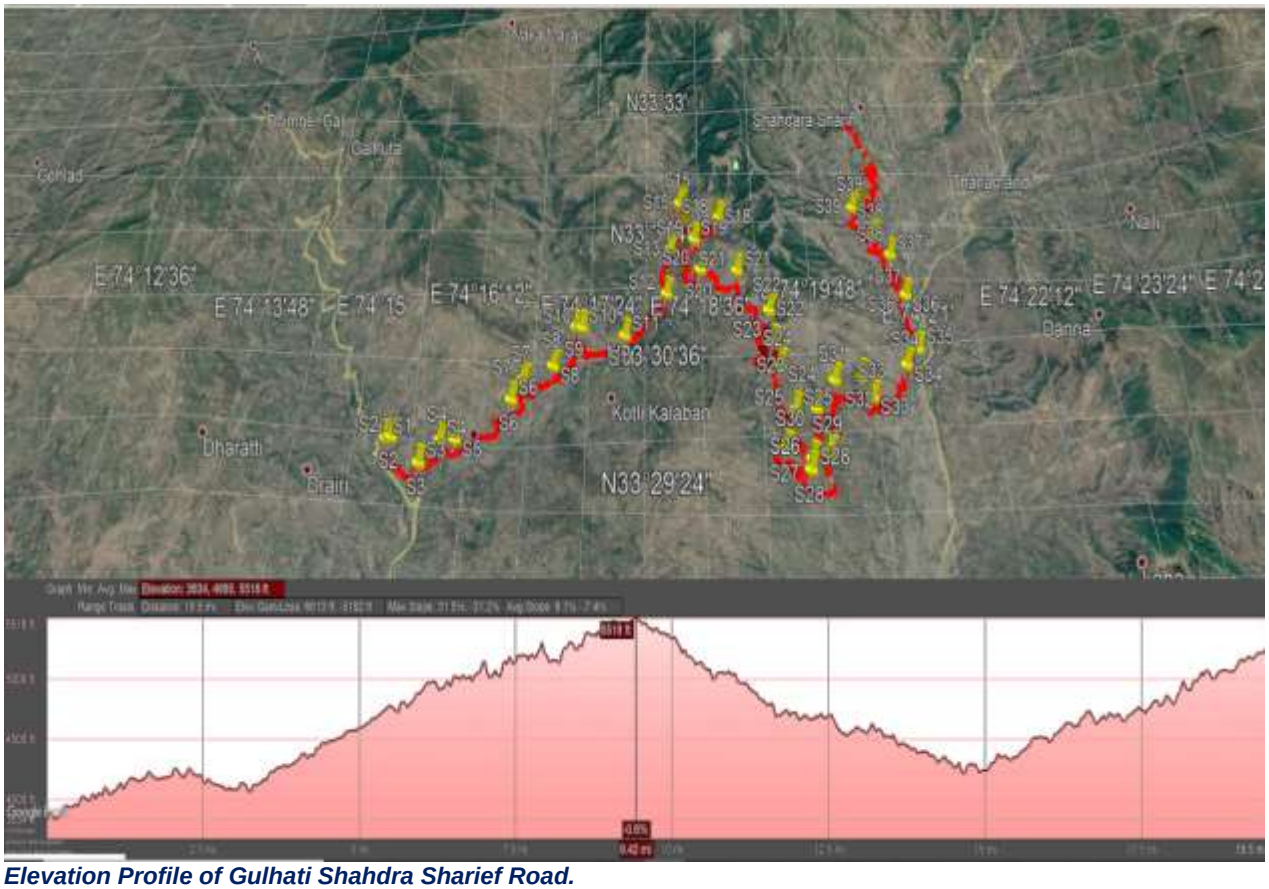
ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

Improvement & Up-gradation of Gulhati to Shahdra Sharief via Ghambir Gali in District Rajouri



Elevation Profile of Gulhati Shahdra Sharief Road.

Jhelum Tawi Flood Recovery Project- The World Bank Financed Project

Environmental Impact Assessment Report

December 2019

Jhelum Tawi Flood Recovery- World Bank Financed Project

Improvement & Up-gradation of Gulhati to Shahdra Sharief via Ghambir Gali in District Rajouri (27.280 km)

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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.

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 and Social Assessment.

Under Road Package-3, Gulati to Shahdra Sharief via Ghambeer Mughlian has been identified and has a total length of 27.280 Km in District Rajouri. The road is having a hilly terrain.

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 project road is located in District Rajouri in Jammu region, having geo-coordinates of 33°29'57.61"N (Latitude) & 74°15'18.19"E (Longitude) at Galhotti (starting point) to 33°32'0.31"N (Latitude) & 74°20'26.80"E (Longitude) at Shahdra Sharief (endpoint) of the road. The proposed subproject "Improvement & Up-gradation of the road under package-3" is a rural road passing through the hilly terrain which connects Shahdra Sharief known for the most revered sufi shrine of Shahdra Sharief.

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-3 in District Rajouri comprise the construction of identified project road "Galhotti to Shahdra Sharief Via Ghambeer Mughlian 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 Gulhati, Kotli and Ghambir Muglian locations of the project corridor 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 Shahdra Sharief which is one of the most revered religious destinations in District Rajouri.

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-3 namely; Gulhati to Shahdra Sharief Via Gambhir Gali in District Rajouri 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 road is a hilly road with rugged terrain features which traverses through Gulhati, Gambhir Mughlian, Behrot and Shahdra areas. 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 Rajouri 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. Floods and flash floods are also frequent in 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 Jammu district received 467.3mm of rainfall in Sept 2014, which exceeds normal by 339%. Similarly Rajouri district received 487.5 mm of rainfall which is 386% in excess of the normal (source-Indian Meteorological department website).

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 J&K

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	Hajin-Ajas Road Via Saidnara Road	7.186	Bandipora
4.		Hamray-Sultanpora-Nowgam Road to Sumbal Bridge.	12.688	Baramulla/ 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	Chiralla Link Road	10.139	Reasi
16.		Malaini to Chakrabatti Road	10.059	Reasi
17.	Package-3	Gulhati to Shahdra Sharief Via Ghambir Gali	27.280	Rajouri
18.	Package-4	Anji-Panasa Road	4.256	Doda
19.		Devi Mai to Ohli Mandir Road	4.999	Doda

This report pertains to environmental assessment and environmental management plan for a road project under Package 3 covering improvement & up-gradation of Gulhatti to Shahdra Sharief Via Ghambir Gali (27.280 km) in District Rajouri (J&K)

1.2. Description of the Project

The project road "Gulhati to Shahdra Sharief Via Ghambir Gali" is located in District Rajouri of J&K. The proposed subproject has a total length of 27.280 km and traverses through hilly area settlements of Gulhati, Dehri Ralyot, Ghambir Muglian, Bharot, Rajdhani, Shahdra Sharief.

The Gulhati to Shahdra Sharief Road vis Ghambir Gali is proposed to be improved and upgraded with a total design length of 27.280 km, which include the Section I of 10.0 km & Section II of 17.280 km. The existing road is 2.50m-3.00m single lane 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, agricultural land and horticultural fields of mainly Pear plantation. The existing surface of the carriageway is flexible broken BT surface which is in poor condition through the entire road length. The existing formation width varies between 3.5m to 4m with an RoW of 6.5m. The proposed new flexible pavement thickness is OGPC-25mm, BM-50mm, WBM-225mm, GSB-200mm. 30 minor junctions exist in the proposed road and cross drainage structures include proposed reconstruction of culverts of 105 no's which include Hume pipe culverts of 102 no's and a box culvert of 3 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 length of this road is 27.280 Km under road Package-3 for its restoration of damage occurred during 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-project under Package-3 in Jammu 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-3 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-3 (Jammu Region) 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 Conditions
6. Potential Environmental Impacts
7. Analysis of Alternatives
8. Consultation with Key Stakeholders
9. Environmental Management Plan

Annexures

2. APPROACH & METHODOLOGY

2.1. Reconnaissance Survey

The reconnaissance survey was conducted in July 2019 in the project domain area of Gulhati to Shahdra Sharief Road via Ghambir Gali in Rajouri district before the inception of the screening exercise and environmental assessment study. The site visit and the initial assessment have become the key elements of the schedule of preparation as a part of the screening report. In addition to field investigations and observations, consultations/ field visits were held jointly with the stakeholders and project proponents and available environmental documentation was assembled for review.

2.2. Project Impact and Project Influence Area

In the perspective of the environmental assessment study of above roads under Package-3, 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-3 which are confined within the existing roads of the area. The 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 Gulhati, Ghambir Mughlian and Shahdra Sharief area. 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 road in Rajouri district under Package-3, 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 road under Package-3 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-3 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 mainly in Gambhir Mughlian and Barot areas. 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-3 "Gulhati to Shahdra Sharief via Ghambir Gali in District Rajouri" and its executive summary shall be disclosed at JTFRP/PMU website as per provisions of World Bank disclosure policies.

3. PROJECT DESCRIPTION

3.1. Project Area

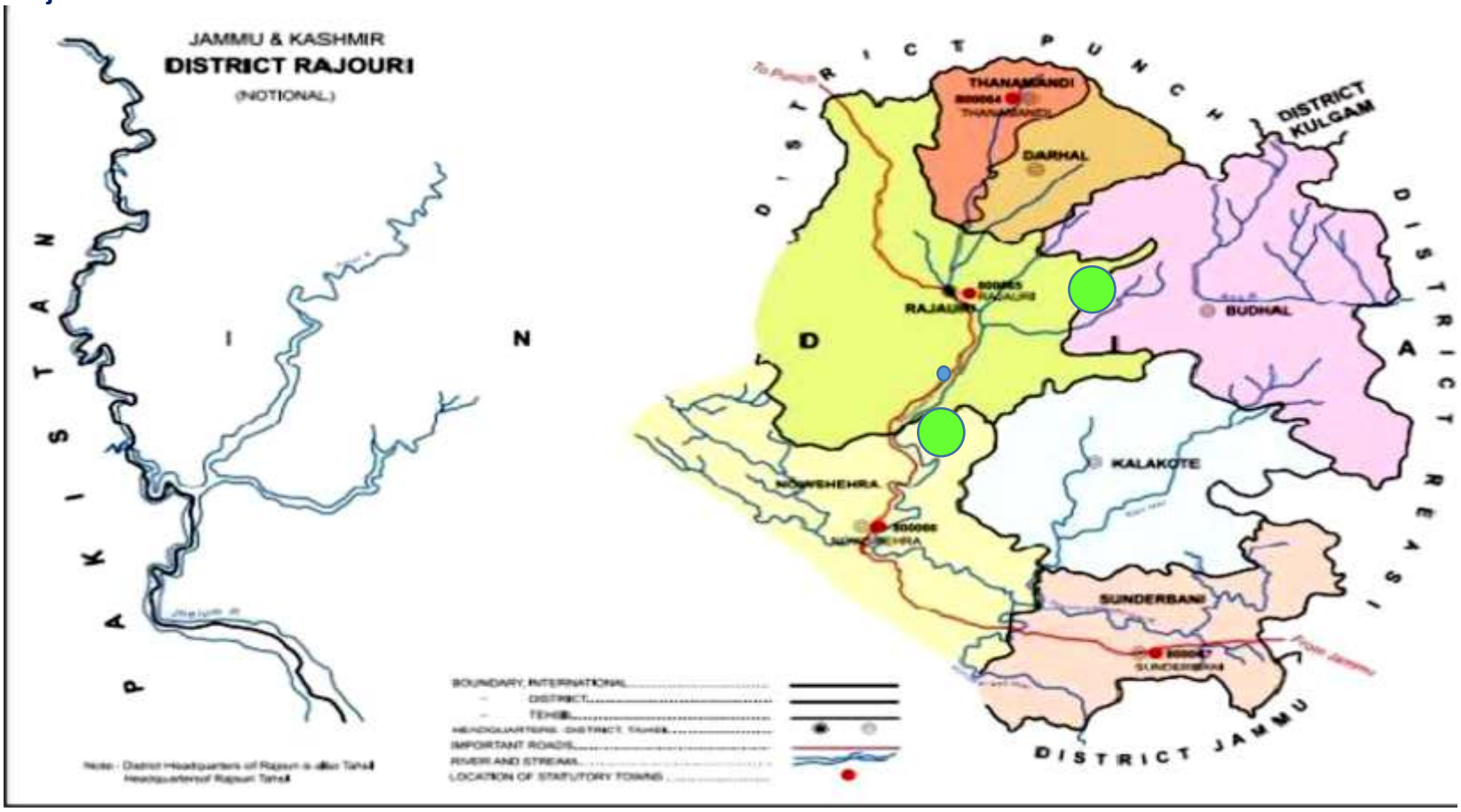


Fig 3.1: Showing Rajouri district map (Green dots showing the indicative start/ end location of the road)

The project road under Package-3 is located in District Rajouri in Jammu region, having geo-coordinates of 33°29'57.61"N (Latitude) & 74°15'18.19"E (Longitude) at Gulhatti (starting point) to 33°32'0.31"N (Latitude) & 74°20'26.80"E (Longitude) at Shahdra Sharief (endpoint) of the road.

3.2. Project Location and Outline

The proposed road starts from Gulhatti of Rajouri Poonch Road and terminates at Shahdra Sharief. It is a village road, having existing carriageway less than a standard single lane. From connectivity & highly revered pilgrim site of Shahdra Sharief. This particular road has high importance and gives connectivity to Dehri Ralyot, Ghambir Muglian, Bharot, Rajdhani, Shahdra Sharief villages. Project Road has been divided into two section – Section I from Km 0.000 to Km 10.000 (Length 18 Km) and Section II from Km 15.000 to Km 33.000 (Length 18 Km). From Km 10.000 to Km 15.000, stretch developed under PMGSY Scheme. 50% of road length having BT surface and rest portion either Earthen or Gravel surface. 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.

Gulhati to Shahdra Sharief Road via Ghambir Gali in District Rajouri

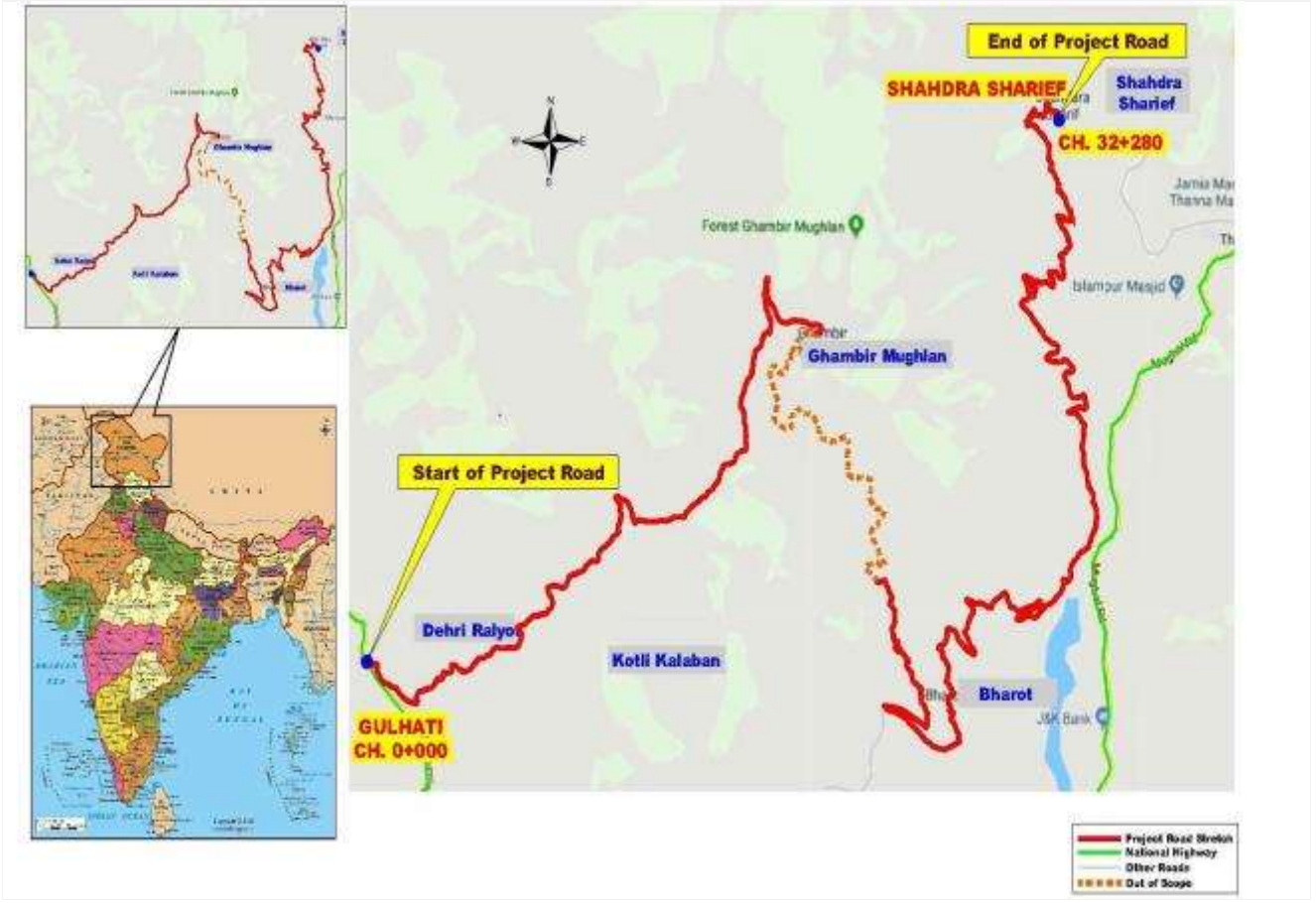


Figure 3.2: Index Map of the subproject "Gulhati to Shahdra Sharief via Gambhir Gali" of Road Package-3 in Rajouri District.

3.3. Technical Description of the Package 3

Table 3.1: Improvement & Up-gradation of Gulhati to Shahdra Sharief Road Via Ghambir Gali in District Rajouri, Jammu Division of J&K.

S. No.	Description of item	Details	
1	Road length	Existing Section I - 10.000 Km Section II – 17.000 Km	Design Section I - 10.000 Km Section II – 17.280 Km
2	Road Configuration	Existing:- 2.50 m to 3.0 m wide carriageway	Propose:- 3.75 m wide carriageway
3	Terrain	Hilly	
4	Land use pattern	Open, Agricultural & Residential	
5	Existing Surface of the carriageway	Flexible Broken BT surface exists for a net length of 14.000 Km (Km 0.000 to Km 0.500, Km 3.500 to Km 4.000, 4.500 Km to 5.500 Km, 7.500 Km to 10.000 Km, 16.500 Km to 20.500 Km, 22.500 km to 27.000 Km) and rest stretches are either Gravel or Earthen.	
7	Existing Formation Width	3.50 m to 4.00 m	
8	Right of Way (ROW)	6.5 m	
9	Pavement Condition	Poor	
10	New Flexible Pavement thickness	OGPC-25 mm; BM -50 mm, WBM - 225 mm; GSB-200 mm	
11	Design CBR	5.40 % (Avg. CBR)	
12	Junctions	Minor-30	
13	Traffic	T9 (15 ESAL to 20 EASL) – IRC SP 72 -2015	
14	Cross drainage structures	Existing Culvert- 123 HP Culvert - 102 Nos. Slab Culvert – 16 Nos Bridge - 5 Nos.	Proposed Culvert- 105 (Reconstruction) HP Culvert - 102 Nos Box Culvert – 3 Nos
15	Settlement	Gulhati, Dehri Ralyot, Ghambir Muglian, Bharot, Rajdhani, Shahdra Sharief	

3.4. Project Features and Design Aspects

3.4.1. Existing Cross Drainage Structures

There are 123 nos. of cross drianage structures in the project road, out of which 69 nos of cross drainage structures are in Section I and 54 nos exist in Section II. There are 102 nos hume pipe culverts, 16 nos slab culverts and 5 Nos of Bridges. Out of these 102 nos hume pipe culverts are chocked by siltation and poor condition; need to replace by 1.2 m dia hume pipe culverts and 3 nos of slab culverts which are in poor condition, converted into Box culverts of suitable size. The details are given in **Table 3.2** below;

Table 3.2: List of Existing Cross Drainage Structures

S No.	Structures		
	Chainage	Types	Dia/Span(m)
1	0+100	Pipe Culvert	1 x 0.6
2	0+480	Pipe Culvert	1 x 0.6
3	0+700	Pipe Culvert	1 x 0.6
4	0+950	Pipe Culvert	1 x 0.6
5	1+050	Pipe Culvert	1 x 0.6
6	1+200	Pipe Culvert	1 x 0.6
7	1+325	Pipe Culvert	1 x 0.6
8	1+450	Pipe Culvert	1 x 0.6
9	1+515	Pipe Culvert	1 x 0.6
10	1+605	Pipe Culvert	1 x 0.6
11	1+690	Pipe Culvert	1 x 0.6
12	1+850	Pipe Culvert	1 x 0.6
13	1+900	Pipe Culvert	1 x 0.6
14	2+120	Pipe Culvert	1 x 0.6
15	2+170	Pipe Culvert	Not Visible
16	2+450	Pipe Culvert	1 x 0.6
17	2+520	Pipe Culvert	1 x 0.6
18	2+650	Pipe Culvert	1 x 0.6
19	2+670	Pipe Culvert	Not Visible
20	2+775	Pipe Culvert	Not Visible
21	2+880	Pipe Culvert	1 x 0.6
22	2+970	Pipe Culvert	1 x 0.6
23	3+090	Pipe Culvert	1 x 0.6
24	3+150	Pipe Culvert	1 x 0.6
25	3+450	Slab Culvert	1 x 1.1
26	3+300	Pipe Culvert	1 x 0.6
27	3+510	Pipe Culvert	1 x 0.6
28	4+020	Pipe Culvert	1 x 0.6
29	4+160	Pipe Culvert	1 x 0.6
30	4+260	Pipe Culvert	1 x 0.6
31	4+310	Pipe Culvert	1 x 0.6
32	4+520	Pipe Culvert	Not Visible
33	4+610	Pipe Culvert	1 x 0.6
34	4+650	Slab Culvert	1 x 1.0
35	4+780	Pipe Culvert	1 x 0.6
36	4+880	Bridge	14.0
37	5+125	Pipe Culvert	1 x 0.6
38	5+380	Pipe Culvert	1 x 0.6
39	5+580	Pipe Culvert	1 x 0.6
40	5+710	Pipe Culvert	1 x 0.6

S No.	Structures		
	Chainage	Types	Dia/Span(m)
41	5+890	Pipe Culvert	1 x 0.6
42	6+050	Slab Culvert	1 x 1.0
43	6+160	Slab Culvert	1 x 1.2
44	6+300	Slab Culvert	1 x 1.1
45	9+490	Slab Culvert	1 x 1.1
46	6+700	Pipe Culvert	1 x 0.6
47	6+780	Pipe Culvert	1 x 0.6
48	6+935	Bridge	15.0
49	6+970	Slab Culvert	1 x 1.0
50	7+190	Pipe Culvert	1 x 0.6
51	7+320	Pipe Culvert	1 x 0.9
52	7+370	Pipe Culvert	1 x 0.6
53	7+512	Pipe Culvert	1 x 0.6
54	7+670	Pipe Culvert	1 x 0.6
55	7+730	Pipe Culvert	1 x 0.6
56	7+790	Pipe Culvert	Not Visible
57	7+890	Pipe Culvert	1 x 0.6
58	8+050	Pipe Culvert	1 x 0.6
59	8+100	Pipe Culvert	1 x 0.6
60	8+300	Slab Culvert	1 x 3.2
61	8+470	Pipe Culvert	1 x 0.6
62	8+650	Pipe Culvert	1 x 0.6
63	8+780	Pipe Culvert	1 x 0.6
64	8+980	Pipe Culvert	1 x 0.6
65	9+620	Pipe Culvert	Not Visible
66	9+690	Pipe Culvert	Not Visible
67	9+750	Pipe Culvert	Not Visible
68	9+840	Pipe Culvert	1 x 0.6
69	9+920	Bridge	8.0
70	15+000	Pipe Culvert	1 x 0.6
71	15+110	Slab Culvert	1 x 1.2
72	15+270	Pipe Culvert	1 x 0.6
73	15+870	Pipe Culvert	1 x 0.6
74	15+990	Pipe Culvert	1 x 0.6
75	16+150	Pipe Culvert	1 x 0.6
76	16+220	Pipe Culvert	1 x 0.6
77	16+380	Pipe Culvert	1 x 0.6
78	16+570	Pipe Culvert	1 x 0.6
79	17+890	Pipe Culvert	1 x 0.6
80	18+070	Pipe Culvert	1 x 0.6
81	18+980	Pipe Culvert	1 x 0.6
82	19+080	Pipe Culvert	1 x 0.6
83	19+220	Pipe Culvert	1 x 0.6
84	19+350	Pipe Culvert	1 x 0.6
85	19+500	Pipe Culvert	Not Visible
86	19+580	Pipe Culvert	1 x 0.6
87	19+640	Pipe Culvert	1 x 0.6
88	19+850	Pipe Culvert	Not Visible
89	20+000	Slab Culvert	1 x 2.4
90	20+150	Pipe Culvert	1 x 0.6
91	20+250	Pipe Culvert	1 x 0.6
92	20+520	Pipe Culvert	1 x 0.6
93	20+630	Pipe Culvert	1 x 0.6

S No.	Structures		
	Chainage	Types	Dia/Span(m)
94	20+810	Pipe Culvert	1 x 0.6
95	21+090	Pipe Culvert	1 x 0.6
96	22+010	Pipe Culvert	Not Visible
97	22+150	Pipe Culvert	Not Visible
98	22+270	Pipe Culvert	1 x 0.6
99	22+800	Pipe Culvert	Not Visible
100	22+880	Pipe Culvert	1 x 0.6
101	23+240	Pipe Culvert	1 x 0.6
102	23+580	Slab Culvert	1 x 3.2
103	23+840	Pipe Culvert	1 x 0.9
104	23+960	Pipe Culvert	Not Visible
105	24+110	Slab Culvert	1 x 0.8
106	24+390	Pipe Culvert	1 x 0.6
107	24+590	Slab Culvert	1 x 2.0
108	24+770	Slab Culvert	1 x 7.0
109	25+120	Pipe Culvert	1 x 0.3
110	25+170	Pipe Culvert	1 x 1.2
111	25+500	Pipe Culvert	Not Visible
112	25+590	Slab Culvert	1 x 5.0
113	25+830	Pipe Culvert	1 x 1.2
114	26+130	Pipe Culvert	1 x 1.2
115	26+970	Pipe Culvert	1 x 1.2
116	27+820	Bridge	28.0
117	28+150	Pipe Culvert	1 x 0.9
118	28+480	Pipe Culvert	1 x 0.6
119	29+950	Pipe Culvert	1 x 1.0
120	30+650	Pipe Culvert	1 x 0.9
121	31+550	Bridge	15.0
122	31+750	Slab Culvert	1 x 1.7
123	32+090	Pipe Culvert	Not Visible

3.4.2. Improvement of Cross Drainage Structures

105 no's cross drainage structures are proposed to be constructed/ reconstructed. Proposed cross drainage structures include 102 nos of hume pipe (HP) culverts and 3 nos slab culverts. These hume pipe culverts are chocked by siltation/ debris over the years due to the improper drainage and are in poor condition and will be replaced by 1.2 m dia hume pipe culverts and 3 nos of slab culverts either 3x3 or 2x2 box culverts. The details are mentioned in **Table 3.3.**

Table 3.3: Details of Proposed Culverts

S. No.	Structures						Proposed Structure		
	Chainage	Types	Dia /Span (m)	Width (m)	Width of Head/ Parapet Wall (m)	Condition	Types	Dia/Span (m)	Remarks
Section I (From Km 0.000 to Km 10.000)									
1	0+100	HPC	1 x 0.6	7.674	0.900	C & P	HPC	1 x 1.2	R & NC
2	0+480	HPC	1 x 0.6	6.803	1.000	C & P	HPC	1 x 1.2	R & NC
3	0+700	HPC	1 x 0.6	7.977	0.900	C & P	HPC	1 x 1.2	R & NC
4	0+950	HPC	1 x 0.6	5.979	0.950	C & P	HPC	1 x 1.2	R & NC
5	1+050	HPC	1 x 0.6	5.759	0.950	C & P	HPC	1 x 1.2	R & NC
6	1+200	HPC	1 x 0.6	7.665	0.900	C & P	HPC	1 x 1.2	R & NC
7	1+325	HPC	1 x 0.6	7.642	1.000	C & P	HPC	1 x 1.2	R & NC

S. No.	Structures						Proposed Structure		
	Chainage	Types	Dia /Span (m)	Width (m)	Width of Head/ Parapet Wall (m)	Condition	Types	Dia/Span (m)	Remarks
8	1+450	HPC	1 x 0.6	6.794	0.900	C & P	HPC	1 x 1.2	R & NC
9	1+515	HPC	1 x 0.6	7.055	1.000	C & P	HPC	1 x 1.2	R & NC
10	1+605	HPC	1 x 0.6	6.770	0.950	C & P	HPC	1 x 1.2	R & NC
11	1+690	HPC	1 x 0.6	6.994	1.000	C & P	HPC	1 x 1.2	R & NC
12	1+850	HPC	1 x 0.6	6.696	0.900	C & P	HPC	1 x 1.2	R & NC
13	1+900	HPC	1 x 0.6	5.938	0.950	C & P	HPC	1 x 1.2	R & NC
14	2+120	HPC	1 x 0.6	7.715	0.900	C & P	HPC	1 x 1.2	R & NC
15	2+170	HPC	-	8.119	-	C & P	HPC	1 x 1.2	R & NC
16	2+450	HPC	1 x 0.6	6.511	0.900	C & P	HPC	1 x 1.2	R & NC
17	2+520	HPC	1 x 0.6	7.600	0.950	C & P	HPC	1 x 1.2	R & NC
18	2+650	HPC	1 x 0.6	7.721	1.000	C & P	HPC	1 x 1.2	R & NC
19	2+670	HPC	-	5.936	-	C & P	HPC	1 x 1.2	R & NC
20	2+775	HPC	-	4.773	-	C & P	HPC	1 x 1.2	R & NC
21	2+880	HPC	1 x 0.6	7.609	0.950	C & P	HPC	1 x 1.2	R & NC
22	2+970	HPC	1 x 0.6	6.736	1.000	C & P	HPC	1 x 1.2	R & NC
23	3+090	HPC	1 x 0.6	7.063	1.000	C & P	HPC	1 x 1.2	R & NC
24	3+150	HPC	1 x 0.6	7.684	1.000	C & P	HPC	1 x 1.2	R & NC
25	3+450	SC	1 x 1.1	5.755	1.400	Good	-	-	Retained
26	3+300	HPC	1 x 0.6	6.849	0.950	C & P	HPC	1 x 1.2	R & NC
27	3+510	HPC	1 x 0.6	7.241	0.950	C & P	HPC	1 x 1.2	R & NC
28	4+020	HPC	1 x 0.6	7.048	0.950	C & P	HPC	1 x 1.2	R & NC
29	4+160	HPC	1 x 0.6	7.276	1.000	C & P	HPC	1 x 1.2	R & NC
30	4+260	HPC	1 x 0.6	7.199	0.950	C & P	HPC	1 x 1.2	R & NC
31	4+310	HPC	1 x 0.6	6.394	1.000	C & P	HPC	1 x 1.2	R & NC
32	4+520	HPC	-	6.744	-	C & P	HPC	1 x 1.2	R & NC
33	4+610	HPC	1 x 0.6	7.830	0.950	C & P	HPC	1 x 1.2	R & NC
34	4+650	SC	1 x 1.0	9.788	1.350	Good	-	-	Retained
35	4+780	HPC	1 x 0.6	6.216	0.950	C & P	HPC	1 x 1.2	R & NC
36	4+880	Bridge	14.000	4.546	15.000	Good	-	-	Retained
37	5+125	HPC	1 x 0.6	6.749	1.000	C & P	HPC	1 x 1.2	R & NC
38	5+380	HPC	1 x 0.6	8.021	1.000	C & P	HPC	1 x 1.2	R & NC
39	5+580	HPC	1 x 0.6	7.674	1.000	C & P	HPC	1 x 1.2	R & NC
40	5+710	HPC	1 x 0.6	7.583	0.900	C & P	HPC	1 x 1.2	R & NC
41	5+890	HPC	1 x 0.6	7.411	0.900	C & P	HPC	1 x 1.2	R & NC
42	6+050	SC	1 x 1.0	5.721	1.300	Good	-	-	Retained
43	6+160	SC	1 x 1.2	4.812	1.500	Poor	BC	2 x 2	NC
44	6+300	SC	1 x 1.1	5.665	1.400	Good	-	-	Retained
45	6+490	SC	1 x 1.1	4.481	1.500	Poor	BC	3 x 4	NC
46	6+700	HPC	1 x 0.6	7.761	0.950	C & P	HPC	1 x 1.2	R & NC
47	6+780	HPC	1 x 0.6	7.021	1.000	C & P	HPC	1 x 1.2	R & NC
48	6+935	Bridge	15.000	4.621	16.000	Good	-	-	Retained
49	6+970	SC	1 x 1.0	9.837	1.350	Good	-	-	Retained
50	7+190	HPC	1 x 0.6	6.899	1.000	C & P	HPC	1 x 1.2	R & NC
51	7+320	HPC	1 x 0.9	5.731	1.300	C & P	HPC	1 x 1.2	R & NC
52	7+370	HPC	1 x 0.6	7.347	1.000	C & P	HPC	1 x 1.2	R & NC
53	7+512	HPC	1 x 0.6	7.054	1.000	C & P	HPC	1 x 1.2	R & NC
54	7+670	HPC	1 x 0.6	5.912	0.950	C & P	HPC	1 x 1.2	R & NC
55	7+730	HPC	1 x 0.6	7.462	0.950	C & P	HPC	1 x 1.2	R & NC
56	7+790	HPC	-	6.559	-	C & P	HPC	1 x 1.2	R & NC
57	7+890	HPC	1 x 0.6	6.446	0.900	C & P	HPC	1 x 1.2	R & NC
58	8+050	HPC	1 x 0.6	6.817	0.950	C & P	HPC	1 x 1.2	R & NC
59	8+100	HPC	1 x 0.6	7.764	1.050	C & P	HPC	1 x 1.2	R & NC
60	8+300	SC	1 x 3.2	5.118	3.600	Good	-	-	Retained
61	8+470	HPC	1 x 0.6	7.250	0.900	C & P	HPC	1 x 1.2	R & NC
62	8+650	HPC	1 x 0.6	7.382	0.950	C & P	HPC	1 x 1.2	R & NC
63	8+780	HPC	1 x 0.6	6.239	0.950	C & P	HPC	1 x 1.2	R & NC
64	8+980	HPC	1 x 0.6	7.821	0.950	C & P	HPC	1 x 1.2	R & NC

S. No.	Structures						Proposed Structure		
	Chainage	Types	Dia /Span (m)	Width (m)	Width of Head/ Parapet Wall (m)	Condition	Types	Dia/Span (m)	Remarks
65	9+620	HPC	-	9.834	-	C & P	HPC	1 x 1.2	R & NC
66	9+690	HPC	-	7.167	-	C & P	HPC	1 x 1.2	R & NC
67	9+750	HPC	-	7.314	-	C & P	HPC	1 x 1.2	R & NC
68	9+840	HPC	1 x 0.6	7.812	1.000	C & P	HPC	1 x 1.2	R & NC
69	9+920	Bridge	8.0	5.520	9.000	Good	-	-	Retained
Section I (From Km 15.000 to Km 33.000)									
70	15+000	HPC	1 x 0.6	7.691	0.900	C & P	HPC	1 x 1.2	R & NC
71	15+110	SC	1 x 1.2	6.498	1.500	Good	-	-	Retained
72	15+270	HPC	1 x 0.6	7.882	0.950	C & P	HPC	1 x 1.2	R & NC
73	15+870	HPC	1 x 0.6	6.630	1.000	C & P	HPC	1 x 1.2	R & NC
74	15+990	HPC	1 x 0.6	7.207	0.950	C & P	HPC	1 x 1.2	R & NC
75	16+150	HPC	1 x 0.6	7.334	0.950	C & P	HPC	1 x 1.2	R & NC
76	16+220	HPC	1 x 0.6	7.199	1.000	C & P	HPC	1 x 1.2	R & NC
77	16+380	HPC	1 x 0.6	7.032	0.900	C & P	HPC	1 x 1.2	R & NC
78	16+570	HPC	1 x 0.6	6.785	0.900	C & P	HPC	1 x 1.2	R & NC
79	17+890	HPC	1 x 0.6	10.057	0.950	C & P	HPC	1 x 1.2	R & NC
80	18+070	HPC	1 x 0.6	7.825	1.000	C & P	HPC	1 x 1.2	R & NC
81	18+980	HPC	1 x 0.6	7.034	1.000	C & P	HPC	1 x 1.2	R & NC
82	19+080	HPC	1 x 0.6	7.318	0.950	C & P	HPC	1 x 1.2	R & NC
83	19+220	HPC	1 x 0.6	7.730	0.950	C & P	HPC	1 x 1.2	R & NC
84	19+350	HPC	1 x 0.6	7.168	0.950	C & P	HPC	1 x 1.2	R & NC
85	19+500	HPC	-	7.766	-	C & P	HPC	1 x 1.2	R & NC
86	19+580	HPC	1 x 0.6	7.092	0.900	C & P	HPC	1 x 1.2	R & NC
87	19+640	HPC	1 x 0.6	6.896	0.900	C & P	HPC	1 x 1.2	R & NC
88	19+850	HPC	-	5.909	-	C & P	HPC	1 x 1.2	R & NC
89	20+000	SC	1 x 2.4	5.809	2.700	Good	-	-	Retained
90	20+150	HPC	1 x 0.6	10.719	0.950	C & P	HPC	1 x 1.2	R & NC
91	20+250	HPC	1 x 0.6	7.389	0.950	C & P	HPC	1 x 1.2	R & NC
92	20+520	HPC	1 x 0.6	5.443	0.900	C & P	HPC	1 x 1.2	R & NC
93	20+630	HPC	1 x 0.6	7.530	1.000	C & P	HPC	1 x 1.2	R & NC
94	20+810	HPC	1 x 0.6	9.569	1.000	C & P	HPC	1 x 1.2	R & NC
95	21+090	HPC	1 x 0.6	6.910	1.000	C & P	HPC	1 x 1.2	R & NC
96	22+010	HPC	-	6.730	-	C & P	HPC	1 x 1.2	R & NC
97	22+150	HPC	-	6.308	-	C & P	HPC	1 x 1.2	R & NC
98	22+270	HPC	1 x 0.6	6.294	0.950	C & P	HPC	1 x 1.2	R & NC
99	22+800	HPC	-	7.297	-	C & P	HPC	1 x 1.2	R & NC
100	22+880	HPC	1 x 0.6	7.174	0.900	C & P	HPC	1 x 1.2	R & NC
101	23+240	HPC	1 x 0.6	8.697	0.900	C & P	HPC	1 x 1.2	R & NC
102	23+580	SC	1 x 3.2	5.610	3.600	Good	-	-	Retained
103	23+840	HPC	1 x 0.9	7.868	1.300	C & P	HPC	1 x 1.2	R & NC
104	23+960	HPC	-	5.615	-	C & P	HPC	1 x 1.2	R & NC
105	24+110	SC	1 x 0.8	19.031	1.350	Good	-	-	Retained
106	24+390	HPC	1 x 0.6	4.996	0.900	C & P	HPC	1 x 1.2	R & NC
107	24+590	SC	1 x 2.0	5.161	2.400	Good	-	-	Retained
108	24+770	SC	1 x 7.0	6.505	3.100	Good	-	-	Retained
109	25+120	HPC	1 x 0.3	5.952	0.600	C & P	HPC	1 x 1.2	R & NC
110	25+170	HPC	1 x 0.9	9.199	1.250	C & P	HPC	1 x 1.2	R & NC
111	25+500	HPC	-	4.552	-	C & P	HPC	1 x 1.2	R & NC
112	25+590	SC	1 x 5.0	6.322	5.400	Good	-	-	Retained
113	25+830	HPC	1 x 0.9	6.787	1.350	C & P	HPC	1 x 1.2	R & NC
114	26+130	HPC	1 x 0.9	6.059	1.300	C & P	HPC	1 x 1.2	R & NC
115	26+970	HPC	1 x 0.9	6.794	1.250	C & P	HPC	1 x 1.2	R & NC
116	27+820	Bridge	28.000	3.442	29.000	Good	-	-	Retained
117	28+150	HPC	1 x 0.9	7.175	1.300	C & P	HPC	1 x 1.2	R & NC
118	28+480	HPC	1 x 0.6	5.074	1.000	C & P	HPC	1 x 1.2	R & NC
119	29+950	HPC	1 x 0.9	11.410	1.250	C & P	HPC	1 x 1.2	R & NC
120	30+650	HPC	1 x 0.9	10.092	1.300	C & P	HPC	1 x 1.2	R & NC

S. No.	Structures						Proposed Structure		
	Chainage	Types	Dia /Span (m)	Width (m)	Width of Head/ Parapet Wall (m)	Condition	Types	Dia/Span (m)	Remarks
121	31+550	Bridge	15.000	4.850	16.000	Good	-	-	Retained
122	31+750	SC	1 x 1.7	4.309	2.100	Poor	BC	3 x 3	NC
123	32+090	HPC	-	7.194	-	C & P	HPC	1 x 1.2	R & NC

Annotations: HPC- HP Culvert, SC – Slab Culvert, BC – Box Culvert, R&NC – Replaced and New Construction

Existing Road Drains

In this project road, there are only 8994.93 m earthen (unlined) drain exists at different stretches. Details are given in **Table 3.4** below;

Table 3.4: List of Existing Drains

S. No.	Chainage		Left	Right	Type of Drain
	From	To	Length (m)		
Section I (From Km 0.000 to Km 10.000)					
1	6+950	6+975	-	24.882	Unlined
2	7+520	7+722	-	202.105	Unlined
3	8+000	8+242	-	242.089	Unlined
4	8+305	8+565	-	260.417	Unlined
5	8+600	8+857	-	257.238	Unlined
6	10+110	10+339	229.063	-	Unlined
Section II (From Km 15.000 to Km 33.000)					
14	15+050	15+238	188.486	-	Unlined
15	15+250	15+481	-	231.076	Unlined
16	15+525	15+789	-	263.583	Unlined
17	15+800	15+905	-	105.437	Unlined
18	16+000	16+061	-	60.776	Unlined
19	16+150	16+216	-	65.92	Unlined
20	16+222	16+292	-	70.457	Unlined
21	16+400	16+426	-	25.763	Unlined
22	16+575	16+936	-	360.654	Unlined
23	17+670	17+735	-	65.007	Unlined
24	17+800	18+698	898.288	-	Unlined
25	18+880	18+983	103.172	-	Unlined
26	19+025	19+091	65.819	-	Unlined
27	19+200	19+244	44.209	-	Unlined
28	19+350	19+557	206.791	-	Unlined
29	19+578	19+600	22.491	-	Unlined
30	19+650	19+668	18.265	-	Unlined
31	19+725	19+864	139.086	-	Unlined
32	19+925	19+988	63.171	-	Unlined
33	20+000	20+104	104.36	-	Unlined
34	20+220	20+245	24.66	-	Unlined
35	20+825	20+849	24.314	-	Unlined
36	21+025	21+141	116.179	-	Unlined
37	21+178	21+343	165.244	-	Unlined
38	21+400	21+469	69.099	-	Unlined
39	21+550	21+624	74.222	-	Unlined
40	21+650	21+871	220.863	-	Unlined
41	21+890	21+957	67.031	-	Unlined
42	21+990	22+060	69.566	-	Unlined
43	22+092	22+298	206.375	-	Unlined
44	22+380	22+418	37.99	-	Unlined
45	22+450	22+518	67.962	-	Unlined
46	22+800	23+551	750.731	-	Unlined
47	23+600	23+733	132.7	-	Unlined

S. No.	Chainage		Left	Right	Type of Drain
	From	To	Length (m)		
48	23+930	23+948	17.539	-	Unlined
49	24+080	24+327	247.215	-	Unlined
50	24+370	24+414	44.048	-	Unlined
51	24+550	24+759	208.864	-	Unlined
52	24+800	25+047	246.574	-	Unlined
53	25+150	25+555	405.181	-	Unlined
54	25+720	25+836	115.78	-	Unlined
55	25+840	26+079	238.627	-	Unlined
56	26+140	26+524	383.915	-	Unlined
57	26+570	26+625	55.045	-	Unlined
58	28+250	28+413	163.016	-	Unlined
59	28+400	28+523	-	123.228	Unlined
60	28+650	28+798	148.088	-	Unlined
61	29+495	29+513	18.284	-	Unlined
62	29+900	30+022	122.077	-	Unlined
63	32+115	32+227	111.906	-	Unlined
		Length	**6636.30**	**2358.63**	
		Total Length		**8994.93**	

3.4.3. Proposed Drains at Different Road Stretches

The PCC line drain are proposed at different stretches towards the hillside for a length of 17770m and breast wall drain provided about the length of 4545m.

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

The proposed road under Package-3, have existing 1415.50 m of Breast Wall and 2664.82 m Retaining Wall in the form of stone masonry at different stretches. Details are shown in **Table 3.5.** below;

Table 3.5: List of Existing Protection Works

S. No.	Chainage		Breast Wall		Chainage		Retaining Wall	
			Left	Right			Left	Right
	From	To	Length (m)		From	To	Length (m)	
Section I (From Km 0.000 to Km 10.000)								
1	0+100	0+103	-	3.239	0+118	0+137	-	18.505
2	1+200	1+208	-	7.617	0+950	1+013	63.08	-
3	1+314	1+337	-	23.116	1+080	1+091	-	10.806
4	1+480	1+481	-	1.218	1+110	1+128	17.53	-
5	1+846	1+893	-	47.026	2+179	2+300	121.355	-
6	1+903	1+924	-	21.4765	2+360	2+385	24.83	-
7	2+120	2+122	-	2.435	2+580	2+593	13.121	-
8	2+625	2+641	-	16.153	2+650	2+767	117.117	-
9	2+649	2+659	-	9.478	2+880	2+944	64.104	-
10	2+867	2+872	-	5.0475	3+162	3+200	38.031	-
11	2+879	2+885	-	5.7045	3+482	3+500	18.024	-
12	3+150	3+167	-	16.768	3+515	3+529	14.442	-
13	3+300	3+310	-	10.054	3+650	3+726	76.347	-
14	4+150	4+164	-	14.227	3+840	3+852	12.318	-
15	4+260	4+270	-	9.7655	4+180	4+188	7.65	-
16	4+310	4+326	-	16.476	5+170	5+231	-	60.545
17	4+600	4+612	-	12.436	6+000	6+011	11.213	-
18	4+647	4+654	-	7.023	6+070	6+082	12.04	-
19	4+660	4+680	-	20.3735	6+393	6+449	55.628	-
20	4+841	4+866	-	24.668	6+970	6+979	-	9.132
21	4+910	4+920	9.6825	-	7+072	7+170	-	97.588

S. No.	Chainage		Breast Wall		Chainage		Retaining Wall	
			Left	Right			Left	Right
	From	To	Length (m)		From	To	Length (m)	
22	4+930	4+935	-	4.7155	7+730	7+748	-	17.82
23	4+895	4+915	-	20.4535	7+790	7+929	-	138.891
24	5+560	5+655	-	94.842	8+430	8+457	-	27.018
25	5+930	5+935	-	5.2025	9+200	9+208	7.697	-
26	6+930	6+935	4.3685	4.7105	9+330	9+405	75.372	-
27	7+035	7+045	10.1235	-	9+850	9+868	17.626	-
28	7+361	7+386	24.79	-	10+050	10+070	19.884	-
29	7+660	7+671	11.069	-	10+100	10+150	50.168	-
30	8+095	8+104	8.911	-	10+350	10+365	15.397	-
31	8+340	8+362	22.1285	-	10+390	10+437	46.134	-
32	8+420	8+475	54.657	-	10+993	11+114	120.704	-
33	8+700	-	21.663	8.617	11+550	11+615	-	64.88
34	9+020	9+023	2.655	-	12+070	12+109	39.362	-
35	8+900	8+915	14.894	-	12+250	12+290	39.925	-
36	8+788	8+800	-	12.092	12+873	12+927	53.641	-
37	8+991	9+028	-	36.884	12+983	13+053	70.004	-
38	9+041	9+094	-	53.38	13+580	13+593	12.561	-
39	9+315	9+350	-	34.7795	13+700	13+730	30.419	-
40	9+367	9+381	-	14.207	14+205	14+248	42.583	-
41	9+393	9+447	-	54.4885	17+180	17+195	-	14.717
42	9+550	9+593	-	43.384	17+600	17+686	-	85.892
43	9+713	9+728	-	14.912	17+715	17+789	74.265	-
44	9+840	9+902	-	61.663	18+000	18+056	55.664	-
45	9+900	9+913	13.157	-	18+076	18+193	117.764	-
		Length	**198.099**	**738.632**		**Length**	**1556.00**	**545.794**
Section II (From Km 15.000 to Km 33.000)								
63	15+350	15+371	20.662	-	28+678	28+812	134.281	-
64	15+860	15+881	20.668	-	30+030	30+081	-	50.938
65	15+960	15+994	-	33.723	30+190	30+256	65.918	-
66	16+000	16+021	-	21.2725	30+563	30+708	145.42	-
67	16+150	16+166	15.5335	-	30+870	30+902	32.479	-
68	16+210	16+222	11.751	-	31+580	31+594	14.4	-
69	17+577	17+585	8.108	-	31+760	31+780	20.237	
70	17+800	17+858	-	57.6455	31+770	31+791	-	21.252
71	17+858	17+891	33.823	-	31+900	31+966	65.521	-
72	18+331	18+587	255.583	-	32+240	32+253	12.575	-
		Length	**366.129**	**112.641**		**Length**	**490.831**	**72.190**
		Total Length	**1415.50**			**Total**	**2664.82**	

3.4.5. Proposed Protective Works

Breast Wall are proposed for about 4545m length with height limit to maximum 1.5 m. PCC Retaining Wall required about length 250 m with maximum height of 3m at the following Chainages as shown in **Table 3.6** and typical cross sections provised in **Figure 3.3 & 3.4** below;

Table 3.6: Proposed Plain Cement Concrete (PCC) protection works

PCC Retaining Walls		
From	**To**	**Length**
1+375	1+425	50
2+600	2+650	50
14+225	14+330	105
18+925	18+970	45

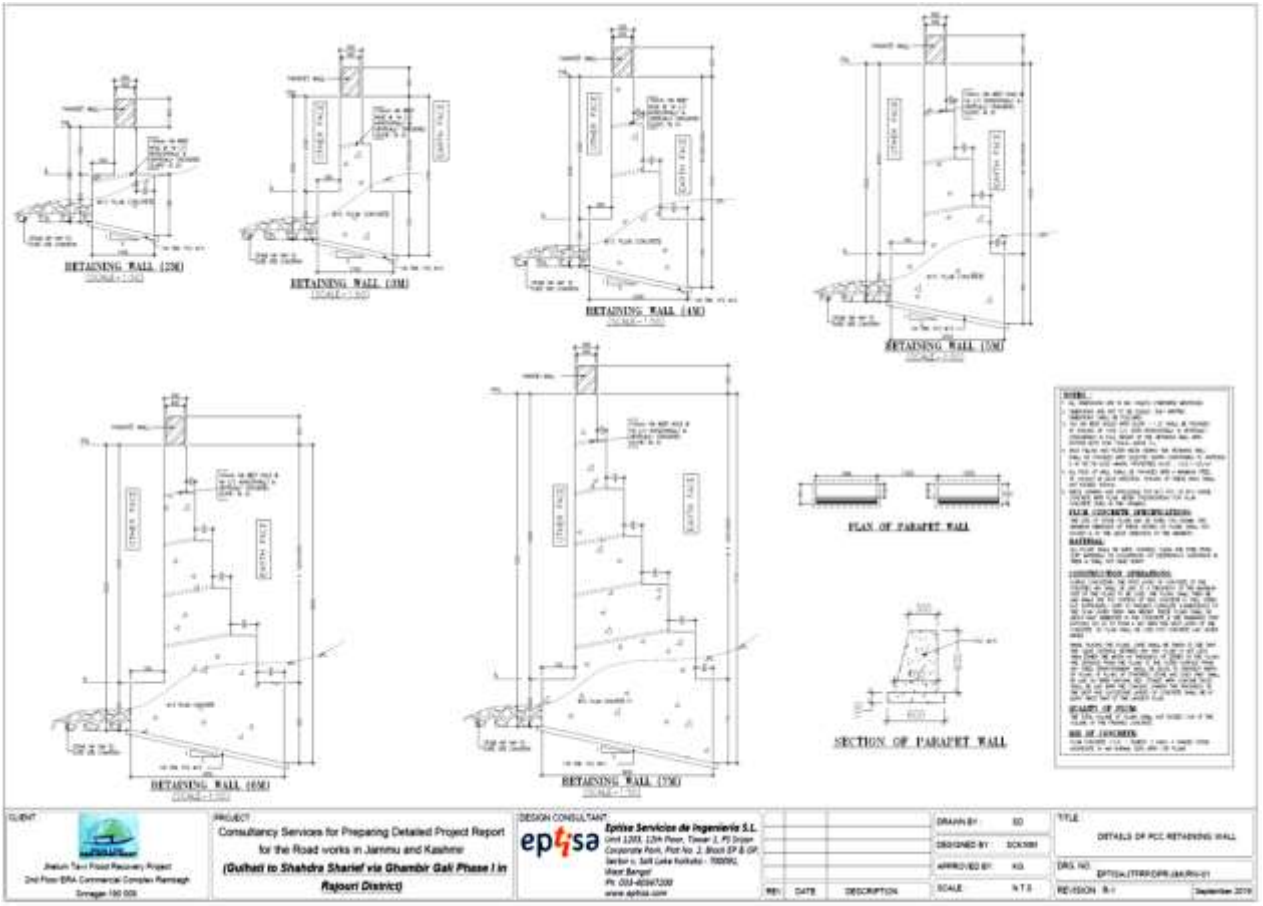
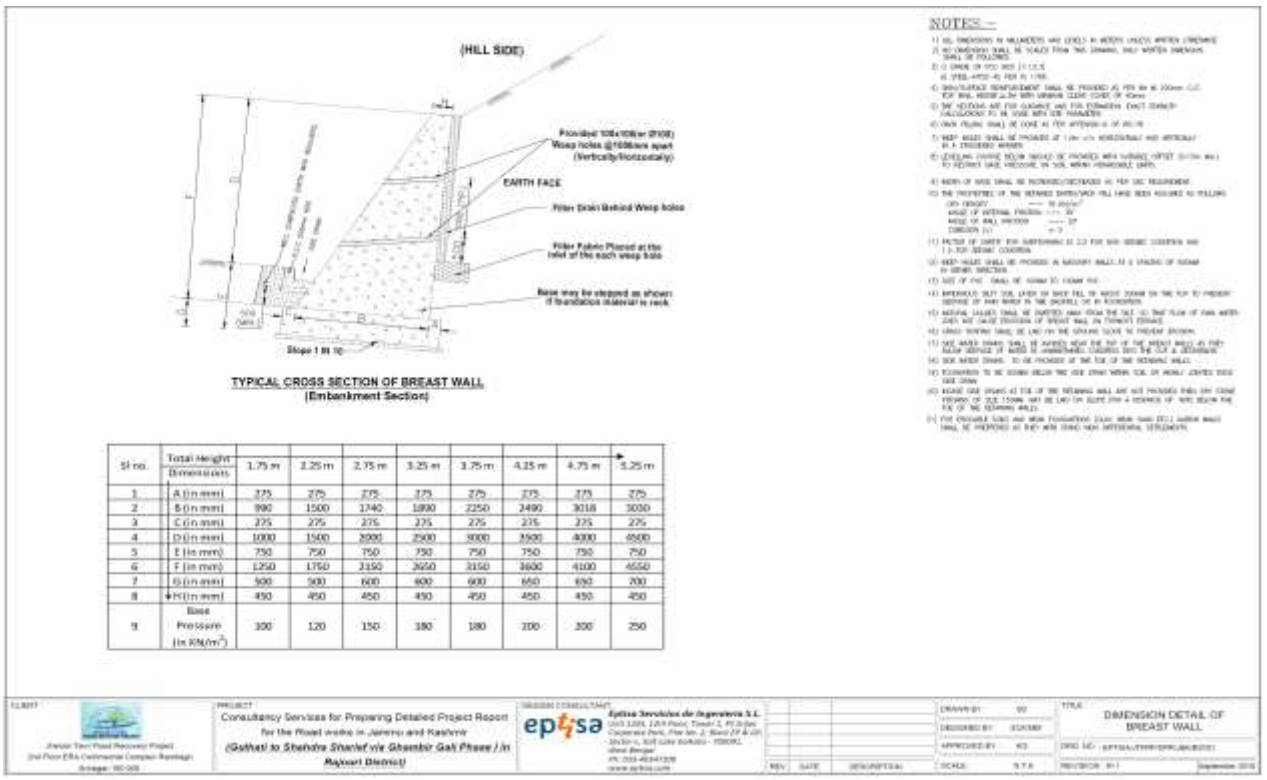


Figure 3.3: Typical Cross-Section of Retaining Walls.



Sl no.	Total Height / Dimensions	1.75 m	2.25 m	2.75 m	3.25 m	3.75 m	4.25 m	4.75 m	5.25 m
1	A (in mm)	275	275	275	275	275	275	275	275
2	B (in mm)	990	1500	1740	1890	2250	2490	3018	3030
3	C (in mm)	275	275	275	275	275	275	275	275
4	D (in mm)	1000	1500	2000	2500	3000	3500	4000	4500
5	E (in mm)	750	750	750	750	750	750	750	750
6	F (in mm)	1250	1750	2150	2650	3150	3600	4100	4550
7	G (in mm)	500	500	600	600	600	650	650	700
8	H (in mm)	450	450	450	450	450	450	450	450
9	Base Pressure (in KN/m²)	100	120	150	180	180	200	200	250

Figure 3.4: Typical Cross-Section of Protective Measures Breast Wall

Improvement of Geometrics

Carriageway width

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 the 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.**

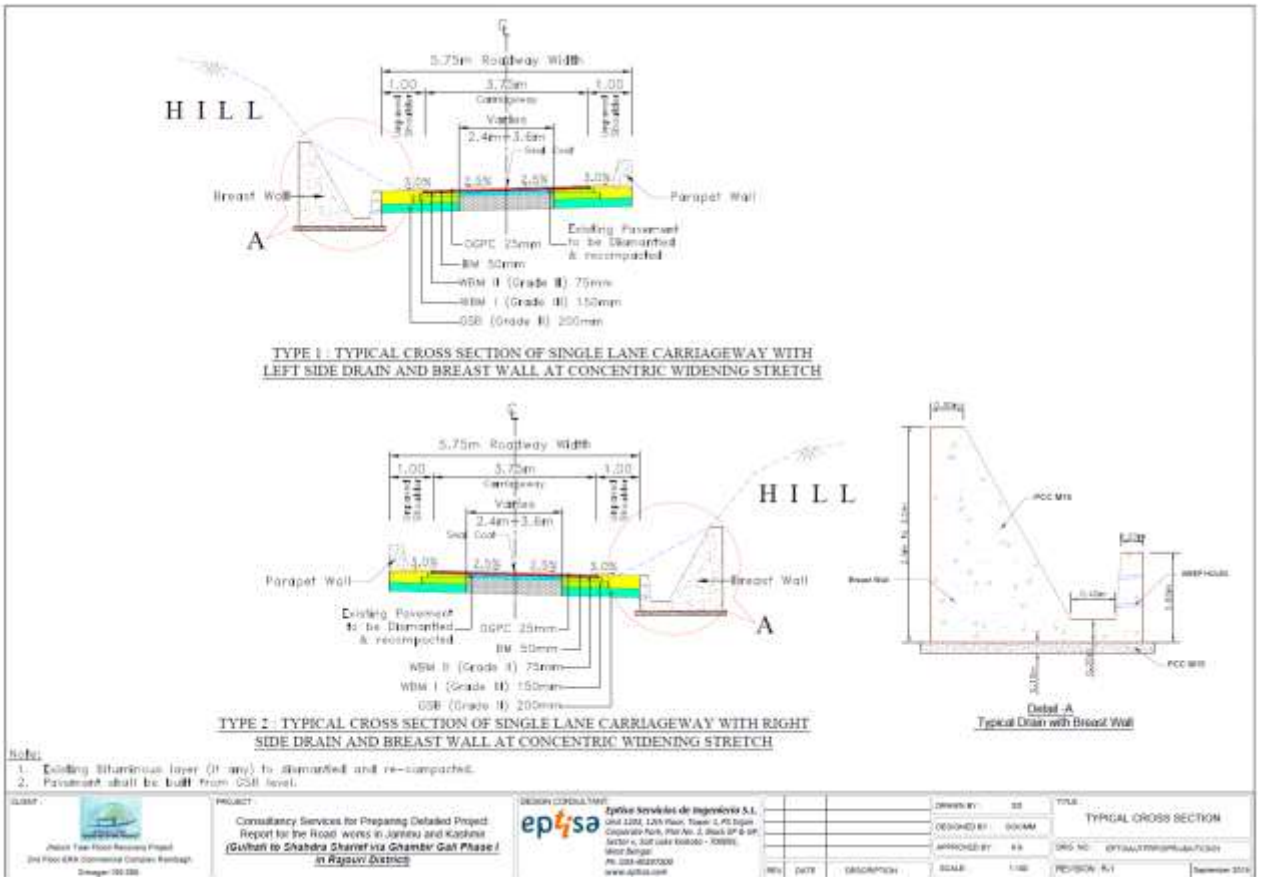


Figure 3.5: Typical Cross-Section of single lane carriageway width (Right/Left side drains) and Breastwall at concentric widening Section

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.

Traffic Safety and Other Appurtenances

Following road furniture and miscellaneous items have been designed keeping the safety aspect in mind.

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". Description of "Road Signage" is given in **Table 3.8**.

Table 3.8: Details of Road Signage

S. No	Signage		Size	Nos.
	Fig No. (3.6 - 3.8)	Description		
1	14.02	Give Way	900 Equilateral	1
2	14.23	Overtaking Prohibited	600 Equilateral	0
3	15.01	Left-Hand Curve	600 Equilateral	24
4	15.02	Right-Hand Curve	600 Equilateral	24
5	15.03	Right Hairpin Curve	600 Equilateral	11
6	15.04	Left Hairpin Curve	600 Equilateral	11
7	15.05	Right Reverse Bend	600 Equilateral	16
8	15.06	Left Reverse Bend	600 Equilateral	14
9	15.07	Series of Bends	600 Equilateral	82
10	15.09	Side Road Right	600 Equilateral	0
11	15.10	Side Road Left	600 Equilateral	0
12	15.18, 15.19, 15.20, 15.21	Intersection	600 Equilateral	1
13	15.23	Narrow Road Ahead	600 Equilateral	0
14	15.24	Road Widens	600 Equilateral	0
15	15.34	School Ahead	600 Equilateral	4
16	15.35	Build Up Area	600 Equilateral	6
17	15.72	Chevron(Normal)		0

18	15.76	Object Hazard(Left)	90 cm x 30 cm rectangular	246
19	15.77	Object Hazard(right)	90 cm x 30 cm rectangular	246
20	16.02	Directional Sign	60 cm x 90 cm rectangular	1
21	16.04	Directional Sign	60 cm x 90 cm rectangular	0
22	16.06	Place Identification Sign	60 cm x 45 cm rectangular	14
23	14.37	Maximum Speed Limit	600 mm dia	257
24	15.30,15.31	Start & End of Dual Carriageway	600 Equilateral	0
25	17.07	Hospital Ahead	600 Equilateral	2
Total				**960**

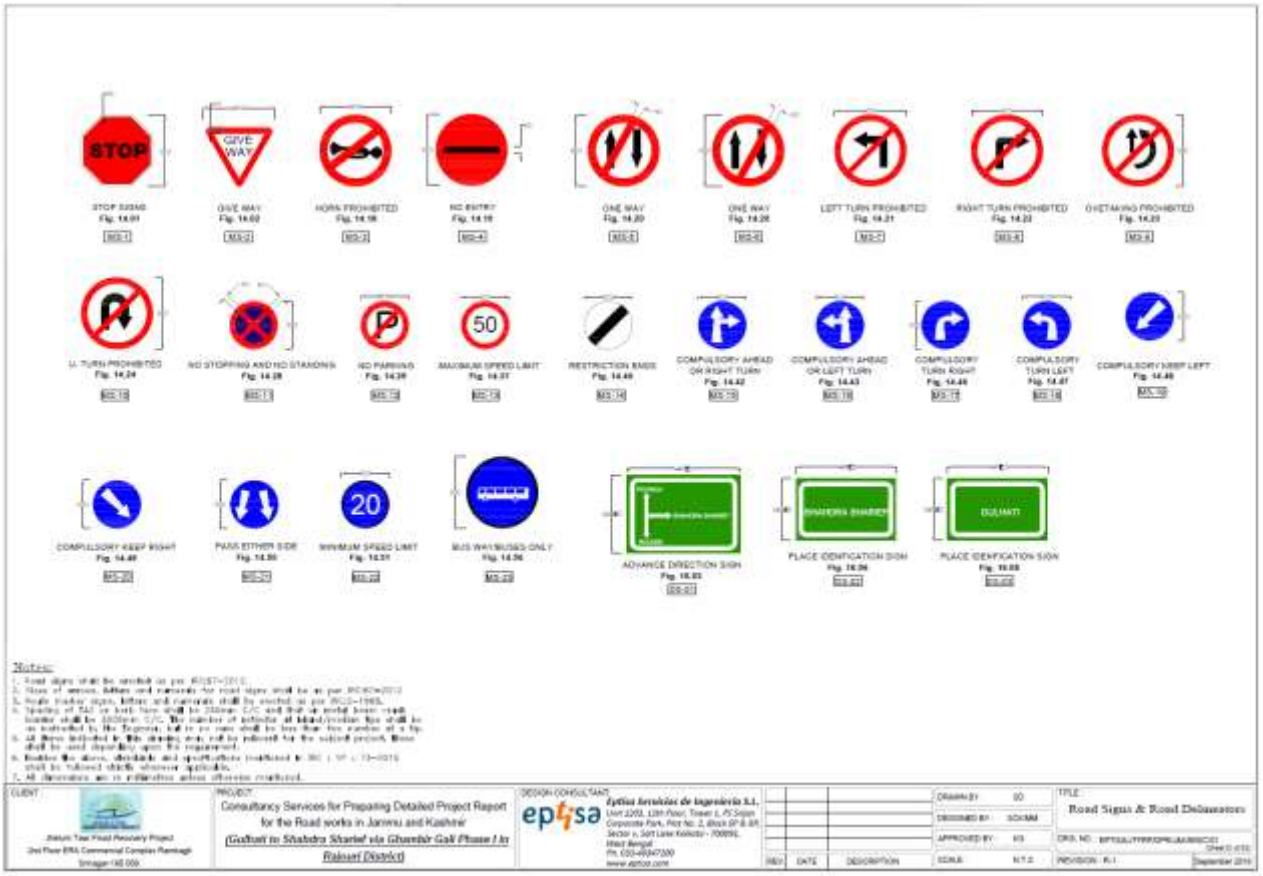


Fig 3.6**:** Road Signage of the proposed Road

Fig 3.7: Road Signage of the proposed Road

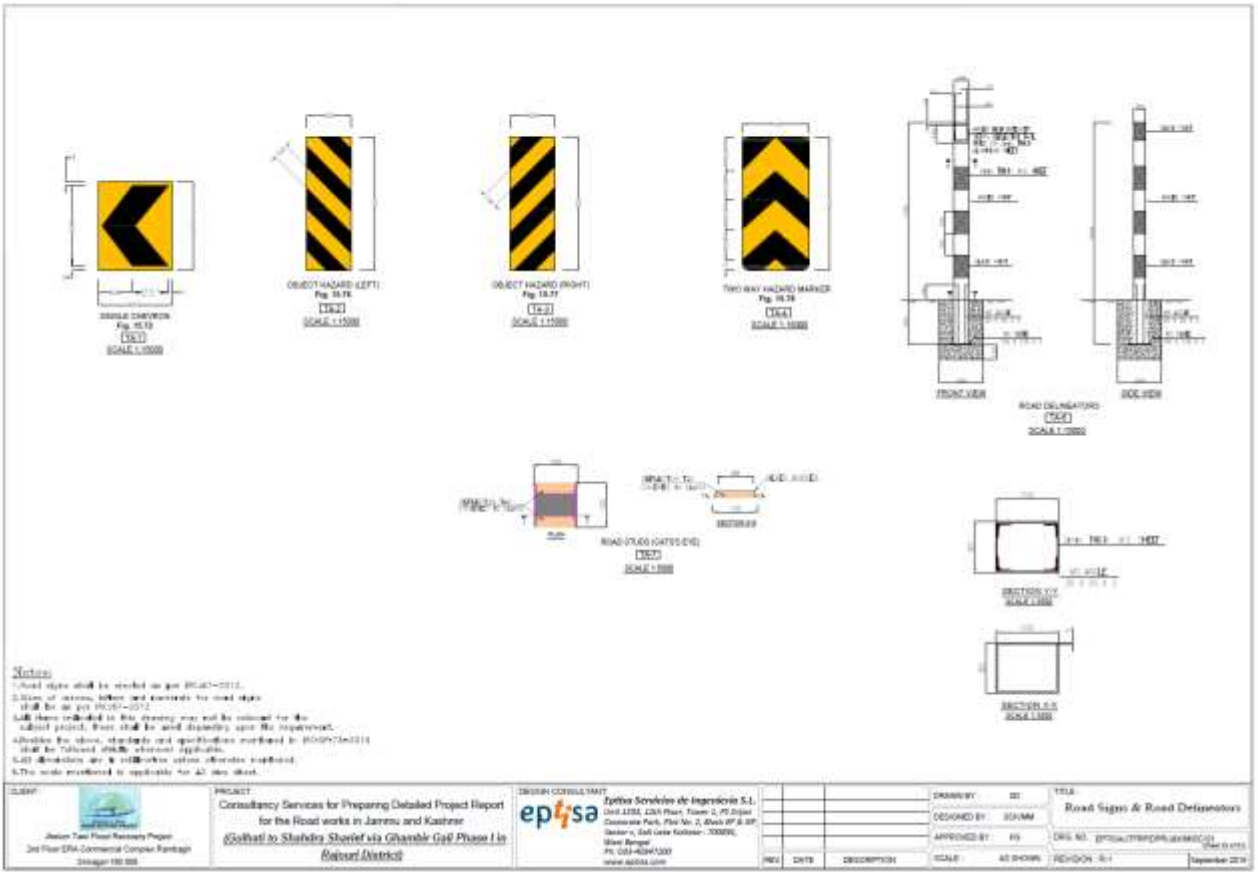


Fig 3.8: Road Signage of the proposed Road

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 from toppling over. **11140m** length parapet wall provided along the project stretches.

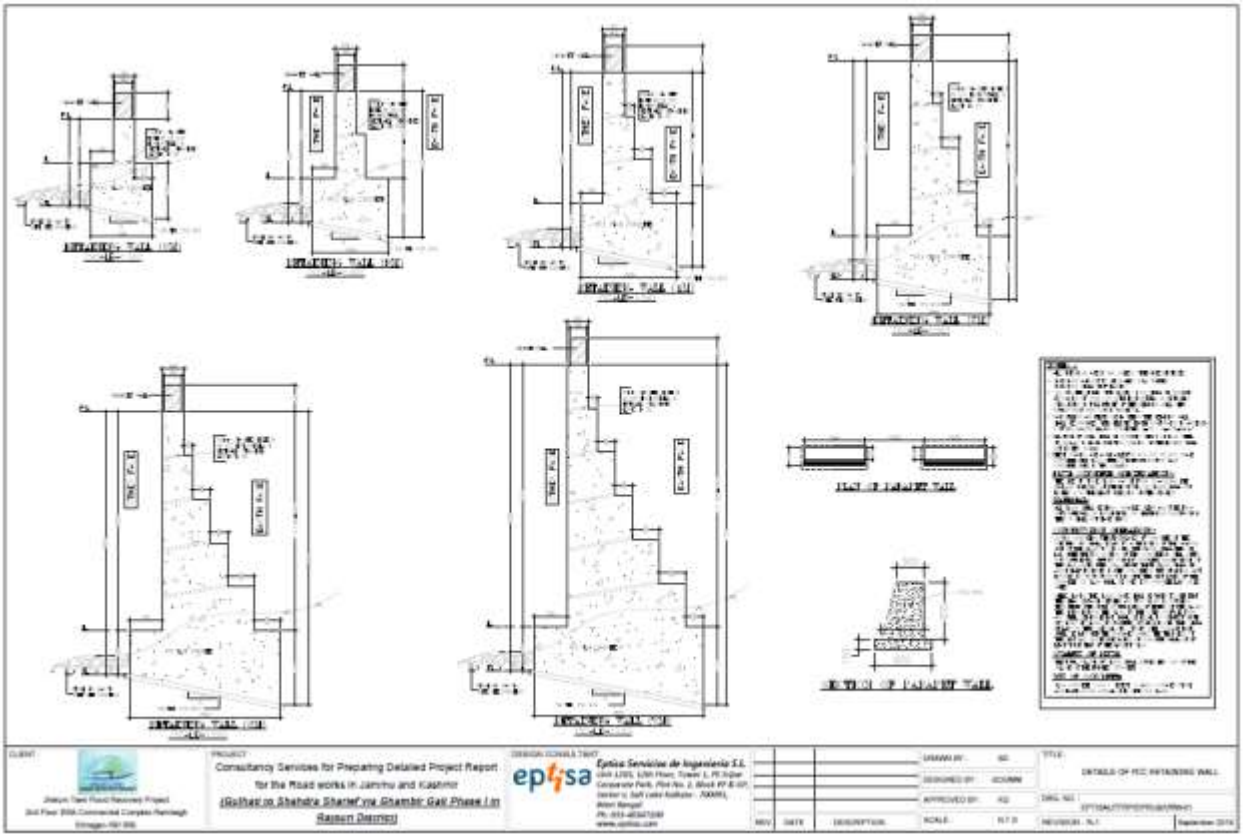


Figure 3.9: Section and Plan of Parapet Wall and Retaining Walls

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. 18 nos. convex mirror required along the project road at the following chainages as given shown Table 3.9 below;.

Table 3.9: Chainage details of proposed convex mirrors

Proposed Convex Mirrors (Chainage Details)					
4+800	8+850	9+800	16+100	16+150	17+700
20+750	21+350	22+480	22+850	25+670	26+555
26+970	27+900	29+040	30+070	30+200	33+720

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 Gulhati to Shahdra Sharief Road via Ghambir Gali in District Rajouri, 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 Gulhati to Shahdra Sharief Road via Ghambir Gali in District Rajouri under Package-3.

4.2. Applicable National and State Regulations

The key environmental and other regulations relevant to improvement and up-gradation of subproject road under Package-3 in District Rajouri in Jammu division in J&K is presented in Table 4.1

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-3), 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 road Package-3 in Rajouri District does not require diversion of forest land.	NONE	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 road of Package-3 in Rajouri District is 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 road Package-3 in Rajouri 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 road Package-3 in Rajouri 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 road Package-3 in Rajouri 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-3 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 road Package-3 in Rajouri 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 road Package-3 in Rajouri.	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.	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.	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 guide 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 Construction of Storm Water Drainage are given in **Table 4.2**.

Table 4.2: Relevant and Applicability of WB Safeguard Policies for Improvement & Up-gradation of Gulhati to Shahdra Sharief Road Via Gambhir Gali under Package-3 in District Rajouri, Jammu, 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 road under Package-3 by way of improvement and up-gradation of the existing road to be	Triggered

			assessed and necessary mitigation measures are to be incorporated accordingly.	
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-critical habitats only if no alternatives are available and if acceptable mitigation measures are in place.	The construction of road under Package-3 by way of improvement and up-gradation of the existing road and the project sites are not located in any forest area/ national park or wild sanctuary.	Not Triggered
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 road under Package-3 is an existing road and is not located in any 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 road of Gulhati- Shahdra road which is a hill road does not have any wetland in the project influence area. Hence, Ramsar convention is not applicable for the project 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

S. No.	IRC Code Theme	Year	Purpose	Applicability
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 Ash	IRC:SP-89-2010	Soil and Granular Material Stabilization Using Cement Lime and Fly Ash	Yes
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 road of Gulhati to Shahdra Sharief Road via Ghambir Gali is 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. BASELINE ENVIRONMENTAL CONDITIONS

5.1. General

Rajouri district lies in the South-western side of the Jammu & Kashmir and is approximately 150 km distance of west side of Jammu City. The Rajouri district has a geo-coordinates of 33°34″N–33°04″N latitude and 74°10″E–74°37″E longitude with an altitudinal range from 460 m to 3900 m above sea level. In 2011, the total population in the district was 619,266, of which more than 80% is rural. Its rural sector comprising of 385 villages, (including 10 uninhabited villages) has an area of 2608.11 Sq.km. Its urban sector is comprised of four towns viz. Thanamandi, Rajouri, Nowshehra and Suderbani spread over an area of 21.89 Sq.km. The decadal growth rate in population during 2001–11 was 28%. The climate in the district ranges from semitropical in the south to temperate in the north. Rajouri town falls in the temperate region. The district receives rainfall from the south-western monsoon from June to August. Average annual rainfall varied from 689 to 1293 mm during 2002 and 2014.. District Rajouri presents a composite culture of Pahari, Gojri, Dogra and Kashmiri. Irrespective of ethnic groups, lakhs speak Pahari language with ease. The district was made up of six tehsils; namely; Budhal, Kalakote, Nowshehra, Rajouri, Thanamandi and Sunderbani at the 2001 Census. After 2001 Census, one more tehsil; namely; Darhal was carved out within the same jurisdiction by detaching eleven villages and one forest block from erstwhile Thanamandi tehsil. As such, the district is constituted of seven tehsils which have further been divided into nine Community Development Blocks viz. Manjakote, Darhal, Budhal, Rajouri, Nowshera, Kalakote, Thanamandi,Sunderbani and Peripheral.

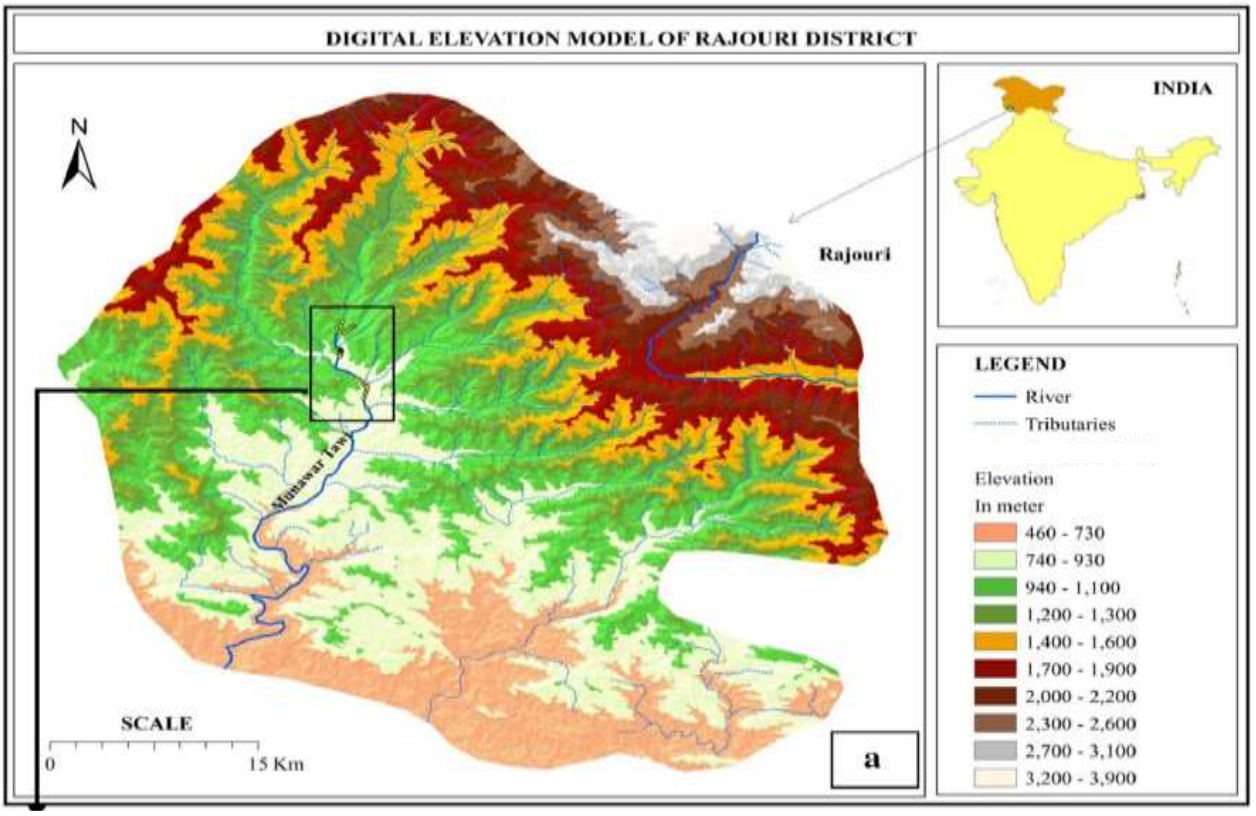


Fig 5.1: District Rajouri Elevation Outline (Source: Zeeshan et al. Environment System Research, 2017)

5.2. Study Area

The project road starts from Gulhati of Rajouri Poonch Road and terminates at Shahdra Sharief. The Gulhati to Shahdara Sharief Road is located in District Rajouri in Jammu region, having geo-coordinates of 33°29'57.61"N (Latitude) & 74°15'18.19"E (Longitude) at Galhotti (starting point) to 33°32'0.31"N (Latitude) & 74°20'26.80"E (Longitude) at Shahdra Sharief (endpoint) of the road. The proposed subproject "Improvement & Up-gradation of the road under package-3" is a rural road passing through the hilly terrain**.** It is a village road, having existing carriageway less than a standard single lane. From connectivity & pilgrim point of view, this particular road has high importance and give connectivity to Dehri Ralyot, Ghambeer Muglian, Bharot, Rajdhani villages and especially Shahdra Sharief known for the revered Sufi shrine of Baba Ghulam Shah Badshah Shahdra Sharief (commonly known as Shahdra Sharief Dargah). Project Road has been divided into two sections i.e. Section I from Km 0.000 to Km 10.000 (Length 18 Km) and Section II from Km 15.000 to Km 33.000 (Length 18 Km). From Km 10.000 to Km 15.000, the road section is already developed under PMGSY Scheme

5.3. Topography and Physiography

The Gulhati to Shahdra Sharief road lies in the District Rajouri of Jammu region in J&K. The project road falls in characteristic hilly terrain topography. The project influence area on both sides of the Gulhati to Shahdra Sharief road is mainly open areas, agriculture fields (mainly in pockets), horticulture fields (esp. Pear orchards etc.) and built-up areas in hamlets. Gambir nallah is flowing at Ch 4+900 near Ghambir Mughlian. The Rajouri district is having sub-temperate climate. The climate of the Rajouri is somewhat cooler than the other surrounding areas. Summers are short and pleasant. The summer temperature generally does not exceed 41 degrees. Inters are cool and chilly characterised with rainfall due to the western disturbances with minimum snowfall. The average rainfall is 769 millimetres in the wettest months. The average temperature of summer is 29°C and the average temperature of winter is 16°C. Landuse pattern along the project road is provided in Annexure XVIII

5.4. Geomorphology and Soil of the Area

The area is undulatory with high peaks and dissected valleys. The land slopes are steep and at many places, escarpments are seen. Physio-graphically the district is characterized by mountain ranges trending NW-SE direction, deep narrow valley and terraces, valley-fill deposits with gentle slopes. Pir Panjal mountain range in the North-eastern side of the district separates it from the Kashmir valley where high peaks are found.

5.4.1. Hilly Terrain

The altitude in the district varies from 562 to 4800m amsl. The major slope of the terrain is towards south and southwest. Structural hills belonging to Murree and Siwalik groups are mostly longitudinal with altitude varying between 700 m and 2200 m amsl. The alluvial terraces are observed along the Tawi River. The district forms a part of the hilly terrain of the sub-Himalayas, consists of parallel hill ranges separated by narrow valleys. Important Ranges in Rajouri district are Rattan- Peer Range, Chhacher Range, Peer Badesarashwar Range and

Kalidhar Range. Important Peaks in Rajauri district are Dakyal Peak, Tade Peak, Rattan Peer Peak, Peer Bradeshwar Peak, Peer Chhacher Peak, Noor Bangla Peak, Khari Marg Peak.

The minimum elevation is observed at Gulhati at 3833 feet (a.s.l) and at Shahdra termination point it is recorded at 5252 feet (a.s.l). Maximum project elevation was recorded at Ghambir Mughlian having geo-reference coordinates of 33°30'22.63"N (Latitude) & 74°19'20.10"E (Longitude). Elevation profile of the project road illustrates Gambhir Mughlian having highest elevation whereas Gulhati section (1km) as the lowest point. Details are provided below;

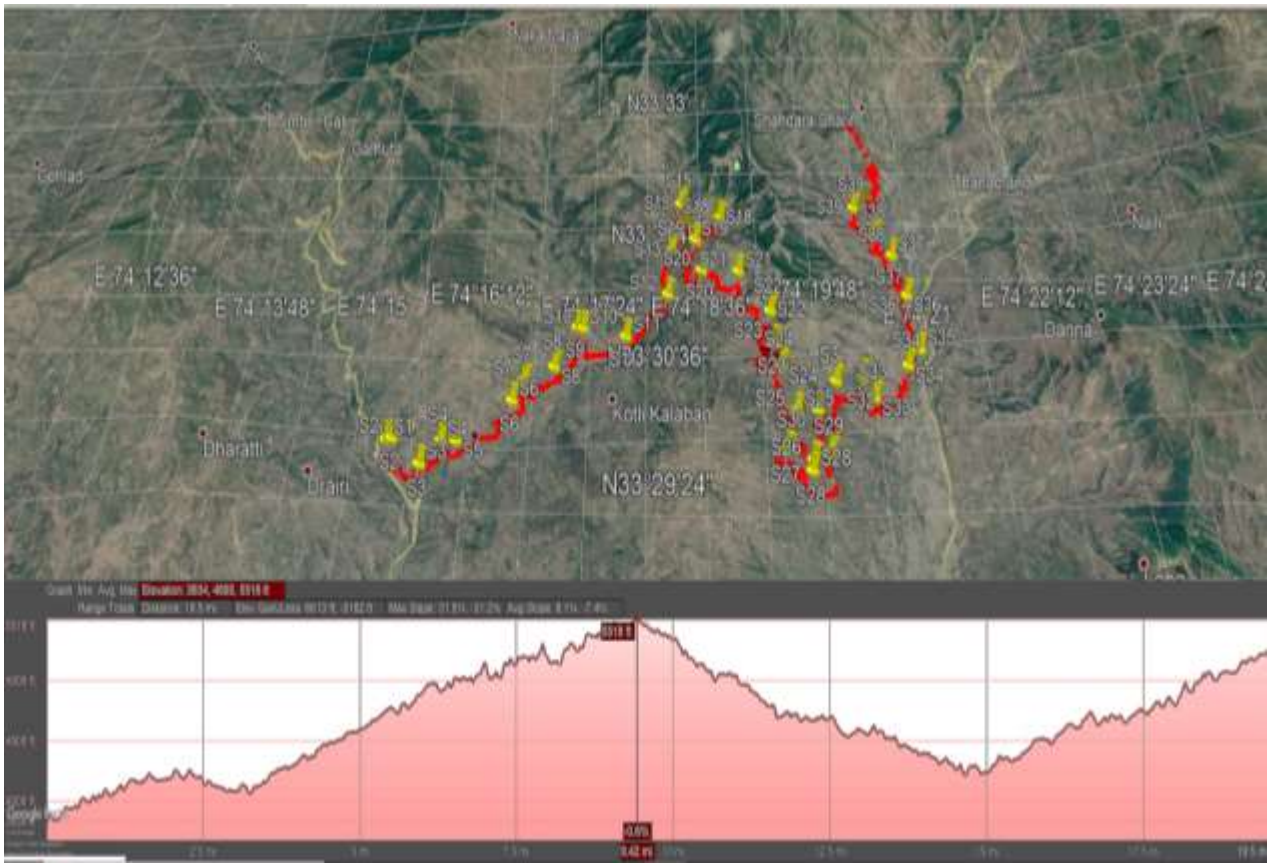


Fig 5.2: Elevation Profile of the proposed road from Gulati to Shahdra Sharief. (Source: Google Maps- Elevation details)

5.4.2. Soil Type

Three types of soils are present in the Rajouri district. They are Brown, Red and Yellow Soils (Ultisols), Sub-Mountainous Soil (Alfisols) and Bhabar Soil (Entisols)

5.4.3. Geology

The district is underlined by rock formations ranging in age from Pre-Cambrian to Quaternary period. The generalized geological succession in the Rajouri district is given below;

Table 5.1: Geological Succession of the Rajouri District.

Group /Formation	Lithology	Age

Quarternary	Heterogeneous Clastic sediments comprising of Sand, Silt, Clay	Sub-recent to Recent
Siwalik	Sandstone, Clays, shale, boulder/pebble etc.	Lower Miocene to Pleistocene
Murrees	Red coloured Sandstone & Clay	Lower Miocene
Unconformity		
Older crystalline and Metamorphic rocks (Subathu, Salkhala, Sirban Formations)	Limestone, shale, Sandstone, Phyllites, Gneisses	Precambrian to Eocene

The northern side of the district comprises of Older Crystalline and Metamorphic rocks consisting of Salkhala, Tanawal and Ramban Formations of Precambrian to Eocene age. The southern part of the district comprises of Siwalik Formation. The Lower Siwalik semi consolidated subgroup constitutes light grey, medium to coarse sandstone and claystone. The sandstones are well compact. The Siwalik consists predominantly of light grey, medium to coarse sandstones and clays.

Rajouri District comprises of about 80% of Murree Group of rocks of late Eocene- Early Miocene age and is dis-conformably underlined by the rocks of Subathu formation in the Rajouri district. Murree Group consists of pink Sandstone & Clay. It is separated from Siwalik in the south by Mandli - Kishanpur thrust and in the north by Murree Thrust from Older Crystalline and Metamorphic rocks

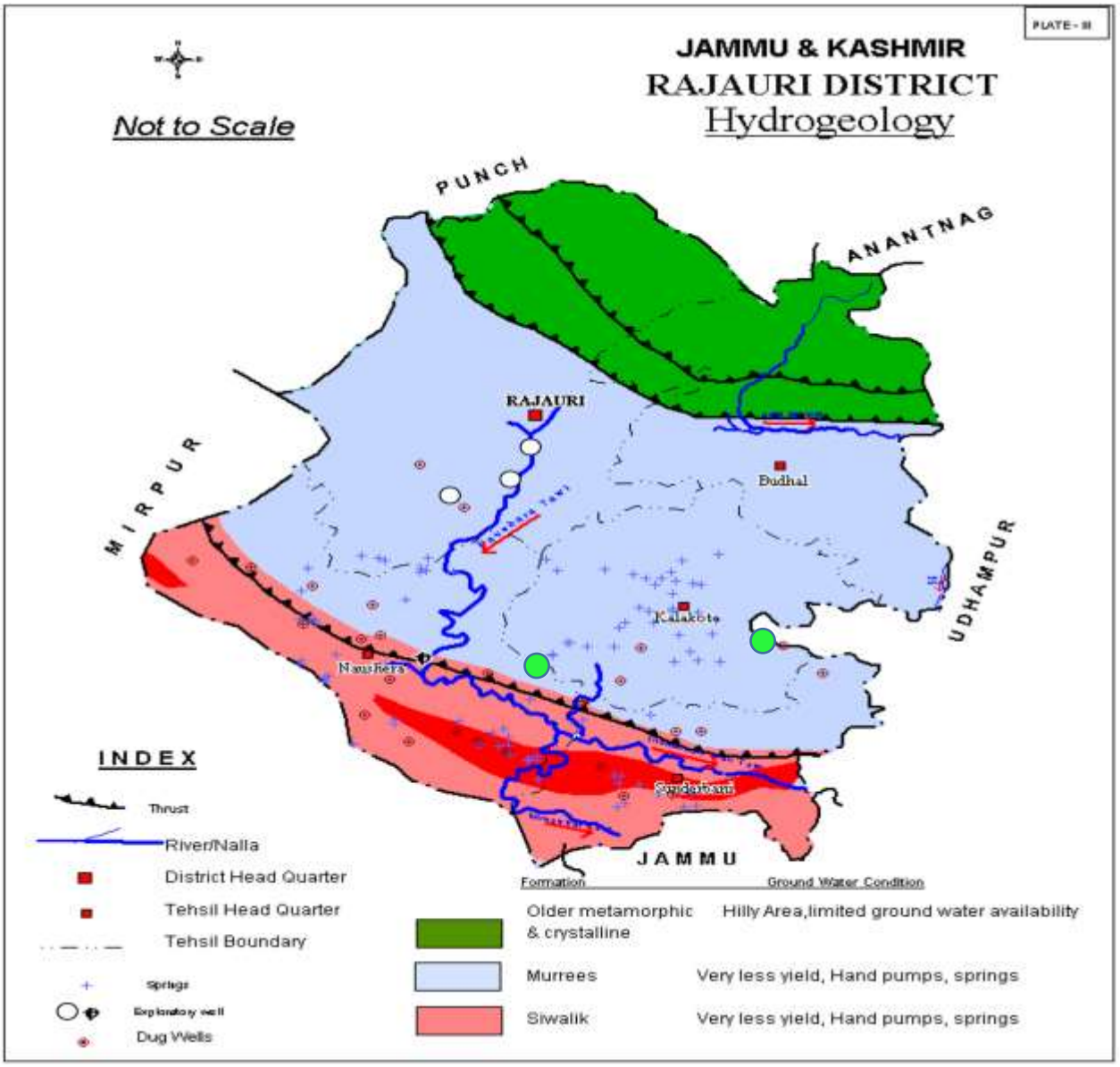
5.4.4. Hydrogeology

In general, the groundwater potential in Siwalik and Murree formation is poor. The shallow dug wells located in the terrace and valley fill deposits yield low to the moderate discharge of groundwater. Recharge to the alluvial aquifers is received both by in situ filtrations of rainwater as well as through subsurface flows from the nearby nallas and streams. The thickness of these alluvial aquifers is limited to a maximum of 12-15 m below ground level. However zones of secondary porosity in the form of suitable areas, worthy of groundwater development. Groundwater occurrence in the area occupied by Siwalik rocks in the district is restricted to small isolated patches in hilly areas. Springs, in the areas, are the main source of groundwater.

The Murree group of rocks occupies the major portion of the Rajouri district. The Murrees are devoid of primary porosity. However, the Groundwater emerges in the form of springs at the contact of pervious and impervious beds and other structural features.

The Alluvial deposits are highly heterogeneous comprising of varying grades from gravels, sand, silt & clay. These deposits possess a good degree of primary porosity & permeability. About 75% of dug wells in the entire district are located in these deposits and yield fresh potable water. Groundwater occurs in the saturated pore spaces of the alluvial sediments.

Springs are formed where the water table is intercepted by the topography. In the study area, the springs are widely distributed, occurring in the different formations at varying altitudes. In the study area, the occurrence of spring is controlled by lithological and structural character of rock formation. Majority of the springs occur along fracture zones. Kishanpur-Mandli Thrust are some major fractures along which springs are located



Source: Ground Water Information Booklet, North-Western Himalayan Region District Rajouri, February 2013

Fig 5.3: Map showing Hydro-Geology of the District Rajouri (Green dots depicts project location- for illustration purpose only)

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 Gulhati-Shahdra Sharief road have been identified at number of places with some of the pictures are shown in **Fig. 5.4 & 5.5** below;

Fig: 5.4: Fresh landslip/ erosion case in Ghala area at Ch 12+600.

Figure 5.5: Critical Landslip/ erosion sites identified sections having stabilization issues falling in Barot and Gambir Mughlian areas of Gulhati to Shahdra Sharief Road

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-V classification), and man-made disasters including road accidents which is synonymous with hilly roads in Rajouri 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 project of “Gulhati to Shahdra Sharief Road via Ghambir Gali” was affected during the September 2014 floods. The hilly terrain feature result into the disintegration of the road surface, slope destabilization, erosion issues etc.

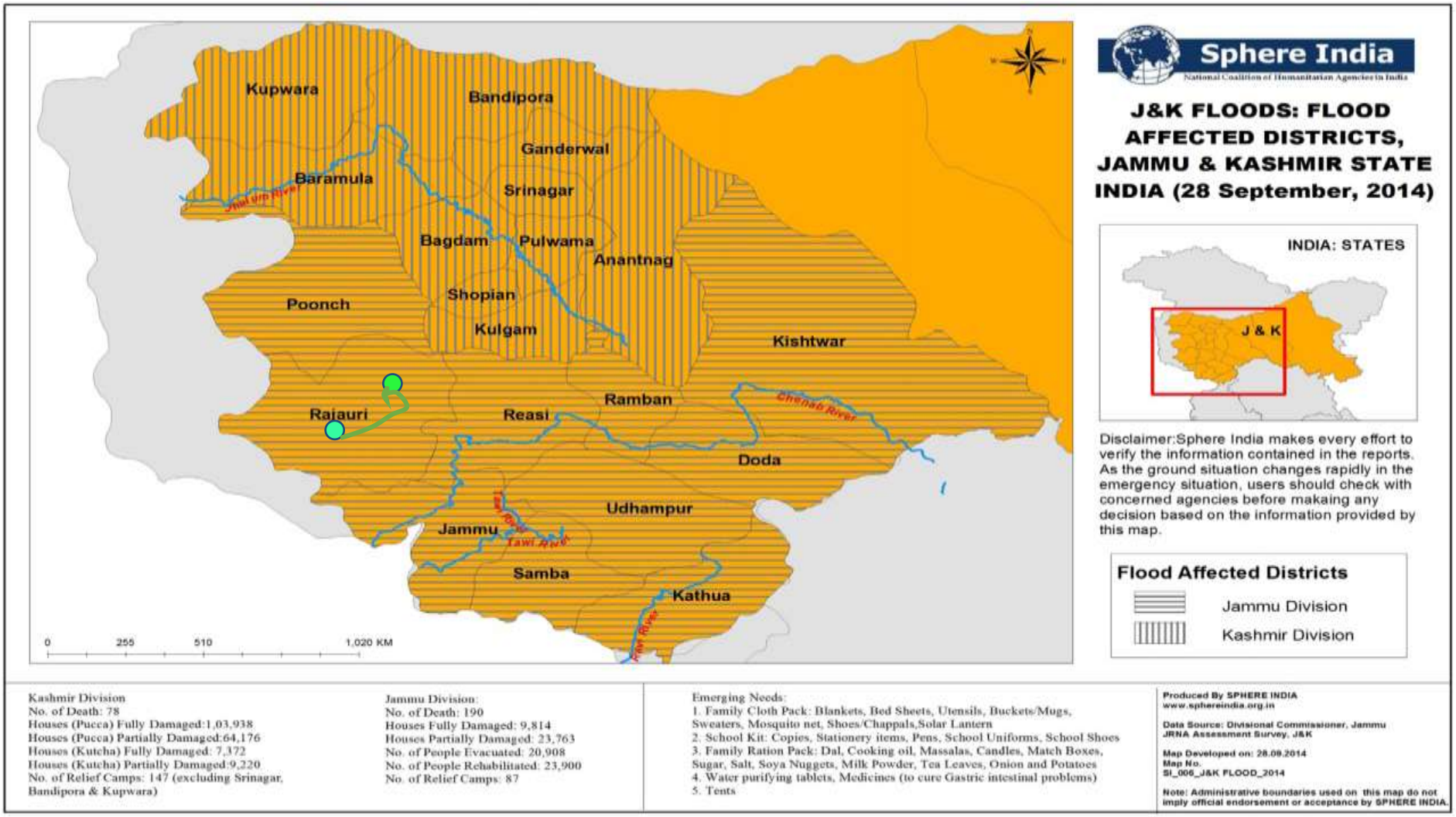


Fig 5.6: Flood Affected District Map (September 2014 Floods in J&K)- Green dots with line showing (only for the illustration) project road in Rajouri District

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 road under Package-3 is located in District Rajouri 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:

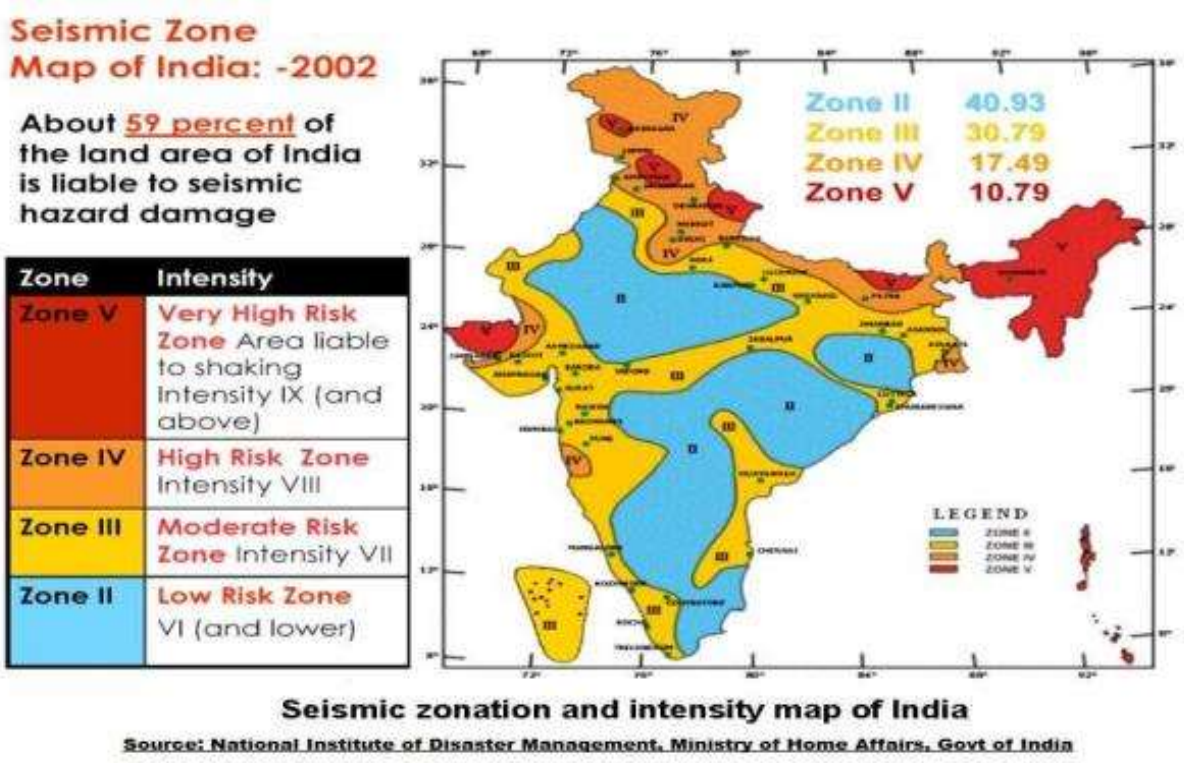


Fig 5.7: Seismic Zonation and Intensity Map of India.

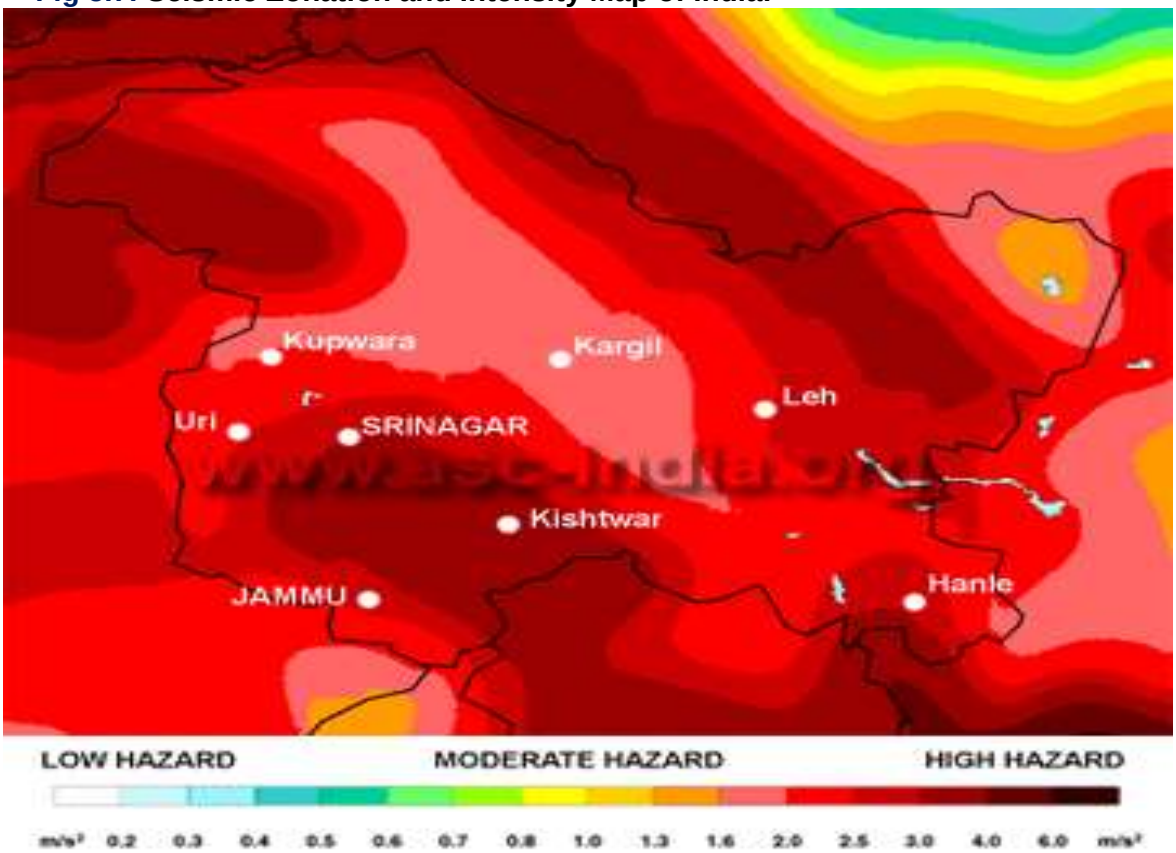


Fig 5.8: Jammu and Kashmir earthquake zones.

5.7. Air Environment

5.7.1. Meteorology and Climatology

The climate varies from semitropical in the southern part comprising Nowshera, Sunderbani and Kalakote to temperate in the mountainous northern part comprising the area of Rajouri, Thanamandi and Koteranka Tehsils of the district. The subtropical southern region receives regular monsoons, whereas the northern part prone to hailstorms experiences excessive rains. The average annual rainfall is 1150 mm and average temperature varies from 7.42-degree celsius to 37.4 degree celsius. The maximum rainfall in the area is received through southwest monsoon during July-September. The rainfall during the rest of the period is sporadic and scanty. The general elevation of the district is in the range of 562-4800 m amsl.

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 but do gain some strength during the late summer and early part of the monsoon season. In the southwest monsoon season winds from easterly and south-easterly directions are more common with north-westerly blowing on some days. In the post-monsoon and winter seasons, the predominant wind direction is north-westerly. In the summer, winds are generally from north-esterly direction but on some day they blow from the southeast.

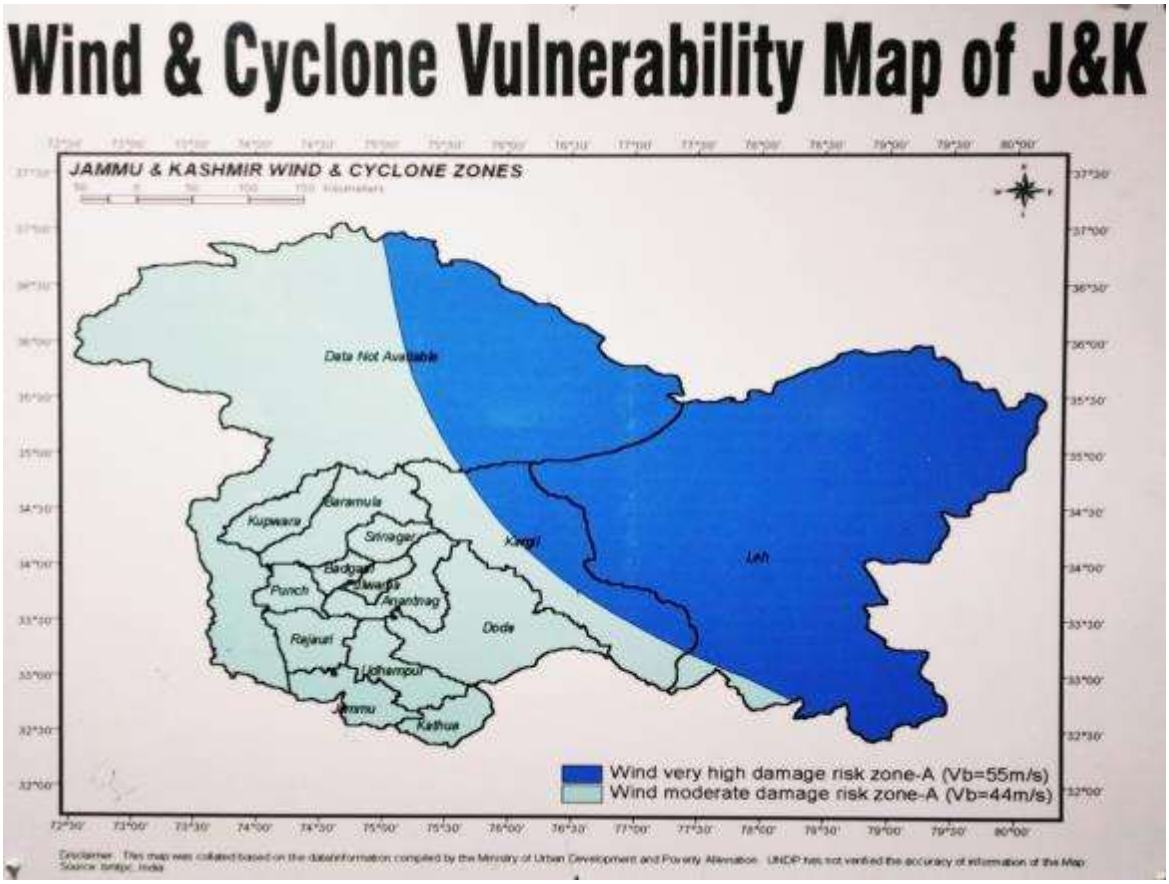


Fig 5.9: Wind & Cyclone Vulnerability Map of J&K (Source: BMTPC)

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

Manwar Tawi (start of the project) and Ghambir Mughlian along with 2 small nallahs/ streams (in Behrote) are located within the project area.

5.9.1. Drainage

The district area is drained by several perennial rivers and ephemeral streams. These nallas/ streams remain dry in summer but create havoc due to flash floods especially in rainy seasons. They carry a huge load of boulders, pebbles, sand and silt during the monsoon period. The district is drained by the Manwar Tawi and its tributaries named Nowshera Tawi, Neari Tawi, and Thande pani wali Tawi, except the eastern side which is drained by Ans River. Both fall in Chenab sub-basin. These rivers originate from the north of the district limit. The northern part of the district is characterized by the dendritic to sub dendritic drainage pattern controlled by the natural topography of the area and geological structures.

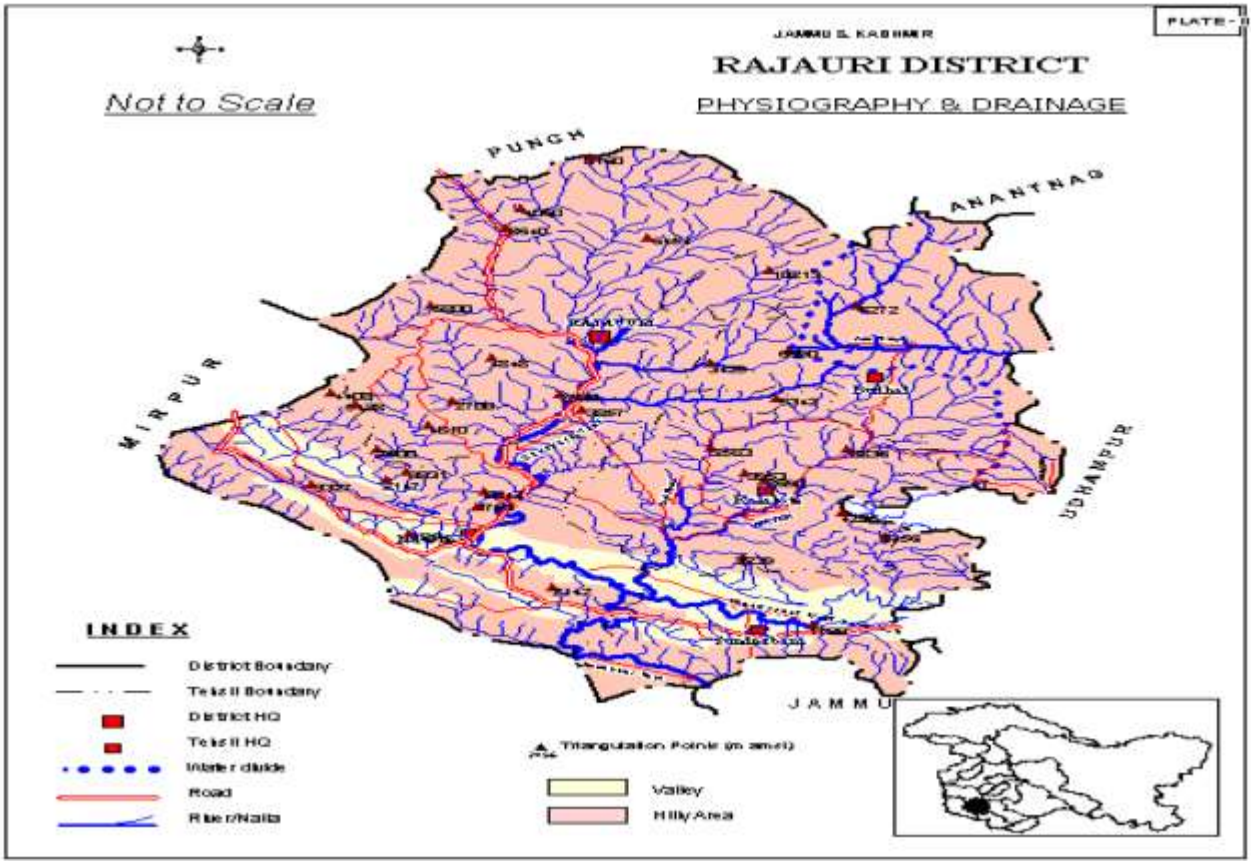


Fig 5.10: Physiography and Drainage Pattern of Rajouri District, J&K (Source: Ground Water Information Booklet, North-Western Himalayan Region District Rajouri, February 2013)

In the project road, no longitudinal drainage system exists along the hillside. Numbers of cross drainage structures exist as most of them are in a highly dilapidated condition or damaged resulting in overflowing of water on the road surface. Due to the lack of efficient drainage system/ structures road gets frequently damaged resulting in unsafe driving conditions for the commuters.

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-3 road is located in Rajouri District of Jammu region. The Gulhati to Shahdra Road via Ghambir Gali is an existing road and falls in hilly terrain. There is no natural forest-like Reserved Forest, Protected Forest or natural heritage sites of national and international importance along the one km radius of the project site.

5.10.2. Flora

The prevailing and predominant vegetative species observed in the direct project corridor/ Project Influence Area (PAF) in the study areas of the project area are listed below. The local flora in the study area usually denotes trees along the road and any other sites of green cover along either side of project road. As per the site survey, the common indigenous species are prevalent through the project corridor/ PAF. The commonly observed trees are Poplar, Willow, Pears, Banana etc., and scheduled trees of Chinar, Mulberry and Walnut. No rare or endangered plant species were observed. Some of the trees numbering about 15 trees of mainly Willow & Poplar are close to the pavement and may be required to be removed as they possess safety/visibility hazard. The dominant/ common plants observed and documented during the field study is present below;

Table 5.2: 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	Indigenous Trees	
4	Willow	Salix alba
5	Poplar	Populus alba
6	Ailanthus	Ailanthus altissima
7	Acacia (Kikar)	*Robinia pseudo-acacia*
8	Apple	*Malus sp.*
9	Pears	*Pyrus sp.*
10	Apricot	*Prunus armenica*
11	Pomegranate	*Pinica granatum*
12	Indian Fig tree	*Ficus recemosa*
13	Grass	*Cynodon dactylon*
14	Common Yarrow	*Achillea millefolium*
15	Carrot Grass	Parthenium hysterophorus

16	Purple fleabane (Sahadevi)	*Vernonia cinerea*
17	Banyan	*Ficus bengalensis*
18	Shishem	*Dalbergia sissoo*
19	Mango	*Mangifera indica*
20	Banana	*Musa sp.*
21	Bamboo	*Graminae sp.*
22	Pine	*Pinus sp.*
23	Butterfly Bush	Buddleja asiatica
24	Lantana, Wild-sage	Lantana camara

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. Scheduled/ protected trees located along the project road is given in Table 5.3 below;

Table 5.3: List of Protected (Scheduled) Trees located along the Project Corridor

S.No	Name of the Scheduled Tree	Location	Chainage (Ch)		Alignment (LHS/RHS	Distance from the Roads Central Alignment
Gulhati to Shahdra Sherief Road via Gambhir Gali, Rajouri Disitrict						
1	Chinar	Ghambir Mughlian	7+200	1	RHS	5
2	Chinar	Ghambir Mughlian	8+000	1	RHS	5.5
3	Chinar	Ghambir Mughlian	9+900	1	LHS	3.2
4	Chinar	Ghambir Mughlian	26+400	1	LHS	40
5	Mulberry	Ghambir Mughlian	2+500	1	RHS	4
6	Mulberry	Ghambir Mughlian	2+800	2	RHS	4.3
7	Mulberry	Ghambir Mughlian	2+950	1	RHS	4.2
8	Mulberry	Ghambir Mughlian	3+500	1	RHS	4.1
9	Mulberry	Ghambir Mughlian	13+600	5	RHS	3.9
10	Mulberry	Bahrot Village	16+200	1	LHS	4
11	Mulberry	Bahrot Village	17+300	3	RHS	5
12	Mulberry	Bahrot Village	18+900	1	LHS	3.9
13	Mulberry	Bahrot Village	19+000	1	LHS	3.8
14	Walnut	Bahrot Village	26+000	3	RHS	3.6
15	Walnut	Bahrot Village	26+300	1	RHS	3.3
16	Walnut	Bahrot Village	26+800	1	LHS	2.6

5.10.3. Fauna

No forest is present along the subproject or in project influence area; the terrestrial fauna is common domestic animals/ livestock. There are no Schedule-I terrestrial mammals" species observed along the project road.

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

Rajouri district lies in the South-western side of the State. It presents a composite culture-Pahari, Gojri, Dogra and Kashmiri. Irrespective of ethnic groups, lakhs speak Pahari language with ease. The district was made up of six tehsils; namely; Budhal, Kalakote, Nowshehra, Rajouri, Thanamandi and Sunderbani at the 2001 Census. After 2001 Census, one more tehsil; namely; Darhal was carved out within the same jurisdiction by detaching eleven villages and one forest block from erstwhile Thanamandi tehsil. As such, the district is constituted of seven tehsils which have further been divided into nine Community Development Blocks viz. Manjakote, Darhal, Budhal, Rajouri, Nowshera, Kalakote, Thanamandi, Sunderbani and Peripheral. Its rural sector comprising of 385 villages, (including 10 uninhabited villages) has an area of 2608.11 Sq.km. Its urban sector is comprised of four towns viz. Thanamandi, Rajouri, Nowshehra and Suderbani spread over an area of 21.89 Sq.km.

The district has returned a population of 6,42,415 which is 5.12 per cent of the total population of the State. It encompasses an area of 2,630 sq.km. Thus, its density i.e. population per sq.km works out to 244. In terms of population, it ranks 7th among all the districts of the State. Sex ratio i.e. number of females per 1,000 males is 860 which is lower when compared with the corresponding ratio of the State (889) and that of the district (878) at 2001 Census as well. The population recorded in 1901 and 1911 Census was 1,36,281 and 1,46,823 respectively, registering thereby a growth rate of 7.74 per cent. During the decades 1911-21 and 1921-31, there was a decrease in the growth rate. It increased to 10.79 per cent during the decade 1931-41. However, it again declined to (-) 3.40 per cent and (-) 3.52 per cent during the decades 1941-51 and 1951-61 respectively. It rose to 26.73 per cent in 1961-71 and further shot to as high as 39.16 per cent during 1971-1981.

The growth rate recorded during the decade 2001-2011 is 32.93 which is higher when compared with the corresponding growth rate of the State, standing at 23.64 per cent.No Census was conducted in the State during 1951 and 1991 due to disturbed conditions prevailing then. 1951 population figures are the arithmetic mean of 1941 and 1961 population, whereas 1991 population figures have been worked out by ‘interpolation’. The child population in the age group

0-6 is 1,08,271 constituting 16.85 per cent of the total population of the district. The number of females per 1,000 males in this age is 865 which is slightly higher than the corresponding ratio of the State standing at 862. The number of literates is 3,64,109 comprising 68.17 per cent of the total population of the district (excluding the population in the age group 0-6), which is higher as compared to that of the State as a whole (67.16 per cent).

The proportions of male and female literates work out to 78.13 per cent and 56.57per cent respectively. The overall percentage of literates at the 2001 Census was 57.99 per cent (excluding the population in the age group 0-6) registering an increase of 10.18 per cent during the period between 2001 and 2011 Census. Sex wise data reveals that an increase in the literacy rate of males (8.37 per cent) is lower than that of females (12.06 per cent). Out of a total population of 6,42,415 in the district, 2,90,912 or 45.28 per cent are total workers (main & marginal workers), comprising 20.29 per cent main workers and 24.99 per cent marginal workers. Non-workers being 54.72 per cent. Amazingly, the work participation rate about State as a whole is very low, as only 34.47 per cent have been recorded as total workers, constituting of 21.08 per cent of main workers and 13.39 per cent marginal workers. Sex wise data shows that the proportion of male total workers (53.5 per cent) is very much higher than that of the corresponding proportion of females (35.74 per cent) in the district.

In the district as a whole, Schedule caste population is 48,157 comprising 7.50 % of the total population of the district which is slightly higher than the corresponding proportion of the State, standing at 7.38 % while the number of Schedule caste males in the district is 25,170, the number of females is 22,987. Sex ratio i.e. the number of females per 1000 males is 913. Schedule tribe number 2,32,815 or 36.24 % of the total population of the district which is higher as compared to the corresponding proportion of the State (11.91 per cent). The number of males and females in the district is 1,21,374 and 1, 11,441 respectively. Sex ratio i.e. the number of females per 1000 males is 918.

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 5.4: Primary Census Abstract (Census 2011) of Rajouri Villages in the project area

District/ CD Town Block/ Town	Particulars	Total	Male	Female
Gulhati	Total No. of Houses	628	-	
	Population	3220	1613	1607
	Child (0-6)	581	295	286
	Schedule Caste	0	0	0

District/ CD Town Block/ Town	Particulars	Total	Male	Female
	Scheduled Tribe	534	266	268
	Literacy	1650	970	680
	Total Workers	1409	845	564
	Main Worker	435	308	172
	Marginal Worker	974	537	437
	Cultivators	152	145	7
	Agricultural labourers	769	385	384
Ghambir Mughlian	Total No. of Houses	1137	-	-
	Population	5860	3072	2788
	Child (0-6)	1088	568	520
	Scheduled Caste	-	-	-
	Scheduled Tribe	1308	698	610
	Literacy	3226	1983	1243
	Total Workers	2591	1360	1231
	Main Worker	1156	1019	137
	Marginal Worker	1435	341	1094
	Cultivators	1249	266	983
	Agricultural labourers	8	3	5
Rajdhani (Thana Mandi)	Total No. of Houses	581		
	Population	2929	1475	1454
	Child (0-6)	470	231	239
	Scheduled Caste			
	Scheduled Tribe	577	311	266
	Literacy	1639	964	675
	Total Workers	1431	775	656
	Main Worker	262	201	61
	Marginal Worker	1169	574	595
	Cultivators	670	305	365
	Agricultural labourers	412	203	209
Rajdhani (Manjakote)	Total No. of Houses	512	-	-
	Population	2426	1251	1175
	Child (0-6)	475	280	195
	Schedule Caste	0	0	0
	Scheduled Tribe	318	162	156
	Literacy	1260	723	537
	Total Workers	652	471	181
	Main Worker	359	265	94
	Marginal Worker	958	387	571
Bharot	Total No. of	605	-	-

District/ CD Town Block/ Town	Particulars	Total	Male	Female
	Houses			
	Population	3121	1616	1505
	Child (0-6)	524	291	233
	Scheduled Caste	-	-	-
	Scheduled Tribe	687	374	312
	Literacy	1675	996	679
	Total Workers	1279	756	523
	Main Worker	680	462	218
	Marginal Worker	782	228	554
	Cultivators	127	28	99
	Agricultural labourers	7	6	1
Shahdra	Total No. of Houses	662	-	-
	Population	3299	1705	1594
	Child (0-6)	673	362	311
	Scheduled Caste	0	0	0
	Scheduled Tribe	1047	534	513
	Literacy	1811	1043	768
	Total Workers	810	724	86
	Main Worker	786	702	84
	Marginal Worker	24	22	2
	Cultivators	5	5	-
	Agricultural labourers	14	14	-
Dehri Ralyot	Total No. of Houses	209	-	-
	Population	1096	575	521
	Child (0-6)	172	98	74
	Scheduled Caste	-	-	-
	Scheduled Tribe	13	8	5
	Literacy	740	428	312
	Total Workers	901	630	271
	Main Worker	130	101	29
	Marginal Worker	771	529	242
	Cultivators	644	434	210
	Agricultural labourers	80	64	16

Source: District Census Handbook 2011, Rajouri

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 sensitive environmental receptors existing along the alignment of proposed up-gradation of existing road subproject include cultural/ religious places, educational institutions and community property resources. The details of the existing sensitive environmental receptors are given in Table 5.5.

Table 5.5: Sensitive Environmental Receptors in Gulati to Shahdra Project Corridor

S. No	Sensitive Feature	Location	Chainage	Alignment (RHS/LHS)[1]	Distance in meters (m) from the alignment (edge of the road)
1	Hand Pump	Gulhati	0+010	LHS	5
2	Hand Pump	Gulhati	1+200	LHS	4.6
3	Mosque (Single Floor)	Gulhati	1+250	LHS	10
4	Hand Pump	Gulhati	2+900	LHS	4.8
5	Hand Pump	Gulhati	6+000	LHS	4.4
6	Primary Health Centre	Ghambir Mughlian	8+400	LHS	50
7	Mosque	Ghambir Muglian	8+900	LHS	20
8	Hand Pump	Ghambir Mughlian	14+800	RHS	4
9	Saint Mary Convent School	Bahrot Village	17+500	RHS	15
10	Mosque	Bahrot Village	18+700	RHS	2.5
11	Primary School	Bahrot Village	21+900	RHS	8

Source: Environmental Assessment- Field Inventory Survey November 2019

[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 Gulati to Shahdra Road via Ghambir Gali in District Rajouri. 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	Gulhati to Shahdra Sharief Via Ghambir Gali
A.	**Negative Impacts**	
1.	Hand pumps[2]	5
2.	Pond Area	Nil
3.	Relocation Religious Properties	Nil
4.	Transfer of Agriculture Land (ha)	Nil
5.	No's of trees to be felled	>15[3]
B.	**Positive Impact**	
1.	Enhancement Sites (Nos.)	4
2.	Cultural/Religious Properties (Nos.)	5
3.	Surface Water Body (Nos.)	[4]2
4.	Educational Institute (Nos.)	3
5.	Safe Access to Educational Institute (Nos.)	3

[2] Construction activities may lead to contamination or disturbances (like machinery operation and vibration) of the hydrological regime of hand pump functioning

[3] For cutting of each tree, 6 trees will be planted (@ 1:6 ratio) in hilly road.

[4] Water bodies include Naushera Tawi tributary, Ghambir Mughlian Nallah and small brooks etc.

6.	Bus Bays (Nos.)	Nil
7.	Village Gates (Nos.)	Nil
8.	Sitting Arrangement (Nos.)	Bharot and Ghambir Mughlian section
9.	Trees Saving (Nos)	Most of the trees within ROW have been saved. 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.
10.	Waste Reuse	
11.	Proposed Plantation	Plantation will be carried in areas along the hillside to strengthen and stabilize slopes in critical areas
12.	Proposed Compensatory Plantation (if tree cutting requirement arises)	About 90 (1:6 ratio)
13.	Bio-stabilization (Bio-Engineering)	Mainly in Bharot and Ghambir Mughlian areas.
C.	**Road Safety Measures**	
1.	Major Junction Improvement (Nos)	
2.	Proposal for Rotary Junctions	Nil
3.	Intersection/Access Improvement	
4.	Bus Bays	Nil
5.	Pedestrian Crossing	As per IRC Guidelines
6.	Signage Boards (Nos.)	As per IRC Guidelines
7.	Sidewalk	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)	Efficient line drains will be developed to carry discharge.
10.	Crash Barriers/Guard Rails (Lengths)	Yes

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

Table 6.2 : Anticipated Impacts on Physical & Biological Environment

Project Activity	Planning and Design Phase	Pre-construction Phase		Construction Phase					Road Operation
Environmental component Affected		Removal of Old Structures	Removal of trees and vegetation	Earth works including and borrow area	Laying of pavement	Vehicle & Machine operation & maintenance	Asphalt & crusher plants	Sanitation & Waste (labour campus)	Vehicle operation
Air		Dust generation 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	Contamination 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 continuity of ditches Siltation, Stagnant water pools in quarries and borrow area.	Reduction of groundwater recharge area	Contamination by fuel and lubricants	Contamination by asphalt leakage or fuel	Contamination from wastes and untreated sewage disposal	Spill Contamination by fuel, lubricants and washing of vehicles
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 productivity 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 the Gulhati to Shahdra Sharief road.

S. No.	Chainage	Location	Identified Critical Erosion /Landslide Prone sections		Hill / Valley side
			LHS	RHS	
1	1+500	Gulhati			Hillside
2	2+500	Gambhir Mughlian			Hillside
3	3+400	Gambhir Mughlian			Hillside
4	5+500	Gambhir Mughlian			Hillside
5	10+250	Gambhir Mughlian			Hillside
6	10+350 to 11+800	Gambhir Mughlian			Hillside
7	13+200	Gambhir Mughlian			Hillside
8	16+400	Behrote			Hillside
9	16+450	Behrote			Hillside
10	17+000	Behrote			Hillside
11	17+600	Behrote			Hillside
12	17+900	Behrote			Hillside
13	17+600 to 18+100	Behrote			Hillside
14	18+150	Behrote			Hillside
15	18+300	Behrote			Hillside
16	21+420	Behrote			Hillside
17	22+700 to 23+500	Behrote			Hillside

Annotation:

LHS	
RHS	

Construction Phase

The proposed up-gradation of Gulhati to Shahdra Sharief road will be confined within the existing ROW with improved protective measures on both hillside and valley side protection by the provision of breast/ retaining walls. 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.

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

The project roads are crossing small natural streams. There is no perennial river crossed by the project roads. 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 and to a much less extent groundwater quality can occur from pavement construction works, bridge 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 6.9: 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 6.10: 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 6.11: 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 proposed up-gradation of the road subproject doesn't have forest/reserved forest areas in the existing corridor. Hence anticipating the impact on Forest area is not envisaged. Existing road has vegetation on both Hillside as well as Valley side and is dominated by Willows, Poplars, some of the fruit trees like Pears, etc are also located at number of sites in project influence area. Few schedule trees of *Platanus orientalis, Moris sp.,* and *Juglans regia* were recorded mainly in Gambhir Mughlian and Behrote villages during the field survey. Pear orchards, pockets of Paddy fields (terraced), Banana trees (mainly in Gulhati section), apricots etc were observed on both sides of the project corridor from Gulhati to Shahdra Sharief. Some of the indigenous trees of Poplar and Willow trees of about 15 nos are likely to be cut down as they are coming close to the road pavement and may possess safety hazard.

As per the design criteria of the DPR, minimum 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.

The major impact in this project on flora involves the removal of trees to permit construction and to provide a clear zone for the safety of the road users. However, loss of vegetation will be compensated at 1:6 ration i.e., cutting of a single tree will be compensated with 6 trees. 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 major adverse impacts on the flora & fauna and the indicators are presented in **Table 6.12** below;

Table 6.12: 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*

There is no forest along the project road. Therefore, the impact related to the forest will not appear in the project.

Wildlife

There is no wildlife sanctuary, national park or bio reserve along the project roads. Therefore, no impact is anticipated on wildlife due to up-gradation of the project road.

Tree Cutting

Trees growing within the proposed toe line (bottom of formation) will need to be removed for up-

gradation of the project road. Roadside trees with strong and rigid stems can pose safety hazards. Some trees obstruct clear sight distances. Others have a propensity to overturn when old and are potential safety hazards depending upon age and decay condition. All such trees that are safety hazards need to be cleared.

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.

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 150 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

Many religious structures are located along the project road. However, no religious structures may be partially or fully affected during up-gradation of the project road. Shifting of religious structures is a sensitive issue, therefore, local community and followers of religious structures should be taken in to confident.

Common Property Resources

Along the project road, community structures like mosques, the school are located, which are used by local communities. The partial or total impact on these common property resources is anticipated due to up-gradation of the project road. These should be properly relocated and rehabilitee before start the construction or proper access to such common properties should be provided.

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 Rajouri District are rugged hilly terrain roads, which counter a number of accidents, resulting in a number of deaths and serious injuries as reported in every year. 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 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 Gulhati to Shahdra Sharief road while undertaking the proposed rehabilitation 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-proof Road infrastructure.

8. CONSULTATION WITH KEY STAKEHOLDERS

8.1. Introduction

The public consultation was conducted for the proposed road up-gradation of Gulati to Shahdra Sharief Road via Ghambir Gali under Package-3 in Jammu region 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/ August 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 Gulhati, Ghambir Mughlian, near Shahdra Sharief etc along with the other areas which were 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 up-gradation of road project “Gulati to Shahdra Road via Ghambir Gali” under Package-3 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 Gulati to Shahdra road project, 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;

- 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.
- 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.
- 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 Gulhati to Shadra Sharief via Ghambir Gali Phase 1 in District Rajouri. The proposed subproject road is having a total length of 27.280 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 Subproject under Package-3

The proposed components of subproject road "Improvement and Upgradation of Gulhati to Shahdra Sharief via Ghambir Gali Phase 1 in District Rajouri is divided into 2 sections;

1. Section 1 (Ch 0+000 to Ch 10+000)
2. Section 2 (Ch 15+000 to Ch 33+000)

The road stretch from Ch 10+000 to Ch 15+000) is already developed under PMGSY scheme. The main road works under this package include; earthworks, Pavement Works, Protection Works/ Slope Stabilization (breast wall, retaining walls, 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-3 in District Rajouri. 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 subproject under Package 3 namely, “Improvement and Upgradation of Gulhati to Shahdra Sharief Road via Ghambir Gali in District Rajouri. 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 subproject under Package-3 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-3 in District Rajouri (Gulhati to Shahdra Sharief Road via Ghambir Gali in Rajouri)

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 3, who will dedicatedly work and ensure implementation of EMP including Occupational, Health and Safety measures. • Appointment of qualified Environmental Safeguard Officer and his/her mobilization for the road under Package 3 "Gulhati to Shahdra Sharief Road via Ghambir Gali" shall be complied. • Contractor to inform the PIU (ERA) for the appointment and mobilization of each Environmental Safeguard Officers (ESOs)	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	Tree cutting	• About 15 trees of indigenous type are coming close to the road pavement on both valley and hillside and may be required to be cut down. These may possess the visibility and safety issues for the traffic movement. However, every effort will be taken to avoid unnecessary cutting. • 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 undertaken, wherever applicable. Replantation will be taken along identified hill/ valley sections prone to erosion/ slips and other stability issues to strengthen the slopes.	PIU/ Line Department and Contractor	PMU TAQAC
A.9	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.10	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.11	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.12	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.13	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 >120 labours/ day will be required during construction stage depending upon extent of construction work.	Contractor	PIU, PMU, TAQAC
A.14	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-15	[5]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 [6]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

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

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

A-16	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-17	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	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 devices. • 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 (Gambhir Mughlian and Barot areas) for Slope Stabilization/ Erosion/ Landslip measures: 1+500, 2+500, 2+500, 3+400, 5+500, 10+350, 10+600 – 11+800, 13+200, 16+400, 16+450, 16+800, 17+000, 17+600, 17+900, 17+600 – 18+100, 18+300, 21+420, 22+700 – 23+500	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. • [7]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. • [8]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

[7] DSCWM (2004)

		• [9]Grassed Waterways: Gassed 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. Applicable sections (Hillside) for grassed waterways in Ghambir Mughlain and Behrot areas: At chainage 1+300, 1+900, 3+700, 4+000, 10+600, 14+200, 16+300, 18+500. 25+180. These are the sections where gullies or its formation exists which leads to high discharge and flooding of roads.	Contractor	PIU, TAQAC

[8] 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).

[9] adopted from Sharda et al. 2007

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
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 3. • 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 schools, temples/mosques, religious places, shrines, community centres, graveyards 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-3 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 devised 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	• Compensatory plantation will be carried in the affected area 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 (ERA) 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 (central verge plantation) 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 devised 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 Protection	Impact monitoring for Slope	Construction/	Contractor/

		Stability Control- 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.	Operation Phase	TAQAC/ PIU/ PMU/
4	Tree Protection	Protective Measures of Scheduled Trees	Pre-Construction/ Construction	Contractor/PIU
5	Tree Cutting	Progress of Tree removal marked for cutting is to be reported	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 from Rivers	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	Along with the road Surface water sources	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		Borrow area Location	Contractor	PIU, TAQAC

					in a month during operation, Post Rehabilitation .				
Slope stabilty	Construction Phase	EMP	Visual Inspection	MoRTH Guidelines	Regular		Mainly Gambhir Mughlian and Behrot	Contractor	PIU, TAQAC
Tree Plantation	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	-	Areas where plantation is being done	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	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 Gulhati to Shahdra Road (Package-3) in District Rajouri

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 2 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) 2 samples	14000	PMU
2	Water	Surface Water Quality at 2 locations (Surface Water body) 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- Scheduled Species of Trees	Reflective strips for safety. About 11 trees	No.	1000	Reflective strips on the tree (Chinar, Walnut and Mulberry Trees)	11000	PMU/ Contractor
~~5~~	Tree Cutting	Trees (about 15 trees)	No.	Cost part of the civil works			PMU/ Contractor
6	Air	Ambient Air Quality at 2 locations within construction zones and operational plants sites.	No.	7000/-	24 hr sample, One-time monitoring 2 Locations (Six monthly) ($PM_{2.5}$, PM_{10}, SO_2 and NO_2)	42000	PMU

		(six-monthly except monsoon)					
7	Water	Surface Water Quality at 2 locations (six monthly) 2 Ground Water/ Public Water Source (six monthly)	No.	5000/- 7000/-	Grab Samples at 2 Locations (pH, TSS, TDS, BOD, COD, Oil & Grease, Turbidity) 6 samples Parameters as per IS 10500:2012	30000 42000	PMU PMU
8	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
9	Air	Dust Suppression Measures	Part of the Civil Works Cost				
10	Labour camp and Ancillary Facilities	Labour Camp and all associated facilities as per EMP	Cost included in DPR				
11	First Aid Kits	First Aid Kits at the construction site, camp and ancillary sites	Cost included in DPR			-	
12	Compensatory Plantation	[10]Replantation of Trees 1:6)	No.	4000/-	90	360000	PMU
Project Enhancement by PMU-JTFRP							
13	Slope Stabilization	Tree plantation/ Grass engraining with indigenous shrubs, other bio-	Lump Sum			2000000	PMU/ Contractor

[10] Replantation of trees under compensatory plantation shall include species synonmous with the hilly road (Gulhati to Shahdra Sharief) landscape vegetation. This will also serve as improvement of aesthetics under landscape management / enhancement of the sites and endorsing of planation of rich evergreen species to increase oxygen footprints throughout the year and elimination of air pollutants. Replantation will be carried mainly along the hillside and valley side at sections prone to erosion/ landslips/ gully formation/ non-vegetative zones etc.

		engineering measures					
14	Beautification Measures	Tree Plantation (Pine Trees and indigenous trees)	Lump Sum			500000	PMU
C	**Operation Stage (Post Construction Monitoring)**						
16	Air	Ambient Air Quality at 2 locations near sensitive receptors	No.	7000/-	24 hourly sample, one-time monitoring (Post Construction) 2 samples	14000	
17	Noise	Noise Levels at 2 locations near sensitive receptors	No.	3000/-	One time monitoring (Post Evaluation) 2 Samples	6000	
18	Water	Surface Water Quality at 2 locations	No.	5000/-	Grab Samples at 2 Locations (pH, TSS, TDS, BOD, COD, Oil & Grease, Turbidity) 2 samples	10000	PMU
		2 Ground Water/ Public Water Source		7000/-	Parameters as per IS 10500:2012 2 samples	14000	PMU
Total Budget						**3109000**	

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 Data Sheet

Part A: General Information

1. Name of the sub-project	Improvement & Up-gradation of Gulhati to Shahdra Sharief Road via Ghambir Gali in District Rajouri	
2. 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)		-
3. Location of the proposed sub-project		
• Name of the Region	Jammu (Jammu & Kashmir)	
• Name of the District	Rajouri	
• Name of the Block	Manjakote, Thanamandi	
• Name of the Settlement	Gulhati, Dehri Ralyot, Ghambir Muglian, Bharot, Rajdhani, Shahdra Sharief	
• Latitude	33°29'57.61"N (Starting Point- Ch 0+000 Gulhati), 33°32'00"N (End of the Road at Shahdra)	
• Longitude	74°15'18.19"E(Starting Point- Ch 0+000 Gulhati), 74°20'26.19"E (End of the Road at Shahdra)	
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)	27.280 Km
5. Land Requirement (in ha./sq.mt.)	
• Total Requirement	Nil
• 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	17th 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		Ghambir Muglian Nallah is within 1 km of the existing road

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	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

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

The outcome of Screening:

As per the screening exercise, the proposed subproject does not have significant environmental and social issues. The proposed sub-project is the "Improvement & Up-gradation of the existing road which is under the R&B and does not involve the land acquisition of private or government land.

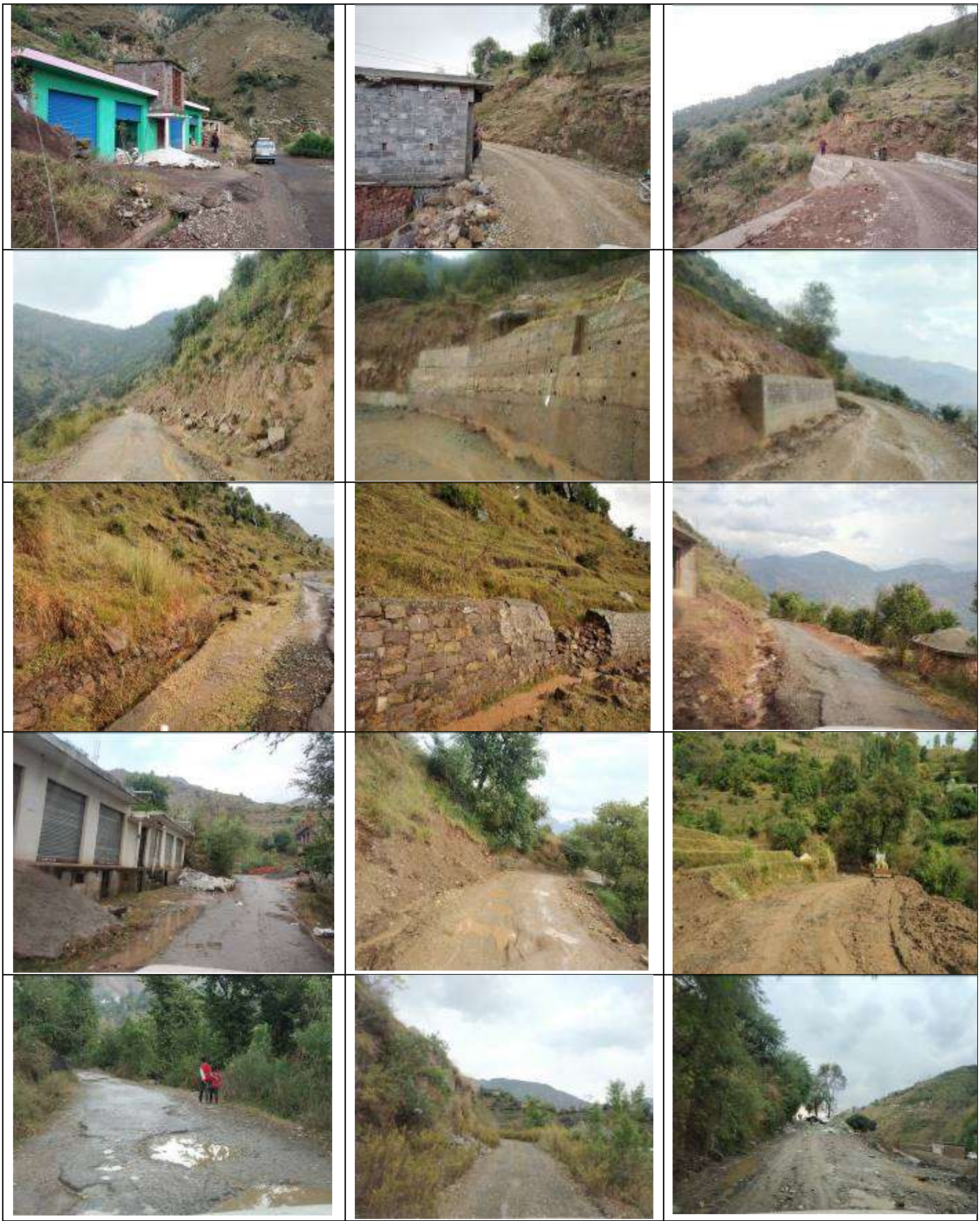
No EIA and SIA required for the proposed subproject. However, Environmental Assessment Reports and EMP will be prepared and implemented to address the environmental and social issues during the execution of the project.

Statutory Clearances/ No Objection Certificate

The subproject is "Improvement and Up-gradation of Gulhati to Shahdra Sharief" of the existing road, which is operational and underuses for a long time and the site is under the possession of R&B Department. Tree cutting permission, if any and Statutory clearances and NOC's for establishment or operation of hot mix, batch mix, crusher, generators, vehicles, material etc shall be required to be obtained by the Contractor before the start of work.

ANNEXURE-II: Photographs showing Existing Road Condition of Gulhati to Shahdra Sharief of proposed Improvement and Upgradation of the road.

Existing Road condition from Ch 0+000 to 10+000



As evident from the site photos, non-existence of hill road drainage road surface is in a degraded state. The exisiting protection walls are old and disintegrating over the period of time and possess potential negative safety issues of the proposed road.

Project starts from Poonch- Rajouri Road

Water supply pipeline near the corridor at 0.000 Km LHS

Start of project road at Gulhati (Ch 0+000)

Bus Bay and damaged road surface at Ch 0.050 Km

Road getting damaged due to water flowing into the Corridor at Ch 2.500 Km RHS

Agricultural activities along the project road

Primary Health Centre at Ch 8.100 Km LHS Gambhir Mughlian

Primary Health Centre at Ch 8.100 Km LHS Gambhir Mughlian

	
Junction of PMGSY road (left) in the project road at Ch 8.800 Km	Road condition is good at Ch 11.000 Km
	
Village Gambhir Mughalan at Ch 15.100 Km	WBM road and sharp curve at Ch 16.000 Km
	
At Chainage 18.200 Km	Trees close to the Corridor Ch 22.600 Km
	
Small trees close to the Corridor at Ch 24.600 Km	End Point at Ch 32.900 km, Shahdra Sharief

ANNEXURE-III: Public Consultation/ Meeting Photographs of Gulhati to Shahdra Sharief Road via Ghambir Gali

At Gulhati Village

Primary Health Centre- Gambhir Muglian

Gambhir Muglian

ANNEXURE-IV: List of consulted participants and their signatures during consultation with the residents of Gulhati- Shadra Sharief areas of proposed project road in Rajouri District

Public Consultation Attendance Sheet

Date: 17/7/2019

Name of Village: Gulati

Name of the Road: Gulhati to Shadra Sharief

Sr. No	Name of person	Contact No	Signature	Remarks
1.	Feeda Majeed	8825004956		
2	Mohd. Aslam	9596627484		
3	Mohd Rafi	7889529884		
4	[illegible]	9797698294		
5	Zafer Iqbal	9682141185		
6	Mohd Naziq	7051315186		
7	Zahoor Sulaiman			
8	Mohd Mudasser			
9	Abdul Majeed	9797411906		
10	Abdul Qayoom	8083730856		
11	Madasser			
12	Ishtiaq			
13	Marooof Ahmed			
14	Manzoor Ahmed			
15	Mohd Kabir		9622365966	
16	Mohd Zahid			
17	Mohd Zabir			
18	Jamshed Ahmed			
19	Makhtar Ahmed			
20	Mohd Younis			

Public Consultation Attendance Sheet

Date: 17/7/2019

Name of the Road Gulhati to Shadra Sharif

Name of Village Ghambir Mughlan, Bahrade Gali

Sr. No	Name of person	Contact No	Signature	Remarks
1	Khalid Hussain Mughal	7051341614	Khalid Hussain	
2	Jangir Iqbal	9858400372	Jangir Iqbal	
3	Irshad Ahmed	6005241592	Irshad	
4	Anwar-Anjum	9107381107	Anjum	
5	Mohd. Farooq	7051055937	M Farooq	
6	Mohd Tariq	8493049367	Mohd Tariq	
7	Mohd Farooq	9797301068		
8	Mohd. Farooq	8492055221	Mohd. Farooq	
9	Mohd Shareef	7051750914	M Shareef	
10	Mazeer Hussain	9055628843	Mazeer Hussain	
11	Mohd. Haneef	7051350293	M Haneef	
12	Mohd. Asif	7051369471	Mohd Asif	
13	Zaheer Hussain	8082056572		
14	Tahira Parveen	-	Tahira Parveen	
15	Khadam Hussain	8899194944		
16	Shahid Akhter	-		
17	Meer Hussain	-		
18	Shaheen Akhter	7051367858		
19	Abdul Rahman	9596922903		Sarpanch
20	Mukhtar Hussain			
21	Abdul Rashid	8899308560		

ANNEXURE-V: Identified Critical Sections for Slope Stabilization Measures of Gulhati to Shahdra Road (Photographic Transcripts- Recorded in November 2019)

Gulhati to Ghambir Mughlian road showing the sections from 0+300 to 9+500 which require bio-stabilization and protective slope measures





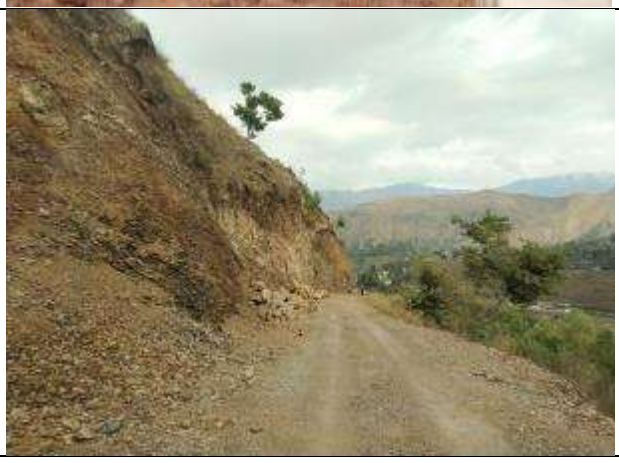



Road sections beyond Ch 9+500 showing critical stretches slope stability issues, landslip/ erosion. Above photographs showing stability issues also include Ch 10+000- 15+000 which is already upgraded under PMGSY.



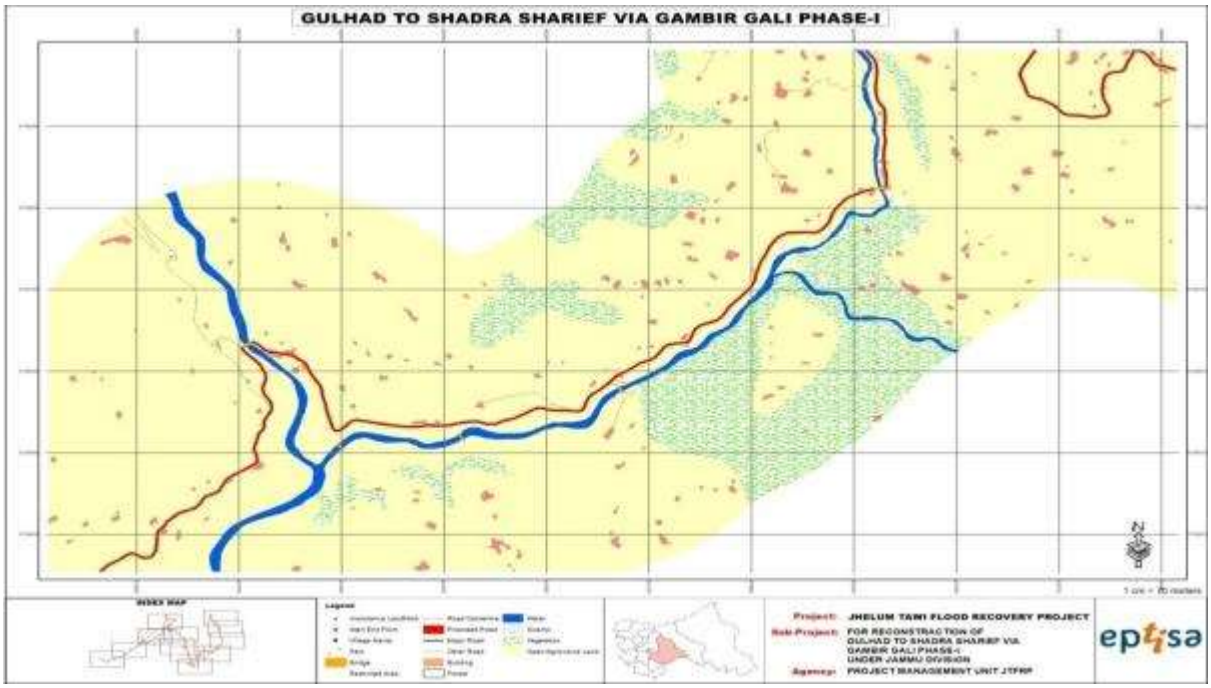


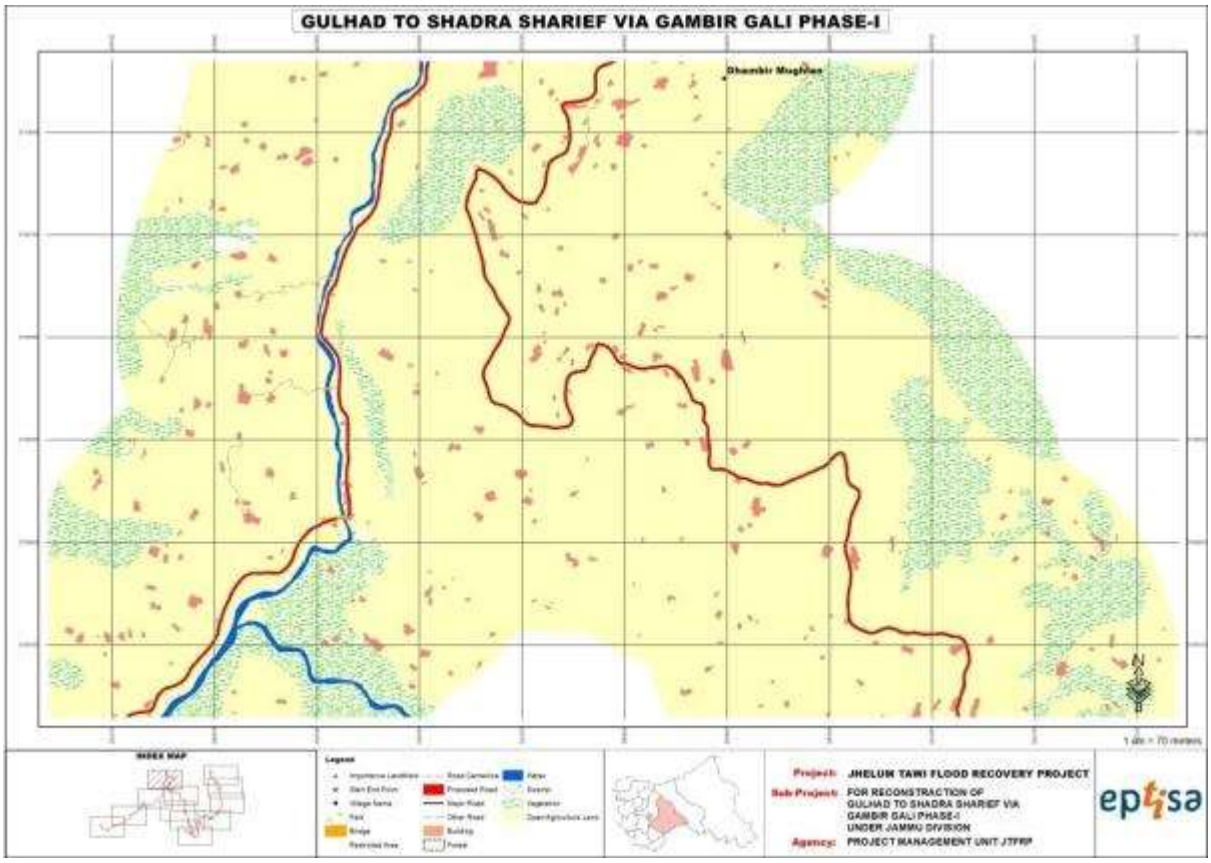


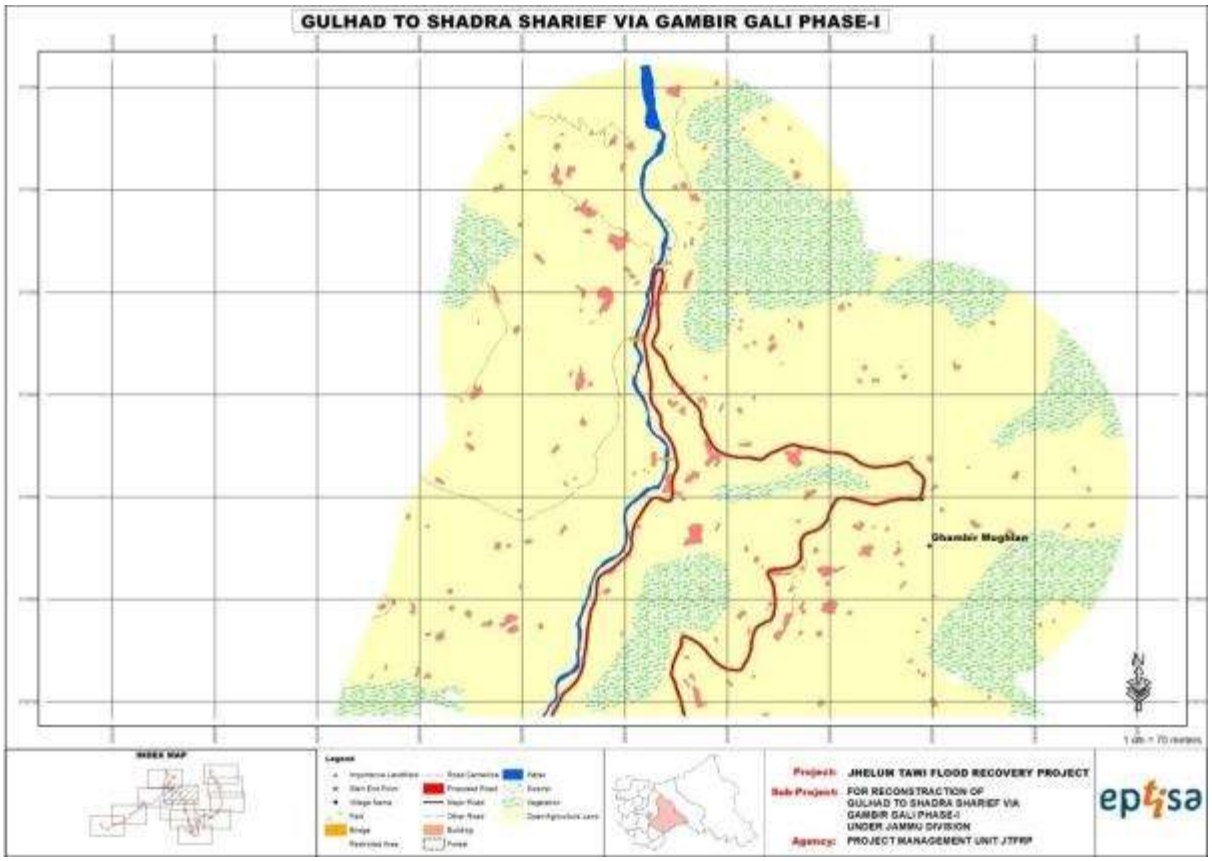



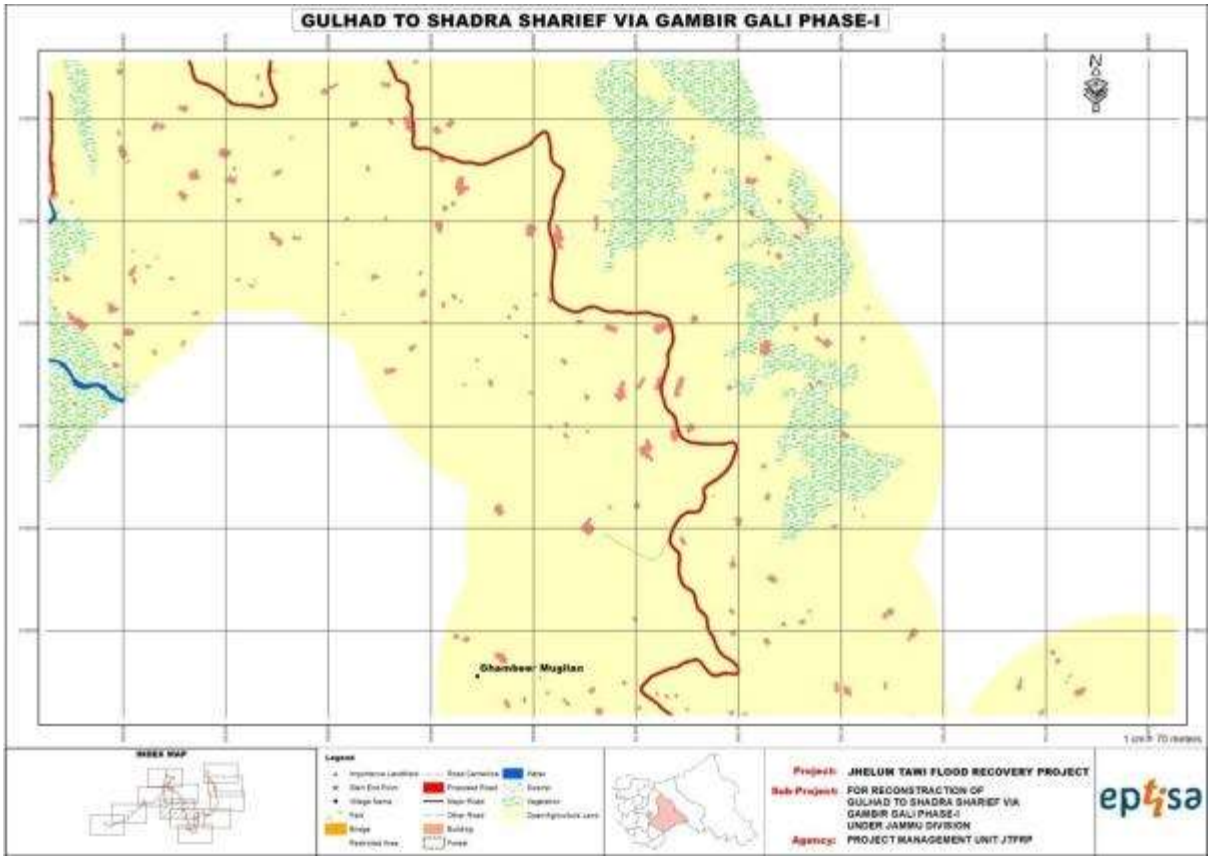
Critical sections from Ch 16+500 to 30+000 and above identified sections require protective mitigation measures by way of retaining walls, breast walls, bio-stabilization engineering intervention techniques, etc.

ANNEXURE-VI: GIS Map of the Proposed Sub-project of Improvement & Up-Gradation of Gulhati- Shahdra Sharief Road in District Rajouri






GULHAD TO SHADRA SHARIEF VIA GAMBIR GALI PHASE-I
Ghambir Mughlan
INDEX MAP
Legend
Project: JHELUM TAWI FLOOD RECOVERY PROJECT
Sub Project: FOR RECONSTRACTION OF GULHAD TO SHADRA SHARIEF VIA GAMBIR GALI PHASE-I UNDER JAMMU DIVISION
Agency: PROJECT MANAGEMENT UNIT JTFRP
eptsa


GULHAD TO SHADRA SHARIEF VIA GAMBIR GALI PHASE-I
Ghambeer Mughlan
INDEX MAP
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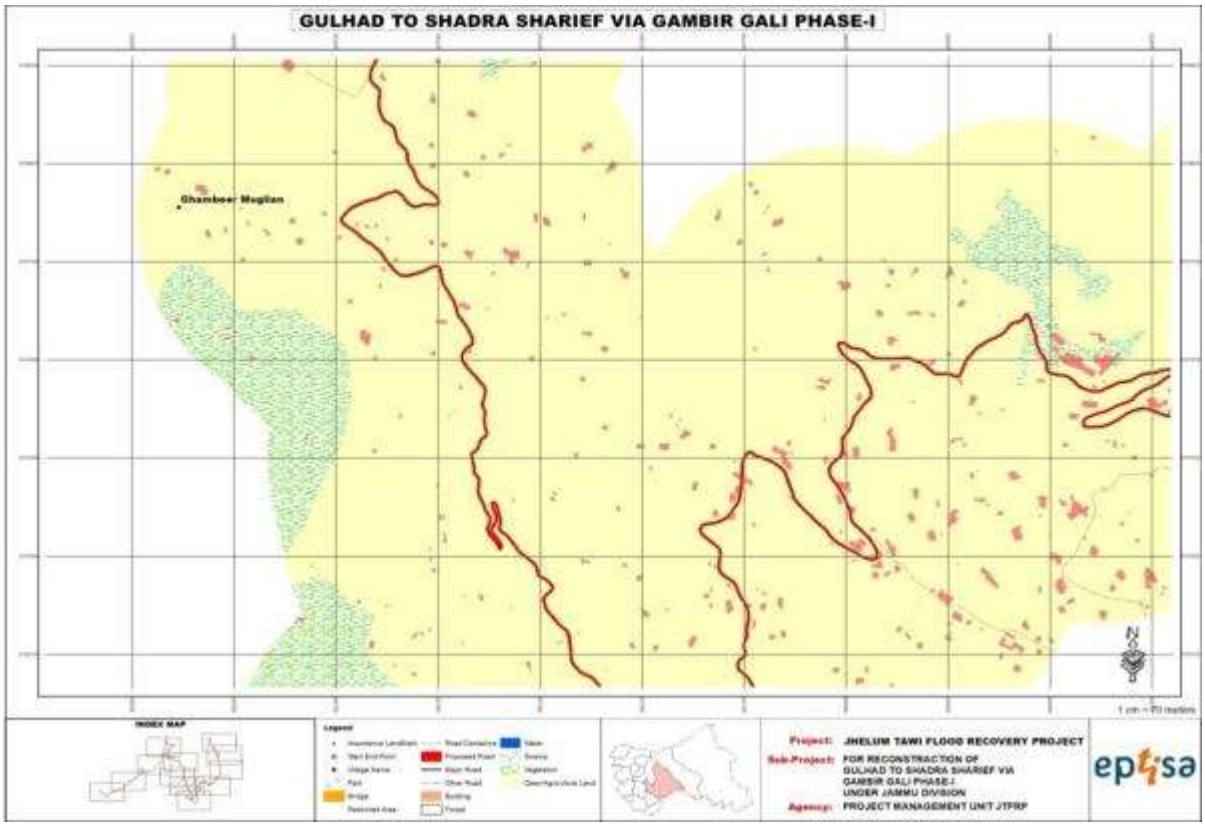
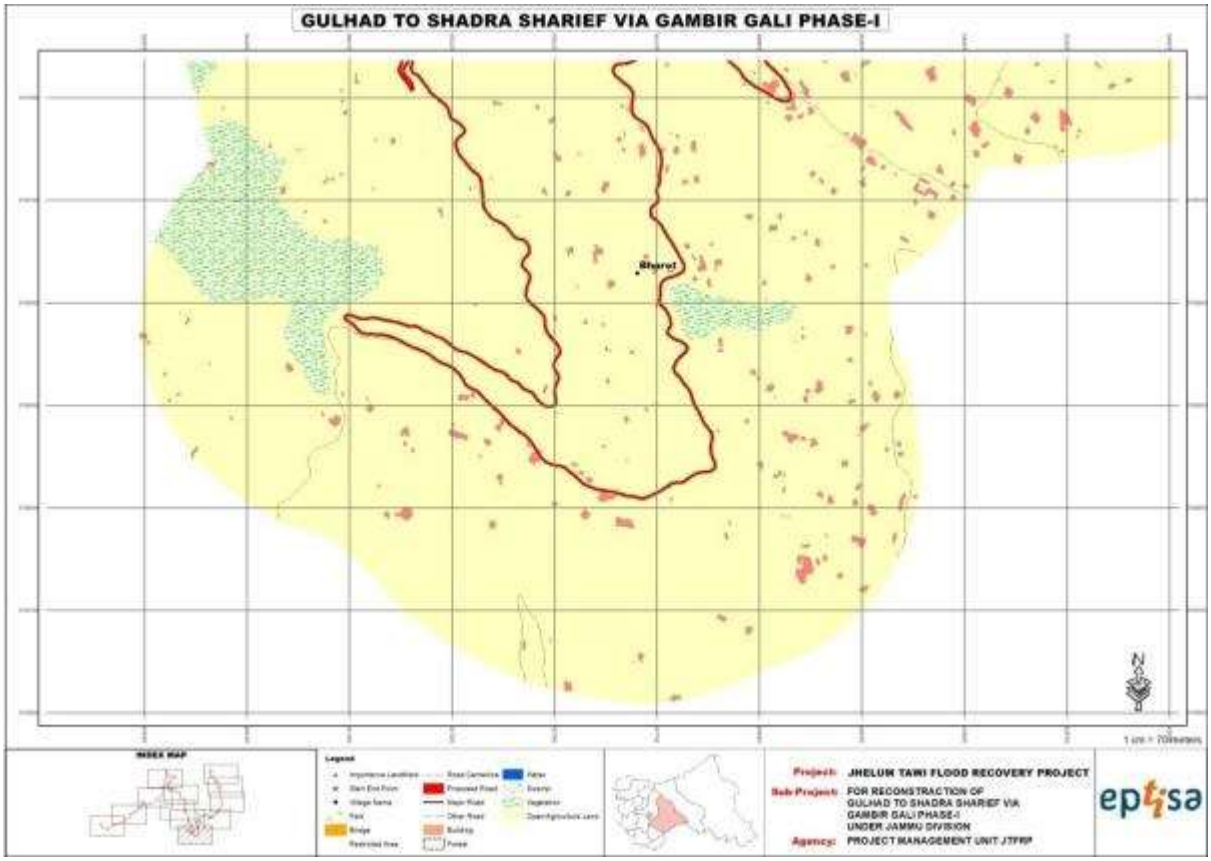
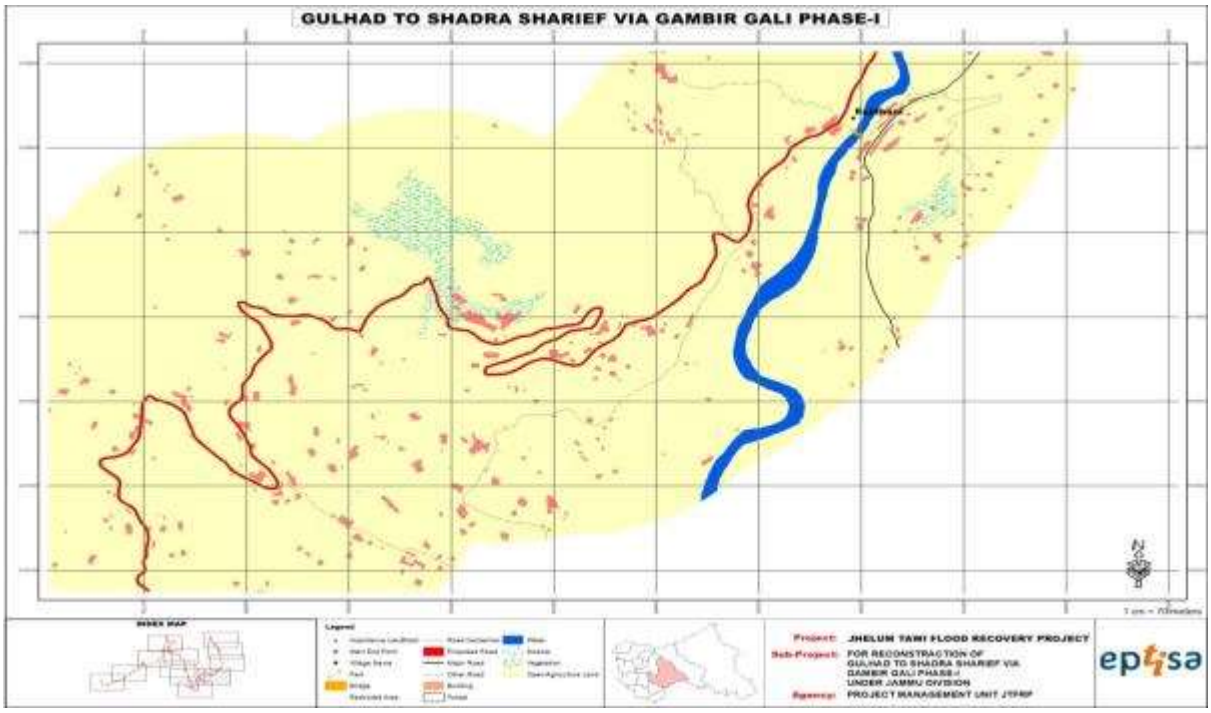

GULHAD TO SHADRA SHARIEF VIA GAMBIR GALI PHASE-I
Ghamboor Mughlan
INDEX MAP
Legend
Project: JHELUM TAWI FLOOD RECOVERY PROJECT
Sub-Project: FOR RECONSTRACTION OF GULHAD TO SHADRA SHARIEF VIA GAMBIR GALI PHASE-I UNDER JAMMU DIVISION
Agency: PROJECT MANAGEMENT UNIT JTFRP
eptisa


GULHAD TO SHADRA SHARIEF VIA GAMBIR GALI PHASE-I
Bhatrot
INDEX MAP
Legend
Project: JHELUM TAWI FLOOD RECOVERY PROJECT
Sub-Project: FOR RECONSTRACTION OF GULHAD TO SHADRA SHARIEF VIA GAMBIR GALI PHASE-I UNDER JAMMU DIVISION
Agency: PROJECT MANAGEMENT UNIT JTFRP
eptisa


GULHAD TO SHADRA SHARIEF VIA GAMBIR GALI PHASE-I
INDEX MAP
Legend
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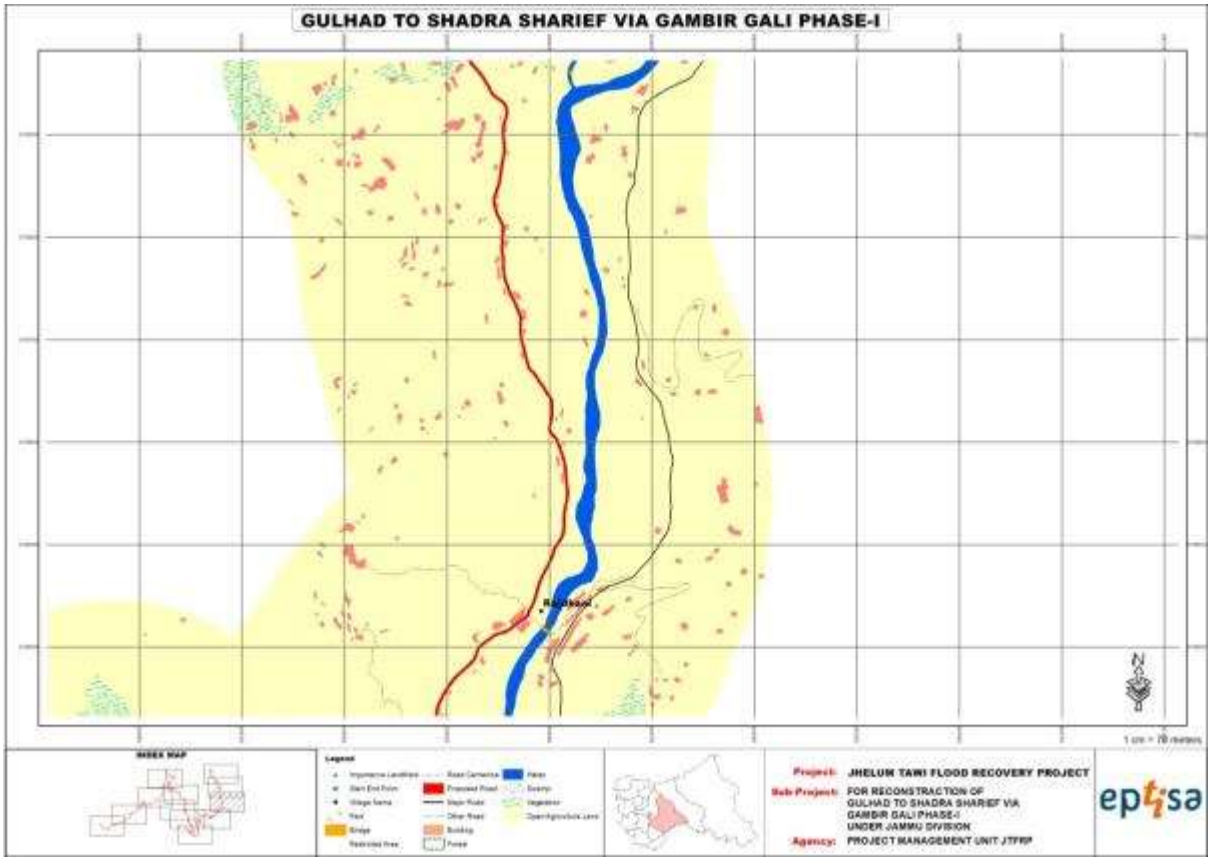
Sub-Project: FOR RECONSTRACTION OF GULHAD TO SHADRA SHARIEF VIA GAMBIR GALI PHASE-I UNDER JAMMU DIVISION
Agency: PROJECT MANAGEMENT UNIT JTFRP
eptsa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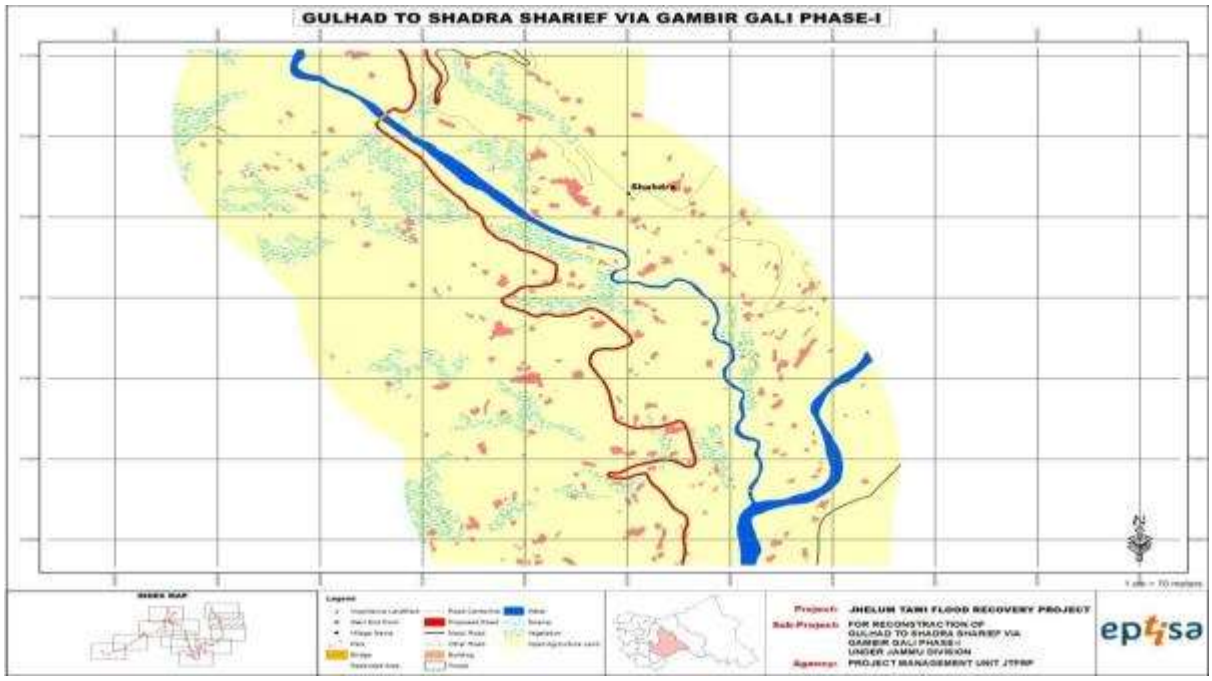
Agency: PROJECT MANAGEMENT UNIT JTFRP
eptsa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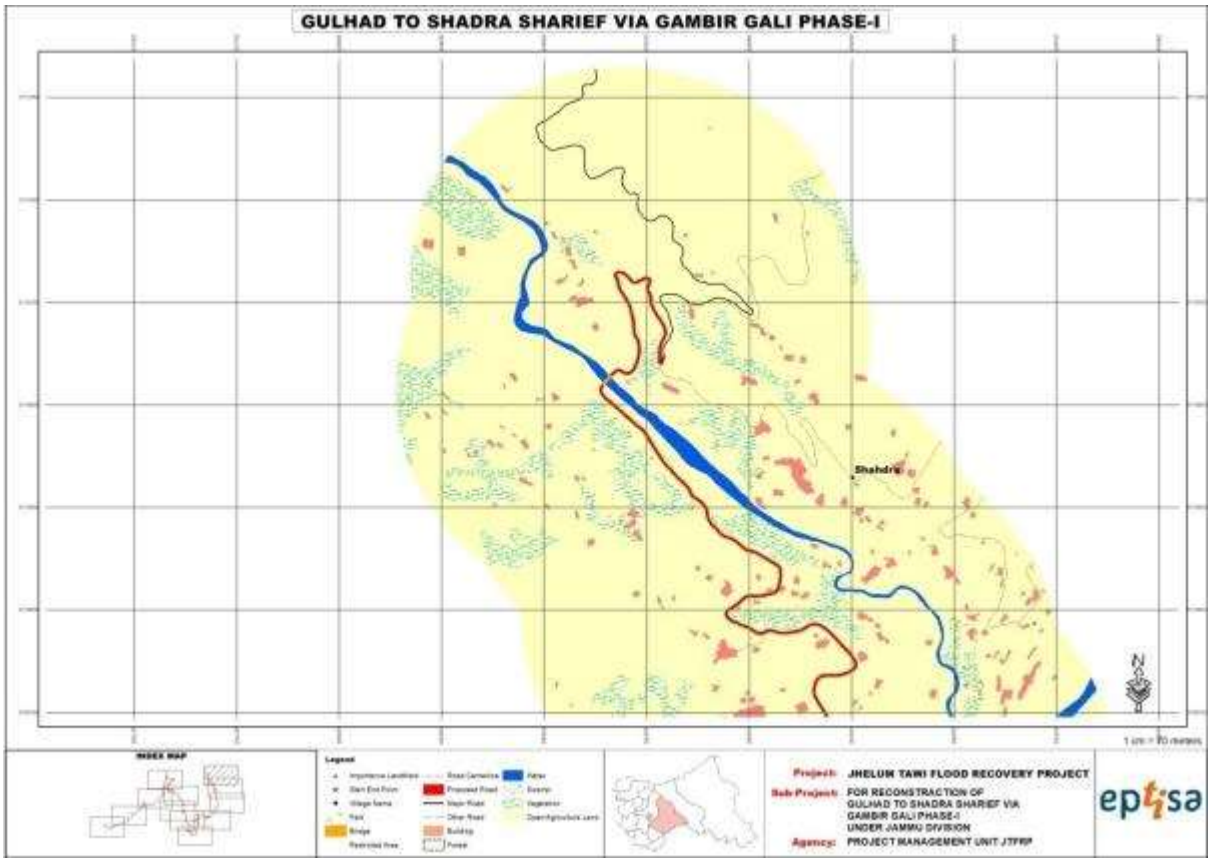
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ANNEXURE VII: Guidelines For Siting, Management And Redevelopment of Labour Camp

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 VIII: 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 IX: Reporting Format 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 X: 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 XI: 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 XII: 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 XIII: 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 devices 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 XIV: 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 devices inoperative			**Failure to use a respirator**
	Working on moving or dangerous			**Failure to use proper clothing**

	equipment			
	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 XV: 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 XVI: 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* 24 hours**	50 80	20 80
Nitrogen Dioxide (NO_2), µg/m^3	Annual* 24 hours**	40 80	30 80
Particulate Matter (size less than 10 µm) or PM_{10} µg/m^3	Annual* 24 hours**	60 100	60 100
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$ µg/m^3	Annual* 24 hours**	40 60	40 60
Ozone (O_3) µg/m^3	8 hours* 1 hour**	100 180	100 180
Lead (Pb) µg/m^3	Annual* 24 hours**	0.50 1.0	0.50 1.0
Carbon Monoxide (CO) mg/m^3	8 hours* 1 hour**	02 04	02 04
Ammonia (NH_3) µg/m^3	Annual* 24 hours**	100 400	100 400
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: Land-use/ Land-cover Pattern along the Project Road of Gulhati to Shahdra Sharief Road via Ghambir Gali under Package-3 in J&K

Sl. No.	Existing Chainage		Name of Village/Town	Terrain (Plain/ Rolling/ Hilly)	Land Use	
	From km	To km			Left	Right
1	0+000	0+100	Dehri Ralyot, Gulhatti	Hill	Open/Plantations	Open/Plantations
2	0+100	0+200		Hill	Open/Plantations	Open
3	0+200	0+300		Hill	Open	Open
4	0+300	0+400		Hill	Open/Plantations/Built-up	Open/Plantations
5	0+400	0+500		Hill	Open	Open/Plantations
6	0+500	0+600		Hill	Open	Open/
7	0+600	0+700		Hill	Open	Open/Built-up
8	0+700	0+800		Hill	Open	Open
9	0+800	0+900		Hill	Open/Plantations	Open/Plantations
10	0+900	1+000		Hill	Open/Plantations	Open/Plantations
11	1+000	1+100		Hill	Open/Plantations	Open/Plantations/Built-up
12	1+100	1+200		Hill	Open/Plantations	Open/Plantations/Built-up
13	1+200	1+300		Hill	Open/Plantations/Built-up	Open/Plantations/Built-up
14	1+300	1+400		Hill	Open	Open/Plantations/Built-up
15	1+400	1+500		Hill	Open	Open/Plantations/Built-up
16	1+500	1+600		Hill	Open	Open
17	1+600	1+700		Hill	Open	Open
18	1+700	1+800		Hill	Open	Open
19	1+800	1+900		Hill	Open	Open/Plantations
20	1+900	2+000		Hill	Open	Open
21	2+000	2+100		Hill	Open/Plantations/Built-up	Open/Built-up
22	2+100	2+200		Hill	Open	Open/Plantations
23	2+200	2+300		Hill	Open/Plantations	Open/Built-up
24	2+300	2+400		Hill	Open/Plantations	Open/Plantations/Built-up
25	2+400	2+500		Hill	Open/Plantations	Open/Plantations
26	2+500	2+600		Hill	Open/Plantations	Open/Plantations/Built-up
27	2+600	2+700		Hill	Open/Plantations	Open/Plantations
28	2+700	2+800		Hill	Open/Plantations/Built-up	Open/Plantations
29	2+800	2+900		Hill	Open/Plantations/Built-up	Open/Plantations
30	2+900	3+000		Hill	Open	Open/Plantations
31	3+000	3+100		Hill	Open/Plantations/Built-up	Open/Plantations
32	3+100	3+200		Hill	Open/Plantations	Open/Plantations/Built-up
33	3+200	3+300		Hill	Open/Plantations	Open/Built-up
34	3+300	3+400		Hill	Open/Plantations/Built-up	Open/Built-up
35	3+400	3+500		Hill	Open/Plantations	Open/Plantations
36	3+500	3+600		Hill	Open/Plantations	Open/Plantations
37	3+600	3+700		Hill	Open/Plantations	Open/Plantations
38	3+700	3+800		Hill	Open	Open
39	3+800	3+900		Hill	Open	Open/Plantations
40	3+900	4+000		Hill	Open	Open
41	4+000	4+100		Hill	Open	Open
42	4+100	4+200		Hill	Open/Plantations/Built-up	Open/Plantations/Built-up
43	4+200	4+300		Hill	Open	Open/Plantations
44	4+300	4+400		Hill	Open/Plantations	Open/Plantations/Built-up
45	4+400	4+500		Hill	Open/Plantations	Open/Plantations
46	4+500	4+600		Hill	Open/Plantations	Open/Plantations
47	4+600	4+700		Hill	Open/Built-up	Open/Built-up
48	4+700	4+800		Hill	Open/Built-up	Open
49	4+800	4+900		Hill	Open/River	Open/River
50	4+900	5+000		Hill	Open/Plantations/Built-up/River	Open/Plantations/Built-up/River
51	5+000	5+100		Hill	Open/Built-up/River	Open/Built-up/River
52	5+100	5+200		Hill	Open/River	Open/River
53	5+200	5+300	Kotli Kalaban	Hill	Open	Open
54	5+300	5+400		Hill	Open	Open
55	5+400	5+500		Hill	Built-up	Open

Sl. No.	Existing Chainage		Name of Village/Town	Terrain (Plain/ Rolling/ Hilly)	Land Use	
	From km	To km			Left	Right
56	5+500	5+600		Hilly	Open/Plantations	Open/Plantations
57	5+600	5+700		Hilly	Open/Plantations	Open
58	5+700	5+800		Hilly	Open/Plantations	Open/Plantations
59	5+800	5+900		Hilly	Open	Open
60	5+900	6+000		Hilly	Open	Open/Plantations
61	6+000	6+100		Hilly	Open/Plantations	Open/Plantations
62	6+100	6+200		Hilly	Built-up/Open/Plantations	Open/Plantations
63	6+200	6+300		Hilly	Open/Plantations	Open/Plantations
64	6+300	6+400		Hilly	Built-up/Open/Plantations	Built-up/Open/Plantations
65	6+400	6+500		Hilly	Open/Plantations	Open
66	6+500	6+600		Hilly	Open/Plantations	Open/Plantations
67	6+600	6+700		Hilly	Open/Plantations	Open/Plantations
68	6+700	6+800		Hilly	Open/Plantations	Open/Plantations
69	6+800	6+900		Hilly	Built-up/Open	Open/Plantations
70	6+900	7+000		Hilly	River	Open/Plantations
71	7+000	7+100		Hilly	River	Open/Plantations
72	7+100	7+200		Hilly	River	Open/Plantations
73	7+200	7+300		Hilly	River	Built-up/Open/Plantations
74	7+300	7+400		Hilly	River	Open
75	7+400	7+500		Hilly	River	Open/Plantations
76	7+500	7+600		Hilly	River	Open/Plantations
77	7+600	7+700		Hilly	River	Open/Plantations
78	7+700	7+800		Hilly	River	Open/Plantations
79	7+800	7+900		Hilly	River	Open/Plantations
80	7+900	8+000		Hilly	River	Open/Plantations
81	8+000	8+100	Gambhir Muglian	Hilly	River	Built-up/Plantations
82	8+100	8+200		Hilly	River	Built-up/Plantations
83	8+200	8+300		Hilly	River	Open
84	8+300	8+400		Hilly	River	Open
85	8+400	8+500		Hilly	River	Open
86	8+500	8+600		Hilly	River	Open
87	8+600	8+700		Hilly	River	Open
88	8+700	8+800		Hilly	River	SH
89	8+800	8+900		Hilly	River	SH
90	8+900	9+000		Hilly	Built-up	SH
91	9+000	9+100		Hilly	Open	SH
92	9+100	9+200		Hilly	Built-up/Plantations	SH
93	9+200	9+300		Hilly	Open	SH
94	9+300	9+400		Hilly	Open	Built-up/Plantations
95	9+400	9+500		Hilly	Open/Plantations	Open/Plantations
96	9+500	9+600		Hilly	Built-up/Open/Plantations	Built-up/Open/Plantations
97	9+600	9+700		Hilly	Open	Open
98	9+700	9+800		Hilly	Open	Open
99	9+800	9+900		Hilly	Open	Built-up/Open
100	9+900	10+000		Hilly	Built-up/Open	Built-up/Open
101	10+000	10+100		Hilly	Open/Plantations	Open
102	10+100	10+200		Hilly	Open/Plantations	Open
103	10+200	10+300		Hilly	Open	Open/Plantations
104	10+300	10+400		Hilly	Open/Plantations/Built-up	Open/Plantations
105	10+400	10+500		Hilly	Open/Plantations/Built-up	Open/Plantations
106	10+500	10+600		Hilly	Open/Built-up	Open/Built-up
107	10+600	10+700		Hilly	Open/Plantations	Open/Plantations
108	10+700	10+800		Hilly	Open	Open/Plantations
109	10+800	10+900		Hilly	Open	Open
110	10+900	11+000		Hilly	Open/Plantations	Open/Plantations
111	11+000	11+100		Hilly	Open/Plantations	Open/Plantations
112	11+100	11+200		Hilly	Open/Plantations	Open/Plantations
113	11+200	11+300		Hilly	Open	Open/Plantations
114	11+300	11+400		Hilly	Open	Open/Plantations
115	11+400	11+500		Hilly	Open	Open/Plantations
116	11+500	11+600		Hilly	Open	Open
117	11+600	11+700		Hilly	Open	Open

Sl. No.	Existing Chainage		Name of Village/Town	Terrain (Plain/ Rolling/ Hilly)	Land Use	
	From km	To km			Left	Right
118	11+700	11+800		Hilly	Open/Plantations/Built-up	Open/Plantations/Built-up
119	11+800	11+900		Hilly	Open/Plantations	Open/Plantations
120	11+900	12+000		Hilly	Open/Plantations/Built-up	Open/Plantations
121	12+000	12+100		Hilly	Open/Plantations/Built-up	Open/Plantations/Built-up
122	12+100	12+200		Hilly	Open/Plantations/Built-up	Open/Built-up
123	12+200	12+300		Hilly	Open/Built-up	Open
124	12+300	12+400		Hilly	Open	Open/Built-up
125	12+400	12+500		Hilly	Open	Open
126	12+500	12+600		Hilly	Open/Built-up	Open
127	12+600	12+700		Hilly	Open	Open
128	12+700	12+800		Hilly	Open/Built-up	Open
129	12+800	12+900		Hilly	Open/Built-up	Open
130	12+900	13+000		Hilly	Open/Built-up	Open
131	13+000	13+100		Hilly	Open/Built-up	Open/Built-up
132	13+100	13+200		Hilly	Open/Built-up	Open
133	13+200	13+300		Hilly	Open/Built-up	Open
134	13+300	13+400		Hilly	Open/Plantations	Open
135	13+400	13+500		Hilly	Open/Built-up	Open/Plantations
136	13+500	13+600		Hilly	Open/Built-up	Open
137	13+600	13+700		Hilly	Open	Open/Built-up
138	13+700	13+800		Hilly	Open	Open
139	13+800	13+900		Hilly	Open/Plantations	Open
140	13+900	14+000		Hilly	Open/Plantations	Open
141	14+000	14+100		Hilly	Open/Plantations	Open
142	14+100	14+200		Hilly	Open/Plantations	Open
143	14+200	14+300		Hilly	Open	Open
144	14+300	14+400		Hilly	Open	Open
145	14+400	14+500		Hilly	Open	Open
146	14+500	14+600		Hilly	Open	Open
147	14+600	14+700		Hilly	Open	Open
148	14+700	14+800		Hilly	Open	Open
149	14+800	14+900		Hilly	Open/Built-up	Open/Built-up
150	14+900	15+000		Hilly	Open	Open/Built-up
151	15+000	15+100		Hilly	Open	Open/Built-up
152	15+100	15+200		Hilly	Open	Open
153	15+200	15+300		Hilly	Open/Built-up	Open/Built-up
154	15+300	15+400		Hilly	Open/Built-up	Open
155	15+400	15+500		Hilly	Open	Open
156	15+500	15+600		Hilly	Open/Plantations	Open
157	15+600	15+700		Hilly	Open/Plantations	Open
158	15+700	15+800		Hilly	Open	Open
159	15+800	15+900		Hilly	SH	Open
160	15+900	16+000		Hilly	SH	Open
161	16+000	16+100		Hilly	SH	SH
162	16+100	16+200		Hilly	Open	SH
163	16+200	16+300		Hilly	Open	Open
164	16+300	16+400		Hilly	Open	Open
165	16+400	16+500		Hilly	Open/Built-up	Open
166	16+500	16+600		Hilly	Open/Built-up	Open/Built-up
167	16+600	16+700		Hilly	Open/Built-up	Open
168	16+700	16+800		Hilly	Open	Open
169	16+800	16+900		Hilly	Open	Open
170	16+900	17+000		Hilly	Open/Built-up	Open
171	17+000	17+100		Hilly	Open/Plantations	Open
172	17+100	17+200		Hilly	Open/Plantations	Open/Built-up
173	17+200	17+300		Hilly	Open	Open
174	17+300	17+400		Hilly	Open	Open
175	17+400	17+500		Hilly	Open	Open
176	17+500	17+600		Hilly	Open	Open
177	17+600	17+700		Hilly	Open/Plantations	Open
178	17+700	17+800		Hilly	Open	Open
179	17+800	17+900		Hilly	SH	Open

Sl. No.	Existing Chainage		Name of Village/Town	Terrain (Plain/ Rolling/ Hilly)	Land Use	
	From km	To km			Left	Right
180	17+900	18+000		Hilly	Open	Open
181	18+000	18+100		Hilly	Open	Open
182	18+100	18+200		Hilly	Open	Open
183	18+200	18+300		Hilly	Open	Open/Built-up
184	18+300	18+400		Hilly	Open/Built-up	Open/Plantations/Built-up
185	18+400	18+500		Hilly	Open/Plantations/Built-up	Open/Plantations
186	18+500	18+600		Hilly	Open	Open/Built-up
187	18+600	18+700		Hilly	Open/Built-up	Open/Built-up
188	18+700	18+800		Hilly	Open	Open
189	18+800	18+900		Hilly	Open	Open/Built-up
190	18+900	19+000		Hilly	Open	Open/Built-up
191	19+000	19+100		Hilly	Open	Open
192	19+100	19+200		Hilly	Open	Open
193	19+200	19+300		Hilly	Open	Open
194	19+300	19+400		Hilly	Open/Built-up	Open
195	19+400	19+500		Hilly	Open/Built-up	Open/Built-up
196	19+500	19+600		Hilly	Open	Open
197	19+600	19+700		Hilly	Open	Open
198	19+700	19+800		Hilly	Open/Built-up	Open/Plantations/Built-up
199	19+800	19+900		Hilly	Open/Built-up	Open/Built-up
200	19+900	20+000	Bharot	Hilly	Open	Open/Built-up
201	20+000	20+100		Hilly	Open/Built-up	Open/Built-up
202	20+100	20+200		Hilly	Open/Built-up	Open/Built-up
203	20+200	20+300		Hilly	Open/Built-up	Open
204	20+300	20+400		Hilly	Open/Built-up	Open
205	20+400	20+500		Hilly	Open	Open
206	20+500	20+600		Hilly	Open/Built-up	Open
207	20+600	20+700		Hilly	Open/Built-up	Open/Built-up
208	20+700	20+800		Hilly	Open/Built-up	Open/Built-up
209	20+800	20+900		Hilly	Open/Built-up	Open/Built-up
210	20+900	21+000		Hilly	Open/Built-up	Open/Built-up
211	21+000	21+100		Hilly	Open	Open
212	21+100	21+200		Hilly	Open/Built-up	Open
213	21+200	21+300		Hilly	Open/Plantations	Open
214	21+300	21+400		Hilly	Open/Plantations	Open/Plantations
215	21+400	21+500		Hilly	Open	Open/Built-up
216	21+500	21+600		Hilly	Open/Built-up	Open
217	21+600	21+700		Hilly	Open/Built-up	Open/Built-up
218	21+700	21+800		Hilly	Open	Open
219	21+800	21+900		Hilly	Open/Plantations	Open
220	21+900	22+000		Hilly	Open/Built-up	Open
221	22+000	22+100		Hilly	Open/Built-up	Open
222	22+100	22+200		Hilly	Open/Built-up	Open/Built-up
223	22+200	22+300		Hilly	Open/Built-up	Open
224	22+300	22+400		Hilly	Open/Built-up	Open
225	22+400	22+500		Hilly	Open	Open
226	22+500	22+600		Hilly	Open	Open
227	22+600	22+700		Hilly	Open	Open
228	22+700	22+800		Hilly	Open/Built-up	Open/Built-up
229	22+800	22+900		Hilly	Open	Open/Built-up
230	22+900	23+000		Hilly	Open/Built-up	Open
231	23+000	23+100		Hilly	Open/Built-up	Open
232	23+100	23+200		Hilly	Open/Built-up	Open
233	23+200	23+300		Hilly	Open/Built-up	Open/Built-up
234	23+300	23+400		Hilly	Open	Open
235	23+400	23+500		Hilly	Open	Open
236	23+500	23+600		Hilly	Open	Open
237	23+600	23+700		Hilly	Open	Open
238	23+700	23+800		Hilly	Open	Open/Built-up
239	23+800	23+900		Hilly	Open/Built-up	Open/Built-up
240	23+900	24+000		Hilly	Open/Built-up	Open
241	24+000	24+100		Hilly	Open/Built-up	Open/Built-up

Sl. No.	Existing Chainage		Name of Village/Town	Terrain (Plain/ Rolling/ Hilly)	Land Use	
	From km	To km			Left	Right
242	24+100	24+200		Hilly	Open	Open
243	24+200	24+300		Hilly	Open	Open
244	24+300	24+400		Hilly	Open	Open
245	24+400	24+500		Hilly	Open/Built-up	Open
246	24+500	24+600		Hilly	Open	Open/Built-up
247	24+600	24+700		Hilly	Open	Open
248	24+700	24+800		Hilly	Open/Built-up	Open
249	24+800	24+900		Hilly	Open/Built-up	Open/Built-up
250	24+900	25+000		Hilly	Open/Built-up	Open/Built-up
251	25+000	25+100		Hilly	Open	Open/Built-up
252	25+100	25+200		Hilly	Open	Open/Built-up
253	25+200	25+300		Hilly	Open	Open
254	25+300	25+400		Hilly	Open	Open
255	25+400	25+500		Hilly	Open	Open
256	25+500	25+600		Hilly	Open	Open
257	25+600	25+700		Hilly	Open/Plantations	Open/Plantations
258	25+700	25+800		Hilly	Open/Plantations	Open/Plantations
259	24+800	24+900		Hilly	Open/Plantations	Open/Plantations
260	25+900	26+000		Hilly	Open/Plantations/Built-up	Open/Plantations
261	26+000	26+100		Hilly	Open/Plantations	Open/Plantations/Built-up
262	26+100	26+200		Hilly	Open/Plantations	Open/Plantations/Built-up
263	26+200	26+300		Hilly	Open/Plantations	Open/Plantations/Built-up
264	26+300	26+400		Hilly	Open/Plantations	Open/Plantations
265	26+400	26+500		Hilly	Open/Plantations	Open/Plantations
266	26+500	26+600		Hilly	Open/Plantations	Open/Plantations/Built-up
267	26+600	26+700		Hilly	Open/Plantations	Open/Plantations
268	26+700	26+800		Hilly	Open/Plantations	Open/Plantations
269	26+800	26+900		Hilly	Open/Plantations	Open/Plantations/Built-up
270	26+900	27+000		Hilly	Open/Plantations	Open/Plantations/Built-up
271	27+000	27+100		Hilly	Open/Plantations/Built-up	Open/Plantations
272	27+100	27+200		Hilly	Open/Plantations	Open/Plantations/Built-up
273	27+200	27+300		Hilly	Open/Plantations	Open/Plantations
274	27+300	27+400		Hilly	Open/Plantations	Open/Plantations
275	27+400	27+500		Hilly	Open/Plantations	Open/Plantations
276	27+500	27+600		Hilly	Open	River
277	27+600	27+700		Hilly	Open	River

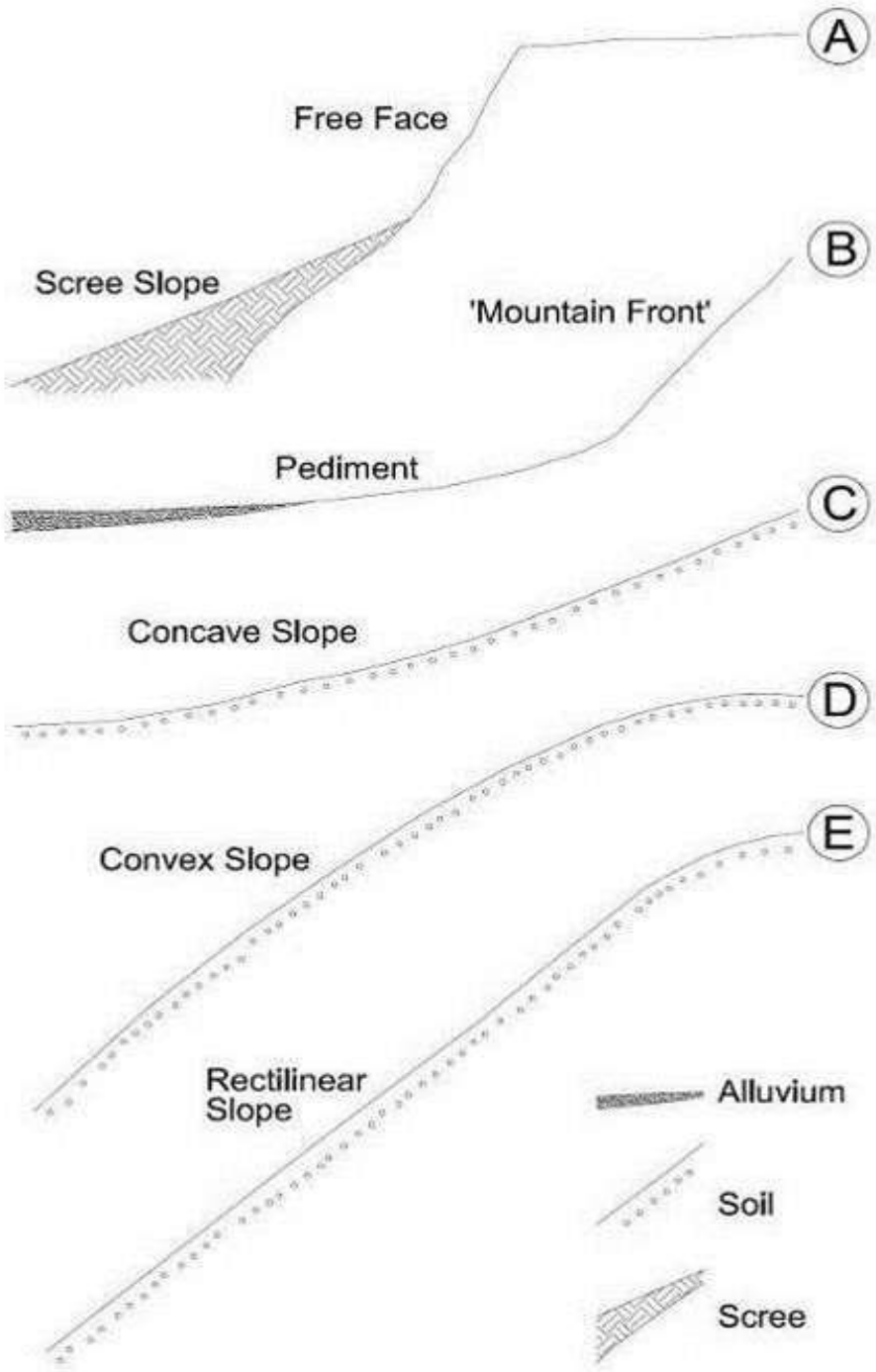
ANNEXURE XVIII: Slope Development and Forms

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.

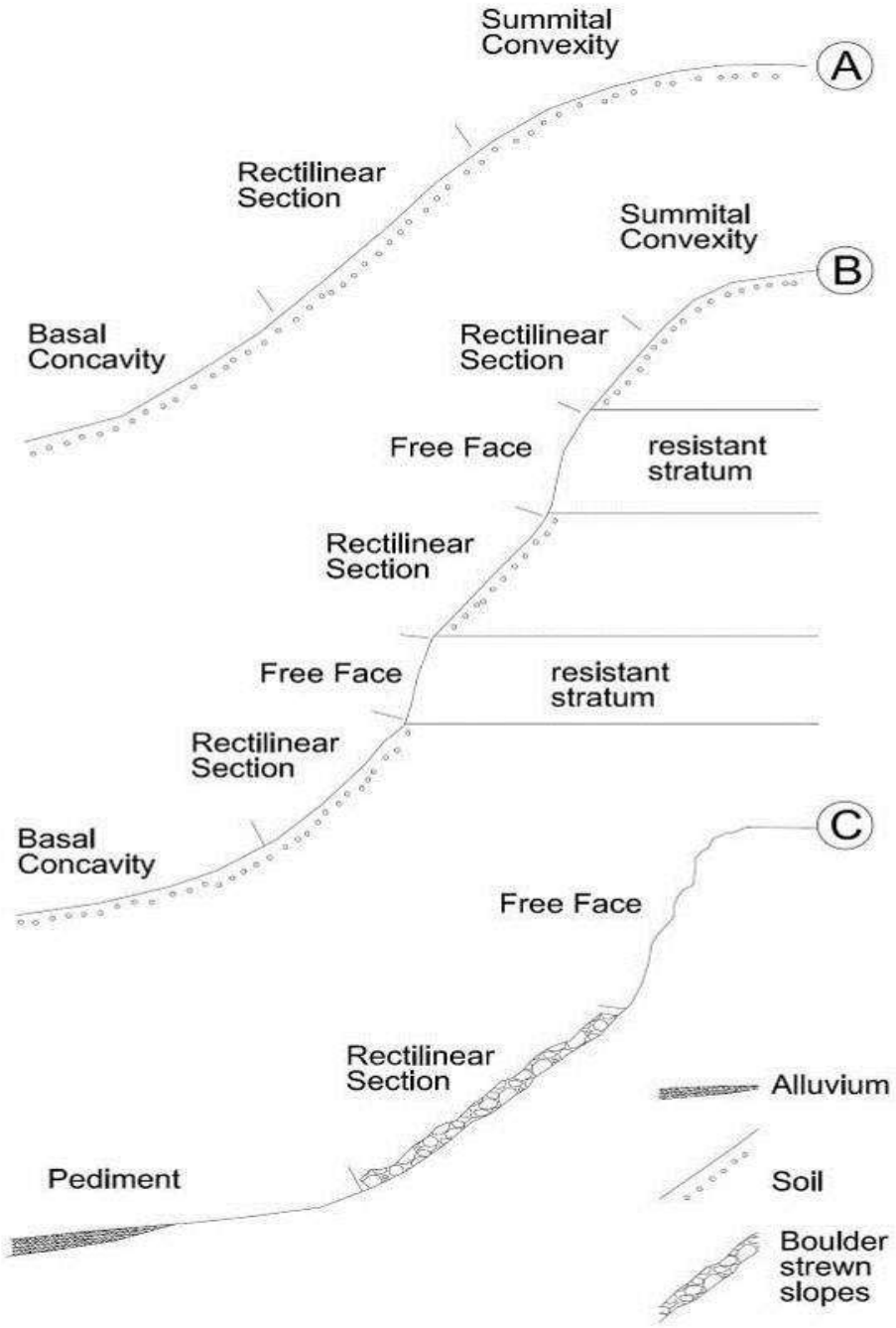
Convex sections are common to many slopes and usually develop on the upper part of the slope (summital convexity) due to erosional processes and are rarely covered by more than a thin layer of soil.



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