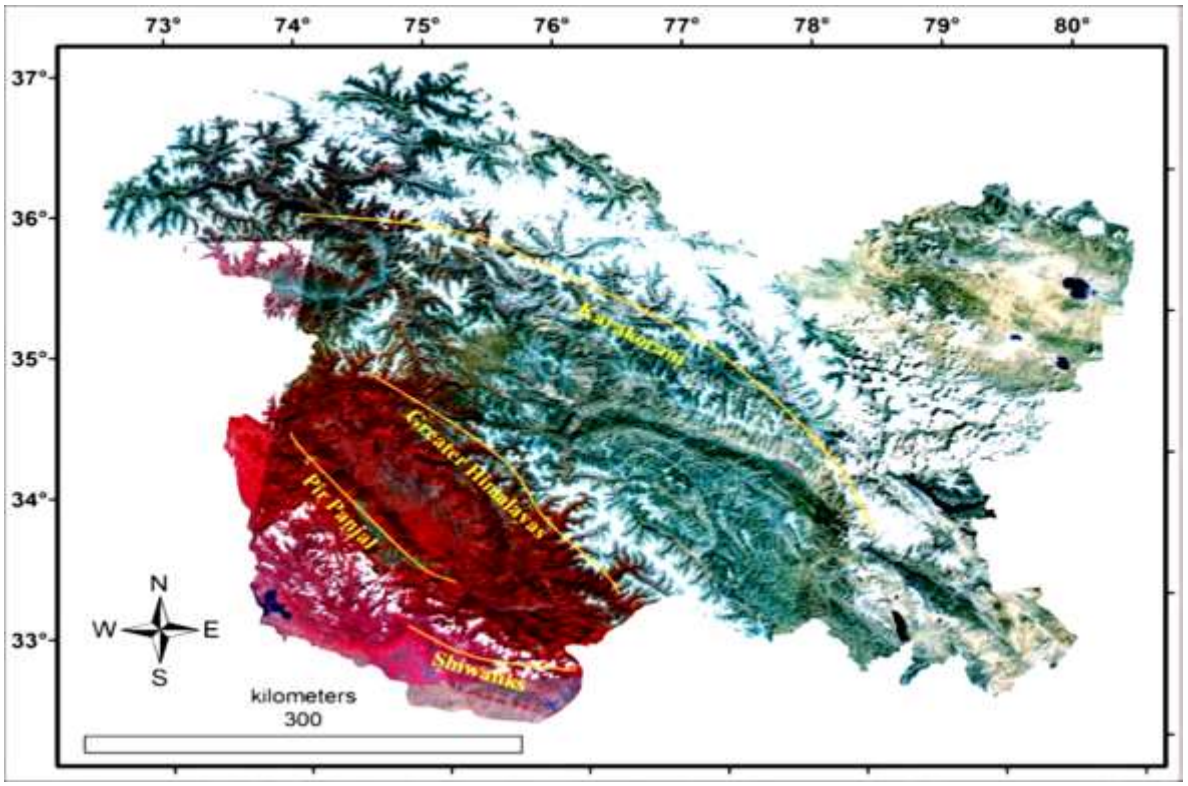


Fig 5.2: The Major Mountain Ranges of the J&K state (The Siwaliks represent the foothills of the Himalaya)

5.4.1. Hilly Terrain Features

Doda district have a total area of 8912 sq. km including 8892.25 sq. km rural area and 19.75 sq. km of urban area. It is predominantly a hilly district with variable climatic features, ranging from subtropical and to semi-temperate.

Altitude variation of the Chiralla Link road varies roughly between 2914 to 5031 feets above mean sea level at an average elevation of 4242 feet which is a typical elevation hilly terrian. Major physiographic slope is facing towards north-west direction high i.e. towards the valleyside of the River Chenab at an average slope variation of 24.8%-16.6%. River Chenab is the main river flowing in the project area and flows LHS of project road (from Valleyside) upto Ch 1+350 which originates from the Kishtwar/ Himachal region.

Similarly, the Malaini to Chakrabatti Road have higher altitudinal variation between 3543 to 5567 ft above sea level at an average elevation of 4441 feet. Elevation details are provided in Figure 5.3 & 5.4 below;

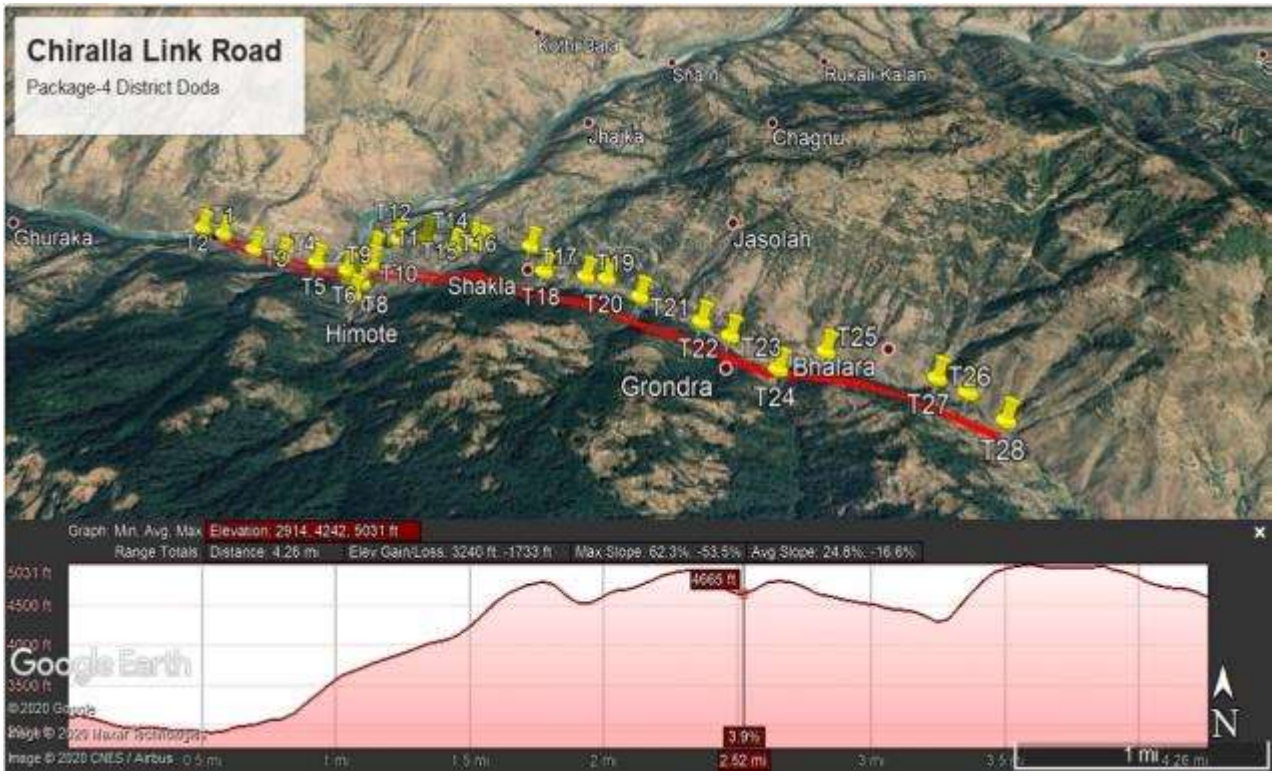


Fig 5.3: Elevation Profile of the proposed road of Chiralla Link Road. (Source: Google Map 2020- Elevation details)

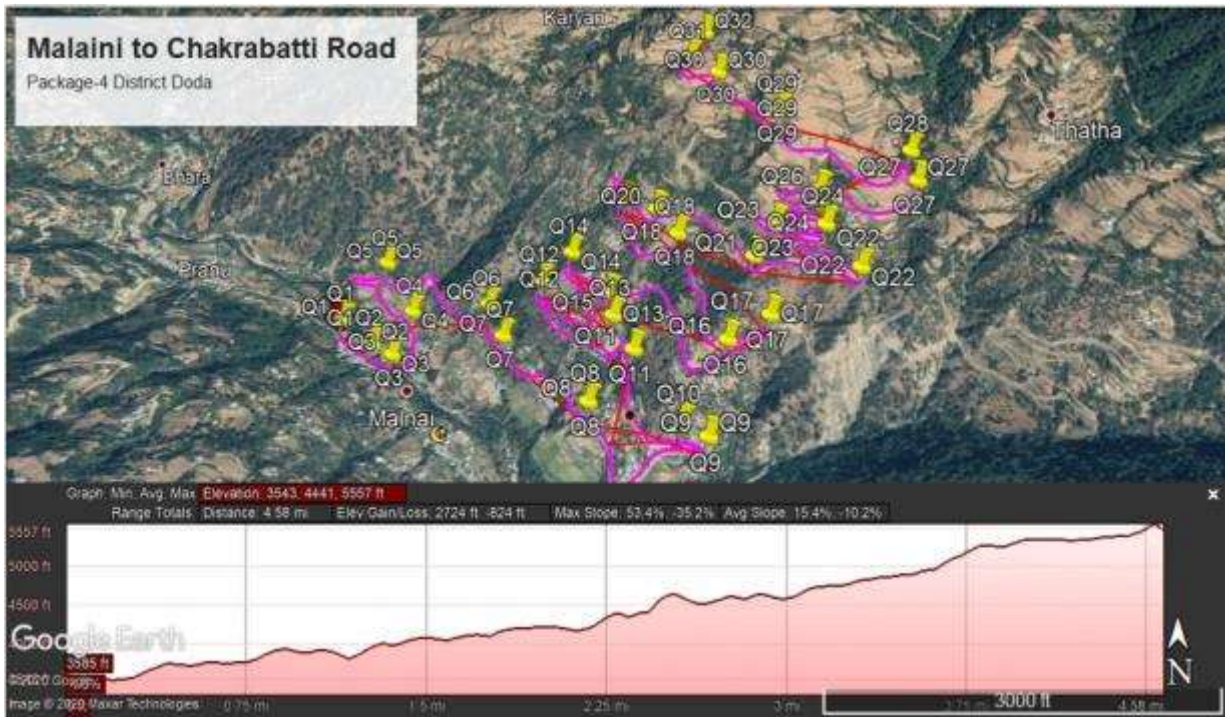


Fig 5.4: Elevation Profile of the proposed road of Malaini to Chakrabatti Road. (Source: Google Map 2020- Elevation details)

5.4.2. Soil Type

The soil in the district is generally loose and sandy with very low moisture. The rate of soil erosion is very high and roads blockage is frequent during the rainy season. Major part of

Doda district comprises hill slopes of various gradients which are not conducive for development of soil profiles. Soils have therefore formed only on the gentle slopes of hills. Podsols are the dominant group of soils in the area. The Deodar forested area of Batote mountains are underlain by the brown earth soils. In the glaciated northern and eastern parts of Doda district, skeletal soils have developed due to diverse climatic conditions. Localized wedges of alluvial soils are also present in the various valleys of the area. In the valley portion clay predominantly form the upper layer where as at higher altitude coarse grained soil exists. The pH of the soils under different land use systems ranged from 4.65-7.21 under forest, 6.10-7.90 under barren land, 5.49-7.55 under agriculture and 5.12-7.30 under horticulture.

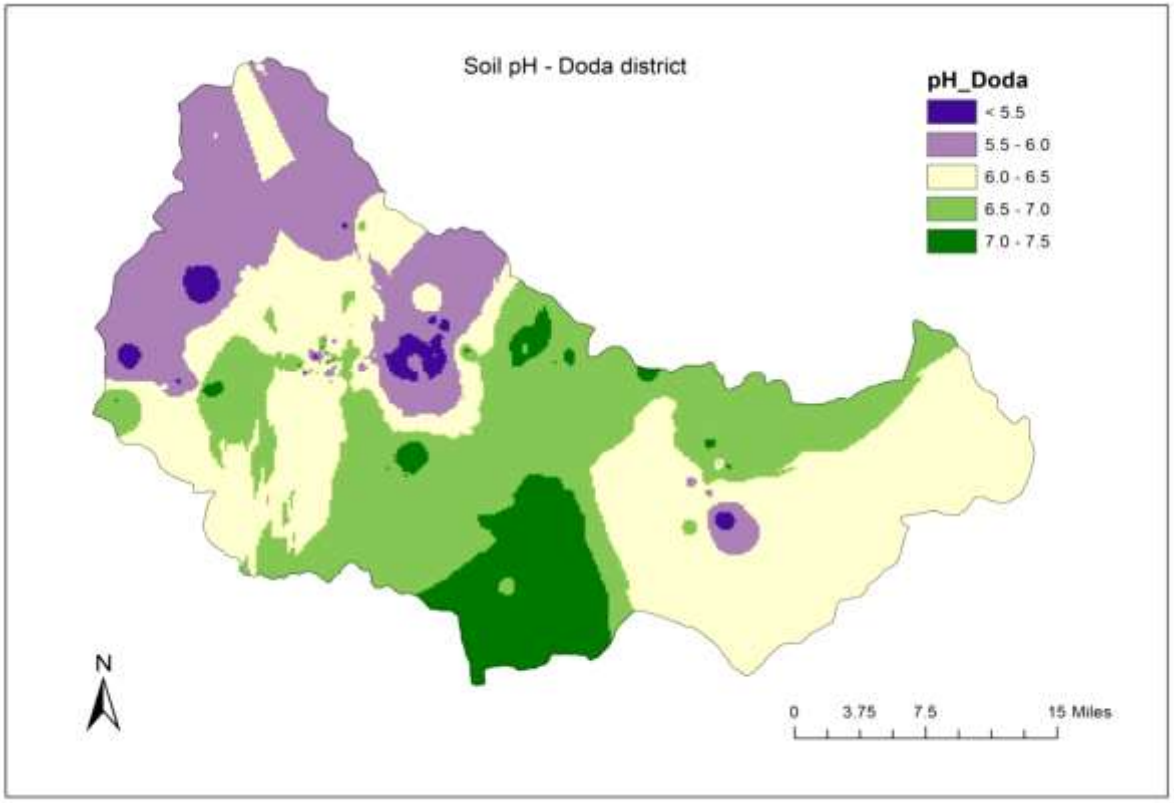


Figure 5.5: Soil pH of Doda District

5.4.3. Geology

Paddar formation of Early Proterozoic comprises high grade schists and granitoids, gneisses, Ramban formation consist of phyllite, slate, quartzose sandstone, diamictite and lenticular bands of limestone and gypsum and Bhadarwah formation of Late Proterozoic consists of slate, phyllite and quartzite. The Permian rocks in Singhpore area of Doda is represented by Nishatbagh formation and Triassic rocks in Desa and Warwan Valleys consist of black shale and sandstone. In Bhaderwah Bhallesh basin shale, shaly limestone, massive limestone with shale partings and sandstone comprises the Triassic rocks.The Kaplas Batholoth occupies an area of about 500 sq.km in part of Doda. It intrudes into Salkhala and Bhadarwah Slate formations.

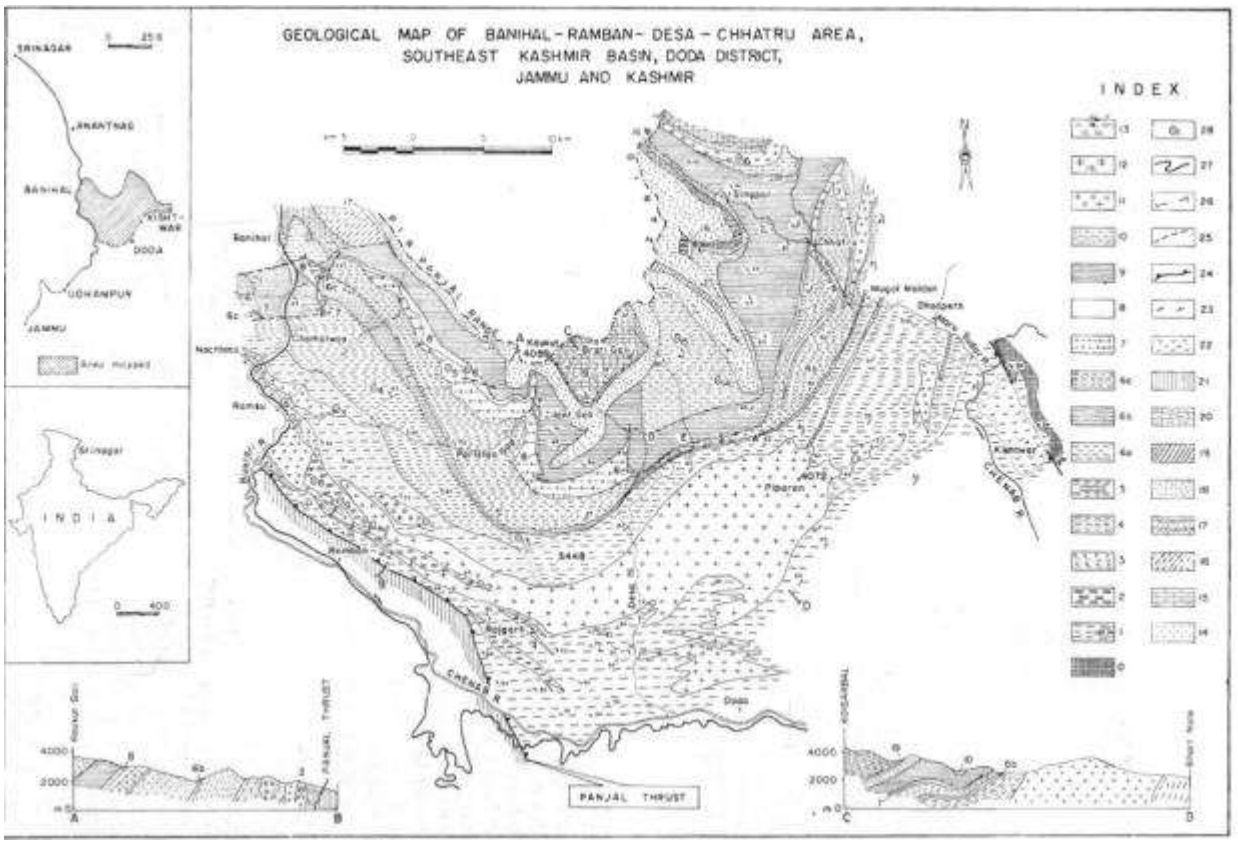


Figure 5.6: Geological Map of Southeast Kashmir Basin, Doda District

Table 5.1: Geological Succession of the Doda District.

Group /Formation	Lithology	Age
Alluvium	Fine to course grained sand silt and clays	Recent to upper Pleistocene
Siwalik Group	Sand, slit and clay, fine to coarse grained sandstone, pinkish grey to brownish mudstone, red mudstone and fine to medium grained grey sand stone	
Murree Group	Purple, brown and buff coarse sandstone, Pseudo-conglomerates, purple shale and deep red clays with several veins of calcite.	Lower Miocene
Subathu Group	Dark coloured carbonaceous and ferruginous shale, containing iron nodules and crystals of Pyrie; dark gray to grey nummilite limestone and olive shale.	Lower Eocene
Unconformity		
Bauxite Formation (Lain Bauxite)	Bauxite pissolitic as well as non-pissolitic, grey aluminous clays, soft clays, carbonaceous shale and bands of grey and red sandstone	Pre-Eocene
Khargala Formation		
Sirban Limestone	Light grey to dark grey, cherty & non cherty dolomitic limestone with a few bands of flaggy limestone, quartzite, marl and black shale beds	Proterozoic

5.4.4. Hydrogeology

The hydrogeological areas of this region are contingent on lithology, composition and geomorphic format. Groundwater in the alluvial sediments appears in vent areas of independent grains beneath water table state. Based on the variation in hydrogeological characters of rocks and rock formations, the area divided into Fissured formation and Porous formation. Former includes hard rock formation comprising mainly of granites, gneisses, quartzite, limestone, sandstone etc. These are generally massive, consolidated and devoid of any primary porosity. Porous formation comprises terrace deposit of Recent to sub-Recent age in the area. All along the Chenab River and its tributaries from Arnas to Akhnoor and from Katra to Jhajhar Nala, alluvial terraces of varying dimensions are deposited.

5.5. Slope Stability Issues

Slope forms and slope processes are important considerations in land use planning, both from the viewpoint of the environmental constraints they pose and the environmental impacts related to subsequent slope alteration. The hill road (physical landscape) is an assemblage of valleys and hill slopes and the dimensions and appearance of slopes give an area its essential morphological character. There is a direct causal relationship between the processes of soil weathering, erosion, transportation and deposition, and the form and gradient of hill slopes. The immense variety of slope form and steepness is because processes of erosion operate in varying combinations and with differing relative effectiveness in areas of different rock type, structure, climate, vegetation, relief and so on. Landforms are the products of the local balance between weathering, erosion and deposition and are continuously evolving. Slopes that are too steep for the weathered material to remain stable are subject to periodic failure. Instability may be associated with moderate to steeply sloping terrain or with land which has been disturbed. There are many factors involved including soil type, geotechnical features (fractures), exposure to saturation, surcharge loading and vibration.

The geological features, unstable slopes are further destabilized by the action of torrential rains and especially in monsoons which result in landslides/ landslips/ erosion etc. Lack of vegetation in such areas are other reasons, responsible for the increased soil erosion and destabilization of slopes. The locations of the erosion/ landslide prone areas along the proposed roads under Package-4 have been identified at number of places.

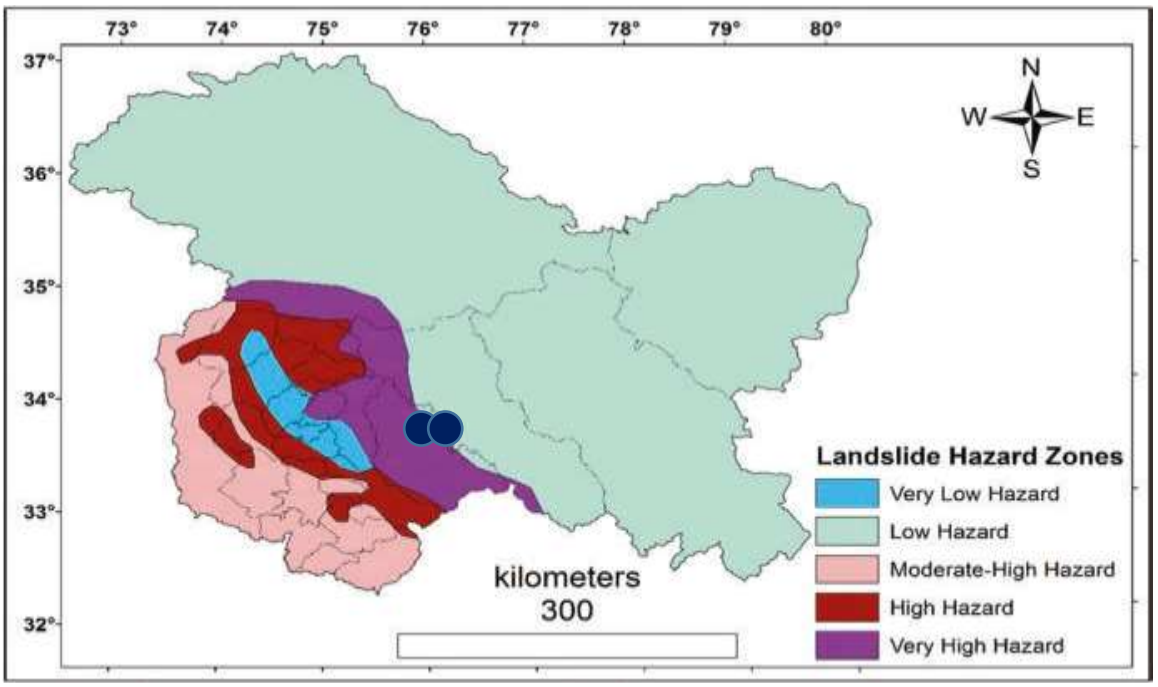


Figure 5.7: Landslide prone areas of the J&K State (Yellow dots showing project roads of Package 4

Hill Road Manual (IRC SP:48)

Hill slopes are subject to erosion from the flowing water leading to the foot of hill slopes. Cutting of forests increase the erosion potential. The debris carried aways by the flowing water may damage the slopes downhill and chokes the streams . It has also been found that, erosion, if unchecked, tends to produce massmovements in the shape of landslides. Thus the slope degradation by surface erosion has a multiplier effect. It is more economical to control the damage at the initial stage itself i.e. when its existing as surface erosion.

Majority of slope stability problems in hill area have their rigin in cumulative erosion of hill slopes. It has been repeatedly observed that the combination of rainfall, soil type and slope condition in these area favour the occurrence of shallow erosion type landslides.Plantation of grass and shrubs to restore the vegetative cover has been found to be successful in arresting this type of mass movements. The presence of vegetative cover is beneficial to the stability of slope in a number of ways as enumerated below:

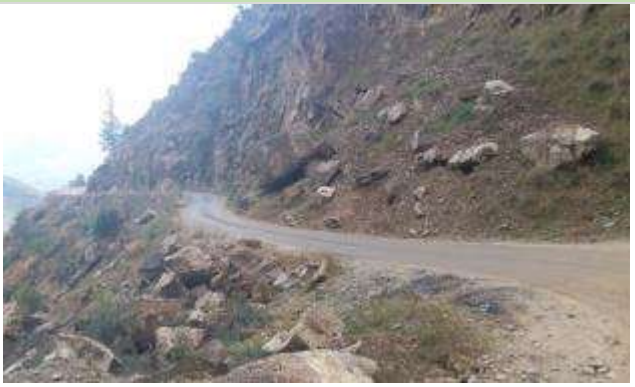
1. Surface erosion will be controlled. If some remains unchecked, there is a high probability that the erosion may extend deeper and wider and eventually endanger the stability of the slope.
2. Infiltration of water into the slope will be controlled, thereby reducing the build-up of pore pressure. Decrease in factor of safety is directly proportional to the increase in pore pressure.

Growth of vegetative cover and spread of root-network to an approximate depth of 0.5 to1.0 meter depth help to improve the overall stability of the slope as brougjt out by filed experiments carried out on different hill slopes for erosion control.

Some of the slope stabilization issues like sliding areas and erosion prone sections of Package-4 roads in Doda District has been captured in photographs and provided below;

Slide/ Erosion Prone Sections of the Package-4 Roads in District Doda.

A. Chiralla Link Road



Slide area at Ch 1+100

Slide area Ch 1+700

Slide Area at Ch 2+250

liding area Ch 2+600

Erosion area Ch 8+100

Slide/ Erosion Prone Sections of the Package-4 Roads in District Doda. B. Malaini- Chakrabatti Road	
	
Slide area at Ch 1+500	Slide area Ch 2+400
	
Erosion area Ch 2+600	Erosion area Ch 3+850
	
Sliding area Ch 2+600	Erosion area Ch 8+100

Figure 5.8: Photo slides showing Slide and Erosion prone sections of the Package-4 roads in Disitrict Doda

5.6. Natural Hazards

The state is a multi-hazard prone region with natural disasters like earthquakes, floods, landslides, avalanches, high-velocity winds, snowstorms, cloud bursts, besides manmade

disasters including road accidents and fires etc. occurring in various parts of the state. The project road comes under influence flood hazard, heavy snowfall in Pir Panjal range, earthquakes (under Zone-IV classification), and man-made disasters including road accidents which is synonymous with hilly roads in Doda district.

5.6.1. Floods

Although flooding is a major hazard to lives and infrastructure the world over, mechanism and trends in flood hazards are poorly understood. Normally, the prolonged and high-intensity rainfall is the trigger for floods, however, the geomorphic setup and nature of the socio-economic development in the river basin would either ameliorate or exacerbate the flooding under various scenarios. Recently, the frequency of extreme rainfall events and floods has increased worldwide including the NW Himalayas. The extreme rainfall event, as evident from the 7-day antecedent rainfall data observed in the Jhelum basin, turned into one of the worst disasters in the flood history of the Jhelum compounded by the existence of the injudicious socioeconomic structures and massive land system changes in the floodplains that interfered with the hydraulic and hydrological processes during the flooding The scenario was further worsened due to the dilapidated flood control structures and the institutional failure on managing the enormity of the extreme flooding. The 2014 flood was very devastating and killing more than 100 people and causing colossal loss to the infrastructure to the tune of INR 1 Trillion (World Bank 2015). The Jhelum and Chenab waters, that used to be the provider of life and sustenance, suddenly became a monstrously destructive force against human life and the infrastructure that co-habit its backyards since millennia.

The proposed road projects of “Chiralla Link and Malaini to Chakrabatti Roads” were affected during the September 2014 floods. The hilly terrain features results into the disintegration of the road surface, slope destabilization, erosion issues etc.

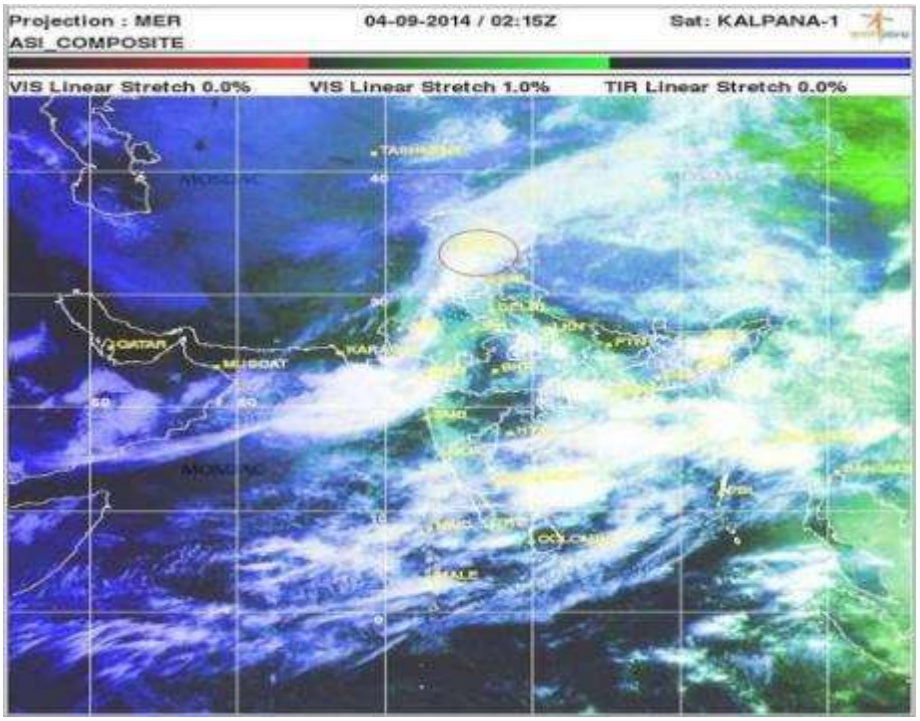


Figure 5.9: Composite Kalpana image showing clouds over J&K (Red circle) on 4 Septembe 2014 (Source: MOSDAC)

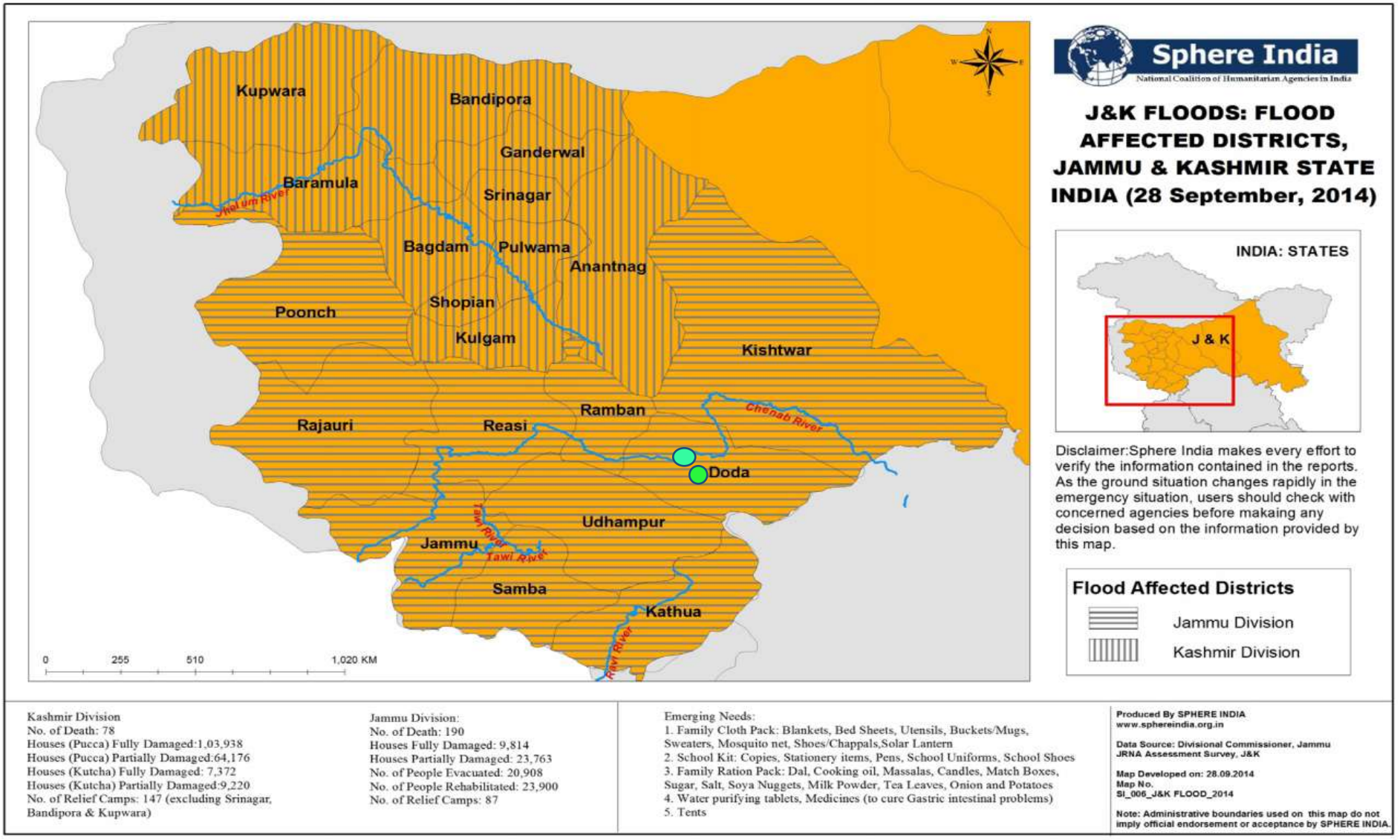


Fig 5.10: Flood Affected District Map (September 2014 Floods in J&K)- Green dots with line showing (for the illustration) project roads in Doda District

5.6.2. Earthquakes- History and Seismic Zonation

The Indian subcontinent has a history of devastating earthquakes. The major reason for the high frequency and intensity of the earthquakes is that India is driving into Asia at a rate of approximately 47 mm/year. Geographical statistics of India show that almost 54% of the land is vulnerable to earthquakes. The latest version of seismic zoning map of India given in the earthquake-resistant design code of India [IS 1893 (Part 1) 2002] assigns four levels of seismicity for India in terms of zone factors. In other words, the earthquake zoning map of India divides India into 4 seismic zones (Zone 2, 3, 4 and 5), unlike its previous version which consisted of five or six zones for the country. According to the present zoning map, Zone 5 expects the highest level of seismicity whereas Zone 2 is associated with the lowest level of seismicity.

The state of Jammu & Kashmir is the westernmost extension of the Himalayan mountain range in India. Here it comprises of the Pir Panjal, Zanskar, Karakoram and Ladakh ranges. The Main Boundary Thrust (MBT) underlies the Pir Panjal Range and is known as the Panjal Thrust in the region. The Zanskar ranges which are part of the Great Himalayan range are underlain by the Zanskar Thrust. The Kashmir Valley lies between the Pir Panjal and the Zanskar thrusts, making it very vulnerable to earthquakes. Other northern parts of Jammu & Kashmir are heavily faulted. Along the Zanskar and the Ladakh, ranges run a North West (NW) – South East (SE) trending strike-slip fault, the longest in the Jammu & Kashmir area. Apart from the routine small tremors, moderate to large earthquakes have hit nearly all parts of the state. However, it must be stated that proximity to faults does not necessarily translate into a higher hazard as compared to areas located farther away, as damage from earthquakes depends on numerous factors such as subsurface geology as well as adherence to the building codes. There are at least four regions of the Himalaya where earthquakes of magnitude 8 or above are likely to occur in the near future as per assumptions made by the scientists . 2005 earthquake of MW 7.6 has released the only $1/10^{th}$ of the stress generated within the region and remaining has to go in future great earthquakes. The damage occurred in Uri, Kupwara and Baramulla districts in Kashmir province and in the Poonch town and its surrounding areas are along the line of control. This earthquake was the strongest in over 120 years in the area. Efforts at all levels need to be taken to ensure whatever new structures are built can withstand future major earthquakes.

The subproject roads under Package-4 is located in District Doda which falls in a seismically active part (Zone-V) of J&K. The design parameters for the proposed road should conform with the BIS code of Practice. Keeping in view the maximum credible earthquake magnitudes in the region, the site area is classified in Zone-V as per the Bureau of Indian Standards (BIS) code of Practice (IS-1893-2002). These maximum credible earthquake magnitudes represent the largest earthquakes that could occur on the given fault, based on the current understanding of the regional Geo-tectonics. The earthquake zonation map of Jammu and Kashmir is given below:

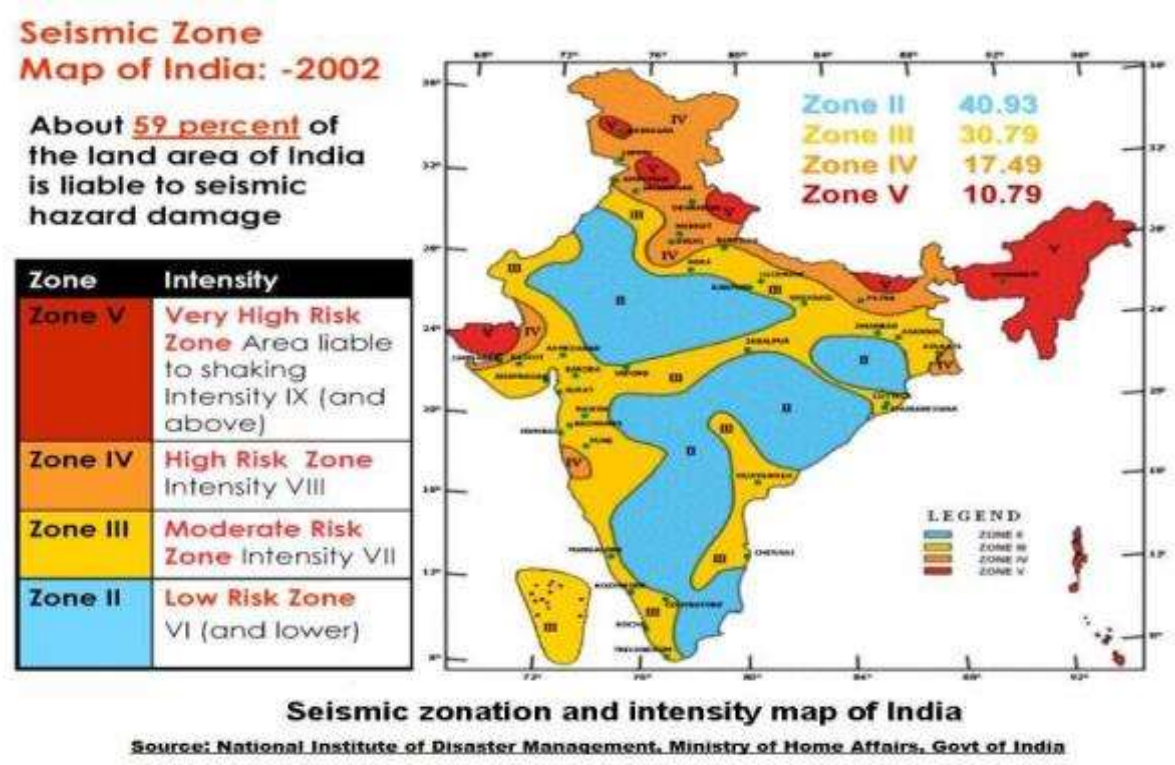


Fig 5.11: Seismic Zonation and Intensity Map of India.

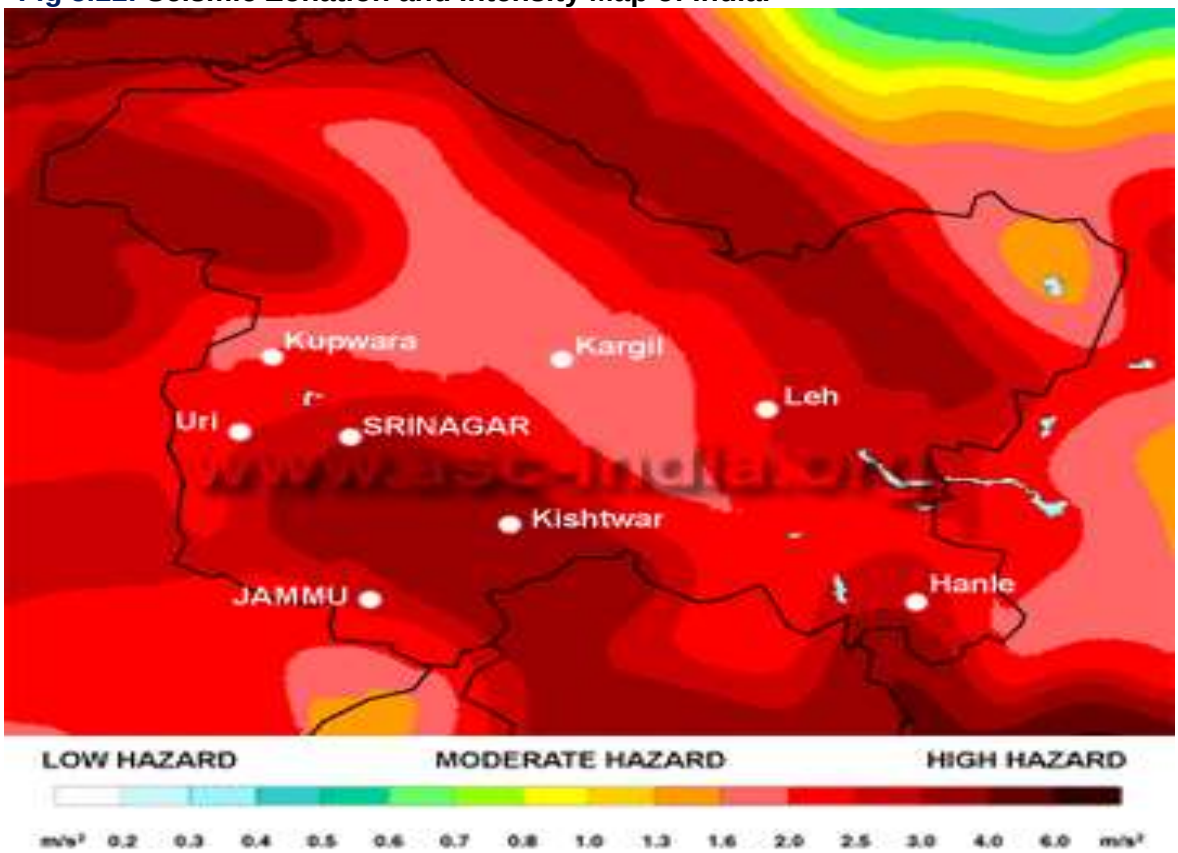


Fig 5.12: Jammu and Kashmir earthquake zones.

5.7. Air Environment

5.7.1. Meteorology and Climatology

Doda district has hilly terrain with the elevation up to 5600 metres above mean sea level and lies in the middle Himalayan ranges. The entire district is hilly with a few plain and valleys with low lying areas. The district does not have a uniform climate due to its varying physical features. It is surrounded by snow clad lofty mountains and mighty river Chenab flows through it. The climate is temperate in the high altitudinal areas of the district while it is sub-tropical in the southern part. It has a severe cold weather in winter. Snowfall is common at high altitudinal areas during winter. Winter starts from the middle of November when both the day and night temperatures fall rapidly till January or mid-February, and lasts till early March. The temperatures start to rise from March to July. The period of mid-November to early March is of winter season while March to the end of June is of summer season followed by southwest monsoon season till September. Summers are pleasant which are associated with the rain. The period of October and mid-November constitutes the post monsoon season.

Records of rainfall in the district are available for only one raingauge station for period of 24 years. The details of rainfall at this station and for the district as a whole are given in Table 5.2-5.4 The average annual rainfall in the district is 1334.5 mm. The rainfall in southwest monsoon season (June-September) is about 33% of the annual normal rainfall, while the rainfall in pre-monsoon months (March to May) accounts for 33% of the annual rainfall, March being the month of the highest rainfall with an average of 213.5 mm. The winter months (December to February) account for about 27% of the annual rainfall. It is seen from Table 5.2 that annual rainfall was between 1001 mm and 1600 mm in 11 years out of 16. In the district especially in higher mountains, considerable amount of precipitation is received in the form of snow. About 64 cm of snowfall occurs annually in the district. Snowfall mainly occurs in the winter months November to March. About 75% of snowfall occurs in December & February. On an average there are 81 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall recorded in 24 hours at any station in the district was 170.2 mm at Badarwah observatory on 5th September 1995.

There is one meteorological observatory in the district at Badarwah at elevation of approximately 1688 metres. The peak height in the district is about 5600 m. Temperature and other meteorological conditions depend very much on the topography of the place. The cold season is from the middle of November to early March. Temperatures begin to decrease from mid-November till January or mid-February. January is the coldest month with mean maximum temperature of about 11.6°C and mean minimum temperature of about -1.9°C. In association with cold waves, the minimum temperature may sometimes drop to below –10°C on individual days. The day and night temperatures both begin to rise from the middle of March and continue till July, while the day temperature reaches its highest in July which is the hottest month with mean maximum temperature of about 31°C whereas mean minimum temperature of July is about 16.5°C. The period of April to June and October is of pleasant with cool atmosphere. On some days, during the period May to August the maximum temperature reaches 37°C. The temperatures may be 10° - 20°C lower at high elevated areas with reference to Badarwah.

Table 5.2: Normals and Extremes of Rainfall (Doda)

STATION	No. of Years of Data		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	ANNUAL RAINFALL AS % OF NORMAL & YEARS**		HEAVIEST RAINFALL IN 24 HOURS*	
																HIGHEST	LOWEST	AMOUNT (mm)	DATE
Badarwah (Obsy)	24	a	119.3	162.5	213.5	128.4	100.2	72.7	146.3	126.1	96.6	40.9	43.8	84.2	1334.5	136	62	170.2	05 Sep 1995
		b	7.0	8.3	9.5	7.4	7.9	6.6	10.0	9.1	5.1	2.7	2.7	4.3	80.6	(1988)	(1999)		
Doda (District)		a	119.3	162.5	213.5	128.4	100.2	72.7	146.3	126.1	96.6	40.9	43.8	84.2	1334.5	136	62		
		b	7.0	8.3	9.5	7.4	7.9	6.6	10.0	9.1	5.1	2.7	2.7	4.3	80.6	(1988)	(1999)		

a: Normal rainfall in mm.
b: Average number of rainy days (i.e. days with rainfall of 2.5 mm or more)
* Based on all available data.
** Years of occurrence given in brackets.

(Source: GOI, IMD)

Table 5.3: Frequency of Annual R/F in the District (Data 1960-2000) Doda

RANGE IN MM	NO. OF YEARS	RANGE IN MM	NO. OF YEARS
801 - 900	1	1401 - 1500	1
901 - 1000	1	1501 - 1600	2
1001 - 1100	2	1601 - 1700	2
1101 - 1200	1	1701 - 1800	0
1201 - 1300	2	1801 - 1900	1
1301 - 1400	3		

(Data available for 16 years)

(Source: GOI, IMD)

The atmosphere over the district is generally humid throughout the year. It is slightly less humid during April to June and September to December especially in the afternoons when relative humidity is of about 50% to 60% but in other months humidity is around 65% in the afternoon. In the mornings relative humidity is at about 63 to 81% throughout the year.

Table 5.4: Normals of Temperature and Relative Humidity (Badarwah-Doda)

MONTH	Mean Maximum Temperature	Mean Minimum Temperature	Highest Maximum ever recorded		Lowest Minimum ever recorded		Relative Humidity %	
	°C	°C	°C	Date	°C	Date	0830 IST	1730 IST
January	11.6	-1.9	21.8	14.01.2002	-10.8	03.01.1991	79	66
February	12.4	-0.7	24.8	10.02.1993	-9.2	23.02.1984	81	66
March	16.8	2.4	29.7	17.03.2004	-6.5	09.03.1979	77	61
April	23.3	6.6	32.6	30.04.1999	-2.5	13.04.1983	65	50
May	27.0	9.4	37.6	30.05.2000	0.2	13.05.1982	63	52
June	31.0	13.6	39.3	10.06.2002	5.2	04.06.1992	63	50
July	30.4	16.5	39.4	12.07.1999	7.0	07.07.1983	77	65
August	30.1	16.0	37.2	11.08.2002	8.1	25.08.1996	81	68
September	28.6	11.8	35.1	01.09.2001	2.5	25.09.1982	76	59
October	24.6	6.3	32.4	06.10.2000	-3.0	18.10.1990	71	52
November	19.8	2.7	28.7	15.11.2001	-2.5	30.11.1986	69	57
December	14.7	0.0	22.9	01.12.2008	-6.5	31.12.1991	68	59
Annual	22.7	7.1	39.4	12.07.1999	-10.8	03.01.1991	73	59

(Source: GOI, IMD)

5.7.2. Wind

Wind speed and wind directions have a significant role on the dispersion of atmospheric pollutants and therefore, it affects the ambient air quality of the area. Ground-level concentrations for the pollutants are inversely proportional to the wind speed in the downwind direction, while in an upwind direction no effect is observed and in crosswind directions partial effect due to emission sources is observed. Winds are generally light and calm throughout the year. Sometimes winds become moderate and strong, as anabatic and katabatic winds blow over hilly terrain and play a dominant role. Southeasterly component is seen in the mornings from the period September to March. Northeasterly component is also observed in district in the mornings from the period March to September. Northerly/northeasterly and Southeasterly/southwesterly components are seen in the afternoons.

Table 5.5: Mean Wind Speed and predominant Wind Direction (Badarwah- Doda)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Wind speed in km/hr.	2.2	2.3	2.6	2.6	2.1	2.0	1.3	1.2	1.6	2.0	2.1	2.1	2.0
Direction in morning	C/SE	C/SE	C/NE/SE	C/NE/N	C/NE	C/NE/N	C/NE	C/NE	C/NE/SE	C/SE	C/SE	C/SE/NE	
Direction in evening	C/NE/ SE	C/NE /N/SE	C/NE/N/ SE/SW	C/N/SW/ NW	C/N/NE/ NW	N/C/NE/ NW	C/N/NE	C/N/NE	C/SW/ N/NE	C/SW/ NE/N	C/N/ NE/ NW	C/NE	

(Source: GOI, IMD)

Fig 5.13: Wind & Cyclone Zones of Jammu & Kashmir

5.8. Noise Environment

Noise is perceived as one of the most undesirable consequences of road development. Though the level of discomfort caused by noise is subjective, there is a definite increase in discomfort with an increase in noise levels. The most commonly reported impacts of increased noise levels are interference in oral communication and disturbance in sleep. The main source of noise will be from the operation of machinery during the construction stage. The impact on noise quality due to the project will be of significance in both constructions as well as operation stages.

5.9. Water Environment

Box 5.1: Description – Surface Water Body

River Chenab flows along Chiralla Link road from Ch 0+000 to 1+350 at an average distance of 145 meters from the LHS of the road (Valleyside) at an average elevational difference of 130 m from the road.

5.9.1. Drainage

The Chenab is the principal river of Doda district. It rises from the glaciated Dhauladhar range (the eastern part of Pir Panjal range) and flows in a regional direction of west or north-west draining in the entire Doda district. It generally follows the regional trend of the NW-SE, but at three places, namely Kishtwar, Ramban and Salal, the river makes southward swings and flows along the transverse direction. At these bends, the river is invariably joined by large southward flowing affluents which make the transverse valleys regionally extensive. A large number of tributary streams and nalas join the Chenab both from northern and southern sides in Doda district. The northern tributaries have generally large watersheds and longer courses than their southern counterparts. The Marusudar is the longest affluent river that flows from the north. Other large tributaries joining the Chenab from the northern sides are Helare, the Bhut, the Bichiane and the Ans. Important southern effluents are the Kullgad, the Kal Nal and the Niru. Being mountainous country the Doda area has a high drainage density. Major rivers and glaciers follow the structural lineaments and form a parallel drainage pattern. Their tributaries exhibit subparallel pattern in the northern area of Doda district. Dendritic pattern is formed by the smaller nalas in the southern part of Doda district.

Ground water in the area occurs and manifests in the form of springs. Fracture porosity rather is an effective factor from point of view of occurrence of groundwater in the area. The occurrence and movement of groundwater in different aquifer is controlled by the structural features in addition to topography. Groundwater occurs in cracks, crevices and joints of these rocks. In Doda area the source of water supply is from khuls. Ganapat spring is the only potential water supply in the Doda area.

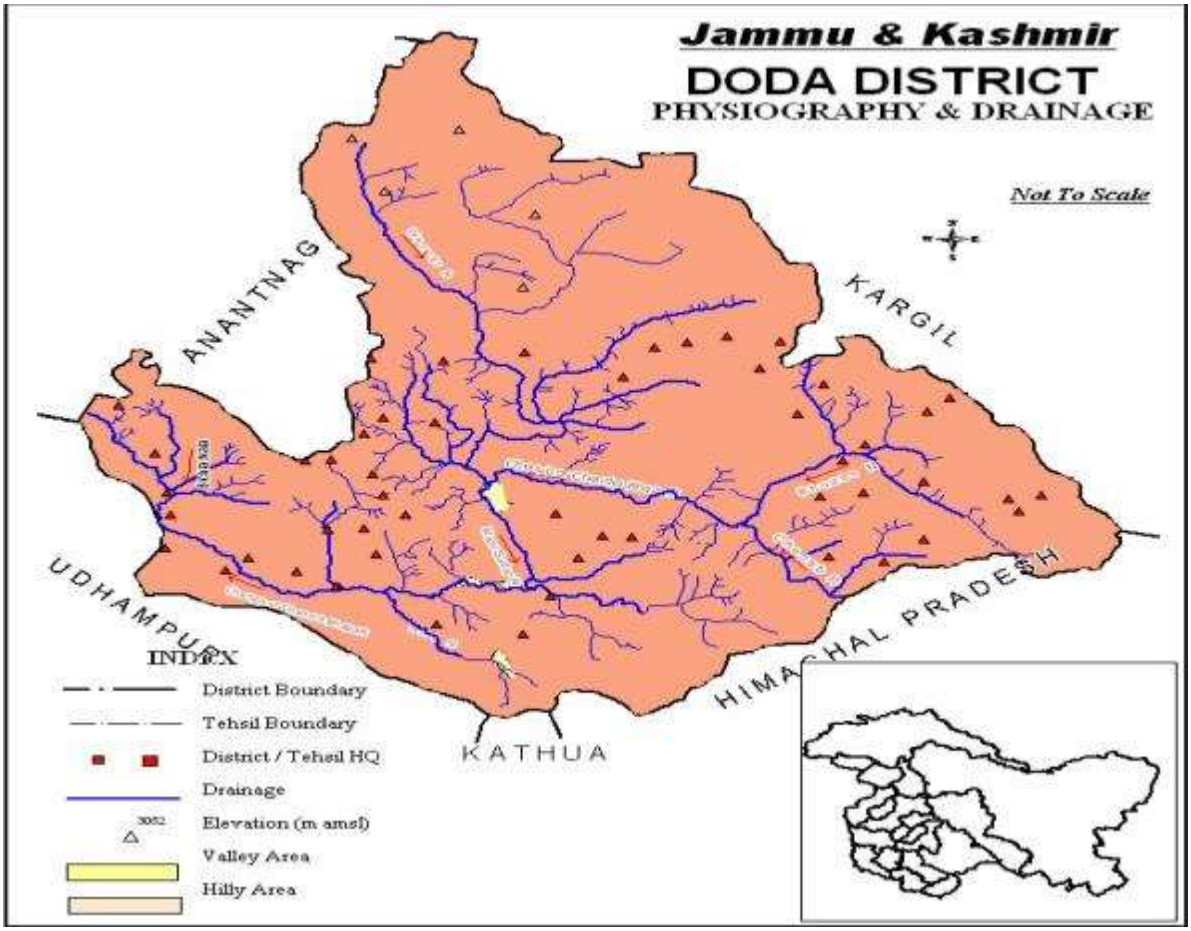


Figure 5.14: Physiography and Drainage pattern of Doda District

5.10. Biological Environment

Plant and animal communities are indicators of the environment. They respond not only to one environmental factor, but also to an interacting group of factors. The plant and animal communities integrate these influences and react sensitively to changes in the balance of environmental stresses. Vegetation is usually the most readily recognized component of ecosystems. Plant communities followed by used often to identify and biological balance through biotic or abiotic pressure or direct interference by man are readily recognized by changes in the physiognomy, structure and species composition of the flora and fauna. Since ecological integrity is one of the fundamental factors towards attaining a sustainable ecosystem, following biological status survey study in the study area was undertaken.

5.10.1. Forests

The Package-4 roads is located in Doda District of Jammu region. The Chiralla Link road and Malaini to Chakrabatti road are existing roads and falls in hilly terrain in district Doda. The proposed improvement and upgradation of the existing road of Chiralla link road is traversing through mixed and open-scrub forest type. The proposed roads under package-04 are not passing through any protected/ reserved forest.

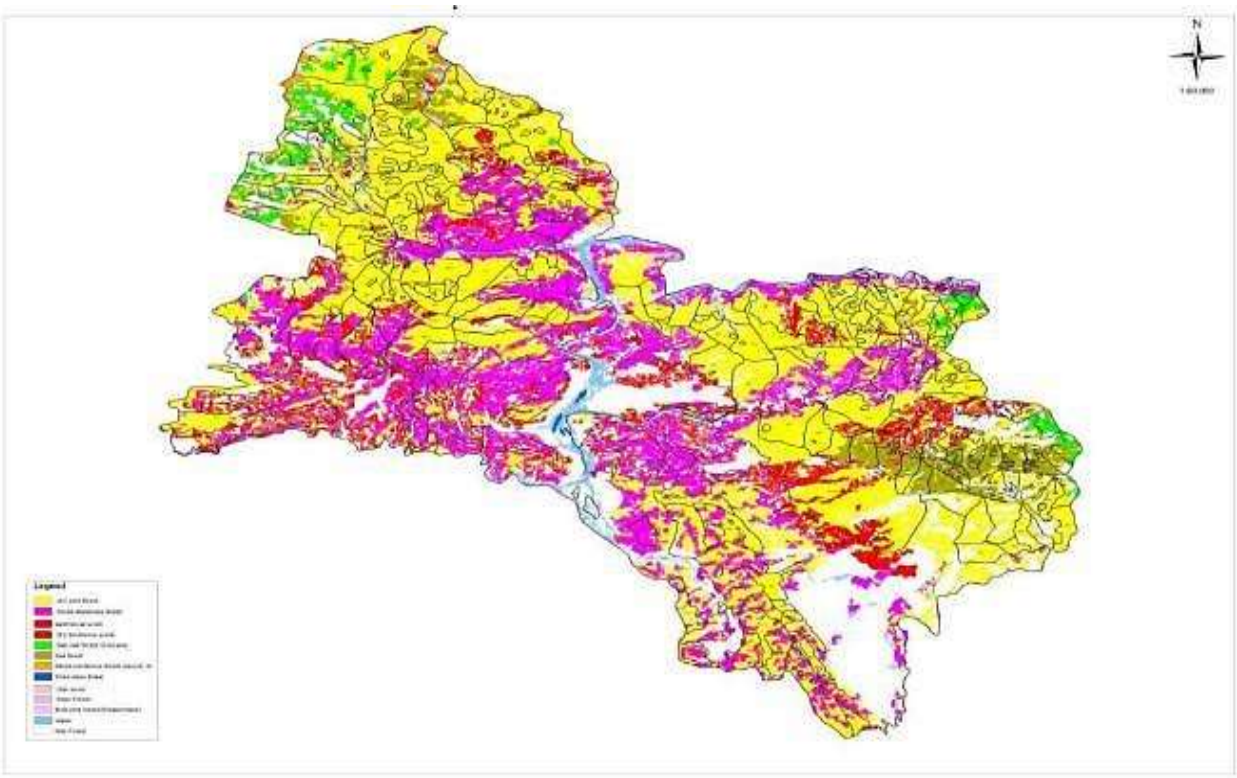


Figure 5.15: Stock map of classification of Doda Forest Division.

5.10.2. Flora

The prevailing and predominant vegetative species observed in the direct project corridor/ Project Influence Area (PAF) in the study areas are listed below. The local flora in the study area usually denotes trees/ shrubs along the road and within the project influence area (PIA) of 1km. As per the site survey, the common indigenous species are prevalent through the project corridor/ PIA. The commonly observed trees are Poplar, Willow, Pines, fruit trees, shurbs *etc.* No rare or endangered plant species were observed or as listed in IUCN/ CITES. The common plants observed and documented during the field study is present below;

Table 5.6: List of Flora in the Project Area Corridor (Commonly found)

S.No	Common Name	Scientific Name
A	Scheduled Trees	
1	Chinar	*Platanus orientalis*
2	Mulberry	*Morus alba, Morus nigra*
3	Walnut	*Juglans regia*
B	Trees/ Fruit trees/Shrubs etc	
4	White Willow	*Salix alba*
5	Poplar	*Populus alba*
6	Bren	*Ulmus villosa*
7	Bemij	*Celtis australis*
8	Heru	*Quercus ilex*
9	Acacia (Kikar)	*Robinia pseudo-acacia*

10	Haadi	*Abies pindrow*
11	Hatab	*Parrotiopsis sp*
12	Shisham	*Dalbergia sissoo*
13	Apple	*Malus sp.*
14	Pears	*Pyrus sp.*
15	Apricot	*Prunus armenica*
16	Pomegranate	*Pinica granatum*
17	Indian Fig tree	*Ficus recemosa*
18	Spruce	*Picea smithiana*
19	Grass	*Cynodon dactylon*
20	Common Yarrow	*Achillea millefolium*
21	Carrot Grass	*Parthenium hysterophorus*
22	Pine	*Pinus sp.*
23	Deodar	*Cedrus Deodara*
24	Bhang	*Cannabis sativa*
25	Shutenger / Nichini	*Rhododendren sp.*
26	Mooin	*Artemisa sp.*
27	Handh	*Taraxacum officinale*
28	Suchal	*Mava neglecta*
29	Dandelion	*Taraxacum officinale*
30	Darnel grass	*Lolium termulentum*
31	Mountain sorrel	*Oxyria digyna*
32	Grass	*Trifolium sp.*

Etc…….

5.10.2.1. Protected (Scheduled) Trees of the J&K State.

As per the Jammu & Kashmir Preservation of Specified Trees Act, 1969, Chinar (Platanus orientalis), Mulberry (Morus sp.) and Walnut (Juglans regia) are scheduled and protected trees. Some of the Chinar, Mulberry and Wanut trees are located near the project road and no such scheduled/ protected trees are coming within the project road.

5.10.3. Fauna

The Package-4 roads in Doda district is passing through the number of villages/ habitations and the terrestrial fauna observed are represented by the domestic animals/ livestock. These domesticated animals are Goats, Buffaloes, Cows, Donkeys. No wild animals were observed/ reported in the project roads during the field visit/ site assessment.

5.10.4. Wetlands

There is no wetlands site within one km radius of the project roads.

5.10.5. Ecological Sensitive Areas

The project corridors do not pass through any Biosphere Reserve, National Park, Wildlife sanctuaries and ecologically sensitive areas.

5.11. Socio-Economic Profile

District Doda lies in the outer Himalayan range in Jammu Division in the Indian union territory of Jammu and Kashmir. It lies in eastern part of state and is located about 175 Km from Jammu and about 200 Km from Srinagar. The District is bounded by Anantnag district in North, Kishtwar in North-East, Kathua and Udhampur in South and South-West, Ramban in West. Chamba area of Himachal Pradesh falls in the South. This district is hilly and the tract is inhabited by sparse rural population. The geographical area of the district is 8912 sq.km, where the rural part of the district is spread over an area of 8892.25 sq.km and the urban sector has area of 19.75 sq.km. The district has good potential for tourism including pilgrimage and adventure. Monuments of archaeological importance in the distt. include a fort at Bhadarwah. Kashmiri, Dogri, Bhadarwahi, Siraji, Punjabi etc. are the languages being spoken here in different areas. The District has its own history and cultural matrix comprising people from different ethnic, religious, cultural, linguistic and social groups. The district is known for its rich mineral deposits like lead, mica, gypsum, manganese, marble, graphite copper etc. The distict is pre-dominantly rural and has agricultural and pastoral economy.

Population of the district is 409,936 (2011 Census) and having a population density of 46. About 92.03% of the population resides in rural areas and their economy mainly sustains on agriculture. The Doda District as per census 2011 consists of 406 census villages, out of which four are un-inhabited. The villages have been grouped into 17 Tehsils, 17 CD Blocks, and 237 Gram Panchayats. The average literacy rate stands at 64.68 per cent as per Census 2011. The decadal growth rate in population during 2001–11 was 28%.

The District has a population of 409,936 comprising 3.27 per cent of the total population of the State, thereby it ranks 13th among all the districts of the State. constituting of 213,641 males and 196,295. In so far as the density i.e. population per sq.km. is concerned, the district has a density of 46. Sex ratio i.e. number of females per 1,000 males is 919 which is higher when compared with the corresponding ratio of the State (889) and also that of the corresponding ratio of the district was (913) as obtained in 2001 Census. The data reveals that the net addition to district's population between 1901 and 1911 was 5,493 registering thereby decadal growth rate of 8.09 per cent. During the decade 1911-21 there was decline in the growth rate. It increased to 13.67 per cent in 1921-31 and then dip rose to 7.39 per cent in 1931-41. However the decade 1961-71 witnessed the highest growth rate at 29.49 percent. During the subsequent decade 1971-81, it again declined to 26.83 percent. The growth rates relating to decades 1981-91 and 1991-2001 were 28.40 per cent and 26.39 per cent respectively. The growth rate recorded during 2001-2011 is 28.00 which is higher as compare with the corresponding rate of the State, standing at 23.64 per cent.

The growth rate recorded during the decade 2001-2011 is 27.89 which is higher when compared with the corresponding proportion of the State (23.63 per cent). The child population in the age group 0-6 is 71,240 comprising 36,862 males and 34378 females; thereby the sex ratio in this age group works out to 933 which is higher than the corresponding ratio of the State; standing at 862. This population accounts for 17.38 per cent of the total population of the district. The number of literates is 219083 comprising 64.15 per

cent of the total population of the district (excluding population in the age group 0-6). The corresponding proportion for the State as a whole at 2001 Census is, (67.16 per cent). The proportions of male and female literates work out to 78.41 per cent and 49.69 per cent respectively.

Out of a total population of 409,936 in the district, 151,912 or 37.06 per cent are total workers (main & marginal workers), comprising 19.36.11 per cent main workers and 17.70 per cent marginal workers. Non-workers being 62.94 per cent. The participation rate relating to state as a whole is low, as only 34.47 per cent have been recorded as total workers, constituting of 21.08 per cent main workers and 13.39 per cent marginal workers. The proportion of non-workers is 65.53 per cent.

Scheduled castes and the scheduled tribes number 53408 and 39216 persons respectively, out of a total population of 409,936 in the district. In other words, while scheduled castes account for 13.03 per cent, scheduled tribes claim 9.57 per cent of the total population of the district. Interestingly, the number of females per 1000 males in respect of scheduled castes is much higher than than that of scheduled tribes, being 963 in case of the former and 925 with regard to latter. In the state, the corresponding number of females per 1,000 males relating to scheduled tribes and scheduled caste is 924 and 902 respectively.

The Primary Census Abstract which is an important publication of 2011 Census gives basic information on Area, Total Number of Households, Total Population, Scheduled Castes, Scheduled Tribes Population, Population in the age group 0-6, Literates, Main Workers and Marginal Workers classified by the four broad industrial categories, namely, (i) Cultivators, (ii) Agricultural Labourers, (iii) Household Industry Workers, and (iv) Other Workers and also Non-Workers. The characteristics of the Total Population include Scheduled Castes, Scheduled Tribes, Institutional and Houseless Population and are presented by sex and rural-urban residence. Details of the primary census is provided in Table 5.4 below;

Table 5.7: Primary Census Abstract (Census 2011) of Doda Villages in the project area

District/ CD Town Block/ Town	Particulars	Total	Male	Female
Bhela	Total No. of Housesholds	330	-	-
	Population	1657	821	836
	Child (0-6)	248	116	132
	Schedule Caste	307	140	167
	Scheduled Tribe	141	65	76
	Literates	1,060	614	446
	Total Workers	648	438	210
	Main Worker	375	330	45
	Marginal Worker	273	108	165
	Cultivators	253	94	159
	Agricultural labourers	1	1	-
Bhalara	Total No. of Households	145	-	-

District/ CD Town Block/ Town	Particulars	Total	Male	Female
	Population	708	373	335
	Child (0-6)	109	54	55
	Scheduled Caste	310	163	147
	Scheduled Tribe	-	-	-
	Literates	411	261	150
	Total Workers	414	218	196
	Main Worker	358	182	176
	Marginal Worker	56	36	20
	Cultivators	20	8	12
	Agricultural labourers	4	2	2
Daronjamani	Total No. of Households	47	-	-
	Population	287	146	141
	Child (0-6)	56	27	29
	Scheduled Caste	287	146	141
	Scheduled Tribe	-	-	-
	Literates	163	103	60
	Total Workers	150	82	68
	Main Worker	7	5	2
	Marginal Worker	143	77	66
	Cultivators	142	76	66
	Agricultural labourers	-	-	-
Pendku	Total No. of Households	49	-	-
	Population	292	139	153
	Child (0-6)	53	22	31
	Schedule Caste	227	111	116
	Scheduled Tribe	10	6	4
	Literates	179	100	79
	Total Workers	146	73	73
	Main Worker	29	24	5
	Marginal Worker	117	49	68
	Cultivators	91	25	66
	Agricultural labourers	3	1	2
Mehrada	Total No. of Households	22	-	-
	Population	107	58	49
	Child (0-6)	15	10	5
	Scheduled Caste	-	-	-
	Scheduled Tribe	-	-	-
	Literates	74	45	29
	Total Workers	62	31	31

District/ CD Town Block/ Town	Particulars	Total	Male	Female
	Main Worker	25	24	1
	Marginal Worker	37	7	30
	Cultivators	33	4	29
	Agricultural labourers	-	-	-

Source: District Census Handbook 2011, Doda

5.12. Recreation Resources

The recreational sites include Amusement Park, centre for musical & cultural activities. There is none of any recreational sites in close proximity of proposed sub-project.

5.13. Archaeological, Historical, Heritage Sites and Religious/ Cultural Sites

No ASI listed or such sites observed along the project corridor or in the project influence area. Religious/ Cultural sites are located along the project corridor/ project influence area details are provided in the Table 5.5 below;

5.14. Sensitive Environmental Receptors

The project roads are in hilly terrain and some of the sensitive environmental receptors exist along the alignment is given in Table 5.5.

Table 5.5: Sensitive Environmental Receptors in Package-4

S. No	Sensitive Feature	Location	Chainage	Alignment (RHS/LHS)[1]	Distance in meters (m) from the alignment (edge of the road)
1	Mosque	Malaini	0+100	RHS	45
2	Hand Pump	Malaini	0+000	LHS	4.5

No other sensitive features were observed along the road alignment.

[1] LHS-Left Hand Side RHS-Right Hand Side

6. POTENTIAL ENVIRONMENTAL IMPACTS

6.1. Project Impacts & Issues

This chapter presents identification and evaluation of anticipated environmental impacts during pre-construction, construction and operation phases of the project road entitled as "Improvement and Up-gradation of Chiralla Link Road and Malaini to Chakrabatti Road in District Doda. The planning of the proposed project intervention points towards the impacts in the pre-construction, construction stages and operation stages. The subsequent sections deal with the prediction of impacts due to the project on the physical, biological environment and social & cultural environment. Tables 6.2 & 6.3 below presents the potential environmental impacts expected due to the proposed improvement and up-gradation of the project road. Potential environmental impacts have been assessed and evaluated based on the information collected from the project activities as per DPR, screening & scoping of environmental attributes and baseline data collected during the EIA study.

The impact matrix for the project road is given Table 6.1 below;

Table 6.1: Impact Matrix for Project Road

S.No.	Parameters	Chiralla Link Road	Malaini–Chakrabatti Road
A.	**Negative Impacts**		
1.	Hand pumps	Nil	1
2.	Pond Area	Nil	Nil
3.	Relocation Religious Properties	Nil	Nil
4.	Transfer of Agriculture Land (ha)	Nil	Nil
5.	No's of trees to be felled	Nil	Nil
B.	**Positive Impact**		
1.	Enhancement Sites (Nos.)	2	2
2.	Cultural/Religious Properties (Nos.)	Nil	1
3.	[2]Surface Water Body (Nos.)	1	1
4.	Educational Institute (Nos.)	Nil	Nil
5.	Safe Access to Educational Institute (Nos.)	Nil	Nil

[2] River Chenab is flowing at Chirala section from Ch 0+000 to 1+350 at an average distance of 150 m from the road. Similarly, a stream/ nallah is flowing at Malaini section at Ch 0+265

6.	[3]Bus Bays (Nos.)	1	1
7.	Village Gates (Nos.)	Nil	Nil
8.	Sitting Arrangement (Nos.)	Nil	Nil
9.	[4]Trees Saving (Nos)	>12	>16
10.	Waste Reuse	Any cutting Soft/ Hard rock cutting will be utilized for the slope stabilization etc. as per approval of the PIU.	
11.	Proposed Plantation	Plantation will be carried in areas along the hillside to strengthen and stabilize slopes in critical areas. And all shrubs/ bushes and grasses which will be extracted or removed for the clearing and grubbing process will be planted immediately in hillsides especially in identified erosion prone sections of the slopes	
12.	Proposed Compensatory Plantation (if tree cutting requirement arises)	Nil	Nil
13.	Bio-stabilization (Bio-Engineering)	In identified Sections	In Identified Sections
C.	**Road Safety Measures**		
1.	Major Junction Improvement (Nos)	1	1
2.	Proposal for Rotary Junctions	Nil	Nil
3.	Intersection/Access Improvement	[5]2	1
4.	Bus Bays	1	1
5.	Pedestrian Crossing	As per IRC Guidelines	
6.	Signage Boards (Nos.)	As per IRC Guidelines	
7.	Sidewalk	Nil	Nil
8.	Traffic Calming Measures Locations	All the traffic safety measures will be implemented like valley side protection- sharp curves, blind curves, installation convex mirrors, signage, valley side plantation at critical curves etc.	
9.	Lined Drains (Length in Km)	8.485 km	3.237 Km
10.	Crash Barriers/Guard Rails (Lengths)	Yes	Yes

Anticipated environmental impacts on the physical, biological and socio-economic environment have been discussed in details in subsequent paragraphs.

[3] Proposed for both the roads of Chirala Link Road & Malaini-Chakrabatti road at Ch 0+000 (Intersection/ minor juntion).

[4] Trees along the Hill and Valley side provide stability of the slopes and protection against soil erosion etc. Hence, utmost importance is given to the vegetation preservation (trees, shrubs, herbs, grasses etc) as effective environment management for hill road improvement. Small trees, shrubs/ bushes will be planted immediately on hill/valley sides especially identified under critical slopes.

[5] Chirala Link Road: Access improvement forIntersection at Ch 0+000 & Ch 3+500

Table 6.2 : Anticipated Impacts on Physical & Biological Environment

Project Activity	Planning and De-sign Phase	Pre-construction Phase		Construction Phase					Road Operation
Environ mental com-ponent Affected		Removal of Old Structures	Removal of trees and vegetation	Earth works in-cluding and borrow area	Laying of pavement	Vehicle & Machine operation & maintenance	Asphalt & crusher plants	Sanitation & Waste (labour campus)	Vehicle operation
Air		Dust gen-eration during dismantling	Reduced buffering of air pollution, Hotter, drier microclimate along the road	Dust generation	Asphalt odour and emissions	Dust, Pollution	Soot, Odour, Gaseous Dust, Pollution	Odour / Smoke from Cooking of food	dust, vehicular emissions
Land	Impact on productive land if land acquisition required, slope stability in landslip/ erosion areas	Generation of debris	Erosion and loss of topsoil	Erosion and loss of topsoil	Land contamination due to improper disposal of bitumen waste/ solid wastes	Contamination by fuel and lubricants and compaction	Contamina-tion and compaction of soil at camp & Plants	Contamination from Wastes and sewage	--
Water	Impact on Water Sources	Siltation due to loose earth	Siltation due to loose earth	Alteration of drainage, Break-in conti-nuity of ditches Siltation, Stagnant water pools in quarries and borrow area.	Reduction of groundwater re-charge area	Contamination by fuel and lubricants	Contamina-tion by as-phalt leakage or fuel	Contamination from wastes and untreated sewage disposal	Spill Contami-nation by fuel, lubricants and washing of ve-hicles
Noise		Noise Pollution	High Noise due to machinery	Noise Pollution	Noise pollution	Noise pollution	Noise Pollution	--	Noise from traffic movement
Flora	Tree cutting		Loss of Biomass and vegetation cover due to Removal of vegetation	Lowered productivity loss of ground for vegetation	--		Lower pro-ductivity Use as fuelwood	Felling trees for fuel	Compensatory plantation and roadside plantation

Table 6.3: Anticipated Impact on Social and Cultural Environment

Project Activity	Planning and Design Phase	Pre-Construction Phase			Construction Phase					Operation	
										Direct	Indirect Induced development
Env. Component Affected	**Design decisions & Implementation policies**	**Land acquisition**	**Removal of Structures**	**Removal of trees & vegetation**	**Earth works including quarrying**	**Laying of Pavement**	**Vehicle & machine operation & maintenance**	**Asphalt and crusher plants**	**Labour Camps**	**Vehicle operation**	**-**
Agricultural land	-	Change in land prices	Change in land economic value	Loss of standing crops	Loss of productive land	-	-	Dust on agricultural land reduce n productivity	-	-	Conversion of Agricultural Land
Buildings and built structures in ROW	-	-	Loss of structures, Debris generation, Noise and Air pollution	-	Dust Deposition on structures	-	Noise, vibration may cause damage to structures near to the road	Dust accumulation on building and structure	-	Vibration and noise	Change in building use and characteristics
People and Community	Impact on nearby community structure,	-	Impact on people and loss of livelihood	Loss of shade & community tree.	Health hazard to people	Odour and dust	Noise and Air pollution and discomfort	Air and noise pollution and discomfort	Community clashes with migrant labour	Risk of an accident due to the increase in speed on the smooth carriageway	Induced pollution and increase in the accident rate
Cultural Assets	-	Impact on access to cultural structure	Displacement loss of structure from RoW	--.	--	-	--	Dust accumulation	-	Damage from vibration & air pollution	-
Utilities and Amenities	-	-	Interruption in supply	-	-	-	Damage to utility and amenities	Dust accumulation on water bodies	Pressure on existing amenities		-
Labour's Health & Safety	-	-	-	-	Stagnation of water and disease	Asphalt odour and dust	Accident and injuries to labour/public	Impact on health due to inhaling of dust	Health hazard from raw sewage disposal /wastes	Road safety issues	-

6.2. Impacts on Topography

Slope Stability

Slope forms and slope processes are important considerations in land use planning, both from the viewpoint of the environmental constraints they pose and the environmental impacts related to subsequent slope alteration. The physical landscape is an assemblage of valleys and hill slopes and the dimensions and appearance of slopes give an area its essential morphological character. Various theories have been forwarded to explain the development of slopes.

There is a direct causal relationship between the processes of soil weathering, erosion, transportation and deposition, and the form and gradient of hill slopes. The immense variety of slope form and steepness is because processes of erosion operate in varying combinations and with differing relative effectiveness in areas of different rock type, structure, climate, vegetation, relief and so on.

Landforms are the products of the local balance between weathering, erosion and deposition and are continuously evolving. Slopes that are too steep for the weathered material to remain stable are subject to periodic failure. Instability may be associated with moderate to steeply sloping terrain or with land which has been disturbed. There are many factors involved including soil type, geotechnical features (fractures), exposure to saturation, surcharge loading and vibration.

Natural slopes that have been stable years may suddenly fail because of construction activities on hill slopes, which may bring about (a) changes in the sloping topography; (b) changes in the groundwater conditions; (c) loss of cohesive strength of soil; (d) Stress changes in the soil underlying the slope; and (e) acceleration of the rate of weathering of rock.

Cut and fill activities change the slope topography and release residual horizontal stresses allowing expansion of the slope. Joints or weak zones may be exposed along which sliding may occur. Overcutting of the toe or over steepening of the slope gradient to create a platform can also induce instability. Placement of surcharge loads, in the form of fill material or heavy machinery, over the slope may also lead to an increase in shear stresses acting on the slope which may lead to slope failure. Stockpiled, or fill material, may also fail if it is not properly designed and constructed to stringent requirements.

The up-gradation of the existing road surface and sub-surface drainage patterns on the existing terrain may be altered as a result of the construction activities on hill slopes. The change in groundwater flow patterns may cause detrimental changes to the stability of the newly constructed slope or the existing in-situ slopes that were stable before construction works.

According to H.R. Thomas (2002), the following are the seven main factors contributing to slope failure:

i. Overloading slope (weight of building or road);
ii. Increase fill on slope without adequate drainage;
iii. Removal of vegetation;
iv. Increase of slope angle;
v. Increase of slope length by cutting at the bottom of the slopes;
vi. Changes in surface drainage routes; and
vii. Changes in sub-surface drainage routes.

Table 6.4: Details of Identified Critical Erosion/ Landslide Prone sections of Chiralla Link Road and Malaini to Chakrabatti Road in Disitrct Doda.

S. No.	Chainage	Location	Identified Critical Erosion /Landslide Prone sections		Hill / Valley side
			LHS	RHS	
A.	Chiralla Link Road				
1	1+000	Chiralla		Slide area	Hillside
2	1+100	Chiralla		Slide area	
3	1+600	Chiralla		Erosion	Hillside
4	1+750	Chiralla		Slide area	Hillside
5	1+800	Chiralla		Slide area	Hillside
6	2+000	Chiralla	Erosion		Hillside
7	2+250			Slide area/Gully Formation	
8	2+400	Bhella		Erosion area	Valleyside
9	4+300	Bhella		Erosion area	Hillside
10	4+500	Bhella		Erosion area	Hillside
11	4+700	Bhella		Erosion area	Hillside
12	5+000	Bhella	Erosion area		Hillside/Valleyside
13	5+100	Bhella		Erosion area	Hillside
14	5+600	Bhella		Slide area/ Erosion area	Hillside
15	6+000	Bhella		Slide area	Hillside
16	6+500	Bhella		Erosion area	Hillside
17	6+800	Bhella		Erosion area	Hillside
18	7+200	Bhalara		Erosion area	Hillside
19	7+400	Bhalara		Erosion area	Hillside
20	9+000-9+200	Bhalara		Erosion area	Hillside
B.	Malaini to Chakrabatti Road				
1	1+000	Malaini	Erosion area		Hillside
2	1+100	Malaini	Slide area		Hillside
3	1+500	Malaini	Slide area		Hillside
4	1+700	Malaini	Erosion area		Hillside
5	2+000	Jahnana	Erosion area	Erosion area	Hillside/ Valleyside
6	2+400	Jahnana	Slide area		Hillside

7	2+600	Jahnana		Slide area	Hillside
8	3+200	Jahnana		Erosion area	Hillside
9	4+500	Jahnana	Slide/ Erosion area	Erosion area	Hillside
10	5+000-5+200	Dranga	Erosion area	Erosion area	Hillside
11	7+200	Dranga		Erosion area	
12	7+800	Dranga		Erosion area	
13	8+500	Drodhu		Erosion area	

Annotation:

LHS	
RHS	

Construction Phase

The proposed up-gradation of proposed roads will be confined within the existing ROW with improved protective measures on both hillside and valley side protection by the provision of effective slope stabilization measures like breast walls, retaining walls proper hillside drainage, hillside/ valley side plantation measures. The overall topography of the area is not going to alter for improvement in road profile.

During construction of the project, the following environmental impacts are anticipated on topography, physiography and geology:

- disfiguration and change are anticipated in the existing profile of the land due to borrowing pits.
- minor disturbance on geological setting due to stone quarrying.
- digging of borrow pits resulting.
- construction of embankments,
- debris disposal,
- construction of diversions roads for construction of bridges and culverts.

Retaining existing vegetation cover- As far as possible, the existing vegetation cover should be retained as a filter along contours to reduce runoff velocity and capture sediment before it reaches the watercourse.

Protection of cut and fill slopes- Cut and fill slopes should be protected with retention structures or vegetation as soon as possible to minimise erosion of exposed material. The programme of protecting cut and fill slopes as contained in the ESCP should be examined and assessed for its effectiveness and practicality.

Physiographic impacts could be due to the improvements of the embankments of the project road. The height and width of the embankment will be altered, when the road is widened and rehabilitated as per the new design for the project road.

In most of the stretch along the project road, the project will stick to the existing ROW.

Borrow earth will be required in the project road for filling and will be obtained from several borrow areas to be opened or from the existing approved borrowing areas. Except for the construction of embankments, there would not be any other impacts to the geomorphology of the area during the construction stage.

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Most of the excavated materials from existing roads derived from the clay/loam formation will be left un-utilised due to poor quality as construction materials. If not careful, the contractor may dispose of this in the nearby areas causing untidiness near disposal areas. Therefore, this is seen as a potential impact. It may increase soil erosion and could cause considerable impacts on natural drainage courses, and siltation to runoff during rains.

Likely impact on the geological resources will occur from the extraction of construction materials like borrow of earth, granular sub-base and aggregates for base courses, culverts bridges.

Operational Phase

Improvement and Up-gradation of the subproject roads will not cause any topographic, physiographic and geological changes during operational stage.

6.3. Impact on Seismological Characteristics

The project road is located in seismic Zone V as per BIS classification. All cross-drainage structures on the project roads need to consider the seismic coefficients with regards to the seismic energy propagation along the fragile geological/lithological strata.

The construction and operation phase of the project road are not expected to add the seismicity issues due to the project road.

6.4. Impact on Soil

Construction Phase

Soil Erosion: Erosion of top-soil can be considered a moderate, direct and long-term negative impact resulting from the construction of the road. The potential for soil erosion is pervasive during the construction stage. Starting with clearing and grubbing, vegetation will be stripped away, exposing raw soil. Earthworks and embankment will also prone to erosion during rains.

Road Slopes and Spoils: Erosion problems may occur on newly constructed slopes and earth fills depending on soil type, angle of slope, the height of slope and climatic factors like the wind (direction, speed and frequency) and rain (intensity and duration). Soil erosion will add siltation to the runoff during the monsoon season.

During the construction period, some amount of drainage alteration and downstream erosion/siltation is anticipated. Some of these alterations maybe because of the construction of temporary traffic detours/diversion. Except for these temporary works, in almost all cases there should be an improvement in the drainage characteristics of the surrounding area due to improved design and added culvert/ditch capacity. Changes in the drainage pattern due to the

raising of the road profile have not been discussed in specific cases, as the likely impact will not adverse and does not warrant mitigation as the road design itself takes care of cross drainage.

Quarries and Borrow Areas: The excavation of quarries and borrow pits used for obtaining aggregate materials and soil for road construction can cause direct, and indirect long-term major adverse impacts on the environment. While the loss of productive soil is the most direct negative impact from borrow areas, other significant indirect negative impacts can also occur. Since most of the construction materials would be available from existing quarries nearby, relatively few new borrow areas may be required. One of the long-term residual adverse impacts of borrow pits not reclaimed, is the spread of mosquitos. Mosquitoes breeding and multiplying in stagnant water that collects in these pits can affect human health in villages in close vicinity.

Generation of Debris: The major source of debris generation is dismantling of existing cross drainage structures, scarifying of bitumen from carriageway and removal of existing road for up-gradation.

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

- Scarified bitumen wastes,
- Debris generation due to dismantling of structures,
- Runoff from muck disposal area,
- Maintenance of the machinery and operation of the diesel generator sets on site,
- Oil spill from the operation of the construction machinery, maintenance and diesel storage and diesel generator sets,
- Spillage from Operation of hot mix plant,
- Wastes from the residential facilities for the labour and officers, and
- Storage and stockyards of bitumen

Operation Phase

No significant impact is anticipated on the soil along the road during the operational phase.

6.5. Impact on Water Environment

6.5.1. Water Resource - Impacts

A. Surface Water -Impacts

River Chenab is flowing along the Chiralla road section from Ch 0+000 to 1+350 at average distance of 145 m. A minor stream/ nallah is also crossing Malaini road section at Ch 0+365. No potential impact is anticipated on surface water bodies during the pre-construction phase.

Construction Phase

Estimated water requirement will be 20 to 30 kl per day per kilometre. Depending on the source of water there could be minor depletion of water sources due to the construction water requirements.

Operation Phase

During operation phase, impact is anticipated on surface water resources as covered/ line drains storm water will be discharge into outfall channel. Silt traps/ screening will be developed in order to arrest the silt/sediments directly into the water bodies.

B. Ground Water - Impacts

Construction Phase

Along the project road, groundwater resources are available and groundwater will be exploited through mostly from tube wells, where surface water sources are not available. Therefore, the eventual impact of the proposed improvement of roads will be negated to a considerable extent.

Operation Phase

During the operation phase, the groundwater resource will not be affected significantly. Therefore, no significant impact is anticipated during the operation phase. However, rainwater harvesting will be provided along the project road in unpopulated areas.

6.5.2. Water Resource - Impacts

A. Impact on Surface Water Quality

Degradation of surface water quality due to sediment transport with runoff through erosion of soil and earth may occur from activities like removal of trees, clearing and grubbing, removal of grass cover, excavation, stockpiling of materials as part of the pre-construction and construction activities. The soil type present along the project corridor consists of the loam soil, which is prone to erosion. The impacts due to increased sediment-laden run-off will make the water more turbid. This is a significant negative impact on the water bodies/flowing streams. Heavier sediment may smother the algae growing in the lower strata and could completely alter the nature of the watercourse. Excessive sediment loads may also mean disruption to areas of fish breeding/aquatic life.

Contamination of Surface Water- The degradation of the surface water is expected as River Chanab is flowing along the road near valley side from Ch 0+000 to Ch 1+350 and a minor stream/ nallah crossing Malaini road section at Ch 0+365 to a much less extent groundwater quality can occur from pavement construction works, cross drainage construction works, construction plants, machinery and accommodations of workers. The sources of water pollution from the construction activities are as follows;

- Water flows from scarified bitumen materials,
- Rainwater flows from muck disposal area,

- From the foundation works of the bridges and culverts such as piling and excavation for open/well foundations,
- Oil spills from the maintenance of the machinery and operation of the diesel generator sets on site,
- Oil spill from diesel storage and parking places,
- Operation of the emulsion sprayer and laying of hot mix,
- Discharge of sewage and waste from labour and plants,
- Storage and stockyards of bitumen and emulsion.

Degradation of water quality is also possible due to accidental discharges into water-courses from the drainage of workers camps and spillages from vehicle parking and/or fuel and lubricant storage areas.

Operation Phase

During the normal operation phase, no impact is anticipated on the surface water quality.

B. Impact on Groundwater Quality

No impact is anticipated on groundwater during the pre-construction phase.

Construction Phase

- During the construction phase, groundwater quality can be affected due to the following reason:
- Spillage of diesel, lube oil and used oil could lead to groundwater pollution in the long term and can affect groundwater quality.
- Leached water from scarified bituminous waste materials entering into the ground.
- Disposal of solid wastes used POL wastes, oil contained cotton wastes in non-environmentally sound manner and leaching to groundwater.

Operational Phase

During the normal operation phase, no impact is anticipated on the groundwater quality of the area.

C. Floods Related Impacts

Pre-construction phase impacts

Pre-construction activities such as tree removal and clearing and grubbing will not lead to any flood-related impacts.

Construction Phase

During the construction phase, the project activities are unlikely to create localized flood-related issues. Nevertheless, various construction activities could temporarily worsen the flooding

problem due to improper drainage conditions on account of the contractor's poor engineering practices and negligence. If the high-intensity rainfall continues for many days several sections along the project road could develop flooding situation.

Operation Phase

During the operation phase, flood-related impacts would not be appeared as culverts and cross drainage structures will be reconstructed, widened or newly constructed to maintain proper drainage. Therefore, no flood-related impact is anticipated during the operation phase.

6.6. Impact on Air Environment

Construction Phase

During the construction phase, there will be two main sources of air emissions *i.e.* mobile sources and fixed sources. Mobile sources are mostly vehicles involve in construction activities while emissions from fixed sources include diesel generator set, construction equipment and excavation/grading activities those produce dust and gaseous emissions.

A certain amount of dust and gaseous emissions will be generated during the construction phase from the excavation machine and road construction machines. Pollutants of primary concern include Particulate Matter ($PM_{2.5}$) and Particulate Matter (PM_{10}). However, suspended dust particles may be coarse and will be settled within a short distance of construction area. Therefore, the impact will be temporary and restricted within the closed vicinity of the construction activities along the project road only.

A considerable amount of emissions of carbon monoxide (CO), unburned hydrocarbon, sulfur dioxide, particulate matters, nitrogen di-oxides (NO_2), etc, will be generated from the hot mix plant may cause air pollution problem in nearby areas.

Summarily, generation of dust is likely due to:

- Site clearance and use of construction vehicles and machinery, etc.
- Transport of raw materials, borrow and quarry materials to construction sites,
- Earthworks,
- Stone crushing operations at the crushers,
- Handling and storage of aggregates at the asphalt plants,
- Concrete batching plants, and
- Asphalt mixing plants due to mixing of aggregates with bitumen.

Generation of dust is a critical issue and is likely to have an adverse impact on the health of workers and vegetation in surrounding areas. Generation of exhaust gases is likely due to movement of heavy machinery for clearance of the RoW for construction. The high concentration of Hydrocarbons (HC) and Nitrogen Dioxide (NO_2) are likely from hot mix plant operations. Toxic gases are released through the heating process during bitumen production. Although the impact will be much localized, it can be dispersed downwind depending on the wind speeds.

Operational Phase

During the operational phase, the congestion will be relieved to an optimum level on the project roads. Widening and improvement along the project road could result in improved surface condition and traffic capacity. During the operation phase, vehicular emission will be emitted from the vehicular movement on the roads.

6.7. Impact on Noise Environment

Construction Phase

Highway traffic noise is a complex phenomenon because its intensity and characteristics vary with time depending upon the frequency as well as the type of vehicles on the road. The impacts of noise due to the proposed project road will be of temporary and its significance locally during the construction phase. Within construction sites, the main source of noise is semi-mobile and mobile machinery conducting the construction activities. These include excavators, loaders, bulldozers, piling machine and cranes, dump trucks, and graders. These machinery and vehicles operate within the construction site and along the access road. Most of the noise from these sources is inherent and difficult to subdue.

The source of noise pollution and the impact categorization is presented in **Table 6.9** below;

Table 6.5: Source of Noise Pollution and Impact Categorization.

S. No.	Phase	Source of Noise pollution	Impact categorization
1.	Pre-construction	• Man, material & machinery movements • establishment of labour camps, onsite offices, stockyards and construction plants	• all activities will last for a short duration and also shall be localized in nature
2.	Construction Phase	• **Plant Site** - stone crushing, asphalt production plant and batching plants, diesel generators etc • **Work zones** - Construction-related machinery - Community residing near to the work zones	• **Plant Site:** Impact will be significant within 250m. • **Work zones**: Such impacts again will be temporary as the construction site will go on changing with the progress of the works.

Construction - Related Noise

With regards to noise-related impacts, the construction phase is a difficult stage. During this period noise impacts will be high due to the operation of construction machinery and the conflict

with the regular traffic requiring more honking of vehicle horns and more stop and go (acceleration and deceleration process).

All temporary noise-related impacts in the immediate vicinity of the project roads will occur during the construction activities. This will occur along the construction zones as well as construction camps, hot mix plants, WMM plants, crusher and quarry sites (if required).

Typical noise levels associated with highway construction is given in **Table 6.10** below. The magnitude of the impact will depend upon the specific types of equipment to be used, the construction methods employed and the scheduling of the work.

Table 6.6: Typical Noise Levels Associated with Highway Construction

Sn.	Activity Noise Levels	(d(B)A)
1.	Grading & Clearing	84
2.	Excavation	89
3.	Foundations	88
4.	Finishing of Road	84

As the operation of the construction machinery and equipment will result in elevated noise levels, monitoring of noise pollution in relation to the surrounding communities will be conducted during the pre-construction, construction and operation phases of the project. This will comprise judgement of noise level from different equipment used in relation to the distances from the site obtained from published literature, as shown in **Table 6.11** below;

Table 6.7: Example of Typical Noise Level from Construction Machinery

S. No.	Type of Equipment	Typical noise Level at 30 metres (dBA)
1	Scrapper at full load	83 – 92
2	Dozers ripping	80 – 90
3	Loaders (100 – 200 kW)	77 – 80
4	Cranes (small mobile)	74 – 77
5	Dump trucks	65 – 82
6	Diesel generator sets (250 kVA)	74 – 81
7	Welding Sets	69 – 75
8	Concrete trucks	69 – 78
9	Pile driver (air hammer)	80 – 101
10	Chipping hammer on steel	63 – 81
11	Grinder	63 – 68
12	Air compressor	65 – 67

Source: World Health Organization

Operational Noise

During the operation phase, noise levels will be reduced due to the smooth flow of traffic on reconstructed/upgraded road. However, traffic will be increased on the road in due course of time and subsequently, noise levels are expected to increase.

6.8. Impact on Biological Environment

6.8.1. Anticipated Impacts

The roads under Package-4 are proposed to be upgraded within the existing ROW's in both Chiralla Link Road and Malaini to Chakrabatti Road. The project roads does not pass through protected forest/reserved forest, however the existing road is passing through a open scrub/ mixed (Pine) forest at different sections Chiralla. Existing road has vegetation on both Hillside as well as Valley side and is dominated by common trees, shrubs and grass species. Number of fruit trees like Pears, Apples, etc are grown in the villages of the project roads. Paddy fields (terraced form) and vegetable cultivation is also observed oin the project area.

As per the design criteria, no tree cutting is envisaged as the road improvement and up-gradation is within the existing RoW/ alignment, however, the resultant pressure on flora and fauna could be the potential impact during pre-construction/construction.

Bio-stabilization process will be carried at all sections where stability/ erosion/ landslip areas exist. Hillside gullies will also be planted with the shrubs/ bushes to check the erosion and flow pattern of drainage. The shrubs/ bushes, grass species, and saplings/ small trees will be replanted immediately during clearing/ grubbing in erosion prones sections of the project roads especialy in weak slopes/ erosion/slide prone areas.

The major adverse impacts on the flora & fauna and the indicators are presented in **Table 6.12** below;

Table 6.8: Impacts Due To Construction and Indicators

Impacts Due To Construction	Indicators
Tree felling	No. of trees to be felled
Vegetation	Area of vegetation loss

F*orest Area*

The project roads located in Doda District of Jammu region. The Chiralla Link Road and Malaini to Chakrabatti Roadare existing roads and falls in hilly terrain in District Doda. The proposed project road of Chiralla link Road is traversing through forest area of Mixed-Open-Scrub Forest Type with Pine trees observed in some sections of the road and mainly open scrub forest. The proposed roads are existing roads and are under Public Works (Roads & Building) Department.

Wildlife

There is no wildlife sanctuary, national park or bio reserve along the project roads. Therefore, no impact is anticipated on wildlife due to the improvement and up-gradation of the project roads. During site survey/ assessment, no wildlife animal was observed or recorded.

Tree Cutting

Trees growing within the proposed toe line (bottom of formation) will need to be removed for up-gradation of the project road. However, no trees are coming within the road alignment. Most of the trees which were close to the RoW were saved and avoided for cutting.

There will be a significant, direct impact due to cutting of the roadside trees, it includes:

- The loss of shade.
- Loss of tree products.
- Loss of birds nesting place.
- Removal of roadside trees will also reduce comfort levels for slow-moving traffic and pedestrians.
- The removal of trees would lead to erosion and contributes to the loss of the micro-ecosystems developed on the roadside.
- Besides these trees act as a noise barrier, dust absorption, pollutant sequester, etc.

Removal of Vegetation

Clearing and grubbing is the foremost requirement to start the construction activities of the project roads. The impact due to removal of vegetation includes:

- Dust generation during the windy atmosphere.
- Loss of productive topsoil.
- Soil erosion during the rainy season may lead to water contamination.
- Removal of vegetation without proper guidance may possess the risk of slope stability

Measures have been taken in reducing and curtailing the clearing and grubbing of excess land. However, during clearing and grubbing process most the shrubs and grasses will be replanted immediately in sections identified for slope stabilization/ bio-engineering process..

6.9. Impact of Dust on the Vegetation Growth

During the construction activities, dust will be emitted and deposited on the leaves of vegetation/crops along the project roads. Dust deposition on the leaves will affect the photosynthesis process and subsequently hamper the growth of the plants.

6.10. Impact on Socio-Economic Environment

Construction and operation phases of the project road will have some beneficial impact on the social environment. Some increase in income of local people is expected as some local unskilled, semiskilled and skilled persons will gain direct or indirect employment during the construction phase. Since the immigration of workforce during the construction phase is likely to be very small, the social impacts on literacy, health care, transport facilities and cultural aspect are expected to be insignificant.

The impacts of the construction of the project road on the socio-economic environment are systematically discussed under the following categories:

- Influx of construction workers,
- Economic impacts,
- Relocation of community structures within the proposed ROW.

The influx of Construction Workers

Although the construction contractors are likely to use un-skilled labour drawn from local communities, use of specialized road construction equipment will require trained personnel not likely to be found locally. Sudden and relatively short-lived influxes of construction workers to communities along the project will have the potential to 'skew' certain demographic variables and the traditional social coherence.

It is anticipated that the construction labour inputs for the construction of the project road will be in the order of about 100 to 120 persons per day. However, this number will fluctuate and the number in any particular activities will be lower.

Economic Impacts

The relatively short-lived economic impacts of the construction phase are likely to be experienced in local communities for the duration of construction, as workers will make everyday purchases from local traders. This is likely to give a short-lived stimulus to these traders that will disappear as soon as the construction is complete. Wider, flow-on economic impacts will be experienced in other sectors of the economy as a result of the purchase of construction materials and the payment of wages and salaries.

6.11. Impact on Religious Structures and Cultural Properties

Mosque is located in Malaini section at Ch 0+100 (RHS and 35 m away from the road) is located in Malaini Chakrabatti road. Hence, no impact is envisaged on the religious structures and cultural properties.

Common Property Resources

In Malaini road section, a Mosque at Ch 0+100 and Hand Pump at Ch 0+000 were recorded. No other such property resources are not located in a project corriodor, hence impact cannot be anitcipated.

Adverse socio-economic impacts include all disruptions on the social and economic interactions of communities due to the road project. This involves an effect on both the adjacent communities (mostly direct) as well as the nearby communities (mostly indirect).

6.12. Impacts Relating To Human Health & Safety

Poor sanitation arrangement and improper methods used for collection and disposal of solid wastes and effluent, accommodation without ventilation, unhygienic food, electrical safety, the risk from mosquito and reptile etc at the construction workers camp will impact human health and safety.

6.13. Road Safety Aspects

The topographic features of the project area are rugged hilly terrain roads and damaged road surface, cross drainage structures etc, which counter a number of accidents, resulting in a number of deaths and serious injuries as reported in every year in a district. Most of these accidents are reported to have occurred by skidding off or rolling down the road. It can be ascribed to the poor geometry of the hilly roads while negotiating sharp curves and bends without adequate signage. Increase of incidence of accidents is anticipated due to disruptions of traffics movements on the road in construction work zones on the project road.

Construction phase

Safety for workers at the work site and health problems at Labour camps

- Occupational health and safety risks to workers due to inadequate housekeeping and unsafe work practices at work sites.
- Health problems to workers due to inadequate sanitation and un-healthy environment at labour camps/plant sites.

Operation phase

During the operation phase, road safety will be improved with better safety aspects of the road will be in a place like improved riding surface, better road furniture especially at sharp curves, improved geometrics, hillside and valley side protection.

7. ANALYSIS OF ALTERNATIVES

This chapter presents a comparative analysis of alternatives considered to avoid or minimize impacts that would be inevitable if technically (based on design speed and geometrics) best-fit alignment is followed. Cross-sections adopted for the improvement and up-gradation component as presented in Chapter 3 are flexible in design to avoid most of the impacts within RoW. An analysis of various alternatives is attempted to arrive at the technically and environmentally best-fit alternative.

The analysis of alternative is a documented illustration/evidence to show and ensure that final decisions taken are;

- Following the project objectives.
- In compliance with the country laws, policies and legal requirements.
- To confirm that the project is actually needed and not imposed and not to lead any major loss or destruction to natural resources either directly or indirectly.
- To confirm that the implementation of the project will not lead to any major crisis or conflict in the community during implementation.
- To confirm that the Public/Government financial resources are not wasted for wrong projects/infrastructural works without the consideration of views of the stakeholders.
- To confirm that no individual and biased approach (for example implementation of a personal ambition using public money in a secretive manner) from the responsible implementing official/s has taken place.
- By the actual requirements of the local people.
- Following the World Bank policies and procedures.
- To create climate-resilient and flood-proof road infrastructure.

These were also an integral part of the analysis of alternatives throughout the project preparation. Debris disposal is one of the most important construction stage issues identified in the project. There are few settlements, as seen in the baseline environmental scenario along the project road, where there is narrow RoW and sometimes traffic is leading to congestion as well as various environmental impacts. Several alternatives are analyzed for avoiding localized environmental impacts & arriving at the best-fit alignment.

At places geometry along the project road is poor. Therefore, for up-gradation of the project roads under Package-4 (Chiralla Link road and Malainito Chakrabatti road), alternative analysis has been carried out for improvement of geometry.

7.1. With or Without Project Scenario

The ‘with’ and ‘without’ project scenarios are analyzed concerning the development of the state by the back-drop of the requirement of reliable quality infrastructure for sustained growth economy and consequent well-being of local people.

The cognizant decision to stick to the existing alignment of the project roads and its connectivity with the different village settlements/ main roads while undertaking the proposed improvement and up-gradation work. To reduce damages to roadside vegetation and to avoid any land acquisition/dislocation of people and properties, the option of semi-concentric and eccentric widening was exercised all along the alignment. This option will also include the enhanced protective measures by way of slope stabilization and effective erosion & landslide measures and provision of both longitudinal and cross drainage. Analysis of alternatives has been carried out for scenarios "with or without the project" on the existing alignment.

Providing better connectivity will ensure that goods and people from areas covered by the road can move in and out of the areas quicker and save time. Increased trade and commerce activity are expected. By improvement and up-gradation of the project road, climate-resilient and flood-proof road infrastructure. The existing project road has been designed with the better road surface, protective measures and roads safety to connect the various settlements safely with the improved and restored road network.

If the project is not implemented, there is every likelihood that the project road will deteriorate further and impacted by the flood. There is every likelihood of deterioration of the existing pavements. In the absence of the project, the J&K Govt may find it difficult to generate resources for such an improvement of the road infrastructure. Increased air pollution, due to slow-moving traffic and congestion, will follow. Noise levels will rise due to the deterioration of the pavement as well as increased honking.

Therefore, the "with" project scenario, with its minor adverse impacts would be reduced considerably if the EMP were fully implemented and is more acceptable than the "without" project scenario which would mean an aggravation of the existing problems. A potential benefit of the proposed road improvement is substantial and far-reaching both in terms of the geographical spread and time. Hence, it is clear that the implementation of the project will have a definite advantage to the area in order to create climate-resilient, hill road slope stabilization measures and flood resilient infrastructure.

8. PUBLIC CONSULTATION AND DISCLOSURE

8.1. Introduction

The public consultation was conducted for the proposed road up-gradation of Chiralla Link Road and Malaini to Chakrabatti Roadunder Package-4 in Doda District. Consultation has been followed by the World Bank's ESMF-JTFRP protocol which is the pre-requisite for the environmental screening process and environmental assessment. The purpose and objective of this consultation is the involvement of residents/ stakeholders and to make them cognizant about the proposed road improvement and up-gradation activity of the subproject. In July 2019, the local community of the subproject road were consulted and participated based on the procedural guidelines of reaching public required for the preliminary baseline characteristics of environmental and social screening. A reconnaissance survey was also conducted in Chiralla Link Road and Malaini Chakrabatti Road which was required to collect baseline information. Formal and informal consultations were undertaken with the project stakeholders to take the views and propositions about the project activities.

The following section highlights the level of consultative procedure adopted at various stages, strategies to participatory and continued consultation and specific inputs from the stakeholder's consultation in project planning.

8.2. Identification of Stakeholders

Consultations were conducted with both primary and secondary stakeholders in the project area. The primary stakeholders consulted are usually (i) Roadside community having their temporary or permanent residences (ii) Roadside shop owners/vendors and (iii) Road users (iv) Community Leaders. While the secondary stakeholders are mostly the project officials, Village representatives and social activists

Table 8.1: Identification of Stakeholders

1	Primary Stakeholders (Main stakeholders)	• Potential PAPs, stakeholders and Community leaders
2	Secondary Stakeholders (Other Stakeholders)	• Groups of affected persons; • Village representatives- like Sarpanch and members, PRI's, Village Level health workers, Patwaris • Local voluntary organizations like NGOs etc • Field level Engineers, Asst Engineers, Junior Engineers), PIU/ PWD (R&B, Government of J&K. • Other project stakeholders such as official of line Department

8.3. Consultations with Stakeholders

Consultation with the local communities of each road was carried out to inform and educate the Project-Affected-People (PAP's) and other stakeholders about the proposed action before the finalization of design to include their inputs. A consultation was also carried out to identify the problems associated with the proposed project and the needs and values of the population likely to be impacted by the project. Locations are selected which represent the predominant land uses of the project area and also included all sections of people in the project region from agricultural labourers to landowners and shop keepers. In each of these consultations, the villagers were briefed about the project (the RoW width, the length of the alignment, the locations where it would be crossing etc) and the potential benefits of the project.

The various forms of public consultations (consultation through adhoc discussions on site-along project corridor) have been used to discuss the sub-project and involve the community in planning the design and mitigation measures.

8.4. Objectives of Consultations

The process of public participation/consultations was taken up as an integral part of the sub-project in accordance with the World Bank guidelines and the following objectives:

- To educate the general public, especially potentially impacted or benefited communities/individuals and stakeholders about the proposed sub-project activities;
- To familiarize the people with technical and environmental issues of sub-project for better understanding;
- Dissemination of information to local communities through the public consultation by briefing the project including its benefits.
- Informal by group consultations in the sub-project vicinity at field level.
- The environmental concerns and suggestions made by the participants were listed out, discussed and suggestions were accordingly incorporated in the EMP.

8.5. Issues Discussed during Public Consultation

The issues discussed during public consultation for the proposed roads of Chiralla Link Road and Malaini to Chakrabatti Road" under Package-4 is given below:

- About proposed sub-project, source of assistance and its implementation/execution etc.
- Information on perceived benefits from the proposed road project including travel time, fuel cost, noise and air pollution.
- Information of the impacts from the proposed road project during construction stage in terms of inconvenience to the public, air and noise pollution, etc. The occurrence of a disaster like floods and cloud bursting in past.
- Whether construction activities will cause any type of health hazard or not?

- Discussions among the public for sharing of information related to the proposed road projects, environment policy of World Bank, direct and indirect impacts of improvement/construction work on the environment.
- Presence of any historical or cultural monuments near the project area and any impact is seen due to the proposed road project?
- Any impact on trees and protective measures to be taken for the safeguarding of trees especially in sensitive slopes.
- Implementation of road safety measures at curves, erosion-prone areas, etc.
- Any possible problems to be faced by the local people in their daily activities due to the proposed road project construction work.

8.6. Outcome and Feedback received from the Public Consultation

In the consultation process about proposed sub-project, local people, students, business, farmers, expressed their keen interest. People, in general, were very enthusiastic about the benefits of the sub-project. The major problems faced by concerned people are related to road damaged in flood, dilapidated conditions of the road and rough riding surface, lack of efficient longitudinal drainage system etc. People are ready to extend all supports during the execution of the sub-project. The valuable feedback received from the consultation conducted in project influence area with the residents are summarized below;

- Stabilization of th slopes at critical slide/ erosion prone section of the road.
- Geometric correction/ alignment of road surface should be followed strictly as per design protocol. As it was seen in most the roads here when macadamized tend to retain rainwater as smooth depression which leads to the formation of potholes etc.
- Constructional materials should not be stored to occupy road stretches and should be dump as per daily requirement. It should be managed in such a way that spillover of material or excess leftover fine earth may not occur which leads to fugitive generation while plying of the traffic and by the action of the wind.
- To maintain the good life of the hill road, efficient longitudinal surface drainage along roads on the hillside where the road surface is prone to waterlogging from the episodes of the rain and small brooks flowing from the hillside should be considered.
- Construction material should be transported during day times only.
- Noise generating activities should be scheduled only during working hours (Day time).
- Proper dust suppression measures by way of sprinkling water must be put in place during the construction phase.
- Construction zone must be properly barricaded to avoid interference of project activity with the day normal traffic flow and other business works.
- Proper and timely disposal of construction wastes shall be ensured.
- Local people must be preferred for employment in the project activity.
- PIU shall ensure that the requisite environmental management measures shall be incorporated in EMP and public consultation shall be a regular process during all stages of the sub-project execution to solve any issues arising out of proposed works.

9. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

9.1. Introduction

Environmental Management Plan has been prepared which mainly centred on the understanding of the interactions between the environmental setting and the project activities and the assessment of the likely impacts. Mitigation measures for anticipated environmental impacts have been elaborated as specific actions which would have to be implemented during the project implementation. The EMP would help the contractors/PIU to implement the project in an environmentally sustainable manner and where contractors, understand the potential environmental impacts arising from the project roads and take appropriate actions/ mitigation measures to properly mitigate/manage such environmental impacts. EMP can thus be considered to be an overview document for contractors that will guide environment management of all anticipated impacts of proposed road subproject of "Improvement and Upgradation of Chiralla Link Road and Malaini Chakrabatti Road in District Doda in Jammu Region. The proposed subproject road is having a combined total length of 20.198 km. This EMP may also be considered as flexible and will be further developed by the Contractor in the Contractor's Environment Management Plan.

9.2. Proposed Works of Road Subprojects under Package-4

The proposed components of subproject road includes Improvement and Upgradation of Chiralla Link Road (Length 10.139 km) and Malaini to Chakrabatti Road (Length 10.059 km) in District Doda.

The main road works under the Package-4 include; Earthworks, Pavement Works, Protection Works/ Slope Stabilization (breast wall, retaining walls, slope planatation etc), Drainage, Culverts, Traffic Signs, Marking and Appurtenances and other ancillary works.

9.3. Outline of EMP and its Implementation Strategy

The EMP is a guiding tool which discusses the potential environmental impacts and specific mitigation/management measures for the proposed roads under Package-4 in District Doda. It refers to the responsibilities ensuring commitment for implementation and means of verifying/ supervision whether the same has been implemented properly. The timing and frequency of monitoring along with the supervision responsibility and reporting requirements are also provided in the Environmental Management Plan. As a part of the EMP, the contractors will commit to the identification of the environmental and, social impacts at the individual sub-project sites. In case of any future changes in the sub-project design, the EMP will need to be updated to reflect the new scope of the activities. Such revisions will be finalized in consultation with the World Bank.

The PIU will be responsible to ensure implementation of EMP for the performance of all by the contractors with the overall accountability resting with the JTFRP-PMU. Whereas, the TAQAC will ensure periodic quality audit/ guidance to the PIU and by imparting regular training, monitoring,

and ensuring that all EMP provisions and requirements are translated into contract documents and that these requirements are implemented to their full intent and extent.

Overall responsibility will be of Contractor for effective implementation of EMP and adherence to all the mitigation measures as outlined in this EMP associated with their respective activities. The Contractor will be required to comply with the provisions of the EMP.

9.4. Environmental Management Plan

The Environmental Management Plan (EMP) will guide the environmentally-sound construction of the road subprojects under Package-4 namely, “Improvement and Upgradation of Chiralla Link Road and Malaini to Chakrabatti Road in District Doda. Environmental Management Plan will ensure efficient lines of communication/ coordination between the PIU, Contractor, PMU and TAQAC. The EMP has been prepared for three stages of road subproject construction activities as (i) Pre-construction Stage; (ii) Construction Stage; and (iii) Demobilization Stage. EMP for above road subprojects under Package-4 have been prepared and presented in **Table 9.1.** Various guidelines, checklists, strip mapping plan and reporting formats for implementation of EMP are given as Annexures at the end of the EIA Report.

The purpose of the EMP is to ensure that the activities are undertaken in a responsible non-detrimental manner with the objectives of: (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on-site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impacts of the subproject; and (iv) ensure that safety recommendations are complied with.

Budgetary provisions for the implementation of EMP shall be integrated with part of the bid/construction contract in the form of technical specifications and environmental performance requirements. The costs to be incurred on implementation of EMP shall be incidental to the civil works and therefore, no separate environment budget/cost will be provided to the contractor for implementation of EMP. The contractor will ensure effective implementation of EMP during pre-construction, construction and demobilization/ operation stages. EMP for operation stage will be implemented by PIU/PMU.

The Contractor is deemed not to have complied with the EMP if; i), within the boundaries of the project site/ ancillary sites, site extensions and haul/ access roads there is evidence of a contravention of clauses if environmental damage ensues due to negligence, the contractor fails to comply with corrective action measures or other instructions issued by the PIU / JTFRP-PMU within a specified timeframe and the Contractor fails to respond adequately to complaints from the public

Table 9.1 : Environmental Management Plan for Up-gradation of Road Subproject under Package-4: (Chiralla Link Road & Malaini to Chakrabatti Road) in District Doda, Jammu & Kashmir

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
A.	**Pre-Construction Stage**			
	Pre-construction Activities By the Contractor			
A.1	Appointment and Mobilization of Environment & Safety Officer	• The contractor will appoint a qualified and experienced Environment & Safety Officers (ESOs) for a subproject under Package-4, who will dedicatedly work and ensure implementation of EMP including Occupational, Health and Safety measures. • Separate appointment of qualified Environmental Safeguard Officer and his/her mobilization for each road under Package-4 i.e Chiralla Link Road and Malaini to Chakrabatti Road shall be complied. • Contractor to inform the PIU (ERA) for the appointment and mobilization of each Environmental Safeguard Officers (ESOs) that is 1 ESO for the Chiralla Link Road and 1 ESO for the Malaini Chakrabatti Road.	Contractor	PIU TAQAC
A-2	Regulatory Approvals	• Permission from concerned department for any works related to culverts, embankment construction, protective works, slope stabilization etc. along or near water bodies, if applicable. • Labour license from the Department of Labour. • Prior permission will be taken from line department offices of Electricity (PDD), Telecommunications (for OFC underground cables etc), water Pipeline (PHE) etc. Utility shifting required to be undertaken by the contractor in the supervision of PIU. • If contractors open new stone quarry or borrow areas, prior Environmental Clearance will be obtained from SEIAA/DEIAA. • For set–up of Stone Crusher Plant, HMM Plants, Batching Plant, D.G Sets- Consent to Establish and Consent to Operate will be obtained from J&K State Pollution Control Board (J&KSPCB) or if contractor intends to procure construction materials from local authorized third party agencies then the contractor will collect and submit necessary clearance/approval from authorized third party agencies.	PIU Contractor	PIU PMU PIU TAQAC

A-3	The orientation of Implementing Agencies	The PIU shall organize orientation sessions for contractors during all stages of the project. This shall include on-site training (general as well as specific to the context of this subproject) as well. These sessions shall involve concerned PIU, project staff, contractors, consultants etc.	PIU	PMU, TAQAC
A-4	Utility Relocation and Common Property Resources (CPR's)	• All utilities and common property resources shall be relocated and restored before the commencement of the road improvement activities. • Before commencement of works, a joint field Monitoring will be conducted by the Contractor, TAQAC, PIU to map out the alignments, to check if any utility is being impacted due to construction works. While relocating these utilities and facilities all concerned agencies including PIU shall take necessary precautions and shall provide barricades/delineation of such sites to prevent accidental fall of pedestrian and other road users into pits, drains both during demolition and construction/ relocation of sum facilities. • Checking for accommodating utilities crossing the drains- raising, lowering or re-location if required.	Contractor	PIU, TAQAC
A.5	Procurement of Machinery, Crushers, Batching Plants etc	• Specifications of Machinery, Crushers, and Batching Plants shall comply with the requirements of the relevant environmental legislation. Crusher, Batching plants and Hot Mix Plants shall be located 250m away from settlements/ commercial establishments, preferably in the downwind direction. • No plants should be set-up within 250m from the residential/ settlement locations. The Contractor shall submit a detailed layout plan for such sites and seek prior approval of PIU before entering into a formal agreement with a landowner for setting-up such sites. • Actions by PIU/PMU against any non-compliance shall be borne by the Contractor at his own cost. Arrangements to minimize dust pollution through the provision of water spray shall have to be provided at such sites.	Contractor	PIU, TAQAC
A.6	Construction Camp Locations - Selection, Design & Lay-out	• If a contractor decides to establish labour camp, siting of the camp will be as per the guidelines given in Annexures- and layout of camp will be approved by PIU). • Labour camp will not be established within 250 m from the nearest settlement to avoid conflicts and stress with the local community.	Contractor	PIU, TAQAC

A.7	Arrangements for Temporary Land for Camp	The Contractor will obtain consent from landowners in writing for temporary use of land for labour camp, etc.	Contractor	PIU, TAQAC
A.8	Safeguarding of Trees and Plantation	• Trees close to the RoW will be marked with horizontal reflective strips before the commencement of works. • These trees in the construction zone will be covered/ wrapped with protective green mesh fibre cloth around the base tree trunk area by 6 feet in height. • No stockpiling of any construction will be allowed around or close to trees. • No concreting shall be allowed around the trees and all excavation activities shall be done only in consultation with the Environmental Specialist of PMU.	Contractor	PMU, PIU, TAQAC
A.9	Construction Vehicles, Equipment and Machinery	• All vehicles and equipment to be procured for the proposed up-gradation works of road subproject will conform to the relevant Bureau of Indian Standard (BIS) norms. The discharge standards promulgated under the Environment Protection Act, 1986 and Motor Vehicles Act, 2019 will be strictly adhered to. • The silent/quiet equipment like DG set as per regulations will be used at the construction site or labour camp. • The contractor will maintain records of Pollution Under Control (PUC) certificates for all vehicles used during the contract period, which will be produced to PIU for Monitoring and whenever required.	Contractor	PIU, TAQAC
A.10	Arrangement for Construction Water	• The contractor shall source construction water preferentially from surface water bodies/nearby rivers in the project area. The contractor shall be allowed to pump only from the surface water bodies. Boring of any tube wells shall be prohibited. Necessary permission for use of water will be obtained from competent authority. • To avoid disruption/disturbance to other water users, the contractor shall extract water from fixed locations. The contractor shall consult the local people before finalization the locations. • Contractor can extract ground water only in case surface water sources are not available and that too only after proper permission from Central Ground Water Authority.	Contractor	PIU, TAQAC
A.11	Sand (all river beds used directly or indirectly for the project)	If the supplier of sand is another (third) party, the authentic copy of lease agreement that has been executed between the local Tehsildar and the supplier has to be submitted to PIU/PMU of the project, before any procurement is made from such a site. Environmental clearance for stone quarry and borrow area.	Contractor	PIU, PMU

A.12	Labour Requirement	The contractor preferably will use unskilled/semiskilled labour from local areas to give the maximum benefit to the local community to avoid any additional stress on the existing facilities (medical services, power, water supply, etc). At an average >100-120 labours/ day will be required during construction stage depending upon extent of construction work.	Contractor	PIU, PMU, TAQAC
A.13	Traffic Management Plan- Planning for Traffic Diversions and Detours	• Detailed traffic control plans shall be prepared by the contractor and same shall be submitted to the PIU for approval. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements including night time safety measures, details of traffic arrangement after cessation of work each day, safety measures undertaken for transport of hazardous materials and arrangement of flagmen etc to regulate traffic congestion. • The contractor shall provide specific measures for safety of pedestrians and workers as a part of traffic control plans. The contractor shall ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. • The Contractor shall also inform local community about diversion in traffic routes and pedestrian access arrangements with assistance from PIU.	Contractor	PIU, TAQAC

A-14	[6]Stockyard/ Storage of Construction Material and Establishing Equipment Lay-down Area	• Contractor in consultation with PIU shall identify the site for temporary use of land storage of construction materials including pipes etc. These sites shall not cause an inconvenience to the local population/traffic movement. These locations shall be approved by the PIU. • Selection of location for material storage and equipment lay-down areas must take into account prevailing winds, distances to adjacent land uses, general on-site topography and water erosion potential of the soil. Impervious surfaces must be provided wherever necessary. • Protect material stockpiles from stormwater (e.g. by excavating a cut-off ditch around stockpiles to keep away stormwater). • Enclosed storage for fuel with non- permeable flooring. • Contractor shall cover material stockpiles with a tarpaulin or other materials. Avoid stockpiling material near water bodies. • Proper cover and stacking of loose construction material will be ensured during the construction of outfall structures at the construction site to prevent surface runoff and [7]contamination of receiving water body. • Staff dealing with these materials/substances must be aware of their potential impacts and follow the appropriate safety measures. The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances like bitumen, diesel, used oil and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training. Necessary training and awareness program shall be carried out to make aware the contractor and its staff aware about the hazardous nature of substances.	Contractor	PIU, TAQAC

[6] These storage areas can be hazardous, unsightly and can cause environmental pollution if not designed and managed carefully

[7] The most expected source of watercourse contamination is excavated soil or loose material being washed into water body during construction of drainage works.

A-15	Information Dissemination and Communication Activities	• Prior to construction activity, information dissemination will be undertaken by the contractor at the project site. The wider dissemination of information to the public will be undertaken by PMU through the disclosure of EA / EMP reports on the website of PMU-JTFRP. • Project information Board showing the name of work, project cost, duration, date of commencement, date of completion, executing agency and contact details (including telephone numbers) shall be displayed both sides of the roads. • Information boards will also be set up at the sites of construction camps and labour camps, plants and stockyard site. Details of Nodal officer with telephone numbers will be displayed for registering complaint/grievances by stakeholder/general public	PMU Contractor	PMU, PIU, TAQAC PIU
A-16	Environmental Monitoring-Baseline Data	Ambient air quality, noise levels and water quality monitoring on six-monthly basis as per environmental monitoring plan and in accordance to instruction of Environmental Specialist of PMU.	PIU	PMU, TAQAC
B.	**Construction Stage**			
B.1	**Site Clearance (Clearing and Grubbing)**			
B.1.1	Clearing, grubbing and Levelling	As per MoRTH sub-clause no. 201.1 and 201 in general, following measures to be implemented; • If required 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. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval and supervise-on of PIU. • The Contractor, under any circumstances will not cut or damage trees. • Trees identified under the project will be cut only after receiving clearance from the Forest Dept (as applicable). Vegetation with girth size of over 30 cm will be considered as trees and shall be compensated. • Contractor to ensure all shurbs/ bushes or grass species of any type which are envisaged for clearing and grubbing will be immediately planted in hill/ valleyside slopes and slopes or sections identified for the eriosn issues.	Contractor	PIU, TAQAC

B.1.2	Dismantling of Culverts	Following MoRTH Clause no. 202, all necessary measures shall be taken especially while working close to cross drainage channels to prevent earthwork, slope instability, stonework, materials and appendage as well as the method of operation from impeding cross-drainage at rivers, streams, water canals and existing drainage. Demolition wastes will be collected and disposed as per the provision of Construction & Demolition Rule 2016.	Contractor	PIU, TAQAC
B.1.3	Generation & disposal of Debris	• Debris generated due to the dismantling of the existing road shall be suitably reused in the proposed construction. • Scarified asphalts and the other construction wastes shall be appropriately re-used in road construction with the permission of PIU. The dismantled road and scarified bitumen waste shall be utilized for the paving of cross roads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes, parking areas along the roads or in any other manner approved by the PIU. • The Contractor will suitably dispose off unutilized debris and waste materials either through filling up of borrows areas located in wasteland or at pre-designated disposal locations, subject to the approval of the Environmental Expert of PIU. • At locations identified for disposal of residual bituminous wastes, the disposal will be carried out over a 60 mm thick layer of rammed clay so as to eliminate the possibility of leaching of wastes into the ground water. The Contractor will ensure that the surface area of such disposal pits is covered with a layer of soil. • 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 PIU. • The pre-designed disposal locations will be a part of Solid Waste Management Plan to be prepared by Contractor in consultation and with approval of Environmental Expert of PIU. • 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.	Contractor	PIU, TAQAC

B.1.4	Stripping, stocking and preservation of top soil	In accordance to MoRTH clause 301, the topsoil from 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 Specialist of PIU. The following precautionary measures will be taken to preserve them till they are used: (a) 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. (b) 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. (c) It will be ensured by the Contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be utilized for: • Covering all disturbed areas including borrow areas, only in a case where there are to be rehabilitation • Dressing of slopes of road embankment • Agricultural fields of farmers acquired temporarily land.	Contractor	PIU/ TAQAC
B 1.5	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. The Contractor will also ensure that the existing accesses will not be undertaken without providing adequate provisions. The Contractor will take care that the cross roads are constructed in such a sequence that construction work on the adjacent cross roads are taken up one after one so that traffic movement in any given area not get affected much.	Contractor	PIU/ TAQAC

B 1.6	Planning for Traffic Diversions And Detours	• Temporary diversions will be constructed with the approval of the Environmental Specialist of PIU. Detailed Traffic Control Plans will be prepared by the Contractor and approved by Environmental Specialist, seven days prior to commencement of works on any section of road. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements for construction under traffic, details of traffic arrangement after cessation of work each day, safety measures for night time traffic and precaution for transportation of hazardous materials and arrangement of flagmen. • The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. • The Contractor will also inform local community of changes to traffic routes, conditions and pedestrian access arrangements. 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).	Contractor	PIU/ TAQAC
B.2	**Procurement of Construction Materials**			
B.2.1	Procurement for Aggregate and other construction materials	• No borrow area will be opened without permission of the Environmental Specialist and without obtaining necessary regulatory permission. The location, shape and size of the designated borrow areas will be as approved by the Environmental Specialist 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 siting and operation of borrow areas. • 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. • During dry seasons (winter and summer) frequency of water sprinkling will be increased in the settlement areas and Environmental Specialist of PIU will decide the sprinkling time depending on the local requirements. Contractor will rehabilitate the borrow areas as soon as borrowing of soil is over from a particular borrow area in accordance with the approved borrow area Redevelopment Plan.	Contractor	PIU, TAQAC

B.2.2	Transporting Construction Materials	All vehicles delivering fine materials like aggregate, cement, earth, sand, etc, to the site will be covered by Tarpaulin to avoid spillage of materials. Existing road used by vehicles of the contractor or any of his subcontractor or suppliers of materials will be kept clear of all dust/mud or other extraneous materials dropped by such vehicles. The contractor will make effort to transport materials to the site in non- peak hours	Contractor	PIU, TAQAC
B.2.3	Quarry Operations & Crushers	The Contractor shall obtain materials for approved quarries. The crushers will be operated after obtaining consent to establish and consent to operate from J&KSPCB.	Contractor	PIU, TAQAC
B.3	**Construction Work**			
B.3.1	Labour Camp Site	• Project information board will be displayed at the labour camp site. • Electrical cables and wires will be properly arranged with proper electrical safety. Loose electrical connections will not be allowed at the labour camp. • Red danger sign with bone & skull will be displayed as per The Electrical Rules at three phase motors, electrical panels and electrical machines, DG sets, etc. • Housekeeping at labour camp will be maintained properly. Daily sweeping and cleaning will be done at the labour camp. • HIV Aid awareness posters will be displayed at the camp site. • Solid waste generated at the camp site will be collected in covered waste bins. Then, it will be segregated as biodegradable (food waste, paper, etc) and non-biodegradable (plastic, polyethylene bag, etc) wastes. Polyethylene/plastic wastes will be stored in empty cement bags and to be sent for recycling through scrap dealer. Biodegradable (food waste, paper, etc) solid waste will be disposed in compost pit. Non-biodegradable inert wastes will be sent to land fill site of Jammu Municipal Corporation (JMC). • Proper drinking water, well ventilated accommodation, sanitation, canteen facilities will be provided to workers at the labour camp. • Suitable signages will be displayed at labour camps.	Contractor	PIU, TAQAC

B.3.2	Drainage and Flood control	• The Contractor shall ensure that no construction materials shall block the water flow from the hill side which may result in water lodging at the work site. The Contractor shall take remedies to remove accumulated water (if any) from the construction sites, camp sites, storage yard, excavated areas etc. Construction works should plan well in advance prior to on-set of monsoon to avoid water- pool besides providing temporary cross drainage systems. The contractor shall take all adequate precautions to ensure that construction materials and excavated materials are enclosed in such a manner that erosion or run off of sediments is controlled. Silt fencing shall be installed prior to the onset of the monsoon at all the required locations, as directed by PIU/PMU. Prior to monsoon, the contractor shall provide either permanent or temporary drains to prevent water accumulation in immediate environs and agricultural areas.	Contractor	PIU, TAQAC
B 3.3	Siltation of Water Bodies and Degradation of Water Quality	• The Contractor will not excavate beds of any stream/canals/ any other water body for borrowing earth for embankment construction. • Contractor will construct silt fencing at the base of the embankment construction for the entire perimeter of any water body (including wells) adjacent to the project road and around the stockpiles at the construction sites including ancillary sites close to water bodies. The fencing will be provided prior to commencement of earthwork and continue till the stabilization of the embankment slopes, on the particular sub-section of the road. • 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. • On completion of construction of culverts and bridges, drainage channels will be cleared by collecting debris and disposed suitably. Detours/diversions constructed for construction of culverts and bridges will be also be cleared before onset of monsoon.	Contractor	PIU, TAQAC

B 3.4	Slope Protection and Control of Soil Erosion	Following MoRTH clause 306, 307, 308 and other applicable clauses; • The Contractor will construct slope protection works (on both hill/ valley side) as per design, or as directed by PIU to control landslide/ soil erosion and sedimentation through use of Breast walls, Retaining Walls, Bio-Engineering slope stabilization methods, dykes, sedimentation chambers, basins, fibber mats, mulches, grasses, slope, drains and other Devaces. • 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 no separate payment will be made for them. • Contractor will ensure the following aspects: • After construction of road embankment, the side slopes will be covered with grass and shrubs as per design specifications. • Turfing works will be taken up as soon as possible provided the season is favourable for the establishment of grass sods. Other measures of slope stabilization will include mulching netting and seeding of batters and drains immediately on completion of earthworks. • In borrow pits, the depth shall be so regulated that the sides of the excavation will have a slope not steeper than 1 vertical to 2 horizontal, from the edge of the final section of the bank. • Along sections abutting water bodies, pitching as per design specification will protect slopes. Critical Sections Identified in Package-4 roads (Chiralla Link Road & Malaini Chakrabatti Road) for Slope Stabilization/ Erosion/ Landslip measures: Chiralla Link Road: 1+000, 1+100, 1+600, 1+750, 1+800, 2+000, 2+250, 2+400, 4+300, 2+200, 2+400, 4+300, 4+500, 4+700, 5+000, 5+100, 5+600, 6+000, 6+500, 6+800, 7+200, 7+400, 9+000-9+200 Malaini-Chakrabatti Road: 0+950, 1+050, 1+500, 1+700, 2+000, 2+400, 2+600, 3+200, 4+500, 5+000-5+200, 7+200, 7+800, 8+500	Contractor	PIU TAQAC

		Hill Road Manual (IRC SP:48) The presence of vegetative cover is beneficial to the stability of slope in a number of ways as enumerated below: 1. Surface erosion will be controlled. If some remains unchecked, there is a high probability that the erosion may extend deeper and wider and eventually endanger the stability of the slope. 2. Infiltration of water into the slope will be controlled, thereby reducing the build-up of pore pressure. Decrease in factor of safety is directly proportional to the increase in pore pressure. Growth of vegetative cover and spread of root-network to an approximate depth of 0.5 to1.0 meter depth help to improve the overall stability of the slope as brought out by filed experiments carried out on different hill slopes for erosion control. Certain methods are described below; **A. Asphalt mulch treatment:** (i) Field trials have indicated that the asphalt mulch technique is effective in controlling erosion of hill slopes by proving suitable vegative turfing. For this treatment, the proposed slope area is prepared into vast seed beds by levelling of the top, regarding or reshaping and finally raking the top soil about 2 cm thick. If the soil is infertile or slightly acidic, calcium ammonium nitrate is applied at the rate of 50 kg per 1000 sq. m in solution. The root slips or locally available grasses are dibbed 15 to 20 cm apart, root to root and row to row. An asphalt emulsion (mulch) of a specified grade is then spread by a suitable sprayer. The optimum rate of application of the emulsion is 0.9 lt.per sq. i.e. just a thick fill. (ii) The asphaltic film gradually disintegrates and its place is taken by a carpet of green vegetation and the deep rooted species of grasses, clovers, etc. The advantages of this technique are: a. Susceptibility to erosion is cut down. b. The moisture content as well as the nutrients in the soil mantle are conserved. c. The soil temperature is raised by absorbing light rays, promoting the emergence and growth of tiny saplings. (iii) This method, if done just before the monsoons, the increased moisture content due to rains automatically helps in the growth of saplings.	Contractor	PIU TAQAC

		B. Slope Treatment by Jute/ Coir Netting (i) Field trails have shown that jute/coir netting are promising techniques for erosion control especially where problem is of sufficient nature. The slopes are initially demarcated, graded, fenced and fertilized as in the case of asphalt mulch technique cited above. The levelling of the area in this case must be uniform so that the netting laid is flush with the ground, permitting water flow over the matting. Initially seeding at the rate of kg per acre or dibbling of the root slips locally available grasses 15cm apart row to row and plant to plant is done. After that light compaction of seeds and root slips is done by tamping. (ii) Thereafter, jute or coir netting with 1.27 cm to 2.54 cm opening size and in widths of 1.0 m to 1.22 m is laid on the prepared ground surface. The widths of netting are secured against displacement by an overlap of 5 cm to 8 cm and pegged down with staples of 3 mm GI wire, 30 cm to 60 cm apart. The top and bottom ends of the nettings are fixed in slots of 30 cm deep fully stretched. Subsequently another dose of light fertilizer and seeding is given. The main advantages of this techniques are:- a. The net provides innumerable miniature check dams thus absorbing the impact and kinetic energy of the falling rain drops and water flow. b. The soil, seed and slips are kept in-situ without being dislodged and are protected by getting the full benefit of moisture. The technique is simple to use and inexpensive and thus merits widespread use to improve the stability as well as the ecology of slopes that have denuded by either mass wasting process such as landslides or due to man-made cause such as clearing of existing forest.	Contractor	PIU TAQAC

B. 3.5.	Addressing Slope Stabilization Issues	• PCC Retaining Walls on valley side and PCC Breast Walls on hill side have been proposed in slide prone areas. Safety of these structures and slope stabilization measures have to be ensured by the Contractor under the strict supervision of the PIU/ TAQAC against sliding, overturning, bearing capacity and tension failure. • [8]Trail Improvement: Trail improvement refers to the vegetative and structural measures used to protect trails from erosion and to improve them for people and livestock traffic, both during construction and in the form of remedial measures. General guidelines should be followed to ensure slope safety when designing and constructing trails and roads along steep slopes. The combination of slope instability, lack of understanding of slope dynamics, and poor planning and construction, means that roads and trails are a major source of landsides, slips, and flows in many parts of the Himalayan region, and thus contribute to the development of flash floods. Basic design considerations are; (i) Ideally, trails should follow a contour. (ii) Drainage ditches should be provided at appropriate locations to guide surface runoff. The trail should slope outwards. A maximum cross slope of 1:20 (vertical height to horizontal length) is recommended to avoid cross ruts. (iii) Trails should be wider than 1.2 m. (iv) An average gradient of 10% is generally considered to be the maximum for comfortable walking; 15% is considered to be the maximum permissible gradient. (v) Trails with gradients of less than 8^o (≈14%) should be cut and levelled and sown with grass. (vi) Trails with gradients of 8^o to 12^o (≈20%) should be paved with stone (vii) Stone steps should be constructed on trails with gradients above 12^o (≈20%). (viii) The length of the landing (step) can be 1 m. • [9]Terracing: It can be utilized at high slide/ landslip prone areas. Terracing is the technique of converting a slope into a series of horizontal step-like structures with the aim of controlling the flow of surface runoff by guiding the runoff across the slope and conveying it to a suitable outlet at a non-erosive velocity; reducing soil erosion by trapping the soil on the terrace; and creating flat land suitable for cultivation. Terracing helps prevent the formation of rills, improves soil fertility through reduced erosion, and helps water conservation.	Contractor	PIU, TAQAC

[8] DSCWM (2004)

		• [10]Grassed Waterways: Grassed waterways are natural or artificially constructed watercourses shaped or graded to the required dimensions and planted with suitable vegetation. Grassed waterways generally run down a slope and are designed to conduct surplus water safely into natural drainage courses. They are usually made broad and shallow, although the shape and size can vary depending on the size of the drainage area, the slope of the land, and soil type. The channels help surface water to flow across the land without causing soil erosion. They are used as outlets to prevent rill and gully formation. The vegetation in the channel helps control the water flow and reduces channel surface erosion. Properly designed grassed waterways can safely transport large volumes of water to the downslope. They are also used as filters to prevent sediments from entering into nearby water bodies. Grassed waterways are used as: (i) outlets for diversions and emergency spillways; (ii) to safely convey runoff from contour and graded (iii) bunds and bench terraces; (iv) as outlets for surface and sub-surface drainage systems on sloping land; (v) to carry runoff from natural drains and prevent the formation of gullies; and (vi) to dispose of water collected in road ditches or discharged through culverts.	Contractor	PIU, TAQAC
B.3.6	Safeguarding of Trees	• All trees close to RoW should be marked (dual horizontal strip- Yellow/ Red colour) with safe reflective strips before the commencement of works. • Trees near the construction zone will be covered/ wrapped with protective green mesh fibre cloth around the base tree trunk area by 6 feet in height. • No stockpiling of any construction material will be allowed around or close to trees • Make-shift steel barricading should be provided around each tree in an active work zone where excavation takes place for drainage, protective works and other ancillary road works which may affect trees.	Contractor	PIU, TAQAC

[9] DWDIP- Level or contour terraces are constructed along slope contours with the main aim of retaining water and sediment. The terrace edge is planted with trees, small plants, and grass, usually with trees on the outward facing edge to increase stability. Bench terracing is similar to contour terracing with the difference that the terraces do not strictly follow the contour line and runoff may run along as well as across the terrace. Bench terraces are primarily constructed to enable crops to be grown on sloping land, rather than to retain water and sediment. Bench terraces are recommended for slopes with gradient of up to 33%, but as a result of pressure on land are constructed on slopes up to 50–60% (Sharda et al. 2007).

[10] adopted from Sharda et al. 2007

B.3.7	Pedestrian and Vehicular Traffic Movement Management	• Detailed traffic control plans will be prepared and submitted to the PIU for approval one week before commencement of works. • The traffic control plans shall contain details of temporary diversion, details of arrangements for construction (road stretches, timing and phases). • Provide the construction itinerary in advance so that the road users can use alternative routes • Erect warning and safety signs of ongoing works. • Suitable retro-reflective warning signs should be placed at near construction locations and should be visible at night. • Alternative access ways should be communicated to the community by way of announcement appropriately for the public information. • The contractor shall take all necessary measures for the safety of traffic during construction and shall provide, erect and maintain such barricades, including signs, markings, flagmen as proposed and approved by PIU/PMU. The contractor shall ensure that all signs, barricades, pavement markings are provided as per applicable IRC code and guidelines. • Install signage, barricading, fencing as required and include safety measures for the transport of materials/ equipment's, which shall be limited to certain times, and arrangements for flagmen at intersection.	Contractor	PIU, TAQAC
B.3.8	Excavation works for longitudinal drains along hill/ valley side	• CC Drainage has been proposed along the hill/ valley side where the drain is necessary for Road Package 1. • At the excavation site, warning signboards will be displayed in vernacular language and English. • The entry of general public/unauthorized person will be restricted. • During works of CC drains necessary safety measures will be taken by the contractor. • Contractor to follow strict protocol during construction/ excavation for longitudinal drainage especially along with the sensitive receptors like schools, mosque/ temples, community centres, religious places, shrines, etc. • Excavated earth will be collected and disposed of in pre-identified site with the approval of PIU. Excavated earth shall not be dump on the carriageway or shoulders. • Casted drain block and drain cover will not be stacked on the road. • To ensure the elimination of excavation hazards, excavation will be carried in the presence of a competent person. • Suitable barricading will be provided around the excavation site. • Suitable personal protective equipment will be provided to the workers.	Contractor	PIU, TAQAC

B.3.9	Handling of Cement Bags	• Cement bags will be stored and emptied in a covered area to control fugitive dust emissions. • While handling and emptying cement bags, workers will wear masks, hand gloves and protective goggles. • Manual transferring of cement bags from one place to another place will not be allowed. For this purpose, the trolley will be used.	Contractor	PIU, TAQAC
B.3.10	Work-zone safety Management	• The Contractor shall prepare the construction safety plan as per provisions under the IRC 67-2001, SP-55 for safe work zone to be duly approved by the environmental specialist of PIU/PMU before the start of road works. • Temporary barricades shall be provided to delineate construction zone as well as material stacking areas. The construction site and the labour facility (if any) shall be appropriately barricaded to prevent entry and accidental tress passing of workers, staff and others into the construction site. • All operational areas shall be access controlled. Watch and ward facilities at all times shall be provided by the contractor. • Proper retro-reflective warning signage will be installed on the access road next to the construction site about the movement of construction machinery and vehicles. • In excavations for longitudinal surface road drains, culverts etc., a high visibility warning and retro-reflective signage shall be displayed in vermicular language and English. The entry of unauthorized persons should be restricted. Excavation of 1.5 metres deep or greater will be adequately barricaded. • There shall be adequate lighting arrangement at night to prevent mishaps after construction activity ceases for the day • All the retro safety signage as per IRC 55 will be erected at the construction site for generating awareness among the local community and road user during the construction.	Contractor	PIU, TAQAC

B.3.11	Sensitive Receptors-Impact Management	• At each sensitive receptor-like Temple as Ch 1+400 etc and in general residential houses, the construction operations in these areas should be limited to time period of 7:30 am to 6:00 pm. • Periodic maintenance and calibration of construction equipment's/ vehicles to meet applicable CPCB emission standards. • Contractor to ensure regular dust suppression measures by way of standard and efficient water sprinkling through water tankers at these designated sensitive receptors. • Noise barriers shall be installed during the construction phase to protect the school from the noise from construction activities. • Adequate barricading and safety measures to protect dust pollution and noise impacts on sensitive receptors like schools and religious places etc. due to vehicle movement to be ensured before the start of work and their effectiveness to be checked during construction.	Contractor	PIU, TAQAC
B.3.12	Occupational Health and Safety of Workers	• The contractor will prepare and follow the OHS plan, including provisions for an emergency response plan. • All workers will be provided with required personal protective equipment • Emergency Telephone Numbers shall be displayed at camp and plant site. • Medical facilities shall be provided for workers at the Labour camp and plant site.	Contractor	PIU, TAQAC
B.4	**Pollution**			
B.4.1	**Water Pollution**			
B.4.1.1	Water Pollution from construction material	• The contractor will take all precautionary measures to prevent entering of wastewater into streams, water bodies or the irrigation system during construction. The contractor will avoid construction works close to the streams or water bodies during monsoon. • Contractor shall not wash his vehicles in river water and shall not enter riverbed for that purpose. • Any type of construction wastes will not be disposed of in rivers or water bodies.	Contractor	PIU, TAQAC

B.4.1.2	Water Pollution from Fuel and Lubricants	• The Contractor will ensure that all construction vehicle parking locations, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance and refuelling sites will be located at least 250 m away from rivers and irrigation canal/ponds. The Contractor will submit all locations and layout plans of such sites before their establishment and will be approved by the Environmental Specialist of PIU. The contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refuelling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Wastewater from vehicle parking, fuel storage areas, workshops, wash down and refuelling areas will be treated in an oil interceptor before discharging into on land or into surface water bodies or another treatment system. • In all, fuel storage and refuelling areas, if located on areas supporting vegetation, the topsoil will be stripped, stockpiled and returned after cessation of such storage. • The contractor will arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites • All oil spills, used oil will be disposed of following the J&K State Pollution Control Board (JKSPCB) guidelines.	Contractor	PIU, TAQAC
B.4.1.3	Waste Water from Labour Camp	• Wastewater generated from the sanitary facilities at labour camp will be treated in septic tank followed by soak pit. • No untreated raw sewage/wastewater will be discharged into any water body. • Workers will not be allowed for open defecation. Proper toilets fitted with the septic tank and soak pit will be provided for workers at a campsite. • At the bridge construction site, portable toilets shall be provided for workers and sewage from portable toilets shall be passed through septic tank followed by soak pit.	Contractor	PIU, TAQAC
B.4.2	**Air Pollution**			
B.4.2.1	Dust Pollution	• Frequent dust suppression will be planned for the road by use of water tankers. • The contractor will procure the construction machinery, which conforms to the pollution control norms specified by the MoEF&CC/CPCB/J&KSPCB. • The excavated earth /construction materials will be stored properly so that it does not generate fugitive emissions. • Regular maintenance of vehicles to be used for material transportation and equipment will be carried and vehicular pollution check should be made mandatory. • Mask and other PPE should be provided as a mandatory effort to the construction workers in dust prone areas.	Contractor	PIU, TAQAC

B.4.2.2	Emission from Construction Vehicles, Equipment and Machinery	• The contractor will ensure that all vehicles, equipment and machinery used for construction works are regularly maintained and conform that pollution emission levels and comply with the requirements of CPCB and/Motor Vehicles Rules. The contractor will submit Pollution Under Control (PUC) certificates for all vehicles for the project. • DG set will be provided with the chimney of adequate height as per CPCB guidelines (Height of stack in meter = Height of the building + 0.2 √KVA). The environmental monitoring is to be conducted as per the monitoring plan.	Contractor	PIU, TAQAC
B.4.3	**Noise Pollution**			
B.4.3.1	Noise Levels from Construction Vehicles and Equipment's	The contractor will confirm the following: • All construction equipment used in excavation, concreting, etc, will strictly conform to the MoEF&CC/CPCB/J&KSPCB noise standards. • All vehicles and equipment used in construction works will be fitted with exhaust silencers/mufflers. • Maintenance and servicing of all construction vehicles and machinery will be done regularly. • Only acoustic enclosures fitted DG sets will be allowed at the construction site and labour camp. At the construction sites within 150 m of the nearest habitation, noisy construction work and use of high noise generation equipment will be stopped during the night time between 10.00 pm to 6.00 am. • Working hours of the construction activities will be restricted around educational institutes/health centres (silence zones) up to a distance of 100 m from the sensitive receptors. • Noise monitoring shall be carried out in construction areas through the approved monitoring agency.	Contractor	PIU, TAQAC

B.5	**Archaeological Resources and Cultural properties**			
B.5.1	Chance Found Archaeological Property	• All fossils, coins, articles of the value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation. • The contractor will take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He will, immediately upon discovery thereof and before removal acquaints the Environmental Expert of the PIU of such discovery and carry out the PIU instructions for dealing with the same, waiting which all work shall be stopped. • The PIU will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.	Contractor	PIU, PMU TAQAC
B.5.2	Impacts on Cultural Properties	• All necessary and adequate care shall be taken to minimize the impact on cultural properties which includes cultural sites and remains, places of worship including mosques, temples, shrines, etc., graveyards, monuments and any other important structures as identified during the design stage. • Relocation and enhancement measures shall be taken up as per the design and in consultation with the local community. Access to such properties from the road shall be maintained clear and clean.	Contractor	PIU, TAQAC
B.6	**Personal Safety**			
B.6.1	Personal Safety Measures for Labours and Staff	The contractor will take necessary measures for the personal safety of workers: • Protective safety shoes, gumboots, hand gloves, protective goggles, etc (as required) will be provided to the workers employed in construction works • Welder's protective eye-shields will be provided to workers who are engaged in welding works. • Earplugs will be provided to the workers exposed to high noise levels. • Safety vests will be used by workers when on a construction site. • The Contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. The contractor will make sure that during the construction work all relevant provisions of Building and other Construction Workers (Regulation of Employment and Conditions of Services) Act, 1996 are adhered to. • The Contractor will not employ any person below the age of 14 years for any work.	Contractor	PIU, TAQAC

B.6.2	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 for the information and protection of traffic approaching or passing through the section of any existing crossroads. • The existing roads are the hilly terrain roads under Package-4 which consist of numerous sharp curves, some minor junction, landslide/ landslip areas which traffic safety installations. The Contractor will ensure that all signs, barricades, pavement markings are provided as per the MoRTH specifications for Hilly Terrain. The Contractor will ensure that all signs, barricades, pavement markings are provided as per the MoRTH specifications. • Before taking up of construction, a Traffic Control Plan will be Devased and implemented to the satisfaction of the Environmental Expert of PIU.	Contractor	PIU TAQAC
B.6.3	Emergency Management	• Emergency numbers will be displayed at the construction sites and campsite, • First boxes will be made available at the construction site and campsite, • Fire extinguishers for petroleum oil fire and electrical fire will be made available at the camp site, fuel storage site, construction site etc. • Designated vehicles, which can be used as an ambulance will be available at the construction site at all the time.	Contractor	PIU, TAQAC
B.6.4	Risk Force Measure	• The contractor will make required arrangements so that in case of any mishap during, operation of machinery/ construction vehicles, dismantling, excavation, concrete pouring, hot asphalt handling and erection of pumps, all necessary steps can be taken for prompt first aid treatment. • Construction Safety Plan for the all the road stretches, embankment development, protection works, works road longitudinal drains, ancillary sites to be prepared by the contractor and will identify necessary actions in the event of an emergency.	Contractor	PIU, TAQAC
B.6.5	First Aid Facility	The contractor will arrange for : • A readily available first aid unit including an adequate supply of sterilized dressing materials, burn ointment and appliances as per the state Factories Rules will be maintained all the time by the contractor. • Availability of first aid trained persons will be ensured at the project site during the construction phase. • Availability of suitable transport will be ensured at all times to take an injured or sick person(s) to the hospital.	Contractor	PIU, TAQAC

B.6.6	Informatory Signs and Hoardings	The Contractor will provide, erect and maintain informatory/safety signs, hoardings written in English and local language, wherever required or as suggested by the Environmental Specialist of PIU.	Contractor	PIU TAQAC
B.7	**Labour Camp and Project Site Management**			
B.7.1	Accommodation for Labourers	• The contractor will follow all relevant provisions of the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp. • The location, layout and basic facility provision of each labour camp will be submitted to Environmental Expert of PIU before their construction. • The construction will commence only upon the written approval of the Environmental Expert of PIU. • The contractor will maintain necessary well ventilated living accommodation, toilets, bathrooms and ancillary facilities functionally and hygienically. • Proper ventilation along with standard exhaust fans will be provided in labour accommodation rooms. • Regular cleaning and sweeping will be ensured at the labour campsite. • Systematic waste collection management at labour camp to be managed as per SWM Rules 2016. • Standard First Aid Kits/units including an adequate of sterilized dressing materials.	Contractor	PIU, TAQAC
B.7.2	HIV/AIDS Prevention Measures	• Necessary HIV/AIDS prevention measures will be taken at the labour camp • HIV/AIDS awareness program will be organized by the contractor's Environment & Safety Officer.	Contractor	PIU, TAQAC

B.7.3	Potable Water for Workers	• The contractor will construct and maintain labour accommodation in such a fashion that uncontaminated clean water is available for drinking, cooking, bathing and washing. The contractor will also provide potable water facilities within the precincts of workplace/pump stations in an accessible place, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. • The contractor will also provide the following: a) Supply of sufficient quantity of potable water (as per IS) at construction site/labour camp (site at suitable and easily accessible places and regular maintenance of such facilities). b) If any water storage tank is provided that will be kept such that the bottom of the tank at least 1 meter above the surrounding ground level. c) If water is drawn from any existing well/ hand pump, which is within 30 meters proximity of any toilet, drain or another source of pollution, the well will be disinfected before water is used for the drinking. • Environmental Expert of PIU will be required to inspect the labour camp once in a week to ensure the compliance of the EMP.	Contractor	PIU, TAQAC
B.7.4	Sanitation and Sewage System at Labour Camp	The contractor will ensure that : • The sewage system for the camp will be designed, built and operated in such a fashion that no health hazard occurs and no pollution to the air, groundwater or adjacent watercourses take place, • Separate toilets/bathrooms, as required, will be provided for men and women, marked in vernacular language, • Toilets will be provided with a septic tank followed by soak pit. • Adequate water supply will be provided in all toilets and urinals, • Night soil can be disposed of with the help of municipality or disposed of by putting a layer of it at the bottom of a permanent pit prepared for the purpose and covered with 15 cm layer of waste or refuse and then covered with a layer of earth for a fortnight.	Contractor	PIU, TAQAC

B.7.5	Waste Disposal	• The contractor will provide garbage bins in the camp & construction site and ensure that these are regularly emptied and disposed of hygienically according to Solid Waste Management Plan as per Solid Waste Management Rule 2016. • Burning of wastes at a construction site, labour camp and roadside will not be allowed. • The solid waste generated at the construction site & labour camp will be collected in covered waste bins and segregated as biodegradable (food waste, paper, etc) and non-biodegradable (plastic, polyethene bag, etc) wastes. Polyethene/plastic wastes will be stored in empty cement bags and to be sent for recycling through scrap dealer. Biodegradable (food waste, paper, etc) solid waste will be disposed of in the compost pit.	Contractor	PIU, TAQAC
B.8	**Environmental Monitoring**			
B.8.1	Environmental Monitoring-Construction Stage	• The PIU will carry out environmental monitoring for Ambient Air Quality, Noise levels and Water Quality on a six-monthly basis as per environmental monitoring plan and in accordance with the instruction of Environmental Specialist of PMU.	PIU	PMU, TAQAC
B.8.2	Compensatory Plantation	• In case of any tree cutting envisaged, compensatory plantation will be carried in the affected areas in the ratio of 1:6 (i.e. for loss of 1 tree 6 trees will be planted) or greater and transplantation of the same may be envisaged, wherever applicable. • Loss of trees will be compensated by 1:6 ratio (i.e. for loss of 1 tree 6 trees will be planted or greater) and transplantation of the same trees may be envisaged wherever applicable. • Regular monitoring will be carried out for plantation along the project road for cutting of trees. • Plantation of indigenous type shall be. This can be achieved in coordination and in association with the Social Forestry Department.	PIU (ERA)	PMU, TAQAC

C.	**Contractor's Demobilization**			
C.1	Clean-up Operations, Restoration and Rehabilitation	• The contractor will prepare the project and labour campsite restoration plan, which will be approved by the PIU (ERA)/ Environmental Expert. The clean-up and restoration operations are to be implemented by the contractor before demobilization from the construction site and labour camp. The contractor will clear all temporary structures, debris, construction wastes, garbage, night soils, etc in an environmentally sound manner. • All disposal pits or trenches will be filled in and effectively sealed off. • Construction places including camp and any other area used/affected due to the project operations will be left clean and tidy at the contractor's expense to the entire satisfaction to the PIU.	Contractor	PIU, TAQAC
C.2	Land Rehabilitation	• All surfaces hardened due to construction activities will be ripped & imported materials thereon removed. • All rubbles to be removed from the site to an approved disposal site. Burying of rubble on-site is prohibited. • Surfaces are to be checked for waste products from activities such as concreting or asphalting and cleared in a manner approved by the Engineer. • All embankments are to be trimmed, shaped and replanted to the satisfaction of the PIU. • Borrow pits are to be closed and rehabilitated in accordance with the pre-approved management plan for each borrow pit. The Contractor shall liaise with the PIU regarding these requirements.	Contractor	PIU, TAQAC
D	**Post Construction Stage**			
D.1	Environmental Monitoring- Post Construction Stage	• The environmental monitoring laboratory of JTFRP-PMU will carry out environmental monitoring for Ambient Air Quality, Noise levels and Water Quality on six-monthly basis as per environmental monitoring plan and in accordance to the instruction of Environmental Specialist of PMU.	PIU	PMU, TAQAC
D.2	Monitoring of Afforested and Landscape areas	Continuous watch and monitoring of afforested and landscape areas shall be done for its performance and survival rate. The plantation will be properly guarded by watch and ward personnel. Provision will be made for manure application and watering on a schedule.	PIU	PMU

D.3	Soil Erosion and Monitoring of Borrow Areas	Visual monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankments and other places expected to be affected, will be carried out once in every three months.	PIU	PMU

9.5. Clause for Nonconformity to Environmental Management Plan (EMP) - Protection of the Environment

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 the laying of drainage pipes) regularly and other unattended Health, Safety & Environment (HSE) 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.**

9.6. Environmental Monitoring Plan

The monitoring programme consists of performance indicators, reporting formats and necessary budgetary provisions. The contractors monitoring plan should be in accordance with the baseline environmental monitoring, locations provided in the Environmental impact assessment report.

The monitoring plan has the following objectives:

- To ensure effective implementation of EMP
- To evaluate the performance of mitigation measures proposed in the EMP
- To comply with all applicable environmental, safety, labour and local legislation
- To ensure that public opinions and obligations are taken into account and respected to the required satisfaction level
- To modify the mitigation measures or implementing additional measures, if required

The monitoring requirement for the different environmental components have been prepared is presented in Table 9.2 below;

9.7. Performance Monitoring Indicators

Physical, biological and environmental management components identified as of particular significance in affecting the environment at critical locations have been suggested as Performance Indicators (PIs). The Performance Indicators shall be evaluated under three heads as:

- Environmental condition Indicators to determine the efficacy of environmental management measures in the control of air, noise, water and soil pollution;
- Environmental management indicators to determine compliance with the suggested environmental management measures
- Operational performance indicators have also been Devased to determine the efficacy and utility of the proposed mitigation measures.

Table 9.2: The Performance Indicators and monitoring plans prepared for Project Implementation

S.No.	Indicator	Details	Stage	Responsibility
A	**Environmental Condition Indicators and Monitoring Plan**			
1	Air Quality	The parameters to be monitored, frequency and duration of monitoring, as well as the locations to be monitored, will be six monthly in summer and post-monsoon seasons	Construction Post-construction	PMU, PIU Environmental Monitoring Laboratory of PMU through TAQAC
2	Noise Levels	Quarterly, Hourly Level equivalent (Leq).	Construction Post Construction	PMU, PIU Environmental Monitoring Laboratory of PMU through TAQAC
3	Water Quality	Nearby rivers, six-monthly in summer and post-monsoon seasons	Construction Post Construction	PMU, PIU Environmental Monitoring Laboratory of PMU through TAQAC agency
B	**Environmental Management Indicators and Monitoring Plan**			
1	Construction Camp	Location of construction camps has to be identified and parameters indicative of the environment in the area has to be reported.	Pre-Construction	PIU/Contractor
2	Borrow Areas	Locations of borrow areas have to be identified and parameters indicative of the environment in the area has to be reported	Pre-Construction	PIU/Contractor
3	Slope Stability Protection	Impact monitoring for Slope Stability Control-	Construction/ Operation	Contractor/ TAQAC/ PIU/ PMU/

		Visual inspection for any signs of slope failure within the site i.e. cracks on slope protection structure (breast/ retaingin walls), tilting oof trees, blockage of wateways, slips, erosion etc.	Phase	
4	Tree Protection	Protective Measures of Scheduled Trees	Pre-Construction/ Construction	Contractor/PIU
5	Tree Cutting (if required)	Progress of Tree removal marked for cutting is to be reported (if any)	Pre-Construction	PIU/Contractor to Forest Department
6	Tree Plantation	Progress of measures suggested as part of the strategy is to be reported	By end of the Construction	PIU/Forest Department
7	Status Regarding Rehabilitation of Borrow Areas	The PIU will undertake site visits to determine how many borrow areas have been rehabilitated in line with the land owner's request and to their satisfaction	After completion of Construction/ borrowing is complete in particular borrow area. Operation Phase	The PIU will be responsible to direct the contractor for full rehabilitation.

9.8. Monitoring Parameters and Standards

The environmental monitoring plan is discussed below:

9.8.1. Ambient Air Quality Monitoring (AAQM)

The ambient air quality parameters viz: Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Particulate Matter (PM_{10}, $PM_{2.5}$), shall be monitored six monthly at identified locations from the start of the construction activity. The ambient air quality parameters shall be monitored following the National Ambient Air Quality Standards. The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan.

9.8.2. Noise Quality Monitoring

The noise levels shall be monitored at designated locations following the Ambient Noise Quality standards. The duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan.

9.8.3. Surface Water Quality Monitoring

Surface Water quality parameters such as pH, BOD, COD, DO coliform count, total suspended solids, total dissolved solids, Hardness, Conductivity etc. shall be monitored

at all identified locations during the construction stage as per standards prescribed by Central Pollution Control Board. The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan

9.9. Monitoring Plans for Environment Condition

For each of the environmental components, the environmental monitoring plan specifies the parameters to be monitored; location of the monitoring sites and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities. The monitoring plan for the various environmental condition indicators of the project in the construction stage is presented in **Table 9.4**. Monitoring plan does not include the requirement of arising out of regulation provision such as obtaining NOC/Consent for plant site operation.

Furthermore, periodical site monitoring should be carried out by the Environmental Expert of PIU for surveillance & monitoring of road safety during the road construction. The brief description of measures has been given in **Table 9.3** below:

Table 9.3: Brief Description of Measures

Sl. No.	Locations of Work Site	Site Safety Measures
1	Construction Sites	Caution boards, Safety Cones, Delineators
2	Deep Cutting	The construction zone should be barricaded with G.I Sheet or arrangement to be made as per the plan approved by the PIU / PMU. [Provide Safety Sign Boards and Safety Barriers marked with reflective tapes]
3	Temporary Diversion (if any)	Diversion Board, Barricading [Provide 'Diversion Ahead' boards at 50m, 100m and 150m ahead of diversions with reflective tape for illumination at night at the all diverted locations]
4	Safety for the Workers	Helmets, Safety-Shoes, Goggles, Dusk mask. etc

Table 9.4: Environmental Monitoring Plan

Attribute	Project Stage	Parameter	Special Guidance	Standards	Frequency	Duration	Location	Implementation	Supervision
Air	Construction Phase	PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO	Use method specified in National Ambient Air Quality Standards (NAAQM).	National Ambient Air Quality Standards (NAAQM).	Six Monthly (Summer and Post Monsoon Seasons)	24 hours of Sampling	Along the road corridor, Batching Plant, Workers Campsite, Project Office Site	PIU through Environmental Monitoring Laboratory	PMU
Surface Water	Construction Phase	pH, BOD, COD, Oil& Grease, Total Suspended Solid (TSS), Total Dissolved Solid (TDS)	Grab sample collected from source and Analyses as per standard Methods for Examination of Water and Wastewater	Indian Standards: for Inland Surface Water (IS: 2296, 1962	Six Monthly (Summer and Post Monsoon Seasons)	Grab Sampling	River Chenab at Chiralla Link road section (0+000 to 1+350), and Stream at Malaini starting section of 0+365)	PIU through Environmental Monitoring Laboratory	PMU
Noise	Construction Phase	Hourly Level Equivalent (Leq) on dB (A} scale	Equivalent noise levels using an integrated noise level meter kept at 1 m distance from the edge of the pavement.	MoEF Noise Rules. 2000	Quarterly (Summer and Post Monsoon Season)	Leq in dB(A) of daytime and night time	Along the road corridor, Batching and HMP Plant, Workers Campsite,	PIU through Environmental Monitoring Laboratory	PMU
Borrow Area	Construction Phase	As per Guidelines	Visual Observations		Before opening, At least once in a month		Borrow area Location	Contractor	PIU, TAQAC

					during operation, Post Rehabilitation .				
Slope stabilty	Construction Phase	EMP	Visual Inspection	MoRTH Guidelines	Regular		Sections in Chiralla link road & Malaini Chakrabatti road (identified sections for slope stability)	Contractor	PIU, TAQAC
Tree Plantation (under environmental enhancement measures)	Operation Phase	Survival Rate	Plantation of tall saplings	National Green Highways policy and IRC guidelines (IRC : SP:21-2019)	Quarterly to two years post plantation	-	Both in Chiralla link road and Malaini Chakrabatti road (areas where slope stability and erosion prone sections)	Contractor	PIU, TAQAC

9.10. Reporting System

The contractor will follow the reporting system for the implementation of an environmental management plan and environmental management indicators. The Contractor will report the PIU on corrective measures and implementation status of mitigation measures as per the environmental management plan. The EMP compliance report will comprise the photographic evidence (with date, time and geo-reference) for implemented mitigation measures in the monitoring reports.

Table 9.5: The reporting requirements are stated in the table below :

S.No	Item	Stage	Contractor Implementation & Reporting to PIU/PMU
1.	Setting up of construction Camp	Pre-Construction	One Time
2.	Identification of disposal locations for constructional & other wastes from the road project	Pre-Construction	One Time
3.	Tree cutting (if required)	Pre-Construction	One Time
4.	Top Soil Preservations	Pre-Construction	One Time
5.	EMP Implementation Report	Construction	Monthly
6.	Rehabilitation of Borrow area/ quarry area/	Construction	Monthly
7.	Pollution Monitoring	Construction	Quarterly- Except during spells of precipitation.
8.	Slope Stabilization Measures	Construction	Monthly
9.	Cleaning and Restoration on Demobilization	On completion of construction of road project	One Time

The contractor will take all reasonable steps to protect the environment on & off the project site and to avoid, minimize and mitigate impacts due to the project roads work activities creating pollution to environment and other causes as a consequence of methods of operations.

9.11. Budgetary Provision for EMP

Mitigation measures proposed in the EMP will be implemented by the Contractor and under the supervision/ monitoring by the PIU/TAQAC. The works to be undertaken by the contractor have been quantified and the quantities included in the respective BOQ items. The essentials of environmental health and safety measures to be followed by the contractor have been included in this EIA report as ann

The indicative split up of capital and recurring cost for the environmental management for the project is presented in following Table 9.6;

Table 9.6: Budgetary Allocation- Indicative Cost for EMP Implementation for Improvement & Up-gradation of Chiralla Link Road and Malaini to Chakrabatti Road in District Doda.

S. No.	Component	Item	Unit	Unit Cost (INR)	Quantity	Total Cost (INR)	Responsibility
A	**Pre-Construction Stage**						
1	Air	Baseline Monitoring Ambient Air Quality at 4 locations especially near sensitive receptors/ settlement sections	No.	7000/-	24 hr sample, One-time monitoring 2 Locations ($PM_{2.5}$, PM_{10}, SO_2 and NO_2) 4 samples	14000	PMU
2	Water	Surface Water Quality at 2 locations (Surface Water body- River Chenab and minor Stream at Malaini) 2 Ground Water/ Public Water Source	No.	5000/- 7000/-	Grab Samples at 2 Locations (pH, TSS, TDS, BOD, COD, Oil & Grease, Turbidity) 2 samples Parameters as per IS 10500:2012 2 samples	10000 14000	PMU PMU
3	Noise	Noise Measurements at 2 locations near sensitive receptors/ Settlement	No.	3000	Hourly measurements for 24 hours. 2 Samples	6000	PMU
B. Construction Stage							
4	Protection/ Safety- Trees	Reflective strips for safety.	Lump sum			10000	PMU/ Contractor
5	Air	Ambient Air Quality at 2 locations within construction zones and operational plants sites. (six-monthly except monsoon)	No.	7000/-	24 hr sample, One-time monitoring 2 Locations (Six monthly) ($PM_{2.5}$, PM_{10}, SO_2 and NO_2)	42000	PMU
6	Water	Surface Water Quality at 2 locations (six monthly)	No.	5000/-	Grab Samples at 2 Locations (pH, TSS, TDS, BOD, COD, Oil	30000	PMU

		2 Ground Water/ Public Water Sources (six monthly)		7000/-	& Grease, Turbidity) 6 samples Parameters as per IS 10500:2012	42000	PMU
7	Noise	Noise measurements at 2 locations near sensitive receptors/ Settlements within the construction zone (Quarterly)	No.	3000/-	Hourly measurements for 24 hours. 12 samples	36000	PMU
8	Air	Dust Suppression Measures	Part of the Civil Works Cost				
9	Labour camp and Ancillary Facilities	Labour Camp and all associated facilities as per EMP	Part of the Civil Works Cost				
10	First Aid Kits	First Aid Kits at the construction site, camp and ancillary sites	Part of the Civil Works Cost			-	
Project Enhancement by PMU-JTFRP							
11	Slope Stabilization	Tree plantation/ Grass engraining with indigenous shrubs, other bio-engineering measures	Lump Sum			1000000	PMU/ Contractor
C	**Operation Stage (Post Construction Monitoring)**						
12	Air	Ambient Air Quality at 2 locations near sensitive receptors	No.	7000/-	24 hourly sample, one-time monitoring (Post Construction) 2 samples	14000	
13	Noise	Noise Levels at 2 locations near sensitive receptors	No.	3000/-	One time monitoring (Post Evaluation) 2 Samples	6000	
14	Water	Surface Water Quality at 2 locations (River Chenab and Stream at Malaini)	No.	5000/-	Grab Samples at 2 Locations (pH, TSS, TDS, BOD, COD, Oil & Grease, Turbidity) 2 samples Parameters as per	10000	PMU

		2 Ground Water/ Public Water Source		7000/-	IS 10500:2012 2 samples	14000	PMU
Total Budget						**1248000**	
Rupees: Twevle Lac Forty Eight Thousand only.							

9.12. FORMATS FOR REPORTING

Formats for reporting/monitoring the progress/parameters achieved will be finalized by PIU/ TAQAC in consultation with the successful bidder.

9.13. ENVIRONMENTAL COMPLIANCE REPORT

The contractor shall submit a monthly progress report as per the reporting format approved by the PIU on the status of the implementation of the EMP. Environmental Compliance report will systematically contain a copy of regulatory permissions/consents/clearance, geo-referenced photographs with date and time for EMP/mitigation measures implementation, environmental monitoring report, accidents report, etc.

ANNEXURE-I: Environment and Social Screening Report Data Sheet
Component A: Chiralla Link Road(District: Doda, J&K)

Part A: General Information

1. Name of the sub-project	Improvement & Up-gradation of Chiralla Link Road in District Doda- 10.139 Km	
2. Type of proposed activity (tick the applicable option and provide details)		
• Road	√	Improvement & Upgradation of the existing road
• Bridge		-
• Fire Station		-
• Hospital/Health Facility		-
• Educational Institute		-
• Building for Livelihoods		-
• Flood Infrastructure Related		-
• Other Public Building		-.
• Any Other (Please Specify)		-
3. Location of the proposed sub-project		
• Name of the Region	Jammu (Jammu & Kashmir)	
• Name of the District	Doda	
• Name of the Block	Chiralla	
• Name of the Settlement	Thalella, Bhella, Bhalara	
• Latitude	Start point 33°7'33.57"N (at Chiralla) End point 33° 6'19.94"N (at Puneja)	
• Longitude	Start point 75°37'39.14"E (at Chiralla) End point 75°41'39.28"E (at Puneja)	
4a. Proposed Nature of Work (tick the applicable options)		
• Minor Repairs	-	
• Major Repairs/Rehabilitation	-	

• Upgrading/Major Improvement	√
• Expansion of the facility	-
• New Construction	-
• Any Other	-
4b. Size of the sub project (approx. area in sq. m/ha. or length in m/km, as relevant)	10.139 Km
5. Land Requirement (in ha./sq.mt.)	
• Total Requirement	The sub-project is improvement and upgradation of the existing road within its available RoW. Hence no land acquisition is envisaged.
• Private Land	Nil
• Govt. Land	Nil
• Forest Land	Nil
6. Implementing Agency Details (sub-project level)	
• Name of the Department/Agency	PIU-ERA (Jammu)
• Name of the contact person	Mr. Mohan Lal Thapa
• Designation	Project Manager (Transport).
• Contact Number	9419187368
• E-mail Id	contact@jkera.org
7. Screening Exercise Details	
• The date on which it was carried out	13th July, 2019
• Name of the Person	Akhter R. Bhat/ Diwalkar
• Contact Number	+91-7006543364; 8667726488
• E-mail Id	akhter_b@hotmail.com;vdhivakar@gmail.com

Part B (1): Environment Screening

Question	Yes	No	Details
1. Is the sub-project located in whole or part within 1 km of the following environmentally sensitive areas?			
a. Biosphere Reserve		No	-
b. National Park		No	-
c. Wildlife/Bird Sanctuary		No	-
d. Wildlife/Bird Reserve		No	-
e. Important Bird Areas (IBAs)		No	-
f. Habitat of migratory birds (outside protected areas)		No	-
g. Breeding/Foraging/Migratory route of Wild Animals (outside protected areas)		No	-
h. Area with threatened/rare/ endangered fauna (outside protected areas)		No	-
i. Area with threatened/rare/ endangered flora (outside protected areas)		No	
j. Reserved/Protected Forest		No	-
k. Other categories of Forest		No	
l. Wetland		No	
m. Natural Lakes		No	

n. Rivers/Streams	Yes		River Chenab is flowing within the 1km of Chiralla road (0+000- 1+350) at an average distance of 145 meters
Question	**Yes**	**No**	**Details**
o. Swamps/Mudflats		No	-
p. Zoological Park		No	-
q. Botanical Garden		No	-
2. Is the sub-project located in whole or part within 500 mts. of any of the following sensitive features?			
a. World Heritage Sites		No	-
b. Archaeological monuments/ sites (under ASI's central/state list)		No	-
c. Historic Places/Monuments/ Buildings/Other Assets (not listed under ASI list but considered locally important or carry a sentimental value)		No	-
d. Religious Places (regionally or locally important)		No	-
e. Reservoirs/Dams		No	-
f. Canals		No	-
g. Public Water Supply Areas from Rivers/ Surface Water Bodies/ Ground Water Sources		No	-
3. What is the High Flood Level in the sub-project area?	-		
4. Is any scheduled/protected tree-like Chinar, Mulberry or Deodar likely to be affected/ cut due to the project?		No	

5. Is the sub-project located in a landslide/heavy erosion-prone area or affected by such a problem?		No	
6. Is sub-project located in an area that faces water paucity or water quality issues?		No	

Part B (2): Result/Outcome of Environmental Screening Exercise

1.	Environment Impact Assessment Required	No
2.	Environment Clearance Required	No
3.	Forest land Clearance/Diversion Required	No
4.	Tree Cutting Permission Required	No
5.	ASI (Centre/State) Permission Required	No
6.	Permission from ULB/Local Body/Department Required	No
7.	Any other clearance/permission required	Yes, consent to establish and consent to operate for the stone crusher plant, Hot mix plant, etc, if established by the contractor, may require to be obtained by the contractor prior to the start of the work.

Part C (1): Social Screening

1. Does the sub-project activity require the acquisition of land?			
Yes		No	√
Give the following details:	Private Land (sq. m / ha.)		Nil
	Govt. Land (sq. m / ha.)		Nil
	Forest Land (sq. m / ha.)		Nil
2. Does the proposed sub-project activity result in demolition/removal of existing structures?			

Yes		No	√
If so, give the following details:			
• Number of public structures/buildings		Nil	
• Number of common property resources (such as religious/cultural/ drinking water/wells/etc.)		Nil	
• Number of private structures (located on private or public land)		Nil	
3. Does the proposed project activity result in loss of crops/trees?			
Yes		No	√
4. Does the proposed Project activity result in the loss of direct livelihood/ employment?			
Yes		No	√
5. Does the proposed activity result in loss of community forest/pastures on which nearby residents/local population are dependent?			
Yes		No	√
If yes, give the details of the extent of the area to be lost (in acres/ha).		-	
6. Does the proposed Project activity affect scheduled tribe/caste communities?			
Yes		No	√

Part C (2): Result/Outcome of Social Screening Exercise

S.No.	Result/Outcome	Outcome
1.	Answer to all the questions is 'No' and only forest land is being acquired	No SIA/RAP required
2.	Answer to any question is 'Yes' and the sub-project does not affect more than 200 people (i.e. either complete or partial loss of assets and/or livelihood)	No Abbreviated RAP is required
3.	Answer to any question is 'Yes' and the sub-project affects more than 200 people *(i.e. either complete or partial loss of assets and/or livelihood)*	No SIA/RAP Required

ANNEXURE-II: Environment and Social Screening Report-Data Sheets
Component B: Malaini to Chakrabatti Road (District: Doda, J&K)

Part A: General Information

4. Name of the sub-project	Improvement & Up-gradation of Malaini to Chakrabatti Road in District Doda- 10.059 Km	
5. Type of proposed activity (tick the applicable option and provide details)		
• Road	√	
• Bridge		-
• Fire Station		-
• Hospital/Health Facility		-
• Educational Institute		-
• Building for Livelihoods		-
• Flood Infrastructure Related		-
• Other Public Building		-.
• Any Other (Please Specify)		-
6. Location of the proposed sub-project		
• Name of the Region	Jammu (Jammu & Kashmir)	
• Name of the District	Doda	
• Name of the Block	Bhaderwah	
• Name of the Settlement	Malaini, Berraru, Jahnana, Dranga, Pendku, Mehrada	
• Latitude	33° 5'31.95"N (At Malaini) 33° 5'56.10"N (At Chakrabatti)	
• Longitude	75°35'16.95"E (At Malaini) 75°36'4.38"E (At Chakrabatti)	
4a. Proposed Nature of Work (tick the applicable options)		
• Minor Repairs	-	
• Major Repairs/Rehabilitation	-	

• Upgrading/Major Improvement	√
• Expansion of the facility	-
• New Construction	-
• Any Other	-
4b. Size of the sub project (approx. area in sq. m/ha. or length in m/km, as relevant)	10.059 Km
8. Land Requirement (in ha./sq.mt.)	
• Total Requirement	Nil
• Private Land	Nil
• Govt. Land	Nil
• Forest Land	Nil
9. Implementing Agency Details (sub-project level)	
• Name of the Department/Agency	PIU-ERA (Jammu)
• Name of the contact person	Mr. Mohan Lal Thapa
• Designation	Project Manager (Transport)
• Contact Number	9419187368
• E-mail Id	contact@jkera.org
10. Screening Exercise Details	
• The date on which it was carried out	15th July, 2019
• Name of the Person	Akhter R. Bhat/ Diwalkar
• Contact Number	+91-7006543364; 8667726488
• E-mail Id	akhter_b@hotmail.com;vdhivakar@gmail.com

Part B (1): Environment Screening

Question	Yes	No	Details
7. Is the sub-project located in whole or part within 1 km of the following environmentally sensitive areas?			
a. Biosphere Reserve		No	-
b. National Park		No	-
c. Wildlife/Bird Sanctuary		No	-
d. Wildlife/Bird Reserve		No	-
e. Important Bird Areas (IBAs)		No	-
f. Habitat of migratory birds (outside protected areas)		No	-
g. Breeding/Foraging/Migratory route of Wild Animals (outside protected areas)		No	-
h. Area with threatened/rare/ endangered fauna (outside protected areas)		No	-
i. Area with threatened/rare/ endangered flora (outside protected areas)		No	
j. Reserved/Protected Forest		No	-
k. Other categories of Forest		No	
l. Wetland		No	
m. Natural Lakes		No	
n. Rivers/Streams	Yes		Stream is flowing within 1 km from the proposed road at Malaini (Ch 0+310).

Question	Yes	No	Details
o. Swamps/Mudflats		No	-
p. Zoological Park		No	-
q. Botanical Garden		No	
1. **Is the sub-project located in whole or part within 500 mts. of any of the following sensitive features?**			
a. World Heritage Sites		No	-
b. Archaeological monuments/ sites (under ASI's central/state list)		No	-
c. Historic Places/Monuments/ Buildings/Other Assets (not listed under ASI list but considered locally important or carry a sentimental value)		No	-
d. Religious Places (regionally or locally important)		No	-
e. Reservoirs/Dams		No	-
f. Canals		No	-
g. Public Water Supply Areas from Rivers/ Surface Water Bodies/ Ground Water Sources		No	-
2. What is the High Flood Level in the sub-project area?	-		
3. Is any scheduled/protected tree-like Chinar, Mulberry or Deodar likely to be affected/ cut due to the project?		No	
4. Is the sub-project located in a landslide/heavy erosion-prone area or affected by such a problem?		No	

5. Is sub-project located in an area that faces water paucity or water quality issues?		No	

Part B (2): Result/Outcome of Environmental Screening Exercise

1.	Environment Impact Assessment Required	No
2.	Environment Clearance Required	No
3.	Forest land Clearance/Diversion Required	No
4.	Tree Cutting Permission Required	No
5.	ASI (Centre/State) Permission Required	No
6.	Permission from ULB/Local Body/Department Required	No
7.	Any other clearance/permission required	Consent to Establish (CTE) and Consent to Operate (CTO) from SPCB will be required for Hot mix Plants, Wet Mix Plants, Stone Crushers, PUC's and other fitness certificates of equipment etc.

Part C (1): Social Screening

3. Does the sub-project activity require the acquisition of land?			
Yes		No	√
Give the following details:	Private Land (sq. m / ha.)		Nil
	Govt. Land (sq. m / ha.)		Nil
	Forest Land (sq. m / ha.)		Nil

4. Does the proposed sub-project activity result in demolition/removal of existing structures?			
Yes		No	√
If so, give the following details:			
• Number of public structures/buildings		Nil	

• Number of common property resources (such as religious/cultural/ drinking water/wells/etc.)		Nil	
• Number of private structures (located on private or public land)		Nil	
7. Does the proposed project activity result in loss of crops/trees?			
Yes		No	√
8. Does the proposed Project activity result in the loss of direct livelihood/ employment?			
Yes		No	√
9. Does the proposed activity result in loss of community forest/pastures on which nearby residents/local population are dependent?			
Yes		No	√
If yes, give the details of the extent of the area to be lost (in acres/ha).		-	
10. Does the proposed Project activity affect scheduled tribe/caste communities?			
Yes		No	√

Part C (2): Result/Outcome of Social Screening Exercise

S.No.	Result/Outcome	Outcome
4.	Answer to all the questions is 'No' and only forest land is being acquired	No SIA/RAP required
5.	Answer to any question is 'Yes' and the sub-project does not affect more than 200 people (i.e. either complete or partial loss of assets and/or livelihood)	No Abbreviated RAP is required
6.	Answer to any question is 'Yes' and the sub-project affects more than 200 people *(i.e. either complete or partial loss of assets and/or livelihood)*	No SIA/RAP Required

ANNEXURE-III: Photographs Showing Existing Condition of Package-4 Roads
Component A: Improvement & Upgradation of Chiralla Link Road

Condition of Road at Ch-0.00 km

View of Terrain near Ch-0.00 km

Army Camp from Ch 0.00-0.700 km

Poor Road Condition at Ch 1.000 km

Condition of Road

At Ch 1.500 Km

Land slide area at Chainage 1.800 Km

Causeway with Sliding Area at Ch 2.250 Km

Village Thalella at Ch 3.000 Km

Army Camp and Army Hopital starts at Ch 3.500 Km Ch 4.000 Km

Poor road condidtion at Ch 3.800 Km

The project road diverts at Ch 3.900 Km RHS

Condition of Road at Ch 5.1 km

Photos show the trees close to the shoulder at Ch 5.400 Km

Land slide area at Ch 6.000 Km

Land slide area at Ch 6.100 Km

Trees close to the shoulder at Ch 7.000 Km

End Point, PMGSY Road Start at Ch 9.400 Km (Puneja Villa

Component B: Improvement & Upgradation of Malaini to Chakrabatti Road

Handpump at Ch 0.00 km

Condition of Existing Road

Mosque at Ch 0.100 km RHS

Condition of Road at Ch 0.0150 Km

Land Slide Area at Ch 0.0150 km

Condition of Road at Ch 0.200 Km

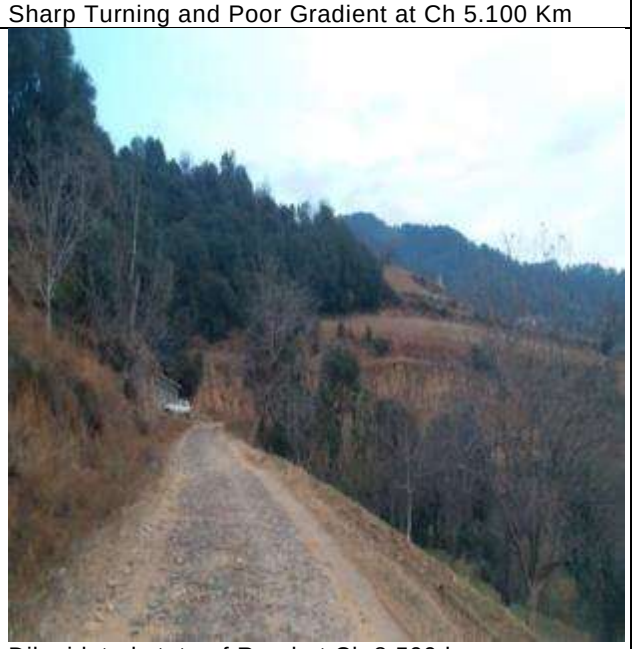
Land Slide area at Ch 1.100 Km

Sub Center at Berraru Ch 1.800 Km LHS

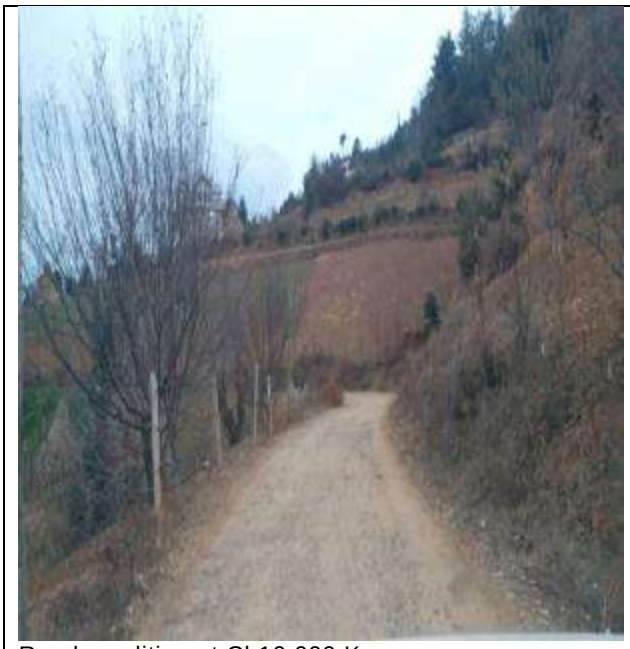
Land Slide area at Ch 2.400 Km LHS

Sharp Turning and Poor Gradient at Ch 5.100 Km

Sharp Turning and Poor Gradient at Ch 6.100 Km



Dilapidated state of Road at Ch 8.500 km

	
Road condition at Ch10.000 Km	End Point Chainage-10.3 km

ANNEXURE IV: Public Consultation/ Meeting Photographs of Package-4 Roads

Public consultation at Thalella Village, Doda

Consultation with staff of Govt Hr. sec. School, Bhella

Consultation with Residents of Malaini Village

Public Consultation at Barrare Village, Doda

Consultation with Residents of Barrare Village

APPENDIX V: List of consulted participants and their signatures during consultation with the residents of Thalella and Bhella areas of proposed project Chiralla Link Road & Malaini CHakrabatti road in Doda District

Public Consultation Attendance Sheet

Date: 15/9/2019

Name of Village: Thalela

Name of the Road: Chiralla Link Road.

Sr. No	Name of person	Contact No	Signature	Remarks
1.	Rahul Sharma	9419125690		
2.	Sham Lal	9858123457		
3.	Mohit	7006547779		
4.	Sohan	9419153079		
5.	Najam Din	9797365382		
6.	Imtiyaz Ahmed	9596980529		
7.	Ram Rattan	9797443261		
8	[illegible]	9596691539		
9.	Raj Kumar	9906112077		
10	Banesi Lal	9622150041		
11.	Balvir Singh	9797504856		
12	Ravi Kumar	9622102516		
13.	Devinder Singh	9906001185		
14	Md. Yusuf	9626669473		Sonpanch

Public Consultation Attendance Sheet

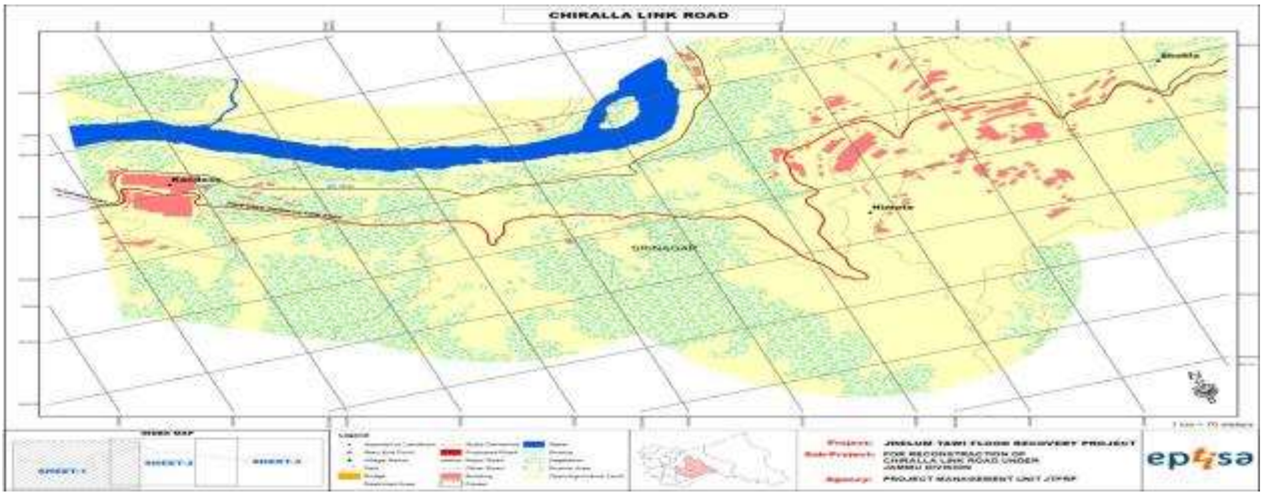
Date: 15/7/2019

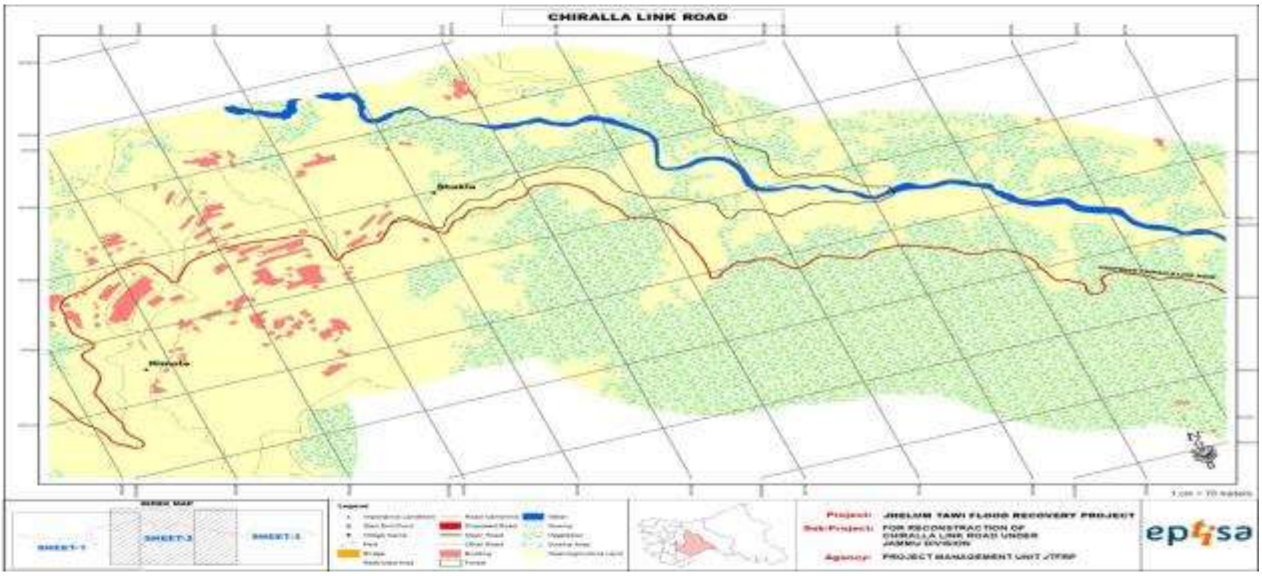
Name of Village: Berarre

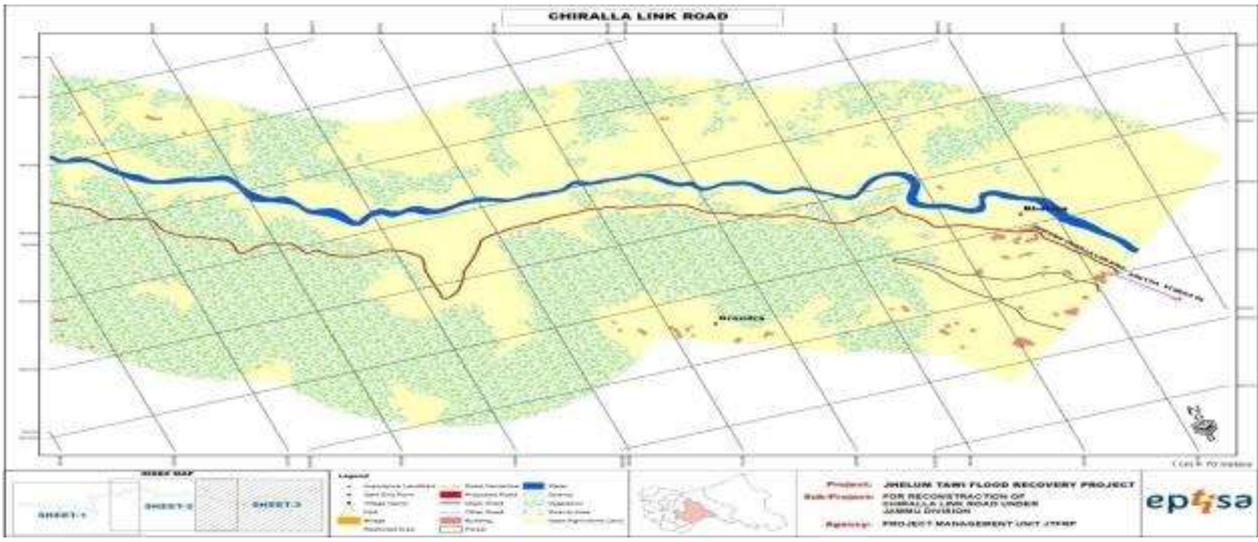
Name of the Road: Malaini to Chakrabarti

Sr. No	Name of person	Contact No	Signature	Remarks
1	Imtiyaz Ahmed	8803347420	[signature]	
2	Shabir Ahmed	7298049553676	[signature]	
3	Mohinder Singh	[illegible]	[signature]	
4	Halima begum	979723649	[signature]	
5	Husma begum	982653614	[signature]	
6	Mahraj Din	—	Mahraj	
7	Shamush Din	—	[signature]	
8	Nazar Ahmed	—	[signature]	
9	Sanjeet Singh	—	[signature]	
10	Hans Raj	—	[signature]	
11	Aniketa Sharma		Anilen	
12	Lakh Raj		Lakil Raj	
13	Vinat Kumar		Vkumar	
14	Vijay Manhas	9697914193	[signature]	
15	Hans Raj Verma	9906386683	[signature]	
16	Mohd Iqbal Baray	9682573358	[signature]	

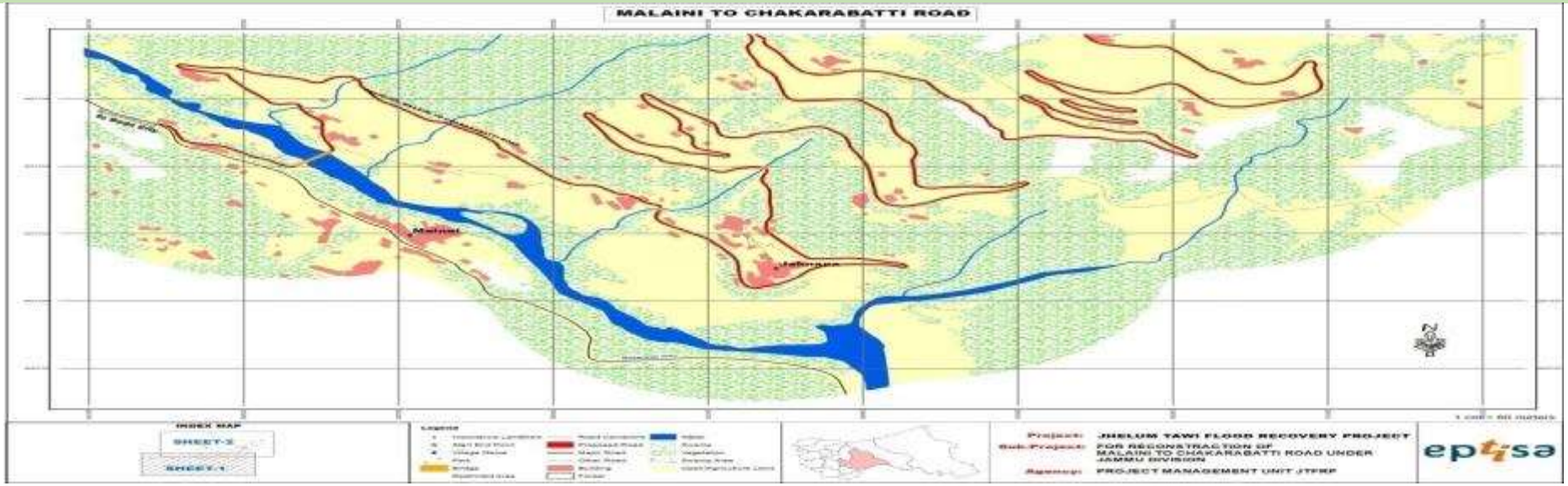
ANNEXURE-VI: GIS/LULC Maps of the Proposed Sub-project of Improvement & Up-Gradation of Chiralla Link Road in District Doda

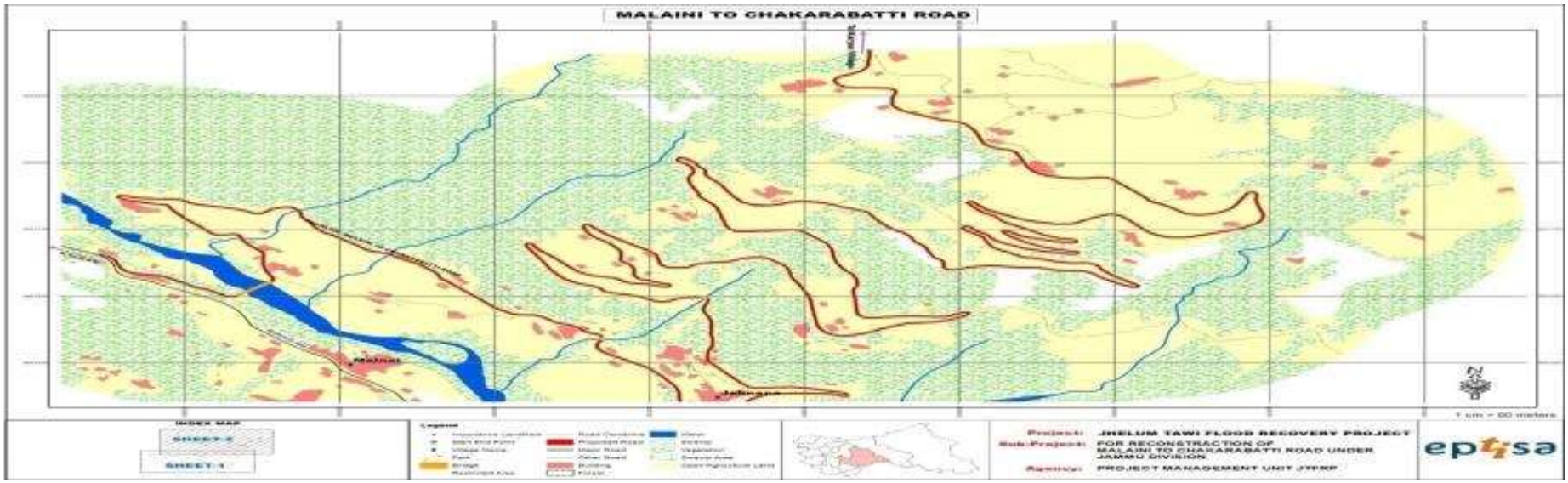






ANNEXURE-VII: GIS/LULC Maps of the Proposed Sub-project of Improvement & Up-Gradation of Malaini to Chakrabatti Road in District Doda





ANNEXURE VIII: Guidelines For Siting, Management And Redevelopment of Labour Camp

A. Overview

Labour camp includes accommodation for workers/labourers along with other basic amenities such as kitchen, potable water supply, sanitation (toilets, bathrooms, washing areas and water supply for such needs), first aid room as well as garbage collection and disposal facility. The guidelines outlined here aims to facilitate the contractor in implementing the measures in the EMP thereby reducing the impact on the environment.

B. Criteria for Locating the Site

To the extent possible, fertile lands shall be avoided for locating the camp site.

C. Finalization of Selected Site

After identification of the site, the Contractor should fill-up the prescribed reporting format provided in EMP as annexure and submit the same for approval to the Environmental Expert of PIU. The selected site shall be approved by Environmental Expert of PIU, after considering the compliance. No agreements or payments shall be made to the landowner/s before receipt of written approval from the Environmental Expert of PIU. Any consequence of rejection before the approval shall be the responsibility of the Contractor and shall be restored at his own cost. After obtaining written approval from the Environmental Expert of PIU for the selected site, the Contractor has to agree with the landowner to obtain his/her consent before commencing any operation/activities in the land. The agreement should also mention its type, duration, amount and mode of payment as well as the preferences of the owner regarding site maintenance and redevelopment.

D. Designing And Setting Up of Labour Camp

The following facilities should be provided in a labour camp to ensure safe, clean and hygienic accommodation for the workers.

(i) **Site preparation**: The site should be graded and rendered free from depressions such that the water does not get stagnant anywhere. Fencing should be constructed all around the camp to prevent the trespassing of humans and animals. The approved layout plan should be strictly adhered to while setting up the camp.

(ii) **Accommodation**: Contractor will follow all relevant provisions of the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp. The height of the worker's and labour accommodation shall not be less than 3m from floor level to the lowest part of the roof. The camp shall be floored with concrete, shall be kept clean, with proper cross-ventilation, and the space provided shall be based on one sqm per head or as per the relevant regulation, whichever is higher. Fire and electrical safety precautions shall be adhered to. Cooking, sanitation and washing areas shall be provided separately. The contractor will maintain necessary living accommodation and ancillary facilities (including the provision of clean fuel to prevent damage to forests and to prevent fuelwood cutting and burning by labour) functionally and hygienically. The site must be graded and rendered free from depressions such that water does not get stagnant anywhere. The entire boundary of the site should be fenced all around with barbed wire to prevent the trespassing of humans and animals.

(iii) **Drinking-Water**: The Contractor should provide potable water within the precincts of every workplace in a cool and shaded area, which is easily accessible as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. All potable water storage facilities will be on a safely raised platform that is at least 1m above the surrounding ground level. Such facilities shall be regularly maintained from health and hygiene point of view. If necessary, water purifier unit shall be installed for providing potable water.

(iv) **Sanitation Facilities**: Adequate nos. of toilets shall be provided separately for males and females (depending on their strength), with markings for identification in vernacular language. All such facilities must have an adequate water supply with proper drainage and disposal facility. They shall be maintained, cleaned and disinfected daily using proper disinfectants. Location and design of soak pit should be in such a way that it doesn't pollute the groundwater. Drains and ditches should be treated with bleaching powder regularly. The sewage system for the camp must be properly designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place.

Portable toilets may be brought to use at the construction site and the night soil from such units has to be disposed of through designated septic tanks to prevent pollution of the surrounding areas. In the main camp, no night soil or sewerage shall be disposed of at any place other than the septic tanks constructed at the site. All these facilities shall be inspected weekly to check the hygiene standards.

(v) **Waste Disposal**: The Contractor should provide garbage bins in the camp and ensure that these are regularly emptied and disposed off hygienically. No incineration or burning of wastes shall be carried out by the Contractor. Separate bins shall be provided for biodegradable and non-biodegradable wastes. The disposal of kitchen waste and other biodegradable matter shall be carried out in pits covered with a layer of earth within the campsite. Discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipe scrubber and polyurethane foam, automobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or sold /given out for recycling.

(vi) **Day Crèche Facility**: At the construction site, provision of a day crèche shall be made to enable women to leave behind their children while going to work. At least one attendant shall be provided to take care of the children at the crèche. At construction site where 20 or more women are employed, there shall be at least one shelter for use of children under the age of 6 years belonging to such women.

Shelters shall not be constructed to a standard lower than that of a thatched roof, mud walls and floor with wooden planks spread over mud floor and covered with matting. Such areas shall be safely barricaded (no sharp sheets or barbed wires that may injure a child) from the rest of the camp for the safety of children. Shelters shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision to keep the place clean. The size of a crèche may vary according to the number of children on a campsite.

(vii) **Mess and Kitchen Facilities**: The Contractor shall adhere to the sanitary/hygiene requirements of local medical, health and municipal authorities at all times. Adoption of such precautions as may be necessary to prevent soil and water pollution at the site while operating mess or kitchen facilities.

(viii) First Aid Facilities: At every workplace, a readily available first-aid unit including an adequate supply of sterilized dressing materials and appliances should be provided. Suitable transport should be provided to facilitate taking injured and ill persons to the nearest hospital. Adequate personal protective equipment and fire fighting equipment as detailed out in EMP should be made available in the camp and provided to the staff/workers.

(ix) Health Care Facilities: Health problems of the workers should be taken care of by providing basic health care facilities. If there is no hospital or clinic, which can be accessed in half an hour, then a temporary health centre should be set up for the construction camp. The health centre should have at least a doctor and a nurse, duty staff, medicines and minimum medical facilities to tackle first aid requirements or minor accidental cases, linkage with nearest higher-order hospital to refer patients of major illnesses or critical cases.

The health centre should carry out quarterly awareness programme of HIV – AIDS with the help of AIDS control society as well as about community living and hygiene practices in day to day living. Posters should be exhibited in the health care clinic.

E. Operation of Labour Camp

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

F. Preparation of Labour Camp Management And Re-development Plan

After the site for the labour camp has been finalized and approved by Environmental Expert of PIU, the Contractor should prepare a labour camp management and redevelopment plan to be submitted to PIU for approval before setting up of the camp and it should comprise the following details:

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

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

Section-3: Arrangements/ facilities within the camp: List of facilities to be provided along with its details like area, no of people to be accommodated and a layout plan showing the plan of the site with all the facilities planned like quarters, labour camp, mess, common facilities, toilet facilities, etc.

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

Section-5: Other details: Any other relevant detail like a list of awareness camp to be provided to workers, details of information dissemination etc. should be included.

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

Section-7: Annexure-(a) Working drawings: Electrical plan showing the electrical network planned for the site, location of generators, master switchboards etc. and plumbing drawing showing the network of water supply lines, water tank, drainage facilities etc. (b) Copy of permissions obtained from local governing body/community etc. as applicable, (c) Copy of agreement entered with the site owner, in case of leased out the site.

All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The labour camp management plan should be submitted to the Environmental Expert of PIU for written approval before any physical work is undertaken on a particular site. The Environmental Expert of PIU will carefully examine the proposals in light of the various EMP and regulatory provisions and provide suggestions, as necessary to the Contractor who shall incorporate it in the management plan. Contractor shall be responsible for the satisfactory and timely implementation of these EMP requirements.

G. Re-development of The Labour Camp

The Contractor should clear all temporary structures; dispose of all building debris, garbage, night soils and any other waste as per the approved debris management plan. All disposal pits or trenches should be filled in, disinfected and effectively sealed off. The entire camp area should be left clean and tidy, in a manner keeping the adjacent lands neat and clear, at the Contractor's expense, to the entire satisfaction of landowner and the Environmental Expert of PIU.

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

- Copy of approved site identification report
- Photographs of the concerned site 'before' and 'after' setting up the camp.
- Certificate from the owner stating his/her satisfaction about the status of re-development of the site.

Engineer-in-charge/Environmental Specialist of PIU shall ensure, through site verification that all clean-up and restoration operations are completed satisfactorily and a written approval should be given to the Contractor mentioning the same before the 'works completion' certificate is issued/recommended. The PIU shall ensure thorough site inspection that the Contractor has restored the site properly & completely. The site can then be handed over to the concerned owner or local bodies or for local communities as the case may be. Certification/documentation about approval for clean-up and restoration operations and thereafter handing-over to the owner shall be properly maintained by the Contractor.

ANNEXURE IX: Guidelines To Ensure Worker's Safety During Construction

To ensure worker's safety while undertaking various operations/stages of construction many safety measures need to be followed, which are listed down below:

A. Labour Camp/ Site Office

- Install perimeter fencing.
- Ensure good visibility and safe access at site entrances.
- Provide adequate warning signs at the entrance and exit, as necessary.
- Provide adequate space/area for loading and unloading, storage of materials, equipment and machinery.
- Display emergency procedure and statutory notices at conspicuous locations.
- Provide areas for collecting garbage and other waste material, and also arrange for their regular/periodic disposal.
- Arrange appropriate storage, transportation and use of fuel, other flammable materials and explosives in line with the license requirements obtained from concerned authorities.
- Provide defined access roads and movement areas within the site.
- Ensure availability of first aid facilities and display notices at various workplaces showing the location of first aid facilities and emergency contact numbers. Provide and enforce the use of PPE at construction sites.

B. House Keeping Practices

- Provide proper slope in kitchen, canteens, washrooms, toilets and bathrooms for easy and immediate draining of water.
- Keep all walkways and circulation areas clear and unobstructed at all times.
- Ensure that spillages of oil and grease are avoided and in case of accidental spills, these are immediately collected.
- Use metal bins for the collection of oily and greasy rags.
- Do not leave tools on the floor or in any location where they can be easily dislodged.
- Keep windows and light fittings clean.
- Maintain the workplace floors dry and in a non-slippery condition
- Provide and maintain proper drainage system to prevent waterlogging and unhygienic conditions.
- Ensure that protruding nails in boards or walls are moved or bent over or removed so that they do not constitute a hazard to people.
- Store all flammable materials like HSD in an appropriate container with proper cover and labels – as required for various products.
- Display 'no smoking' signs in areas with high risks of fire, (*eg.* near fuelling areas, diesel/oils/lubricant/paint storage area, Hessians (Convases), rubber, wood and plastic etc.) in and around working area.

C. Safety During Excavation

- During the excavation of foundations, necessary safety measures will be taken by the contractor.

- Excavation of 1.5 meters deep or greater require a sides protection unless the excavation is made entirely in stable rock
- Safe access and egress will be required including ladders, steps, ramps, or other safe means of exit of workers in the excavated depth of 4 feet (1.22 meters) or deeper
- Excavated earth will be collected and disposed of in pre-identified site with the approval of PIU.
- To ensure the elimination of excavation hazards, excavation will be carried in the presence of a competent person.
- Suitable barricading will be provided

D. Handling of Cement Bags

- Cement bags will be stored and emptied in a covered area to control fugitive dust emissions.
- While handling and emptying cement bags, workers will wear a mask and goggle and hand gloves.
- Manual transferring of cement bags from one place to another place will not be allowed. For this purpose, a trolley will be used.

E. Steel Bars Reinforcement for Foundation and Roof

- Manual cutting of steel bars for reinforcement will be discouraged
- Only skilled workers will be deployed by the contractor for steel bar bending and rebaring reinforced structures.
- Correct hand and power tools will be used to tie and cut steel bars.
- Workers engaged in steel bar bending and reinforcement will be provided helmet, suitably strong and flexible leather gloves and safety shoes.
- Workers will take extra caution and attention when walking on steel bar mattes and areas that contain exposed steel bar.
- First aid facilities will be provided at the site to provide first aid in case of cuts or injuries to workers. After providing first aid, the injured worker will be taken to the hospital for further treatment.

F. Operation of Trucks And Dumpers

- Ensure that only trained, authorized and licensed drivers operate the vehicles.
- Enlist the help of another worker before reversing the vehicle.
- Switch off the engine when not in use to save fuel, prevent accidents and unnecessary noise and air pollution.
- Lower the tipping bodies when the machine is unattended, but if it is necessary to leave them in the raised position they should be blocked to prevent their fall by fixing a sturdy support below.
- Carry out periodic servicing as per the manufacturer's requirements. All records of maintenance and repairs should be in writing and available for verification.
- Keep the vehicle tidy and the cabin free from clumsy utilities, which might obstruct the controls and create hazards.

- Avoid carrying additional passengers in the cabin or on the body of the dumper, while in field operation other than the connected workers.
- Provide stop blocks when the vehicle is tipping into or running alongside excavations or when it is parked.
- Do not overload the vehicle.
- Carry only well-secured loads and use proper covers and fasteners.

G. Manual Handling and Lifting

- Avoid manual handling of heavy materials.
- Pre-assess the actual requirement of manpower in case of emergencies.
- All concerned persons shall be trained in proper methods of lifting and carrying.
- In all manual operations where groups of workers are involved, a team leader with the necessary training to handle the entire workforce in unison has to be provided for.
- Watch and ward to control/supervise/guide movement of equipments and machinery, loading and unloading operations, the stability of the stockpiled materials and irregularly shaped objects have to be provided for safety and security of workers.
- Carriageway used by the workers must be free from objects.
- Loading and unloading from vehicles shall be under strict supervision.

H. Electrical Hazards

- Statutory warning leaflets/posters are to be distributed/displayed by the Contractor in the vicinity of the work site for the benefit of all workers, officers and supervisors as well as the public, indicating the do's and don'ts and warning related to electrical hazards associated with operations to be executed/in progress.
- All wires shall be treated as live wires.
- Report about dangling wires to the site-in-charge and do not touch them.
- Only a qualified electrician should attempt electrical repairs.
- Train all workers about electrical safety.
- Shut down the equipment that is sparking or getting overheated or emitting smoke at the time of operation, if it is not the normal way of working of such machines.
- Inform technical person/s for required maintenance.
- Never use damaged wires for electrical connection.

I. Use And Storage of Flammable Gas

- A store filled gas/LPG cylinder in a secure area – mark this as a no-smoking area.
- Transport, store, use and secure cylinders in an upright position.
- Ensure proper ventilation at the ground level in locations where LPG is in use.
- Avoid physical damage to the cylinders.
- Never weld near the cylinder.
- Store empty cylinders secured and upright.
- Make sure that the cylinder is closed immediately after use.

- Investigate immediately if there is the smell of LPG or gas.
- Never use destined gas/LPG on site.
- Make sure that there is no other unrelated fire in the vicinity of the cylinder.

J. Gas Welding

The welders and welding unit should follow all the basic principles of welding for safety and security:

- Use face shield to protect the eyes.
- Use goggles, particularly when chipping slag and cutting strips.
- Use gloves long enough to protect wrists and forearms against heat, sparks, molten metal and radiation hazards.
- Use high-top boots/gumboots to prevent sparks, splinters, sharp edges of metal and hot welded strips, welding rods, electric cables etc. from injuring the legs.
- Avoid inhaling the noxious fumes and gasses from burning electrodes by using gas masks and screen of the work area to prevent the glair from moving outside it.
- Keep the key hung from the regulator control for split seconds operations to stop the valve in case of any accidental damage or leakage to supply pipeline that may catch fire and cause accidents in case Acetylene or LPG cylinder.
- The welding area should have sufficient openings with fixed exhaust ventilators or adequate airflow openings to remove poisonous fumes and gases.
- Take precautions of wearing hard hats or fibre helmets to prevent injury due to fall of any object and accidental injury from projections while welding.
- Welders operating above ground should have adequate safety belt secured to a stable platform to prevent accidental fall or injury from the scaffold. All electrical and gas connection lines up to the welder should be sufficiently insulated and protected from sharp edges and sharp objects. These shall not come into contact with hot metal.
- Do not use gas cylinders for supporting work or as rollers.
- While using LPG cylinders for welding, follow all safety precautions as has been prescribed by the supplier company.
- Avoid fire hazards and accidents by posting safety supervisors to oversee the activities of workers.
- Do not store explosives, high inflammable materials, loose hanging overhead objects, hot welded strips etc. near gas cylinders.
- Close all valves, switches and circuits while leaving the workplace under proper lock and key. In the case of mobile units, proper carriage procedures have to be followed for the safety and security of men and materials.

K. Fire Safety Practices

- Store flammable material in proper areas having adequate fire protection systems.
- Display sufficient warning signs.
- Install fire alarm wherever required and test regularly.
- Inspect fire extinguishers regularly and replace as necessary.
- Train selected personal on the use of fire extinguishers

- Fire escape route should be kept clear at all times and indicated
- Display escape route maps prominently on each side.
- Provide sufficient exit signs at prominent locations for directing people to escape staircases and routes.
- Train workers about the escape route and assembly point/s.
- Carry out fire drill periodically.

L. Noise Hazards And its Control

- Plan camp layout in a manner that ensures barriers/buffers between residential/ office units and high noise generating zones.
- Use sound meters to measure the level of noise and if it exceeds 75 dB(A), then ensure preventive measures.
- Make personnel aware of noisy areas by using suitable warning signs and insist on the use of ear protectors/earplugs to prevent excess noise affecting the workmen.
- Reduce noise at source by use of improved equipments; regular and proper maintenance of the machinery as per the manufacturer's manual; by replacing rickety and noisy equipments and machinery. Screening locations with noise absorbing material; making changes in the process/equipment; controlling machine speeds; ensuring that two noise-generating machines are not running at the same time close to each other at the same location; using cutting oils and hydraulic noise breakers; providing vibration and noise absorbing platform and firm embedding of equipments with fasteners.
- Appoint a competent person to carry out a detailed noise assessment of the site; designate ear protection zone/s; give training/instructions on the necessary precautionary measures to be observed by site personnel including using a suitable type of ear protection equipments.

M. Personal Protective Equipment

General

- Provision of personal protective equipment has to be made over and above all measures taken for removing or controlling safety hazards on a worksite.
- Ensure that sufficient personal protective equipments are provided and that they are readily available for every person who may need to use them.
- The Contractor's Project Manager shall ensure that all persons make full and proper use of the personal protective equipment provided.
- Provide instruction/s and training for the proper use and care of personal protective equipment.
- Ensure that the personal protective equipments are in good condition.
- Train workers to report unintentional damages for replacement and to always keep the personal protective equipment clean.
- PPE includes, but may not be limited to, hard hats, goggles, earplugs, gloves, air filters/masks, boots, ropes etc.

Head Protection

- Hard hats are compulsory for all workers, supervisors and managers/officials while working and/or inspecting a work site.
- Hard hat areas shall be demarcated clearly.

Hearing Protection

- Provide earplugs or earmuffs to the workers and to those who need to get in and out of a high noise area frequently. Use re-usable earplugs when the reduction required (15-25 dBA) is not excessive. Use earmuffs where a large attenuation of up to 40 dBA is demanded.
- Do not use dry cotton wool for hearing protection because it doesn't provide any such protection.
- Provide disposable earplugs for infrequent visitors and ensure that these are never re-used.
- Replenish earplugs from time to time for those who need to work continuously for a long period in a high noise area/s.
- Use ear muffs with replaceable ear cushions because they deteriorate with age or may be damaged in use.
- Avoid wearing spectacles with earmuffs.
- Use soap and water or the recommended solvent for cleaning ear muffs.

Respiratory (Protective) Equipment

- Wear a suitable mask for protection when there is a potential for small particles entering the lungs, e.g. emptying of cement bags, etc.
- Provide training to all persons using the masks/respirators for their correct fitting, use, limitations and symptoms of exposure.
- Clean and inspect all respirators before and after use.
- Store respirators properly when not in use.

Safety Footwear

- Wear suitable footwear for work
- Use safety footwear on-site or in other dangerous areas.
- Wear suitable safety shoes or ankle boots when working anywhere where there is a high risk of foot injuries from slippery or uneven ground, sharp objects, falling objects etc.
- All safety footwear, including safety shoes, ankle boots and rubber boots, should be fitted with steel toecaps.
- Avoid wearing flip flops, high heeled shoes, slippers, light sport shoes in situations where there is a risk of a foot injury.
- Keep shoelace knots tight.

Hand Protection

- Wear suitable gloves for selected activities such as welding, bending steel bars, cutting and manual handling of materials and equipment.

- Do not wear gloves where there is a risk of them becoming entangled in moving parts of machinery.
- Wash hands properly with disinfectant soap and clean water before drinking or eating.
- Wash hands immediately after each operation on-site when the situation warrants.

N. First Aid

- Provide first aid boxes at every worksite in a cool and shaded place.
- Ensure that training on the use of the first aid box is provided to at least every supervisor on the site.
- Display the list of persons along with their contact numbers who are trained on providing first aid.
- Ensure that every first aid box is marked "First Aid" in English and the local language.
- Check for expiry dates and replace the contents, as necessary.
- Maintain a register on health records including injuries/accidents.

O. Reporting of Accident and Investigations

- Any accident at the site will be reported.
- Carry out the investigation as quickly as possible.
- An investigation should be carried out both internally as well as through the third party.
- Conduct interviews with as many witnesses as necessary including the affected persons and supervising officials.
- Do not rely on anyone/limited source of evidence.
- Check all the logbooks, stock registers, issue registers, movement registers on site
- After completion of the investigation/enquiry, a summary of the facts recorded, the sequence of happenings, persons-in-charge, persons examined, equipments and machinery tested, follow-up of action as per legal requirements, copy of station diary entry, hospital entry, safety regulations etc. to be prepared with a comparative analysis for proper assessment.

ANNEXURE X: Reporting Format For Camp Site

S.No	Project Details			Date of reporting
1.	Name of the project			
2.	Name and address of the Contractor			
3.	Contract date and duration			
B	**Site Details**			
1.	Place Name		Landmark	
2.	Area of site		Current land use	
3.	Ownership of the land	Owned / leased	Survey no.	
4.	If leased/rented, name, address and contact details of the owner			
5.	Distance from the construction site			
6.	Distance from Water Body, Forest (if any)			
7.	Distance from the Populated Area			
8.	No of trees with girth> 0.3m on the site			
9.	No of trees to be cut			
10.	Is topsoil conservation required (Yes/ No)			
List of enclosures:	(a) Location map			
	(b) Layout plan			
	(c) Photographs of the site			
	(d) List of machinery, equipments and vehicles to be used			
	(e) List of schools and hospitals with in 200 m distance from the boundary of the camp			
C. Submission Details	Submitted by (Environment & Safety Officer of Contractor)		**Approved / Rejected by (Environmental Officer of PIU)**	
Signature & date				
Name				
Designation				
Remarks by Environmental Expert of PIU				

*** All distances are to be measured from the boundary of the site.**

Note: Contractor has to fill and submit this format to the Environmental Expert of PIU upon identification of labour campsite. Subsequently, the Environmental Expert of PIU has to visit the site and approve/reject the site with reasons. The Environmental Expert of PIU has to give a copy of this format to the contractor after his approval/rejection with remarks. On approval of a site, the Contractor has to prepare the Management and Redevelopment Plan for this site as per the Guidelines given in EMP and submit to Environmental Expert of PIU for approval

ANNEXURE XI: Format For Register of Complaints (Grievance) and it's Reporting

A	Project Details	Information		
1.	Name of the project			
2.	Name and address of the Contractor			
3.	Contract date and duration			
B	Details of Complaint Received		Site Name	
Sl. No.	Date of Complaint	Name and address of the person with contact details	Complaint	Action was taken with a date **Signature of ESO of Contractor**
1				
2				
3				

A register in this format shall be maintained at each site office of the contractor. This same format shall be used to compile and report the details of complaints received at all site to the Environmental Expert of PIU along with the Monthly Report of the Contractor. The Environmental Expert of PIU has to give instruction to the Contractor, if any further action has to be taken on any complaint.

ANNEXURE XII: Checklist For Monitoring of Labour Camp Management

A	Project Details		Date of Monitoring:	
1.	Name of the project.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Name of Labour Camp			
B	Monitoring Details			
Sl. No.	Environmental Management Measures	Environmental Expert's observation (Yes / No / Not Applicable)	Corrective Actions Proposed	Remarks
1.	Whether the camp is floored with concrete?			
2.	Are all the first aid facilities provided in the camp?			
3.	Whether the camp is located in such a way that there are no residences, public institutions or bio-sensitive area within a radius of 500 m from the camp?			
4.	Whether the vehicle movement in and out of the camp is in a controlled manner?			
5.	Whether LPG for cooking is provided?			
6.	Whether safe drinking water is provided?			
7.	Whether all the drains and channels are covered?			
8.	Whether a green belt is provided along the periphery of camp?			
9.	Whether daycare centres are provided within the camp?			
10.	Whether sanitation facilities are provided separately for male and female?			
11.	Whether separate garbage bins are provided to collect the garbage?			
12.	Whether septic tanks with soak pits are provided?			
13.	Whether the location of soak pit is in such an away that it does not pollute the groundwater?			
14.	Whether a qualified safety officer is appointed for			

	ensuring safety?			
15.	Whether proper fencing of the camp is done?			
16.	Whether the workers are well aware of cleanliness, hygiene, community livings, AIDS etc.?			
17.	Whether all applicable clearances are obtained and valid to date?			
Signature of Environment and Safety Officer (ESO) of the Contractor with date			**Signature of Environmental Expert of PIU with date**	
Note: The Environmental Expert of PIU has to use this format to monitor the implementation of Environmental Management Measures for each Labour Camp Quarterly. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESO of the Contractor. Environmental Expert of PIU has to attach this format to the Quarterly Report, with details of corrective action taken by the Contractor.				

ANNEXURE XIII: Check List For Monitoring of Redevelopment of Labour Camp Site

A	Project Details	Date of Monitoring:		
1.	Name of the project			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Name of Labour Camp			
B	Monitoring Details			
Sl. No.	Environmental Management Measures	Environmental Expert's observation (Yes / No / Not Applicable)	Corrective Actions Proposed	Remarks
1.	Are all the temporary structures cleared as per the list in the redevelopment plan?			
2.	Are all building debris, garbage, night soils and POL waste disposed off safely?			
3.	Are all disposal pits or trenches filled, disinfected and effectively sealed off?			
4.	Are the facilities that could be put to re-use maintained well?			
5.	Are all the spills within the campsite effectively disposed off from the site?			
6.	All the area within the campsite is levelled and spread over with stored topsoil.			
7.	Has the residual top soil been utilized effectively?			
8.	Has the entire camp area been made clean and tidy without disturbing the adjacent lands?			
9.	Are the 'before' and 'after' scenarios of the site documented through photographs and submitted to PIU?			
10.	Are the conditions mentioned by the owner in the agreement adhered to?			
11	If not, mention the details of the conditions that are not			

	adhered to and further steps to be taken.			
12.	Can 'works completion' certificate be issued to this site?			
Signature of Environment and Safety Officer (ESO) of the Contractor with date			**Signature of Environmental Expert of PIU with date**	
Note: The Environmental Expert of PIU has to use this format to monitor the implementation of Environmental Management Measures for the redevelopment of each Labour Camp Site as and when it is closed. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESO of the Contractor. Environmental Expert of PIU has to attach this format to the Quarterly Report, with details of corrective action taken by the Contractor.				

ANNEXURE XIV: Reporting Format for Occupational Health And Safety Measures

A	Project Details	Date of Reporting:	
1.	Name of the project.		
2.	Name and address of the Contractor		
3.	Contract date and duration		
B	Implementation Status of Health and Safety Measures		
Sl. No.	**Health and Safety Measures**	**Implementation Status (Yes / No)**	**Remarks**
1	Appointment of qualified Environment and Safety Officer		
2	Approval for Construction Safety Management Plan by the Environmental Expert of PIU.		
3	Provision for flags and warning lights for potential hazards		
4	Provision of adequate staging, formwork and access (ladders with handrail) for works at a height of more than 3.0 m		
5	Provision of adequate shoring/bracing / barricading / lighting for all deep excavations of more than 3.0 m depth.		
6	Provision for sufficient lighting especially for nighttime work		
7	Construction Workers safety – Provision of personnel protective equipment's		
	A. Helmets		
	B. Safety Shoe		
	C. Gumboot		
	D. Dust masks		
	E. Hand Gloves		
	F. Safety Belts		
	G. Reflective Jackets		
	H. Earplugs for labour		
8	Workers engaged in welding work shall be provided with welder protective shields		
9	All vehicles are provided with reverse horns.		
10	All scaffolds, ladders and other safety Devaces shall be maintained in a safe and sound condition		

11	Regular health checkup for labour/ Contractor's personnel		
12	Ensuring the sanitary conditions and all waste disposal procedures & methods in the camp.		
13	Provision for insurance coverage to the workers		
C.	Submission Details		

	Submitted by (Environment & Safety Officer of Contractor)	Approved by (Environmental Officer of PIU)
Signature & date		
Name		
Designation		

Remarks by Environmental Expert of PIU

Note: Contractor has to fill and submit this format to the Environmental Expert of PIU along with the Monthly Report. The Environmental Expert of PIU has to visit the site and verify the details. Further mitigation measures, if required, can be suggested by the Environmental Expert of PIU. The Environmental Expert of PIU has to give back a copy of this format to the contractor after his approval with remarks.

ANNEXURE XV: Format For Register of Accidents and It's Reporting

A	Project Details			Date of Reporting:
1.	Name of the project			
2.	Name and address of the Contractor			
3.	Contract date and duration			
B	**Details of Accident and People Involved in Accident**			
	Name of the site where the accident happened			
	Name and address of people involved in the accident			
	Whether Contractor's personnel or General public			
	Details of Injury			
	Details of treatment given			
	Details of compensation given			
C	**Type of Accident (√)**			
	Fall of the person from a height			**Explosion**
	Slip, trip or fall on the same level			**Fire**
	Struck against fixed objects			**Contact with a hot or corrosive substance**
	Struck by flying or falling objects			**Contact with poisonous gas or toxic substances.**
	Struck by moving objects			**Contact with poisonous gas or toxic substances**
	Struck/caught by cable			**Hand tool accident**
	Stepping on hail etc.			**Vehicle / Mobile plant accident**
	Handling without machinery			**Machinery operation accident**
	Crushing/burying			**Other (please specify)**
	Drowning or asphyxiation			
D	**Agent Involved in Accident (√)**			
	Machinery			**Stair edge**
	Portable power appliance			**Excavation**
	Vehicle or associated equipment /machinery			**Ladder**
	The material being handled, used or stored			**Scaffolding**
	Gas, vapour, dust, fume or oxygen			**Construction formwork, shuttering and falsework.**
	Hand tools			**Electricity supply cable, wiring switchboard and associated equipment**
	Floor edge			**Nail or chipping**
	Floor opening			**Other (Please specify)**
	Left shaft			
E	**Unsafe Action Relevant to the Accident (√)**			
	Operating without authority			**Failure to use proper footwear**
	Failure to secure objects			**Failure to use eye protector**
	Making safety Devaces inoperative			**Failure to use a respirator**

	Working on moving or dangerous equipment			**Failure to use proper clothing**
	Using un-safety equipment			**Failure to use warn others or given proper signals**
	Adopting an unsafe position or posture			**Horseplay**
	Operating or working at an unsafe speed			**No unsafe action**
	Unsafe loading, Placing, mixing et			**Others (please specify)**
	Failure to use the helmet			
F	**Lack of Safety Measures Relevant to the Accident (√)**			
	No protective gear			**The unsafe layout of job, etc.**
	Defective protective gear			**Unsafe process of job methods**
	Improper dress/footwear			**Poor housekeeping**
	Improper guarding			**Lack of warning system**
	Improper ventilation			**The defective tool, machinery or materials**
	Improper illumination			**No unsafe condition**
	Improper procedure			**Others (please specify)**
G	**Personal Factor Relevant to the Accident (√)**			
	Incorrect attitude /motive			**No unsafe personal factor.**
	Unsafe act by another person			**Other (please specify)**
H	**Details of Corrective and Preventive action taken**			
1				
2				
3				
4				
I	**Submission Details**			

	Submitted by (Environment & Safety Officer of Contractor)	**Approved by (Environmental Officer of PIU)**
Signature & date		
Name		
Designation		
Remarks by Environmental Expert of PIU		

Note: Contractor has to fill this format as and when an accident happens and submit to the PIU along with the Monthly Report. The Environmental Expert of PIU has to visit the site and verify the details. Additional safety measures, if required, can be suggested by the PIU. The Environmental Expert of PIU has to give back a copy of this format to the contractor after his approval with remarks.

ANNEXURE XVI: Reporting Format For Environmental Pollution Monitoring

A	Project Details				Date of Reporting:	
1.	Name of the project					
2.	Name and address of the Contractor					
3.	Contract date and duration					
B	Environmental Monitoring Details					
Sl. No	Details of Monitoring Location	Period of Monitoring	Details of values exceeding the relevant standards	Reasons for pollution	Details of Corrective actions taken	Remarks
a.	Ambient Air Monitoring					
1.						
2.						
b.	Water Monitoring					
1.						
2.						
c.	Noise Monitoring*					
1.						
2.						
C	Submission Details					

	Submitted by (Environment & Safety Officer of Contractor)	Approved by (Environmental Officer of PIU)
Signature & date		
Name		
Designation		
Remarks by PIU		

*** Noise monitoring at the site will be done by the PIU (ERA), using the Noise Meter. The PIU has to give the monitoring results to the Contractor for corrective actions, if any, required and included in this report.**

Note: The Contractor has to conduct Environmental Monitoring through a NABL approved Laboratory as per the Environmental Monitoring Plan given in the EMP, fill this format and submit to the PIU along with the Monthly Report, if monitoring was due in that month. A copy of the monitoring report given by the Laboratory has to be attached to this format. The PIU has to visit the site and verify the details. Additional mitigation measures, if required, can be suggested by the PIU. The Environmental Expert of PIU has to give back a copy of this format to the contractor after his approval with remarks.

ANNEXURE XVII: List of Environmental Standards

1. National Ambient Air Quality Standards

Pollutant	Time Weighted Average	Concentration in Ambient Air	
		Industrial, Residential, Rural and Other Areas	Ecologically Sensitive Area (notified by Central Government)
Sulphur Dioxide (SO_2), µg/m^3	Annual*	50	20
	24 hours**	80	80
Nitrogen Dioxide (NO_2), µg/m^3	Annual*	40	30
	24 hours**	80	80
Particulate Matter (size less than 10 µm) or PM_{10} µg/m^3	Annual*	60	60
	24 hours**	100	100
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$ µg/m^3	Annual*	40	40
	24 hours**	60	60
Ozone (O_3) µg/m^3	8 hours*	100	100
	1 hour**	180	180
Lead (Pb) µg/m^3	Annual*	0.50	0.50
	24 hours**	1.0	1.0
Carbon Monoxide (CO) mg/m^3	8 hours*	02	02
	1 hour**	04	04
Ammonia (NH_3) µg/m^3	Annual*	100	100
	24 hours**	400	400
Benzene (C_6H_6) µg/m^3	Annual*	5	5
Benzo(a)Pyrene (BaP)-particulate phase only, ng/m^3	Annual*	1	1
Arsenic(As), ng/m^3	Annual*	6	60
Nickel (Ni), ng/m^3	Annual*	20	20
* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.			
** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time; they may exceed the limits but not on two consecutive days of monitoring.			
Source: National Ambient Air Quality Standards, Central Pollution Control Board Notification in the Gazette of India, Extraordinary, New Delhi, 18th November 2009			

2. National Ambient Noise Level Standards

Area Code	Category of Area	Limits in dB (A) Leq.	
		Daytime	Night time
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence	50	40

Source: *Central Pollution Control Board, New Delhi.*
Note-1 Day time is reckoned in between 6 AM to 10 PM
Note-2 Night time is reckoned in between 10 PM to 6 AM
Note-3 Silence zone is defined as areas up to 100 meters around such as premises as hospitals, educational institutions and courts. The silence zones are to be declared by the Competent Authority
Note-4 Mixed categories of areas should be declared as one of the four above mentioned categories, by the Competent Authority and the corresponding standard shall apply.

3. Surface Water Quality

S. No	Parameters	IS:2296 (Class C)	Method Adopted
1	pH	6.5-8.5	pH meter
2	BOD (3 day, 27^0C)	3.0	DO-Azide modification of Wrinkler's method
3	Temperature (^{0}C)	NS	Thermometer
4	Dissolved oxygen	4	Azide modification of Wrinkler's method
5	Color (Hazen)	300	Visual Comparison method
7	Chloride (Cl)	600	Argentometric Titration
8	Total Dissolved Solids	1500	Gravimetric Analysis
9	Sulphates (SO_4)	400	Barium Chloride method
10	Oil and Grease	0.1	Partition -Gravimetric method
11	Nitrates	50	Chromotropic acid
12	Total Coliform (MPN/100 ml)	5000	Multiple Tube Fermentation Technique

NS: Not specified. All the values in mg/l if otherwise mentioned

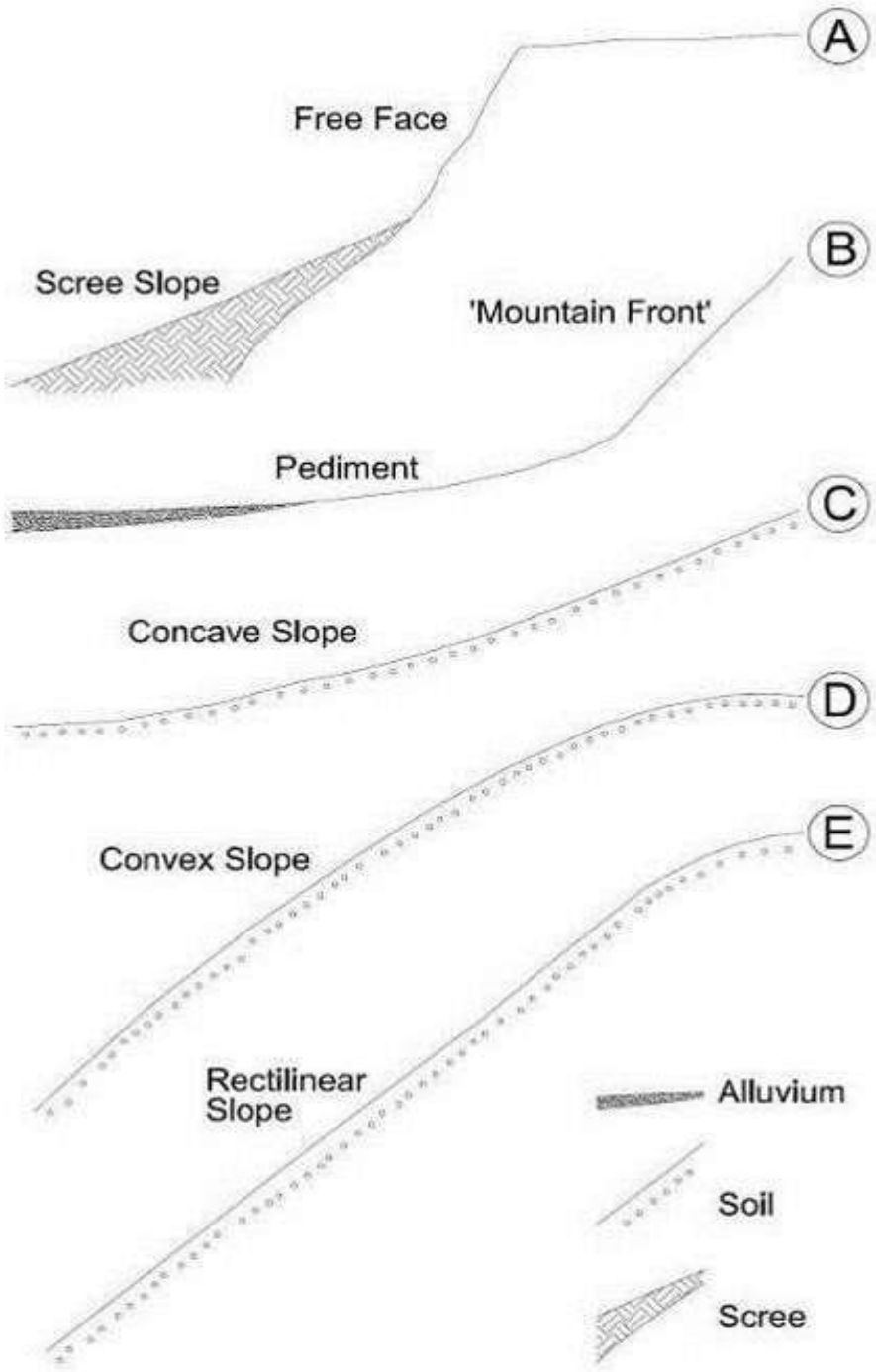
ANNEXURE XVI: Slope Development and Forms

Four main types of slope forms recognised. These include cliffs, concave slope, rectilinear slopes and convex slopes

Cliffs are developed on slopes in deeply cut river valleys, on escarpment faces (long steep slopes at the edge of a plateau), in massive rocks and on faulted landscapes. Cliffs are steep, often with faces of 40 degrees or more and the products of weathering for the most part fall immediately to the base. A talus or scree slope will develop at an angle controlled by the size and shape of the weathered fragments).

The lower part of a slope profile will commonly exhibit a concave section) due, in some cases, to deposition processes. However, it is more usual to find slopes covered only by a thin layer of soil or exposing bare rocks with marked basal concavities. Many slopes display rectilinear sections which normally form the steepest part of the whole profile. It is quite common to find such a major rectilinear section leading down to the very bottom of the valley. On other slopes, the rectilinear section is restricted to the central part of the profile where it separates a broader convexity above from a large concave section below.

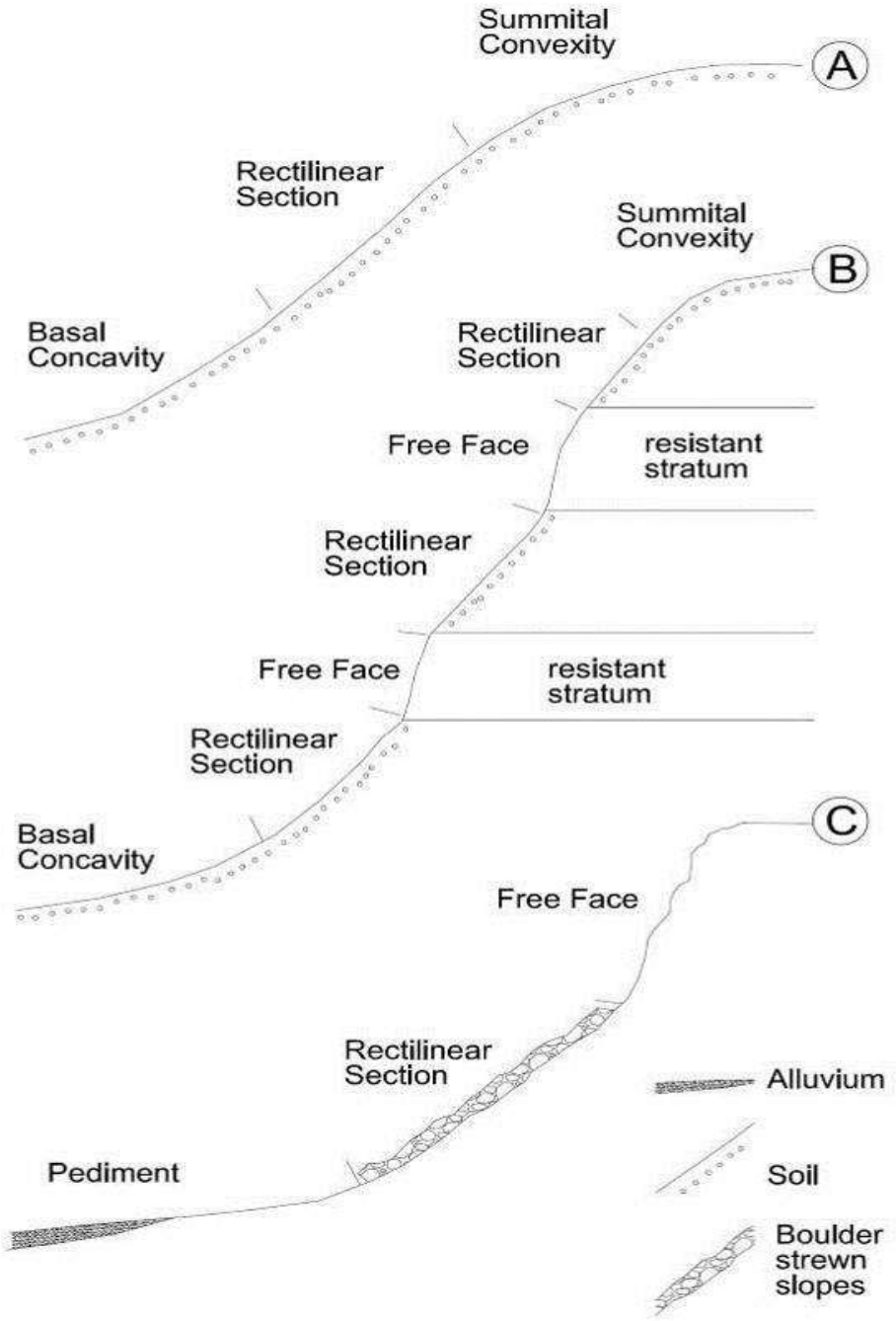
Convex sections are common to many slopes and usually develop on the upper part of the slope (summital convexity) due to erosional processes and are rarely covered by more than a thin layer of soil.



Common simple slope forms

Most slopes, however, are not made up of these simple forms but rather are composite resulting from a combination in one profile of two or more of these simple forms. A convexo-rectilinear-concave slope comprises an upper convexity, a central rectilinear section and a lower concavity, the three grade into each other to give a smoothly curving profile. Such slopes typically form on weak rocks. In areas where the rock type is varied, comprising alternating resistant and less

resistant strata there may be a whole sequence of convexities, rectilinearity and concavities, giving a complex slope form.



Complex Slope forms

Measurement of Slope Gradient

Area of Influence: To determine whether a proposed development is located on a slope with a gradient of 20 degrees or more, representative slope profiles must be drawn from a contour map. The slope profiles should include the area of influence to the first sharp break in the slope above and below the site or at least a minimum 500 m upslope and downslope of the site whichever is applicable. Topographic features may, however, indicate modifications to this general axiom.

Map Scale: The accuracy of slope measurement is very dependent on the map scale and contour intervals. A detailed topographical survey of the proposed development is normally carried out as part of the planning process. Such detailed site topographical is produced on scales ranging from 1:1,500 to 1:500. These maps should be used in conjunction with the 1:12,500 (contour intervals of 10 m) or nearest equivalent for the upslope and downslope areas produced by the Lands and Surveys Department to construct slope profiles, where available.

Section Lines: Critical section lines of representative profiles should be selected so that they intersect the locations of all the proposed structures to be erected on the site and also existing land use features, i.e. road, houses, telecommunication tower upslope and downslope of the site. The section lines should be orientated perpendicular to the steepest slopes. The number of section lines will be dependent on the proposed development and existing land use in the vicinity.

Suggested Method: Construction of slope profiles involves plotting the elevation of contour lines where they intersect with the section lines. The suggested method of slope profile construction is as follows:

a. Determine the alignment of the section lines. The section lines should start from the area of influence upslope and follow the steepest gradient onto the site and across the proposed constructions at the site and onto the area of influence downslope of the site. It is recommended to construct multiple slope profiles, each profile across each proposed construction at the site.
b. A line is drawn on the contour map from upslope of the site and across the proposed construction at the site and onto the downslope area as shown in the slope profile figure attached. This line provides the baseline ABC (attached example) for the graph; the length of this baseline is equivalent to the length of the area of influence as defined above.

c. The points at which contour lines intersect the baseline are marked and their elevations recorded. The vertical axis of the graph is scaled for elevation and constructed perpendicular to the baseline; preferably, the vertical and horizontal scales should be similar to show the true gradient of the slope. Points of elevation may now be plotted at the appropriate distances along the baseline. For precise plotting, intersecting lines may be drawn from the corresponding values on the distance and elevation scale. Connecting the points, a line profile of the slope is produced. The site boundaries, location of each

proposed construction on the site and existing construction on the upslope and downslope areas, are marked on the profile.

d. The profile may show sections of the slope with varying gradients. The gradient of each slope section should be measured. This can be easily determined by measuring directly with a protractor the gradient of each slope section at the point of each slope break along with the profile.
e. Repeat steps b-d to plot the slope profiles of the other section lines.
f. If any of the slope section of the profiles has a gradient of 20 degrees or more, then it is concluded that the site is located on the slope with a gradient of 20 degrees or more.

Source: EIA Guidelines for Construciton of Hill Slopes, EPD SABAH, 2012