GOVT OF THE PUNJAB
TOURISM DEVELOPMENT COORPORATION OF PUNJAB

y

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

June, 2025

A joint Venture of

Rehman Habib Consultants (Pvt.) Limited

DOCUMENT INFORMATION

Category	Information
Document	Draft EIA Report – Establishment of Chairlift and Allied Infrastructure at Kotli Sattian, District Murree
Version	2.0
Code	
Department	Rehman Habib Consultants (Pvt.) Limited
Project	Establishment of Chairlift and Allied Infrastructure at Kotli Sattian, District Murree
Status	Final
Author(s)	Rehman Habib Consultants (Pvt.) Limited
Contributors	Rehman Habib Consultants (Pvt.) Limited
Approver	Team Leader, Establishment of Chairlift and Allied Infrastructure at Kotli Sattian, District Murree
Issue Date	**JUNE , 2025**
Distribution	Tourism Development Corporation of Punjab (TDCP), Government of the Punjab

REVISION HISTORY

Date	Version	Author	Comments
28 March, 2025	1.0	Dr. Akhtar , M. Husnain Aazam	
25 June 2025	2.0	Dr. Akhtar , M. Husnain Aazam	

TABLE OF CONTENTS

Page No.

LIST OF TABLES

Page No.

LIST OF FIGURES

Page No.

ANNEXURES

Page No.

ACRONYMS

AWWA	American Water Works Association
AoI	Area of Influence
AMC	Antecedent Moisture Conditions
AF	Acre Feet
APs	Affected Persons
APC	Affected Persons Committee
BOQs	Bill of Quantities
CMS	Conservation of Migratory Species of Wild Animals
CSC	Construction Supervision Consultant
CC	Construction Contractor
dB	Decibels
DPs	Displaced Persons
DEP	Dam Emergency Plan
DoA	Department of Archaeology
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
EMP	Environmental Management Plan
EPC	Environmental Protection Council
EPRP	Emergency Preparedness and Response Plan
ERP	Emergency Response Plan
EGST	Elevated Ground Storage Tanks
EMP	Environmental Management Plan
EA	executing agency
EHS	Environment Health and Safety
GoPb	Government of Punjab
GPH	Gallon Per Hour
GRM	Grievances Redress Mechanism
GRC	Grievance Redress Committee
IEE	Initial Environmental Examination
IFC	International Financing Corporation
IESCO	Islamabad Electric Supply Company
LAA	Land Acquisition Act
MAF	Million Acre Feet
MS	Mild Steel
MDD	Max day demand
NOC	No Objection Certificate
NEQS	National Environmental Quality Standards
NCS	National Conservation Strategy
NE	North East
NNE	North North-East
O & M	Operation and Maintenance
OHS	Occupational Health and Safety
PEPA	Pakistan Environmental Protection Act
PEPO	Pakistan Environmental Protection Ordinance
PEQS	Punjab Environmental Quality Standards
PPC	Pakistan Penal Code
PWA	Punjab Water Act
PAHs	Poly-nuclear aromatic hydrocarbons
PM	Particulate Matter
PGA	Peak Ground Acceleration
PPE	Personal Protective Equipment

PMU	Project Management Unit
PMO	Project Management Office
PDMA	Provincial Disaster Management Authority
PM	Project Manager
RE	Resident Engineer
SSEMP	Site Specific Environmental Management Plan
SOP	Standard Operating Procedure
SC	Supervisory Consultants
THQ	Tehsil Head Quarters
TDCP	Tourism Development Corporation
TMP	Traffic Management Plan
USEPA	United States Environmental Protection Agency
WHO	World Health Organization
WT	Water Table

EXECUTIVE SUMMARY

ES.1. INTRODUCTION

The Kotli Sattian Chair Lift Project is a transformative initiative in Punjab, Pakistan, aimed at boosting tourism and accessibility by constructing a modern chair lift system. It will connect key attractions, offering breathtaking aerial views of mountains, valleys, and forests while ensuring passenger comfort and safety with international standards. The project includes design studies, environmental assessments, and community consultations, with a carefully managed construction phase to minimize disruption. Upon completion, rigorous testing will ensure reliability, positioning Kotli Sattian as a premier tourism destination while preserving its natural beauty and fostering economic growth.

Kotli Sattian, in Rawalpindi District, Punjab, Pakistan, is a historically rich and culturally vibrant region with breathtaking natural beauty, dense forests, and panoramic hilltop views. The proposed chairlift project aims to boost tourism and economic growth while ensuring sustainable development, preserving the area's unique heritage, and enhancing accessibility for visitors.

The broader objective of the Projects is aimed at:

- Making the Kotli Sattian Future Tourist Destination,

ES.2. LEGISLATIVE FRAMEWORK

The proposed project is governed by a host of national and provincial statutes and regulations.

Amongst the various rules and statutes, as summarized in Chapter-2 of this EIA Report, the most pertinent from an environmental perspective are as follows:

- National Policy on the Environment;
- National Biodiversity Strategy & Action Plan;
- The Land Acquisition act, 1884;
- National & Provincial Conservation Strategy;
- Pakistan Environmental Protection Act, 1997;
- Pakistan EPA Review of IEE and EIA Regulations, 2000;
- Punjab Environmental Protection Act, 2012;
- Punjab EPA Review of IEE and EIA Regulations, 2022
- The Punjab Wildlife (Protection, Preservation, Conservation and Management) Act, 1974 (Last amended in 2007)
- Forest Act 1927
- The Antiquities Act, 1975
- Pakistan Penal Code, 1860
- Punjab Plantation and Maintenance of Trees Act, 1974
- Punjab Water Act 2019
- Punjab Drinking Water Policy, 2011
- Punjab Urban Water and Sanitation Policy, 2007

- The Canal and Drainage Act, 1873 (amended in 2016)

ES.3. DESCRIPTION OF PROJECT

This Kotli Sattian Chairlift Project broadly comprises the following components:

1. Start and End Stations

- Start Station (Parchen)
- End Station (Pafundi)

2. Chairlift Infrastructure

- Towers (Steel & Reinforced Concrete)
- Cable Cars (Spacious, Safe & Accessible)

3. Essential Amenities

- Ticket Booths (Multiple Payment Options)
- Waiting Areas (Sheltered Seating & Accessibility)
- Accessible Boarding Platforms (Step-Free, Wheelchair Friendly)
- Information Displays (Schedules, Weather, Safety Guidelines)
- Security Personnel (Visitor Safety & Crowd Control)
- Car & Bike Parking Facilities (Accessible & Convenient)
- Machine Room (Operational Support & Maintenance)
- Kiosks & Tuck Shops (Snacks, Beverages & Souvenirs)
- First Aid Room (Emergency Medical Assistance)
- Lost and Found (Recovery of Misplaced Items)
- Signage & Wayfinding (Multilingual, Clear Navigation)
- Observation Decks & Viewing Areas (Scenic Panoramic Views)
- Restaurant or Café (Diverse Dining Options)
- Children's Play Area (Safe & Engaging for Families)
- Prayer Area (Catering to Religious Needs)
- Waste Disposal & Recycling Facilities (Clean & Eco-Friendly)

ES.4. BASELINE CONDITIONS

- **Topography:** Kotli Sattian, located in the foothills of the Himalayas, features steep slopes, deep valleys, and peaks with elevations ranging from 500 to over 1,500 meters above sea level.
- **Geology and Soil**: The project area lies in the southern Pothohar Plateau, with Dhok Pathan Formation rocks (Middle Miocene age) composed of sandstone, siltstone, and shale, while the predominantly mountainous soil is rocky, shallow, and prone to erosion.
- **Climate and Meteorology:** The climate of the area is hot during the summer and cold during the winter. Daily mean maximum temperature varies from 33° to 44° during the summer and 2° to 22° during the winter. During the summer the hot air blows during the day timings. The major rainfall in the area is during the monsoon season, which

start from mid of July and lasts for two months, about 70% rainfall Is during these months, there are winter rainfall as well. The average annual rainfall varies from 1562 millimeters to 1655 millimeters.

- **Seismology:** According to the seismic zone map of Pakistan, Tehsil Kotli Sattian lies in Zone 3 of the Pakistan Seismic zone map, which means 'moderate' to 'severe' damage due to earthquakes.
- Environmental Protection Agency (EPA), Punjab PA-registered laboratory Pak Green Enviro-Engineering was hired from Environmental Monitoring of water, air and Noise quality of the project area. Lab monitoring results depicts following
  - **Ambient Air Quality:** Average value of PM2.5 and PM10 were exceeding WHO limits, which possibly due to the flow of continuous traffic on the Kotli Sattian Road and Tourism Highway present near to the project site while as per NEQS all the parameters are within the permissible level.
  - **Ambient Noise:** The noise levels monitored in project area were within prescribe limits of PEQS and WHO values.
  - **Drinking Water Quality:** All the parameters are within permissible limits as per PEQS. The main reason behind the such purity of water is less anthropogenic activities in the project area
- **Protected Sites:** The project area is located within the Kotli Sattian Reserved Forest. On May 22, 2023, the Governor of Punjab officially declared the Kotli Sattian Reserved Forest as the Murree, Kotli Sattian and Kahuta National Park, Murree. This declaration signifies a significant step towards the conservation and protection of the forest ecosystem.
- **Flora:** The project area is entirely surrounded by the Kotli Sattian Reserved Forest. The dominant tree species is Chir Pine (*Pinus roxburghii*), while other major species include Blue Pine (*Pinus wallichiana*), Oaks (*Quercus* spp.), and Wild Chestnuts (*Castanea mollissima*). The area also contains fruit trees such as Walnut (*Juglans regia*), Black Persimmons (*Diospyros texana*), Pear (*Pyrus* spp.), Apricot (*Prunus armeniaca*), and Plum (*Prunus domestica*), along with various grasses, sedges, and herbs that support local wildlife. The Forest Department is actively planting Blue Pine within the project site. Tree cutting is necessary for the project, and the Forest Department has established a structured process for tree removal, replantation, and replenishment, which will be conducted in coordination with the Tourism Development Corporation of Punjab (TDCP). As the project area lies within the Kotli Sattian Reserved Forest, obtaining a No Objection Certificate (NOC) from the Forest Department is a mandatory prerequisite before initiating any work.
- **Fauna:** The project area hosts a diverse range of fauna, including mammals such as Wild Boar (Sus scrofa), Fox, Rhesus Monkey (Macaca mulata), Himalayan Palm Civet (Paguma larveta), Yellow-Throated Marten (Martes flavigula), Flying Squirrel (Eoglaucomys fimbriatus), Jackal (Canis aureus), and Rabbits (Oryctolagus cuniculus). Leopards (Panthera pardus), which pose potential risks to tourists, are also present. Avifauna includes species such as Parrots (Psittaciformes), Myna (Acridotheres tristis), Dove (Columbidae), Bulbul (Pycnonotus barbatus), Heron (Ardeidae), Hoopoe (Upupidae), Pigeon (Columbidae), Black-winged Kite (Elanus), Black Kite, Golden Backed Woodpecker, Red-vented Bulbul (Pycnonotus cafer), Indian Tree-pie (Dendroceta vagabunda), Jungle Crow (Corvus corone), and House Sparrow (Passer domesticus). The reptilian species identified in the area include Monitor Lizard

(Varanus albigularis), Porcupine (Erethizon dorsatum), Mongoose (Herpestidae), and various Snakes (Serpentes). As the project site lies within Kotli Sattian National Park, obtaining a No Objection Certificate (NOC) from the Wildlife Department is mandatory before initiating any work.

- **Archaeology and Cultural Heritage:** Sites of importance in regard to cultural heritage are not reported from the specific area of the project.
- **Main Mouza Jat** of the project area are Perchan and Phofandi.
- **Demography and Living Pattern:** Perchan has 450-500 households (HHs) with 3,800 people, and Phofandi has 280-300 HHs with 2,400 people; 90% houses are pacca, and 10% are semi-pacca.
- **Caste Groups in Studied Mouza:** Perchan has Satti, Janjua, Syed, Qureshi, and Abbasi castes, while Phofandi has Satti, Qureshi, and Abbasi.
- **Source of Religion:** 100% of the population is Muslim.
- Literacy Ratio: Overall literacy rate is 85%, with Perchan at 80% and Phofandi at 85%.
- **Mother Tongue:** Potohari is the primary language, while most men can speak Urdu.
- **Main Occupation of Respondents:** Government service is the dominant occupation (70% in Perchan, 80% in Phofandi), followed by private service, labor, and business.
- Main Crops: Small land holdings mainly grow wheat and jawar for domestic use.
- **Fruit Trees:** Fruit trees include apple, peach, pear, plum, and walnut.
- **Source of Drinking Water & Quality:** Drinking water sources include hand pumps, boreholes, and springs, with good quality water in both villages.
- **Source of Irrigation Water:** No canals or tube wells; irrigation depends on rainwater recharge from hilly nullas.
- **Waterborne Diseases:** No major diseases; seasonal illnesses include fever, cough, flu, dengue, hepatitis, blood pressure, and heart diseases in Perchan.
- **Social Amenities:** Both Mouzas have electricity, mobile networks, grocery shops, primary, middle, and high schools, while health emergencies are handled at THQ Kotli Sattian.
- **Gender Participation:** Women actively participate in household work, child care, farming, and livestock but have no role in property dealings, social obligations, or local representation.
- **Community Opinion on Project Impacts:** The community perceives the project to have positive impacts on employment, land value, and business development.
- **Land Acquisition and Resettlement:** The project requires 26.5147 acres of land, mostly forest land, for stations, the chairlift route, and the approach road. Three residential structures fall within the right-of-way (ROW) and require relocation.

ES.5. PROJECT ALTERNATIVES

Three potential routes were analyzed for the Kotli Sattian Chairlift Project: Route #1 (Parchen to Balawra), Route #2 (Parchen to Phofandi via forested terrain), and Route #3 (Parchen to Phofandi via ridge terrain). Route #3 was selected as the most suitable due to its optimal balance of technical feasibility, minimized environmental impact, cost-effectiveness, and enhanced scenic views. It follows a ridge terrain with a shallow decline, requiring less complex engineering while avoiding sensitive ecological areas and minimizing disruption to local communities. Route #1, the longest, posed higher construction complexity and environmental disruption due to its winding path through populated areas, while Route #2, traversing steep slopes and forested regions, had higher ecological impacts and engineering challenges. Route #3 offered the most favorable cost-benefit ratio, the best scenic experience, and operational ease, aligning with the project's long-term vision for tourism and accessibility.

ES.6. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Some of the main impacts at this stage are described below.

- **Land acquisition:** The project requires 26.5147 acres of land, mostly forest land, for stations, the chairlift route, and the approach road. Three residential structures fall within the right-of-way (ROW) and require relocation.
- **Mitigation Measures:**
  To ensure transparency and adherence to the Land Acquisition Act of 1894, Tourism Development Corporation of Punjab (TDCP) and the Land Revenue Department must oversee the acquisition process. Complete records, particularly regarding asset valuation and compensation, should be meticulously maintained. Addressing community grievances promptly is crucial to prevent unrest and mistrust. Establishing contractor camps on acquired land is preferred to avoid leasing issues; if this is not feasible, land for these facilities should be leased beforehand from private landowners to streamline the construction phase.
- **Ambient Air Quality**
  - **Fugitive Dust Emissions:** Construction activities like excavating, material transportation, and movement of vehicles generate fugitive dust emissions, impacting air quality and posing risks to site workers, local populations, and natural vegetation.
    Mitigation measures include covering material stockpiles, regular monitoring of air quality, dust prevention during unloading operations, suspension of grading during high wind speeds, proper road maintenance, and ensuring the use of Personal Protective Equipment (PPE) for workers. These measures aim to reduce the impact of dust emissions to a low significance level.
  - **Smoke from Burning of Waste Material or Burning Firewood:** Fires in labour camps can produce smoke and smog, affecting visibility, traffic, and causing respiratory issues.
    Mitigation measures involve using clean, smoke-free fuel in labour camps, prohibiting the cutting and burning of trees or shrubs for fuel, and using gas cylinders for cooking purposes. These measures aim to minimize the impact of smoke emissions and ensure a healthier environment for labour camp occupants.
  - **Vehicular and Generator Exhaust Emissions:** Movement of heavy machinery, batching plants, and generators releases noxious gases, contributing to air pollution in the vicinity.
    Mitigation measures include maintaining vehicles in good condition, proper maintenance and repair of power generators and construction machinery, positioning batching plants to minimize community exposure, enforcing applicable emission standards, and using high-quality fuel and lubricants. These measures aim to mitigate the impact of exhaust emissions on air quality and public health during construction activities.
- **Noise Pollution:** The main sources for noise in the project area may be heavy machinery such as excavators, concrete mixing plant, stone crushers and other equipment. Noise pollution from construction activities poses significant health risks, including high blood pressure, hypertension, annoyance, and sleep disturbance, particularly for sensitive receptors within the area of influence (AoI), resulting in a medium significance impact.
  Mitigation measures include maintaining vehicles with silencers, limiting high-noise

activities near sensitive areas, providing workers with hearing protection, restricting night time construction near settlements, consulting stakeholders for noise control solutions, conducting regular noise monitoring per PEQS/WHO standards, and adjusting schedules to minimize wildlife disruption.

- **Vibration:** Construction activities such as soil compaction, excavation, and the movement of heavy trucks have the potential to generate vibrations that can be disruptive to humans, fauna, and structures, with possible consequences such as annoyance and structural damage if precautions are not taken, indicating a notable impact.

  Mitigation Measures: To mitigate these effects, specific measures are recommended, including restricting the use of heavy machinery to designated time frames, employing machinery with low vibration levels and ensuring regular maintenance, conducting building condition surveys in proximity to sensitive areas, evaluating the impact of piling before construction, and engaging with the local community to discuss the timing and potential effects of construction activities. These measures are aimed at reducing the impact of vibrations to a low significance level, thereby minimizing disruption and damage during the construction phase.
- **Disposal of Soil Material**: Solid waste generation, including spoil material from excavation activities, poses potential environmental impacts such as land conversion for disposal areas, erosion leading to spoil reaching water bodies, and aesthetic concerns, with a medium significance impact.

  Mitigation Measures: To mitigate these impacts, several measures are proposed, including proper collection and disposal of camp waste through coordination with solid waste management departments, segregation of toxic waste, labelling and sealing of waste containers, and development of a waste management plan for efficient handling and recycling. Additionally, recyclable and reusable materials will be sold or used appropriately, and spoil material will be dumped at approved sites, avoiding disposal into water bodies and ensuring proper management and restoration of the construction site. These measures aim to reduce the impact of solid waste generation to a low significance level, promoting responsible waste management practices during the construction phase.
- **Resource Conservation:** Resource conservation during construction activities can lead to overburden on local resources, potentially creating conflicts between workers and local communities, with a medium significance impact.

  Mitigation Measures: To mitigate these impacts, various measures are recommended, including the use of potable water bowsers and ground water for drinking purposes, insulation to reduce heat loss, training to reduce water wastage, and reuse of construction waste materials. Additionally, sourcing aggregates responsibly, using low-sulphur fuels for machinery, employing efficient equipment and machinery, and implementing camp design and worksite management plans to minimize water demand and waste volumes are proposed. These measures aim to reduce the impact of resource consumption to a low significance level, promoting sustainable practices and minimizing conflicts with local communities during construction.
- **Community health and safety:** Community health and safety within the project areas may be compromised due to deep excavation works and the movement of heavy machinery and vehicles, potentially leading to injuries or fatalities among community

members, particularly women and children, if adequate precautions are not taken. This impact is assessed as having medium significance.

Mitigation Measures: To address these concerns, several mitigation measures are proposed. These include the preparation of site-specific community health and safety plans, the clear barricading of work areas to prevent public access, the exclusion of vehicles and vendors from construction zones, the removal of potential hazards such as excavated earth and debris, the provision of temporary lighting for night time construction, the reinforcement of excavation safety measures, the prompt reinstatement of interrupted services, the installation of speed control and traffic calming devices, the development of an Emergency Preparedness and Response Plan (EPRP), strict enforcement of keeping non-working persons off sites, timely public notifications of construction works, close consultation with local communities, and additional provisions to address any environmental nuisances. These measures, to be enforced through bidding specifications and contract documents, aim to ensure the safety and well-being of the community during construction activities.

- **Occupational Health and Safety (OHS):** Occupational Health and Safety (OHS) issues are anticipated during various construction activities, including excavation, levelling, and testing, primarily involving physical and chemical hazards, as well as noise exposure. The medium significance impact includes potential accidents due to lack of an efficient Emergency Response Plan (ERP) and exposure to high noise levels.
  Mitigation measures include proper barricading, warning tapes, isolation of areas during excavation, dust control, storage precautions, designated entry and exit points, confined space procedures, and traffic safety measures. Additionally, an Occupational Health and Safety Management plan framework is established to address worker and community health and safety concerns, including monitoring programs, regular inspections, surveillance of the working environment and worker health, and comprehensive training activities. These measures aim to reduce the impact of OHS issues to a low significance level, ensuring a safe working environment during construction activities.
- **Ecological Impacts (Loss of Vegetation and Deforestation):** The construction of the Kotli Sattian Chairlift Project will require tree removal in the Kotli Sattian Reserved Forest, affecting ecologically significant species like Chir Pine, Blue Pine, Oaks, Wild Chestnuts, and Walnut, which play vital roles in biodiversity, erosion control, and habitat provision, making the impact highly significant.
  Mitigation Measure: To mitigate these impacts, several measures are proposed. These include obtaining a obtaining an NOC, replanting trees, avoiding ecologically sensitive areas, conducting environmental surveys, restricting construction activities to designated areas, prohibiting tree cutting for fuel, ensuring proper trench compaction, and banning open fires will minimize environmental impacts, reducing their significance to a low level.
- **Fauna**
  Mammals and Reptiles: Construction activities within the project area are anticipated to negatively impact terrestrial fauna, including mammals such as Wild Boar, Fox, and Jackal, as well as reptiles like Monitor Lizards and Snakes. These activities may restrict the movement of wildlife, leading to avoidance of construction areas and potential fatalities due to accidental collisions with project vehicles. Additionally, the presence of eatable goods in contractor camps may attract wildlife, posing further risks. This impact

is assessed as medium significance.

Mitigation measures: To mitigate this, Biodiversity Action Plan (BAP) and Biodiversity Management Plan (BMP) must be developed before site clearance to ensure ecological protection. Other mitigation measures include obtaining necessary NoC from the Wildlife Department, prohibiting hunting and harassing of wild animals, avoiding noise-generating activities during the night, properly fencing camps to prevent wildlife entry, and maintaining vehicles to reduce noise levels, ultimately reducing the risk of striking fauna on access routes to a low level.

Birds - Avian Fauna: Avifauna within the project area, including species such as Peacock, Jungle Fowl, and Parrots, may be disturbed by construction activities, leading to temporary displacement from their habitats. This impact is considered of medium significance.

Mitigation measures: To mitigate this, a comprehensive wildlife management plan should be developed, which includes monitoring local fauna and implementing measures to minimize disruption. Other mitigation measures include such as restricting noise-generating activities during breeding seasons, enforcing a strict "No Hunting" policy, prohibiting the trapping or harming of birds, and limiting construction to daylight hours will help protect wildlife, reducing the impact to a low significance level.

- **Use of Local Water Resources:** The project's water requirements, including those for construction activities and campsite facilities, are expected to be met from local surface water and groundwater sources. This utilization may have medium significance impacts due to potential strain on already scarce water resources.

  Mitigation measures involve obtaining necessary approvals for water use, ensuring minimal disruption to existing local water users, maintaining dialogue with local communities to resolve any conflicts, and implementing guidelines to minimize water wastage during construction. With these measures in place, the impact is expected to be of low significance.
- **Visual and aesthetic impacts:** The project's visual and aesthetic impacts should not be overlooked. The construction of chairlift towers, stations, and other infrastructure could alter the natural beauty of Kotli Sattian, potentially detracting from its appeal as a tourist destination.

  Mitigation Measures: To Mitigate this incorporation aesthetic considerations into the design, using natural materials, and strategically positioning towers to reduce visibility, the project can minimize visual intrusion. Avoiding sensitive areas and mitigating disturbances will help preserve Kotli Sattian's scenic beauty, ensuring an enhanced visitor experience while maintaining the region's visual integrity.
- **Contamination of Water Resources:** Construction activities in Kotli Sattian's hilly terrain may cause soil disturbance, vegetation removal, and machinery use, leading to sedimentation, increased turbidity, and water pollution from oils, chemicals, and heavy metals, impacting aquatic life and local water sources (Medium Significance).

  Mitigation measures: These measures will effectively reduce the impact on water quality to a low significance by controlling runoff, preventing sedimentation, and ensuring proper wastewater management. Regular monitoring and worker training will further help maintain water quality standards and protect aquatic ecosystems.

Operational Phase Impacts

- **Visual and Aesthetic Impact:** Chairlift towers, cables, and stations may alter the natural landscape, reducing Kotli Sattian's scenic appeal for tourists.

Mitigation Measures: Use natural colors/materials, landscape screening, and strategic siting to minimize visual intrusion.

- **Wildlife Disruption:** Chairlift noise and tourist presence may disturb wildlife, affecting feeding, breeding, and migration.
  Mitigation Measures: Implement noise reduction, wildlife monitoring, buffer zones, and restrict operations during breeding/migration seasons.
- **Increased Human-Wildlife Interaction:** More tourists may lead to increased human-wildlife encounters, disturbing animals and causing habituation.
  Mitigation Measures: Educate visitors, deploy park rangers, and enforce designated paths and boundaries.
- **Waste Generation and Pollution:** Higher tourist numbers may increase litter and pollution, degrading the environment and threatening wildlife.
  Mitigation Measures: Provide waste disposal bins, recycling systems, conduct awareness campaigns, and organize clean-up drives.
- **Water Usage and Resource Management:** Chairlift operations may require water for facilities, potentially straining local water resources.
  Mitigation Measures: Use water-saving fixtures, implement rainwater harvesting, and monitor water usage.
- **Noise Pollution from Operational Machinery:** Continuous noise from the moving chairlift system may disturb wildlife and local communities.
  Mitigation Measures: Use noise-reducing technology, restrict operations during sensitive hours, and conduct regular noise monitoring.
- **Traffic Congestion and Increased Human Activity:** The chairlift may attract more visitors, leading to traffic congestion near stations.
  Mitigation Measures: Improve transportation infrastructure, provide parking and shuttle services, manage traffic flow, and promote public transport.
- **Maintenance and Infrastructure Longevity:** Wear and tear of the chairlift system may affect safety, aesthetics, and functionality over time.
  Mitigation Measures: Establish a routine maintenance program, use durable materials, and train local staff for quick issue resolution.

ES.7. ENVIRONMENTAL MANAGEMENT PLAN

The EMP sets out mitigation actions, monitoring actions, responsibilities, and schedules for impact mitigation and monitoring. Environmental monitoring has to be undertaken during both the construction and operational phases to ensure the effectiveness of the proposed mitigation measures.
EMP also provides its implementation mechanism during construction and operational Phases

- **Implementation during Construction Phase**: The executing agency for this Tourism Development Corporation of Punjab (TDCP) having core implementation responsibility. The TDCP will overall monitor the environment related activities of Supervision Consultant and Construction Contractor and report to EPA-Punjab regarding implementation status of EMP. Construction Contractor will be in direct coordination with Supervision Consultant through its HSE Department. Contractor's HSE Department is highly recommended to be on-board before mobilization.
- **Implementation during O&M**: The key players involved during operation of the

proposed project will be General Manager, TDCP Rawalpindi Division and Municipal committee, Murree.

The EMP is prepared taking into account environmental consequences of the proposed action. Mitigation measures are suggested in Environmental Mitigation Plan at different stages of activities with performance indicators to mitigate the potential impacts. Environmental Monitoring Plan has also been prepared as a part of EMP which details about monitoring mechanism of a specific receptor /item, its frequency and parameters to be considered. The designer has carefully considered all recommendations related to the design. Though construction impacts are not severe, proper mitigation measures are needed. A suitable training program is proposed to train the Contractor(s) staff who will be involved in the Construction Phase and the professional staff from the proponent involved at the operational phase of the project. All required permits/NoCs shall be obtained from the concerned departments before starting the related activity. Grievances should be addressed promptly, as suggested in the EMP.

ES.8. EMP BUDGET

The EMP budget for construction and operations period of Project is 16.2 Million PKR.

CONCLUSION

The Environmental Impact Assessment (EIA) concludes that the proposed project, situated within the environmentally sensitive Kotli Sattian Reserved Forest and Murree-Kotli Sattian-Kahuta National Park, presents adverse but manageable environmental impacts—primarily during the construction phase. These impacts, informed by both primary and secondary data, are addressed through a comprehensive Environmental Management Plan (EMP), which outlines mitigation measures for excavation, waste disposal, flora and fauna conservation, and occupational and community health and safety. The Contractor will be responsible for implementing these measures, under the supervision of the Construction Supervision Consultant (CSC) and oversight of the Tourism Development Corporation of Punjab (TDCP). The EMP is to be further elaborated into Site-Specific Environmental Management Plans (SSEMPs) by the Contractor prior to the start of physical works. Given the project's location within an Environmentally Sensitive Area, it falls under Category I (Schedule-II) and requires No Objection Certificates (NOCs) from the Forest and Wildlife Department and other relevant authorities. With effective execution of the EMP and compliance with regulatory obligations, the environmental impacts of the project can be minimized and effectively managed throughout the project lifecycle.

Recommendations

TDCP is required to obtain statutory environmental clearance from the Punjab Environmental Protection Agency (EPA) before awarding any contract, ensuring that all environmental conditions are reflected in the project design and tender documents. Upon contractor mobilization, TDCP must also conduct an orientation on environmental and social safeguards, aligned with the EIA and project administration manual. The Contractor is obligated to appoint qualified personnel to manage environmental compliance, occupational health and safety (OHS), and core labor standards. While template management plans are included in the annexures, the Contractor must prepare and submit detailed plans prior to mobilization. Site-

Specific Environmental Management Plans (SSEMPs) are to be developed and implemented during construction, with oversight by TDCP through the Construction Supervision Consultant (CSC). Biodiversity Action Plan (BAP) and Biodiversity Management Plan (BMP) must be developed before site clearance to ensure ecological protection. Additionally, TDCP must secure a No Objection Certificate (NOC) from the Forest and Wildlife Department before commencing construction, and the Contractor must obtain TDCP's approval for establishing and operating construction camps, including waste management arrangements.

1 INTRODUCTION

1.1 PROJECT BACKGROUND

The Kotli Sattian Chair Lift Project is a transformative initiative poised to elevate tourism and accessibility in the scenic Kotli Sattian region of Punjab, Pakistan. This project centers on constructing a modern chair lift system, gracefully traversing the area's breathtaking landscapes and connecting key points of interest. By providing a convenient and exhilarating mode of transportation, the project aims to unlock Kotli Sattian's immense tourism potential, stimulate economic growth, and enrich the visitor experience.

The project's core objective is to create a seamless and enjoyable transportation experience. The chair lift system will feature strategically located stations, offering easy access to panoramic viewpoints, hidden trails, and other attractions. Modern chair lift technology will ensure passenger comfort and safety, adhering to stringent international standards.

Carefully planned routes will showcase Kotli Sattian's most spectacular vistas. The chair lift journey will be a highlight of the tourism experience, providing breathtaking aerial views of mountains, valleys, and forests. This unique perspective will create lasting memories for visitors.

Carefully planned routes will showcase Kotli Sattian's most spectacular vistas. The chair lift journey will be a highlight of the tourism experience, providing breathtaking aerial views of mountains, valleys, and forests. This unique perspective will create lasting memories for visitors.

The project will progress through distinct phases, including design studies, environmental assessments, and community consultations. The construction phase will be carefully managed to minimize disruption and prioritize safety. Upon completion, rigorous testing and commissioning will ensure the chair lift system's reliability and safety. This project will transform Kotli Sattian into a premier tourism destination, preserving its natural beauty and empowering its community.

1.2 LOCATION OF THE PROJECT

Kotli Sattian, nestled in the Rawalpindi District of Punjab, Pakistan, is a region ripe with tourism potential, boasting a compelling blend of historical significance, vibrant cultural heritage, and breathtaking natural beauty. Its name, derived from the town of Kotli and the Satti tribe, reflects the unique interplay of geography and culture that has shaped its identity. Geographically, Kotli Sattian lies within the Rawalpindi and Kahuta hills, extensions of the Pir Panjal Range. This mountainous terrain, with its dramatic slopes, dense forests, and awe-inspiring vistas, has profoundly influenced the region's character and the lives of its inhabitants. Historically, Kotli Sattian, once part of Rawalpindi Tehsil, was granted separate subdivision status in 1990, recognizing its distinct characteristics and development needs. The region's history is deeply intertwined with its tribes, particularly the Satti, whose traditions and customs have left a lasting mark. This rich cultural heritage, combined with the area's unspoiled natural beauty, makes Kotli Sattian an increasingly popular destination for tourists seeking tranquility, adventure, and a connection with nature and local traditions.

Kotli Sattian's primary attraction is its pristine natural environment, encompassing verdant forests, diverse flora and fauna, and spectacular panoramic views from its hilltops. This natural splendor makes it ideal for tourists seeking respite from urban life and outdoor recreation. Projects like the proposed chairlift are key initiatives to enhance accessibility and attract more visitors, drawing inspiration from successful ventures in nearby areas. The chairlift is envisioned as a major attraction, offering a unique aerial perspective of the landscape and stimulating economic growth by creating jobs and supporting local businesses. The selection of hilltop locations for the chairlift further enhances its tourism potential, offering unforgettable experiences with panoramic views. However, sustainable development is crucial. Balancing progress with the preservation of Kotli Sattian's natural beauty and cultural heritage is paramount, ensuring that tourism benefits both visitors and local communities while safeguarding the region's unique character for future generations.

The project location maps are provided as Figure **1-1** below.

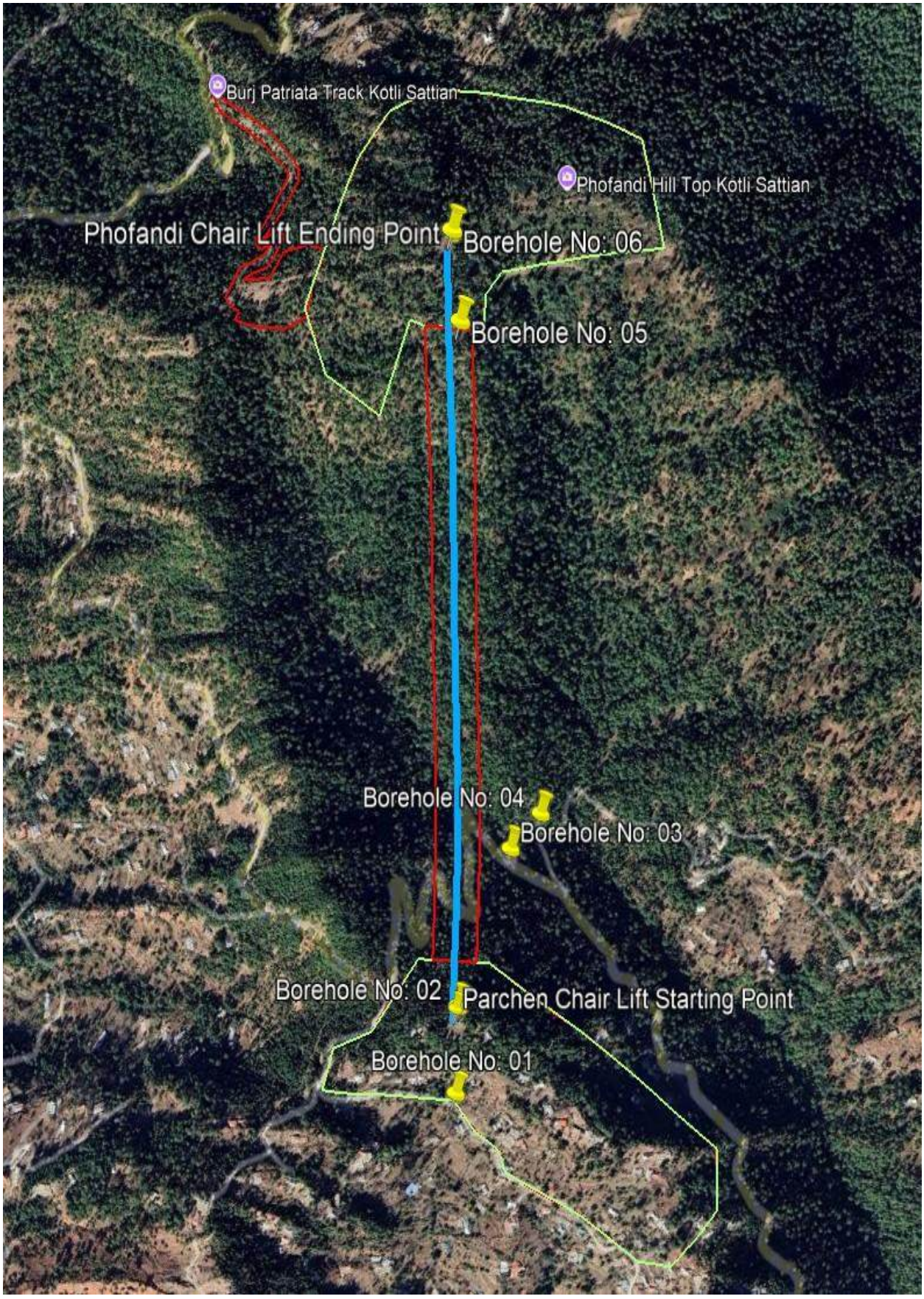


Figure 1-1: Location Map of the project sites in Tehsil Kotli Sattian

1.3 ENVIRONMENTAL CATEGORY OF PROJECT

After the 18th amendment to the constitution of Pakistan, environment became a provincial subject, and the environmental law governing the proposed project activity is the “Punjab Environmental Protection Act, 1997(As amended up to 2017)”.

The Punjab Review of IEE/EIA Regulations, 2022 provide categories of projects for which IEE or EIA needs to be conducted. The proposed project falls under the category I “Environmentally Sensitive Areas” of Schedule II of these regulation that require EIA study to be conducted. Accordingly, the environmental study has been conducted and an EIA report has been prepared.

The EIA report complies with both the PEPA and Punjab Environmental Protect Act requirements for environmental management of projects.

1.4 OBJECTIVES OF EIA REPORT

The objectives of this EIA report are as follows:

(i) Meet the statutory requirements set forth by the Pakistan Environmental Protection Act (PEPA) 1997 and the Punjab Environmental Protection Act, 1997(As amended up to 2017).

(ii) Facilitate proponents of the project in ensuring environmental and social acceptability of the project.

(iii) Establish a baseline of existing environmental status at the project site prior to project initiation by collecting secondary and primary data/information on physical, biological and social environment of the project area.

(iv) Help the TDCP to incorporate necessary measures for legally compliant and socially acceptable environmental performance of their project.

(v) Identify significant environmental impacts (both positive and negative) during all stages of the project implementation and propose mitigation measures for negative impacts.

1.5 SCOPE OF EIA STUDY

The scope of this EIA study is collection and analysis of data related to physical, biological and socio-economic environment of the project area and to prepare the baseline environmental profile. It also aims at the identification, prediction and evaluation of the possible environmental impacts of the proposed project on its immediate surroundings on both short and long-term basis. Based on the nature and scale of those impacts, appropriate mitigation measures are proposed in this EIA report.

1.6 PURPOSE OF EIA REPORT

The purpose of this EIA report is to assess significant adverse environmental and social impacts and to suggest mitigation and remedial measures to make the project environmental

friendly and sustainable during the construction and operational stages of the project and to initiate the process of NOC from the EPA, Punjab prior to mobilization of the Contractor.

1.7 STUDY TEAM

A multidisciplinary team was formulated to conduct the study. The team comprised the following experts:

Dr. Akhtar Iqbal	:	Environment Specialist
Rana Abdur Rehman	:	Sociologist/Resettlement Expert
M. Hussnain Azam	:	Jr. Environmentalist
Faayyaz Ahmed	:	Jr. Sociologist
Umar Raza	:	GIS Expert

1.8 METHODOLOGY

The following methodology was adopted for carrying out the EIA study of the proposed project:

a) Orientation

Meetings and discussions were held among the members of the EIA consulting team. This activity was aimed at achieving a common ground of understanding of various issues of the study.

b) Planning for Data Collection

Subsequent to the concept clarification and understanding obtained in the preceding step, a detailed data acquisition plan was developed for the internal use of the EIA consulting team. The plan identified specific data requirements and their sources; determined time schedules and responsibilities for their collection; and indicated the logistics and facilitation needs for the execution of the data acquisition plan.

c) Data Collection

In this step, primary and secondary data were gathered through field observations, concerned departments and published materials to establish baseline of physical, biological and socio-economic environmental conditions.

- Site reconnaissance
- Analysis of maps and plans
- Literature review
- Meetings with concerned department
- Public consultation

d) Physical Environment

Information was gathered on the existing physical environment, particularly as related to geology, topography, soils, hydrology and drainage, water quality, air quality, climate, seismology and noise through available secondary and primary data about water, air and noise and field surveys.

e) Biological Environment

The status of the flora and fauna of the study area were determined by a review of literature of the area and an assessment of both terrestrial and aquatic environments.

Flora

The vegetative communities were identified and classified into community types. Identification was carried out of dominant tree species, assessment of stage of growth (mature or sapling) and assessment of canopy cover.

Fauna

Information on fauna was gathered from existing literature on reported species as well as observations in the field.

f) Socio-Cultural Environment

The consultants utilized a combination of literature, field investigations, census report, meetings through public consultation and interviews to describe the existing social environment and assessment of the potential impact of the construction of the proposed sub-projects. Data was gathered on the following aspects of the social environment:

- Land use and municipal status
- Demographics
- Livelihoods
- Community facilities
- Solid waste management
- Proposed developments
- Archaeological and cultural heritage
- Identification and evaluation of environmental impacts

The impacts of the proposed project on the physical, biological and socio-economic environments prevalent in the project area are identified at the design, construction and operational phases.

g) Mitigation Measures and Implementation Arrangements

The adequate mitigation measures and implementation framework were proposed so that the TDCP can incorporate them beforehand in the design phase.

1.9 STRUCTURE OF THE REPORT

Section 1 **"Introduction"** briefly presents the project background, objectives, methodology and need of the EIA study.

Section 2 **"Policy, Legal and Administrative Framework"** comprises policy guidelines, statutory obligations and roles of institutions concerning the EIA study of the proposed project.

Section 3 **"The Project"** furnishes information about the studied alternatives, location of the proposed project, cost and size of the project, its major components and alternatives considered for the proposed project to select at the preferred alternative for detailed environmental assessment.

Section 4 **"Environmental and Social Baseline"** describes physical, biological and socioeconomic conditions prevalent in the project area.

Section 5 "**Analysis of Alternatives"** describes the proposed alternatives of the project and identified the environmentally, socially and economically viable project design.

Section 6 **"Public Consultation"** identifies the main stakeholders and their concerns raised through scoping sessions and deals with the measures to mitigate the social impacts.

Section 7 **"Environmental Impacts Assessment and Mitigation Measures"** identifies and evaluates impacts of the project activities during the construction and operation stages and recommends with the measures proposed to mitigate potential environmental impacts of the proposed sub-project activities.

Section 8 **"Environmental Management Plan"** outlines institutional arrangements for the implementation of the proposed mitigation measures, training needs of the staff for implementation of the mitigation measures, monitoring requirements, monitoring cost etc.

Section 9 **"Conclusion and Recommendation"** describes the conclusion of this EIA report and recommendations for the proposed sub-project activities.

2 POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

2.1 GENERAL

This chapter provides the current legal framework which is applicable on the proposed project in context of environment and sustainable development. The institutional arrangement that exists in Pakistan and may influence the environmental management of the proposed project is also discussed in this chapter.

2.2 BACKGROUND

The enactment of PEPA 1997 took up the key issues of PEPO and in addition provided for a considerable strengthening of institutions at the national and provincial level for the formulation, execution and enforcement of environmental policies and conferred broad-based enforcement powers to the EPA. NEQS for municipal and liquid industrial effluent, industrial gaseous emissions and motor vehicle exhaust and noise, were issued by Pakistan EPA in 1994.

Punjab EPA review of IEE and EIA Regulations, 2022 and Pakistan Environmental Assessment Procedures were published, to provide necessary guidelines for preparation, submission and review of IEE and EIA studies.

2.3 NATIONAL ENVIRONMENTAL POLICY

The National Environment Policy aims to protect, conserve and restore Pakistan's environment in order to improve the quality of life of the citizens through sustainable development. The Policy provides broad guidelines for addressing environmental concerns and ensuring effective management of their environmental resources. The provincial, AJK, Northern Areas and local governments, however may devise their own strategies, plans and programs in pursuit of this Policy.

Enforcement of the policy is being carried out through National Environmental Quality Standard (NEQS) and Self-Monitoring & Reporting Tools (SMART) in order to optimize energy and environmental resource consumption within the industries; encourage reduction, recycling and reuse of municipal and industrial solid and liquid wastes; introduce discharge licensing system for industry; devise and implement master plans for treatment of municipal and industrial wastewater in urban and rural areas. The policy has not been revised since 2005.

2.4 ENVIRONMENTAL LEGISLATIONS

The key environmental regulations and legislations which are applicable to the proposed project is discussed below.

2.4.1 National Regulations

The environmental policy framework, which will govern the project, is the NCS of Pakistan. The Pakistan NCS is a broad-based policy statement aimed at achieving environmentally sustainable social and economic development in Pakistan. The three overriding objectives of the NCS are:

- Conservation of natural resources
- Sustainable development
- Improved efficiency in the use and management of resources

Three operating principles are identified to achieve these objectives. These are:

- Greater public participation in development and environmental management
- A merging of environmental and economic decision making
- Lasting improvements in the quality of life

The NCS specifies the basic guidelines for an integrated effort aimed at protecting the environment and the natural resources of the country. This broad framework provides a comprehensive point of reference for all agencies, departments, private sector companies, financial institutions, and donor agencies for undertaking systematic efforts to bring about an effective change for sustainable development.

2.4.2 Pakistan Environmental Protection Act, 1997

The PEPA 1997 is the apex environmental law of the country. Under section 12 of the Act, it is mandatory for the proponents of the projects to execute the IEE and / or EIA (where warranted) and get the approval from provincial EPA.

The following rules and regulations have been issued under the Pakistan Environmental Protection Act, 1997.

Rules:

- National Environmental Quality Standards (Self-monitoring and Reporting by Industries) Rules, 2001.
- Provincial Sustainable Development Fund (Procedure) Rules, 2001.
- Pakistan Sustainable Development Fund (Utilization) Rules, 2001.
- Pollution Charge for Industry (Calculation and Collection) Rules, 2001.
- Environmental Tribunal Procedures and Qualifications Rules, 2000.
- Environmental Samples Rules, 2001.
- Hazardous Substance Rules, 2000

Regulations:

- Review of IEE / EIA Regulations, 2020.
- National Environmental Quality Standards (Certification of Environmental Laboratories)

2.4.3 Punjab Environmental Protection Act, 1997 (as amended up to 2017)

After the 18th Constitutional amendments, the subject of environment vides Notification No.4-9/2011-Min dated 29th June, 2011 stand devolved to the provinces with effect from 1st July, 2011. Even after the deletion of the subject of environment from the concurrent list, the Pakistan Environmental Protection Act 1997 remained intact as per Article 270-AA, Sub Article (6). However, there is provision that the province, through an appropriate legislature / competent authority, may alter, repeal and amend the laws related to the subject.

To regulate and effectively address the peculiar environmental issues of the province of Punjab this act namely “Punjab Environmental Protection Act 2017” is submitted as per provisions of the Article 270-AA, Sub-Article (6) of 18th Constitutional amendments.

In terms of requirements of EIA / IEE, the provincial Act contains, in its section 33, similar provisions as given in the PEPA section 12. The PEPA has entrusted the authority of review and to approve environmental assessments to the provincial EPA. The proposed project falls under the jurisdiction of the Environmental Protection Department, Punjab.

The Punjab Environmental Protection Act, 1997 (Amended, 2017) is comprehensive legislation and provides the legislative framework for protection, conservation, rehabilitation and improvement of the environment. The ‘environment’ has been defined in the Act as: (a) air, water and land; (b) all layers of the atmosphere; (c) all organic and inorganic matter and living organisms; (d) the ecosystem and ecological relationships; (e) buildings, structures, roads, facilities and works; (f) all social and economic conditions affecting community life; and (g) the interrelationships between any of the factors specified in sub-clauses ‘a’ to ‘f’. The notable points of the law are:

- No proponent of a project shall commence construction or operation unless he has filed an EIA with the Provincial Agency designated by the Provincial EPAs an EIA, and has obtained an approval;
- Establishment and formation of the Punjab Environmental Protection Council;
- Prohibition of certain discharges or emissions;
- Punjab Environmental Quality Standards (PEQS) for wastewater, air emissions and noise; and
- Provincial Government can issue notices and enforce them to protect the environment.

For the proposed project, Environmental Protection Agency (EPA), Government of Punjab (GoPb) is the concerned authority. The capability of regulatory institutions for environmental management is ultimately responsible for the success of environmental assessments and that development projects are environmentally sound and sustainable.

2.4.4 Punjab EPA Review of IEE and EIA Regulations, 2022

Punjab Environmental Protection (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2022 are made under the Section 33 of the Punjab Environmental Protection Act, 1997 and the Punjab Environmental Protection Agency with approval of the Punjab Government. These regulations provide a legal framework for conducting environmental assessments, defining the scope of projects subject to assessment in Schedules I and II respectively, and establishing procedures for submitting and reviewing environmental reports. The proposed interventions are likely to fall under the Category I (Environmentally Sensitive Area) as defined in Schedule – II. According to these guidelines, the proposed project would require an EIA to be conducted.

According to the details provided in the regulations regarding preparation, submission, and review of IEE’s and EIA’s, following is a brief description of the approval process.

- A project is categorized as requiring an IEE or EIA using the two schedules attached to the regulations.
- The EIA or IEE is submitted to EPA Punjab.
- A non-refundable review fee, depending on the cost of the project and the type of the report, is submitted along with the document as per the rates shown in Schedule III.
- The submittal is also accompanied by an application in the format prescribed in Schedule IV of the regulations.
- The EPA Punjab conducts a preliminary scrutiny and replies within 10 days of the submittal of a report, (i) confirming completeness, or (ii) asking for additional information, if needed, or (iii) returning the report requiring additional studies, if necessary.
- The EPA Punjab is required to make every effort to complete the IEE and EIA review process within 30 and 45 days, respectively, for the issue of confirmation of completeness.
- When the EPA Punjab accord their approval subject to certain conditions:
- Before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions.
- Before commencing operation of the project, the proponent is required to obtain from EPA Punjab a written confirmation of compliance with the approval conditions and requirements of the EIA.
- An environmental management plan (EMP) is to be submitted with a request for obtaining confirmation of compliance.
- The EPA Punjab is required to issue confirmation of compliance within 15 days of the receipt of request and complete documentation.

The EIA approval is valid for three years from the date of accord. The proponents are required to complete the construction and installation within this time period and start operations. In case of any delays, the proponents are required to obtain extension from EPA Punjab.

2.4.5 Land Acquisition Act 1894

The primary law for acquisition of land for public purposes in Pakistan is the “Land Acquisition Act, 1894” (hereinafter referred as the Act). The land acquired under the Act vests in the Province and it is only thereafter that the Province may transfer it to someone else.

This law is applicable to this project because it involves land acquisition, but mostly the land is owned by Government Departments, especially the Forest Department.

2.4.6 Forest Act 1927

The Forest Act, 1927 was largely based on previous Indian Forest Acts implemented under the British. The first and most famous was the Indian Forest Act of 1878. Both the 1878 act and the 1927 one sought to consolidate and reserve the areas having forest cover, or significant wildlife, to regulate movement and transit of forest produce, and duty leviable on timber and other forest produce. It also defines the procedure to be followed for declaring an area to be a Reserved Forest, a Protected Forest or a Village Forest.

This act is relevant as the project lies within the Kotli Sattian Reserved Forest land of Punjab.

2.4.7 The Antiquities Act, 1975

This act basically defines how to repeal and re-enact the law relating to the preservation and protection of antiquities. The Federal Government may, by notification in the official Gazette, declare any antiquity to be a protected antiquity for the purposes of this Act. No person shall put any neon signs or other kinds of advertisement, including bill posting, commercial signs, poles or pylons, electricity or telephone cables and television aerials, on or near any protected immovable antiquity. No person shall, for any commercial purpose, make a cinematograph film of any protected antiquity or any part thereof except under, and in accordance with, a license granted by the Director. A contravention of any provision of this Act or the rules shall, where no punishment has been specification provided, be punishable with rigorous imprisonment for a term which may extend to six months, or with fine which may extend to five thousand rupees, or with both.

2.4.8 Pakistan Penal Code, 1860

The Pakistan Penal Code usually called PPC is a penal code for all offences charged in Pakistan. It was originally prepared on the behalf of the Government of British India. After the partition of India in 1947, Pakistan inherited the same code and subsequently after several amendments by different governments, it is now a mixture of Islamic and English Law. Presently, the Pakistan Penal Code is still in effect and can be amended by the Senate of Pakistan.

2.4.9 The Punjab Wildlife (Protection, Preservation, Conservation And Management) (Amendment) Act, 2007

The Wildlife Protection Ordinance empowers the government to declare certain areas reserved for the protection of wildlife and control activities within these areas. It also provides protection to endangered species of wildlife. As the project area falls under the Kotli Sattian National Park in Rawalpindi, this law is applicable to the proposed project.

2.4.10 Punjab Plantation and Maintenance of Trees Act, 1974

The Punjab Plantation and Maintenance of Trees Act, (1974) regulates tree plantations and enforces measures for their protection.

The requirements of this act are applicable in terms of planting new trees and their maintenance by the occupier of the existing land who would have the physical possession. i.e., Proponent of project.

2.4.11 Punjab Water Act 2019

An Act to comprehensively manage and regulate water resources in the Punjab in the interest of conservation and sustainability. It is expedient to provide for comprehensive management of all water resources in the Punjab and to regulate their use in the interest of conservation and sustainability and matters connected with and ancillary thereto.

2.4.12 Punjab Drinking Water Policy, 2011

The overall objective of Punjab's Water Policy is to provide clear policy directions to the Government of Punjab on the sustainable management and development of water from all sources of water (surface water, groundwater and rainwater), for all sub-sectors of water use (domestic, stock water, agriculture, industry).

2.4.13 Punjab Urban Water and Sanitation Policy, 2007

The Punjab Urban Water and Sanitation Policy of the Government of the Punjab is intended to guide and support provincial institutions, District Governments, Tehsil Municipal Administrations, Water Utilities and communities for improving water and sanitation services. TDCP will get support from Punjab Urban Water and Sanitation Policy, 2007 and will use to promote the key policy principles.

2.4.14 The Canal and Drainage Act, (Amended 2016)

According to part VII of Drainage clause 59 (A): Prohibition and control regarding the discharge of effluent into canal and drainage works. – (1) The Provincial Government may, by notification in the official gazette, prohibit the discharge of any effluent, including any solid or liquid matter or combination of them from industrial, municipal or any other source, into any river, canal and drainage work including any natural drainage channel.

1.10 INSTITUTIONAL SETUP FOR ENVIRONMENTAL MANAGEMENT

The structural setup of agencies/departments in the environmental sector is such that the Provincial Ministry of Environment governs and regulates environment-related work at the government level. The EPA Punjab works directly under the control of ministry.

2.4.15 Provincial Environmental Protection Council (Provincial EPC) and the Environmental Protection Department, Punjab (EPA Punjab)

After devolution of the subject environment to provincial level under 18th amendment, these two organizations are primarily responsible for administering the provisions of the Punjab Environmental Protection Act, 2017. The EPC oversees the functioning of the PEPA. Its members include the representatives of the government, industry, nongovernmental organizations and the private sector. The EPA is required to ensure compliance with the National Environmental Quality Standard (NEQS), establish monitoring and evaluation systems, and both identify the need to, as well as initiate legislation, whenever necessary. It is thus the primary implementing agency in the hierarchy. Another function of the provincial EPA are the review and approval of environmental assessment reports.

2.5 Relevant International Treaties

2.5.1 Convention on Biological Diversity

The Convention was opened for signature on 5th of June 1992 at the United Nations Conference on Environment and Development (the Rio "Earth Summit"). It remained open for signature until 4th of June 1993, by which time it had received 168 signatures. The Convention entered into force on 29th of December 1993, which was 90 days after the 30th ratification.

The first session of the Conference of the Parties was scheduled on 28thof November – 9th of December 1994 in the Bahamas.

The Convention on Biological Diversity was inspired by the world community's growing commitment to sustainable development. It represents a dramatic step forward in the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources. Pakistan became its member in 1994. The Inspector General of Forests Office in the Ministry of Climate Change act as its Focal point.

2.5.2 Convention on the Conservation of Migratory Species of Wild Animals

Also Known as CMS, it is an environmental treaty under the aegis of the United Nations Environment Program. CMS provides a global platform for the conservation and sustainable use of migratory animals and their habitats. CMS brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range. This was established at Bonn in 1979 and Pakistan has become its member in 1987. National Council for the Conservation of Wildlife in the Ministry of Climate Change is the focal desk for CMS.

2.6 COMPARISON OF INTERNATIONAL AND LOCAL ENVIRONMENTAL LEGISLATIONS

The ADB's SPS 2009 requires application of pollution prevention and control technologies and consistency with international good practice, as reflected in internationally recognized standards. The SPS states that when host country regulations differ from these standards, the EA will achieve whichever is more stringent.

In order to select the most stringent standards applicable, a comparison of local (PEQS) and international i.e., International Financing Corporation (IFC)/ World Health Organization (WHO) and United States Environmental Protection Agency (USEPA) regulations have been made, as shown in Table 2-2 below. For air quality, comparison was only possible for pollutants having same averaging periods in PEQS, IFC and WHO. WHO for ambient air quality are more stringent in comparison to USEPA and PEQS standards, in the case of most pollutants. So, WHO standards will be used.

Similar to the standards for air quality, the comparison of noise standards provided in Table 2-3 clearly shows that PEQS for noise are more stringent in comparison to the WHO/IFC standards so these will be used to compare with baseline noise values. The only exception is the daytime noise level standard for Industrial areas where the WHO/IFC standard is more stringent (70 dB (A)) in comparison to PEQS (75 dB (A)) and so for this particular parameter, the WHO/IFC standard will be used.

As far as regulations regarding other environmental parameters are concerned such as acceptable effluent disposal parameters, the local regulations i.e., PEQS are more stringent and would be preferred over any other international regulations such as WHO/IFC.

Similar to the standards for air and noise quality, the comparison of drinking water quality standards provided in Table 2-4 clearly shows that PEQS for biological and physical

parameters of drinking water quality are same as for WHO standards except for Total hardness as CaCO3. PEQS for chemical, toxic inorganic and organic parameters are mostly similar/comparable to zinc, residual chlorine, Phenolic compounds (as Phenols) mg/l, Poly-nuclear aromatic hydrocarbons (as PAHs) g/l. WHO for Lead and Zn are more stringent comparatively. No WHO standards will be used to compare with baseline values.

Table 2-1 Applicable Most Stringent Air Quality Standards*

Pollutants	WHO/IFC		PEQS	
	Avg. Time	Standard	Avg. Time	Standard
SO2	24 hr. 10 min	20 up/m^3 500 up/m^3	Annual Mean 24 hrs.	80 up/m^3 120 up/m^3
CO	-	-	8 hrs. 1 hr.	5 mg/m^3 10 mg/m^3
NO2	1 yr. 1 hr.	40 up/m^3 200 up/m^3	Annual Mean 24 hrs.	40 up/m^3 80 up/m^3
O3	8 hrs.	100 up/m^3	1 hr.	130 up/m^3
TSP	-	-	Annual Mean 24 hrs.	360 up/m^3 500 up/m^3
PM10	1 yr. 24 hr.	20 up/m^3 50 up/m^3	Annual Mean 24 hrs.	120 up/m^3 150 up/m^3
PM2.5	1 yr. 24 hr.	10 up/m^3 25 up/m^3	Annual Average 24 hrs. 1 hr.	15 up/m^3 35 up/m^3 15 up/m^3

Table 2-2 Applicable Most Stringent Noise Standards

Category of Area/Zone	Limit in dB(A) Leq			
	PEQS		WHO	
	Day Time 06:00 – 22:00	Night Time 22:00-06:00	Day Time 07:00 – 22:00	Night Time 22:00-07:00
Residential area (A)	55	45	55	45
Commercial area (B)	65	55	70	70
Industrial area (C)	75	65	70	70
Silence zone (D)	50	45	55	45

There are no national standards for surface water quality. Instead, drinking water quality and effluent discharge (to inland waters) are listed below. The latter standard assumes a dilution factor of 10 to 1 at discharge and this dilution is taken as an indicator of acceptable surface water quality. The WHO standards will be used for comparison with baseline water quality values.

Table 2-3 Comparison of International and Local Drinking Water Quality Standards

Parameter	Unit	PEQS	WHO/IFC
Bacterial			
E-Coli	numbers/ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
Total Coliform	numbers/ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
Physical			
Color	TCU	≤ 15 TCU	≤ 15 TCU
Taste	No objectionable/Acceptable	No objectionable/Acceptable	No objectionable/Acceptable
Odor	No objectionable/Acceptable	No objectionable/Acceptable	No objectionable/Acceptable
Turbidity	NTU	< 5 NTU	< 5 NTU
Total Hardness	mg/l	< 500 mg/l	--
TDS	mg/l	< 1000	< 1000
pH		6.5-8.5	6.5-8.5
Chemical			
Aluminum	mg/l	≤0.02	0.2
Antimony	mg/l	≤0.005 (P)	<0.02
Arsenic	mg/l	≤0.05 (P)	0.01
Barium	mg/l	0.7	0.7
Boron	mg/l	0.3	0.3
Cadmium	mg/l	0.01	0.003
Chloride	mg/l	<250	250
Chromium	mg/l	≤0.05	0.05
Copper	mg/l	2	2
Cyanide	mg/l	≤0.05	0.07
Fluoride	mg/l	<1.5	1.5
Lead	mg/l	≤0.05	0.01
Manganese	mg/l	≤0.5	0.5
Mercury	mg/l	≤0.001	0.001
Nickel	mg/l	≤0.02	0.02
Nitrate	mg/l	≤50	50
Nitrite	mg/l	≤3	3
Selenium	mg/l	0.01)P)	0.01
Residual Chlorine	mg/l	0.2-0.5 at consumer end	-
Zinc	mg/l	5.0	3

The PEQS for vehicular emissions and wastewater are given in Table 2-5 and 2-6 respectively.

Table 2-4: PEQS for Motor Vehicle Exhaust and Noise

Sr. No.	Parameter	Standards (maximum permissible limit)	Measuring method
1	Smoke	40% or 2 on the Ringelmann Scale during engine acceleration mode.	To be compared with Ring Lemann Chart at a distance of 6 meters or more.
2	Carbon Monoxide	Emission Standards: New Used Vehicles 6%	Under idling conditions: Non-depressive infrared detection through gas analyzer
3	Noise	85 dB (A)	Sound-meter at 7.5 meters from the source

[F. No. 2(21)/93-E-II

Table 2-5: Punjab Environmental Quality Standards for Municipal and Liquid Industrial Effluents (Mg/L, Unless Otherwise Defined)

Sr. No.	Parameter Standards	Value
1.	Temperature or Temperature Increase	<3°C
2.	pH value (H+)	6-9pH
3.	5-days Biochemical Oxygen Demand (BOD) at 20°C	80mg/L
4.	Chemical Oxygen Demand (COD)	150 mg/L
5.	Total Suspended Solids	200 mg/L
6.	Total Dissolved Solids	3500 mg/L
7.	Oil and Grease	10 mg/L
8.	Phenolic compounds (as phenol)	0.1 mg/L
9.	Chloride(as Cl^-)	1000mg/L
10.	Fluoride (as F^-)	10mg/L
11.	Cyanide (as CN^-)	1.0 mg/L
12.	An-ionic detergents (2) (as MBAS) (5)	20mg/L
13.	Sulphate($SO4^{2-}$)	600mg/L
14.	Sulphide (S^{2-})	1.0mg/L
15.	Ammonia (NH_3)	40mg/L
16.	Pesticides, herbicides, fungicides and	0.15mg/L
17.	insecticides Cadmium (4)	0.1mg/L
18.	Chromium (trivalent and hexavalent)	1.0 mg/L
19.	Copper (4)	1.0mg/L
20.	Lead (4)	0.5mg/L
21.	Mercury (4)	0.01mg/L
22.	Selenium (4)	0.5mg/L
23.	Nickel (4)	1.0mg/L
24.	Silver (4)	1.0mg/L
25.	Total toxic metals	2.0 mg/L
26.	Zinc	5.0mg/L
27.	Arsenic	1.0mg/L
28.	Barium	1.5mg/L
29.	Iron	8.0mg/L
30.	Manganese	1.5mg/L

Sr. No.	Parameter Standards	Value
31.	Boron	6.0mg/L
32.	Chlorine	1.0mg/L

Explanations:

1. Assuming minimum dilution 1: 10 on discharge. Lower ratios would attract progressively stringent standards to be determined by the Federal Environmental Protection Agency.
2. Assuming surfactant as biodegradable.
3. MBAS means Methylene Blue Active Substances.
4. Subject to total toxic metals discharge as at S. No. 25.

3 PROJECT DESCRIPTION

3.1 BACKGROUND

The Kotli Sattian Chairlift Project aims to create a world-class tourism experience in the scenic Kotli Sattian region of Punjab, Pakistan, by constructing a modern chairlift system that traverses the picturesque landscapes of the area. This ambitious project is designed to offer a unique aerial view of the stunning mountain vistas, lush forests, and rolling valleys, enhancing accessibility to key tourist spots. The chairlift will not only serve as a convenient transportation system but also as an unforgettable experience for visitors, allowing them to explore Kotli Sattian's natural beauty from above. By improving accessibility and promoting the region as a premier tourist destination, the project is expected to significantly boost local economic growth, create employment opportunities, and preserve the area's pristine environment. The project will progress in several phases, including design, environmental impact assessments, and community consultations, ensuring that the development aligns with sustainability goals and preserves the cultural and natural heritage of the region.

3.2 LOCATION OF THE PROJECT

Kotli Sattian, nestled in the Rawalpindi District of Punjab, Pakistan, is a region ripe with tourism potential, boasting a compelling blend of historical significance, vibrant cultural heritage, and breathtaking natural beauty. Its name, derived from the town of Kotli and the Satti tribe, reflects the unique interplay of geography and culture that has shaped its identity. Geographically, Kotli Sattian lies within the Rawalpindi and Kahuta hills, extensions of the Pir Panjal Range. This mountainous terrain, with its dramatic slopes, dense forests, and awe-inspiring vistas, has profoundly influenced the region's character and the lives of its inhabitants. Historically, Kotli Sattian, once part of Rawalpindi Tehsil, was granted separate subdivision status in 1990, recognizing its distinct characteristics and development needs. The region's history is deeply intertwined with its tribes, particularly the Satti, whose traditions and customs have left a lasting mark. This rich cultural heritage, combined with the area's unspoiled natural beauty, makes Kotli Sattian an increasingly popular destination for tourists seeking tranquility, adventure, and a connection with nature and local traditions.

Kotli Sattian's primary attraction is its pristine natural environment, encompassing verdant forests, diverse flora and fauna, and spectacular panoramic views from its hilltops. This natural splendor makes it ideal for tourists seeking respite from urban life and outdoor recreation. Projects like the proposed chairlift are key initiatives to enhance accessibility and attract more visitors, drawing inspiration from successful ventures in nearby areas. The chairlift is envisioned as a major attraction, offering a unique aerial perspective of the landscape and stimulating economic growth by creating jobs and supporting local businesses. The selection of hilltop locations for the chairlift further enhances its tourism potential, offering unforgettable experiences with panoramic views. However, sustainable development is crucial. Balancing progress with the preservation of Kotli Sattian's natural beauty and cultural heritage is paramount, ensuring that tourism benefits both visitors and local communities while safeguarding the region's unique character for future generations.

The location map of the proposed project site is shown in Figure 3-1.

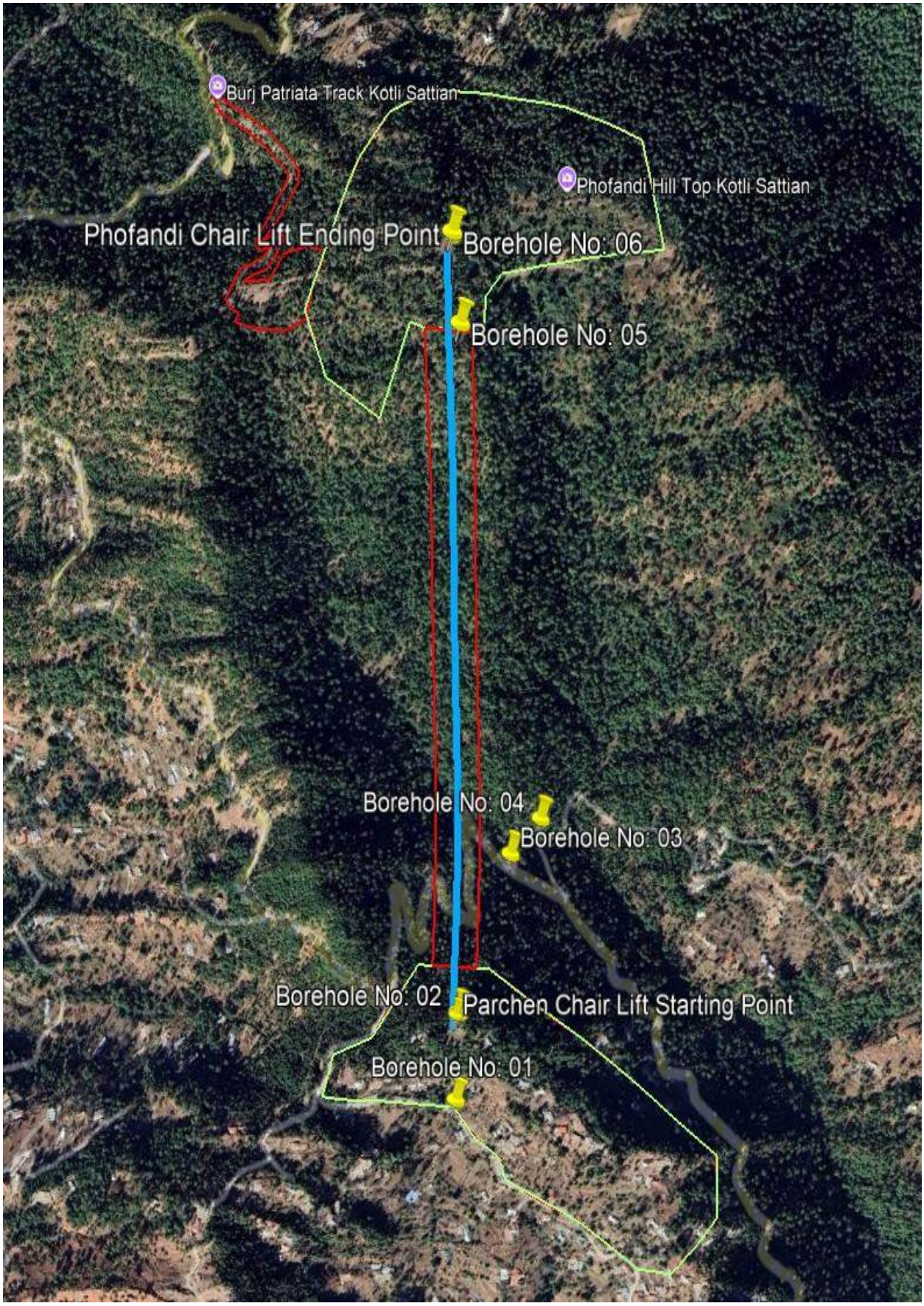


Figure 3-1: Location Map of the Project Area

3.3 COMPONENTS OF THE PROJECTAND SCOPE OF WORK

This Kotli Sattian Chairlift Project broadly comprises the following components:

3.3.1 Start and End Stations of the Project

The Kotli Sattian Chairlift Project will feature two main stations: the **Start Station** and the **End Station**, strategically located to offer seamless access to the chairlift while ensuring an optimal tourism experience. These stations will serve as key points for boarding and disembarking, equipped with essential amenities to cater to visitors' needs.

Start Station:

The Start Station will be located at the base of the chairlift, near the main entry point Parchen. This station will serve as the primary boarding point for visitors, offering easy access to the chairlift from the surrounding areas, including parking facilities and transportation hubs. The Start Station will feature all necessary amenities, such as ticket booths for streamlined ticketing operations, waiting areas with sheltered seating, accessible boarding platforms, and information displays to keep passengers informed. Designed to handle high visitor traffic, the Start Station will ensure efficient crowd management, reduce congestion, and provide a welcoming environment for tourists. Additionally, security personnel will be present to monitor the area and ensure passenger safety

End Station:

The End Station will be situated at the top of the hill or at another prominent scenic location at Pafundi, offering panoramic views of the surrounding landscapes. The End Station will serve as the disembarkation point for visitors, providing easy access to key tourist attractions, observation decks, and walking trails. Much like the Start Station, the End Station will be equipped with modern amenities to enhance the visitor experience, including comfortable waiting areas, information displays, and clear signage. A restaurant or café may also be available to offer refreshments, providing a perfect spot for visitors to relax and enjoy the breathtaking views. Both stations will be designed to meet international accessibility standards, ensuring that individuals with disabilities or mobility challenges can easily access and enjoy the chairlift experience.

Tower: The towers will provide essential support for the chairlift system, constructed from durable materials such as steel and reinforced concrete. Positioned at regular intervals, the towers will ensure stability, safety, and minimal environmental impact. Designed to withstand various weather conditions, they will blend seamlessly with the natural surroundings while maintaining structural integrity for reliable operation.

Cable Car: The cable cars will offer a comfortable and scenic experience for visitors, featuring spacious cabins with large windows for panoramic views. Designed for safety and accessibility, they will include seating for multiple passengers and accommodate those with disabilities. The cable cars will operate smoothly with climate control and secure harnesses, ensuring passenger comfort and safety throughout the ride.

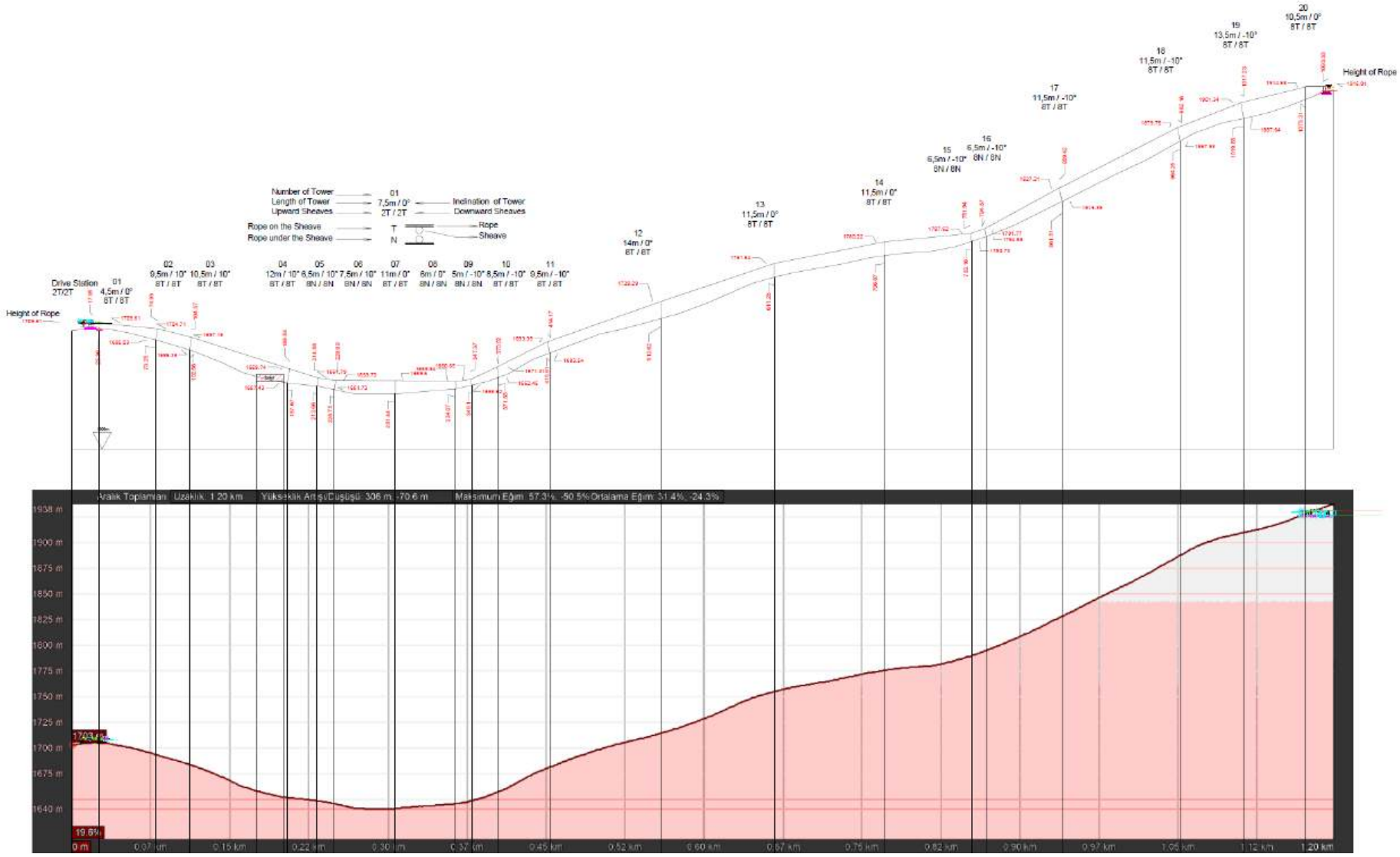


Figure 3-2:Plan Profile of Route

3.3.2 Essential Amenities

The Kotli Sattian Chairlift Project will be equipped with a variety of essential amenities designed to ensure a smooth, enjoyable, and safe experience for all visitors. These amenities are strategically placed throughout the facility, enhancing the overall visitor experience and operational efficiency.

Ticket booths

The **ticket booths** will be an integral part of the project, designed to ensure efficient crowd management, minimize waiting times, and offer multiple payment options such as cash, card, and digital methods. This system aims to streamline visitor flow, reducing congestion at entry points while ensuring a seamless boarding experience. Additionally, the ticketing system will provide a reliable mechanism for revenue generation and improve security in financial transactions.

Waiting areas

To complement the ticketing process, **waiting areas** will provide sheltered seating for visitors, particularly during peak hours or inclement weather. These areas will enhance visitor comfort and improve overall crowd management, making the waiting experience more pleasant and organized. With designated spaces for families, elderly visitors, and individuals with disabilities, the waiting areas will be inclusive and accessible, creating a welcoming environment for all.

Accessible boarding platforms

For the safety and comfort of visitors, **accessible boarding platforms** will be designed to be step-free and wheelchair accessible, ensuring that people of all abilities can board the chairlift comfortably. These platforms will be equipped with safety features to prevent slips and falls, enhancing passenger safety while optimizing operational efficiency by reducing delays and ensuring a smooth boarding process.

Information displays

Information displays throughout the site will provide real-time updates on chairlift schedules, weather conditions, and operational changes, keeping visitors informed. Additionally, these displays will include multilingual signage to cater to both local and international tourists, making the information accessible to a diverse audience. The displays will also feature important safety guidelines and emergency procedures to help visitors respond effectively to any situation, further improving safety and visitor confidence.

Security personnel

Security personnel will be stationed throughout the site to ensure the safety and well-being of visitors. The presence of trained security staff will help prevent accidents, theft, and misconduct while ensuring a quick response in case of emergencies. This visible security

presence will help deter criminal activity, create a safe environment, and enhance the overall tourist experience by providing visitors with peace of mind.

Car and bike parking facilities

The project will also include **car and bike parking facilities**, strategically located to ensure easy access to the chairlift while reducing traffic congestion. Designated accessible parking spaces will be available for individuals with disabilities, elderly visitors, and families with children, ensuring that the facility is inclusive and welcoming to all.

Machine room

To support the operational needs of the chairlift system, a **machine room** will house critical machinery and equipment, ensuring that the system operates smoothly and efficiently. The machine room will be equipped for routine inspections, repairs, and safety checks, extending the lifespan of the equipment and reducing the likelihood of operational disruptions.

Kiosks and tuck shops

Kiosks and tuck shops will be strategically placed throughout the site, offering refreshments, snacks, and souvenirs to enhance the visitor experience. These kiosks will provide a convenient way for tourists to purchase food and essentials without leaving the premises, encouraging them to spend more time at the destination and boosting local businesses through increased sales.

First aid room

In case of emergencies, a **first aid room** will be available, providing immediate medical assistance for minor injuries or health issues. The availability of medical staff and essential supplies on-site will ensure that any medical emergencies are addressed promptly, improving visitor safety and comfort.

Lost and found

For lost belongings, a **lost and found** area will be designated to assist visitors in retrieving misplaced items. Clear procedures for reporting and recovering lost property will help visitors feel more secure, knowing that their belongings are handled with care.

Signage and wayfinding

Clear **signage and wayfinding** throughout the site will ensure that visitors can easily navigate the facility and locate key areas such as ticket booths, restrooms, and dining options. Multilingual signage will be provided to accommodate a diverse range of visitors, improving accessibility and reducing confusion. This efficient signage system will also enhance emergency preparedness, guiding visitors to safety points in case of an emergency.

Observation decks & **viewing areas**

Observation decks and **viewing areas** will be designed to offer panoramic views of the breathtaking surroundings, encouraging visitors to relax, take photos, and fully immerse themselves in the beauty of Kotli Sattian. These spaces will not only enhance the visitor experience but also promote longer stays and increased engagement, benefiting local businesses.

Restaurant or cafe

A **restaurant or cafe** will be located on-site to provide visitors with meals and refreshments, allowing them to enjoy a relaxing break while taking in the scenic views. The dining options will cater to diverse tastes and dietary preferences, offering an additional reason for visitors to extend their stay and enjoy the destination fully.

Children's play area

A **children's play area** will be created to ensure that families with young children can enjoy the visit without concerns, providing a safe and fun environment for children to play. This family-friendly feature will enhance the overall experience, encouraging longer stays and positive word-of-mouth.

Prayer area

Finally, a **prayer area** will be provided to cater to the religious needs of visitors, ensuring that the facility is inclusive and respectful of diverse cultural practices. The availability of a prayer space will attract a wider range of tourists, including those for whom religious practices are important during travel.

Waste disposal and recycling facilities

Waste disposal and recycling facilities will be implemented to maintain a clean and attractive environment, ensuring that waste is properly managed and disposed of. This will not only enhance the site's aesthetic appeal but also contribute to environmental sustainability by promoting eco-friendly practices, such as recycling.

These essential amenities will work together to create an enjoyable, safe, and accessible experience for all visitors, while also ensuring that the Kotli Sattian Chairlift Project operates efficiently and sustainably. The integration of these amenities into the design of the chairlift system underscores the project's commitment to enhancing the tourism experience, supporting local communities, and preserving the natural beauty of the region.

3.4 PROJECT ADMINISTRATIVE JURISDICTION

The proposed project area falls in Kotli Sattian Tehsil under the jurisdiction of Deputy Commissioners of District Rawalpindi of Punjab Province.

3.5 CONSTRUCTION ACTIVITIES AND CIVIL WORKS

The Kotli Sattian Chairlift Project involves various construction activities to create a seamless experience for visitors. Key activities include:

- **Site Clearance and Grading**: Removing vegetation and debris, leveling the land, and preparing foundations for stations and pylons.
- **Excavation and Foundation Works**: Excavating for foundations, including trenches for utilities and the pylon supports.
- **Station Construction**: Building the Start and End Stations, including ticket booths, waiting areas, and machine rooms.
- **Cableway System Installation**: Erecting pylons, installing cables, and setting up the chairlift system.
- **Roads and Parking Areas**: Constructing access roads, pathways, and parking facilities.
- **Amenities Construction**: Developing kiosks, restrooms, first aid rooms, and landscaping.
- **Security and Safety**: Installing fencing, barriers, and surveillance systems for safety.
- **Testing and Commissioning**: Conducting operational testing and final inspections to ensure safety and compliance.
- **Site Restoration**: Backfilling trenches, paving roads, and beautifying the area for visitors.

3.6 CONSTRUCTION MATERIAL

The materials used in the construction of the Kotli Sattian Cable Car Project will include, but are not limited to, the following: cement, sand, aggregates, stones, reinforced cement concrete (RCC) frame, brick infill, brick cladding, coarse aggregates (crush), fine aggregates (sand), water, asphalt, reinforcement cement, and steel. These materials will be selected to ensure the strength, durability, and safety of the cable car infrastructure, including the stations, pylons, and associated facilities.

Construction material specifying the requirements of technical specifications will be used preferably which is as follows:

- Crush: Margalla
- Sand: Qibla Bandi/Lawrencepur
- Steel: Industrial Area Hattar
- Cement: Bestway, Askari, FECTO, Cherat, etc.
- Asphalt: Sourced from authorized local asphalt plants adhering to the project's technical requirements.

3.7 PROJECT IMPLEMENTATION SCHEDULE

The proposed project is expected to be also completed within 2 years.

3.8 CONSTRUCTION CAMPS

The Camp sites will be selected based on following considerations:

- Number of workforces deployed;
- Type and quantity of machinery mobilized;
- Availability of adequate area for establishing camp sites including parking areas for machinery, stores and workshops;
- Access to communication and local markets;
- Appropriate distance from sensitive areas including settlements and religious and/or cultural facilities.

Final locations will be selected by the contractor with the assistance of Supervision Consultant. Care will be taken to safeguard the existing environment of the area and location, which shall be selected away from settlements. The Contractor(s) may acquire land on lease from private landowners.

3.9 WORKFORCE REQUIREMENT

Man-power demand estimation is an essential component to facilitate deployment of manpower. Total man power required on site for Kotli Sattian Cable Car Project will be approximately 200 workers per day.

3.10 WATER REQUIRED FOR CONSTRUCTION AND SOURCE OF CONSTRUCTION MATERIAL

Contractor will be responsible to arrange water for construction works. The water consumption is estimated to be 16,000[1] gallons/day for 200 construction workers during construction phase of the this Project.

3.11 WASTEWATER GENERATION

The wastewater generation is estimated to be 12,800[2] gallons/day for 200 construction workers during construction phase of this Project.

3.12 SOLID WASTE GENERATION

Due to construction activities, waste will be generated at construction and contractors camp site. The construction waste will include wastewater, oil spillage from machinery, domestic waste and waste construction materials (construction waste will be reused or recycled through vendors).

Considering the labourers about 200 in numbers for the proposed Project residing in the construction camp and the locally available labour, an average solid waste generation rate of 0.5 kg/capita/day[3]is adopted for the estimation of solid waste generation[4]. Based on this assumption, a total of about 100 kg of solid waste will be generated from construction camp

[1] *WASA Average Daily Per Capita Water Consumption (80 gallons/day)*

[2] *Design Criteria of Public Health Engineering for Water Supply, Sewerage and Storm Water Drain (Domestic sewage generation = 80% of water consumed/day)*

3 The Asian Development Bank. (2022). Initial Environmental Examination Report (2023): Punjab Arterial Roads Improvement Project. Corridor 3: Depalpur–Pakpattan Sharif–Vehari. Pp. 58. https://www.adb.org/sites/default/files/project-documents/54149/54149-001-iee-en_56.pdf.

of the proposed project on daily basis. Solid waste generated during construction and camp sites shall be safely disposed in designated waste disposal sites after consultation with the concerned authorities of Kotli Sattian Tehsil.

3.13 POWER REQUIREMENT

The main source of electricity/electric power during construction phase will be diesel generators for construction camps and construction machinery. Islamabad Electric Supply Company (IESCO) will be responsible entity for providing electricity supply for the proposed Project during operational phase.

3.14 CONSTRUCTION EQUIPMENT

Table 3-1 shows a tentative list of construction equipment required by the Contractor to enable him to undertake this work and meet the prescribed schedule.

Table 3-1: List of Construction Equipment Required by the Contractor

Type of Machinery and Equipment	No. Required
Cranes	Various depending upon Contractor progress
Dump Truck	
Dozer	
Vibratory Roller	
Water Tankers	
Tandem Roller	
Asphalt Plant	
Paver	
Concrete Transit Truck	
Concrete Pump	
Excavator	
Water Pumps	
Vibrators	
Generators	
Leveling Equipment	

4 ENVIRONMENTAL AND SOCIAL BASELINE

4.1 GENERAL

The purpose of this chapter is to establish the baseline conditions for the physical, biological and the socio-economic aspects of environment of the project area. The data were collected regarding the physical environment, biological environment and social aspects of the study area during stakeholder consultation and technical visits conducted by the environment team.

4.2 AREA OF INFLUENCE(AOI)

This chapter describes the environmental, social and biological baseline conditions of the project area. The baseline conditions have been established on the basis of the data collected from the field, and through unstructured interaction with the local communities as well as the officials from various departments. In addition, the published data (secondary data) was also used to provide background information about the project area.

In this report, the Area of Influence (AOI) is referred where the potential impacts of the proposed project are anticipated. The AoI includes all those areas in the region within 0.5 km from the project site and which may be affected directly or indirectly by the project activities. This AoI of 500 meters is considered sufficient to assess any potential impacts that might take place on the biological and physical environment, particularly considering the limited and site-specific nature and scope of the proposed scope of works. This chapter describes the environmental setting of the proposed interventions.

4.3 PHYSICAL ENVIRONMENT

4.3.1 Topography

Kotli Sattian is in the foothills of the Himalayas and has a rough landscape with steep slopes, deep valleys, and tall peaks. It has elevations ranging from about 500 to over 1,500 meters above sea level. The area has different kinds of land, like fertile valleys, steep ridges, and wide plateaus.

4.3.2 Geology and Soil

The project area falls into the southern part of the Pothohar plateau. The rock exposed in the area belong to Dhok Pathan formation (Siwalik of middle Miocene age) the Dhok Pathan formation is typically represented by cyclic alternation of sandstone, siltstone and shale.[5]

The soil in Kotli Sattian, a region in Pakistan, is predominantly classified as mountainous soil. This type of soil is typically characterized by being rocky, shallow, and less fertile compared to soils found in plains. It often consists of a mixture of sand, silt, and clay, with varying degrees of organic matter content.

[5] PC-II of Technical Feasibility Study of Kotli Sattian and Santh Ni Khuri Dam in Tehsil Kotli Sattian (District Development Package)

Due to the mountainous terrain, erosion can be a significant factor influencing soil composition in Kotli Sattian. Additionally, the soil's characteristics can vary depending on factors such as elevation, slope, and vegetation cover.

4.3.3 Climate and Meteorology

a) Average Temperatures

Table 4-1 gives mean, maximum and minimum monthly temperatures at Murree. Mean monthly air temperatures vary from a minimum of about 4°C in January to a maximum of about 23°C in June. Monthly Temperature variation at Murree is presented in the Figure **4-1**.

Table 4-1: Summary of Monthly Temperature at Murree

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. Temperature (°F)	4	6	11	16	20	23	23	22	20	16	11	6
	(39.7) °F	(43.2) °F	(51.3) °F	(60.4) °F	(68.8) °F	(73.5) °F	(72.9) °F	(71.4) °F	(67.6) °F	(60) °F	(51) °F	(43.5) °F
Min. Temperature (°F)	-1.6	0.3	4.1	8.8	13.1	16.7	18.7	18.1	14.7	9.2	4.3	0.2
	(29) °F	(32.5) °F	(39.4) °F	(47.8) °F	(55.6) °F	(62.1) °F	(65.7) °F	(64.6) °F	(58.5) °F	(48.5) °F	(39.8) °F	(32.3) °F
Max. Temperature (°F)	10.9	12.3	17	22.1	26.8	28.6	26.6	25.8	24.8	22	17.5	13.8
	(51.6) °F	(54.1) °F	(62.7) °F	(71.7) °F	(80.3) °F	(83.4) °F	(80) °F	(78.4) °F	(76.7) °F	(71.6) °F	(63.4) °F	(56.8) °F

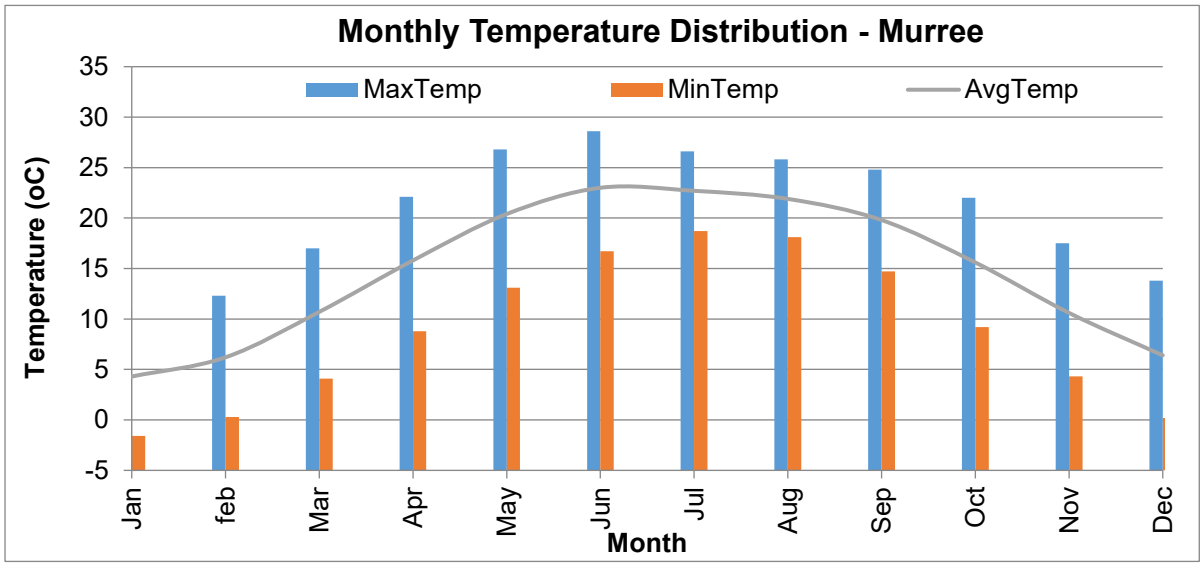


Figure 4-1: Monthly Temperature variation at Murree

b) Rainfall

Annual normal isohyet map for period of 1981 to 2010 has been collected from Pakistan Meteorological Department website. It clearly indicates that Murree gauge station and project site both lie near the same isohyet. Therefore, rainfall recorded at Murree is applicable to Kotli Sattian Chairlift. Daily rainfall data for Murree has been collected for period of 1993-2022 (30 Years).

The monthly rainfall data shows that period from July to August is the wettest period (due to Monsoon). Murree Station Mean monthly rainfall varies from 40.6 mm to 310.2 mm (1.60 in to 12.2 in) as shown in Figure 4-2 while the average annual rainfall for corresponding period is 1656 mm (65.2 in).

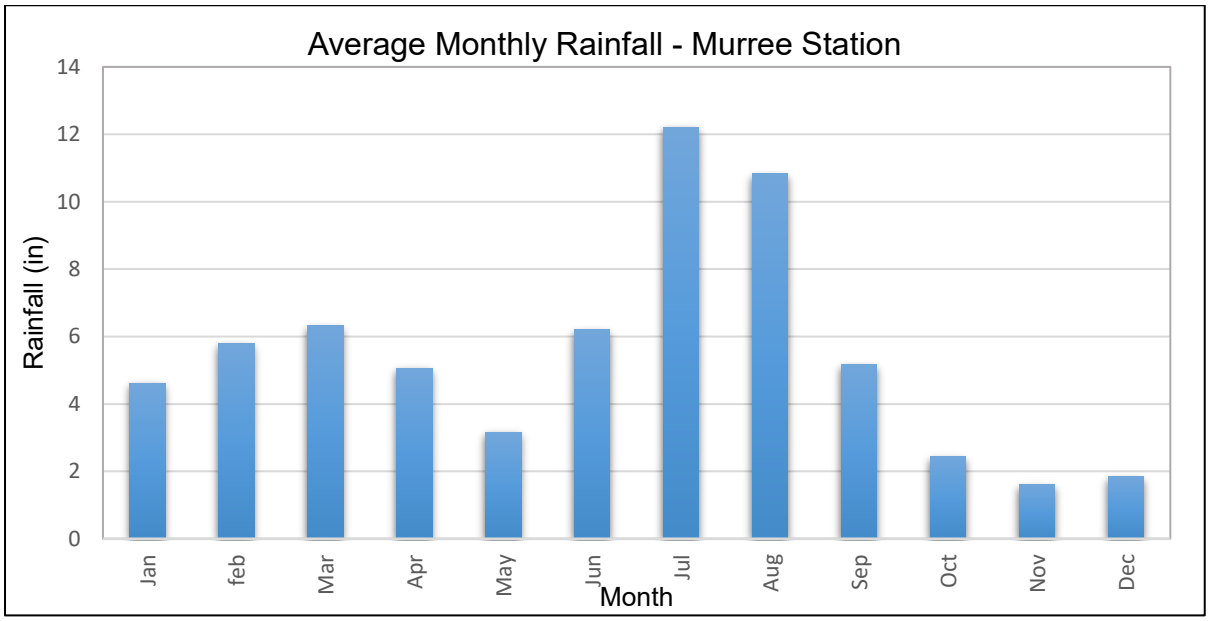
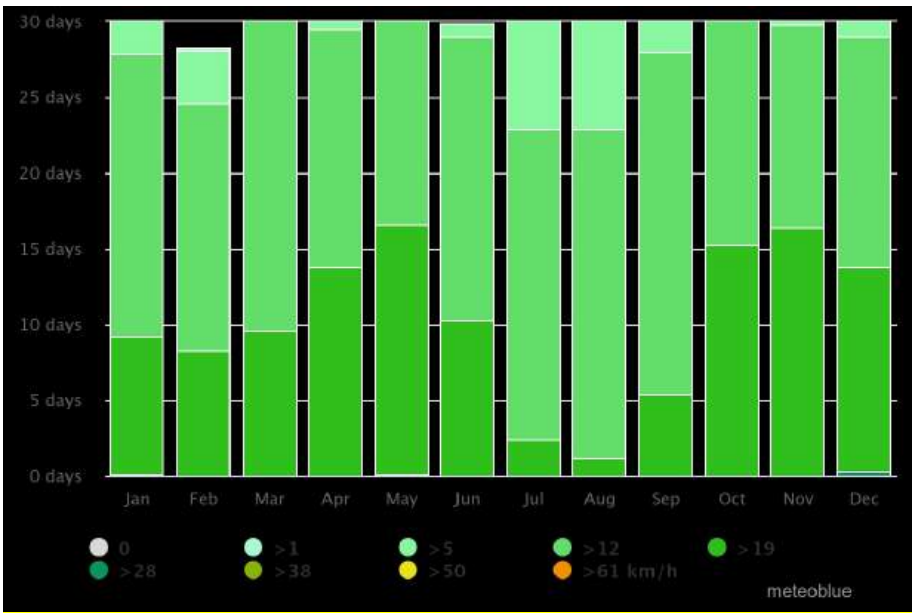


Figure 4-2: Average Monthly Rainfall-Murree Station

c) Wind[6]

Figure 4-3 shows the days per month, during which the wind reaches a certain speed. Maximum wind speeds can be observed in the months of December, January and May which is >28 km/h. Wind speed >19 km/h dominates throughout the year.



[6] https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/kotli-sattian_pakistan_1173053

Figure 4-3: Wind Speed

The wind rose for Kotli Sattian shows the number of hours per year the wind blows from the indicated direction. Wind rose is shown in Figure **4-4**. It can be seen from the wind rose that dominant wind direction is towards North East (NE) and then North North-East (NNE).

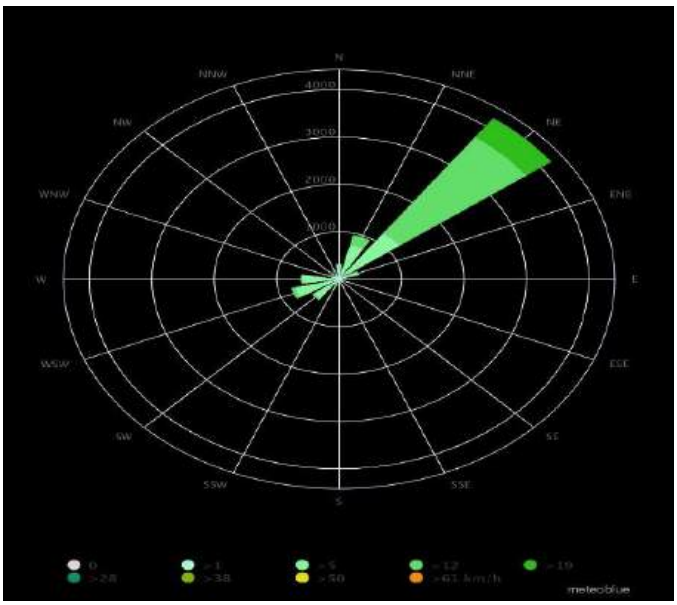


Figure 4-4: Wind Rose

4.3.4 Seismology

According to the seismic zone map of Pakistan, Tehsil Kotli Sattian lies in Zone 3 of the Pakistan Seismic zone map, which means ‘moderate’ to ‘severe’ damage due to earthquakes.

Figure **4-5** shows the seismic zoning map of Pakistan indicating that project area is falling under Seismic Zone-3.

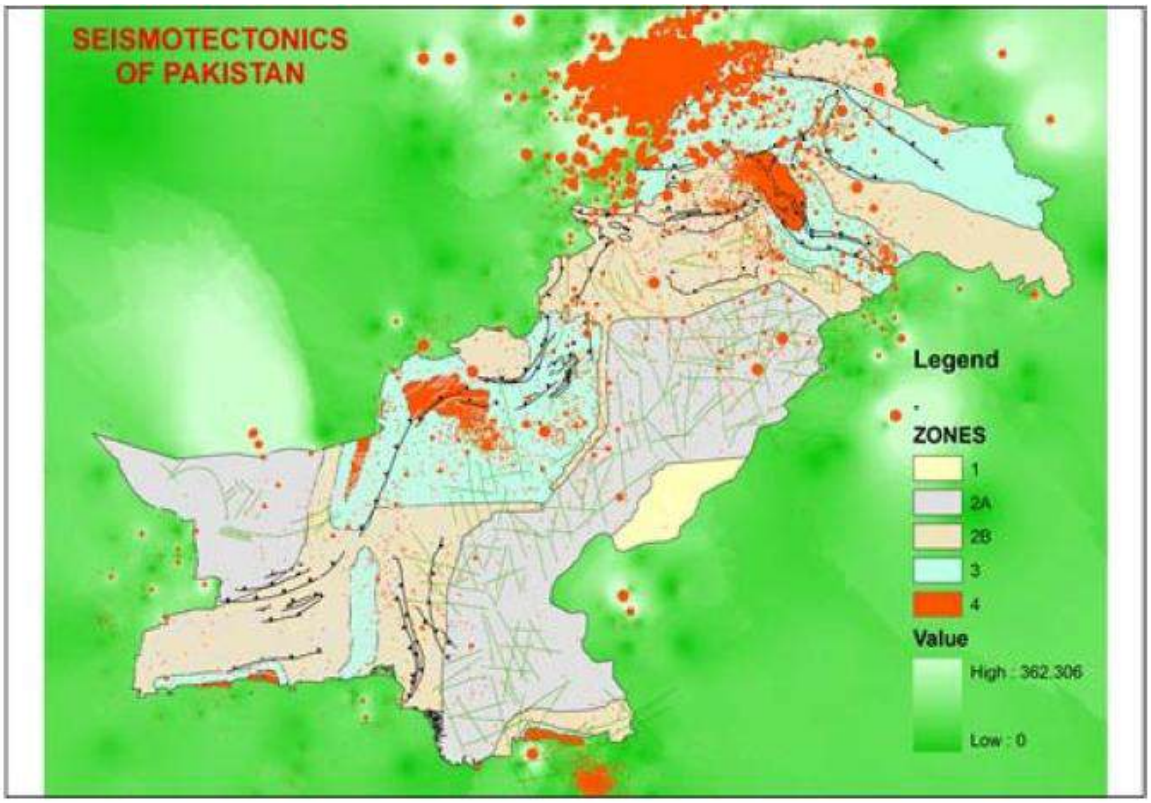


Figure 4-5: Seismic Zoning Map of Pakistan

4.3.5 Ambient Air Quality[7]

The ambient air quality monitoring was conducted by EPA registered Lab Pak Green Enviro-engineering from 27 January, 2024 to 30 January, 2024 in the project area for TDCP. The sampling was conducted for 24 hours. The results of laboratory analysis of ambient air quality parameters are given in Table 4-2. Average value of PM2.5 and PM10 were exceeding WHO limits, which possibly due to the flow of continuous traffic on the Kotli Sattian Road and Tourism Highway present near to the project site while as per NEQS all the parameters are within the permissible level. The photographic evidence of Ambient Air quality Monitoring is given below in Figure 4-6.

Air quality monitoring results of EPA registered lab are in Annexure 2.

[7] The environmental monitoring was conducted for the Kotli Sattian and Santh Ni Khuri Dam Project (District Development Project). It is recommended that environmental monitoring also be conducted for this proposed project.

Table 4-2: Ambient Air Quality of the Project Area

Location	Parameters	NO	NO2	SO2	CO	PM2.5	PM10
	NEQS Limits	24 hrs. (40 µg/m^3)	24 hrs. (80 µg/m^3)	24 hrs. (120 µg/m^3)	8 hrs. (5 µg/m^3)	24 hrs. (35 µg/m^3)	24 hrs. (150 µg/m^3)
	WHO Limits	-	24 hrs. (25 µg/m^3)	24 hrs. (40 µg/m^3)	8 hrs. (4 µg/m^3)	24 hrs. (15 µg/m^3)	24 hrs. (45 µg/m^3)
Point: 1 N 33.870639° E 73.531004 °	**Test Result**	1.54	17.39	8.29	0.70	27.6	70.3
Point:2 N 33.829219 ° E 73.531701°	**Test Result**	4.50	19.93	21.54	1.25	32.4	76.2

Figure 4-6: Photographic Evidence Ambient Air Quality Monitoring

4.3.6 Ambient Noise

Noise monitoring was conducted by EPA registered Lab Pak Green Enviro-Engineering in the project area. Noise level was monitored with the help of a potable digital sound meter. Table 4-3 indicates that noise levels monitored in project area were within prescribe limits of PEQS and WHO values. The photographic evidence of Ambient Air quality Monitoring is given below in Figure 4-7.

Environmental monitoring report has been attached as Annexure-2.

Table 4-3 Ambient Noise Quality

Time	WHO Limits dB(A)	PEQS Limits dB(A)	Average Results dB(A)	
			Point: 1 N 33.870639° E 73.531004 °	**Point:2 N 33.829219 ° E 73.531701°**
Day Time	55	60	52.2	48.2
Night Time	45	50	40.8	36.2

Figure 4-7: Photographic Evidence of Ambient Noise Quality Monitoring

4.3.7 Drinking Water Quality

Drinking Water samples were collected from the motor pump and spring in the project area by the EPA-registered laboratory Pak Green Enviro-Engineering from 27 January, 2024 to 30 January, 2024. The tested parameters of the samples were compared to and complied with the Punjab Environmental Quality Standards for drinking water. Results showed that all the parameters are within permissible limits as per PEQS. The main reason behind the such purity of water is less anthropogenic activities in the project area. Environmental Monitoring results of groundwater are shown in Table **4-4** and Environmental Monitoring report has been annexed as Annexure 3.

The photographic evidence of Drinking water Sample collection is given below in Figure 4-8.

Figure 4-8: Photographic Evidence of Drinking water Sample Collection

Table 4-4: Drinking Quality of the project area

Sr. No.	Parameters	Unit	Testing Method	PEQS Limits	Average Results of Sampling Location	
					N 33.870639° E 73.531004°	N 33.829219° E 73.531701°
1.	E Coli	MPN/ 100ml	APHA-9221 F	Must not be detectable in any 100 ml sample	Nil	Nil
2.	Total Coli-form	MPN/ 100ml	APHA-9221 D	Must not be detectable in any 100 ml sample	Nil	Nil
3.	Fecal Coliform	MPN/ 100ml	APHA-9221 E	Must not be detectable in any 100 ml sample	Nil	Nil
4.	Color	TCU	APHA-2120 C	≤ 15	0.000	0.000
5.	Taste	-	APHA-2160 C	Non- Objectionable / Acceptable	Non-Objectionable	Non-Objectionable
6.	Odor	-	APHA-2150 B	Non- Objectionable / Acceptable	Non-Objectionable	Non-Objectionable
7.	Turbidity	NTU	APHA-2130 B	< 5	0.30	0.38
8.	Total Hardness ^	mg/L	APHA-2340 C	<500	230	350
9.	Total Dissolved Solids ^	mg/L	APHA-2540 C	< 1000	305	460
10.	pH ^	-	APHA-4500-H^+ B	6.5-8.5	8.454 at 22.6℃	7.480 at 22.5°C
11.	Aluminum (Al)	mg/L	APHA-3111 D	≤ 0.2	BDL	BDL
12.	Antimony (Sb)	mg/L	APHA-3111 B	≤0.005	BDL	BDL
13.	Arsenic (As)	mg/L	APHA-3114 B	≤ 0.05	BDL	BDL
14.	Barium (Ba)	mg/L	APHA-3111 D	0.7	BDL	BDL
15.	Chromium (Cr)^	mg/L	APHA-3111 D	≤ 0.05	BDL	BDL
16.	Copper (Cu)^	mg/L	APHA-3111 B	2	BDL	BDL
17.	Boron (B)	mg/L	APHA-3111 D	0.3	BDL	BDL
18.	Cadmium (Cd)^	mg/L	APHA-3111 B	0.01	BDL	BDL
19.	Chloride (Cl^{-1}) ^	mg/L	APHA-4500- Cl^{-1} B	< 250	10	05
20.	Fluoride (F)	mg/L	APHA-4500-F-D	≤ 1.5	0.2	0.4

Sr. No.	Parameters	Unit	Testing Method	PEQS Limits	Average Results of Sampling Location	
					N 33.870639° E 73.531004°	N 33.829219° E 73.531701°
21.	Lead (Pb)^	mg/L	APHA-3111 B	≤ 0.05	BDL	BDL
22.	Manganese (Mn)^	mg/L	APHA-3111 B	≤ 0.5	BDL	BDL
23.	Mercury (Hg)	mg/L	APHA-3112 B	≤ 0.001	BDL	BDL
24.	Nickel (Ni)	mg/L	APHA-3111 B	≤ 0.02	BDL	BDL
25.	Nitrate^	mg/L	APHA-4500-NO3-1-E	≤ 50	BDL	BDL
26.	Nitrite^	mg/L	APHA-4500-NO2-1-B	≤ 3	BDL	BDL
27.	Selenium (Se)	mg/L	APHA-3114 C	0.01	BDL	BDL
28.	Residual Chlorine (Cl2)	mg/L	APHA-Cl-B	0.2-0.5 at the consumer end 0.5-1.5 at the source	BDL	BDL
29.	Zinc (Zn)^	mg/L	APHA-3111 B	5.0	0.1895	0.2889
30.	Phenolic Compound (As Phenol)	mg/L	APHA-5530 D	-	BDL	BDL
31.	Sodium (Na)^	mg/L	APHA-3111 B	-	39.1671	44.5078
32.	Potassium (K)^	mg/L	APHA-3111 B	-	3.0196	2.9869

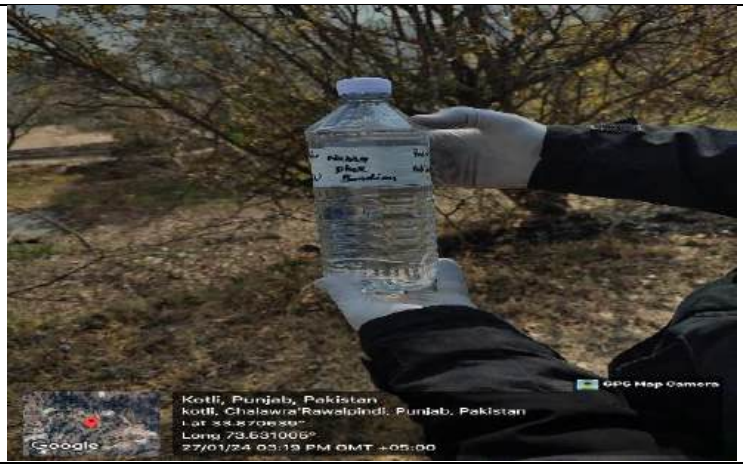
4.3.8 Surface Water Quality

Surface Water samples were collected from the both streams on which proposed project will be constructed the EPA-registered laboratory Pak Green Enviro-Engineering from 27 January, 2024 to 30 January, 2024. The coordinates of samples collected and results are given below in the Table 4-5 and Environmental Monitoring Report is annexed as Annexure 3 while photographic evidence of surface water Sample collection is given below in Figure 4-9.

Table 4-5: Surface Water Quality of the project area

Parameters	Unit	Method / Technique	N 33.870639° E 73.531005°
Temperature	°C	APHA-2550 B	**22.2**
pH^	---	APHA-4500-H+ B	**8.440 at 22.2°C**
Biological Oxygen Demand (BOD5 at 20 0C)	mg/L	APHA-5210 D	**BDL**
Chemical Oxygen Demand (COD) ^	mg/L	APHA-5220 B	**08**
Total Suspended Solids (TSS) ^	mg/L	APHA-2540 D	**05**
Total Dissolved Solids (TDS) ^	mg/L	APHA-2540 C	**300**
Chloride (as Cl1-) ^	mg/L	APHA-4500-Cl B	**05**
Sulphate (SO42-) ^	mg/L	APHA-4500-SO4 C	**35**
Copper (Cu)^	mg/L	APHA-3111 B	**BDL**
Lead (Pb)^	mg/L	APHA-3111 B	**BDL**
Mercury (Hg)	mg/L	APHA-3112 B	**BDL**
Selenium (Se)	mg/L	APHA-3114 C	**BDL**
Nickel (Ni)	mg/L	APHA-3111 B	**BDL**
Zinc (Zn)^	mg/L	APHA-3111 B	**0.5364**
Iron (Fe)^	mg/L	APHA-3111 B	**BDL**
Manganese (Mn)^	mg/L	APHA-3111 B	**BDL**
Sodium	mg/L	APHA-3111 B	**45.1523**
Potassium (K)^	mg/L	APHA-3111 B	**3.6216**
Dissolved Oxygen (DO) ^	mg/L	APHA-4500-O C	**7.0**
Calcium (Ca) ^	mg/L	APHA-3500-Ca-B	**76**
Magnesium (Mg) ^	mg/L	APHA-3500-Mg-B	**9.7**
Total Nitrogen	mg/L	APHA-4500 P-J	**1.468**
Total Phosphorus	mg/L	APHA-4500 P-J	**0.460**
Total Hardness^	mg/L	APHA-2340 C	230

Figure 4-9: Photographic Evidence of Surface water Sample Collection



4.4 BIOLOGICAL ENVIRONMENT

4.4.1 Protected and Historical Area:

The project area is encompassed by the Kotli Sattian reserved forest. All components of the proposed project are situated within the boundaries of the Kotli Sattian reserved forest.

The Governor of Punjab has officially declared the Kotli Sattian Reserved Forest area as a National Park, named the Murree-Kotli Sattian-Kahuta National Park, Murree, on the 22nd of May, 2023. The letter confirming this declaration is attached as Annexure 3.

4.4.2 Flora

A team of environmentalists and sociologists visited the project area on March 1, 2025, March 5, 2025, and March 6, 2025, to collect data on its flora. The field visit revealed that the entire project area is surrounded by the Kotli Sattian Reserved Forest. The major tree species in the forest include Chir Pine (Pinus roxburghii), and Blue Pine (Pinus wallichiana). Fruit trees in the area include Walnut (Juglans regia), Black Persimmons (Diospyros texana), Pear (Pyrus spp.), Apricot (Prunus armeniaca), and Plum (Prunus domestica). Additionally, various grasses, sedges, and herbs contribute to the vegetation cover, providing food for wildlife species in the area.

Chir Pine (Pinus roxburghii) is the dominant tree species in the project area. However, the Forest Department has been undertaking new plantations of Blue Pine (Pinus wallichiana) within the project site.

Tree species and new plantation in the project area is shown in the Figure 4-10.

Tree cutting is required for the project. The Forest Department has a comprehensive procedure in place for tree removal, replantation, and replenishment of the new plantation. This process will be carried out by the Forest Department in coordination with the Tourism Development Corporation of Punjab (TDCP).

As the project area falls within the Kotli Sattian Reserved Forest, obtaining a No Objection Certificate (NOC) from the Forest Department is mandatory before commencing any work.

Figure 4-10: Flora in project area

Vegetation at Perchan

Vegetation at Phofandi

Samplings of new plantation at Phofandi

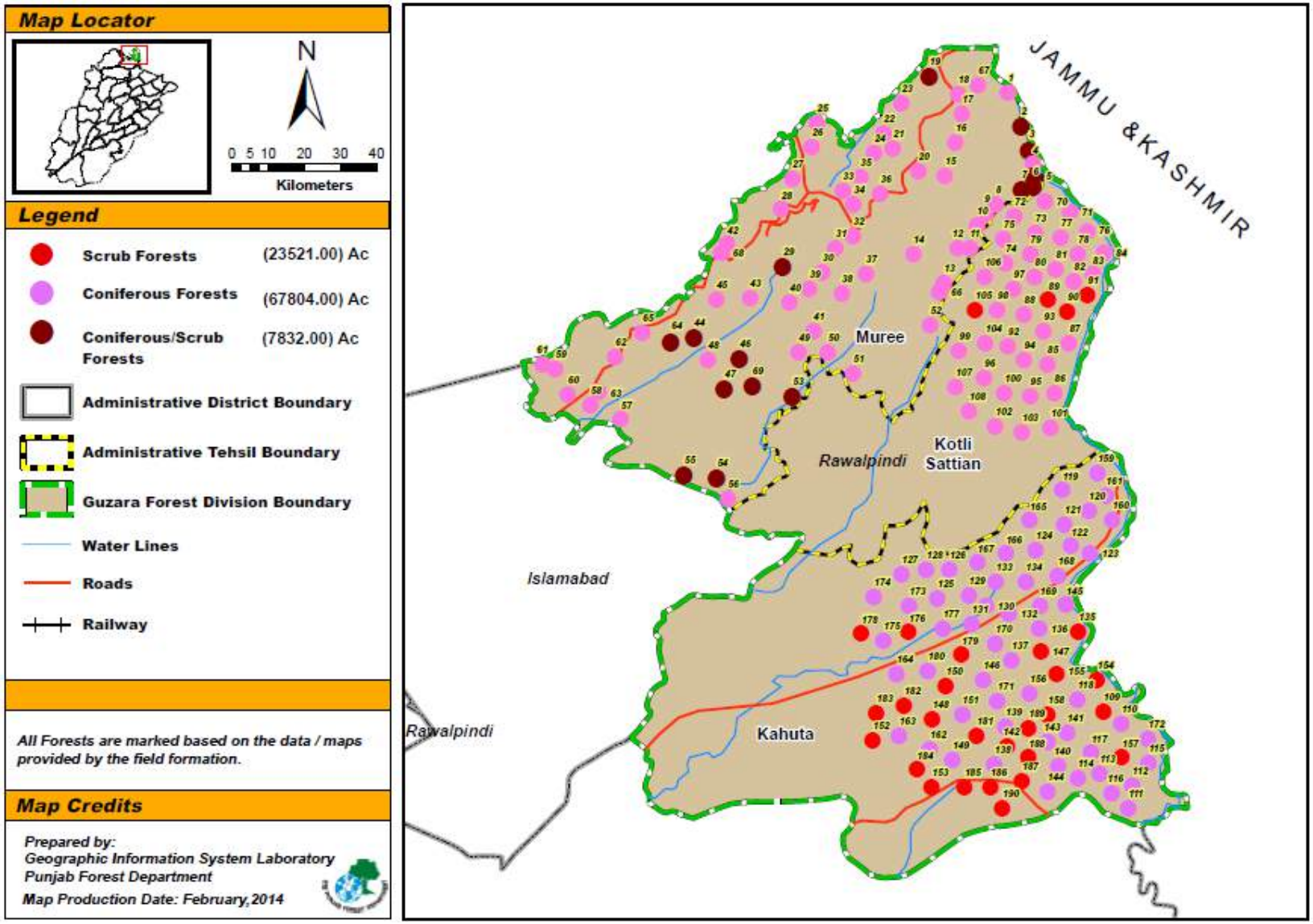


Figure 4-11: Kotli Sattian Reserve Forest (https://fwf.punjab.gov.pk/system/files/Rawalpindi%20Part%202%20%281%29.pdf)

4.4.3 Fauna

Following fauna found naturally in the project area. **Mammals:** In the project area, the most commonly found mammal is the Wild Boar (Sus scrofa), followed by Fox, Rhesus Monkey (Macaca mulata), Himalayan Palm Civet (Paguma larveta), Yellow-Throated Marten (Martes flavigula), Flying Squirrel (Eoglaucomys fimbriatus), and Jackal (Canis aureus) and Rabbits (Oryctolagus cuniculus). However, Leopards (Panthera pardus) are also seen in the project area which could be dangerous for the tourist. **Birds:** The commonly found birds in the project area include Parrot (Psittaciformes), Myna (Acridotheres tristis), Dove (Columbidae), Bulbul (Pycnonotus barbatus), Heron (Ardeidae), Hoopoe (Upupidae), Pigeon (Columbidae), Black-winged Kite (Elanus), Black Kite, Golden Backed Woodpecker, Red-vented Bulbul (Pycnonotus cafer), Indian Tree-pie (Dendroceta vagabunda), Jungle Crow (Corvus corone), and House sparrow (Passer domesticus). **Reptiles:** The reptiles of the project area are Monitor Lizard (Varanus albigularis), Porcupine (Erethizon dorsatum), Mongoose (Herpestidae), Snakes (Serpentes), are included.

As the project area falls within the Kotli Sattian National Park, it is necessary to obtain a No Objection Certificate (NOC) from Wildlife Department prior to the commencement of any work.

4.5 SOCIO-ECONOMIC BASELINE STRUCTURE

4.5.1 Demography and Living Pattern

The data is provided in the following Table 4-6.

Table 4-6: Living Status of the Project Area Resident

Mouza Name	Total HHs (Nos.)	Population	Pacca (%)	Semi Pacca (%)
Perchan	450-500	3800	90	10
Phofandi	280-300	2400	90	10

4.5.2 Caste Groups Exist in The Studied Mouza

The dominant caste has an important role to control the social system especially in the local politics the data was collected and is presented in the following Table 4-7 below.

Table 4-7: Caste Groups Exist in the Studied Mouza

Name of Mouza	Major Caste
Perchan	Satti, Janjua, Syed, Qureshi, Abbasi
Phofandi	Satti, Qureshi and Abbasi

4.5.3 Source of Religion

About 100 percent of the population was Muslim.

4.5.4 Literacy Ratio

A person was treated as literate if he or she could read newspaper and write a simple letter in any language. According to the current socio-economic survey, the overall literacy rate of the studied Mouza was 85 percent while Mouza wise literacy level was as below:

Perchan 80%, Phofandi 85%,

4.5.5 Mother Tongue

Potohari is spoken as the major language in the area, while majority of the people (males) speak Urdu.

4.5.6 Main Occupation of the Respondents

In the area, the main occupation was Govt service as reported 80%. In Phofandi Mouza. Further details are provided in Table 4-8 below.

Table 4-8: Occupations of the People

Name of Mouza	Farming (%)	Govt. Service (%)	Private Service/Labour (%)	Business (%)
Perchan	5	70	15	10
Phofandi	5	80	10	5

4.5.7 Main Crops

There is very small land holding. Main crops of the surveyed Mouza are Wheat and Jawar. The wheat is the main crop usually produced at maximum area for domestic use only.

4.5.8 Fruit Trees

In the project area, apple, peach, pear plump and walnut are recored in the project area.

4.5.9 Source of Drinking Water with the Quality of Water

The data was collected to ascertain source of drinking water and its quality in the surveyed Mouza. The information is presented in the Table 4-9.

Table 4-9: Source of Drinking Water in the Surveyed Mouza

Mouza Name	Hand Pump	Electrical Pump	Well	Bore	Spring	Quality
Perchan	Yes	No	No	Yes	Yes	Good
Phofandi	Yes	No	No	Yes	Yes	Good

4.5.10 Source of Irrigation Water

Due to several hilly nullas flow through rain water playing role to develop ground water recharge, many farmers have installed their small capacity private tubewells to irrigate their lands. The data was also collected from the participants regarding source of irrigation for their agriculture and is provided in the Table 4-10 below.

Table 4-10: Source of Irrigation Water

Mouza Name	Canal	Tube Well	Rain
Perchan	No	No	Yes
Phofandi	No	No	Yes

4.5.11 Water Born Disease

The data was also collected regarding major diseases. No specific or fatal disease in the project area while seasonal diseases were recorded and provided in the following Table 4-11 below.

Table 4-11: Water Born/ Common Disease

Name of Mouza	Major Disease
Perchan	Fever, Cough, Flue, Dengue, Hepatitis, Blood Pressure, Heart Patients
Phofandi	

4.5.12 Social Amenities

The facility of electricity and mobile phone and grocery shops are available in the project area. The metaled road was available to Phofandi mouza of Kotli Sattian Chairlift project. The primary, middle and high school was available in Phofandi and Perchan Mouza. The locals avail the health emergency facility from THQ hospital Kotli Sattian city.

4.5.13 Gender Participation

The rural setup cannot survive without participation of women. Except, ploughing and irrigation to the field, all other activities start from land preparation up to harvesting, in the area Mouza of Phofandi & Perchan. Kotli Sattian chairlift project women can participate in harvesting and livestock. Further information is provided in Table 4-12 below.

Table 4-12: Women Participation in the Rural Set Up (Percent

Mouza Name	Household	Child Caring	Farm/Crop	Livestock Rearing	Sale & Purchase of Property	Social Obligations	Local Representatives
Perchan	100	100	10	10	20	0	0
Phofandi	100	100	10	10	20	0	0

4.5.14 Community Opinion Regarding Project Impacts

The participants showed their satisfaction level and opinion regarding project impact on their socio-economic condition. The indicators of social assessment showed that in all sphere of life, the project will have +ve impact as provided in the following Table 4-13.

Table 4-13: Community Opinion Regarding Project Impacts

Community Opinion	Impacts
Employment opportunity	+ve
Increase land value	+ve

Community Opinion	Impacts
Business development	+ve

4.5.15 Land Acquisition and Resettlement

The Kotli Sattian Chairlift Project will require the permanent acquisition of 26.5147 acres of land, mostly forest land, for the Perchan Station (06 acres), Phofandi Station (09 acres), the chairlift route (08 acres), and the approach road (3.5147 acres of private and forest land). The exact land distribution will be finalized after a survey by the revenue department. A walkthrough survey identified three residential structures within the right-of-way (ROW) requiring relocation, though the owners do not reside there permanently. Details of land acquisition and impacted residential structures are provided in the Table 4-14 and Table 4-15 tables below.

Table 4-14: Component wise Distribution of Land to be Acquired

Sr. No	Project Component	Legal Status of Land	Land to be Acquired (acres)
1	Perchan Station	Reserved Forest	06
2	Phofandi Station	Reserved Forest	09
3	Chairlift route	Reserved Forest	08
4	Access Road	Reserved Forest	03
5	Access/Approach Road	Protected Forest	0.5147
Total			**26.5147**

Table 4-15: Impacted Residential Structures of the Project Area

Sr. No.	Name	Type of Construction	Type of Structure	Dimension (Ft.)		Area	Rate Per unit (RS.)	Estimated Cost (RS.)	Dismantling Allowance	Shifting Allowance	Total Compensation(millions)
				Width	Length	Sq. ft					
1	Haji Rasheed Satti	Pacca	Room	24	14	336	745	250320	20000	37000	0.54
			Room	18	14	252	745	187740			
			Water Tank	8	8	64	745	47680			
2	Muhammad Nisar Satti	Pacca	Veranda	106	15	1590	745	1184550	20000	37000	1.24
3	Hawaladar Kabeer	Pacca	Room	14	14	196	745	146020	20000	37000	0.78
			Room	14	14	196	745	146020			
			Room	14	14	196	745	146020			
			Room	14	14	196	745	146020			
			Room	14	14	196	745	146020			
Total								**2400390**	**60000**	**111000**	**2.56**

5 ANALYSIS OF ALTERNATIVES

5.1 DESCRIPTION OF PROPOSED ROUTES

Following routes were discussed and analyzed during site visit:

5.1.1 Route #01 Parchen to Balawra:

One of potential aligned route starting from Parchen to Balawra as terminating point was analyzed and marked on GIS. It intended to be the longest route, traversing through more populated areas and alignment following a more winding path.

5.1.2 Route #02 Parchen to Phofandi:

Second most potentially aligned route starting from Parchen to Phofandi as terminating point was analyzed and marked on GIS. It intended to go through a more forested area compared to the other routes. This route traverses mostly valley terrain, with some sections involving steep slopes.

5.1.3 Route #03 Parchen to Phofandi:

Third most potentially aligned route starting from Parchen to Phofandi as terminating point was analyzed and marked on GIS. This route traverses mostly ridge terrain with a shallow decline.

5.2 MOST SUITABLE ROUTE:

Among the three proposed routes for the Kotli Sattian chairlift project, Route #3, connecting Parchen to Phofandi Hilltop, has been recommended as primary route by the consultant. This pivotal decision significantly influences the project's overall success, was reached through a rigorous and balanced consideration of numerous factors. The selection process prioritized not simply connecting the two points by the shortest distance, but rather finding the optimal path that maximizes benefits, minimizes negative impacts, and aligns with the long-term vision for the region.

5.2.1 A MULTIFACETED DECISION-MAKING PROCESS

The suggestion of Route #3 resulted from a multifaceted process, employing a systematic approach that integrated diverse perspectives and data. This involved carefully weighing competing priorities and making informed trade-offs. The decision-making process was structured around three core components:

5.2.1.1 CLIENT INPUT: ALIGNING WITH VISION AND OBJECTIVES:

The client's vision for the project served as the foundation for route selection. Their specific goals, priorities, and constraints played a crucial role in shaping the final decision.

Key aspects of client input included:

Project Objectives: The client's primary goal for the chairlift project, whether focused on maximizing tourist traffic, providing access to remote areas, or a combination of factors, strongly influenced the importance placed on various route characteristics.

Operational Considerations: The client's long-term operational goals, including ease of maintenance, accessibility for emergency services, and potential for future expansion, were considered in the route selection.

Risk Tolerance: The client's risk tolerance, related to terrain stability, environmental hazards, or construction challenges, influenced the selection of a route that balanced potential rewards with acceptable risks.

5.2.1.2 Route #3 Recommendation Rationale:

Route #3, connecting Parchen Hilltop to Phofandi Hilltop, emerged as the recommended route due to a convergence of positive factors revealed through the analysis. While specific details of the analysis remain within the project documentation, it can be inferred that Route #3 likely offered an optimal balance of factors:

Favorable Terrain: Route #3 likely presented a more manageable terrain profile compared to the other routes, potentially requiring less complex engineering solutions and minimizing construction challenges.

Minimized Environmental Impact: The EIA for Route #3 likely indicated a lower potential for environmental disruption compared to the other routes, possibly avoiding sensitive ecological areas or minimizing impacts on wildlife and vegetation.

Cost-Effectiveness: While not necessarily the shortest route, Route #3 likely presented a favorable cost-benefit ratio, balancing construction and operational costs with projected economic benefits.

Enhanced Scenic Views: Route #3 may have offered unique scenic views or traversed areas of natural beauty, enhancing the passenger experience

Below table analyzes the three proposed routes for the Kotli Sattian Chairlift Project based on the factors discussed in the provided information:

Criteria	Route #1: Parchen to Balawra	Route #2: Parchen to Phofandi (Forest)	Route #3: Parchen to Phofandi (Ridge)
Environmental	- Passes through populated areas	- Passes through a more forested area	- Minimizes environmental disruption
	- Potential higher environmental disruption due to winding path	- Likely higher ecological impacts due to forested areas	- Likely avoids sensitive ecological areas and reduces impact on wildlife and vegetation
Technical	- Longest route, likely requiring more complex engineering solutions	- Steep slopes in sections, may require specialized engineering	- Most manageable terrain profile with shallow decline, likely requiring less complex construction

Criteria	Route #1: Parchen to Balawra	Route #2: Parchen to Phofandi (Forest)	Route #3: Parchen to Phofandi (Ridge)
	- More winding path, which increases construction complexity	- Requires detailed planning due to the varied terrain	- Shorter route with smoother construction path and fewer challenges
Social	- Passes through more populated areas, may cause social disruption	- Potential to affect fewer local residents but traverses forested areas	- Least social disruption, primarily traverses ridge terrain
Cost	- Likely the most expensive due to longer distance and complex terrain	- Moderate cost, balancing terrain difficulty and forested area	- Most cost-effective, shorter distance and simpler terrain
Scenic Views	- Potential for scenic views, but more affected by winding path and populated areas	- Likely to have more natural scenic beauty due to forested areas	- Likely offers the best scenic views, traversing areas of natural beauty and ridge terrain
Operational Considerations	- Longest route, potential operational challenges	- Moderately long route, operational feasibility is balanced	- Shortest route, operationally optimal with easier maintenance

Recommended Route: Route #3

Rationale: Route #3 is recommended for the Kotli Sattian Chairlift Project due to its optimal balance of favourable terrain, reduced environmental impact, manageable construction challenges, and enhanced scenic views. This route provides a shorter, cost-effective solution that minimizes social disruption and operational challenges while offering an exceptional passenger experience with unique scenic views. Route #3 is considered to best align with the project's long-term goals and vision.

6 PUBLIC CONSULTATION AND DISCLOSURE

6.1 GENERAL

This section describes the outcome of the public consultation sessions held with different stakeholders that may be affected (positive / negative) by the proposed project activities. Public consultation is a mandatory part of the EIA process for development projects. The adequacy of the public consultation and information disclosure is one of the basic criteria used to determine the project compliance with the national laws.

The consultation process was carried out in accordance with the requirements of Pakistan environmental procedures. The objectives of this process were to:

- Informing the public about what is proposed project.
- Identify and involve all stakeholders, especially local residents, in the consultative and participation process;
- Share information with stakeholders on the design and construction of the proposed project and anticipated impacts (positive / negative) on the physical, biological and socio-economic environment of the project area;
- Understand stakeholders' concerns regarding various aspects of the project, including the existing available facilities and problems, construction of the project and the likely impacts of construction and operation related activities;
- Understand the perceptions, assessment of social impacts and concerns of the communities in the vicinity of the proposed project;
- Provide an opportunity to the public in the public consultation session to provide valuable suggestions for the project design in a positive manner; and
- Reduce the chances of conflict through the early identification of controversial issues, and consult them to find acceptable solutions.

6.2 Consultation and Participation Process

For ascertaining the perceptions of different stakeholders about the project (during construction/operation), consultation meetings were held with them. Site visits of project sites were conducted from 1st March, 2025, 5th March, 2025 and 6th March, 2025. Consultation meetings were carried out during the site visit with local community of Phofandi Village. Attendance sheets have been provided as Annexure 1.

6.3 METHODS OF PUBLIC CONSULTATION

Public consultations were conducted in order to establish stakeholder’s opinion regarding project implementation. The following methods were used for public consultation with project stakeholders:

- Scoping sessions
- Informal meetings
- Individual interviews

6.4 IDENTIFICATION OF STAKEHOLDERS

Stakeholders are those who have a direct or indirect interest in project development, and who will be involved in the consultation process. During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. The stakeholders identified during field survey were the local residents, private land owners, shop keepers, farmers, job holders (Govt / pvt), drivers, daily wage labour and students. All the stakeholders had different type of stakes according to their professions which are listed down along with their comments and/or feedback. Informal group discussions were also held as an additional tool for the assessment of the perceptions of the stakeholders.

6.5 MAJOR STAKEHOLDERS AND THEIR APPREHENSIONS

The Table 6-1 contains the list of major stakeholders.

Table 6-1 Stakeholders Contacted in the Project Area

Sr. No.	Stakeholder Category	Number of Respondents
1	Shop keepers	1
2	Farmers	1
3	Businessman	1
4	Students	1
5	Retired	1

No major concerns were raised by the local residents during these consultation meetings. Participants showed their full support for project implementation. The Figure 6-1 below shows the pictorial view of interviews and consultation meetings held with the stakeholders. Attendance sheets of public consultations are attached as Annexure 1.

6.6 CONSULTATION MEETINGS AND FORMAL AND INFORMAL GROUP DISCUSSIONS

In order to get spontaneous responses, scoping sessions in the proposed project area were held to extract qualitative information about the perception and apprehensions about the project. The views of the locals were formally recorded and effort will be made to make those beneficial for the project.

Consultation meetings regarding project impacts, their magnitude and mitigation measures were held with the local residents, private land, shop keepers, farmers, job holders (Govt / pvt), drivers, daily wage labour and students to know their concerns regarding proposed project.

Generally, it was found that people were already aware of the proposed project. After the meetings, most of the respondents including all local residents and other stakeholders showed their full support for the proposed project. This project will be beneficial in terms of water resource management and agricultural development, not only for the local residents but also good for the development of the area. Concerns of the local communities and responses are provided in Table 6-2 below.

Table 6-2: Community Concerns and Consultant Responses

S. No.	Concerns and Suggestions	Responses
1.	What is the starting and end point of the chairlift?	The chairlift is located within the jurisdiction of Tehsil Kotli Sattian. Its starting point is Perchan, and the endpoint is Phofandi Hill Top. These locations have been indicated on the layout plan of the project area, which has been shared with the community for their understanding.
2.	What will be the components of this project?	Following are the components of the project. • Ticket booths • Waiting areas • Accessible boarding platforms • Information displays • Security personnel • Car/Bike Parking • Machine Room • Kiosks/Tuck Shops • First Aid Room/Medical Assistance • Public Restrooms • Lost and Found • Clear Signage and Wayfinding • Observation Deck/Viewing Area • Restaurant/Café • Children's Play Area • Prayer Area • Waste Disposal and Recycling
3.	What is the main purpose of this project?	The main purpose of this project is to attract tourists to the area and establish Kotli Sattian as a future tourist destination.
4.	Who is funding the project?	The project is funded by the Tourism Development Corporation of Punjab (TDCP) under the Government of Punjab.
5.	The construction activities will cause inconvenience to local residents due to hindrance in routine activities.	The Contractor will ensure that construction work do not create disturbance for local people's access to the local route and their routine life activities.
6.	Noise and dust will be generated from construction activities and may cause health issues.	Regular sprinkling of water will be carried out to control the dust emissions at the construction site, whereas construction activities will be avoided during night time.
7.	Will there be tree cutting?	Efforts will be made to protect as much trees / plants as possible. Where avoidance will not be possible, ten saplings will be planted for each tree cut.
8.	Will employment opportunities be generated for locals during the construction and operational phase?	Maximum workforce will be employed from the project area during the construction and operational phase.
9.	Does this project require any land acquisition for development, or any demolish of house, building?	Land acquisition and resettlement will be required for the construction. The affected individuals will be compensated according to the extent of their losses.

Figure 6-1: Pictorial View of Interviews & Public Consultation

Public Consultation at Phofandi Village for Kotli Sattian Chairlift

6.7 Departmental Consultation

Stakeholder consultations were conducted with relevant departments i.e. Forest department, Wildlife department, EPA, Punjab etc. during the field visits from 1st March, 2025, 5th March, 2025 and 6th March, 2025 to obtain their views/concerns for the proposed sub-projects. The Table 6-3 below presents the details of consultations including stakeholder's designations/department and their views/concerns regarding the proposed project.

Table 6-3: Departmental Consultation Concerns and Responses

Sr. No.	Name of Department	Name & Designation of Official	Comments/Concerns	Consultant Response
1.	Forest Department, Punjab	Head Clerk/ Assistant to DFO, Murree	The Consultant's Team described the Project Scope and Location and inquired about their apprehensions/ suggestions regarding the project; Discuss the Major tree species present in the project area and Kotli Sattian Reserved Forest. • Is the project located within a reserved or protected area? • When asked, Head Clerk/Assistant provided information about the jurisdiction of the forest for chairlift. • Will there any tree	• Yes, the project area falls within the Kotli Sattian Reserved Forest. • Yes, tree cutting is involved

Sr. No.	Name of Department	Name & Designation of Official	Comments/Concerns	Consultant Response
			cutting involved?	due to the construction of chairlift, but it will be our priority to minimize tree cutting wherever possible.
			• There is a comprehensive procedure in place for tree cutting, plantation of new trees, and replenishment of the new plantation. This process will be carried out through coordination between the forest department and TDCP.	• Noted. The consultant will assist as much as possible to facilitate this process smoothly.
2.	Wildlife Department, Punjab	Mr. Mian Abrar Assistant Director Wildlife Bansra Gali, Murree	The Consultant's Team described the Project Scope, Location and component of the project. Discussed about local species of fauna present in the project area.	Discussed about local species of fauna present in the area, endangered species and Migratory Birds.
			• Also discussed the presence of any protected/Game Reserve in the area.	• The entire project area falls within the boundaries of the Kotli Sattian Reserved Forest.
			• The Governor of Punjab has declared the Kotli Sattian Reserved Forest as a National Park.	• Noted, and the letter of declaration has also been received which is annexed as Annexure 3.
			• As per the Punjab wildlife (protection, preservation, conservation and management) (amendment) act, 2007 any innovation in the National Park is Prohibited therefor Wildlife department will be unable to provide NOC for the construction of the	

Sr. No.	Name of Department	Name & Designation of Official	Comments/Concerns	Consultant Response
			project. The attack of the wild animals on the humans could be another concern in the project area.	
3.	Environmental Protection Department, Punjab	Miss. Maria Safeer Deputy Director, Murree & Rawalpindi	The Consultant's Team described the Project Scope, Location and component and proposed activities to Deputy Director, District Murree, Rawalpindi and inquired about their apprehensions/ suggestions regarding the project; • The EIA Report of the project should include and address the following studies: ○ Biological Studies ○ Number of Trees to be Cut and ○ During the execution of the project the major concern arrived is land acquisition and resettlement and privacy issues in the project area. ○ Must conduct Analysis of Alternatives	All the suggestions shall be incorporated. ○ Biological studies have already been conducted prior to the consultation with the EPA, Punjab. ○ The tree cutting survey will be conducted by the forest department, and a complete procedure will be followed for tree cutting, plantation of new trees, and replenishment of the new plantation in coordination with the project proponent (TDCP). ○ Mitigation measures of these impact will be the part of the EMP/EIA Report ○ Analysis of Alternatives will be conducted and will be the part of this EIA Report.

Figure 6-2: Pictorial evidence of Departmental Consultation

Consultation with Assistant Director Wildlife Bansra Gali, Murree

Consultation with Head Clerk/Assistant to DFO of Forest Department, District Murree

Consultation with Deputy Director, Murree/Rawalpindi of EPA, Punjab.

7 ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION MEASURES

7.1 GENERAL

This chapter identifies the significant potential environmental and socio-economic impacts which may occur during the project life. The appropriate mitigation measures are also discussed in this and the subsequent chapters of this report. A brief qualitative description of each aspect and the affected environment in the project Area is presented in the following sections.

7.2 METHODOLOGY FOR IMPACT SCREENING

Determining the significance of potential environmental impacts and their effects enables the identification of necessary mitigation and benefit enhancement measures as well as an estimation of the related financial costs associated with the impacts of a project. An impact can be either beneficial or adverse and is assessed by comparing the quality of the baseline conditions with the predicted quality once the project is under implementation or in place.

The procedure for determining the level of risk associated with each potential impact is described below. The likelihood that the activity will have an effect on the environment, as well as the consequence of the effect occurring, are used to assess risk. It is frequently described as follows:

Risk = Likelihood × Consequence

Table 7-1: Likelihood Scale

Likelihood	Definition	Scale
Certain	Will certainly occur during the activity at a frequency greater than every week if preventative measures are not applied	5
Likely	Will occur more than once or twice during the activity but less than weekly if preventive measures are not applied	3
Unlikely	May occur once or twice during the activity if preventive measures are not applied	2
Rare	Unlikely to occur during the project	1

Table 7-2: Consequence Scale

Consequence	Definition	Score
Catastrophic	The action will cause unprecedented damage or impacts on the environment or surrounding communities	5
Major	The action will cause major adverse damage on the environment or surrounding communities.	3
Moderate	No or minimal adverse environmental or social impacts	2
Minor	No or minimal adverse environmental or social impacts	1

Table 7-3: Risk Score Table

Likelihood	Consequence				
		Catastrophic	Major	Moderate	Minor
	Certain	**25**	**15**	**10**	5
	Likely	**15**	**9**	6	3
	Unlikely	**10**	**6**	4	2
	Rare	5	3	2	1

Risk: Significant: 15-25
Medium: 6-10
Low 1-5

Any 'Medium' to 'Significant' risk requires an environmental management measure to manage the potential environmental risk. Judgment will be required concerning the application of an environmental management measure to mitigate low risk situations.

The impact assessment matrix presenting the potential impacts and expected impacts during the different project development phases are presented in the Table 7-4 below.

Table 7-4: Impact Assessment Matrix

Activity / Impact	Likelihood	Consequence	Impact (Consequence x likelihood)	Residual Impact
Design Phase				
Seismic damage	Likely	Moderate	Medium	Low
Land Acquisition	Likely	Major	High	Low
Construction Phase				
Air Quality	Likely	Moderate	Medium	Low
Noise Pollution	Likely	Moderate	Medium	Low
Vibration impacts	Likely	Minor	Medium	Low
Solid waste generation incl. Spoil material	Likely	Moderate	Medium	Low
Resource Conservation	Likely	Minor	Medium	Low
Soil Contamination	Likely	Moderate	Medium	Low
Soil erosion/ silt run-off	Likely	Moderate	Medium	Low
Community Health and Safety	Likely	Minor	Medium	Low
Occupational Health and Safety	Likely	Moderate	Medium	Low
Traffic management	Likely	Minor	Medium	Low
Communicable diseases	Likely	Minor	Medium	Low
Flora	Likely	Major	High	Low
Fauna	Likely	Major	High	Low
Use of local water resources	Likely	Moderate	Medium	Low
Contamination of water resources	Likely	Moderate	Medium	Low

Activity / Impact	Likelihood	Consequence	Impact (Consequence x likelihood)	Residual Impact
Social and Cultural Conflicts	Likely	Minor	Medium	Low
Religious and Cultural Heritage	Unlikely	Minor	Low	Low
Operation Phase				
Wildlife Disruption:	Likely	Major	High	Medium
Waste Generation and Pollution	likely	Minor	Medium	Low

7.3 Anticipated Impacts during Pre-Construction/ Design Phase

Following is the description of impacts envisaged and the recommended mitigation measures during pre-construction/design phase.

7.3.1 Land acquisition

Potential Impacts

The project requires 26.5147 acres of land, mostly forest land, for stations, the chairlift route, and the approach road. Three residential structures fall within the right-of-way (ROW) and require relocation.

Mitigation Measures

TDCP and Land Revenue Department to ensure that the land acquisition act 1894 procedures are followed in a transparent manner. Complete records should be maintained, particularly for asset valuation and compensation payment. The communities' grievances associated with the land acquisition and compensation should be addressed on priority basis, in order to avoid any unrest/mistrust among the communities towards the project. By adopting the aforementioned measures, the impact would be of low significance.

It is the foremost option to establish the Contractor camps at the acquired land to eliminate the issues of land leased etc. However, if this option is not feasible than the land for above mentioned facilities should be selected and leased prior to the start of construction phase. Land for above mentioned facilities will be directly rented from the private landowners by the Contractors.

7.3.2 Seismic Hazard

Potential Impacts

As per the seismic zone map of Pakistan, the tehsil Kotli Sattian is located in Zone 3. This implies the potential for 'moderate' to 'severe' damage in the event of earthquakes. In Zone 3, the design of various structures should be formulated considering the Peak Ground Acceleration (PGA). The occurrence of a highly intense earthquake in the vicinity of the project site could lead to detrimental impacts on its development, constituting a significant negative consequence. The resultant impact is expected to hold 'moderate' significance.

Mitigation Measures

At the detailed design stage, the safety of the proposed project structures against the damages due to seismic activity need to be ensured. As such structural designs of the proposed project need to follow the applicable criteria for the zone 3 recommended in the Building Code of Pakistan, 2021. By adopting the aforementioned measures, the impact would be of low significance.

7.4 Construction Phase

7.4.1 Impact on Air Quality

o **Fugitive Dust Emissions**

Potential Impacts

The construction phase of the Kotli Sattian Chairlift Project is expected to generate increased dust pollution due to the use of heavy machinery, earth-moving equipment, and transportation activities. These activities will disturb the soil and surrounding environment, leading to dust being released into the air. The elevated levels of dust can have significant consequences for both the surrounding environment and the health of workers, local residents, and visitors. inhalation of dust particles can cause respiratory issues, including asthma and other pulmonary conditions, particularly among construction workers and vulnerable groups like children and the elderly. Additionally, dust can negatively affect plant life by settling on leaves and reducing photosynthesis, potentially harming local flora and vegetation in the Reserve Forest area. Moreover, dust pollution can degrade the aesthetic appeal of the area, detracting from the experience of visitors who come to enjoy the pristine natural environment. This impact would be of medium significance.

Mitigation Measures

The measures are as follows:

- The material being transported or stored at the stockpiles will be kept covered with plastic to ensure protection of ambient air from fugitive emission during wind storm emissions.
- The contractor will monitor air quality on regular basis near the plant.
- Preventive measures against dust should be adopted for unloading operations. Regular water sprinkling of all excavation work the site should be carried out to suppress excessive dust emission(s);
- Grading operation will be suspended when the wind speed exceeds 20 km /hr.
- The plant should be located at least 500m away from any living area.
- Enforce the maximum speed limit to 20km/h for vehicles using embankments and access road.
- Road damage caused by project activities will be promptly attended to with proper road repair and maintenance work.
- To safeguard the health of workers, personal protective equipment (PPE), such as masks and respirators, should be provided.
- Regular air quality monitoring should be conducted to track dust levels, ensuring they remain within acceptable limits. If air pollution levels exceed recommended thresholds,

corrective actions, such as increasing water suppression or adding additional dust barriers, should be taken promptly to reduce air quality degradation.

By adopting the aforementioned measures, the impact would be of low significance.

o **Smoke from Burning of Waste Material or Burning Firewood**

Potential Impacts

A number of big and small fires in the labour camp can produce smoke and smog, which can cut off visibility, reduce traffic ability and cause suffocation along with causing diseases of respiratory tract.

Mitigation Measures

The mitigation measures will be as follows:

- It is contractor's contractual obligation to use and provide clean and smoke free fuel in the labor camp.
- Cutting and burning trees or shrubs for fuel should be prohibited.
- Gas Cylinders should be used in the labor camp for cooking purposes.

o **Vehicular and Generator Exhaust Emissions**

Potential Impacts

Emissions of noxious gases from movement of heavy machinery, batching plant and generators etc. would release emissions which would certainly add to the ambient air levels of the immediate vicinity. Also, the movements of heavy machinery and vehicles of old make and poor engine condition tend to release more than new well-tuned vehicles while the use of low-grade fuels and lubricants also increase pollutant emission levels.

Mitigation Measures

The mitigation measures will be as follows:

- All vehicles during construction activities will be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions;
- Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair are needed to minimize the hazardous emissions.
- Batching plant should be set up considering the wind direction so that the nearby communities are not affected by the emissions from batching plant.
- PEQS / WHO applicable standards to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works.
- Best quality fuel and lubes should be purchased where possible lead-free oil and lubes should be used.

7.4.2 Impact of Noise Pollution

o **Noise from Construction Activities**

Potential Impacts

Construction activities associated with the Kotli Sattian Chairlift Project, including the operation of heavy machinery and earth-moving equipment, are likely to result in elevated noise levels in the Reserve Forest. The noise generated from these activities can disrupt the natural peace of the area, which is a crucial element of the local environment for both human visitors and wildlife. Excessive noise can have detrimental effects on the health and well-being of workers and local residents, potentially causing stress, sleep disturbances, and hearing impairment in prolonged exposure situations. Moreover, wildlife, especially sensitive species in the forest, may be disturbed by the noise, leading to habitat displacement, altered behavior, and disruptions to breeding and feeding patterns. Species that rely on quiet environments for communication, such as birds, may face heightened stress levels due to constant noise. This impact would be of medium significance.

Mitigation Measures

The mitigation measures will include the following:

- Vehicles and equipment used should be well fitted, as applicable, with silencers and properly maintained; that will reduce noise hazards according to permissible limits as fixed by EPA, Punjab (noise is 80 dB (A) while the WHO noise guidelines prescribed a limit of 55 dB (A).
- Plan construction activities to concentrate high-noise operations in areas less sensitive to noise, away from residential zones and wildlife habitats.
- Construction workers will be provided suitable hearing protection like ear cap, or earmuffs and will be trained about their usage.
- Construction activities that are close to settlements will be stopped during night times if high noise values are observed.
- Consultations will be held to discuss appropriate solutions and techniques to control noise (e.g. mud or brick walls, bushes, etc.). Such hearings consultations should also be regularly conducted to solicit public feedback, to avoid public inconvenience and suggestions for improvement in working strategy / working environment and progress of project activities; and
- In accordance with the environmental monitoring plan, noise measurements will be carried out on regular basis at locations and schedule specified to maintain the level within the PEQS / WHO standards and to ensure the effectiveness of mitigation measures.
- Monitor wildlife to assess the impact of noise and adjust construction schedules to minimize disruption during key breeding or feeding periods.

By adopting the aforementioned measures, the impact would be of low significance.

7.4.3 Vibration

Potential Impacts

Construction activities i.e. soil compaction, excavation, moving of heavy trucks have the potential to produce vibration levels that may be annoying or disturbing to humans and fauna and may cause damage to structures if appropriate precautions are not taken.

Mitigation Measures

Following mitigation measures should be implemented to combat the potential vibration impacts during the construction stage:

- Use of heavy machinery should be allowed in limited time only from 07.00 a.m. to 10.00 p.m. except for any emergency for which contractor should take prior approval; and
- Low vibration level machinery should be used and a system of regular maintenance and repairs to be employed.
- Where vibration could become a major consideration (within say 100m of schools, religious premises, hospitals or residences) a building condition survey should take place prior to construction.
- The physical effect of piling should be assessed prior to construction and measures.
- should be discussed with the local population as well as timing of the works to serve as a vehicle for further public consultation at the implementation stage and to assist in public relations.

By adopting the aforementioned measures, the impact would be of low significance.

7.4.4 Solid Waste Generation Incl. Spoil material

Potential Impact

Considering the labourers residing in the construction camp and the locally available labour, solid waste generation will take place. The major components of the labour camp waste will be garbage, putrescible waste, rubbish and small portion of ashes and residues. Other type of wastes may include inorganic construction wastes including hazardous waste.

Spoils will be generated from the excavation activities. Disposal of spoil / surplus material may cause negative environmental impacts, if not properly mitigated during implementation of the proposed project. Potential impacts from spoils and its disposal are (i) land for disposal of spoil, (ii) conversion of those land areas into a permanent dumping area, (iii) potential erosion from the spoil areas and spoil material reaching the Nullahs/Streams, and (iv) aesthetic impacts. Material will be excavated most of which will be reused after approval of quality control engineer. The spoil will be dumped safely and levelled to avoid any harm to aesthetic sense at approved disposal areas. This impact would be of medium significance.

Mitigation Measures

- All the solid waste from the camps will be properly collected at source by placing containers and disposed of through proper solid waste management system. The contractor will

coordinate with local representatives and administration of the concerned solid waste management department for the disposal of solid waste;

- The contractor must develop a plan of action with the help of concerned solid waste management department for transporting the waste to the disposal site;
- Toxic waste will be handled, stored, transported and disposed separately;
- The waste will be properly sealed in containers with proper labels indicating the nature of the waste; and
- Solid waste will be segregated at source so that it can be re-used or recycled.
- Waste management plan will be developed to implement an efficient and responsive solid waste management system during construction phase. Recyclable wastes e.g. steel bars will be sold to waste vendors;
- Reusable material will be used as a filling material during ground levelling;
- Solid waste generated during construction will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan; and
- The site will be restored back to its original condition after construction completion.
- The spoil material from the excavation will be dumped at designated places. The dumping sites must be approved by environment specialist of the Construction Supervision Consultant (CSC).
- The contractor will also ensure that no spoil material is disposed into stream/nullahs and into any other water body along the project site.
- As far as possible barren/waste lands available will be used for disposal of the excavated waste material.
- The spoil material shall be deposited in layers and properly rolled and sprinkled to avoid any negative environmental impacts.
- Contractor will prepare and approve a impspoil management plan, prior any disposal of spoil.

By adopting the aforementioned measures, the impact would be of low significance.

7.4.5 Resource Conservation

Potential Impact

During the construction, overburden on local resources is possible if construction facilities such as workers camp and construction camp built near rural areas and can create problems for local communities. There can be a conflict for resources between workers and local community. This impact would be of medium significance.

Mitigation Measures

- Use potable water bowsers for construction works and mineral water bottles/ ground water for drinking purposes;
- Plan for the provision/purchase of adequate insulation to reduce heat loss through construction plants;
- Reduction of wastage of water through training of workers involved in water use;
- Reuse of construction waste materials may be adopted wherever possible;
- Aggregates will not be sourced from river and stream beds.

- Diesel and fuels with low Sulphur content should be used to operate construction machinery and equipment;
- Efficient and well -maintained equipment and machinery will be used;
- The equipment and machinery will be turned off when not in use;
- A good camp design and an efficient worksite management plan can help the contractor to reduce the water demand, wastewater and solid waste volumes to the lowest levels.

By adopting the aforementioned measures, the impact would be of low significance.

7.4.6 Soil Contamination

Potential Impacts

Surface soil has the potential to be contaminated by construction material, vehicle movements and various construction activities. Spillage of fuel, lubricants, cement and chemicals has the potential to result in contamination. Possible sources of spillage are:

- During transfer of fuel from one container to another or during refueling;
- Unloading of construction material due to careless handling;
- Maintenance of equipment and vehicles;
- Due to leakages from equipment and containers;
- It is anticipated that a large quantity of excavated material will need to be disposed of. If this waste material is not properly disposed of, it will contaminate the soil and water resources, especially during the rainy season. Improperly managed excavated material, if left exposed or not stored correctly, can easily erode and get washed away by rainwater. During the rainy season, the increased water flow can carry the eroded soil into nearby water bodies, causing sediment runoff.

This impact would be of medium significance.

Mitigation Measures

The following practices will be adopted to minimize the risk of soil contamination:

- The Contractor will be required to train its workforce in the storage and handling of materials like oils, diesel, petrol, other chemicals, concrete and cement, etc., that can potentially cause soil contamination. The Contractor will be required to prepare a training manual and module for all the construction related activities along with the schedule of training program and submit to the supervising consultants for approval.
- Refueling areas will have impervious concrete bases with appropriate drainage to prevent spills from contaminating the surrounding area.
- During on-site maintenance of construction vehicles and equipment, tarpaulin or other impermeable material will be spread on the ground to prevent contamination of soil.
- Oils, fuels and hazardous materials will be stored in appropriately bounded areas. Fuel tanks will have to be placed within sealed bunds capable of containing 120% of the total volume of the tank in case of leakage.
- Regular inspections will be carried out to detect leakages from vehicles and construction machinery.

- Vehicles and/or equipment with leakage will not be used, until repaired.
- Solid waste generated during construction and at camp sites will be properly treated and safely disposed of only in demarcated waste disposal sites.
- The construction phase will consume lot of cement additives and oils and the empty containers will contain dangerous amount of chemicals inside, which can impact the humans as cancer producers. All such containers must not be sold to general public and must be destroyed and sent for recycle. This will be contractor's responsibility who must seek consultant's supervision. The people must be warned against use of empty chemical containers through local press and erecting banners in project area.

By adopting the aforementioned measures, the impact would be of low significance.

7.4.7 Soil Erosion

Potential Impacts

Soil erosion can pose a significant environmental challenge in the Kotli Sattian area due to its hilly and mountainous terrain. The construction activities associated with the Kotli Sattian Chairlift Project, such as land clearing, excavation, and tower construction, are likely to disturb the natural soil structure. This disturbance increases the vulnerability of the soil to erosion, particularly during the monsoon season when rainfall intensity is higher. The removal of vegetation and alteration of slopes can exacerbate the erosion process, resulting in the loss of topsoil, which is vital for supporting local plant life. The erosion process could lead to sedimentation of nearby rivers and streams, degrading water quality, disrupting the local hydrological cycle, and impacting plant and wildlife habitats. Additionally, the loss of fertile soil could hinder the growth of vegetation and degrade the local ecosystem.

This impact will be of medium significance.

Mitigation Measures

To mitigate the soil erosion impacts during the construction of the Kotli Sattian Chairlift Project, several measures can be implemented. Erosion control techniques, such as silt fences, sediment traps, and mulching, should be employed to stabilize disturbed soil and prevent further erosion. These measures will help trap sediments before they reach water bodies, reducing the risk of sedimentation. Additionally, revegetation efforts should be undertaken immediately after construction activities to restore the natural habitat and stabilize the soil. Fast-growing grass species can be planted as ground cover to prevent soil washout. For steep slopes, terracing and re-grading the land can reduce runoff and decrease the erosive impact of rainfall. Furthermore, efficient stormwater drainage systems, such as diversion channels, should be installed to direct water away from disturbed areas, minimizing the impact of surface runoff and further soil erosion. These measures will collectively help protect the environment and minimize the long-term effects of soil erosion in the area.By adopting the aforementioned measures, the impact would be of low significance.

7.4.8 Community Health and Safety

Potential Impacts

The communities residing in the project areas might be at risk from the proposed works since deep excavation works will take place along with movement of heavy machinery and vehicles transporting the raw materials and spoils etc. to and from the work sites. This could potentially result in injury and/or death to community members, particularly women and children if care and precautions are not taken while moving in the project areas. This impact will be of medium significance.

Mitigation Measures

- The Contractor will prepare the site-specific community health and safety plan in compliance with applicable national and international regulations and guidelines.
- The Contractor will clearly barricade work areas to prevent access by the public, while ensuring passage by providing safe pathways for pedestrians around construction zones;
- The Contractor will exclude parking, waiting vehicles and vendors from areas adjacent to the work by means of clearly marked barricades and posted signage;
- The Contractor will remove excavated earth, spoil, rubble, cut vegetation and refuse whether generated by the project or discarded by third parties from areas within the construction zone, where it has potential to interfere with the public or generate dust;
- The Contractor will provide temporary lighting to facilitate construction during night time;
- The Contractor will remove hazardous conditions on construction sites that cannot be controlled effectively with site access restrictions and will barricade any excavations and materials placed near the public place (if applicable);
- Hard Barricades will be provided at the excavation deeper than 1.5 meter as per “NZS 3845:1999 Road safety barrier systems”;
- The Contractor will promptly reinstate any services and reinstall any physical facilities that are cut, disconnected or damaged during construction, and maintain or provide temporary services that are interrupted by construction. The Supervisory Consultant will inspect and certify the adequacy of all reinstated services and facilities;
- Installation and maintenance of speed control and traffic calming devices at pedestrian crossing areas especially near the settlements;
- An Emergency Preparedness and Response Plan (EPRP) in coordination with the local emergency responders to provide timely first aid response in the event of accidents and hazardous materials response in the event of spills;
- Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work sites;
- Timely public notification on planned construction works;
- Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity and social links;
- Any environmental condition that is disagreeable to the public and causes an avoidable nuisance can be addressed with additional provisions over and above those described above, as determined necessary by the supervisory consultant.
- These requirements will be incorporated into the bidding specification and contract documents, and will be binding on the contractor, at risk of penalty for noncompliance, as charges to be recovered from contractor for unsafe act or condition.

7.4.9 Occupational Health and Safety

Potential Impacts

Occupational Health and Safety (OHS) related impacts will arise during construction stage activities including clearing of earth, levelling, compaction, foundations, finishing, testing & commissioning. In a nutshell, occupational health and safety issues associated with the construction of proposed sub-projects will primarily include physical hazards; chemical hazards; and noise.

Noise: Construction and maintenance personnel may be potentially exposed to high levels of noise from heavy equipment operation and from working in proximity to vehicular traffic. As most of these noise sources can be prevented by using personal hearing protection by exposed personnel and implementation of work rotation programs to reduce cumulative exposure.

Lack of Emergency Response Plan (ERP) or an inefficient response plan may lead to an accident or critical injury. This impact would be of medium significance.

Mitigation Measures

Following mitigation measures shall be adopted by the contractor to control accidents due to deep excavations:

- Proper barricading shall be applied to all excavation deeper than 6feet.
- Warning taps shall be applied to trenches which are around 3 feet deep.
- Isolation of area must be done during excavation activities to control accidents.
- Damping down of area to control fugitive dust.
- Where necessary, apply green sheet to control fugitive dust, especially during high wind season.
- Material shall be stored at least 3 feet away from the edges of excavations.
- Designated entry and exit points at all deep excavations.
- If any confined space encounters (excavation deeper than 10 feet or any main hole etc.), procedure for confined space entry shall be followed.

For further details, framework for Occupational Health and Safety Management plan has been developed to handle any health and safety issue of workers and community. Mitigation measures to prevent and control physical hazards include:

Moving Equipment and Traffic Safety

Establishment of work zones to separate workers on foot from traffic and equipment by:

- Routing of traffic to alternative roads when possible;
- Regulation of traffic flow by warning lights, avoiding the use of flaggers if possible;
- Reduction of maximum vehicle speeds in work zones; and
- Training of workers in safety issues related to their activities, such as the hazards of working on foot around equipment and vehicles; and safe practices for work at night and in other low-visibility conditions, including use of high-visibility safety apparel and proper

illumination for the work space (while controlling glare so as not to blind workers and passing motorists).
- Provide appropriate PPE in conjunction with training, use, and maintenance of the PPE.
- Furthermore, the noise reduction options that should be considered which include:
- Selecting equipment with lower sound power levels;
- Installing suitable mufflers on engine exhausts and compressor components;
- Installing vibration isolation for mechanical equipment;
- Providing noise protection PPEs (ear plugs/ear muffs) to the construction workers;
- Re-locating noise sources to fewer sensitive areas to take advantage of distance and shielding;
- Developing a mechanism to record and respond to complaints; and
- Regular monitoring of noise levels at active sites or near noise producing equipment/machinery and compare it to the available occupational noise standards.

Monitoring of OHS Activities:

During the construction phase of proposed project, occupational health and safety monitoring programs of the contractor (s) should verify the effectiveness of prevention and control strategies. The selected indicators should be representative of the most significant occupational, health, and safety hazards at the construction site and camps, and the implementation of prevention and control strategies. The occupational health and safety monitoring program should include:

- Regular inspection and testing of all safety features and hazard control measures focusing on engineering and personal protective features, work procedures, places of work, installations, equipment, and tools used;
- Surveillance of the working environment: The contractors should document compliance using an appropriate combination of portable and stationary sampling and monitoring instruments. Monitoring and analyses should be conducted according to internationally recognized methods and standards. Monitoring methodology, locations, frequencies, and parameters should be established individually for each project following a review of the hazards;
- Continuous and efficient surveillance of worker's health during the entire construction phase by the nominated officials of contractors; and
- Training: Training activities for employees (construction contractor & supervision consultant staff) and visitors should be adequately monitored and documented (curriculum, duration, and participants). Emergency exercises, including fire drills, should be documented adequately. Service providers and contractors should be contractually required to submit to the employer adequate training documentation before start of their assignment.
- Contractor(s) shall prepare a comprehensive OHS Plan as part of Site Specific Environmental Management Plan (SSEMP).

By adopting the aforementioned measures, the impact would be of low significance.

7.4.10 Traffic Management

Potential Impacts

During construction activities, large number of light and heavy vehicles is expected to use the community roads. Similarly, heavy machinery will be stationed in and adjoining areas of the project site. This may create a burden on the capacity of the existing road network and the project-generated traffic may be a nuisance for surrounding communities. This impact would be of medium significance.

Mitigation Measures

- Construction traffic hindrance should be avoided by providing proper diversion and signage.
- Traffic management plan will be prepared by the contractor after consultation with RE for its implementation.
- GRM will be put in place to address community grievances in this regard.

By adopting the aforementioned measures, the impact would be of low significance.

7.4.11 Communicable diseases

Potential Impacts

The laborers in the Contractor Camp, truck drivers and like personnel who interact with each other have the potential for the spread of HIV/AIDS if the incidence exists. Majority of the people living in the surrounding of the Project, and potential Labour are not aware of the source, mode of communication or consequences of HIV/AIDS. Although their religious and cultural value system, to a large extent excludes the outbreak or rapid communication of HIV/AIDS, yet its occurrence in such a situation cannot be precluded. It is necessary that awareness and preventive campaigns are run from time to time in the Labour camps and the field offices of the Project to prevent the communicable diseases like Cholera, Typhoid and Tuberculosis.

There is a chance of spreading of an epidemic of Coronavirus disease (COVID-19) due to close interaction of the labour force during construction not only among the workers but also in the area. This impact is medium adverse in nature.

Mitigation Measures

The Contractor shall:

- Arrange to run an active campaign, in the labour camp, to make people aware of the cause, mode of transmission and consequences of HIV/AIDS;
- Latest / Updated SOPs by WHO, national and provincial Government related to the construction industry to control spreading of COVID-19, should be implemented by the contractor and should be strictly monitored;
- Strengthen the existing local health & medical services for the benefit of labour as well as the surrounding villages;

- Ensure cleanliness and hygienic conditions at the labour camp by ensuring proper drainage and suitable disposal of solid waste. Inoculation against Cholera will be arranged at intervals recommended by the Health Department;
- Locating a labour camp at least away from the villages (local settlement), and
- Keep all the camps, offices, material depots, machinery yards and work sites open for the inspection of health and safety measures and related documents

By adopting the aforementioned measures, the impact would be of low significance.

7.4.12 Ecological Impacts (Loss of Vegetation and Deforestation)

The construction of the chairlift system, including towers, stations, and access routes, will require the removal of about 69,421 trees in the project area, which is part of the Kotli Sattian Reserved Forest. The major tree species to be cut for the Kotli Sattian Chairlift Project include Chir Pine (Pinus roxburghii) and Blue Pine (Pinus wallichiana). These species are ecologically significant species providing critical habitat, food, and nesting sites for a wide range of wildlife. They play a vital role in soil stabilization, water regulation, and maintaining microclimatic conditions. The mass removal of trees will significantly degrade wildlife habitats, resulting in fragmentation and loss of nesting, foraging, and breeding grounds for numerous species, especially birds. Tree canopies serve as essential cover for avian fauna, and their loss will directly threaten sensitive and forest-dependent species like pheasants, barbets, and parrots. Additionally, mammals such as squirrels and martens that rely on tree hollows for shelter may be displaced. Increased sunlight and wind exposure due to deforestation will further alter the microhabitat, affecting ground-dwelling reptiles and small mammals.
Construction activities could result in other indirect impacts on the National Park. Dust blown from the construction site could adversely affect floral species composition, as could light spill if construction activities require task or security lighting. Workforce, if left unattended, could collect timber and non-timber forest products. The likelihood of these impacts will be of High Significance.

Mitigation Measures

The recommended measures to avoid, minimise and control the likely adverse effects on the National Parks and other protected sites are introduced below and further details are provided in the BMP and the EMP. The mitigation has been designed in consideration of the Government of Punjab's 'Modern Protected Areas' legislation 2020. Chapter II, Section 7, Paragraph 5 states '*The provision for access roads to and construction of rest houses, hostels, hotels and other buildings in the national park along with amenities for public may be so made and the forest therein shall be so managed, and forest produce so obtained so as not to impair the object of the establishment of the national park.* Therefore, the legislation promotes public use, the construction of roads and associated infrastructure. These factors are taken into consideration when designing the mitigation. It is also evident that the Parks and Forest Reserves provide essential food, shelter and fuel for many locals. The mitigation is therefore designed to control the effects of the Project only.

Following measures will be adopted during construction and operation stages.

- As the project area falls within the Kotli Sattian Reserved Forest, it is necessary to obtain a No Objection Certificate (NOC) from Forest Department before commencing any work.
- Habitat loss will be avoided by prioritising the use of existing access roads and if none are available prioritising land already devoid of vegetation
- The loss of trees will be mitigated by planting ten new trees for every tree lost, elsewhere in the forest as part of the Forest Department's replantation program. Additionally, efforts should be made to plant indigenous species to restore the biodiversity of the forest.
- All vegetation clearance works must be planned and approved by the Forest Department before clearance starts
- All vegetation clearance will be supervised by a National Biodiversity Specialist to ensure that the pre-agreed clearance plan is adhered to
- The risk of fire will be minimised by educating the construction workers on how to prevent bush fires and banning the use of wildfires as a method for land clearance method
- All works within 50m of a watercourse, of any size will be banned.
- The construction plan should avoid areas of critical ecological importance, such as habitats of endangered species or areas of dense vegetation, whenever possible.
- Environmental surveys should be conducted prior to construction to identify vulnerable plant species and critical habitats. This will allow for targeted mitigation strategies to protect these areas.
- Campsites and Elevated Ground Storage Tanks (EGST) will be established on waste/barren land rather than on forested or agriculturally productive land. However, if such type of land is not available, it will be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to trees and undergrowth or agricultural area.
- Construction vehicles, machinery and equipment will remain confined within their designated areas of movement.
- The Contractor’s staff and labour will be strictly directed not to damage any vegetation such as small trees or bushes.
- Contractor will provide gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel will not be allowed.
- The compaction of trenches should also be done properly. Inadequate compaction of trenches will result in flow of soil during rainy season resulting in increased soil erosion.
- Open fires should be banned in the area to avoid hazards of fire in the project area.
- The BMP should be prepared implemented that will avoid, and control all identified disturbances to a level that will be negligible.

By adopting the aforementioned measures, the impact would be of low significance.

7.4.13 Fauna

o **Mammals and Reptiles**

The impact on mammals and reptiles will include the following:

During the construction phase, there will be negative impacts on the mammals and reptiles of the area, due to construction activities involving excavation, movement of labour, carriage of goods and machinery to various sites.

The key terrestrial species in the project area are:

Mammals:

- Common Leopard (Panthera Pardus)
- Wild Boar (Sus scrofa)
- Red Fox (Vulpes vulpes)
- Golden Jackal (Canis aureus)
- Rabbits (Oryctolagus cuniculus).

Reptiles:

- Monitor Lizard (Varanus albigularis)
- Porcupine (Erethizon dorsatum)
- Mongoose (Herpestidae)
- Snakes (Serpentes)

All mammal species, including smaller rodents, are mobile and typically avoid disturbances. Additionally, the surrounding area provides ample suitable and undisturbed habitat. With the preparation and implementation of the Biodiversity Management Plan (BMP), residual impacts on mammal populations, including leopard, are expected to be negligible.

Impacts on reptiles during construction are likely. Reptiles maybe killed or injured during the clearance of vegetation, particularly if such activities are undertaken in cooler temperatures when reptiles are less active. The preparation and implementation of the BMP will, however, ensure that all clearance works are managed carefully to encourage reptiles to move offsite naturally into adjacent and suitable habitat. Vegetation clearance may also lead to the loss of refugia and hunting grounds, but the extent of the loss compared with the retained, adjacent land and habitat is negligible.

Eatable and refuse goods of the Contractor's camps may attract wildlife that might be hunted by the workers. The accidental striking of all terrestrial fauna by project vehicles on access routes is a considerable risk during the project. This impact would be of High significance.

o **Birds-Avian Fauna**

Impacts on birds during construction are possible, both via the loss of vegetation and the associated increase in noise, light and movement. The greatest risk will be the destruction of active nests, but implementation of the BMP will avoid such impacts. All other risks will be restricted to the construction sites only, temporary and reversable. Birds are also highly mobile and will move to adjacent areas during infrequent times of disturbance.

The key avifauna species in the project area includes:

- Kalij Pheasant (Lophura Leucomelanos)
- Black Francolin (Francolinus francolinus)
- Jungle fowl (Gallus)
- Parrot (Psittaciformes)
- Common Raven (Corvus corax)

- Coal Tit (Periparus ater)
- Great barbet (Psilopogon virens)
- Quail (Coturnix coturnix)

Birds will try to find shelter and food somewhere else and will tend to move away from the project area due to the activities mentioned above for fear of being hunted/trapped.

7.4.13.1 Mitigation Measures

Given the project's location within the Kotli Sattian Reserved Forest and its proximity to sensitive ecological habitats, it is strongly recommended to develop and implement a Biodiversity Action Plan (BAP) and an associated Biodiversity Management Plan (BMP). The BAP will serve as a proactive framework for conserving biodiversity, mitigating ecological impacts, and ensuring compliance with national environmental regulations and international conservation standards. BAP should be read and applied in conjunction with the EIA and its biodiversity mitigation and its associated Biodiversity Management Plan (BMP).

The National Biodiversity Specialist will lead the preparation and oversight of the BAP, with collaboration from local Forest and Wildlife Departments, project contractors, and the Environmental Monitoring Team. The BAP and BMP must be prepared prior to the initiation of site clearance and implemented throughout the project lifecycle. The measures included in this BMP should be used over and above the Environmental Management Plan (EMP) for all project Biodiversity related management and monitoring.

Other mitigations involve

o **Mammals and Reptiles**

- As the project area falls within the Murree-Kotli Sattian-Kahuta National Park, it is necessary to obtain a No Objection Certificate (NOC) from Wildlife Department before commencing any work.
- The risk of killing or injuring small mammals, reptile and amphibians during vegetation clearance will be minimised by cutting all scrub and trees, or strimming all grass to a minimum height of 20cm and leaving it for at least 24 hours for the species to naturally move out of the area before the remainder of any vegetation is cleared
- The risk of killing or injuring small mammals, reptile and amphibians during construction will be minimised by limiting all construction traffic to 25kph
- Hunting, poaching and harassing of wild animals will be strictly prohibited and Contractor will warn their labour accordingly.
- Noise generating activities will be avoided during the night.
- The camps will be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly, wastes of the camps will be properly disposed off to prevent the chances of eating by wild animals, which may become hazardous to them.
- Vehicles will be maintained in good condition and provided with mufflers to reduce noise.

After adopting the above-mentioned mitigation measures, the residual impact will be of low risk of striking fauna on access routes.

o **Birds-Avian Fauna**

- All vegetation clearance will be completed between May and June to minimise the impacts on breeding bird season
- The contractor should be committed to ensuring the conservation and protection of wildlife within the project area. To achieve this goal, a strict "No Hunting" policy shall be implemented and enforced among all workers and personnel involved in the project.
- Staff working on the project should be given clear orders, not to shoot, snare or trap any bird.
- Restricting construction to daylight hours and avoiding work during sensitive periods, such as breeding seasons, can help reduce disturbances to wildlife.
- A training program should be arranged by the National Biodiversity Specialist, which all site workers will be required to attend. The specialist will explain what the Biodiversity Management Plan (BMP) is, how it will be implemented, why it is important, what actions to take if wildlife or any malpractice is observed, and what their individual roles are in its implementation.

By adopting the aforementioned measures, the impact would be of low significance.

7.4.14 Use of Local Water Resources

Potential Impacts

The water resources of the project area mainly comprised of surface water (Jhelum river and streams) in project area and groundwater that is being used by all communities for drinking purpose which is also scarce. There will be ample need of water not only for construction purposes (of concrete side slopes) but also for meeting the consumptive and non-consumptive needs of the campsites, workshop, washing yard, etc. It is obvious that these needs will be met from the existing resources of the areas in close proximity to the proposed project. This impact would be of medium significance.

Mitigation Measures

Mitigation measures regarding use of local water supplies as follow.

- Availability of water for camp site facilities and construction purposes will be ensured by the contractor prior to start of construction activities. As per Local Government Act, the contractor will seek approval from the Local Government for exploitation of the water resources.
- Contractor will ensure that the water availability of the existing local users remains unimpeded by the project interventions. The contractor will make arrangements for the availability of drinking water and construction works on his own. For this purpose, contractor will install hand pumps/tube wells accordingly.
- The Contractor will be required to act as a go-between closely with local communities to ensure that any potential conflicts related to common resource utilization for project purposes are resolved quickly.
- The contractor will prepare guidelines for the workers for minimizing the wastage of water during construction activities and at campsites.

By adopting the aforementioned measures, the impact would be of low significance.

7.4.15 Visual and aesthetic impacts

Potential Impacts

The project's visual and aesthetic impacts should not be overlooked. The construction of chairlift towers, stations, and other infrastructure could alter the natural beauty of Kotli Sattian, potentially detracting from its appeal as a tourist destination.

Mitigation Measures

To mitigate this, the design of the infrastructure should incorporate aesthetic considerations that blend with the natural surroundings, minimizing visual intrusion. Using natural materials for construction and strategically positioning towers to minimize their visibility from key vantage points can help preserve the area's scenic value. The project should also ensure that sensitive areas are avoided and that any visual disturbance is minimized, thereby enhancing the overall visitor experience while safeguarding the region's visual integrity.

7.4.16 Contamination of Water Resources

Potential Impacts

Kotli Sattian's hilly terrain makes the area particularly vulnerable to surface runoff, especially during the rainy season. Construction activities associated with the Kotli Sattian Chairlift Project, such as soil disturbance, vegetation removal, and the use of machinery, can lead to increased sedimentation in nearby water bodies, such as rivers and streams. This sedimentation can elevate turbidity levels, harming water quality and aquatic ecosystems. Furthermore, construction activities like the mixing of concrete, handling materials, and the use of machinery can introduce pollutants such as oils, chemicals, and heavy metals into the environment. These contaminants can degrade water quality, threatening local aquatic life and potentially contaminating water sources used by local communities for consumption.

This impact would be of medium significance.

Mitigation Measures

Measures to prevent contamination of surface and ground water will include the following.

To mitigate the potential water quality impacts, a series of measures can be implemented. Stormwater management systems should be installed to control runoff and prevent contaminated water from reaching nearby streams or rivers. This includes retention ponds, sediment traps, and silt fences to capture and filter runoff before it enters water bodies. Additionally, a regular water quality monitoring program should be established to assess key water quality parameters, including turbidity, pH, dissolved oxygen, and the presence of pollutants, both during and after construction. Proper wastewater disposal systems must also be put in place to manage construction-related wastewater, such as from machinery or worker camps, to prevent contamination of water sources. The implementation of buffer zones of native vegetation around water bodies will help filter runoff and prevent sedimentation from reaching rivers and streams. These zones will act as natural filters, trapping sediments and

pollutants before they enter water bodies. Furthermore, training for construction workers on best practices for reducing water pollution and soil erosion, such as proper disposal of waste and careful handling of chemicals and fuels, will help minimize adverse impacts on water quality.

By adopting the aforementioned measures, the impact would be of low significance.

7.4.17 Social and Cultural Conflicts

Potential Impact

During the construction phase of the proposed project, conflicts may arise between labour force and local community. Use of local resources and products by the construction workers can generate stress on the local resources. Furthermore, difference in cultural values may also cause discomfort to local residents. This impact would be of medium significance.

Mitigation Measures

- Local labor especially from nearby communities should be given preference for the construction works;
- Careful planning and training of work force to minimize disturbance to the local people;
- Public notification through print or electronic media during the entire construction phase to avoid any inconvenience in accessibility to the locals; and
- Adequate training especially for the transitive workforce of the station (involved both in the construction process and in the commissioning) to regard the customs of the area so that the locals do not feel insecure.

By adopting the aforementioned measures, the impact would be of low significance.

7.4.18 Religious and Cultural Heritage

Potential Impacts

No graveyard will be disrupted due to this project. No historical or archaeological site has been observed or reported along the project area. So, no mitigation measured for graves, cultural and historical sites needed.

Mitigation Measures

Currently no graveyard is affected by this project. However, if any graves affected by the project, they will have to be shifted. The proponent will obtain Fatwa from local Mufti before shifting the graves. During such operation the proponent will inform local administration and seek their assistance for security. The request will also be extended to Health Department for deputation of medical and paramedical staff during the operation. As referred earlier, no relocation of historical site is involved, so no mitigation is required except that contractor will follow the prayer timing particularly at prayer of Juma and the workforce will observe the sanctity of religious properties.

There are no cultural sites located within the study area and no impacts on archaeological sites are envisaged. However, the Contractor will be required to instruct the construction crews

and site supervisors in respect of archaeological site recognition, conservation procedures, and temporary site protection. In case of a chance finding during excavation, the contractor will protect the site and notify the Engineer who will inform Department of Archaeology & Museums through Irrigation Department and hand over such sites to the department if instructed by Engineer / Irrigation Department. The Chance Find Procedure is provided as Annexure 7.

7.5 Operational Phase

7.5.1 Visual and Aesthetic Impact

Potential Impacts

The presence of the chairlift towers, cables, and stations may alter the natural landscape and views of the Kotli Sattian Reserve Forest, potentially affecting the visual appeal of the area. This could reduce the aesthetic value for tourists who come to experience the natural beauty of the region.

Mitigation Measures

- The design of the chairlift infrastructure should incorporate natural colors and materials to blend with the surrounding environment.
- Landscape screening, such as planting native trees and shrubs around key infrastructure points, should be used to minimize visual intrusion.
- Careful siting of towers and stations to avoid disturbing the most scenic viewpoints of the area.

7.5.2 Wildlife Disruption

The operation of the chairlift could disrupt local wildlife, especially species that rely on undisturbed habitats for feeding, breeding, or migration. The noise from the moving cable cars and presence of tourists may disturb the natural behaviors of local fauna.

Mitigation Measures

- Implement noise reduction measures for the chairlift system to minimize disturbances to wildlife.
- Install wildlife monitoring systems to observe impacts on animal movements and behaviors.
- Develop wildlife corridors or buffer zones to provide undisturbed areas for animals.
- Limit the operational hours of the chairlift during critical wildlife breeding or migration periods.

7.5.3 Increased Human-Wildlife Interaction

The increased number of tourists visiting Kotli Sattian due to the chairlift could lead to increased human-wildlife interactions, which could disturb animals and increase the risk of wildlife habituation to human presence.

Mitigation Measures

- Educate tourists on how to behave responsibly around wildlife, including not feeding animals and maintaining a respectful distance.
- Employ park rangers to monitor wildlife interactions and guide tourists accordingly.
- Set up clear boundaries and guidelines for tourists, ensuring they stay on designated paths and viewing areas.

7.5.4 Waste Generation and Pollution

The operation of the chairlift and associated facilities could lead to an increase in waste generation (e.g., litter, food packaging, etc.), which could degrade the local environment and pose a threat to wildlife.

Mitigation Measures

- Provide ample waste disposal bins throughout the site and encourage visitors to use them.
- Implement a waste management system, including recycling stations and waste segregation.
- Educate tourists on responsible waste disposal practices.
- Conduct regular clean-up drives to maintain the cleanliness of the area.

7.5.5 Water Usage and Resource Management

The operation of the chairlift may require water for various purposes, including for use in on-site facilities (e.g., restaurants, restrooms) and landscape maintenance. Excessive water use may strain local resources, especially during dry seasons.

Mitigation Measures

- Implement water-saving measures, such as the use of low-flow plumbing fixtures and water-efficient landscaping practices.
- Recycle and reuse water wherever possible, such as using rainwater harvesting systems.
- Monitor water usage to ensure it remains within sustainable limits.

7.5.6 Noise Pollution from Operational Machinery

While operational noise from the chairlift system may be less intense compared to construction, the continuous noise of moving cable cars and machinery could still disturb the surrounding environment and wildlife.

Mitigation Measures

- Ensure that the chairlift system operates with minimal noise by maintaining equipment regularly and using noise-reducing technology.

- Limit operations during early mornings or late evenings to avoid disturbing both wildlife and nearby residents.
- Regularly monitor noise levels and adjust operational procedures to stay within acceptable thresholds.

7.5.7 Traffic Congestion and Increased Human Activity

The chairlift is likely to increase the number of visitors to Kotli Sattian, which could lead to traffic congestion in the surrounding areas, especially near the Start and End Stations.

Mitigation Measures

- Develop adequate transportation infrastructure to manage the increased number of visitors, including parking areas and shuttle services from nearby towns.
- Implement traffic management strategies to minimize congestion and ensure smooth visitor flow, including the use of traffic control personnel during peak times.
- Encourage visitors to use public transportation or carpool to reduce the impact of personal vehicle traffic.

7.5.8 Maintenance and Infrastructure Longevity

Over time, wear and tear from the operation of the chairlift system could lead to degradation of infrastructure, impacting the safety and aesthetics of the project.

Mitigation Measures

- Implement a robust maintenance program to ensure that the chairlift system, stations, and related infrastructure are regularly checked and serviced.
- Use high-quality, durable materials in the construction of the chairlift system to extend its lifespan and reduce maintenance needs.
- Train local staff in routine maintenance procedures to ensure quick response to issues and to reduce operational disruptions.

8 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

8.1 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

8.1.1 General

The EMP is a strategic approach towards the effective implementation of the mitigation measures and environmental protection of the project area and its surroundings. This EMP ensures that the undue or reasonably adverse impacts of a project are prevented and the positive benefits of the project are enhanced. According to this plan, all the activities related to various phases of the project are controlled and monitored.

This EMP encompasses all the phases of the project and may be used as a quick reference by the personnel(s) of client and contractors for effective implementation of the proposed mitigation measures and tracking the overall environmental performance of the project.

This EMP addresses all the significant impacts that are identified during the impact's identification process. It will be amended in consultation with the concerned regulatory authority; if any issue has been overlooked or if any need would arise as the project continues.

8.1.2 Structure of EMP

The contents of this chapter are given below:

- Regulatory requirements
- Purpose & need of the EMP
- Objectives of EMP
- Scope of EMP
- Institutional arrangement for implementation of EMP

❑ Institutional arrangements for implementation of EMP during Construction phase

- Role and responsibilities of the functionaries involved in EMP implementation
- Reporting mechanism
- Non-compliance of the EMP

❑ Institutional arrangements for implementation of EMP during Operation phase

- Role and responsibilities of the functionaries involved in EMP implementation
- Reporting mechanism
- Environmental mitigation plan
- Environmental monitoring plan
- Implementation of EMP

❑ NOC and other approvals

❑ Stakeholder coordination

❑ Trainings

❑ Communication and documentation

- Environmental management cost
- Change management

8.1.3 Regulatory Requirements

This EMP refers to the applicable national and provincial legal framework for the proposed project for the protection of the environment.

8.1.4 Purpose & Need of the EMP

Primarily, the purpose of this EMP is to serve as a quick reference for the consultants, contractor as well as TDCP to implement the proposed mitigation measures effectively and to monitor the overall environmental performance of the project.

Furthermore, to house the procedure, which the TDCP follows to implement and maintain this EMP. The need of the EMP is mentioned as follows:

- Ensure that attention is paid to the actual environmental effects arising from construction and operation of the proposed project;
- Ensure that anticipated impacts are maintained within the predicted levels;
- Ensure that unanticipated impacts are managed or mitigated before they become a problem; and
- Ensure that environmental management brings about real environmental benefits and achieves environmental sustainability.

8.1.5 Objectives of the EMP

The main objectives of the EMP during different phases of the project is to implement mitigation measures and to evaluate the effectiveness of mitigation measures as proposed in the EIA and recommend improvement if any need would arise.

8.1.6 Scope of the EMP

The scope of the EMP includes the following phases of the project:

- Design phase
- Construction phase; and
- Operation phase.

All the activities performed during these phases will be controlled and monitored according to this EMP.

8.1.7 Institutional Arrangement for Implementation of EMP

The following is a broad guideline has been proposed for institutional setup under this project as a reference for TDCP. The final organizational structure, working and monitoring of Institutional setup would be proposed by the TDCP.

8.1.7.1 Institutional Arrangements for Implementation of EMP during Construction Phase

The TDCP is the project's executing agency (EA). The key players involved during construction stage of the proposed project are the TDCP; EPA, Punjab, the Contractor and the Supervisory Consultants (SCs).

The following staff will be involved in the implementation of EMP:

- TDCP
- SC's Environmental specialist/engineer; and
- Contractor's Environmental engineer/scientist.

The Construction Contractor will make a bond through contract documents to implement the EMP. The EIA study and EMP will be included as a clause of the contract documents.

8.1.7.1.1 Roles and Responsibilities

The roles, remits and responsibilities of organizations that will be involved in EMP implementation are outlined below.

a) EPA, Punjab

EPA, Punjab is the regulatory authority for issuance of NOC for the proposed projects. As part of its mandate, protection of environment is its responsibility. Therefore, this agency will undertake inspection (as and when required) of project activities with respect to the protocols as defined in the EMP.

b) General Manager (Operations):

General Manager (Operations) through environmental safeguards staff will have responsibility for assuring implementation of EMP. This includes the following:

- Ensuring that required environmental training is provided to the concerned staff.
- Carrying out random site visits to the construction site to review the environmental performance of the construction contractors.
- Review monitoring reports for the progress of environmental related activities.
- Make sure that the construction contractor is implementing the additional measures suggested by the supervision consultant in environmental monitoring reports.
- To assist contractor for obtaining necessary approval from the concerned departments.
- Maintaining interference with the other lined departments / stakeholders.
- Reporting to EPA, Punjab on status of EMP Implementation.

c) Supervision Consultant: Resident Engineer

Resident Engineer's (RE) roles and responsibilities will be:

- To oversee the performance of construction Contractor to make sure that the

Contractor is carrying out the work in accordance with the tender design and follow the specifications;
- Ensuring that the day-to-day construction activities are carried out in an environmentally and socially sound and sustainable manner;
- Strong coordination with the Contractor and EA.

d) Supervisory Consultant: Environmental Specialist-Field

Supervisory consultant (SC)'s Environmental Engineer / Scientist will perform following responsibilities.

- Directly reporting to R.E
- Preparing training materials and implementing programs
- Ensure the implementation of the mitigation measures suggested in the EMP.
- To supervise and monitor environmental activities being performed at site
- To organize periodic environmental training programs and workshops for the Consultants and Contractor staff.
- Periodic reporting as mentioned in the EMP.
- Suggest any additional mitigation measures if required.
- Ensure that no civil works are started without submitting and approval of Contractor SSEMP.

e) Construction Contractor: Environmental Engineers / Managers

Its contractor contractual obligation to appoint site Environmental Engineer / Manager with relevant educational background and experience. Contractor Environmental Engineer manager will carry out the following activities:

- Implementation of mitigation measures and SSEMP recommendations at construction sites.
- Plan, manage, monitor and coordinate the entire construction phase in term of HSE.
- Take account of health and safety risk to everyone effected by the work.
- Liaise with the client and consultant for the duration of the project to ensure that all the risks are effectively managed.
- Maintain and practice good housekeeping and keep everything at work in its proper place.
- Ensure suitable welfare facilities are provided from the start of project and maintained throughout the construction phase.
- Contractor will be bound through contract to take action against all the special and general provision of contract document.
- Ensure the provision of Personal Protective Equipment (PPE), conduct the environmental, health & safety training to the workers / Labor and coordinate with Environmental Engineer of SC.
- The Contractor will prepare and submit the Site-Specific Environmental Management Plan (SSEMP) to the CSC and PMU for approval at least ten (10) days prior to commencement of the physical works.

Implementation during O&M:

- The key players involved during operation of the proposed project will be Executive Engineer Irrigation Islamabad and Public Health Engineering Department, Punjab.

8.1.7.1.2 Reporting Mechanism

Progress reporting related to environmental activities will be responsibility of Supervision Consultant, Environmental Specialist. He will also be responsible for submitting monthly EMP compliance report for the project to the GM Operations TDCP.

GM Operations will in turn add his remarks / comments / feedback and submit the Report to EPA, Punjab in accordance with the frequency defined by them.

8.1.7.1.3 Non-Compliance of the EMP

The implementation of the proposed EMP involves inputs from various functionaries. Construction Contractor will be primarily responsible for ensuring implementation and reporting of the mitigation measures proposed in the EMP, which will be part of the contract documents. In addition, the Contractor will also need to prepare Site Specific Environmental Management Plan (SSEMP) and get it approved from SC / TDCP before start of any construction phase. The SSEMP will provide the risk rating for each construction activity and will provide mitigation measures to reduce activities with higher degree of risk. Various plans, and layout maps (construction camp layout plan) will also form part of SSEMP. The provision of the environmental mitigation cost will be made in the total cost of project, for which Construction Contractor will be paid on the basis of monthly compliance reports. However, if the Construction Contractor fails to comply with the implementation of EMP and submission of the monthly compliance reports, deductions will be made from the payments to the Construction Contractor claimed under the heads of environmental components.

8.1.8 Environmental Management and Monitoring Plan

Potential impacts and their mitigation measures are devised against the project activities to minimize their significance. Responsibilities for the collection and analysis of data as well as the reporting requirements have been outlined in Table 8-1. Implementation of environmental impact mitigation measures during construction is to avoid and reduce short- and long-term potential environmental impacts. Incorporation of environmental impact mitigation considerations into the tender and contract documents is a fundamental pre-requisite for effective implementation of the EMP.

Table 8-1: ENVIRONMENTAL MANAGEMENT PLAN (EMP)

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
A. Design & Planning Phase					
1.	Seismic Hazard	Failure of design	• At the detailed design stage, the safety of the proposed water conservation structures against the damages due to seismic activity need to be ensured. As such structural designs of proposed project need to follow the applicable criteria for the zone 3 recommended in the Building Code of Pakistan 2021.	Design Engineer	TDCP
2.	Land Acquisition	Land acquisition and resettlement	• TDCP and Land Revenue Department must ensure transparent compliance with Land Acquisition Act 1894. Maintain complete records for asset valuation and compensation. Address community grievances promptly to prevent unrest. Impact can be minimized to a low level. Establish Contractor camps on acquired land or lease land for facilities before construction. Contractors directly rent land from private owners.	Executing Agency	Executing Agency
B. Construction Phase					
1.	Impact on Air Quality	Air quality will be affected by fugitive dust emissions from excavating activities of construction machinery, material stockpiles & material transportation, dust from the unpaved surfaces and movement of construction vehicles, which can be very harmful for the site worker,	**Fugitive Dust Emissions** • The material being transported or stored at the stockpiles will be kept covered with plastic to ensure protection of ambient air from fugitive emission during windstorm emissions. • The contractor will monitor air quality on regular basis near the plant. • Preventive measures against dust should be adopted for unloading operations. Regular water	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
		local population and natural vegetation.	sprinkling of all excavation work the site should be carried out to suppress excessive dust emission(s); • Grading operation will be suspended when the wind speed exceeds 20 km /hr. • The plant should be located at least 500m away from any living area. • Enforce the maximum speed limit to 20km/h for vehicles using embankments and access road. • Road damage caused by project activities will be promptly attended to with proper road repair and maintenance work. • Proper Personal Protective Equipment (PPE) should be issued to the site worker and make sure the worker wears the PPE properly during working on site. **Smoke from Burning of Waste Material or Burning Firewood** • Clean and smoke free fuel will be used in the labour camp. • Cutting and burning trees or shrubs for fuel should be prohibited. • Gas Cylinders should be used in the labour camp for cooking purposes. **Vehicular and Generator Exhaust Emissions** • All vehicles during construction activities will be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions;		

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• Proper maintenance and repair of power generators and construction machinery will be ensured to minimize hazardous emissions. • Batching plant should be set up considering the wind direction so that the nearby communities are not affected by the emissions from batching plant. • PEQS / WHO applicable standards to gaseous emissions generated by construction vehicles, equipment and machinery will be enforced during construction works. • Best quality fuel and lubes will be purchased and where possible, lead free oil and lubes will be used.		
2.	Impact of Noise Pollution	The main sources for noise in the project area may be heavy machinery such as excavators, concrete mixing plant, stone crushers and other equipment.	• Vehicles and equipment used should be well fitted, as applicable, with silencers and properly maintained; that will reduce noise hazards according to permissible limits as fixed by EPA, Punjab (noise is 85 dB (A) while the WHO noise guidelines prescribed a limit of 55 dB (A). • Construction workers will be provided suitable hearing protection like ear cap, or earmuffs and will be trained about their usage. • Construction activities that are close to settlements will be stopped during night times if high noise values are observed. • Consultations will be held to discuss appropriate solutions and techniques to control noise (e.g. mud or brick walls, bushes, etc.). Such hearings consultations should also be regularly conducted to solicit public feedback, to avoid public inconvenience and suggestions for improvement in	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			working strategy / working environment and progress of project activities; and • In accordance with the environmental monitoring plan, noise measurements will be carried out on regular basis at locations and schedule specified to maintain the level within the PEQS / WHO standards and to ensure the effectiveness of mitigation measures.		
3.	Vibration impacts	Construction activities i.e. soil compaction, excavation, moving of heavy trucks have the potential to produce vibration levels that may be annoying or disturbing to humans and may cause damage to structures if appropriate precautions are not taken.	• Use of heavy machinery should be allowed in limited time only from 07.00 a.m. to 10.00 p.m. except for any emergency for which contractor should take prior approval; and • Low vibration level machinery should be used and a system of regular maintenance and repairs to be employed. • Where vibration could become a major consideration (within say 100m of schools, religious premises, hospitals or residences) a building condition survey should take place prior to construction. • The physical effect of piling should be assessed prior to construction and measures. • Should be discussed with the local population as well as timing of the works to serve as a vehicle for further public consultation at the implementation stage and to assist in public relations.	CC	SC
4.	Solid Waste Generation Incl. Spoil Material	Waste and Spoils will be generated from the camps and from excavation activities. Disposal of spoil / surplus material may cause	• All the solid waste from the camps will be properly collected at source by placing containers and disposed of through proper solid waste management system. The contractor will	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
		negative environmental impacts, if not properly mitigated during implementation of the proposed project.	coordinate with local representatives and administration of the concerned solid waste management department for the disposal of solid waste; • The contractor must develop a plan of action with the help of concerned solid waste management department for transporting the waste to the disposal site; • Toxic waste will be handled, stored, transported and disposed separately; • The waste will be properly sealed in containers with proper labels indicating the nature of the waste; and • Solid waste will be segregated at source so that it can be re-used or recycled. • Waste management plan will be developed to implement an efficient and responsive solid waste management system during construction phase. Recyclable wastes e.g. steel bars will be sold to waste vendors; • Reusable material will be used as a filling material during ground levelling; • Solid waste generated during construction will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan; and • The site will be restored back to its original condition after construction completion. • The spoil material from the excavation will be dumped at designated places. The dumping sites		

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			must be approved by environment specialist of the Construction Supervision Consultant (CSC). • The contractor will also ensure that no spoil material is disposed into stream/nullahs and into any other water body along the project site. • As far as possible barren/waste lands available will be used for disposal of the excavated waste material. • The spoil material shall be deposited in layers and properly rolled and sprinkled to avoid any negative environmental impacts. • Contractor will prepare and approve a spoil management plan, prior any disposal of spoil.		
5.	Resource Conservation	During the construction, overburden on local resources is possible if construction facilities such as workers camp and construction camp built near rural areas and can create problems for local communities.	• Use potable water bowsers for construction works and mineral water bottles/ ground water for drinking purposes; • Plan for the provision/purchase of adequate insulation to reduce heat loss through construction plants; • Reduction of wastage of water through training of workers involved in water use; • Reuse of construction waste materials may be adopted wherever possible; • Aggregates will not be sourced from river and stream beds. • Diesel and fuels with low sulphur content should be used to operate construction machinery and equipment; • Efficient and well -maintained equipment and machinery will be used;	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• The equipment and machinery will be turned off when not in use; • A good camp design and an efficient worksite management plan can help the contractor to reduce the water demand, wastewater and solid waste volumes to the lowest levels.		
6.	Soil Contamination	Surface soil has the potential to be contaminated by construction material, vehicle movements and various construction activities. Spillage of fuel, lubricants, cement and chemicals has the potential to result in contamination.	• The Contractor will be required to train its workforce in the storage and handling of materials like oils, diesel, petrol, other chemicals, concrete and cement, etc., that can potentially cause soil contamination. The Contractor will be required to prepare a training manual and module for all the construction related activities along with the schedule of training program and submit to the supervising consultants for approval. • Refuelling areas will have impervious concrete bases with appropriate drainage to prevent spills from contaminating the surrounding area. • During on-site maintenance of construction vehicles and equipment, tarpaulin or other impermeable material will be spread on the ground to prevent contamination of soil. • Oils, fuels and hazardous materials will be stored in appropriately bounded areas. Fuel tanks will have to be placed within sealed bunds capable of containing 120% of the total volume of the tank in case of leakage. • Regular inspections will be carried out to detect leakages from vehicles and construction machinery.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• Vehicles and/or equipment with leakage will not be used, until repaired. • Solid waste generated during construction and at camp sites will be properly treated and safely disposed of only in demarcated waste disposal sites. • The construction phase will consume lot of cement additives and oils and the empty containers will contain dangerous amount of chemicals inside, which can impact the humans as cancer producers. All such containers must not be sold to general public and must be destroyed and sent for recycle. This will be contractor's responsibility who must seek consultant's supervision. The people must be warned against use of empty chemical containers through local press and erecting banners in project area.		
7.	Soil erosion/ silt run-off	Phenomenon may pose serious environmental impacts like landslides, slumps, slips and other mass movements.	• All the freshly cut surfaces will be restored/stabilized as soon as possible; • Seeding or plantation of erodible surfaces will be done; • Construction activities will be planned in such a way so as to avoid cutting of erodible surfaces and earth movement in rainy season; • Along cross-drainage structures of the access road where embankments are more susceptible to erosion by water runoff stone pitching or a riprap will be provided across the embankment. • Proper monitoring of the soil erosion prone areas will be carried out during operation phase and soil	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			conservation measures (if needed) will be carried out like provision of physical structures e.g. retaining walls, etc.		
8.	Community Health and Safety	The communities residing in the project areas might be at risk from the proposed works since deep excavation works will take place along with movement of heavy machinery and vehicles transporting the raw materials and spoils etc. to and from the work sites.	• The Contractor will prepare the site-specific community health and safety plan in compliance with applicable national and international regulations and guidelines. • The Contractor will clearly barricade work areas to prevent access by the public, while ensuring passage by providing safe pathways for pedestrians around construction zones; • The Contractor will exclude parking, waiting vehicles and vendors from areas adjacent to the work by means of clearly marked barricades and posted signage; • The Contractor will remove excavated earth, spoil, rubble, cut vegetation and refuse whether generated by the project or discarded by third parties from areas within the construction zone, where it has potential to interfere with the public or generate dust; • The Contractor will provide temporary lighting to facilitate construction during night time; • The Contractor will remove hazardous conditions on construction sites that cannot be controlled effectively with site access restrictions and will barricade any excavations and materials placed near the public place (if applicable);	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• Hard Barricades will be provided at the excavation deeper than 1.5 meter as per "NZS 3845:1999 Road safety barrier systems"; • The Contractor will promptly reinstate any services and reinstall any physical facilities that are cut, disconnected or damaged during construction, and maintain or provide temporary services that are interrupted by construction. The Supervisory Consultant will inspect and certify the adequacy of all reinstated services and facilities; • Installation and maintenance of speed control and traffic calming devices at pedestrian crossing areas especially near the settlements; • An Emergency Preparedness and Response Plan (EPRP) in coordination with the local emergency responders to provide timely first aid response in the event of accidents and hazardous materials response in the event of spills; • Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work sites; • Timely public notification on planned construction works; • Close consultation with local communities to identify optimal solutions for diversions to maintain community integrity and social links; • Any environmental condition that is disagreeable to the public and causes an avoidable nuisance can be addressed with additional provisions over and		

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			above those described above, as determined necessary by the supervisory consultant. • These requirements will be incorporated into the bidding specification and contract documents, and will be binding on the contractor, at risk of penalty for noncompliance, as charges to be recovered from contractor for unsafe act or condition.		
9.	Occupational Health and Safety	Occupational Health and Safety (OHS) related impacts will arise during construction stage activities including clearing of earth, levelling, compaction, foundations, finishing, testing & commissioning.	• All suggested project-specific health and safety plans would include appropriate training and supervision of employees and enforcement of workplace safety policies. • All processes and equipment will be designed and constructed for safe operation. • A process of safety management program will be developed and implemented to identify hazards associated with each applicable chemical. • All project related staff will be provided with the required personal PPE and shall be trained to make sure that they are aware of the usefulness and correct use. • Working at heights and in confined spaces should be done after obtaining approvals from the safety supervisors and should regularly be monitored. • Emergency preparedness and response plan and emergency escape routes shall be identified and all the workers will be made aware of them. • Use of correct signage for better understanding of all the health safety instructions and precautions for the workers. Signage will be in languages appropriate to the workforce employed.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
10.	Traffic Management	During construction activities, large number of light and heavy vehicles is expected to use the community roads. Similarly, heavy machinery will be stationed in and adjoining areas of the project site.	• Construction traffic hindrance should be avoided by providing proper diversion and signage. • Traffic management plan will be prepared by the contractor after consultation with RE for its implementation. • GRM will be put in place to address community grievances in this regard.	CC	SC
11.	Communicable diseases	The laborers in the Contractor Camp, truck drivers and like personnel who interact with each other have the potential for the spread of HIV/AIDS if the incidence exists.	• Arrange to run an active campaign, in the labour camp, to make people aware of the cause, mode of transmission and consequences of HIV/AIDS; • Latest / Updated SOPs by WHO, national and provincial Government related to the construction industry to control spreading of COVID-19, should be implemented by the contractor and should be strictly monitored; • Strengthen the existing local health & medical services for the benefit of labour as well as the surrounding villages; • Ensure cleanliness and hygienic conditions at the labour camp by ensuring proper drainage and suitable disposal of solid waste. Inoculation against Cholera will be arranged at intervals recommended by the Health Department; • Locating a labour camp at least away from the villages (local settlement), and • Keep all the camps, offices, material depots, machinery yards and work sites open for the inspection of health and safety measures and related documents.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
12.	Ecological Impacts (Loss of Vegetation and Deforestation)	The construction of the Kotli Sattian Chairlift Project will require tree removal in the Kotli Sattian Reserved Forest, affecting ecologically significant species like Chir Pine, Blue Pine, Oaks, Wild Chestnuts, and Walnut, which play vital roles in biodiversity, erosion control, and habitat provision, making the impact highly significant.	• As the project area falls within the Kotli Sattian Reserved Forest, it is necessary to obtain a No Objection Certificate (NOC) from Forest Department before commencing any work. • Tree cutting due to project intervention is not expected. However, ten saplings will be replanted in case a tree is cut elsewhere in the forest as part of the Forest Department's replantation program. Additionally, efforts should be made to plant indigenous species to restore the biodiversity of the forest. • The construction plan should avoid areas of critical ecological importance, such as habitats of endangered species or areas of dense vegetation, whenever possible. • Environmental surveys should be conducted prior to construction to identify vulnerable plant species and critical habitats. This will allow for targeted mitigation strategies to protect these areas. • Campsites and Elevated Ground Storage Tanks (EGST) will be established on waste/barren land rather than on forested or agriculturally productive land. However, if such type of land is not available, it will be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to trees and undergrowth or agricultural area. • Construction vehicles, machinery and equipment will remain confined within their designated areas of movement.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• The Contractor's staff and labour will be strictly directed not to damage any vegetation such as small trees or bushes. They will use the paths and tracks for movement and will not be allowed to trespass through farmlands. • Contractor will provide gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel will not be allowed. • The compaction of trenches should also be done properly. Inadequate compaction of trenches will result in flow of soil during rainy season resulting in increased soil erosion • As far as possible digging in the cultivated land should be done when the land is barren to avoid damage to agricultural crops. • Open fires should be banned in the area to avoid hazards of fire in the project area. • Ten trees will be replanted for each tree cut as per EPA, Punjab rule.		
13.	Fauna	The accidental striking of all terrestrial fauna by project vehicles or equipment/machinery Avifauna may be disturbed due to sensory disturbance from construction equipment; movement of vehicles and crew personnel; location and operation of camps	**Mammals and Reptiles** • As the project area falls within the Kotli National Park, it is necessary to obtain a No Objection Certificate (NOC) from Wildlife Department before commencing any work. • Hunting, poaching and harassing of wild animals will be strictly prohibited and Contractor will warn their labour accordingly. • Noise generating activities will be avoided during the night.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• The camps will be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly, wastes of the camps will be properly disposed off to prevent the chances of eating by wild animals, which may become hazardous to them. • Vehicles will be maintained in good condition and provided with mufflers to reduce noise. **Birds-Avian Fauna** • As the project area falls within the Kotli National Park, it is necessary to obtain a No Objection Certificate (NOC) from Wildlife Department before commencing any work. • Special measures will be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding. • The contractor should be committed to ensuring the conservation and protection of wildlife within the project area. To achieve this goal, a strict "No Hunting" policy shall be implemented and enforced among all workers and personnel involved in the project. • Staff working on the project should be given clear orders, not to shoot, snare or trap any bird.		
14.	Use of local water resources	Burden on local water resources and possible social conflicts.	• Availability of water for camp site facilities and construction purposes will be ensured by the contractor prior to start of construction activities. As per Local Government Act, the contractor will seek	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			approval from the Local Government for exploitation of the water resources. • Contractor will ensure that the water availability of the existing local users remains unimpeded by the project interventions. The contractor will make arrangements for the availability of drinking water at site. The contractor will arrange for the water required for construction works on his own. For this purpose, he will install hand pumps/tube wells accordingly. • The Contractor will be required to act as a go-between closely with local communities to ensure that any potential conflicts related to common resource utilization for project purposes are resolved quickly. • The contractor will prepare guidelines for the workers for minimizing the wastage of water during construction activities and at campsites.		
15.	Contamination of Water Resources	The water resources, may get polluted from may get polluted from hazardous construction materials, wastewater effluent, solid waste, silt from construction and soil erosion, etc.	• Camps will be located at least 500 m away from the nearest local settlement to prevent the contamination of hill torrents, etc. • Wastewater effluent from contractors' workshops and equipment washing-yards will be passed through an oil skimmer and to gravel/sand beds to remove oil/grease contaminants before discharging it into natural streams. Similarly, the wastewater effluent from the campsite will be treated before disposal into a stream. • Borrow pits and natural depressions lined with impervious liners will be used to dispose of scraped	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			obnoxious material, and then covered with soil. Cost will be added in Contractor's BOQs. • Fuels, lubricants and other hazardous material will have to be properly stored in adequate containers in sites equipped with retaining structures, including oil skimmers for the treatment of contaminated runoff water. • Repair and maintenance work on machines and vehicles will only be done in specific places designed and equipped for this purpose (oil skimmer). These must be at a safe distance from the stream/nullah. No washing of vehicles will be done in or near the stream/nullah. • Water contaminated with concrete will have to be collected in sedimentation ponds and, if required, will have to neutralized before being discharged to the natural streams/Wetlands. Contamination of the springs/nullah with concrete or cement must be avoided. • Sewage water from the camp will have to be collected and treated in a suitable septic tank before being released into the streams. • Generally, waste should be reduced, re-used, recycled and the disposal has to be controlled. • Contractor will have to get water quality testing of project sites at the start of construction and biannual basis as per PEQS.		
16.	Social and Cultural Conflicts	During the construction phase of the proposed project, conflicts may	• Local labour especially from nearby communities should be given preference for the construction works;	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
		arise between labor force and local community.	• Careful planning and training of work force to minimize disturbance to the local people; • Public notification through print or electronic media during the entire construction phase to avoid any inconvenience in accessibility to the locals; and • Adequate training especially for the transitive workforce of the station (involved both in the construction process and in the commissioning) to regard the customs of the area so that the locals do not feel insecure.		
17.	Religious and Cultural Heritage	No graveyard will be disrupted due to this project. No historical or archaeological site has been observed or reported along the project area.	• If any graves affected by the project, they will have to be shifted. The proponent will obtain Fatwa from local Mufti before shifting the graves. During such operation the proponent will inform local administration and seek their assistance for security. The request will also be extended to Health Department for deputation of medical and paramedical staff during the operation. • Contractor will follow the prayer timing particularly at prayer of Juma and the workforce will observe the sanctity of religious properties. • Contractor will be required to instruct the construction crews and site supervisors in respect of archaeological site recognition, conservation procedures, and temporary site protection. • In case of a chance finding during excavation, the contractor will protect the site and notify the Engineer who will inform Department of Archaeology & Museums through TDCP and hand	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			over such sites to the department if instructed by Engineer /TDCP.		

Table 8-2: Environmental Management Plan (Operation Phase)

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility
C. Operation Phase				
1.	Visual and Aesthetic Impact	Chairlift towers, cables, and stations may alter the natural landscape, reducing Kotli Sattian's scenic appeal for tourists.	• The design of the chairlift infrastructure should incorporate natural colors and materials to blend with the surrounding environment. • Landscape screening, such as planting native trees and shrubs around key infrastructure points, should be used to minimize visual intrusion. • Careful siting of towers and stations to avoid disturbing the most scenic viewpoints of the area.	EA Staff
2.	Wildlife Disruption	Chairlift noise and tourist presence may disturb wildlife, affecting feeding, breeding, and migration	• Implement noise reduction measures for the chairlift system to minimize disturbances to wildlife. • Install wildlife monitoring systems to observe impacts on animal movements and behaviors. • Develop wildlife corridors or buffer zones to provide undisturbed areas for animals. • Limit the operational hours of the chairlift during critical wildlife breeding or migration periods.	EA Staff
3.	Increased Human-Wildlife Interaction	More tourists may lead to increased human-wildlife encounters, disturbing animals and causing habituation	• Educate tourists on how to behave responsibly around wildlife, including not feeding animals and maintaining a respectful distance. • Employ park rangers to monitor wildlife interactions and guide tourists accordingly.	EA Staff

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility
			• Set up clear boundaries and guidelines for tourists, ensuring they stay on designated paths and viewing areas.	
4.	Waste Generation and Pollution	Higher tourist numbers may increase litter and pollution, degrading the environment and threatening wildlife	• Provide ample waste disposal bins throughout the site and encourage visitors to use them. • Implement a waste management system, including recycling stations and waste segregation. • Educate tourists on responsible waste disposal practices. • Conduct regular clean-up drives to maintain the cleanliness of the area.	EA Staff
5.	Noise Pollution from Operational Machinery	Continuous noise from the moving chairlift system may disturb wildlife and local communities.	• Ensure that the chairlift system operates with minimal noise by maintaining equipment regularly and using noise-reducing technology. • Limit operations during early mornings or late evenings to avoid disturbing both wildlife and nearby residents. • Regularly monitor noise levels and adjust operational procedures to stay within acceptable thresholds.	EA Staff
6.	Traffic Congestion and Increased Human Activity	The chairlift may attract more visitors, leading to traffic congestion near stations.	• Develop adequate transportation infrastructure to manage the increased number of visitors, including parking areas and shuttle services from nearby towns. • Implement traffic management strategies to minimize congestion and ensure smooth visitor flow, including the use of traffic control personnel during peak times. • Encourage visitors to use public transportation or carpool to reduce the impact of personal vehicle traffic.	EA Staff

Key: CC=Construction Contractor, DC=Design Consultant, EA=Executing Agency, SC=Supervision Consultant, PD = Project Director

8.1.9 Planning for Implementation of EMP

NOC and Other Approvals

8.1.9.1 EPA, Punjab Approval Process

The TDCP will obtain No Objection Certificate (NOC) from the EPA, Punjab that is mandatory requirement before project commencement.

8.1.9.2 Stakeholder Coordination

Notwithstanding the efforts so far put in for public participation, this activity will have to be pursued through the forthcoming implementation phases of the project. In particular, the focus will be on the improvement and modification of the proposed intervention designs.

Participation mechanisms facilitate the consultative process and include information sharing and dissemination, disclosure, and participation of affected people and other stakeholders in the project related activities. In the peculiar social set-up of the Project Area, it is also important to involve the religious leaders as representatives of the public as well as part of effective communication process. They can provide a very effective medium to bring information to the affected male population through Friday prayers. Local business community, specially the affected one, should also be brought into the process of awareness and participation.

The related institutional arrangements should also be in place for continuous consultation throughout the process of planning, implementation and liaison with key stakeholders through continuous process of information disclosure, consultation and participation.

8.2 Training

In order to raise the level of professional and managerial staff, there is a need to upgrade their knowledge in the related areas. An environmental and social training program is to be carried out before the implementation of the project. Contractor's environmental awareness and appropriate knowledge of environmental protection is critical to the successful implementation of the EMP because without appropriate environmental awareness, knowledge and skills required for the implementation of the mitigation measures, it would be difficult for the Contractor(s) workforce to implement effective environmental protection measures. A suitable training program is proposed to train the Contractor(s) staff who will be involved in the Construction Phase and the professional staff from the proponent involved at the operational stage of the project.

Contractor's environmental awareness and appropriate knowledge of environmental protection is critical to the successful implementation of the EMP because without appropriate environmental awareness, knowledge and skills required for the implementation of the mitigation measures, it would be difficult for the Contractor(s) workforce to implement effective environmental protection measures. A suitable training program is proposed to train the Contractor(s) staff who will be involved in the Construction Phase and the professional staff from the proponent involved at the operational stage of the project.

The training consultant will organize training courses for Proponent and Contractor staff to train them in specialized areas such as air and noise pollution monitoring and water quality monitoring etc. The details of this training program are presented in Table 8-3.

Table 8-3: Personnel Training Program

Training Provided by	Contents	Trainees	Duration
supervision / training consultants/ organizations specializing in environmental management and monitoring	Short seminars and courses on: Environmental laws and regulations, daily monitoring and supervision	• TDCP Staff • Contractor • project staff • Project Implementation Staff	1 day
Training consultants/ organizations specializing in social management and monitoring	Short seminars and courses on: Social awareness	• Project staff dealing • in Social/lands • matters	1 day
Training consultants/ organizations specializing in Occupational, health and safety issues	Short lectures relating to Occupational Safety and Health	• Contractor's staff	2 days

8.3 Communication & Documentation

Communication and documentation are an essential feature of EMP. The key features of such mechanism are:

8.3.1 Data Recording and Maintenance

All forms to be used for recording information during the environmental monitoring will follow a standard format which will correspond to the data base in to which all the gathered information will be placed. Check boxes will be used as much as possible to facilitate data entry. Tracking system will be developed for each form.

8.3.1.1 Database

The database may include the following information:

- Training programs;
- Staff deployment;
- Non-compliance;
- Corrective actions
- List of environmental data and

- List of environmental data to be maintained:
- Soil and land pollution
- Disposal of excavated silt and earth
- Disposal of waste
- Water resource
- Fuel oil and chemical spills
- Vegetation record
- Noise pollution
- Air and dust pollution
- Socio-economic data

8.3.2 Meetings

The following environmental meetings during the project will take place. Primary meeting for setting out the requisite end frame sounding for the regular meetings. Scheduled meetings between Contractor and Supervising Consultants.

The purpose of the meeting will be to discuss the conduct of the operation, non – compliances noted by the consultant's environmental team and measures for their remedy. The meeting will be recorded in the form of a daily/monthly environmental report.

8.3.3 Social Complaint Register

The Supervising Consultant (SC) and TDCP will maintain a register of complaints record from local communities and measures taken to mitigate these concerns.

8.3.4 Photographic Records

Contractors, SC and TDCP will maintain photographic records during the implementation of the project. As a minimum, the photographic records will include the site photographs, all the roads, camp sites and monitoring activities etc.

8.4 Grievance Redressal Mechanism

The Grievance Redress Mechanism (GRM), outlines the policy and procedure for documenting, addressing, responding and employing methods to resolve project grievances (and complaints) that may be raised by displaced persons (APs) or community members arising from environmental and social performance, the engagement process, land acquisition and resettlement and/or unanticipated environmental or social impacts resulting from project activities that are performed and/or undertaken by Client. The document describes the scope and procedural steps and specifies roles and responsibilities of the parties involved. The purpose of the GRM is to receive, review and resolve grievances from APs and ensure smooth and fair implementation of subproject activities.

8.4.1 Principles

A GRM is proposed to address any complaints or grievances arising during the implementation period of the projects undertaken by the Client. Members of the public may perceive risks to themselves or their property or their legal rights or have concerns about the possible adverse

environmental and social impact that a project may have. Any concerns or grievances should be addressed quickly and transparently, and without retribution to the AP or complainant.

The primary principle is that any complaints or grievances are resolved as quickly as possible in a fair and transparent manner.

8.4.2 Objectives

The objectives of the GRM are to:

- Develop an organizational framework to address and resolve the grievances of individual(s) or community(s), fairly and equitably;
- Provide enhanced level of satisfaction to the aggrieved;
- Provide easy accessibility to the aggrieved/affected individual or community for immediate grievance redress;
- Ensure that the targeted communities and individuals are treated fairly at all times;
- Identify systemic flaws in the operational functions of the project and suggest corrective measures; and
- Ensure that the operation of the project is in line with its conception and transparently to achieve the goals for sustainability of the project.

8.4.3 Structure of Grievance Redress Mechanism

The project shall have multi-tier GRM with designated staff responsibilities at each level. These levels comprise the following:

8.4.4 Affected Person Committee (APC)

For effective coordination in the field with APs and community, APCs of each village will be established to maintain a close rapport with affected persons and local community throughout project implementation. The APC will act as coordinator among the Client, the APs and local community for coordination and information dissemination to keep them informed about day-to-day development on the project, particularly about the grievance resolution progress. The Sociologist (Client), Social/Community Organizer & Environment Specialist of supervision consultant (Design team) will coordinate with the affected persons for constitution of APC at the village level comprising of at least five members with one as committee convener. The APC at village level will provide a platform for APs to raise and discuss their concerns, resolve petty issues at the village level with PMO. The project safeguards and engineering staff will coordinate with APs and village level committees to review and resolve the issue or concern related to LAR planning or implementation & environmental concerns preferably within 15 days from receipt of the grievance. The APC can comprise of the following members;

- Social/Community Organizer of Support Consultants (DC) (male/female);
- Female member, if possible (if there are many female APs losing their land)
- Two male members (From APs); and
- Environment Specialist of SC (Design Team)
- Project Level Committee

The Project level committee shall constitute a Grievance Redress Committee (GRC) at project level. The committee will have following composition:

- Project Director, as head/ convener of GRC;
- Social Development & Gender Specialist, Consultant Member / Secretary;
- Representative of the Revenue Department Member;
- Representative of the Law Department Member; if required and
- Representative of the Environment Department Member.

This GRC of project level, through authorized representative, will acknowledge the complainant about his complaint, scrutinize the record of the GRC, investigate the remedies available and request the complainant to produce any record in favour of his claim. After thorough review and scrutiny of the available record on complaint, visit the field and collect additional information, if required. Once the investigations are completed, the GRC-project level shall give decision within 30 days of receipt of the complaint. If the complainant is still dissatisfied with the decision, he can go to the court of law, if he/she wishes so. Organogram of the GRM is shown in Figure 8-1.

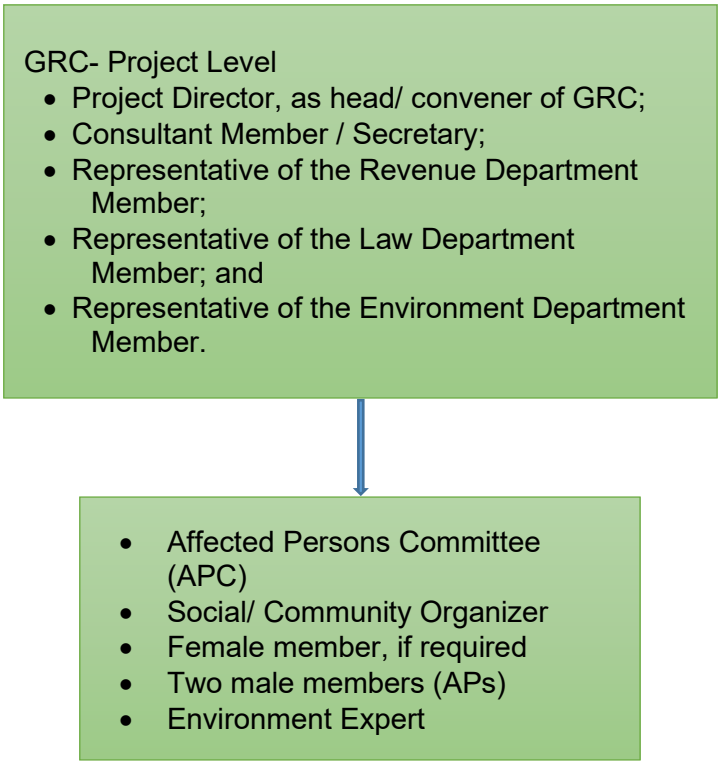


Figure 8-1: Organogram for GRM

8.4.5 Grievance Redress Procedure

Disputes on land title, land compensation awarded and payable under law and apportionment of compensation will be dealt under the grievance redress mechanism provided in the LAA-1894. Any complaint received will be registered in the GRM and the APs will be clarified on the process and supported to access the legal course. All other issues will be resolved through the project-based GRM. Community complaints and grievances will be addressed through two different processes as described in the following Table-8-4.

Table 8-4: Grievance Redressal Process

Land/Crop Compensation Issues	Project/ Other Issues (Including Environmental)
a. First, complaint resolution will be attempted at site (village level) through the involvement of the PMO/APC. b. If unsettled, grievance can then be lodged to the GRC or BOR/LAC to proceed under law and communicate decision in least possible time. c. GRC will acknowledge the complaint within 5 days of complaint and after initial review and consultation with the LAC, within 15 days of receipt of complaint, the GRC will clarify the legal course of action and guide aggrieved persons to approach appropriate legal forum. PMO will coordinate with the land administration authorities including District Collector and LAC to request early resolution of the issue/complaint. d. In case the grievance pertains to awarded compensation, PMO will clarify with the APs the process as set out in Section 18 to 22 of the LAA.	a. First, complaints resolution will be attempted at site (village level) through the involvement of the PMO/DPC. b. If unresolved, a grievance will be lodged to the GRC, which will acknowledge receipt of the complaint within 5 days. c. The GRC will conduct fact finding in 15 days of receipt of complaint and after review of fact findings reports and hearing the DPs in person will conclude its recommendations in 30 days of receipt of complaint. In case GRC could not decide in stipulated time, the reasons if any will be recorded and the grievance will be resolved in next 30 days. d. If the complainant is not satisfied, he can pursue further by submitting to the appropriate court of law.

8.5 Environmental Management Costs

The Table 8-5 below provides cost estimates for 'Pre-Construction phase' monitoring while Table 8-6 provides cost estimates for 'Construction phase' monitoring of key environmental parameters.

The costs associated with implementation of the EMP and the necessary mitigation measures are provided as Table 8-7 below. The Table 8-8 below provides the cost for capacity development and training programme for project contractors for the proposed sub-projects.

Table 8-5: Cost Estimates for 'Pre-Construction Phase' Environmental Monitoring

Monitoring Component	Parameters	Quantity	Amount PKR	Details
Air Quality[8]	CO, NO2, SO2, O3 PM10, PM2.5	2 (Once only at two random sensitive receptor locations in project area)	110,000	2 readings @ PKR 55,000 per sample
Noise Levels[9]	dB(A)	2 (Once only at two random sensitive receptor locations in project area)	12,000	2 readings @ PKR 6,000 per reading
Groundwater Quality	PEQS /NEQS	2 (Once only at two random	29,000	2 readings @ PKR 14,500 per sample

[8] For air quality monitoring: 'Passive samplers' such as test tubes can be used or 'Active samplers' with sorbent tubes can also be used

[9] For noise monitoring: sampling equipment with duration greater than 1 hour can be used.

Monitoring Component	Parameters	Quantity	Amount PKR	Details
		sensitive receptor locations in project area)		
Surface water Quality	PEQS /NEQS	2 (At each of the sub-project locations)	27,600	2 readings @ PKR 13,800 per sample
Contingencies			8,930	5% of monitoring cost
Total (PKR)			**187,530**	

Table 8-6: Cost Estimates for 'Construction Phase' Environmental Monitoring

Monitoring Component	Parameters	Quantity	Amount PKR	Details
Surface water Quality	NEQS / WHO	16 [Quarterly basis at 2 locations (Up Stream and Down Stream of project site)]	220,800	16 readings @ PKR 13,800 per sample
Ground water quality	NEQS / WHO	16 (Quarterly basis at 2 locations)	232,000	16 readings @ PKR 14,500 per sample
Air Quality	CO, NO_2, PM_{10}, $PM_{2.5}$	16 (Quarterly basis at 2 locations)	880,000	16 readings @ PKR 55,000 per sample
Noise Levels	dB(A)	16 (Quarterly basis at 2 locations)	96,000	16 readings @ PKR 6,000 per reading
Total				**1,428,800**
Contingencies			71,440	5% of monitoring cost
Total (PKR)			**1,500,240**	

*Subject to monitoring requirements of EPAs as per conditions of Environmental Approval for construction phase.

Table 8-7: Estimated Costs for EMP Implementation

Item	Sub-Item	Estimated Total Cost (PKR)
Contractor Environment Specialist	2 persons for 24 months (@ 100,000 per month)	4,800,000
Monitoring Activities	Provided separately in Tables 8.6 and 8.7.	-
(i) Water sprinkling	To suppress dust emissions	2,400,000
(ii) Solid waste collection & disposal (including hazardous waste)	From construction sites (based on initial estimates)	4,800,000
(iii) HSE & Staffing	PPEs	2,000,000
Total		**14,000,000**
Contingencies	5% of EMP implementation cost	700,000
Total Estimated Cost (PKR)		**14,700,000**

Table 8-8: Cost of Capacity Development and Training Programme for Project Contractor(s)

Provided by	Organized by	Contents	No. of training events	Duration	Cost (PKR)
Pre-construction Phase Monitoring Consultants / Organizations offering specialized services in environmental management and monitoring	CSC & PMU	Short seminars and courses on: Environmental Management Plan and Environmental Monitoring Plan	Six seminars for Contractor management staff and project staff	1 day	300,000
Construction Phase Monitoring Consultants / Organizations offering specialized services in environmental management and monitoring	CSC & PMU	Short seminars on Environmental risks associated with construction phase. Development of Environmental Performance Indicators Occupational Health and Safety (OHS) issues	Six seminars for Contractor management staff and project staff dealing in environment and social issues	1 day	300,000
Total			**600,000 (PKR 0.6 million)**		

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusion

The Environmental Impact Assessment (EIA) determines that while the proposed project is located in a highly sensitive ecological zone namely the Kotli Sattian Reserved Forest and Murree-Kotli Sattian-Kahuta National Park the environmental impacts expected from the project are not irreversible or unmanageable. These impacts are largely associated with the construction phase, which typically involves earthworks, vegetation clearance, transportation of materials, waste generation, and human activity that may disturb local ecosystems, biodiversity, and community settings.

The impact assessment was carried out using a combination of field data (primary data), departmental inputs, and published sources (secondary data) to ensure a holistic understanding of the project area's environmental and social context. Based on this, a comprehensive Environmental Management Plan (EMP) has been formulated. This EMP lays out specific mitigation and monitoring measures to reduce, control, or offset adverse environmental effects. Key areas of focus include:

- Excavation impacts such as erosion, slope instability, and habitat disturbance.
- Waste disposal management to prevent land and water contamination.
- Biodiversity conservation, particularly concerning flora and fauna sensitive to construction disturbance.
- Health and safety protocols to safeguard workers and nearby communities from accidents and pollution exposure.

The Contractor is contractually obligated to implement these measures, but will be supervised by the Construction Supervision Consultant (CSC), ensuring technical oversight, and under the policy-level guidance of the Tourism Development Corporation of Punjab (TDCP), which is responsible for overall project compliance and coordination.

Before actual physical construction begins, the general EMP must be translated into Site-Specific Environmental Management Plans (SSEMPs). These detailed documents should include customized mitigation and monitoring actions based on the exact conditions of each work site, such as the location of spoil disposal sites, sensitive habitats, community access points, and risk-prone areas.

Due to the project's setting in an Environmentally Sensitive Area, it is legally classified under Category I (Schedule-II) of the Pakistan Environmental Protection Agency (Pak-EPA) regulations. This designation means the project cannot proceed without acquiring No Objection Certificates (NOCs) from relevant authorities, particularly the Forest Department (for tree cutting, habitat disturbance) and the Wildlife Department (for impacts on protected species and habitats). Other sectoral clearances may also be required, such as for solid waste disposal and construction camp establishment.

In conclusion, as long as the EMP is implemented effectively, SSEMPs are prepared and followed diligently, and regulatory requirements (including NOCs) are fulfilled, the project's environmental risks can be adequately mitigated. The impacts are localized and temporary and do not pose long-term environmental threats if managed responsibly.

9.2 Recommendations

Based on the findings of this EIA report, following recommendations have been formalized for smooth functioning of proposed project:

- TDCP shall obtain statutory clearances from EPA Punjab prior to award of contract and ensure conditions/requirements are incorporated in the project design and documents;
- Upon mobilization of the contractors, PMU to provide a safeguards orientation as per EIA and project administration manual;
- Biodiversity Action Plan (BAP) and Biodiversity Management Plan (BMP) must be developed before site clearance to ensure ecological protection
- Contractor to appoint environmental and social safeguards, responsible for environmental compliance, occupational health and safety and core labour standards.
- The templates for different management plans are attached as annexures. However, detailed plans shall be developed by the contractor before mobilization of construction teams.
- SSEMPs shall be developed and implemented by the contractor during the construction phase. PMU will supervise the implementation status through CSC.
- Prior approval of commencement of work shall be obtained by the TDCP from Forest and Wildlife Department.
- Prior approval for setting up of construction camps shall be obtained by the Ccontractor from PMU, TDCP.
- Employment opportunities shall be given to local community as per plans discussed in the EIA report.

.

.

ANNEXURE

Annexure 1: Attendance Sheets

Phofandi

Chairlift project Phofandi

Annex : List of Consultation Participants of village پھوفندی

3
1/25

Sr. No.	Name	Father's Name	Occupation
1	Azkar ul Haq 0336-3303163	Raja M. Arif Phofandi	Shopkeeper
2	Ikram ul Haq	Raja M. Arif	Son in job
3	Adnan Rafeeb	M. Rafeeb	Business
4	Abdul Hassan	Ikram ul Haq	Student

Annexure 2: Environmental Monitoring Reports

Ambient Air Quality Monitoring Results

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

PGG/IMS/FF/063	Rev.#02	Rev date: 04-09-23

EPA Certified

TEST REPORT

Ref #: PGG/LAB/2024-0916/AA

Issue date: 06-Feb-24

Name of Industry/Client:	M/s Rehman Habib Consultants Pvt. Ltd
Name of Project:	Environmental Monitoring, testing, and reporting for feasibility Study of Kotli Sattian and Santh Ni Khuri Dams in Tehsil Kotli Sattian (District Development Package)
Nature of Monitoring:	Ambient Air
Monitoring Instrument:	AQMS
Monitoring Location:	Point-01: Chalawra
Monitoring Coordinates:	N 33.870639° E 73.531004°
Monitoring Duration:	24 hours
Monitoring Date:	27-Jan-24 to 28-Jan-24

Results:

Parameters	CO	NO	NO_2	SO_2	PM_{10}	$PM_{2.5}$
	mg/m³	µg/m³	µg/m³	µg/m³	ug/m³	ug/m³
Methodology	Non-Dispersive Infrared Absorption (NDIR)	Reduced Pressure Chemiluminescence (CLD)	Reduced Pressure Chemilumine scence (CLD)	UV fluorescence (UVF)	Integrated Sampling Technique	Integrated Sampling Technique
Result (24-hour Average)	0.70	1.54	17.39	8.29	70.3	27.6
NEQS for Ambient Air	5 (8 hour)	40 (24 hour)	80 (24 hour)	120 (24 hour)	150 (24 hour)	35 (24 hour)

End of Report

PEQS: Punjab Environmental Quality Standards

Remarks: All Parameters are in compliance with PEQS Limit.

Terms & Conditions:

- Analysis was conducted on the request of project proponent for IEE/EIA Baseline Study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The report is not valid for any negotiations.
- Dually calibrated instruments were used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge

Pak Green Enviro-Engineering (Pvt.) Ltd. 46-M, Gulberg-III, Lahore, Pakistan

Page 1 of 1

PNAC LAB 180 17025

info@pakgreen.pk pakgreen@hotmail.com www.pakgreen.pk

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

PGG/IMS/FF/063	Rev.#02	Rev date: 04-09-23

EPA Certified

TEST REPORT

Ref #: PGG/LAB/2024-0917/AA **Issue date:** 06-Feb-24

Name of Industry/Client: M/s Rehman Habib Consultants Pvt. Ltd
Name of Project: Environmental Monitoring, testing, and reporting for feasibility Study of Kotli Sattian and Santh Ni Khuri Dams in Tehsil Kotli Sattian (District Development Package)
Nature of Monitoring: Ambient Air
Monitoring Instrument: AQMS
Monitoring Location: Point-02 Balawra
Monitoring Coordinates: N 33.829037° E 73.530123°
Monitoring Duration: 24 hours
Monitoring Date: 28-Jan-24 to 29-Jan-24

Results:

Parameters	CO	NO	NO_2	SO_2	PM_{10}	$PM_{2.5}$
	mg/m³	µg/m³	µg/m³	µg/m³	ug/m³	ug/m³
Methodology	Non-Dispersive Infrared Absorption (NDIR)	Reduced Pressure Chemiluminescence (CLD)	Reduced Pressure Chemilumine scence (CLD)	UV fluorescence (UVF)	Integrated Sampling Technique	Integrated Sampling Technique
Result (24-hour Average)	1.25	4.50	19.93	21.54	76.2	32.4
NEQS for Ambient Air	5 (8 hour)	40 (24 hour)	80 (24 hour)	120 (24 hour)	150 (24 hour)	35 (24 hour)

End of Report

PEQS: Punjab Environmental Quality Standards
Remarks: All Parameter are in compliance with PEQS Limit.
Terms & Conditions:

- Analysis was conducted on the request of project proponent for IEE/EIA Baseline Study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The report is not valid for any negotiations.
- Dually calibrated instruments were used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge

Pak Green Enviro-Engineering (Pvt) Ltd. 46-M, Gulberg III, Lahore. Pakistan

Page 1 of 1

PNAC LAB 180 17025

info@pakgreen.pk pakgreen@hotmail.com www.pakgreen.pk

Noise Level Results

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.
ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018
Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

PGG/IMS/FF/063	Rev.#02	Rev date: 04-09-23

TEST REPORT

Ref #: PGG/LAB/2024-0919/NL

Issue date: 06-Feb-24

Name of Industry/Client:	M/s Rehman Habib Consultants Pvt. Ltd
Name of Project:	Environmental Monitoring, testing, and reporting for feasibility Study of Kotli Sattian and Santh Ni Khuri Dams in Tehsil Kotli Sattian (District Development Package)
Nature of Monitoring:	Noise Level
Monitoring Location:	Point-01: Chalawra
Monitoring Coordinates:	N 33.870639°, E 73.531004°
Monitoring Instrument:	Noise Meter Land Tek SL 5868-P
Monitoring Duration:	24 hours
Monitoring Date:	27-Jan-24 to 28-Jan-24

Results:

Sr. No.	Day Time	Equivalent Noise dB (A)
1.	7:00 AM	45.1
2.	8:00 AM	46.5
3.	9:00 AM	50.2
4.	10:00 AM	52.3
5.	11:00 AM	54.1
6.	12:00 PM	51.4
7.	1:00 PM	50.4
8.	2:00 PM	55.3
9.	3:00 PM	52.2
10.	4:00 PM	57.0
11.	5:00 PM	54.2
12.	6:00 PM	51.6
13.	7:00 PM	53.3
14.	8:00 PM	55.1
15.	9:00 PM	52.5
16.	10:00 PM	48.2
Average		52.2

Sr. No.	Night Time	Equivalent Noise dB (A)
17.	11:00 PM	35.4
18.	12:00 AM	37.5
19.	1:00 AM	41.4
20.	2:00 AM	36.3
21.	3:00 AM	44.6
22.	4:00 AM	42.1
23.	5:00 AM	43.7
24.	6:00 AM	45.4
Average		40.8

End of Report

Pak Green Enviro-Engineering 46-M, Gulberg-III, Lahore Pakistan

PNAC LAB 180 17025

info@pakgreen.pk pakgreen@hotmail.com www.pakgreen.pk

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.
ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018
Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

PGG/IMS/FF/063	Rev.#02	Rev date: 04-09-23

Ref #: PGG/LAB/2024-0919/NL **Issue date: 06-Feb-24**

PEQS: Punjab Environmental Quality Standards

Sr. No.	Category of area/Zone	Units	Day Time	Night Time
1.	Residential Area (C)	dB (A) Leq	60	50

Terms & Conditions:

- Analysis was conducted on the request of project proponent for IEE/EIA Baseline Study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The report is not valid for any negotiations.
- Dually calibrated instruments were used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge

Pak Green Enviro-Engineering (Pvt) Ltd. 46-M Gulberg III Lahore Pakistan

info@pakgreen.pk pakgreen@hotmail.com www.pakgreen.pk

EPA Certified

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

PGG/IMS/FF/063	Rev.#02	Rev date: 04-09-23

TEST REPORT

Ref #: PGG/LAB/2024-0920/NL **Issue date:** 06-Feb-24

Name of Industry/Client: M/S Rehman Habib Consultants Pvt. Ltd
Name of Project: Environmental Monitoring, testing, and reporting for feasibility Study of Kotli Sattian and Santh Ni Khuri Dams in Tehsil Kotli Sattian (District Development Package)
Nature of Monitoring: Noise Level
Monitoring Location: Point-02 Balawra
Monitoring Coordinates: N 33.829037° E 73.530423°
Monitoring Instrument: Noise Meter Land Tek SL 5868-P
Monitoring Duration: 24 hours
Monitoring Date: 28-Jan-24 to 29-Jan-24

Results:

Sr. No.	Day Time	Equivalent Noise dB (A)
1.	7:00 AM	41.7
2.	8:00 AM	43.4
3.	9:00 AM	49.3
4.	10:00 AM	48.3
5.	11:00 AM	46.2
6.	12:00 PM	45.4
7.	1:00 PM	48.2
8.	2:00 PM	47.3
9.	3:00 PM	50.1
10.	4:00 PM	53.5
11.	5:00 PM	51.6
12.	6:00 PM	48.6
13.	7:00 PM	52.4
14.	8:00 PM	46.4
15.	9:00 PM	50.4
16.	10:00 PM	44.5
Average		**48.2**

Sr. No.	Night Time	Equivalent Noise dB (A)
17.	11:00 PM	36.3
18.	12:00 AM	38.2
19.	1:00 AM	37.3
20.	2:00 AM	32.1
21.	3:00 AM	39.8
22.	4:00 AM	33.5
23.	5:00 AM	38.3
24.	6:00 AM	34.2
Average		**36.2**

End of Report

Pak Green Enviro-Engineering (pvt) Ltd. 46-M, Gulberg III, Lahore Pakistan

PNAC LAB 180 17025

info@pakgreen.pk pakgreen@hotmail.com www.pakgreen.pk

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.
ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018
Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

PGG/IMS/FF/063	Rev.#02	Rev date: 04-09-23

Ref #: PGG/LAB/2024-0920/NL **Issue date:** 06-Feb-24

PEQS: Punjab Environmental Quality Standards

Sr. No.	Category of area/Zone	Units	Day Time	Night Time
1.	Residential Area (C)	dB (A) Leq	60	50

Terms & Conditions:

- Analysis was conducted on the request of project proponent for IEE/EIA Baseline Study.
- Report cannot be used regarding compliance of any complaint, EPO or any other court case.
- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client. Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The report is not valid for any negotiations.
- Dually calibrated instruments were used during monitoring.

Field Analyst	Chief Analyst	Laboratory Incharge

Pak Green Enviro-Engineering (Pvt) Ltd. 46-M Gulberg III Lahore Pakistan

PNAC LAB 180 17025

info@pakgreen.pk pakgreen@hotmail.com www.pakgreen.pk

Drinking Water Tests Results

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.

ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

PGG/IMS/FF/159	Rev.#00	Rev date: 04-09-23

TEST REPORT

Ref #: PGG/LAB/2024-0923/DW **Issue date:** 06-Feb-24

Name of Industry/Client:	M/s Rehman Habib Consultants Pvt. Ltd
Name of Project:	Environmental Monitoring, testing, and reporting for feasibility Study of Kotli Sattian and Santh Ni Khuri Dams in Tehsil Kotli Sattian (District Development Package)
Nature of sample:	Drinking water
Sampling By:	Pak Green Laboratories
Monitoring Location:	Point-01: Chalawra
Monitoring Coordinates:	N 33.870639°, E 73.531004°
Sample Source:	Chasma
Sample Code:	DW-196
Date of sampling:	27-Jan-24
Sample Receiving Date:	27-Jan-24
Testing Facility:	Pak Green Laboratories
Testing Date:	27-Jan-24 to 02-Feb-24

Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Method / Technique	Results
1.	*E Coli*	MPN / 100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 F	Nil
2.	*Total Coli-form*	MPN / 100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 D	Nil
3.	*Fecal Coliform*	MPN / 100ml	=	=	APHA-9221 E	Nil
4.	Color	TCU	≤ 15	≤ 15	APHA-2120 C	0.000
5.	Taste	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable	APHA-2160 C	Non-Objectionable
6.	Odor	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable	APHA-2150 B	Non-Objectionable
7.	Turbidity	NTU	< 5	< 5	APHA-2130 B	0.30
8.	Total Hardness ^	mg/L	-	<500	APHA-2340 C	230
9.	Total Dissolved Solids ^	mg/L	< 1000	< 1000	APHA-2540 C	305
10.	pH ^	-	6.5-8.5	6.5-8.5	APHA-4500-H+ B	8.454 at 22.6°C
11.	Aluminum (Al)	mg/L	0.2	≤ 0.2	APHA-3111 D	BDL
12.	Antimony (Sb)	mg/L	0.02	≤0.005	APHA-3111 B	BDL
13.	Arsenic (As)	mg/L	0.01	≤ 0.05	APHA-3114 B	BDL
14.	Barium (Ba)	mg/L	0.7	0.7	APHA-3111 D	BDL
15.	Chromium (Cr)^	mg/L	0.05	≤ 0.05	APHA-3111 B	BDL
16.	Copper (Cu)^	mg/L	2	2	APHA-3111 B	BDL
17.	Boron (B)	mg/L	0.3	0.3	APHA-3111 D	BDL
18.	Cadmium (Cd)^	mg/L	0.003	0.01	APHA-3111 B	BDL

Pak Green Enviro-Engineering (Pvt) Ltd. 46-M, Gulberg-III, Lahore.

PNAC LAB 180 17025

info@pakgreen.pk pakgreen@hotmail.com www.pakgreen.pk

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.
ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018
Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

PGG/IMS/FF/159	Rev.#00	Rev date: 04-09-23

Ref #: PGG/LAB/2024-0923/DW

Issue date: 06-Feb-24

Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Method / Technique	Results
19.	Chloride (Cl^{-1}) ^	mg/L	250	< 250	APHA-4500- Cl^{-1} B	10
20.	Fluoride (F)	mg/L	1.5	≤ 1.5	APHA-4500-F-D	0.2
21.	Lead (Pb)^	mg/L	0.01	≤ 0.05	APHA-3111 B	BDL
22.	Manganese (Mn)^	mg/L	0.5	≤ 0.5	APHA-3111 B	BDL
23.	Mercury (Hg)	mg/L	0.001	≤ 0.001	APHA-3112 B	BDL
24.	Nickel (Ni)	mg/L	0.02	≤ 0.02	APHA-3111 B	BDL
25.	Nitrate^	mg/L	50	≤ 50	APHA-4500-NO_3^{-1}-E	BDL
26.	Nitrite^	mg/L	3	≤ 3	APHA-4500-NO_2^{-1}-B	BDL
27.	Selenium (Se)	mg/L	0.01	0.01	APHA-3114 C	BDL
28.	Residual Chlorine (Cl_2)	mg/L	-	0.2-0.5 at the consumer end 0.5-1.5 at the source	APHA-Cl-B	BDL
29.	Zinc (Zn)^	mg/L	3	5.0	APHA-3111 B	0.1895
30.	Phenolic Compound (As Phenol)	mg/L	0.002	-	APHA-5530 D	BDL
31.	Sodium (Na)^	mg/L	-	-	APHA-3111 B	39.1671
32.	Potassium (K)^	mg/L	-	-	APHA-3111 B	3.0196

.....End of Report.....

PEQS: Punjab Environmental Quality standard
WHO: World Health Organization
BDL: Below Detection Limits
^PNAC Accredited

Remarks: All Parameters are in compliance with PEQS Limits.

Terms & Conditions:

- Analysis was conducted at the request of the project proponent for IEE/EIA Baseline Study.
- Report cannot be used to comply with any complaint, EPO, or other court case.
- This report should be reproduced as a whole and not in parts.
- The values represent the sample conditions when sampling/monitoring was carried out.
- The Environmental Conditions while performing testing activities are (Temp=22.0-23.0°C) and (RH=52.9-57.9%)
- The Sampling was done as per the sampling and preservation protocol method APHA 1060-B&C
- The responsibility of the ethical use of the results reported in this report lies with the client.
- The leftover sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.
- Dually calibrated instruments were used during monitoring and testing activities.

Lab Analyst	Chief Analyst	Laboratory Incharge

Pak Green Enviro-Engineering (Pvt) Ltd. 46-M, Gulberg-III, Lahore. Lahore Pakistan

PNAC LAB 180 17025

info@pakgreen.pk pakgreen@hotmail.com www.pakgreen.pk

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.
ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018
Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

PGG/IMS/FF/159	Rev.#00	Rev date: 04-09-23

TEST REPORT

Ref #: PGG/LAB/2024-0922/DW **Issue date:** 06-Feb-24

Name of Industry/Client:	M/s Rehman Habib Consultants Pvt. Ltd
Name of Project:	Environmental Monitoring, testing, and reporting for feasibility Study of Kotli Sattian and Santh Ni Khuri Dams in Tehsil Kotli Sattian (District Development Package)
Nature of sample:	Drinking water
Sampling By:	Pak Green Laboratories
Monitoring Location:	Point-02 Balawra
Monitoring Coordinates:	N 33.829037° E 73.530423°
Sample Source:	Motor Pump
Sample Code:	DW-198
Date of sampling:	28-Jan-24
Sample Receiving Date:	28-Jan-24
Testing Facility:	Pak Green Laboratories
Testing Date:	28-Jan-24 to 02-Feb-24

Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Method / Technique	Results
1.	*E Coli*	MPN / 100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 F	Nil
2.	*Total Coli-form*	MPN / 100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	APHA-9221 D	Nil
3.	*Fecal Coliform*	MPN / 100ml	-	-	APHA-9221 E	Nil
4.	Color	TCU	≤ 15	≤ 15	APHA-2120 C	0.000
5.	Taste	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable	APHA-2160 C	Non-Objectionable
6.	Odor	-	Non-Objectionable / Acceptable	Non-Objectionable / Acceptable	APHA-2150 B	Non-Objectionable
7.	Turbidity	NTU	< 5	< 5	APHA-2130 B	0.38
8.	Total Hardness ^	mg/L	-	<500	APHA-2340 C	350
9.	Total Dissolved Solids ^	mg/L	< 1000	< 1000	APHA-2540 C	460
10.	pH ^	-	6.5-8.5	6.5-8.5	APHA-4500-H^+ B	7.480 at 22.5°C
11.	Aluminum (Al)	mg/L	0.2	≤ 0.2	APHA-3111 D	BDL
12.	Antimony (Sb)	mg/L	0.02	≤0.005	APHA-3111 B	BDL
13.	Arsenic (As)	mg/L	0.01	≤ 0.05	APHA-3114 B	BDL
14.	Barium (Ba)	mg/L	0.7	0.7	APHA-3111 D	BDL
15.	Boron (B)	mg/L	0.3	0.3	APHA-3111 D	BDL
16.	Cadmium (Cd)^	mg/L	0.003	0.01	APHA-3111 B	BDL
17.	Chromium (Cr)^	mg/L	0.05	≤ 0.05	APHA-3111 B	BDL
18.	Chloride (Cl^{-1}) ^	mg/L	250	< 250	APHA-4500- Cl^{-1} B	05

Page 1 of 2

PNAC LAB 180 17025

info@pakgreen.pk pakgreen@hotmail.com www.pakgreen.pk

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.
ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018
Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

PGG/IMS/FF/159	Rev.#00	Rev date: 04-09-23

Ref #: PGG/LAB/2024-0922/DW **Issue date:** 06-Feb-24

Results:

Sr. No.	Parameters	Unit	WHO	PEQS	Method / Technique	Results
19.	Copper (Cu)^	mg/L	2	2	APHA-3111 B	BDL
20.	Fluoride (F)	mg/L	1.5	≤ 1.5	APHA-4500-F-D	0.4
21.	Lead (Pb)^	mg/L	0.01	≤ 0.05	APHA-3111 B	BDL
22.	Manganese (Mn)^	mg/L	0.5	≤ 0.5	APHA-3111 B	BDL
23.	Mercury (Hg)	mg/L	0.001	≤ 0.001	APHA-3112 B	BDL
24.	Nickel (Ni)	mg/L	0.02	≤ 0.02	APHA-3111 B	BDL
25.	Nitrate^	mg/L	50	≤ 50	APHA-4500-NO_3^--E	BDL
26.	Nitrite^	mg/L	3	≤ 3	APHA-4500-NO_2^--B	BDL
27.	Selenium (Se)	mg/L	0.01	0.01	APHA-3114 C	BDL
28.	Residual Chlorine (Cl_2)	mg/L	-	0.2-0.5 at the consumer end 0.5-1.5 at the source	APHA-Cl-B	BDL
29.	Zinc (Zn)^	mg/L	3	5.0	APHA-3111 B	0.2889
30.	Phenolic Compound (As Phenol)	mg/L	0.002	-	APHA-5530 D	BDL
31.	Sodium (Na)^	mg/L	-	-	APHA-3111 B	44.5078
32.	Potassium (K)^	mg/L	-	-	APHA-3111 B	2.9869

End of Report

PEQS: Punjab Environmental Quality standard
WHO: World Health Organization
BDL: Below Detection Limits
^PNAC Accredited
Remarks: All Parameters are in compliance with PEQS Limits.

Terms & Conditions:

- Analysis was conducted at the request of the project proponent for IEE/EIA Baseline Study.
- Report cannot be used to comply with any complaint, EPO, or other court case.
- This report should be reproduced as a whole and not in parts.
- The values represent the sample conditions when sampling/monitoring was carried out.
- The Environmental Conditions while performing testing activities are (Temp=22.0-23.0°C) and (RH=52.9-57.9%)
- The Sampling was done as per the sampling and preservation protocol method APHA 1060-B&C
- The responsibility of the ethical use of the results reported in this report lies with the client.
- The leftover sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.
- Dually calibrated instruments were used during monitoring and testing activities.

Lab Analyst	Chief Analyst	Laboratory Incharge

Pak Green Enviro-Engineering (Pvt.) Ltd. 46-M Gulberg III Lahore Pakistan

PNAC LAB 180 17025

info@pakgreen.pk pakgreen@hotmail.com www.pakgreen.pk

Surface Water Test Results

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.
ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018
Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

PGG/IMS/FF/063	Rev.#02	Rev date: 04-09-23

TEST REPORT

Ref #: PGG/LAB/2024-0925/SW **Issue date:** 06-Feb-24

Name of Industry/Client:	M/s Rehman Habib Consultants Pvt. Ltd
Name of Project:	Environmental Monitoring, testing, and reporting for feasibility Study of Kotli Sattian and Santh Ni Khuri Dams in Tehsil Kotli Sattian (District Development Package)
Nature of sample:	Surface Water
Sampling By:	Pak Green Laboratories
Monitoring Location:	Narra Dhok Bandian P-01
Monitoring Coordinates:	N 33.870639°, E 73.531005°
Sampling type (Grab/Composite):	Grab
Sample Code:	SW-197
Date of sampling:	27-Jan-24
Sample Receiving Date:	27-Jan-24
Testing Facility:	Pak Green Laboratories
Testing Date:	27-Jan-24 to 02-Feb-24

Results:

Sr. No.	Parameters	Unit	Method / Technique	Results
1.	Temperature	°C	APHA-2550 B	22.2
2.	pH ^	---	APHA-4500-H^+ B	8.440 at 22.2°C
3.	Biological Oxygen Demand (BOD_5 at 20 °C) ^	mg/L	APHA-5210 D	BDL
4.	Chemical Oxygen Demand (COD) ^	mg/L	APHA-5220 B	08
5.	Total Suspended Solids (TSS) ^	mg/L	APHA-2540 D	05
6.	Total Dissolved Solids (TDS) ^	mg/L	APHA-2540 C	300
7.	Chloride (as Cl^-) ^	mg/L	APHA-4500-Cl^- B	05
8.	Sulphate (SO_4^{2-}) ^	mg/L	APHA-4500-SO_4 C	35
9.	Copper (Cu)^	mg/L	APHA-3111 B	BDL
10.	Lead (Pb)^	mg/L	APHA-3111 B	BDL
11.	Mercury (Hg)	mg/L	APHA-3112 B	BDL
12.	Selenium (Se)	mg/L	APHA-3114 C	BDL
13.	Nickel (Ni)	mg/L	APHA-3111 B	BDL
14.	Zinc (Zn)^	mg/L	APHA-3111 B	0.5364
15.	Iron (Fe)^	mg/L	APHA-3111 B	BDL
16.	Manganese (Mn)^	mg/L	APHA-3111 B	BDL
17.	Sodium (Na)^	mg/L	APHA-3111 B	45.1523
18.	Potassium (K)^	mg/L	APHA-3111 B	3.6216

Pak Green Enviro-Engineering (Pvt.) Ltd. 46-M, Gulberg-III, Lahore, Pakistan

PNAC LAB 180 17025

info@pakgreen.pk pakgreen@hotmail.com www.pakgreen.pk

PAK GREEN ENVIRO-ENGINEERING (Pvt.) Ltd.
ISO/IEC 17025:2017 Accredited Testing Lab, ISO 9001:2015, ISO 14001:2015, ISO 45001:2018
Head Office: 46-M, Gulberg III, Lahore-Pakistan. Ph: +9242-35441444 Cell: 0303-4442334

EPA Certified

PGG/IMS/FF/063	Rev.#02	Rev date: 04-09-23

Ref #: PGG/LAB/2024-0925/SW **Issue date:** 06-Feb-24

Results:

Sr. No.	Parameters	Unit	Method / Technique	Results
19.	Dissolve Oxygen (DO)^	mg/L	APHA-4500-O C	7.0
20.	Calcium (Ca)^	mg/L	APHA-3500 Ca-B	76
21.	Magnesium (Mg)^	mg/L	APHA-3500 Mg-B	9.7
22.	Total Nitrogen	mg/L	APHA 4500 P-J	1.468
23.	Total Phosphorus	mg/L	APHA 4500 P-J	0.460
24.	Total Hardness ^	mg/L	APHA-2340 C	230

End of Report

^PNAC Accredited BDL: Below Detection Limits

Terms & Conditions:

- Analysis was conducted at the request of the project proponent for IEE/EIA Baseline Study.
- Report cannot be used to comply with any complaint, EPO, or other court case.
- This report should be reproduced as a whole and not in parts.
- The values represent the sample conditions when sampling/monitoring was carried out.
- The Environmental Conditions while performing testing activities are (Temp=22.0-23.0°C) and (RH=52.9-57.9%)
- The Sampling was done as per the sampling and preservation protocol method APHA 1060-B&C
- The responsibility of the ethical use of the results reported in this report lies with the client.
- The leftover sample (if so available) shall be retained for fifteen days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiations.
- Dually calibrated instruments were used during monitoring.

Lab Analyst	Chief Analyst	Laboratory Incharge

Pak Green Enviro-Engineering (Pvt) Ltd. 46-M, Gulberg-III, Lahore, Pakistan

PNAC LAB 180 17025

info@pakgreen.pk pakgreen@hotmail.com www.pakgreen.pk

Annexure 3: Declaration letter of Kotli Sattian National Park

GOVERNMENT OF THE PUNJAB
FORESTRY, WILDLIFE AND FISHERIES
DEPARTMENT
Dated: 22.05.2023

NOTIFICATION

No.SOP(WL)12-1/2019(E).- In exercise of the powers conferred under subsection (1) of section 7 of the Punjab Protected Areas Act 2020 (*XXIII of 2020*) and in supersession of Notification No. SOFT(EXT)XII-2/2009, dated 15.09.2009, Governor of the Punjab is pleased to declare the following area as **"Murree, Kahuta and Kotli Sattian National Park, Rawalpindi"**, with immediate effect:

Locality	Tehsil and District	Area
Forest land under the Administrative control of the Divisional Forest Officer, Rawalpindi North and Divisional Forest Officer, Murree (Murree, Kahuta and Kotli Sattian)	Tehsil Murree, Kahuta, Kotli Sattian and Kallar Syedan District Rawalpindi	1,17,044 acres

The boundary of the Murree, Kahuta and Kotli Sattian National Park, Rawalpindi shall be as follows:

North	Kohala Bridge to Barian upto Khyber Pakhtunkhwa Boundary.
South	Islamabad Capital Territory boundary to Ari-Kahuta Road, Kahuta-Matore Road to Nara to Panjwar-Jandral upto Dhan Gali River Jhelum.
East	River Jhelum from Kohala Bridge of Tehsil Murree upto the Dhan Gali of Tehsil Kalar Syedan.
West	Khyber Pakhtunkhwa boundary upto the Boundary of Islamabad Capital Territory.

2. The GPS coordinates along with satellite image/map covering the area is enclosed at **Annex-I**.

(MUDDASIR WAHEED MALIK)
SECRETARY FW&F, DEPARTMENT

No. & Date Even.

Copy is forwarded to:

1- The Commissioner, Rawalpindi Division, Rawalpindi.
2- The Director General Wildlife & Parks, Punjab, Lahore.
3- The Chief Conservator of Forests, Northern Zone, Rawalpindi.
4- The Deputy Commissioners, Rawalpindi & Murree.
5- The District Police Officers, Rawalpindi & Murree.
6- The Deputy Director Wildlife, Rawalpindi Region Rawalpindi.

(MUHAMMAD FAREED GHAURI)
SECTION OFFICER (WILDLIFE)

C.C

PS to the Secretary, FW&F Department.

Annexure 4: Occupational Health and Safety Plan

General

Occupational Health and Safety covers all personnel working under the project and will be in line with the World Bank/IFC EHS guidelines on health and safety.

The Occupational Health and Safety program will aim to ensure that the workplace is safe and healthy by: addressing the hazards and risks at the workplace; outlining the procedures and responsibilities for preventing, eliminating and minimizing the effects of those hazards and risks; identifying the emergency management plans for the work place or work places; and, specifying how consultation, training and information are to be provided to employees at various workplaces.

Some of the risks/hazards associated with workplaces are due to working close to or at sites associated with the various project construction activities. Other risks associated with the project construction phase include risk of increase of vector borne and other different diseases.

The following sections will be implemented during the construction phase to address and ensure workers' health and safety.

a. Screening and regular unannounced checking of workers

As per the procedure for hiring workers, all contractors and labor agencies are required to make all prospective workers undergo medical tests to screen for diseases and sicknesses, prior to selection and employment of any worker. The contractor is also responsible for ensuring that no worker who has a criminal record is employed at the project site. It will be ensured that all workers undergo medical tests to screen diseases at source and at sites in consultation with the designated Health Officer.

In addition to this, the Project Management will also undertake sudden, unannounced checks on workers to look for diseases such as HIV, STDs, and hepatitis and take necessary steps as mandated by the Contractual agreement between the Contractor and the Worker(s).

b. Minimizing hazards and risks at the workplace.

To ensure safety at all work sites, the following will be carried out:

i. Installation of signboards and symbols in risky and hazardous areas, to inform workers to be careful.

ii. Construction of barricades around construction sites and deep excavated pits, to cordon off and deter entry of unauthorized personnel and workers into these areas.

iii. Providing a safe storage site/area for large equipment such as power tools and chains, to prevent misuse and loss.

iv. Proper Housekeeping: Ensuring that materials are all stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling, or collapse. Brick stacks will not be more than 7 feet in height and for concrete blocks they will not be more than 6 feet high.

v. Removing all scrap timber, waste material and rubbish from the immediate work area as the work progresses.

vi. Where scaffolds are required, ensuring that each scaffold or its components shall be capable of supporting its own weight and at least 4 times the maximum intended load applied or transmitted to it. The platform/scaffold plank shall be at least 15 inches wide and 1.5 inches thick. The rope should be capable of supporting at least 6 times the maximum intended load applied or transmitted to that rope. Pole scaffolds over 60 feet in height shall be designed by a registered professional engineer and shall be constructed and loaded in accordance with that design. Where scaffolds are not provided, safety belts/safety nets shall be provided;

vii. Ensure that all ramps or walkways are at least 6 feet wide, having slip resistance threads and not inclined at more than a slope of 1 vertical and 3 horizontals.

viii. Stacking away all excavated earth at least 2 feet from the pit to avoid material such as loose rocks from falling back into the excavated area and injuring those working inside excavated sites.

ix. Constructing support systems, such as bracing to adjoining structures that may be endangered by excavation works nearby.

x. Only a trained electrician to construct, install and repair all electrical equipment to prevent risks of electrical shocks and electrocution.

xi. Install fire extinguishers and/or other fire-fighting equipment at every work site to prepare for any accidental fire hazards.

c. Provision of Personal Protective Equipment

Risks to the health and safety of workers can be prevented by provision of Personal Protective Equipment (PPEs) to all workers. This will be included in the construction cost for each Contractor. Depending on the nature of work and the risks involved, contractors must provide without any cost to the workers, the following protective equipment:

i. High visibility clothing for all personnel during road works must be mandatory.

ii. Helmet shall be provided to all workers, or visitors visiting the site, for protection of the head against impact or penetration of falling or flying objects.

iii. Safety belt shall be provided to workers working at heights (more than 20 ft) such as roofing, painting, and plastering.

iv. Safety boots shall be provided to all workers for protection of feet from impact or penetration of falling objects on feet.

v. Ear protecting devices shall be provided to all workers and will be used during the occurrence of extensive noise.

vi. Eye and face protection equipment shall be provided to all welders to protect against sparks.

vii. Respiratory protection devices shall be provided to all workers during occurrence of fumes, dusts, or toxic gas/vapor.

viii. Safety nets shall be provided when worPunjablaces are more than 25 feet (7.5 m) above the ground or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors or safety belts is impractical.

The specific PPE requirements for each type of work are summarized below.

Table 6.1 PPE Requirement List

Type of Work	PPE
Elevated work	Safety helmet, safety belt (height greater than 20 ft), footwear for elevated work.
Handling work safety	Helmet, leather safety shoes, work gloves.
Welding and cutting work	Eye protectors, shield and helmet, protective gloves.
Grinding work	Dust respirator, earplugs, eye protectors.
Work involving handling of chemical substances	Dust respirator, gas mask, chemical-proof gloves. Chemical proof clothing, air-lined mask, eye protectors.
Wood working	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.
Blasting	Hard hat, eye and hearing protection.
Concrete and masonry work	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.
Excavation, heavy equipment, motor graders, and bulldozer operation	Hard hat, safety boots, gloves, hearing protection.
Quarries	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.

d. Procedures to Deal with Emergencies such as Accidents, Sudden Illness and Death of Workers

First aid kits will be made available at all times throughout the entire construction period by the respective contractors. This is very important, because most work sites will be at some distance from the nearest hospital. In addition to the first aid kits, the following measures should be in place:

i. Provision of dispensaries by the individual EPC contractor.

ii. A vehicle shall be on standby from the Project Office so that emergency transportation can be arranged to take severely injured/sick workers to the nearest hospital for immediate medical attention.

iii. A designated Health Officer/worker for the Project will be identified as a focal person to attend to all health and safety related issues. This employee's contact number will be posted at all work sites for speedy delivery of emergency services. The focal person shall be well versed with the medical system and facilities available at the hospital.

iv. Communication arrangements, such a provision of radios or mobile communication for all work sites, for efficient handling of emergencies, will be made.

e. Record Maintenance and Remedial action

The Project Management will maintain a record of all accidents and injuries that occur at the work site. This work will be delegated by the contractor to the site supervisor and regularly reviewed every quarter by project management. Reports prepared by the contractor shall include information on the place, date and time of the incident, name of persons involved, cause of incident, witnesses present and their statements. Based on such reports, the management can jointly identify any unsafe conditions, acts or procedures and recommend for the contractor to undertake certain mitigative actions to change any unsafe or harmful conditions.

f. Compensation for Injuries and Death

Any casualty or injury resulting from occupational activities should be compensated as per the local labor laws. Where compensation is sought by the injured party, proper procedures for documentation of the case will be followed, including a detailed report on the accident, written reports from witnesses, report of the examining doctor and his/her recommendation for treatment. Each individual contractor will be responsible for ensuring compensation for the respective workers.

g. Awareness Programs

The Project management will undertake awareness programs through posters, talks, and meetings with the contractors to undertake the following activities:

i. Dissemination sessions will clarify the rights and responsibilities of the workers regarding interactions with local people (including communicable disease risks, such as HIV/AIDS), work site health and safety, waste management (waste separation, recycling, and composting), and the illegality of poaching.

ii. Make workers aware of procedures to be followed in case of emergencies such as informing the focal health person who in turn will arrange the necessary emergency transportation or treatment.

h. Nomination of a Health and Safety Focal Person

Within each site (especially if different sites are being implemented by different contractors), a Health and Safety Focal Person will be appointed. The Terms of Reference for the focal person will mainly be as follows:

i. Function as the focal person/representative for all health and safety matters at the workplace;

ii. Responsible for maintaining records of all accidents and all health and safety issues at each site, the number of accidents and its cause, actions taken and remedial measures undertaken in case of safety issues;

iii. Be the link between the contractor and all workers and submit grievances of the workers to the contractor and instructions/directives on proper health care and safety from the contractors back to the workers;

iv. Ensure that all workers are adequately informed on the requirement to use Personal Protective Equipment and its correct use;

v. Also responsible for the first aid kit and making sure that the basic immediate medicines are readily available.

Annexure 5: Emergency Response Plan

PURPOSE

The purpose of this Emergency Response Procedure is to provide measures and guidance for the establishment and implementation of emergency preparedness plans for the project. The aim of the Emergency Response Procedure is to:

(i) Ensure all personnel and visitors to the office/job sites are given the maximum protection from unforeseen events.

(ii) Ensure all personnel are aware of the importance of this procedure to protection of life and property.

EMERGENCY PREPARATION AND RESPONSE MEASURE SCOPE

The emergency management program is applied to all Project elements and intended for use throughout the Project life cycle. The following are some emergencies that may require coordinated response.

(i) Construction Accident

(ii) Road & Traffic Accident

(iii) Hazardous material spills

(iv) Structure collapse or failure

(v) Trauma or serious illness

(vi) Sabotage

(vii) Fire

(viii) Environmental Pollution

(ix) Loss of person

(x) Community Accident

RESPONSIBILITIES

The detailed roles and responsibilities of certain key members of the Emergency Response team available to assist in emergency are provided in **Table 7.1** below.

Table 7.1 Emergency Response Team

Action Group	Responsibility
Emergency Coordinator	Overall control of personnel and resources. The Emergency Coordinator will support and advise the Site Safety Supervision as necessary. Serves as public relations spokes persons, or delegates to some staff member the responsibility for working with news media regarding any disaster or emergency. Also assure proper coordination of news release with appropriate corporate staff or other designated people.
Site Safety Supervision (Emergency Commander)	Overall responsibility for activating emergency plan and for terminating emergency actions. Be alternative of emergency response chairpersons.

Action Group	Responsibility
	Disseminates warnings and information as required to ensure all people in the immediate area have been warned and evacuated either by alarms or by word of mouth. Supervise the actions of the Emergency Response Team to ensure all persons are safe from the danger. Notify outside authorities if assistance is required. Carries the responsibility for coordinating actions including other organizations in accordance with the needs of the situation. Ensure maximum co-operation and assistance is provided to any outside groups called to respond to an emergency. Establish and appoint all emergency organization structure and team. Assures adequate delegation of responsibilities for all key positions of assistants on the Project to assist with any foreseeable emergency. Ensure resources available to purchase needed emergency response equipment and supplies. Assures that all persons on the Emergency Response Team aware and fully understand their individual responsibilities for implementing and supporting the emergency plan. Establish the emergency drill schedule of all identified emergency scenarios, track the status and evaluate the emergency. The Emergency Commander shall ensure that senior management personnel have been reported of the emergency as soon as practical after the event.
Security Team	Ensure that the exit route is regularly tested and maintained in good working order. Maintain station at the security gate or most suitable location to secure the area during any emergency such that only authorized personnel and equipment may enter, prevent access to the site of unauthorized personnel. Assist with strong/activation of services during an emergency. Ensure vehicles and obstructions are moved to give incoming emergency vehicles access to the scene, if ambulance or emergency services are attending the site, ensure clear access and personnel are located to direct any incoming emergency service to the site of emergency.
Rescue & Medical Team	Protect the injured from further danger and weather. Provide treatment to the victim(s) to the best of their ability by first aid and then transfer to hospital. Remain familiar with the rescue activities and rescue apparatus. Assist outside medical services personnel when they arrive
General Administration Team	Response to support any requested general facilities for assisting Emergency Response Team in their work.
Government Relation Team	Coordinate with local government on a matter of concerned in the emergency response plan to liaise with local officers in their affair for support Emergency Response Team. Coordinate emergency plan with the government authorities, local community.
Environment Team	In case of emergency related to the environmental pollution such as the chemical spill, oil spill into the ambient, the environment team will support the technical advice to control and mitigate the pollution until return to the normal situation.
Department Heads	Call up of personnel into the safe location for protective life and property.

Action Group	Responsibility
	Take immediate and appropriate action while Emergency Response Team is being mobilized. Keep in touch with the Emergency Commander Control and supervise operators and contractors on the implementation of this procedure, with consultation with Safety Team as necessary. Provide and maintain emergency equipment of their responsible areas.
Other Staff and Employees	All other staff and employees will remain at their workstations or assembly point unless directed otherwise from Emergency Response Team. Each supervisor will ensure that all members of his work group are accounted for and keep in touch with each of their Department Head.

PROCEDURE

Emergency situation and injuries to person can occur at any time or place either on Project site or elsewhere. The most two common types of emergencies on site are fire and serious accident.

Figure 7.2. Emergency Procedure for Fire

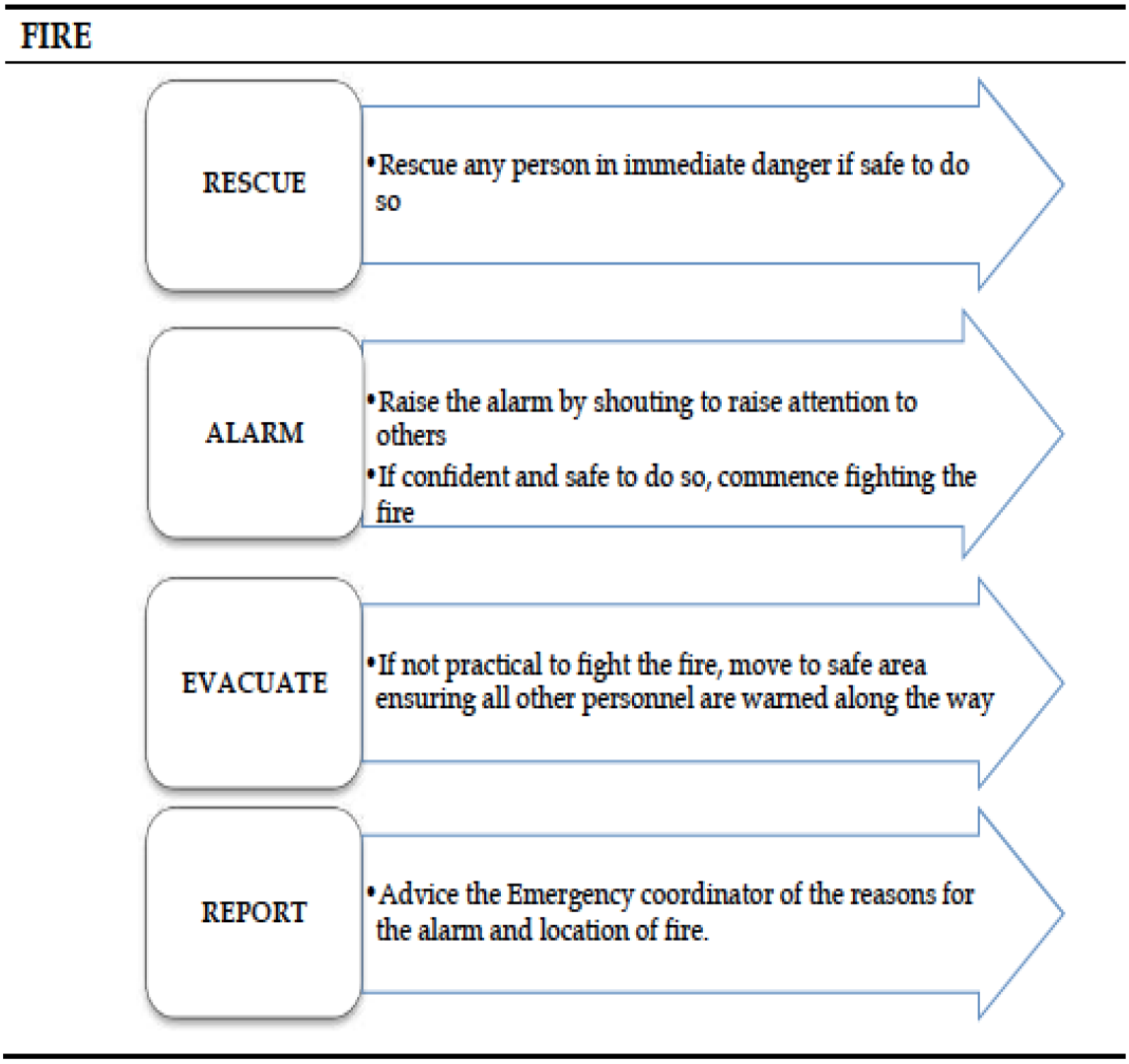
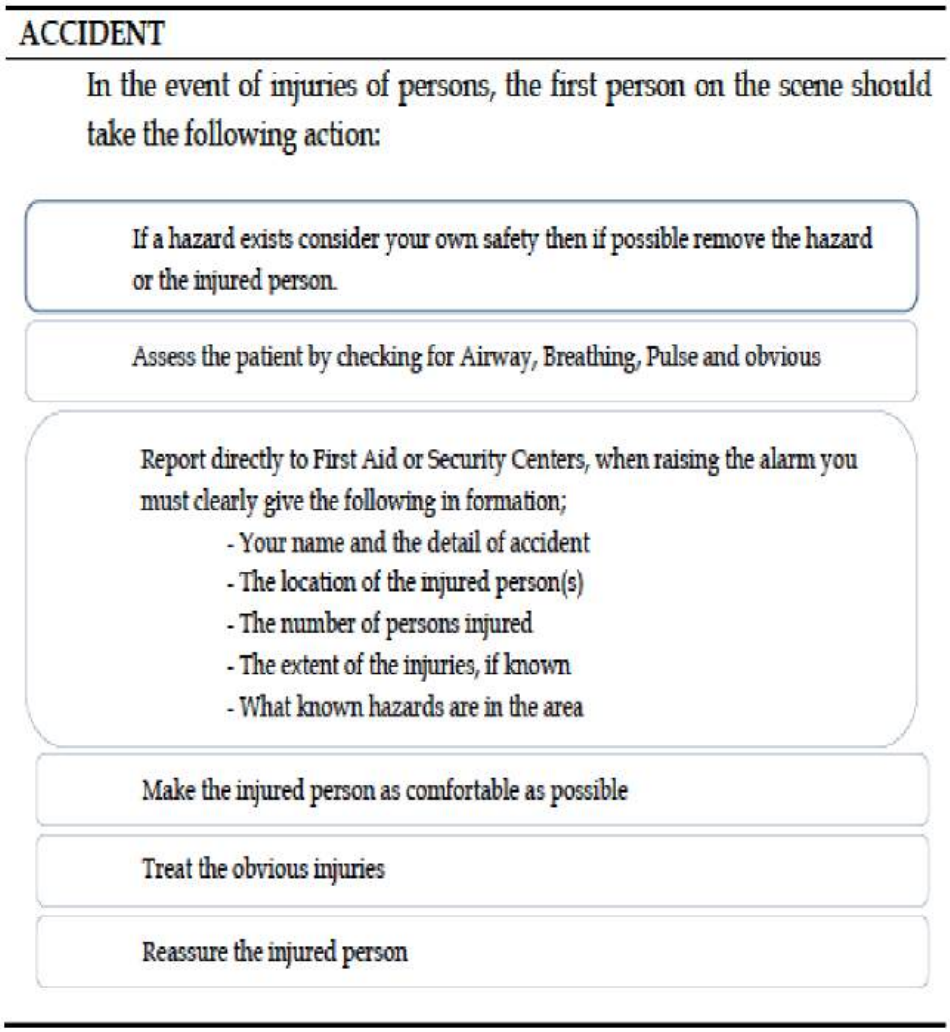


Figure 7.3 Emergency Procedure for Serious



COMMUNICATION WITH AUTHORITIES / PRESS AT SITE

In the event of an accident or incident, only senior staff is permitted to give factual information to the authorities for resource of liability exposure. The press must be avoiding politely, at all costs, with the terse comment that “the matter is under investigation and relevant information when available will be provided by our Head Office” Do not ever give your opinion or story.

First Aid Persons

- Upon advice of medical emergency, make immediate assessment to response required and if necessary, advise security to summon ambulance or medical assistance, the qualified first aid attendant should also,
- Provide treatment to the victim(s) to the best of his/her ability.
- Ensure the safety of victims by ceasing any work activity in the area.
- Protect the injured from further danger and weather.
- Assist medical services personnel when they arrive.

General Administration Team

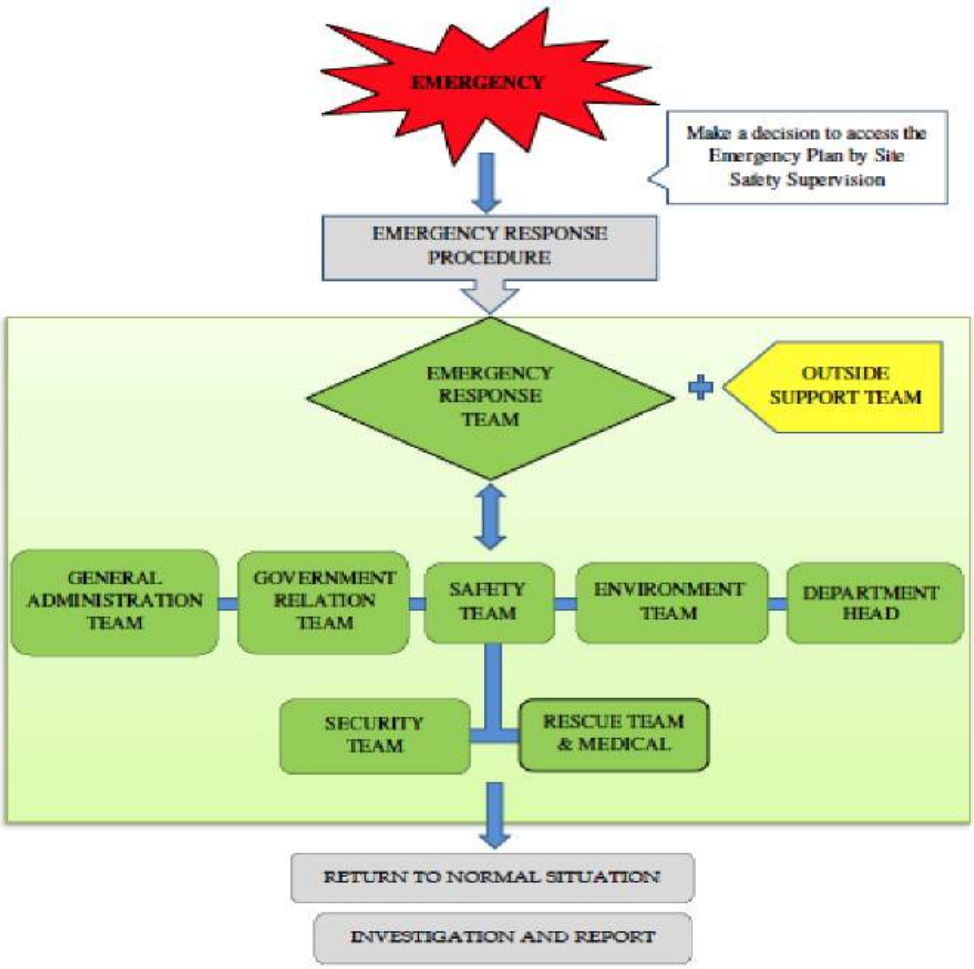
- Upon advice of medical emergency, maintain contact with first aid personnel and summon ambulance if required.

Security Team

- If ambulance or emergency services are attending the site, ensure clear access and personnel are located to direct vehicle closest to the scene.
- Prevent access to the site of unauthorized personnel (press, etc.).

Emergency Coordinator

- The Emergency Coordinator shall assist emergency personnel at the scene as required through allocation of company resources.
- The Emergency Coordinator shall ensure next-of-kin are properly notified as soon as possible and give whatever company support and assistance is necessary to assist them bundle the situation
- The Emergency Coordinator shall ensure that senior management personnel are advised of the emergency as soon as practical after the event.



Note: Name of contact person and call number from Owner/Contractor to be determined.

Details of the actual Job Being done at the time:

Details of Accident / Incident / What actually happened?

Section F: Accident Cause (Basic cause mark X / Contributing cause, if any mark O)

UNSAFE CONDITIONS		UNSAFE ACTS	
1	☐ Inadequately Guarded	1	☐ Operating Without Authority / Training
2	☐ Unguarded	2	☐ Operating at Unsafe Speed
3	☐ Defective Tools, Equipment, or Substance	3	☐ Marking SHE Device Inoperative
4	☐ Unsafe Design or Construction	4	☐ Using Unsafe Equipment or Equipment Unsafely
5	☐ Hazardous Arrangement	5	☐ Unsafe Loading, Placing, Mixing
6	☐ Unsafe Illumination	6	☐ Taking Unsafe Position
7	☐ Unsafe Ventilation	7	☐ Working on Moving or Dangerous Equipment
8	☐ Unsafe Clothing	8	☐ Distraction, Teasing, Horse Play
9	☐ Insufficient Instruction	9	☐ Failure to use Personal Protective Devices
10	☐ Lack of system of work	10	☐ Lack of effective instruction or supervision

Why was the unsafe act committed? _____ Why did the unsafe condition exist? _____

Section G: Guide to Corrective Action (Base on the cause checked above, I am taking the following corrective action)

UNSAFE ACT	UNSAFE CONDITION	If Supervisor can't handle, then recommend to
☐ Stop the Behaviour	☐ Remove	☐ Site Engineer, or
☐ Study the job	☐ Guard	☐ Site Manager, or
☐ Instruct (tell-show-try-check)	☐ Warn	☐ Project Manager, or
☐ Follow Up	☐ Supervisory Training	☐ Safety Committee
☐ Enforce		

Detail below any immediate remedial actions that have been taken:

Detail below any corrective and preventative actions that could be taken to prevent future re-occurrence:	Responsible	Completion Date

Annexure 6: Archaeological 'Chance Find' procedure

Background

The purpose of this document is to address the possibility of archaeological deposits becoming exposed during ground altering activities within the project area and to provide protocols to follow in the case of a chance archaeological find to ensure that archaeological sites are documented and protected as required.

Archaeological sites are an important resource that is protected for their historical, cultural, scientific and educational value to the general public and local communities. Impacts to archaeological sites must be avoided or managed by development proponents. The objectives of this 'Archaeological Chance Find Procedure' are to promote preservation of archaeological data while minimizing disruption of construction scheduling/ It is recommended that due to the moderate to high archaeological potential of some areas within the project area, all on site personnel and contractors be informed of the Archaeological Chance Find Procedure and have access to a copy while on site.

Potential Impacts to Archaeological Sites

Developments that involve excavation, movement, or disturbance of soils have the potential to impact archaeological materials, if present. Activities such as road construction, land clearing, and excavation are all examples of activities that may adversely affect archaeological deposits.

Archaeological 'Chance Find' Procedure

If you believe that you may have encountered any archaeological materials, stop work in the area and follow the procedure below:

The following 'chance-find' principles will be implemented by the contractor throughout the construction works to account for any undiscovered items identified during construction works:

(i) Workers will be trained in the location of heritage zones within the construction area and in the identification of potential items of heritage significance.

(ii) Should any potential items be located, the site supervisor will be immediately contacted and work will be temporarily stopped in that area.

(iii) If the site supervisor determines that the item is of potential significance, an officer from the department of Archaeology (DoA) will be invited to inspect the site and work will be stopped until DoA has responded to this invitation.

(iv) Work will not re-commence in this location until agreement has been reached

between DoA and proponent as to any required mitigation measures, which may include excavation and recovery of the item.

(v) A precautionary approach will be adopted in the application of these procedures.

Detailed Procedural Steps

If the Director, department of Archaeology receives any information or otherwise has the knowledge of the discovery or existence of an antiquity of which there is no owner, he shall, after satisfying himself as to the correctness of the information or knowledge, take such steps with the approval of the Government, as he may consider necessary for the custody, preservation and protection of the antiquity.

Whoever discovers, or finds accidentally, any movable antiquity shall inform forth with the Directorate within seven days of its being discovered or found.

If, within seven days of his being informed, the Director decides to take over the antiquity for purposes of custody, preservation and protection, the person discovering or finding it shall hand it over to the Director or a person authorized by him in writing.

Where the Director decides to take over an antiquity, he may pay to the person by whom it is handed over to him such cash reward as may be decided in consultation with the Advisory Committee.

The Director or any officer authorized by him with police assistance may, after giving reasonable notice, enter into, inspect and examine any premises, place or area which or the sub-soil of which he may have reason to believe to be, or to contain an antiquity and may cause any site, building, object or any antiquity or the remains of any antiquity in such premises, place or area to be photographed, copied or reproduced by any process suitable for the purpose.

The owner or occupier of the premises, place or area shall afford all reasonable opportunity and assistance to the Director.

No photograph, copy of reproduction taken or made shall be sold or offered for sale except by or with the consent of the owner of the object of which the photograph, copy or the reproduction has been taken or made.

Where substantial damage is caused to any property as a result of the inspection, the Director shall pay to the owner thereof reasonable compensation for the damage in consultation with the Advisory Committee.

If the Director after conducting an inquiry, has reasonable grounds to believe that any land contains any antiquity, he may approach the Government to direct the Revenue Department to acquire such land or any part thereof and the Revenue Department shall thereupon acquire such land or part as for a public purpose.

Annexure 7: Dust Management Plan

General

The purpose of this plan is to describe the measures that the project shall take to ensure that the risk of emissions from dust generated by site operations during construction are minimized and that best practice measures are implemented.

Dust emissions from construction can cause ill health effects to Contractor staff along with nuisance and annoyance to members of the local community. Dust will be controlled through:

- Elimination
- Reduction/Minimization
- Control

This dust management plan shall be implemented based on the measures already provided in the Environmental Management Plan (EMP) relating to controlling dust emissions.

Methodology

The following methodology will be undertaken for each project section:

Step 1 – Identify the dust generating activities

Construction activities that are likely to produce dust will be identified. The activities that will be taken into account are:

- Haulage Routes, Vehicles and Asphalt/Concrete Batching Plant
- Roads, surfaces and public highways
- Static and mobile combustion plant emissions
- Tarmac laying, bitumen surfacing and coating
- Materials Handling, Storage, Spillage and Disposal
- Storage of material
- Stockpiles
- Spillages
- Storage of Waste
- Site Preparation and Restoration after Completion
- Earthworks, excavation and digging
- Storage of spoil and topsoil
- Demolition
- Construction and Fabrication Processes

Step 2 – Identify Sensitive Receptors

Sensitive receptors have already been identified. The nature and location of the sensitive receptors will be taken into account when implementing control measures.

Step 3 – Implement Best Practice Measures to Control

Based on the nature of the activity producing the dust, the likelihood of dust being produced and the possible consequence of dust based on the sensitive receptors, the most effective control measure will be identified and implemented.

Step 4 – Monitor effectiveness of control

Construction Supervision Staff (CSC) will have the responsibility to ensure that dust control measures are being implemented and are effective.

Step 5 – Record and report result of monitoring

All inspections, audits and results of monitoring will be recorded and kept as part of the site filing system.

Method Statements and Risk Assessments

- The Contractor's Risk Assessments and Method Statements will be required to be approved by the CSC prior to commencing work and will be required to contain environmental aspects of the task, including dust control measures where required.
- Where dust has been identified within the risk assessment as a significant issue, the method statement will be required to cover the following:
- Methods and materials that will be used to ensure that dust generation is minimized.
- The use of pre-fabricated materials where possible.
- Optimum site layout:
- Dust generating activities to be conducted away from sensitive receptors
- Supply of water for damping down.
- Good housekeeping and management
- All employees will be briefed on the Risk Assessment and Method Statement before starting work.

Training

All Contractor staff will be required to attend training seminars as already mentioned in the EMP document. A site-specific induction will also be required before being allowed to work on site. These will include site-specific sensitive receptors and details regarding dust control measures to be taken.

Toolbox talks on air pollution and minimizing dust emissions will be provided on a regular basis to Contractor staff.

Identification of Dust Generating Sources and Control Methods Haulage Routes, Vehicles and Asphalt/Concrete Batching Plant

Dust Source	Dust Control Methods
Major haul roads and traffic routes	Haul roads will be dampened down via a mobile bowser, as required.

Dust Source	Dust Control Methods
Public Roads	Road sweeper will be used to clean public roads as required.
Site traffic management	Site traffic will be restricted to constructed access roads as far as possible. Site speed limit will be set at 10 mph as this will minimize the production of dust.
Road Cleaning	A mechanical road sweeper will be readily available and used.
Handling, Storage, Stockpiling and Spillage of Dusty materials	
Material handling operations	The number of times a material will have to be handled will be kept to a minimum to prevent double handling and ensure dusty materials are not handled unnecessarily.
Transport of fine dusty materials and aggregates.	Closed tankers will be used or sheeted vehicles.
Vehicle loading/unloading materials on to vehicles and conveyors.	Dusty materials will be dampened down Drop heights will be kept to a minimum and enclosed where possible.
Storage of Materials	
Bulk cement, bentonite etc.	Bentonite will be delivered in tankers and stored in dedicated enclosed areas. Bulk cement will be transported through tractor trollies or trailers.
Fine dry materials	These will be protected from the weather and by storing in appropriate containers and indoors, where necessary.
Storage location	Material will be stored in dedicated lay-down areas.
Storage of Stockpiles	
Stockpile location	Stockpiles will be placed so as to minimize double handling and facilitate the site restoration.
Building stockpiles	Stockpiles, tips and mounds will not be stored at an angle greater than an angle of repose of the material.
Small and temporary stockpiles	Where possible, stockpiles will be placed under sheeting. Dusty material will be damped down. Wind barriers (protective fences) of a similar height to the stockpiles will be erected, if required.
Large and long-term stockpiles	Long-term stockpiles will be vegetated and stabilized as soon as possible. Stock piles will be dampened down until stabilized, where necessary. Wind barriers (protective fences) of a similar height to the stockpile will be erected, if required.
Waste Material from Construction	
Disposal method	A dedicated lay-down area will be available for waste. Waste will not be allowed to build up and will be disposed off at the designated locations as per EMP.
Site Preparation and Restoration	
Earthworks, excavation and digging	These activity areas will be kept damp where required and if possible, will be avoided during dry and windy periods.
Completed earthworks	Surfaces will be stabilized by re-vegetation as soon as possible, where applicable.
Construction and Fabrication Process	

Dust Source	Dust Control Methods
Crushing of material for reuse, transportation and disposal	Authorization will be obtained from PMU and ADB before using any mobile plant on site for activities such as crushing and screening. Any crushing or screening activities will be located away from sensitive receptors.
Cutting, grinding, drilling, sawing, trimming, planning, sanding	These activities will be avoided wherever possible. Equipment and techniques that minimize dust will be implemented. Water will be used to minimize dust.
Cutting roadways, pavements, blocks	Water sprinkling to be used.
Angle grinders and disk cutters	Best practice measures will be used such as dust extraction

Monitoring Arrangements

Monitoring will be conducted at sensitive receptor locations in the project area as provided in the EMP. Furthermore, at locations where PM levels are exceeding applicable guidelines, additional stringent measures will be implemented at the respective location(s) in the project area to ensure dust levels are controlled as far as possible.

Annexure 8: Site Specific EMP (SSEMP) Guide & Template for Guidance to Contractor

Guide for Development of SSEMP

Step 1: Define Boundaries
Step 2: Identify Sensitive Receptors
Step 3: Specify construction activities
Step 4: Conduct Risk Assessment
Step 5: Assign Environment Management measures
Step 6: Prepare Site Plans
Step 7: Prepare Environment Work Plans (if required)
Step 8: Monitoring

Step 1: The project area needs to be clearly defined.

Step 2: The mapping of sensitive receptors has already been conducted and needs to be presented clearly in a map.

Step 3: The tentative construction activities to be conducted are as follows:

Site Surveying and Vegetation (Trees and plants) Clearance
Establishment of Work Camp, Batching and Asphalt plant and access roads
Dismantling of Asphalt and existing structures including Utilities
Preparation of ground for Asphalting
Asphalting
Landscaping

Step 4: The Risk Assessment matrix template is provided in the table below.

Risk is assessed as the likelihood that the activity will have an effect on the environment as well as the consequence of the effect occurring. It is often described like this:

Risk = Likelihood × Consequence

Likelihood Scale

Likelihood	Definition	Scale
Certain	Will certainly occur during the activity at a frequency greater than every week if preventative measures are not applied	5
Likely	Will occur more than once or twice during the activity but less than weekly if preventative measures are not applied	3
Unlikely	May occur once or twice during the activity if preventative measures are not applied	2
Rare	Unlikely to occur during the project	1

Consequence Scale

Consequence	Definition	Score
Catastrophic	The action will cause unprecedented damage or impacts on the environment or surrounding community e.g. extreme loss of soil and water resources and quality from stormwater runoff extreme pollution of soil and water resources including major contamination from hazardous materials widespread effects on ecosystems with deaths of fauna/flora widespread community impacts resulting in illness, injury or inconvenience loss or destruction of archaeological or historical sites Occurrence will almost certainly result in the work being halted and a significant fine.	5
Major	The action will cause major adverse damage on the environment or surrounding communities' e.g. major loss of soil and water resources and quality from stormwater runoff major pollution of soil and water resources including contamination from hazardous materials significant effects on ecosystems with isolated deaths of non-vulnerable flora and fauna significant annoyance or nuisance to communities major damage to or movement required to archaeological or historical sites Occurrence may result in work being halted and a fine	3
Moderate	No or minimal adverse environmental or social impacts e.g. no measurable or noticeable changes in stormwater quality. Water quality remains within tolerable limits little noticeable effect on ecosystems no or isolated community complaints no or unlikely damage to archaeological or historical sites no likelihood of being fined	2
Minor	No or minimal adverse environmental or social impacts e.g. no measurable or noticeable changes in stormwater quality. Water quality remains within tolerable limits little noticeable effect on ecosystems no or isolated community complaints no or unlikely damage to archaeological or historical sites no likelihood of being fined	1

Risk Score Table

Likelihood	Consequence				
		Catastrophic	Major	Moderate	Minor
	Certain	25	15	10	5
	Likely	15	9	6	3
	Unlikely	10	6	4	2
	Rare	5	3	2	1

Risk: Significant: 15-25
Medium: 6-10
Low 1-5

Any Medium to Significant risk requires an environmental management measure to manage the potential environmental risk. Judgement will be required concerning the application of an environmental management measure to mitigate low risk situations.

The higher the risk the more intensive the required mitigation measure will need to be; e.g. where site sedimentation is deemed to be low risk, then silt fences may be needed but as the risk increases, then sediment traps may be required. The selection of the appropriate mitigation measure will require judgement based on the level of risk and the specific site parameters.

Step 5: The Environmental Management measures are to be extracted from the EIA study for the project and should be added in the last column of the table below.

No.	Construction Activity	Hazards to Consider	Likelihood that the site or sensitive receptors will be affected?	Consequence of the site or sensitive receptors being affected?	Risk Score (consequence x likelihood)	Environmental Management Measures
i	Site Surveying & vegetation clearance	Damage to vegetation beyond project footprint				These can be taken from the EMP provided in the EIA report (If Risk Score is 6 or more)
		Erosion of exposed areas and sediment				
		Loss of topsoil				
		Dust generation				
		Noise				
ii	Establishment of Work Camp, Batching plant etc.	Soil deposited onto roads from tires				
		Stock Pile erosion				
		Noise & Vibration				
		Traffic congestion				
		Fuel spills				
iii	Dismantling of Asphalt and	Noise and vibration				
		Dust generation				

No.	Construction Activity	Hazards to Consider	Likelihood that the site or sensitive receptors will be affected?	Consequence of the site or sensitive receptors being affected?	Risk Score (consequence x likelihood)	Environmental Management Measures
	existing structures including Utilities	Community safety				
		Worker safety				
		Traffic Congestion				
iv	Preparation of Sub-Base	Noise and vibration				
		Dust generation				
		Traffic Congestion				
vi	Landscaping	Dust generation				
		Sediment runoff				
		Failure of vegetation to take root				

Step 6: The Site plans are a critical part of the SSEMP and will need to be prepared, otherwise the document will be considered as incomplete.

The site plan will need to provide the following:

- Indication of North and scale
- Existing and planned supporting infrastructure (e.g. access roads, water supplies and electricity supplies)
- Location of planned work
- Contours
- Drainage systems
- Locations of sensitive receptors

Step 7 (if required)[10]: The completed SSEMP provides details of all the environmental management requirements for all stages of the construction process. For individual work teams who are responsible for only a small part of the overall construction works it can be confusing as to what is required for their particular work component. For example, the work team responsible for stripping soil for the construction areas are not going to be interested in the requirements for pouring concrete for footings and foundations. However, it is essential that the soil stripping team knows exactly what to clear and what to leave, as well as where to put stockpiles of soil for later use.

In situations where, different work activities are required at different times or at different locations, environmental work plans can be prepared. These are similar to the work method statements that are often produced for major construction projects.

Step 8: A detailed monitoring plan will be provided along with frequency and responsibilities to ensure all key environmental parameters are monitored to ensure compliance with both national and provincial requirements.

Template for SSEMP

- Introduction
- Project Overview
- Scope of SSEMP
- Objectives of SSEMP
- Map of Sensitive Receptors
- Construction Activities
- Risk Assessment
- Risk Assessment Matrix & Mitigation Measures
- Site Plan(s)
- Environmental Monitoring Plan

[10] ADB, Safeguards Unit for Central & West Asia Department, *Environmental Management for Construction Handbook*.

- Instrumental Monitoring of Environmental Parameters by Contractor as per EMP
- In-house monitoring
- Third Party environmental monitoring
- Visual monitoring of Environmental Parameters by Contractor as per EMP
- Responsibilities
- Organizational Responsibilities and Communication
- Responsibility of EA
- Responsibility of Construction Supervision Consultant (CSC)
- Responsibility of Contractor
- Responsibility of EPA

Annexure 9: Accident and Incident Investigation Procedure

INCIDENT / NEAR MISS REPORT	QUALITY RECORDS / FORMS	
	Doc. Level:	Doc. Version:1
	Doc. No	

HS.T.02	INCIDENT / NEAR MISS REPORT	
Title of Project:		
Location:		Date:

Objective(s)

To implement immediate and effective process in order to provide immediate treatment against any fatality, Injuries, Casualty.

SECTION A: TO BE COMPLETED BY PERSON INVOLVED (OR BY SUPERVISOR OR HEALTH AND SAFETY REPRESENTATIVE IF WORKER IS INCAPACITATED) AND BY THEIR SUPERVISOR

Details of the person involved in the incident/near miss

Employee #: ..... **Site Address** ..... **Work phone:** .....

Name: ..... **Father Name:** .....

Position: ..... **Date of birth:** ..... ☐ **Male** ☐ **Female**

Please select one: ☐ Member ☐ Client Member ☐ Sub Contractor ☐ Visitor/Other

Details of the: ☐ Incident ☐ Near miss ☐ Medical

Date: ..... **Time:** ..... A.M /P.M

City: ..... **Location:** .....

Was the incident/near miss reported to your supervisor, immediately: ☐ Yes ☐ No

Part of the body injured

Head	Trunk	Internal	Arm	Hand	Leg	Foot eye
☐ neck	☐ heart	☐ left	☐ left	☐ left	☐ left	☐ ear
☐ hip	☐ lungs	☐ right	☐ right	☐ right	☐ right	☐
☐ nose	☐ chest	☐ systemic	☐ shoulder	☐ thumb	☐ knee	☐ great toe
☐ mouth	☐ stomach		☐ upper arm	☐ fingers	☐ lower leg	☐ other toes
☐ teeth	☐ groin		☐ elbow	☐ palm	☐ ankle	
☐ face	☐ back		☐ forearm		☐ thigh	
☐ skull	☐ multiple		☐ wrist		☐ upper leg	☐ psychosocial

Nature of injury

☐ abrasion	☐ puncture	☐ heart attack	☐ sprain	☐ burn	☐ traumatic shock
☐ bruise	☐ laceration	☐ hearing loss	☐ strain	☐ scald	☐ electric shock
☐ fracture	☐ amputation	☐ foreign body	☐ hernia	☐ rash	☐ psychosocial
☐ concussion	☐ bite	☐ minor cuts		☐ allergy	☐ chemical

☐ aggravation of previous injury or medical condition *(please describe)*: .....

Type of incident which caused injury

☐ striking against	☐ stumbling	☐ lifting	☐ pushing	☐ ingestion
☐ struck by	☐ slipping	☐ bending	☐ pulling	☐ absorption
☐ caught in/on	☐ tripping	☐ twisting	☐ jumping	☐ inhalation
☐ stepping on	☐ falling	☐ stress	☐ vehicle	☐ needlestick
☐ other *(please describe)*:				

Annexure 10: Traffic Management Plan

Need for Plan

The construction of the Landfill will take over 24 months and, in this period, huge vehicular movement carrying large amount of material and machinery is expected. This will definitely interrupt the local traffic and is therefore important to manage the traffic to avoid the nuisance to local residents in terms of noise, dust, congestion and inconvenience.

The plan

The Objective of Traffic Management Plan (TMP) is to define the requirements that should be implemented to mitigate any potential negative risks to the environment, workers or the community resulting from construction traffic.

- The TMP will advise and inform site Contractors and external suppliers of equipment and materials of access and entry points along with other key information such tipping areas and wash-out areas. It is intended to compliment and work alongside relevant ESMMP. The TMP will be classed as “live” and therefore be subjected to updates as required.
- Contractor, at the time of the execution of the project will prepare a comprehensive TMP in coordination with local traffic police department, PMU, emergency services and local administrative department. The PMU and CSC will review and approve contractors TMP. The contractor’s TMP shall include following mitigation measures during its preparation:
- Undertake a road conditions assessment prior to and following the peak construction period, to assess any damage to road infrastructure that can be attributed to Project construction.
- Repair damage as appropriate or enter into a voluntary agreement with the relevant roads authority to reimburse the cost of any repairs required to the public road network as a result of the Project.
- Spoil dumpsites located close to Project site to minimize journey distance and limit movements to site access roads.
- Concrete mixing plant located at Project site limiting traffic movements associated with concrete delivery to site access roads
- Construction of worker accommodation on site to reduce light vehicle movements relating to travel to/ from the site
- Provision of bus/minibus services for personnel living in nearby settlements
- Movements of construction workers will be planned to avoid the busiest roads and times of day when traffic is at its greatest.
- Schedule deliveries and road movements to avoid peak periods
- Road maintenance fund to leave a useful asset for communities after the construction phase.
- Driver training for HGV drivers and refresher course every six months for Project drivers
- Speed restrictions for project traffic travelling through communities (to be agreed with Traffic Management Authority)

- Run a safety campaign to improve the people's knowledge of the traffic hazard on their roads, public information and other activities to address the issues.
- Run a pedestrian awareness program
- Temporary signage
- The traffic management plan is provided below.
- Other Recommendations

It is important to manage public access routes during construction because it can cause delay to local traffic and create a safety hazard both on and offsite. People working and living near the project site would be annoyed by the emissions, noise and visual intrusion of queuing vehicles. Some important factors involved in access routes and site traffic are as follows:

- Public Access Routes
- The use of public road for site access may be restricted in terms of:
- Vehicle size, width and type of load
- Time limits
- Parking
- Pedestrian conflicts
- Contractor should have consultation with the local police or local authority to address these issues and to effectively manage them before the beginning of the construction.

Site Workers Traffic

Site personnel should not be permitted to park vehicles near the site boundary; this will lead to disruption in material deliveries. Designated parking area with appropriate parking space will be needed for this purpose; any plain area near construction site can be used for this purpose.

Site Rules

- Access to and from the site must be only via the specified entrance.
- On leaving the site, vehicles must be directed to follow the directions given.
- Drivers must adhere to the site speed limits.
- All material deliveries to site must keep allocated time limits.
- No material or rubbish should be left in the loading-unloading area.
- Develop a map for alternate routes showing material delivery services.
- Assign designated personnel on site to receive deliveries and to direct the vehicles.
- Monitor vehicle movement to reduce the likelihood of queuing or causing congestion in and around the area.
- Project vehicles should have a unanimous badge or logo on windscreen displaying that they belong to the project.

Contractor's Obligation

The traffic management plan of the Contractor should be safe enough and widening of access roads and construction of the detours must be completed before start of project construction activities so that heavy vehicular transportation for construction activities do not hinder the normal course of traffic lanes. While widening the access roads, the safe movement of the vehicles, people, animals and wildlife must be ensured. It will be sole responsibility of Contractor. The roads widening should be designed on the basis of the traffic survey, summarized and estimated site traffic. Contractor must ensure that road closures are carried out by a competent person. The Contractor obligation must include the display of traffic signs according to the need to divert the traffic volume and to guide the road users in advance. The traffic sign, traffic light should be placed from any diverting route or road marking.

The Contractor should consider the environmental and social impacts of the traffic during construction. It will be sole responsibility of the Contractor to implement a plan which produces minimum nuisance to the local people and to the environment. Safety of the people should be given due importance. It will be under Contractor obligation to notify the traffic management plan and its later changes to CSC, PMU, emergency services and Traffic Police, and also publish weekly program in local newspapers.

Annexure 11: Solid Waste Management Framework

INTRODUCTION

Construction contractors may use this framework as guiding document for preparation of site-specific solid waste management plan. The purpose of this Framework Solid Waste Management Plan is to ensure that wastes arising from the proposed construction works are managed, reused, recovered or disposed of by a method that ensures the provisions of the PEPA rules. It also ensures that the optimum levels of waste reduction, re-use and recycling are achieved.

Waste management priorities for project are based following waste management hierarchy.

- Prevent material wastage
- Minimize the quantity of waste
- Reuse of site materials
- Recycling of waste
- Energy recovery
- Disposal

WASTE MANAGEMENT AT PUNJAB PROJECT SITES

National Level

Waste management of the project will be carried as per national rules including:

- Solid Waste Management Policy, 2000
- Requirements of Punjab Environmental Protection Act
- Draft Guidelines on Solid Waste Management, 2005.
- Section 11 of PEPA, 1997 prohibits discharge of waste in amount that violates the NEQS.
- Draft Hazardous Substances rule of 1999
- Section 132 of Cantonment Act, 1942
- Provision Contains in the Local Government Ordinance, 2001

Regional Level

- Best practices of waste management on construction sites

Details of the wastes to be produced

During construction/civil works, potential sources of waste will include spoils generated during excavation, concrete and construction waste, domestic wastes (solid & wastewater), fuel or oil leakages or spills, onsite effluents from vehicle wash & cleaning, and cement spills. It is the responsibility of all personnel on site including Contractors, Sub-Contractors and their Employees to ensure compliance with this Waste Management Plan.

Main Waste Categories

Contractors are required to develop inventory of main waste categories that will be generated during construction phase of the project. Anticipated main waste categories include construction debris, concrete waste, scrap wood, bricks, concrete, asphalt, plumping fixtures,

piping, insulation (asbestos and non-asbestos), metal scraps, oil, electrical wiring and components, chemicals, paints, solvents.

Anticipated Hazardous Waste Arising

Fuels stored on site that will be used during the construction phase are classed as hazardous. There will be fuel stored on site for machinery and construction vehicles. All fuel tanks and draw off points will be bunded. If the fuel is correctly contained and bunded, it is not expected that there will be any fuel wastage at the site. Other sources of hazardous waste include used paints, used oil/lubricants, electrical waste and chemicals. Project contractors are required to develop SOPs for handling, storage and disposal of hazardous waste arising from the project.

ESTIMATED WASTE GENERATION

Construction Waste Generation

Project contractors are required to develop and maintain waste inventory clearly showing the type, amount and location of waste generated from different activities at the site. Waste record keeping is key to successful implementation of waste management plan.

Proposed Waste Management Options

Waste will be segregated on site. Contractor will ensure that sufficient number of waste drums are placed at site with appropriate color coding. All recyclable waste will be handed over to recycling contractor. The appointed waste contractor will collect and transfer the recyclable wastes as receptacles are filled. The non-recyclable waste will be transferred by an authorized waste collector to an appropriate facility. Project contractors will identify both recycling and non-recycling contractor working in the project area. Contractors through bidding documents will be bound to hire such waste contractors for efficient waste management at project sites.

A successful Waste Management Plan is largely dependent on how readily it can be changed in to normal site operations by the person responsible. It is recognized that the plan should not be obstructive to site operations and the construction program by placing the responsibility of construction waste management with the Manager, all reuse, recycling, wastage and necessary disposal can be monitored as close to the source as possible. An Environmental Representative from each Works Sub-Contractor will also be nominated responsible for all waste management in their own operations. In this way, it is possible to identify where the greatest material wastage occurs, with a view to implementing better management.

The site Construction Manager will be designated as the Responsible Person and have overall responsibility for the implementation of the on-site Waste Management Plan. The Responsible Person will be assigned the authority to instruct all site personnel to comply with the specific provisions of the plan. At the operational level, a nominated Environmental Representative from each sub-contractor company on the site shall be assigned the direct responsibility to ensure that the discrete operations stated in this framework for solid waste management are performed on an on-going basis.

Tracking and documentation procedures for off-site waste

The site construction Manager will maintain a copy of all waste collection permits. If waste (soil & stone) is being accepted on-site, a waste docket must be issued to the collector. If the waste is being transported to another site, a copy of the waste permit for that site must be provided to the manager. Record of waste collection docket, a receipt from the final destination of the material will be kept as part of the on-site waste management records. All information will be entered in a waste management system to be maintained on-site.

Disposal Waste

Contractors are required to develop SOP for disposal of recyclable, non-recyclable and hazardous waste generated at site. Food waste will be disposed at food waste pit which will be fenced. Recycling waste will be handed over to recycling waste contractor. Hazardous waste will be disposed through incineration facility available in close proximity of the project area. Workers on the site will be encouraged to recycle as much municipal waste as possible i.e. cardboard, plastic, metals and glass. Prior to removal, the municipal waste will be examined to determine if recyclable materials have been placed in other containers. If this is the case, effort will be made to determine the cause of the waste not being segregated correctly.

ESTIMATED COST OF WASTE MANAGEMENT

Contractors are required to estimate and budget cost for waste management through BOQ items. Such waste management cost should include cost of waste drums, cost of waste handling crew, cost of waste transportation, cost of EPA approved waste contractor services and associated incineration costs if any. By reusing materials on site, there will be reduction in transport and disposal costs for a waste contractor taking the material away.

TRAINING PROVISIONS FOR WASTE MANAGER AND SITE CREW

A waste manager will be appointed or designated by construction contractors to ensure commitment, operational efficiency and accountability during the project execution.

Site Manager Training and Responsibility

The waste manager will be given responsibility and authority to select a waste team if required i.e. members of the site crew that will aid him in the organization, operation and recording the waste management system implemented on-site. The waste manager will have overall responsibility to oversee record and provide feedback to the CSC on everyday waste management at the site. Authority will be given to the waste manager to delegate responsibility to sub-contractors where necessary and to co-ordinate with suppliers, service providers and sub-contractors to prioritize waste prevention and salvage. The waste manager will be trained in how to set up and maintain a record keeping system, how to perform an audit and how to establish targets for waste management on-site. He will also be trained in the best method for segregation and storage of recyclable materials, have information on the materials that can be reused on-site and know how to implement this Framework for Solid Waste Management.

Site Crew Waste Management Training

Training of the site crew is the responsibility of the waste manager and as such, a waste training program should be organized. A basic awareness course will be held for all crew to outline the construction waste management plan and to detail the segregation of waste at source. This may be incorporated with other training needs (e.g. general site induction, safety training etc.). This basic course will describe the materials to be segregated, the storage methods and the location of the waste storage areas. A subsection on hazardous wastes will be incorporated and the particular dangers of each hazardous waste will be explained.

RECORD KEEPING

Records will be kept for each waste material which leaves the site, either for reuse on another site, recovery, recycling or disposal. A system will be put in place to record the construction waste arising on-site. The waste manager or delegate will record the following:

- Waste taken off-site for reuse
- Waste taken off-site for recovery
- Waste taken off-site for recycling
- Waste taken off-site for disposal
- Waste (soil & stone) accepted on-site for recovery

For each movement of waste off-site, a signed waste collection docket will be obtained by the waste manager (or delegate) from the contractor. This will be carried out for each material type. This system will also be linked with the delivery records. A signed waste acceptance docket will be issued for each movement of waste on-site.

OUTLINE WASTE AUDIT PROCEDURE

Contractors are required to develop SOP for waste auditing at the construction sites. Such SOP should reflect frequency and types of waste audits, audit criteria and way forward to close non-compliances.

Responsibility for Waste Audit

The appointed waste manager will be responsible for conducting a waste audit at the site during project execution.

Review of Records and Identification of Corrective Actions

A review of all the records for the waste generated and transported off-site, as well as waste accepted, should be undertaken. If waste movements are not accounted for, the reasons for this should be established in order to see if and why the record keeping system has not been maintained. Each material type will be examined in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved. Waste management costs will also be reviewed. Upon completion of the construction phase a final report will be prepared summarizing the outcomes of waste management processes adopted and the total recycling/reuse/recovery figures for the development.

CONSULTATION WITH RELEVANT BODIES

Local Authority

Project contractors are required to maintain close coordination with focal government departments/agencies to ensure that all available waste reduction, re-use and recycling opportunities are identified and utilized.